MARKET CONCENTRATION IN INDUSTRIAL SECTOR IN INDIA SINCE 1991: EXTENT AND IMPLICATIONS

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DECLARATION

I, Madhurima Kundu, hereby declare that the dissertation entitled **"Market Concentration in Industrial Sector in India since 1991: Extent and Implications"** submitted by me in partial fulfillment of the requirement for the award of the degree of **MASTER OF PHILOSOPHY** is my bonafide work and that it has not been submitted so far in part or in full, for any degree or diploma of this university or any other university.

(MADHURIMA KUNDU)

CERTIFICATE

It is hereby recommended that the dissertation may be placed before the examiners for evaluation.

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Madhurima Kundu

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ABBREVIATIONS

2G	Second-Generation Cellular Network
A C C	Associated Cement Companies
ADA	Anil Dhirubhai Ambani
AGR	Adjusted Gross Revenue
AIDP	Addendum to the IDP
BAL	Bharti Airtel Limited
BALCO	Bharat Aluminium Company Limited
BoP	Balance of Payment
BP	Breusch-Pagan
BPCL	Bharat Petroleum Corporation Limited
BSNL	Bharat Sanchar Nigam Limited
CAG	Comptroller and Auditor General of India
CBI	Central Bureau of Investigation
CBM	Coal Bed Methane
CCI	Competition Commission of India
CD	Cross-Sectional Dependence
CMIE	Centre of Monitoring of India Economy
COAI	Cellular Operators Association of India
COVID-19	Coronavirus Disease of 2019
CR	Concentration Ratio
DGH	Directorate General of Hydrocarbons
DoT	Department of Telecommunications
DVC	Damodar Valley Corporation
E&P	Exploration & Production
ELI	Export Led Industrialisation
ENT	Entropy Index
ESS	Explained Sum of Squares
EXP	Exponential Index
FC	family conglomerates

FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GMPCS	Global Mobile Personal Communication by Satellite
GoI	Government of India
GSPA	Gas Sales and Purchase Agreement
GSPC	Gujarat State Petrochemicals Corporation
GVA	Gross Value Added
HHI	Hirschman-Herfindahl Index
HOR	Horvath Index
HS	Harmonised Commodity Description and Coding System
IAS	Indian Administrative Services
IBSL	Infotel Broadband Services Limited
IBSPL	Infotel Broadband Services Private Limited
IDP	Initial Development Plan
IIP	Index of Industrial Production
IM	Investment Multiplier
IMF	International Monetary Fund
IO	Industrial Organisation
ISI	Import Substitution Industrialisation
ITC	Indian Trade Classification
IUC	Inter-Connection Usage Charges
J S W	Jindal South West
KG	Krishna-Godavari
KG-D5	Krishna Godavari basin – site Dhirubai-5
KG-D6	Krishna Godavari basin – site Dhirubai-6
LM	Lagrange Multiplier
LNG	Liquefied Natural Gas
LoI	Letter of Intent
LPG	Liquefied Petroleum Gas
LPG	Liberalisation-Privatisation-Globalisation
MCI	Market Concentration Index

MMT	Million metric tonnes
MMTPA	million metric tonnes per annum
MoPNG	Ministry of Petroleum and Natural Gas
MoU	Memorandum of Understanding
MRTP	Monopolies and Restrictive Trade Practices
MTNL	Mahanagar Telephone Nigam Limited
MTP	Monopolistic Trade Practices
NELP	New Exploration Licensing Policy
NPCIL	Nuclear Power Corporation of India Limited
NTPC	National Thermal Power Corporation
OIL	Oil India Limited
OLS	Ordinary Least Squares
ONGC	Oil and Natural Gas Corporation (earlier, Oil and Natural Gas Commission)
PEL	Production & Exploration Licenses
PLMN	Public Land Mobile Network
PSC	Production Sharing Contract
PSTN	Public Switched Telephone Network
PSU	Public Sector Undertaking
R&D	Research & Development
RIL	Reliance Industries Limited
RINL	Rashtriya Ispat Nigam Limited
RJIL	Reliance Jio Infocomm Limited
RJio	Reliance Jio
RMS	Revenue Market Share
RNRL	Reliance Natural Resources Limited
RSS	Residual Sum of Squares
RTP	Restrictive Trade Practices
SAIL	Steel Authority of India Limited
SC	Supreme Court
SCI	Submarket Concentration Index

SCP	Structure-Conduct-Performance
SIC	Standard Industrial Classification
SMS	Subscriber Market Share
STPL	Swan Telecom Private Limited
TDSAT	Telecom Disputes Settlement and Appellate Tribunal
TechARC	Technology Analytics, Research and Consulting
TH	Tideman-Hall Index
TRAI	Telecom Regulatory Authority of India
TSP	Telecom Service Provider
TSS	Total Sum of Squares
UK	United Kingdom
UP	Uttar Pradesh
USA	United States of America
UTP	Unfair Trade Pratices
Vi	Vodafone Idea Limited
VIL	Vodafone India Limited
VSNL	Videsh Sanchar Nigam Limited
WTO	World Trade Organisation

CHAPTER 1

INTRODUCTION

The present study is an attempt to explore the level of concentration in various industries in India and the possible reasons behind it. The study then delves into the implications of market concentration on the nature of the Indian economy. The study has been done for the period after 1991. This was the year when neoliberal reforms were introduced in India.

The understanding about market concentration and market competition has evolved with changing patterns of globalisation and international trade, which in turn have been affected by evolving political and economic ideas. This evolving understanding about concentration and competition have led to changes in Competition Laws across the world, and also in India. Evolving political and economic ideas have led to changes in patterns of globalisation and international trade, leading to changes in the level and extent of concentration and also in the nature of concentration in industries. The present study in an enquiry into the reasons behind the changes in level of concentration and the implications it has for the nature of the economic system in India.

1.1 Understanding Market Concentration and Market Competition

Market Concentration is related to Industrial Organisation (IO). Before defining market concentration, let us understand the meaning of Industrial Organisation.

Cabral (2002), in his book, *Introduction to Industrial Organization*, defines "industry" in accordance with the definition 4b of the word in *Webster's New World Dictionary*. Hence, industry is defined as any large-scale business activity. Therefore, industrial organisation is equally applicable for both steel and tourism industry.

Industrial organisation concerns itself with how markets and industries work. IO is concerned particularly with how firms in an industry compete with one another. It emphasises on the study of the firm strategies that are characteristic of market interaction, price competition, product positioning, advertising, research and

development, and so forth. It is oligopoly (intermediate case between perfect competition and monopoly) that concerns IO, whereas traditional models of microeconomics focus on the extremes of monopoly and private competition (Cabral, 2000).

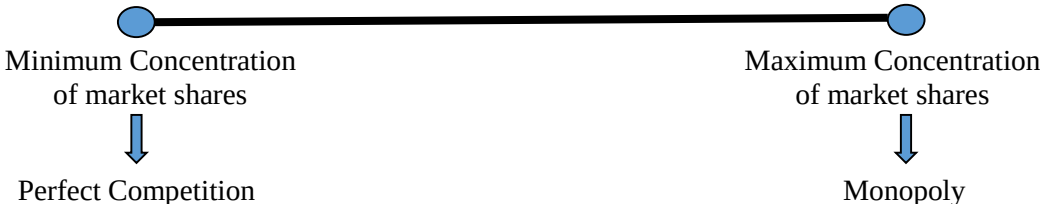
Table 1.1: Important features of Perfect Competition, Monopoly and Oligopoly

Traits	**Perfect Competition**	**Monopoly**	**Oligopoly**
Number of sellers	Many	One	Small number of large firms
Numbers of buyers	Many	Many	Many
Supply	Infinite supply at given price; decision of one seller cannot affect market supply	Supply fixed by the seller	Supply fixed by sellers; decision of one seller affects decision of other sellers, and therefore affects market supply
Nature of Competition	Perfect competition	No competition, neither product nor price competition	Non-price competition
Degree of homogeneity	Homogeneous product	Homogeneous product	Either homogeneous or differentiated product
Barriers to entry/exit	No barrier	Huge barrier	Barriers exist, but less than that in monopoly
Price of product	Given to seller; where Marginal Revenue or Average Revenue is equal Marginal Cost	Fixed by seller; where Marginal Revenue (which is less than Average Revenue) is equal to Marginal Cost	
Share of market commanded	Market is divided equally among all sellers; therefore, there is minimum concentration of market shares	Entire market is commanded by one seller; therefore, entire market share is concentrated with one seller	Different sellers command different market shares; therefore, market share for various sellers varies

Given all traits such as homogeneity of products, number of buyers and sellers, supply and demand of products, nature of competition, price and output of

products, the major trait which concerns our current discussion is the number of sellers and share of market commanded.

Figure 1.1: Relation between competition and concentration



The Oxford Dictionary of Economics (2017) defines 'concentration' as "the extent to which a market is dominated by a limited number of firms". For example, in case of a monopoly, the entire market is dominated by one firm, and therefore, there is maximum concentration in such a case. Whereas, in case of perfect competition, no one firm or few firms dominate the market, and therefore, there is minimum concentration in such a case.

Market concentration, according to all mainstream schools of thoughts of economics, is inefficient, and therefore undesirable. Governments across the world have been coming up with laws and policies to curb market concentration, so as to improve market efficiency. Such laws and policies are known as antitrust policies or competition laws.

Market concentration is an area of interest for economists, policy-makers and consumers alike. Market concentration is considered undesirable since it diminishes consumer welfare. It is a common notion that a perfectly competitive market, with no concentration, will ensure maximum consumer welfare, and therefore, optimise total welfare in the economy. However, what entails concentration and how competition is defined has changed with evolving political and economic ideas, leading to changes in policies and laws across various economies of the world to curb concentration and to promote competition. The Indian government has also followed suit.

1.2 Ideas behind Competition and Concentration

Neoliberalism, as a political and economic idea, emerged in the 1970s as opposed to Keynesianism which was adopted by many capitalist economics in the late

1930s in the wake of the Great Depression. The Great Depression, which started in 1929 and continued till 1933, was marked by high unemployment and deflation. Both labour and capital remained unemployed. Production fell drastically. Keynes (1936) argued that the real reason for sustained unemployment is lack of effective demand. Therefore, in order to raise the level of employment, efforts should be done to raise aggregate demand. Keynes criticized the classical theory that the 'invisible hand' of a free market would ensure that the economy returned to full employment. Keynes advocated government intervention and action to ensure a rise in demand to combat the crisis of unemployment. During the post-World War II period, many capitalist economies followed the Keynesian method to boost production and employment. The period saw development and use of Fiscal and Monetary policies by the government, institutional mechanisms to protect those who were hit by the depression and the rise of unionism in the US.

The phase of policy making guided by Keynesian economics ended in the 1970s with the new phenomenon of stagflation marked by high inflation and high unemployment. Philips (1958) reported an inverse relationship between nominal wage rate and unemployment in Britain. Later, in 1960, Paul Samuelson and Robert Solow developed on this empirical relationship to formulate an inverse relationship between inflation and unemployment, which is known as the Philips' Curve. Policy makers employed policies guided by Keynesian economics to control inflation and unemployment. However, with stagflation in UK in the late 1970s and early 1980s, along with in other countries, this trade-off between unemployment and inflation broke down.

Keynesian economics came under criticism from monetarists such as Milton Friedman and Edmund Phelps. Monetarists argued that the Philips Curve could shift when people in any economy expect inflation. Therefore, there can be higher rate of unemployment even at same level of inflation. Monetarists also argued that the Great Depression was a result of contractionary monetary policies. Monetarists are of the opinion that changes in money supply affects the output of an economy only in short run; in the long run, changes in money supply leads to changes only in price levels. In other words, if money supply is increased by the central bank or the government, it can lead to an increase in the level of production in the country and thereby increase

the rate of employment in the short run. However, in the long run, this increase of money supply will only lead to inflation. Therefore, the use of monetary policy was advocated to target the supply of money directly or indirectly using various instrument. One such instrument used is the interest rate.

The Chicago School, apart from giving birth to monetarist theory, had also created the ideological climate for the eventual rise of neoliberal policies. Monetarists hold that the market is inherently stable in the absence of any unexpected shock in the level of money supply. Friedman (2002) argued that a competitive economy, which is allowed to function without any form of state intervention, will essentially ensure that the economy remains stable. Competition, he argued, must be the guiding principle for economies. He also argued for privatisation over public ownership since that would ensure efficient allocation of resources. These economic policies would essentially lead to a society where people are free to choose, that is, a 'liberal' society. In such a society, individual freedom was supreme, which would guide economic efficiency and social upliftment.

The argument for a socio-economy guided by 'free choice' and 'individuality' meant going back to the Classical School of Economics. Adam Smith, one of the proponents of the Classical School, argued that the 'invisible hand' of the market in which individuals act towards their own benefit would ensure that the market allocation would be efficient and that it would lead to greater benefit of the society. Classical economics also propagated that state should not intervene in the economy, as that would lead to inefficient solutions.

The emergence of neoliberalism reiterated some of the principles of early classical economists. Neoliberalism refers to 'market-oriented' policies which aim to reduce the intervention of the state in the economy. This is done by deregulating capital markets, eliminating control over prices, lowering trade barriers and promoting competition. Proponents of neoliberal policies argue that these policies will lead to efficiency in the economy and to maximum economic growth and optimal distribution of resources. That market players be allowed to function in an environment of free competition is at the heart of neoliberal policies for effective functioning of the market. The role of the state is limited to defining property rights, ensuring that terms of contract are adhered to by all parties and in regulating the money supply.

The first implementation of neoliberal policies can be seen in the policies of Margaret Thatcher in UK and Ronald Reagan in US. Margaret Thatcher, on assuming office in 1979, privatized State-owned industries and housing, cut down the tax rate drastically, increased the interest rate to reduce inflation, deregulated the financial market and also broke the power of trade unions. Similarly, Ronald Reagan on assuming the office of the President of USA in 1981, reduced government regulation of the private sector, cut down tax rates, increased interest rates and tightened money supply to reduce inflation. Reagan also reduced government spending.

Neoliberal policies have since then been 'embraced' or 'imposed'[1] across economies. Whether the policies were embraced or imposed is a highly debated issue. Neoliberal policies guided the economies of Latin American countries such as Chile, Argentina, Paraguay, Brazil among others. The shift towards neoliberal policies wreaked havoc on many economies. India has also followed suit in adopting neoliberal policies.

India was not aloof from the international climate where neoliberal policies were gaining dominance. The IMF and the World Bank imposed certain conditions to extend help to India to overcome the economic downfall in 1991. Among multiple conditions, these included the conditions for withdrawal of government intervention in industries, cutting down government spending, making PSUs independent of the government, withdrawal of industrial licensing policies, opening up industries for private players, forgoing price controls, policy for disinvestment. The Narsimha Rao government, with Manmohan Singh as the Finance Minister, fulfilled these conditions in the form of economic reforms in exchange for aid from the IMF and the World Bank.

In the mid-term budget speech of 1991-92, then Finance Minister Dr. Manmohan Singh argued for liberalisation and privatization to take the India out of the precarious economic situation. In his speech, he said that the fiscal deficit of India stood at 8% of GDP, a sharp rise from 6% in the beginning of 1980s and 4% in mid-

[1] Chaudhary et al. (2004) charts India's relation with the IMF pre-1990s and how India did not give in to IMF's attempt to exert 'leverage' over the Indian economy in exchange for giving out loan. Petra & Brill (1986) and Ismi (2004) talks about how IMF conditionalities destroyed the economies of Latin America and Africa. Stiglitz (2002) and Easterly (2007) are a couple of books which can be read for understanding how IMF conditionalities have devastated economies and have proven to be against the poor of the countries.

1970s. The Balance of Payment (BoP) was also precarious. The Current Account Deficit had increased to 2.5% of GDP in 1990-91 from an average of 2% in earlier years. Deficits had to be financed by borrowing, leading to rise in debt. India had large borrowing from the International Monetary Fund (IMF). The foreign exchange situation was such that India had just enough to ensure imports for another two weeks as on 24 July 1991. Reforms were undertaken in this background with the objective of achieving macro-economic stability (Singh, 1991). This need led to a series of reforms which have come to be known as the LPG policies. Singh announced multiple changes in Industrial policy to curb the growth of monopolies and to promote competition between producers so as to ensure adequate incentives for increasing productivity and efficiency and for decreasing costs. He also announced the need for liberalising trade so as to ensure that domestic industries did not go away without international competition, and to ensure greater technological input for domestic industries. Singh also welcomed foreign investment and announced policies to smoothen the way for foreign direct investment. He considered Public Sector Undertakings (PSUs) as 'absorber of national savings without adequate return' and therefore were restructured (leading to disinvestment of multiple PSUs). Singh announced that PSUs would be focusing on industries of strategic importance. Focus was put on reduction of public spending to ensure good fiscal health (Singh, 1991). These reforms can be are often dubbed as neoliberal policies aimed at reducing government intervention in the economy, reducing government spending and public ownership and moving towards a free market oriented economy.

1.3 Concentration, Competition and Competition Laws in India

Post-independence in 1947, India adopted the route of a planned economy for growth and development, which essentially meant that the Government of India (GoI) could control major aspects of economic activities. In 1951, The Industries (Development and Regulation) Act was passed. This empowered the government to regulate and develop industries which were considered important for the nation's economy. All private industrial undertakings had to be registered with the government. A policy of licensing was ushered, wherein industries were given permit to produce goods upto certain level, which could be altered only by further obtaining of licence. The government could keep a check on the quantity and quality of

products and could set the prices. The stated objective of the Act was to regulate industrial development, channelise resources according to the five year plans, protect small scale industries against competition from large scale industries, encourage entry of new entrepreneurs in the market, equitable geographical distribution of industries and encourage technological improvement. Despite this, the economy experienced concentration of economic power in favour of large industrial houses. In order to curb this concentration, the Monopolies and Restrictive Trade Practices (MRTP) Act was passed in 1969. Based on the premise that concentration of economic power leads to decrease in consumer welfare, the MRTP Act sought to restrict concentration, control monopolies and prohibit monopolistic trade practices (MTP), restrictive trade practice (RTP) and unfair trade practices (UTP). Under this Act, the structure of the firm, given by its size, would be the guiding factor to analyse whether any firm was engaged in activities leading to concentration by means of MTP, RTP and UTP. Undertakings by the government, trade unions, co-operatives were exempt from the ambit of the MRTP Act.

India, in 1991, undertook economic reforms towards liberalisation, privatisation and globalization, popularly known as the LPG reforms. A series of reforms were undertaken to make the market competitive. This was based on the assumption that increasing market competition leads to increase in productivity, efficiency and decrease in costs, thus increasing consumer welfare.

The licensing policy was amended to keep only 6 key sectors under its ambit. Subsequently, the MRTP Act was amended with the understanding that the structure or size of a firm doesn't matter; what matters is whether the firm is engaging in monopolistic trade practices. The objectives of restricting concentration and controlling monopolies were diluted. However, the act was still strict with monopolistic trade practices as they were considered as anti-competitive. The requirement for prior government permission before expansion of productive capacity and for mergers and acquisitions were withdrawn. Public sector undertakings were also brought under the ambit of the MRTP Act. The objective of the MRTP Act moved towards keeping the market competitive so as to ensure consumer welfare.

In 1996, an Expert Group on interaction between Trade and Competition Policy was set up by the GoI, which in its report, submitted in 1999, suggested setting

up a regulatory agency to keep a check on anti-competitive practices which might come up during international trade and while implementing the WTO Agreements (Mehta, 2006). In 1999, a High Level Committee on Competition Policy and Law was appointed by the GoI, to suggest amendments to the MRTP Act towards a new Competition Law, in line with international developments (Mehta, 2006).The MRTP Act, which played its role in pre-1991 era in restricting concentration was obsolete in the post-1991 era which was defined by increasing globalization, international trade and rising competition, which was believed to promote productivity and efficiency. Thus, it was decided to abandon the MRTP Act for the Competition Act 2002.

The Competition Commission of India, established in 2003, claims that it was created with the goal to create and sustain an environment of fair competition such that producers get a level playing field and consumers get a range of products and services at competitive prices and welfare of consumers is ensured. The CCI is of the opinion that with increased competition, producers are forced to innovate and specialize which will lead to cost reduction and greater basket of choices for consumers (Competition Commission of India, 2015).

The primary thrust of the neoliberal policies implemented in India was opening up the economy and moving towards greater privatisation. In order for that, the policies which restricted setting up of industries or new companies had to go away. The policy of licensing had to be amended. The MRTP Act had to be amended to encourage private participation in industrial sector. Finally, the MRTP Act was replaced by the Competition Act, 2002, in order to encourage free and fair competition. It was argued that the policies of licensing, regulation and also the MRTP Act led to the problem of rent seeking. Since government had ultimate power to decide who can get to set up industries, it meant that the government could be manipulated to favour certain companies or individuals or PSUs in making more profit. Therefore, the need for a robust competition policy came up along with neoliberal reforms to curtail the issue of rent seeking.

The thrust of competition policy shifted from curbing concentration (as seen in the MRTP Act) to promoting competition (as seen in the Competition Act). However, competition and concentration are not distinct from each other. Market concentration is used to indicate the level of market competition. Markets with higher level of

competition have lower levels of concentration, and vice versa. The concentration level serves as a marker to the state of competition in the market. The neoliberal policies claim greater competition. Therefore, it should lead to reduction in level of concentration. The present study is conducted to understand the trend in the levels of concentration, the reasons behind the level of concentration, inquire into the reasons unexplained by econometric analysis and analyse the implications of concentration.

1.4 Research Objectives and Questions

The objectives and questions which of the present study addresses are as follows:

1. Analyse the trend in market concentration since 1991 in different industries in India
    - Analyse the trend of Hirschman-Herfindahl Index (HHI) and CR4 for selected industries
2. Analyse the reasons behind changes in market concentration in industrial sector in India since 1991
    - Map the determinants of changes in market concentration
    - Construct an econometric model with market concentration index as dependent variable and the determinants of market concentration as explanatory variables
3. Examine the strength of different explanatory frameworks that help understand concentration and explore the implications of concentration in understanding the nature of economy and State in India
    - Explore changes in concentration in two industries - telecommunication services and petroleum products industry – with policies and laws working behind them and analyse different explanatory frameworks that help understand these changes
    - Analyse the implication of market concentration in understanding nature of economy and State in India

The data for the analysis have been taken from CMIE Prowess Database. The case studies have been done by studying official government documents and policies and news reports. All econometric work has been done on R Studio. The dissertation is divided into 3 main chapters, with each chapter exploring one objective.

CHAPTER 2

MARKET CONCENTRATION: CONCEPT AND MEASUREMENT

2.1 Introduction

People working with or on the topic of Industrial Organisation (IO) have varied interests. As the study of IO is concerned with the structure of the market and how industries perform with regard to various performance related variables, business strategists have a keen interest in the subject. Policy makers who have the aim of increasing social welfare also take a substantial interest in the subject as it concerns competition and concentration. This interest is based on the notion that increasing concentration and reducing competition leads to monopoly power of certain firms, leading to an undesirable reduction in consumer welfare and in social welfare. IO also interests the academicians and the economists, as it is a study of markets and how firms behave within various market structures. However, for Industrial Organisation to emerge as one of the main fields of economics has taken quite some time.

Tirole (1988) observes that there have been two waves with distinct emphasis - theoretical and empirical - for IO to become one of the major fields in economics. The first wave or the 'Harvard tradition' owes to Joe Bain and Edward Mason. This wave resulted in the 'structure-conduct-performance' paradigm, which suggests that the structure of the market (identified by the number of sellers, degree of product differentiation, cost structure, degree of vertical and horizontal integration, etc) affects the conduct of industries (in terms of price, advertising cost, expenditure on Research and Development, etc), which in turn affects the performance of the industry in the market (measured in terms of profit, margin, efficiency, etc). A typical regression consisted of a measure of market concentration or barriers to entry as one of the explanatory variables and some measure of industry performance (such as profit or price-cost margin, efficiency etc) as the dependent variable. The second wave of interest in IO started in the 1970s in a response to the limitation of the empirical approach. This wave came as an attempt to give a theoretical approach to Industrial Organisation.

The present chapter gives a conceptual overview of the various measures of market concentration. It then moves onto the study of the level of market concentration in various industries in India. Various scholars have calculated different measures of market concentration so as to give an index of concentration which captures essential structural features of any market. However, only a few indices are used by governments and regulatory authorities to determine the nature of the industries. In the context of our present study, the conceptual framework of these indices have been explored in details. Calculation of selected indices have been done to study the level and trend of market concentration in various industries.

2.2 Literature Review

The current section discusses the existing literature on various indices of market concentration, and the theories behind the need to develop such indices. It compares the various advantages and disadvantages of multiple indices. While a substantial part of the literature review pertains to the cumulative indices of market concentration, the discrete index of market concentration has also been discussed.

Concentration index is a single aggregate index that captures the distribution of market shares among firms (Tirole, 1988, p. 221). It has been used as a measure to describe the extent to which the structure, and consequently the conduct and performance, of an industry approximates competition or monopoly conditions (Bailey & Boyle, 1971). Various economists have given different indices to measure market concentration. The n-firm concentration ratio (CR) was one of the initial measures of concentration. This index reflected the share in the market held by n-firms. ‘n’ could be 3 or 4 or 6 or 8. So, if we are finding the 4-firm concentration ratio, the index would give the percentage of market captured by the top 4 firms. A study of existing literature about measuring concentration shows other measures of concentration such as – Hirschman-Herfindahl Index, Horvath Index, Entropy Index, Exponential Index, Tideman-Hall Index (Hall & Tideman, 1967), Ginevičius Ginevičius Index (GIN), GIS Index and GRS Index (Ginevičius & Čirba, 2009).

Table 2.1: Various cumulative indices of Market Concentration

Hirschman-Herfindahl Index (HHI)	$HHI = \sum_{i=1}^{n} s_i^2$	where, n = total number of firms in an industry s_1 = market share of largest firm in the industry s_i = market share of i^{th} firm in corresponding industry
Horvath Index (HOR)	$ENT = s_1 + \sum_{i=2}^{n} s_i^2(2 - s_i)$	
Entropy Index (ENT)	$ENT = \sum_{i=1}^{n} s_i \ln\left[\frac{1}{s_i}\right]$	
Exponential Index (EXP)	$EXP = \prod_{i=1}^{n} s_i^{s_i}$	
Tideman-Hall Index (TH)	$TH = \frac{1}{2\sum_{i=1}^{n} i s_i - 1}$	
Ginevičius Index (GIN)	$GIN = \sum_{i=1}^{n} \left[\frac{s_i}{1 + n(1 - s_i)}\right]$	
GIS Index	$GIS = [1 + \sum_{i=1}^{n-1} \frac{s_{i+1}}{s_1} . \frac{n + 2 - 2(n-1)(s_{i+1} - s_i)}{n + 2 - n(s_{i+1} - s_i)}] s_1^2$	
GRS Index	$GRS = \sum_{i=1}^{n} \left[\frac{n^2 s_1 + 0.3 s_i^2}{n^2 + o.3 n s_1 s_i} s_i\right]$	

Hall & Tideman (1967) analyses the CR based on the 6 properties of measures of concentration put forward by them. The criterias are - (i) the measure should be one-dimensional, that is, it should be comparable across industries, (ii) the measure

should be independent of the size of the whole industry, that is, it should be some function of the relative share of all firms in the industry, (iii) the measure should change if there is a change in relative share of the firm in the industry, (iv) if an industry, say A, has $k\ times$ the number of firms in another industry, say B, given $k > 1$, and if the shares of firms in industry A, s_i^A, are distributed such that corresponding to share of each firm in B, s_i^B, there are $k\ firms$ of size $\frac{s_i^B}{k}$, then the measure of concentration in industry A should be $\frac{1}{k}$ times the measure of concentration in B, (v) the measure should be a decreasing function of N, when an industry is divided into N equal sized firms, (vi) the measure should range between 0 and 1, with 0 signifying perfect competition and 1 signifying a monopoly. CR does not fulfil Hall & Tideman's 6 properties. n-firm CR is not affected by change in relative share of firms which are not in the top n ranks since it considers only n firms in its calculation. Also, it does not include the relative share of all the firms. Hall and Tideman conclude that using only the market shares of the largest firms and giving them equal weights, irrespective of the differences in market shares among those largest firms, are the reasons why CR fails to satisfy the other properties.

Criticism of n-firm CR also stems from the arbitrariness with which n is chosen. There is no economic theory to reason the choosing of n. Apart from this, CR doesn't represent the true level of concentration in an industry. For example, a 4-firm CR gives the market share held by the largest 4 firms, thereby excluding, in its calculation, all other firms in the industry. Also, the distribution of market share even within the 4 firms cannot be understood from the single 4-firm CR (Ginevičius & Čirba, 2007). Say, there are 2 industries - A and B. In industry A, the largest 4 firms have market shares - 40%,30%,10%, 10%. In Industry B, the largest 4 firms have market shares - 70%, 10%, 5%, 5%. The 4-firm CR for both industry A and industry B is 0.9. However, even a glance at the individual market shares shows that industry B is more concentrated. However, the 4-firm CR doesn't capture this. Mishra, Mohit & Parimal (2011) even went on to mention in passing that they 'do not consider the n-firm concentration ratio as the defining measure of market structure since it is highly sensitive to the choice of *n*'. This was a paper where the authors compared various indices of concentration with respect to Indian manufacturing sector, and they did not include CR in the comparison.

However, everyone accepts the simplicity of the n-firm CR. The data for the same is easily available and can be calculated easily, without the need for lots of statistical information. The advantage ends at that. To sum up, CR is appreciated for its simplicity and criticised for being not as accurate as other measures of concentration. In their quest to find the optimal measure of concentration, Bailey and Boyle (1971) compared the discrete and the cumulative measures of concentration. Discrete measures include n-firm CR, while cumulative measures are Herfindahl Index, Hall-Tideman Index and others such as Entropy Index and Horvath Index. Given all the advantages and disadvantages of both the discrete and the cumulative measures of market concentration, the question is whether the discrete measures "yield results which differ significantly from those obtained from other measures" (Bailey & Boyle, 1971). They conclude that irrespective of firm size distribution for any given industry, there are hardly any differences between variations of CR or between variations in Herfindahl Index. The authors also underline that the 4-firm CR estimate is at least as good as or superior to other estimates of market concentration, and thus, for reasons of economic efficiency and the index being comparable to other indices, CR-4 should be used.

Among both the discrete and cumulative measures of concentration, the Herfindahl Index or the Hirschman-Herfindahl Index, commonly known as the HHI, is the most widely used measure. Orris C. Herfindahl, in his doctoral thesis at Columbia University in 1950, developed a measure of concentration by squaring the market shares of firms in an industry and then adding them up. A similar measure was developed by Albert O. Hirschman in 1945, independently. The index came to be known as the Hirschman-Herfindahl index. Ginevičius & Čirba (2007) criticised the HHI for giving more weight to firms with a larger share in the market, and being insensitive to firms with smaller shares in the market. This happens since HHI is calculated by adding the squares of the market shares of the firms. HHI is not useful in research conducted to analyse the effect of entry of small firms in the market. However, to analyse competitiveness, HHI is sufficient (Ginevičius & Čirba, 2007). Hall and Tideman (1967) argues that though HHI satisfies all the 6 properties that a measure of concentration should have, it is not 'ideal' since HHI is dependent only upon relative market shares of firms in an industry, and not on the absolute number of firms in the industry. They argue that the absolute number of firms in an industry is an

important indicator of barriers to entry, and thus should be included in calculating a measure of concentration. Milne (1992) criticised the HHI as being unable to capture product market differentiation. Milne explains that product market differentiation leads to firms gaining market power. For example, if there is a merger of firms with similar (not homogeneous, but differentiated) products and the products are marketed to the same segment, the demand curve becomes steeper. Therefore, the inelastic demand raises the market power of the merged firm. However, if firms with homogenous products merge, the demand elasticity does not decrease, therefore leading to no significant change in market power. Milne argues that HHI assumes homogeneity of products, and therefore fails to capture changes in market concentration in markets where products are differentiated, and this can be a problem for policy makers trying to restrict mergers which restricts competition in the market. Rhoades (1993), in a technical note, stresses the importance of HHI in the "analysis of competitive effects of bank mergers". However, he also says that detailed economic analysis of mergers is required to understand the state of competition, and HHI is efficient in being a "screening device for regulators and planning tool for bankers".

One of the criticisms of HHI stems from the requirement of having data of market share of all firms in an industry. To overcome this, Naldi and Flamini (2017) came up with a method of calculating the upper and lower bound of HHI in absence of all the data. They gave a method of calculating the upper and lower bound of HHI even when market shares of only the largest firms are known or market share of the largest firms and a few scattered ranked firms are known.

The TH index, the Market Concentration Index, the Horvath Index came up as a direct attempt at overcoming the shortcomings of the HHI. Hall and Tideman (1967) developed a measure of concentration to overcome their criticism of the HHI. They came up with a measure to ensure that the absolute number of firms is emphasized, which was neglected in the HHI. The measure was such that it "weighted each firm by its rank - the i^{th} largest firm receiving weight i. The measure was defined as $TH = 1/(2\sum_{i=1}^{n} iP_i) - 1$. This measure satisfies all the 6 properties for an ideal measure of concentration forwarded by them. However, in their comparison between CR, HHI and TH, they argued that the correlation between CR and TH was slightly less than the correlation between CR-HHI and HHI-TH. They concluded that "if HHI or TH is the correct measure of concentration then the concentration ratio is certainly a good

proxy. The CR may not be a good measure of monopoly but as a measure of concentration, it seemed to hold up." Lack of availability of robust data prevented the authors from further exploring the subtle linkages between TH and HHI.

Milne (1992) developed the Market Concentration Index (MCI) in an attempt to overcome his criticism of HHI being unable to capture product differentiation. Calculating MCI involves identifying submarkets within markets, different brands of the same firm, calculating a Submarket Concentration Index (SCI), and then using it to calculate MCI. He argued that MCI is better suited to detect anticompetitive practices in markets with high degree of product differentiation, and therefore should be used by regulators to ensure competition in markets.

Horvath Index is calculated by adding the market share of the single largest firm with the sum of squares of weighted market shares of remaining firms. Horvath named his index as the 'Comprehensive Concentration Index (CCI)'. However, we will call it the Horvath Index. Horvath (1970) argued that 'for the purposes of HOR, the role of the largest firm is simple: its share in the industry; however for the remaining firms, it is the square of the market share it commands multiplied by one plus the market share it does not have" (Horvath, 1970). He further argued that the HOR brings together the two types of indices of market concentration - the absolute percentage measures (or discrete measures such as CR) and the relative dispersion measures (such as the Lorenz curve, Gini coefficient), and therefore, overcomes the disadvantages of both. Though the HHI had overcome the criticism of the relative dispersion measures of not being able to shed light on the degree of concentration among the large firms, yet it had its own shortcomings. Thus, there was a need for a Comprehensive Concentration Index "which had the power to include significant characteristics of both major types of measures" (Horvath, 1970). HOR, by incorporating the absolute market share of the dominant firm, retained the characteristics of the percentage measure, and built on it to incorporate market shares of other firms. It is similar to the HHI, yet distinct in its treatment of the dominant firm. Horvath argues that this dual treatment of the dominant firm and the rest of the firms increases the divergence between them, and gives more importance to the dominant firm. However, this is not a flaw, but is based on theoretical understanding that the larger the share of the dominant firm, the more the market is concentrated.

Horowitz (1972) argued that the HOR had two fundamental flaws in relation to merger analysis. The first flaw stems from HOR being solely a function of the smaller firms in case the dominant firm acquires the smaller firm. The second flaw stems from the situation that HOR may fall in case the dominant firm captures part of the market share of one of its competitors. However, Horvath (1972) refutes both the criticisms.

Ginevičius & Čirba (2007) and Mishra, Mohit and Parimal (2011) argue that the formula of HOR is such that it eliminates the problem of giving larger weights to dominant firms, as was the case with HHI. The Horvath Index gives weights larger than those given by HHI for all firms. However, they argue that the reason for taking the market share of the single largest firm separately has no theoretical backing. The reason why the market share of the largest two or three or four firms is not considered separately, and why the market share of only the largest firm is considered is not theoretically explained. Also, the cumulative part of the formula is not clear. The value for the cumulative part for firms with higher market share ranges from 1.5 to 2, while for firms within lesser market share has the value at about 2 (Ginevičius & Čirba, 2007). If market share of a firm increases, the value of a measure of concentration should increase. However, the Horvath Index reduces with increase in value of market share of a firm (Ginevičius & Čirba, 2007; Ginevičius & Čirba, 2009).

The Entropy Index (ENT) for market concentration was forwarded by Horowitz & Horowitz (1968). They drew an analogy between the concept of entropy (a measure of degree of randomness in a system) of communication theory and industrial concentration, and thereafter analysed concentration in the brewing industry between 1944 and 1964. In case of monopoly, where there is no randomness as to selecting the firm from which the consumer will buy goods, ENT equals 0. In case of perfect competition, where every firm holds a market share of (1/n), n being the total number of firms in the industry, ENT equals $\sum_{i=1}^{n} s_i \ln\left(\frac{1}{s_i}\right)$. ENT rises with increase in n as competition or randomness increases with increase in the number of firms. ENT ranges between 0 and $\ln(n)$. "As a measure of industry concentration, ENT has the property of being analogous to industry competition, since ENT varies directly with degree of competition and uncertainty as to which firm a buyer chosen at random

would purchase from " (Horowitz & Horowitz, 1968). The authors argue that the Entropy Index takes into account both market shares of firms and total number of firms. Suppose there are 2 industries - A and B, with A having many more firms than B. However, ENT can be lower for A, indicating less competition in industry A than in industry B. This happens in a situation where there are a few firms dominating industry A and the remaining market share distributed more or less equally among others. Therefore, ENT is not solely dependent on the number of firms in an industry. Now say, an industry moves towards equalization of market shares among its firms. However, this won't guarantee an increase in ENT depicting a rise in competition, if the equalization of market shares happens simultaneously with decrease in number of firms. Thus, ENT is also not solely dependent on market shares of firms. ENT, therefore, overcomes one of the criticisms of HHI - that HHI is dependent solely on relative market shares, and not on the absolute number of firms in an industry. Ginevičius & Čirba (2009) and Mishra, Mohit and Parimal (2011) argue that ENT overcomes the problem of HHI giving more than required weightage to larger firms, and much lesser weightage to smaller firms. However, Ginevičius & Čirba (2007; 2009) questions ENT on this theoretical underpinning as to why the concept of entropy of communication theory be used as a measure of concentration. Also, they criticise Entropy Index as measuring competition, and not concentration. In case of pure monopoly, there is no randomness or entropy in consumer's decision of buying a product from a firm, since there is only one firm. Thus, there is no competition, and Entropy is 0. In case there are many suppliers and there is competition, there is uncertainty. Uncertainty rises with increasing numbers of firms. So, entropy is more of a measure of competition, than a measure of concentration. "Entropy can be treated as a measure of competition, depending on market structure and performance, and strongly affected by a concentration measure (Ginevičius & Čirba, 2007; Ginevičius & Čirba, 2009)." Another criticism of the Entropy Index arises as Entropy value decreases with increase in market share of a firm.

Ginevičius (2005), Ginevičius & Čirba (2007) and Ginevičius & Čirba (2009) gave the GIN index, the GIS index and the GRS respectively in their subsequent attempts to overcome the criticisms of the various indices of measurement. They argue that existing literature criticises the HHI as giving larger weights to firms with higher market share, and smaller weights to firms with smaller market share, thereby

not truly representing the impact of smaller firms on the market dynamics even if they are present in the market in considerable numbers. Both the Entropy Index and the Exponential Index overcomes this criticism by giving weights such that the weights given to firms with larger market share decreases, and weights given to firms with lower market share increases. The Horvath Index assigns larger weights to all firms, and also breaks the measure of concentration into a discrete part (capturing the share of the largest firm), and an additive part (capturing the share of other firms). The Hall-Tideman Index overcomes the criticism of HHI giving importance only to relative market shares of firms, and not to absolute number of firms, by including the number of firms in its calculation. However, relative contribution of firms to either ROS or TH Index differs even if the market share of all the firms are equal. This is why, according to Ginevičius & Čirba (2007; 2009), neither is a suitable measure of concentration. The GIN Index, like the Hall-Tideman Index, includes both the number of firms and relative share, however underestimates the level of market concentration when market share is highly skewed in favour of one or few firms. For example, if a market has only 2 firms, which the first holding 90% of all market shares, the value of GIN is equal to 0.786. This value underestimates the true level of concentration (Ginevičius & Čirba, 2009).

The GIS index was given by Ginevičius & Čirba (2007) in an attempt to find a better measure of concentration. In 2009, the authors gave another measure of concentration, the GRS, which fulfills the 3 criteria forwarded by them – (i) GRS should be between 0 and 1, i.e, $0 \leq GRS \leq 1$, (ii) If market share of all firms are equal, i.e., when $s_i = \frac{1}{n}$, $i = 1, 2, 3, \ldots, n$, then $GRS = \frac{1}{n}$, and (iii) the value of R should be smaller than its value calculated using other indices of market concentration. $R_j = \sum_{i=1}^{n} |P_i - P_i^*|$, where R_j is accuracy criterion of the j^{th} concentration measure and P_i^* is i^{th} firm's market share according to the j^{th} concentration measure (Ginevičius & Čirba, 2009). The lower the R for a given measure of concentration, the better is the measure. Ginevičius & Čirba (2009) showed that the R for GRS is actually zero, and therefore, is the best measure which can be used for both theoretical research and practical calculations.

Despite all the indices available, HHI and CR4 are the most used indices in the analysis of actual markets and in policy making. Mehta (2006) and Saraswathy (2019)

has analysed product concentration using HHI and CR4. The Competition Act of India uses HHI to make guidelines on what constitutes a threat to competition. The CCI, in its reports and assessments, has used HHI only. The Department of Justice and the Federal Reserve of the US has used HHI extensively to analyse competitive effects of mergers (Rhoades, 1993).

The overwhelming use of HHI and CR4, despite their shortcomings, lays in the ease of calculating and interpreting them. Therefore, in the analysis of industries in India, these two indices will be used.

2.3 Data Source and Methodology

The data for the current and subsequent chapter is taken from CMIE Prowess database. Data for 38 industries, based on CMIE's own classification, between 1992 and 2018 is used to calculate the indices. A brief discussion about the CMIE ProwessIQ database in given in this section, followed by a discussion on the methodology used in calculating the indices and analysing the level of market concentration.

2.3.1 CMIE Prowess Database

The Centre for Monitoring of Indian Economy (CMIE), established in 1976, is a private limited company. It provides data regarding various macroeconomic indicators of the Indian Economy and consolidated data of government and private companies. It publishes regular reports on the Indian economy.

The Prowess database of CMIE is the database which contains data on financial performance of Indian companies. This database has information on all listed companies as well as many unlisted companies. The Prowess database is made accessible to customers via ProwessIQ (or Prowess Interactive Querying) which is an "internet-based application for querying" (ProwessIQ, CMIE) the database.

The Prowess database does not have any filtering criteria for inclusion of companies in the database. If annual audited profit and loss statement and balance sheet of a company is available or prices of the shares of the company is available from either NSE or BSE or the quarterly financial statements of the listed companies are available, then the company is included in the database.

Not only information regarding companies are available, but also information of cooperatives or banks, which are not companies, or a statutory body, given that the entity produces an Annual Report based on audited annual accounts and is available with the CMIE (ProwessIQ, CMIE).

Information regarding companies are never deleted, even if the company ceases to exist. Data of a private limited company is deleted only on request by that company (ProwessIQ, CMIE).However, CMIE Prowess does not have the data for all registered business enterprises in India. Registered companies which fail to operate in the market are not accounted for in the database. Only those companies which are operational and are able to provide with audited Annual Reports are added to the database, resulting in a large number of small companies never getting included in the database. Also, since Annual Reports of private limited companies, small or large, are not mandatory to be available for public, many large private companies also remain outside the purview of the database as information on such companies is not available (ProwessIQ, CMIE).

As of 2016-17, the Prowess database covered a mere 4.5% of the registered companies. Despite this, the CMIE claims that "Prowess is significant as it covers a fairly large proportion of the business conducted in India" (CMIE). In 2016-17, the total income of all the companies in the Prowess database was approximately 82% of India's GDP. In the same financial year, the value of output of all companies in Prowess was around 48% of the total value of output in the non-agriculture and non-government services sector and the value of output of all manufacturing companies in Prowess was at 73% of the value of output of the manufacturing sector of India. Companies included in Prowess in 2016-17 accounted for nearly half of India's external trade – they covered around 49% of India's exports and around 60% of India's imports. Corporate taxes paid by the companies in the database accounted for 61% of all taxes paid by business enterprises in the same year (ProwessIQ, CMIE). These figures show that despite Prowess not covering all registered business enterprises, the companies covered by Prowess account for a substantial proportion of business conducted in India.

There is lack of availability of data of all registered business enterprises. Prowess has the most comprehensive data available currently. However, Prowess does have a shortcoming as it does not cover all registered business enterprises. Also, over

the years, the coverage of Prowess has increased. This increase in coverage is not necessarily in line with increase in number of registered business enterprises. As a result, analysis of the indices and level of concentration must be done with caution.

2.3.2 Classification of Industries in Prowess

The ProwessIQ Database (CMIE, 2020) details out the classification of industries and explains all the categories and variables. In the Prowess database, CMIE has classified the products/services in the form of a 'tree-like' structure. At the broadest level, it is a set of groups of products/services, which then branches out into individual products/services, and then branches out further based on more narrow classification. The product and services classification developed by CMIE is based on the Indian Trade Classification (ITC) (which itself is based on the Harmonised Commodity Description and Coding System or the HS). As ITC does not cover services or utilities, CMIE has added these classifications. A company is classified under a particular industry if more than half of its sales originates from the particular industry or industry group.

CMIE classifies all industries into 4 groups – (i) Non-Financial, (ii) Financial Services, (iii) Irrigation, and (iv) Diversified. The analysis here is limited to industries under Non-Financial Industries. Based on the study of Mishra et. al. (2011) and after a study of the classification of industries given by CMIE, the following industries were chosen for the analysis:

1. Food & Agro based Products
   (a) Food Products (without beverages)
   (b) Beverages & Tobacco
2. Textiles
   (a) Cotton & Blended Yarn & Cloth
   (b) Synthetic Textiles
   (c) Textile Processing
   (d) Readymade Garments
   (e) Diversified Cotton Textile
   (f) Other Textiles
3. Chemicals & Chemical Products
   (a) Alkali ('caustic soda' in Prowess)
   (b) Inorganic Chemicals
   (c) Fertilisers
   (d) Pesticides
   (e) Dyes & Pigments
   (f) Drugs & Pharmaceuticals
   (g) Organic Chemicals
   (h) Polymers
   (i) Plastic Products
   (j) Petroleum Products
   (k) Rubber Products
   (l) Other Chemical Products

4. Consumer Goods
   (a) Cosmetics, toiletries, soaps & detergents
   (b) Domestic Appliances
5. Construction Materials
   (a) Cement
   (b) Paints & Varnishes
6. Metals & Metal Products
   (a) Ferrous Metals
   (b) Non Ferrous Metals
7. Machinery
   (a) Non electrical machinery
   (b) Electrical machinery
   (c) Electronics
8. Transport Equipment
   (a) Automobile
   (b) Automobile Ancillaries
   (c) Tyres & Tubes (part of automobile ancillaries)
9. Mining
   (a) Mining
10. Electricity
    (a) Electricity
11. Services (other than financial)
    (a) Hotels & Tourism
    (b) Retail Tourism
    (c) Telecommunication Services
    (d) Information Technology

2.3.3 The Dataset

The data for **'Sales'** for the 38 industries between 1992 and 2018 was extracted from the Prowess Database using ProwessIQ. Prowess defines **'Sales'** as all regular income (that is, income excluding income from prior periods and income from extra-ordinary transactions) generated by companies from clearly identifiable sale of goods and from non-financial services (ProwessIQ Database, CMIE, 2020). **'Sales'** value has been used to calculate market share of companies. Also, data for **'Total Income'**, **'Total Expenses'**, **'Selling & Distribution Expenses'**, **'Profit after Tax'** and **'Total Assets'** was extracted. The definitions of these datafields will be given in the next chapter.

Observations where any of the datafields were missing were dropped, leading to a loss of 23.86% observations. The total number of observations finally stood at 150497. The distribution of the number of firms used in the calculations for each year and in each industry is given in Table 2.2.

Table 2.2: Number of companies in each industry in each year

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Alkali	9	9	9	11	12	13	11	11	10	10	9	9	9	9	9	9	9	9	9	10	10	9	10	11	9	9	9
Automobile	15	15	15	18	17	17	17	19	20	20	23	21	21	21	22	24	23	25	31	26	27	27	42	47	49	48	47
Automobile Ancillaries	109	123	146	153	157	160	167	195	238	242	220	254	270	294	304	323	343	358	364	343	357	371	602	668	669	667	668
Beverages & Tobacco	80	83	98	114	120	114	119	164	166	161	165	189	192	217	220	226	223	226	240	221	212	193	212	234	243	225	238
Cosmetics & Toiletries	19	22	24	36	38	34	37	39	41	42	42	50	53	54	51	53	50	45	45	41	45	45	76	83	83	83	89
Diversified Cotton Textile	4	6	6	6	8	6	6	8	9	9	8	9	9	12	12	12	14	15	16	13	12	13	12	12	12	13	13
Cotton Blended & Yarn Cloth	162	175	217	238	246	247	258	261	251	249	289	321	296	331	347	353	372	398	395	353	323	302	387	417	412	416	420
Drugs & Pharmaceuticals	99	115	146	190	206	190	208	222	228	221	219	250	289	306	320	336	339	353	368	350	334	321	395	440	461	450	463
Dyes & Pigment	17	22	30	33	31	33	33	37	39	34	37	49	47	47	47	49	51	51	58	55	56	55	65	66	71	71	71
Electrical Machinery	59	66	82	94	100	99	94	112	112	118	116	145	150	150	163	173	187	195	199	192	203	202	301	327	326	320	313
Electricity	19	19	21	24	22	22	26	32	29	36	46	67	79	99	112	116	132	145	151	149	162	177	214	244	234	242	247
Electronics	51	64	81	96	101	97	89	103	105	113	106	144	155	164	170	186	186	194	189	185	191	199	304	373	385	372	369
Ferrous Metals	185	210	271	305	295	281	312	361	373	379	377	421	454	545	623	667	688	751	776	711	673	698	894	966	980	957	1001
Fertilisers	25	31	31	32	32	31	30	30	29	27	29	41	39	40	42	39	35	40	46	45	45	43	54	61	63	65	62
Food Products	212	248	320	383	392	353	374	452	459	464	466	535	548	624	649	666	664	686	731	673	649	600	831	916	914	903	957
Information Technology	15	26	45	66	69	79	101	133	186	237	250	274	285	312	322	338	359	366	366	337	351	351	492	551	569	566	542
Inorganic Chemicals	25	29	38	41	36	38	43	42	44	40	42	52	57	56	56	56	53	58	60	64	55	52	71	84	80	80	78
Non Electrical Machinery	131	144	157	163	172	163	167	170	176	183	190	221	251	263	278	303	301	302	318	318	320	310	515	626	625	600	605
Non Ferrous Metals	35	42	51	58	56	50	45	55	56	53	56	60	69	75	89	98	100	106	110	113	105	102	134	147	147	144	156
Organic Chemicals	33	42	55	59	65	63	66	65	59	66	63	67	83	83	79	79	83	86	81	75	70	68	93	100	99	101	101
Other Chemical Products	43	49	53	62	69	66	73	81	82	82	88	110	112	135	139	143	156	162	165	163	156	159	210	221	227	213	226
Other Textiles	35	44	60	73	79	79	82	91	93	96	99	110	110	131	130	138	137	141	160	148	142	136	164	173	175	173	175
Paints & Varnishes	10	10	13	13	13	15	17	18	20	22	21	21	24	20	19	17	17	18	20	17	18	19	34	36	39	41	37
Pesticides	17	26	24	33	33	32	42	49	49	41	40	55	59	65	62	61	61	63	65	57	56	53	67	70	75	72	73
Petroleum Products	18	21	24	25	27	22	25	26	29	33	30	37	35	40	38	38	39	37	37	39	39	31	45	54	54	52	55
Plastics Products	53	85	120	156	169	169	161	162	168	176	183	205	225	246	235	244	251	276	289	286	268	269	357	397	398	391	403
Polymers	12	11	14	19	22	21	26	27	26	26	23	27	28	30	28	31	35	38	34	33	30	31	45	55	56	56	50
Readymade Garments	12	11	19	30	38	33	40	43	49	48	51	74	75	71	81	88	95	99	93	93	86	89	138	146	154	144	151
Rubber Products	11	15	23	22	30	35	34	36	34	32	39	48	54	55	62	65	64	67	68	64	53	46	78	91	92	89	89
Synthetic Textiles	45	52	60	65	65	63	65	64	65	64	67	73	69	71	71	69	73	77	81	78	70	69	77	83	81	81	83
Textile Processing	15	34	46	59	60	48	49	49	42	40	45	47	51	56	58	59	63	65	61	54	59	50	59	61	66	66	62
Tyres & Tubes	13	14	17	16	17	18	19	20	18	19	20	22	22	21	24	22	23	23	25	23	23	26	28	27	25	26	25
Domestic Appliances	35	43	48	45	43	42	41	41	47	48	47	53	58	59	57	57	58	61	66	67	67	68	97	106	112	109	111
Cement	48	53	60	62	62	60	56	58	57	56	57	60	62	64	65	68	73	74	79	74	70	75	83	83	85	80	79
Mining	34	39	42	45	58	56	59	59	60	56	58	68	82	79	89	86	104	102	112	105	102	100	115	114	122	111	109
Hotels & Tourism	28	38	51	62	66	72	74	78	85	92	104	137	159	181	209	218	234	254	257	245	255	253	325	380	419	410	410
Retail Trading	11	12	23	27	34	36	32	39	48	55	54	73	74	94	110	125	144	162	170	181	198	196	320	385	410	387	381
Telecommunication	4	5	6	6	12	17	19	27	29	40	46	48	53	56	55	54	59	66	63	63	65	68	82	92	86	75	76

Source: Calculated by author from ProwessIQ database of CMIE

Table 2.2 shows that, for any industry, the number of companies which were included have increased substantially between 1992 and 2018. This follows from the fact that the coverage of companies by CMIE has increased over the years. It is also to be noted that this increase in the number of companies is not proportional to the increase in the actual number of companies, but is mostly a result of increased coverage by CMIE.

The calculations and graphs have been made in RStudio, an open source software.

2.3.4 Indices of Concentration: HHI and CR4

The indices of market concentration – HHI and CR4 - were calculated in the RStudio software.

The entire time period between 1992 and 2019 was divided into 6 periods:

Period I:	1992 – 1995	Period IV: 2006 – 2010
Period II:	1996 – 2000	Period V: 2011 – 2015
Period III:	2001 – 2005	Period VI: 2016 – 2019

The mean HHI and CR4 was calculated for each industry for each period. A modified dumbbell graph was constructed. A dumbbell graph shows movement between two periods. In the modified dumbbell graph, which has been created, the movement of HHI and CR4 between all the 6 periods have been shown using 'bells' of different colours and sizes. The plot area was divided into segments with gradient colour to differentiate between various market structure based on values of HHI and CR4. The criteria used for this has been given in Table 2.3 and Table 2.4.

Table 2.3: Market Structure based on HHI

Value of HHI	Likely Market Structure
< 1500	Unconcentrated
1500 – 2500	Moderately Concentrated
> 2500	Highly Concentrated

Source: (Saraswathy, 2019)

Table 2.4: Market Structure based on CR4

Level of CR4	Likely Market Structure
CR = 0	Perfect Competition
0 < CR4 < 40	Effective Competition or Monopolistic Competition
40 ≤ CR4 ≤ 60	Loose Oligopoly or Dominant Firm with Competitive Fringe
60 ≤ CR4 < 90	Tight Oligopoly or Dominant Firm with Competitive Fringe
90 ≤ CR1	Effective Monopoly (Near Monopoly)

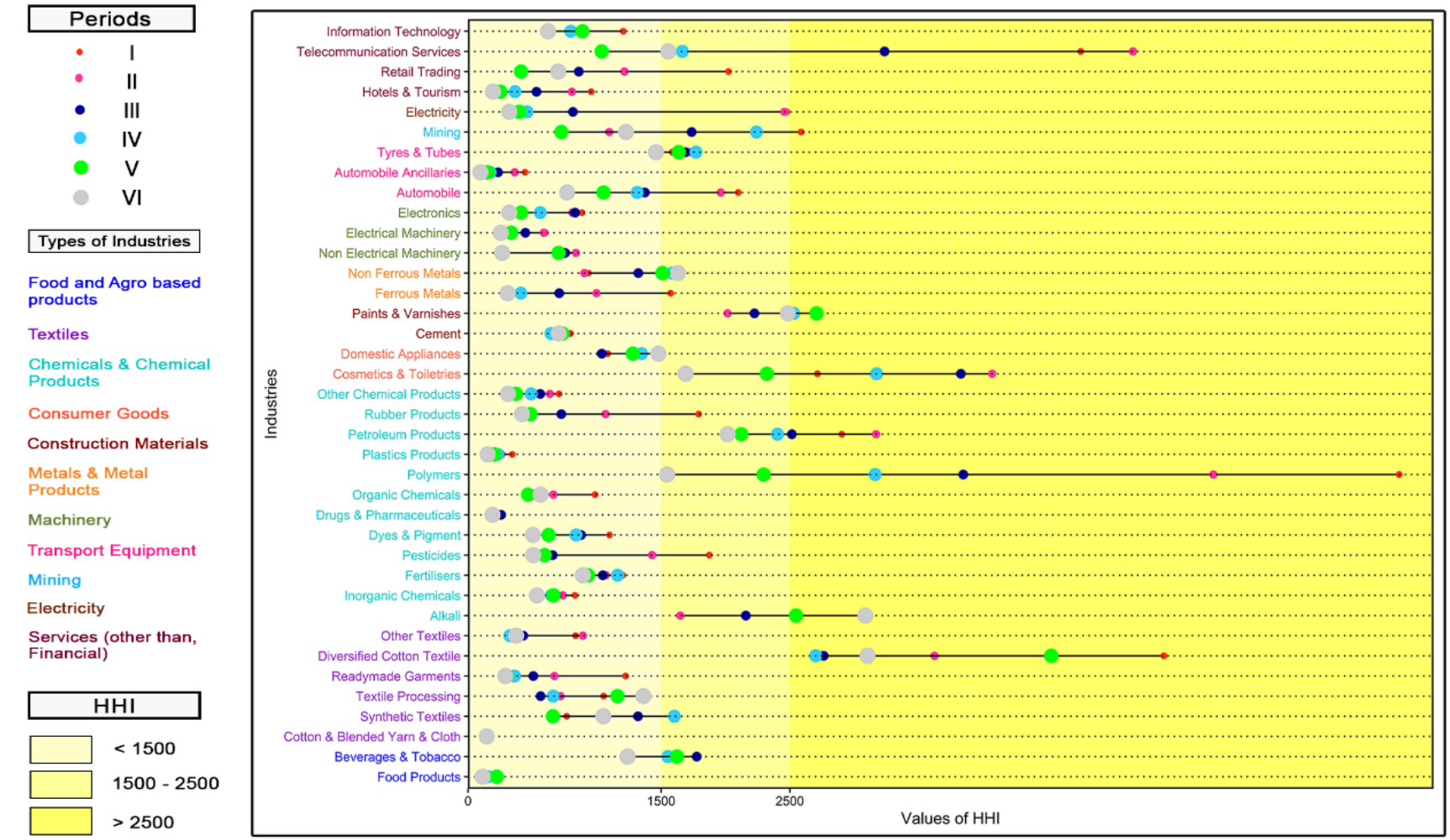
Source: (Saraswathy, 2019)

The analysis of the movement of the indices must be done with caution. It is important to note the increase in the number of companies used for the calculations over time. While a part of this can be attributed to the actual increase in the number of companies over time, there also has been an increase in coverage by CMIE. In other words, a company might have existed in 1992 and produced annual reports, but CMIE started covering it only after 2000. This will give a bias in the actual values of the indices. The bias is based on availability of data and not on purpose.

2.4 Industry Level Analysis of Market Concentration

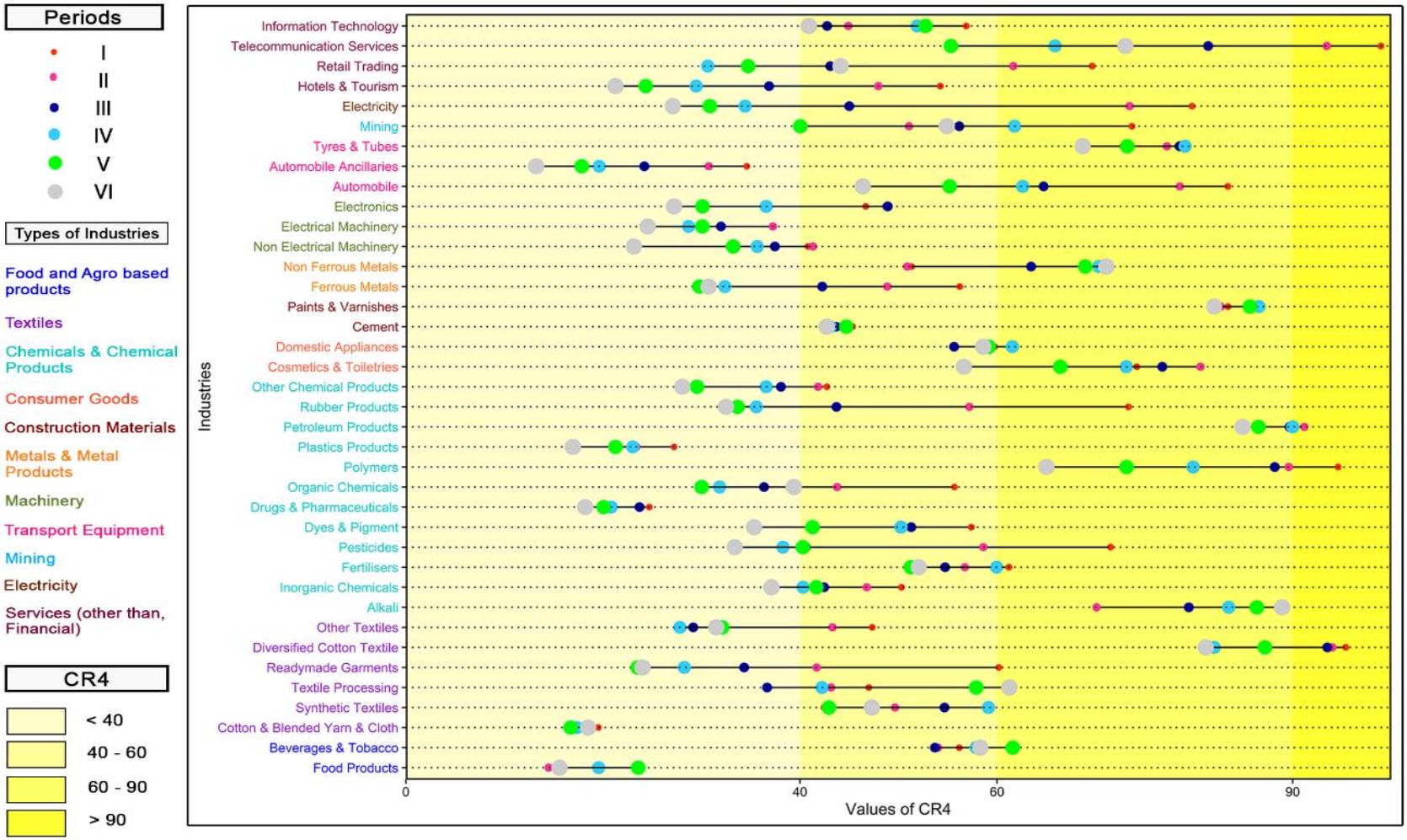
Two indices of market concentration – HHI and CR4 – have been taken into consideration for drawing an analysis on the extent of market concentration in the industrial sector in India. The indices have been calculated on the basis of value of sales of firms. While HHI takes into consideration all the firms in the industry in its calculation, CR4 indicates the sales of the largest 4 firms as a percentage of total sales of the industry. The movement of the two indices across the 6 periods for all industries have been depicted by the modified dumbbell graph shown in Figure 2.1 and Figure 2.2. Table 2.5 and Table 2.6 gives the values of HHI and CR4 respectively for all the industries in all the periods.

Figure 2.1: Change in HHI of various industries



Source: Constructed from ProwessIQ database of CMIE

Figure 2.2: Change in CR4 of various industries



Source: Constructed from ProwessIQ database of CMIE

Table 2.5: HHI for all industries across all 6 periods

Industry Names	Type	I	II	III	IV	V	VI
Food Products	**Food & Agro Based Products**	138.57	128.18	128.43	157.81	223.31	113.97
Beverages & Tobacco	**Food & Agro Based Products**	1615.16	1621.16	1776.67	1552.93	1623.25	1239.46
Cotton & Blended Yarn & Cloth	**Textiles**	175.06	152.15	147.48	152.74	148.31	145.69
Synthetic Textiles	**Textiles**	766.20	1039.62	1320.54	1603.32	659.26	1052.18
Textile Processing	**Textiles**	1053.52	718.85	563.86	661.21	1161.24	1362.64
Readymade Garments	**Textiles**	1224.20	671.39	507.45	361.90	300.10	290.54
Diversified Cotton Textile	**Textiles**	5406.63	3624.19	2762.84	2700.95	4530.75	3102.99
Other Textiles	**Textiles**	835.72	892.63	429.25	324.40	368.98	373.71
Alkali	**Chemicals & Chemical Products**	1652.74	1649.58	2158.11	2546.59	2547.96	3087.10
Inorganic Chemicals	**Chemicals & Chemical Products**	830.77	736.97	686.84	648.59	664.12	535.36
Fertilisers	**Chemicals & Chemical Products**	1200.89	1070.85	1046.90	1162.06	932.59	891.87
Pesticides	**Chemicals & Chemical Products**	1874.70	1430.45	657.71	584.76	594.67	506.64
Dyes & Pigment	**Chemicals & Chemical Products**	1099.31	877.47	878.54	839.17	625.93	505.41
Drugs & Pharmaceuticals	**Chemicals & Chemical Products**	271.27	219.14	256.79	200.40	194.40	190.01
Organic Chemicals	**Chemicals & Chemical Products**	986.84	662.76	514.15	467.98	466.11	563.90
Polymers	**Chemicals & Chemical Products**	7233.85	5790.40	3847.81	3162.30	2296.88	1546.61
Plastics Products	**Chemicals & Chemical Products**	343.45	258.70	241.50	229.78	202.22	152.95
Petroleum Products	**Chemicals & Chemical Products**	2904.54	3170.18	2516.29	2404.23	2122.66	2016.55
Rubber Products	**Chemicals & Chemical Products**	1791.95	1068.78	724.37	486.46	485.49	420.12
Other Chemical Products	**Chemicals & Chemical Products**	706.25	636.09	560.87	490.22	372.12	310.39
Cosmetics & Toiletries	**Consumer Goods**	2714.93	4072.30	3828.80	3174.59	2321.30	1690.86

Industry Names	Type	I	II	III	IV	V	VI
Domestic Appliances	**Consumer Goods**	1085.37	1029.43	1039.60	1348.36	1280.44	1479.15
Cement	**Construction Materials**	796.20	703.23	681.54	643.87	733.68	704.66
Paints & Varnishes	**Construction Materials**	2457.69	2016.68	2225.16	2530.38	2707.17	2484.77
Ferrous Metals	**Metals & Metal Products**	1574.22	998.07	708.48	410.30	305.48	307.51
Non Ferrous Metals	**Metals & Metal Products**	935.07	903.37	1322.55	1586.52	1510.57	1630.77
Non Electrical Machinery	**Machinery**	771.20	838.00	754.12	705.02	703.01	265.28
Electrical Machinery	**Machinery**	601.45	588.81	445.57	330.90	335.19	254.57
Electronics	**Machinery**	886.34	809.92	832.02	561.43	412.17	320.85
Automobile	**Transport Equipment**	2098.77	1964.43	1373.90	1314.79	1052.59	770.01
Automobile Ancillaries	**Transport Equipment**	442.47	363.04	233.25	171.69	151.21	95.85
Tyres & Tubes	**Transport Equipment**	1586.79	1716.20	1689.79	1771.61	1636.87	1460.94
Mining	**Mining**	2588.19	1097.51	1737.35	2240.95	725.34	1226.76
Electricity	**Electricity**	2477.02	2457.86	814.88	460.58	398.85	320.41
Hotels & Tourism	**Non Financial Services**	956.62	806.74	531.61	365.40	250.82	194.49
Retail Trading	**Non Financial Services**	2023.16	1215.53	860.84	411.40	412.33	700.24
Telecommunication Services	**Non Financial Services**	4760.52	5165.57	3235.91	1665.32	1039.01	1556.51
Information Technology	**Non Financial Services**	1205.65	889.73	605.71	797.95	888.57	621.27

Note: Rounded to two decimal points
Source: Calculated from ProwessIQ Database of CMIE

Table 2.6: CR4 of all industries across all 6 time periods

Industry Names	Type	I	II	III	IV	V	VI
Food Products	**Food & Agro Based Products**	14.58	14.50	15.59	19.57	23.59	15.59
Beverages & Tobacco	**Food & Agro Based Products**	56.17	54.01	53.70	57.87	61.60	58.30
Cotton & Blended Yarn & Cloth	**Textiles**	19.54	17.45	17.12	17.38	16.73	18.49
Synthetic Textiles	**Textiles**	42.43	49.65	54.66	59.13	42.93	47.29
Textile Processing	**Textiles**	46.99	43.16	36.67	42.23	57.88	61.25
Readymade Garments	**Textiles**	60.17	41.69	34.33	28.26	23.52	24.02
Diversified Cotton Textile	**Textiles**	95.38	94.03	93.51	82.04	87.18	81.17
Other Textiles	**Textiles**	47.33	43.30	29.16	27.82	32.10	31.50
Alkali	**Chemicals & Chemical Products**	70.01	70.10	79.46	83.51	86.36	88.93
Inorganic Chemicals	**Chemicals & Chemical Products**	50.30	46.78	42.45	40.31	41.66	37.11
Fertilisers	**Chemicals & Chemical Products**	61.20	56.74	54.73	59.96	51.24	52.05
Pesticides	**Chemicals & Chemical Products**	71.52	58.61	40.60	38.27	40.30	33.38
Dyes & Pigment	**Chemicals & Chemical Products**	57.38	50.43	51.29	50.24	41.27	35.35
Drugs & Pharmaceuticals	**Chemicals & Chemical Products**	24.71	20.69	23.72	20.85	20.07	18.21
Organic Chemicals	**Chemicals & Chemical Products**	55.68	43.77	36.35	31.84	30.02	39.38
Polymers	**Chemicals & Chemical Products**	94.61	89.60	88.17	79.89	73.14	65.02
Plastics Products	**Chemicals & Chemical Products**	27.22	23.39	22.96	23.02	21.28	16.96
Petroleum Products	**Chemicals & Chemical Products**	90.31	91.18	89.68	90.00	86.52	84.92
Rubber Products	**Chemicals & Chemical Products**	73.33	57.18	43.70	35.58	33.66	32.49
Other Chemical Products	**Chemicals & Chemical Products**	42.74	41.84	38.07	36.57	29.55	28.07
Cosmetics & Toiletries	**Consumer Goods**	74.17	80.65	76.77	73.11	66.41	56.63

Industry Names	Type	I	II	III	IV	V	VI
Domestic Appliances	**Consumer Goods**	59.73	55.70	55.64	61.55	59.16	58.61
Cement	**Construction Materials**	45.34	42.69	43.67	43.06	44.70	42.71
Paints & Varnishes	**Construction Materials**	83.44	82.72	85.97	86.59	85.65	82.03
Ferrous Metals	**Metals & Metal Products**	56.22	48.86	42.25	32.38	29.79	30.72
Non Ferrous Metals	**Metals & Metal Products**	51.32	50.89	63.45	70.32	68.95	71.08
Non Electrical Machinery	**Machinery**	40.82	41.31	37.45	35.67	33.22	23.14
Electrical Machinery	**Machinery**	37.22	37.26	31.98	28.70	30.09	24.54
Electronics	**Machinery**	46.67	48.76	48.90	36.57	30.11	27.22
Automobile	**Transport Equipment**	83.42	78.55	64.72	62.60	55.19	46.38
Automobile Ancillaries	**Transport Equipment**	34.60	30.74	24.20	19.63	17.85	13.23
Tyres & Tubes	**Transport Equipment**	72.76	77.24	78.52	79.08	73.22	68.69
Mining	**Mining**	73.69	51.06	56.16	61.77	40.03	54.90
Electricity	**Electricity**	79.79	73.45	45.00	34.43	30.85	27.09
Hotels & Tourism	**Non Financial Services**	54.24	47.95	36.86	29.47	24.35	21.27
Retail Trading	**Non Financial Services**	69.65	61.65	43.08	30.64	34.74	44.12
Telecommunication Services	**Non Financial Services**	98.96	93.46	81.42	65.88	55.31	73.02
Information Technology	**Non Financial Services**	56.88	44.91	42.75	51.89	52.74	40.90

Note: Rounded to two decimal points
Source: Calculated from ProwessIQ Database of CMIE

The extent and trend of market concentration in the 11 categories of industries have been discussed here.

2.4.1 Food and Agro based products

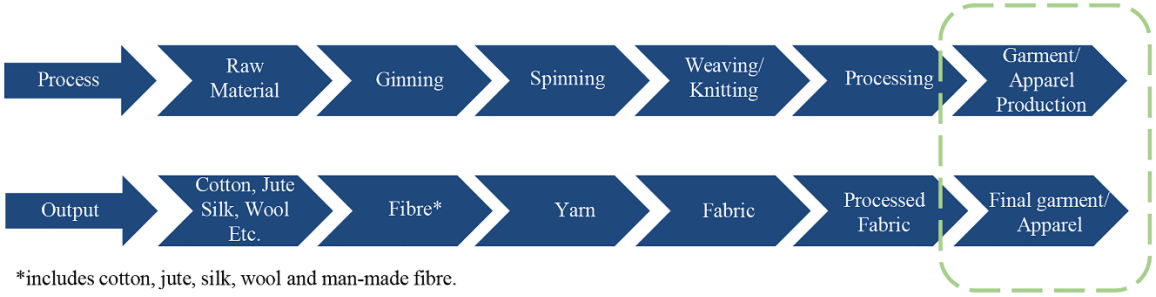
Two industries – (i) Food Products, and (ii) Beverages & Tobacco – have been categorised under Food and Agro based products. The HHI values show that while the industry for Food Products have been unconcentrated, the Beverages & Tobacco industry has been moderately concentrated, and has fallen under the unconcentrated category in Period VI. The CR4 values show that the Food Products industry has always been a competitive industry, with the largest four firms having a market share of less than 25% throughout. However, the Beverages & Tobacco industry has been one with Loose Oligopoly. The CR4 of this industry decreased through Period I, II and III, and then increased in Period IV and V, and fell again in the final period. However, the change was not significant. Thus, the Food Products industry is an industry with low concentration and the Beverages & Tobacco industry is one with medium-low concentration.

Both of these industries produce many different kinds of products. For example, the food products industry produces biscuits, dairy products, bakery products, sweets, cereals, fruits & vegetables, processed foods, etc. Even within a kind of product. The beverages & tobacco industry produces cold drinks, alcohol, tea, coffee, water, cigarettes, etc. Even within these broad kinds of products, there are varieties, and companies are engaged in continuous innovation to attract more consumers. In the industry for coffee, there is coffee powder, beaten coffee, instant coffee powder with milk and many other products. Non-price competition is a key feature of this industry. However, a better insight into this industry can be possible by studying individual product competition.

2.4.2 Textile

The Textile industry constitutes of the entire value chain from making yarn from fibre, turning the yarn into fabric or textile and turning it into a finished product in the form of a readymade garment. Figure 2.3 shows the value chain of this industry.

Figure 2.3: Value chain of the Textile industry



Source: Indian Readymade Garments (Apparel): Industry Overview, 2019

The industry at the lower side of the value chain, that is the Cotton & Blended Yarn and the Cloth Industry, is an unconcentrated industry, with the largest 4 producers making a sale of less than 20% throughout. The industries higher up the value chain, that is, the Diversified Cotton Textile, Synthetic Textile and the Other Textiles industry, has different market structures. The Synthetic Textiles and Other Textiles industry are unconcentrated, with the HHI of the Synthetic Textiles industry increasing from Period I to Period IV, falling in Period V, and rising again in Period VI, and the HHI of the Other Textiles industry rising from Period I to Period II, and then falling till Period IV and then rising again. The largest 4 firms made 47% of the total sales in Period VI in the Synthetic Textile industry, and the figure was 31.5% for the Other Textiles Industry. Thus, the Other Textiles industry is a competitive industry while the Synthetic Textiles industry is one with Loose Oligopoly. The Diversified Cotton Textiles industry, on the other hand, is an industry with concentration with HHI of 3102.99 and CR4 of 81.17 in Period VI. Alok Industries Ltd. has been the firm with maximum sales since 2002. The firm, in 2018, made around 47.8% of all sales in the Diversified Cotton Textile industry (author's calculation from CMIE ProwessIQ database). In the Readymade Garments industry, the industry at the top of the value chain, both HHI and CR4 shows a downward trend. The industry is one with low concentration. Fast fashion guides the readymade garment industry. With style easy to adapt, and clothing easy to produce, this industry is a highly competitive industry. The level of concentration in the Textile Processing industry, which requires high level of technical know-how, has increased consistently. The CR4 in Period VI stood at 61.25% and the HHI stood at 1362.64. This industry is one with medium-high concentration.

2.4.3 Chemical & Chemical Products

The HHI and CR4 values of the Alkali industry shows that the industry has moved from being moderately concentrated to being highly concentrated. The number of firms covered by Prowess database has remained between 9 and 11 throughout. Many chemical manufacturers such as Grasim Industries, Tata Chemicals Ltd., manufacture Alkali. However, CMIE's mapping of every company to a particular industry group, alkali in this case, only when sales from that product exceeds 50% of the total sales of the company, have led to exclusion of some major manufacturers of alkali. These companies produce diverse range of chemicals; alkali may not make more than 50% of the entire sales basket. Analysis of level of concentration in the alkali industry on the basis of the Prowess database will be limited.

Seven industries classified in this sector – Inorganic Chemicals, Organic Chemcials, Fertilisers, Drugs & Pharmaceuticals, Plastic Products, Dyes & Pigments and Other Chemical Products – has been industries with low concentration throughout. The level of concentration in two industries – Rubber Products and Pesticides – have declined from being moderately concentrated to being unconcentrated.

The level of concentration in two industries – Petroleum Products industry and Polymers – have declined from being highly concentrated to being moderately concentrated. However, the CR4 values shows that even in Period VI, 65.02% of the total sales in the Polymers industry and 84.92% of total sales in the Petroleum Products industry were made by 4 companies in respective industries. Both these industries continue to remain concentrated.

The share of government enterprises in total sales in the Petroleum Products industry has declined, while that of Reliance Industries Ltd. has increased. RIL has activities in both upstream industry (mining crude oil & natural gas) and downstream industry (manufacturing petroleum products), putting it at an advantage vis-s-vis other private players. This industry has been discussed at length in Chapter 4.

The Polymers industry is also a concentrated industry. As of 2019, Haldia Petrochemicals Ltd. (initially a joint venture of the West Bengal government, the Chatterjee Group, the Tata Group and the Soros Group; in 2015, The Chatterjee

Group acquired controlling stakes of the company *(Haldia Petrochemicals Ltd, n.d.)*), made 30% of the total sales in the industry. RIL acquired Indian Petrochemical Corporation Ltd. in 2007 (The Economic Times, 2007), and is a major player in the industry. However, CMIE's method of mapping each company to one industry group has left out RIL from being classified under the Polymer industry. RIL has been classified under the Petroleum Products industry. Despite this limitation of Prowess database, it can be said that the Polymers industry is a concentrated industry.

2.4.4 Consumer Goods

Two industries under this category have been considered – the Domestic Appliances industry and the Cosmetics, Toiletries, Soaps & Detergents industry. Both of them are moderately concentrated. The firms in both the industries require investment in R&D and engage in non-price competition. Within soaps, there are a range of varied products – skin brightening soap, anti-acne soap, bathing liquid soap, soap powder, soap with herbs, etc. There is intense competition in this industry. The level of concentration has seen a decline; nevertheless, they continue to be moderately concentrated. The Domestic Appliances industry constitutes multiple products – mobile phones, water heater, geyser, washing machines, air conditioner, mixer grinder, microwave, etc. Since 2014, Samsung India Electronics Pvt. Ltd. has held around 35% of the total sales in the industry (author's calculation from CMIE ProwessIQ Database). This firm produces almost all high value domestic appliances, making it a giant in the domestic appliances industry.

2.4.5 Construction Materials

Two industries – Cement industry and Paints & Varnishes industry – have been considered. The Cement industry has been one with medium-low concentration and the Paints & Varnishes industry has been one with high concentration. In Period V and VI, 4 firms – Ultratech Cement Ltd., A C C Ltd., Ambuja Cement Ltd. and Shree Cement Ltd. – made more than 40% of the total sales in the Cement industry. However, 50% of this 40% was controlled by Ultratech Cement Ltd (author's calculation from CMIE ProwessIQ database), which is a subsidiary of Grasim Industries Ltd, which in turn is controlled by the global conglomerate Aditya Birla Group (MarketScreener, n.d.). Aditya Birla Group has stakes in major industry groups

– textiles, telecommunication, chemicals, retail, mining and manufacturing for aerospace, sporting goods and surface transport industries (*Our Businesses – Aditya Birla Group*, n.d.). Four firms – Asian Paints Ltd., Kansai Nerolac Paints Ltd., Berger Paints India Ltd. and Akzo Nobel India Ltd. – have controlled more than 80% of the Paints & Varnishes industry since 1992. Out of these 4, Asian Paints Ltd. has increased its share from around 30% in 1992 to more than 40% in 2019. Akzo Nobel India Ltd. was pushed down to the 4th largest player by Kansai Nerolac Paints Ltd. and Berger Paints India Ltd. This industry remains a highly concentrated industry.

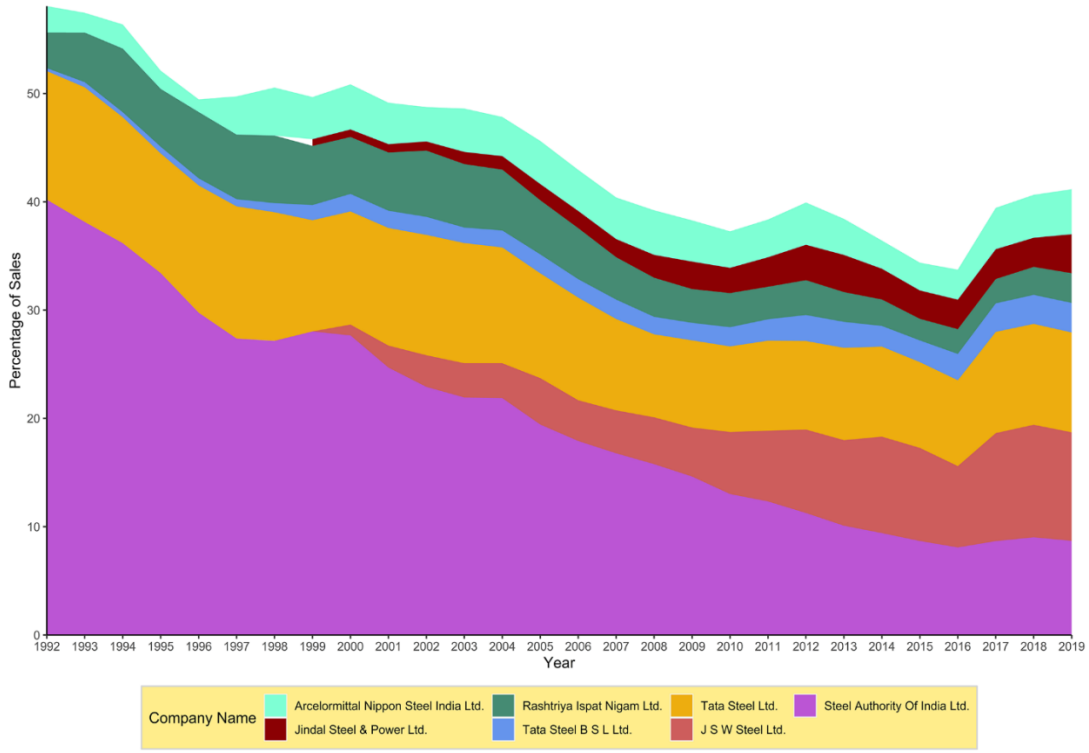
2.4.6 Metal & Metal Products

The Ferrous Metals industry and the Non Ferrous Metals industry have been considered for analysis. Ferrous metals are those which contain iron and steel such as cast iron, wrought iron, alloy steel, carbon steel, etc. Ferrous metals are used in construction, in building ships, trains, automobiles, etc. Non-ferrous metals are those which do not have iron or steel. Some non-ferrous metals are copper, aluminum, nickel, zinc. These are used in automobile, telecommunications, electricity distribution, electronics, chemicals and construction industry. Both these industries require access to mining resources, high technical know-how and heavy investment.

The trajectory of concentration in both the industries have been opposite. While the ferrous metal industry have less concentrated over time, the non-ferrous metal industry have become more concentrated. In the ferrous metal industry, the share of Public Sector Undertakings such as Sail Authority of India Ltd. (SAIL) and Rashtriya Ispat Nigam Ltd. (RINL) has declined, whereas that of private enterprises such as J S W Steel Ltd. and Jindal Steel & Power Ltd., Tata Steel B S L Ltd. and others (Figure 2.4). The share of Tata Steel Ltd. has remained almost constant throughout. As of 11 November 2021, Tata Steel BSL completed its merger with its parent company, Tata Steel Ltd.[2] Though concentration has declined since 1992 and currently the industry is unconcentrated, the growth of J S L Steel Ltd. and Jindal Steel & Power Ltd and the recent merger of Tata Steel BSL with Tata Steel Ltd., combined with the disinvestment policy of the government can change this trajectory in the near future.

[2] The given web address gives the information of the merger. It was accessed on 20 February 2022. https://tatasteelbsl.co.in/

Figure 2.4: Market Share of 7 largest companies in Ferrous Metals industry

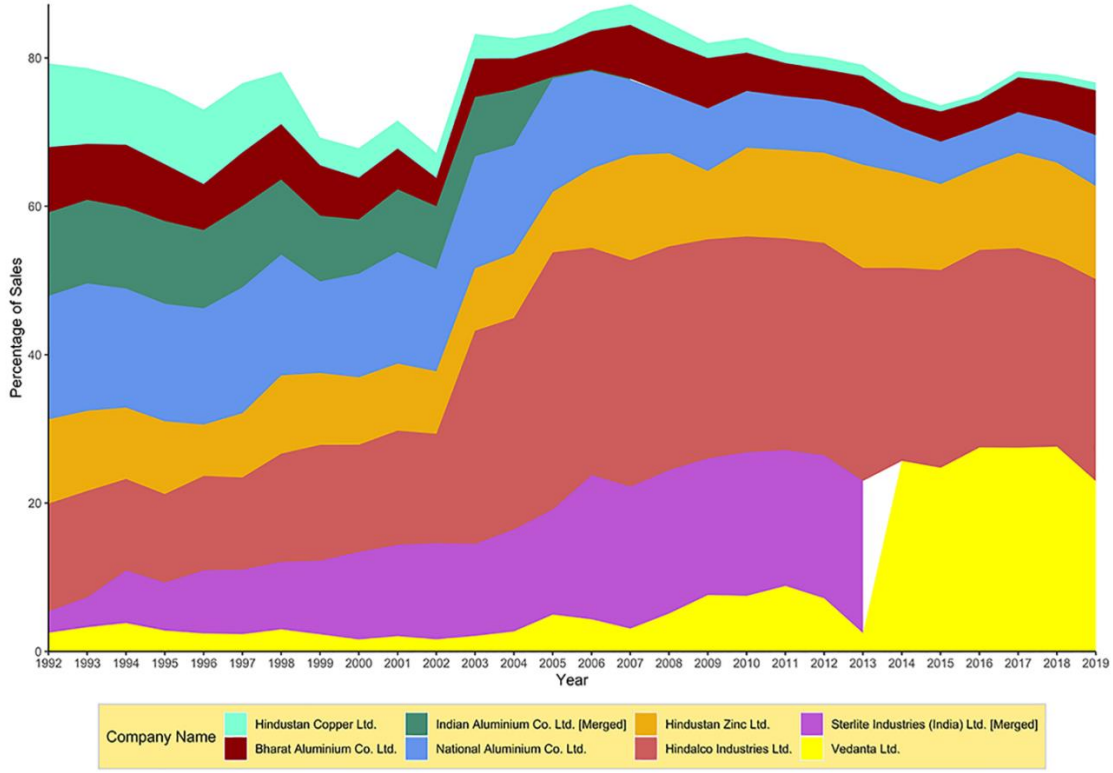


Source: Constructed from ProwessIQ database of CMIE

The non-ferrous metal industry has moved from a loose oligopoly to a tight oligopoly (Figure 2.2). It is currently an industry with medium high concentration. Figure 2.5 shows how the percentage of sales of 8 industries have changed since 1992. Currently, there are two major business groups owning most of the market share – the Aditya Birla Group and the Vedanta Resources Limited. Vedanta Ltd. is a subsidiary of Vedanta Resources Ltd (Vedanta – Transforming for Good, *Home Page*). Bharat Aluminum Company Ltd., incorporated in 1965 as a Public Sector Undertaking by the GoI, sold 51% of its stake to Sterlite Industries Ltd., a subsidiary of Vedanta Ltd., in 2013 (Vedanta – Transforming for Good, *About Company | Bharat Aluminium Company Ltd. (BALCO) - INDIA*). Sterlite Industries (India) Ltd. is also a subsidiary of Vedanta (The Economic Times, *Sterlite Indus. History*). Hindustan Zinc Ltd. is also a subsidiary of Vedanta Ltd. which owns 64.9% stake in the company, while GoI retains a stake of 29.5% (Vedanta – Transforming for Good, *About Hindustan Zinc [Largest Lead-Zinc Miner]*). Hindalco Industries Ltd. is owned

by the Aditya Birla Group.[3] On 24 August 2004, Indian Aluminum Company Ltd. was merged with Hindalco Industries (Business Standard India, 2004). National Aluminum Company Ltd. and Hindustan Copper Ltd. are PSUs whose market share is on a decline.

Figure 2.5: Market Share of 8 largest companies in non-ferrous metals industry



Source: Constructed from ProwessIQ database of CMIE

2.4.7 Machinery

This category includes 3 industries – Non Electrical Machinery industry, Electrical Machinery industry and Electronics industry. All these industries have been unconcentrated throughout.

2.4.8 Transport Equipment

This includes the Automobile industries and the Automobile Ancillaries industries. Within the Automobile Ancillaries industries, the Tyres & Tubes industry is a narrowly defined industry. Both the Automobile and the Automobile Ancillaries

[3] The Aditya Birla Hindalco website http://www.hindalco.com/about-us gives the ownership structure of the company alongwith and the acquisitions and mergers.

industry has shown a decline in the level of concentration. Though Automobile industry has moved from being a moderately concentrated industry to an unconcentrated industry (according to HHI values in Figure 1), CR4 was still more than 43% in Period VI. This industry can be said to be an industry with medium-low concentration. However, there are multiple products within the Automobile industry – motor bikes (further segmented into sports bike, standard bike, cruiser bike, etc.), three-wheelers (mini trucks, auto-rickshaws), passenger cars, buses, trucks, etc. These are different products. It is essential to study concentration for each product differently, which is beyond the scope of the present study. The number of firms covered by CMIE ProwessIQ Database has increased from 15 to 47, showing that entry is difficult in this industry. Studying narrower markets within the Automobile industry can give better insight into the level of market concentration.

The Automobile Ancillaries is one with low concentration and is competitive. However, a narrower industry within the automobile ancillaries industry – the tyres & tubes industry – is one with medium-high concentration with a HHI value close to 1500 and CR4 greater than 70%. With more innovation in the automobiles industry, the automobile ancillaries industry has become more varied, with newer products and newer markets, which can be a reason for the decline in concentration. Even for this industry, a study of narrowly defined industries will be able to give better insight into the level of concentration.

2.4.9 Mining

The Mining industry has been further classified into 3 categories by CMIE ProwessIQ – Coal & Lignite, Crude Oil & Natural Gas and Minerals. This classification has not been taken into consideration for the present analysis. Also, mining is an upstream activity. For example, a company involved in mining Crude Oil & Natural Gas (an upstream activity) can also be involved in producing petroleum products (a downstream activity). If sales from downstream activity makes more than 50% of the total sales for the company, the company will not be listed under ‘Mining’. Reliance Industries Ltd. has not been covered under ‘Mining’, even though it has substantial market power in both upstream and downstream activities of Crude Oil & Natural Gas mining and petroleum products production (detailed explanation in Chapter 4). Prowess IQ’s classification of industries has this major disadvantage,

making analysis limited. Despite this, in Period VI, the largest 4 companies made 54% of total sales in the industry, making the industry a moderately concentrated industry. The total number of companies covered by CMIE has increased from 34 to 109 (Table 2). This is an indicator of difficulty of entry. Entry in this industry requires high capital requirement and high sunk cost, making entry difficult. Narrower industry studies would be helpful in understanding the nature of the Mining industry.

2.4.10 Electricity

The Electricity industry constitutes 3 phases – generation, transmission and distribution. The electricity generation industry of two kinds – energy from fossil fuels (coal, lignite, gas and diesel) and energy from non-fossil fuels (hydro, solar, waste to power, nuclear) (Ministry of Power, Government of India, 2022). In Figure 2.1 and Figure 2.2, the Electricity industry has taken into consideration all the industries together. This has been done as many power generation companies also engage in distribution such as National Thermal Power Corporation (NTPC) and DVC (Damodar Valley Corporation). With policies being taken to encourage renewable energy, companies are also diversifying from being just coal and gas based. Both HHI and CR4 shows a decline in the level of concentration from being highly concentrated to being unconcentrated. However, the analysis of the level of concentration in the electricity sector has to go beyond this.

Till the enactment of the Electricity Act, 2003, India's electricity sector was highly regulated and neither generation nor transmission and distribution could be made by companies without licenses. The need for license in electricity generation (except for nuclear power generation and hydro power generation above certain limit) was waived off. Promoting competition in the electricity sector was one of the aim of this act. As of 2021, the power generation capacity of the government (central and state governments combined) is almost equal to the power generation of the private players (Table 2.7). Within the electricity generation industry, power generation from nuclear energy, is with the government (Dr. Jitendra Singh (on behalf of the Minister of State for Personnel, Public Grievances & Pensions and Prime Minister's Office), 2020). The Nuclear Power Corporation of India Ltd. (NPCIL), a GoI enterprise under

the Department of Atomic Energy, is the only corporation engaged in nuclear power generation.[4]

The Electricity (Amendment) Bill, 2020, proposes delicensing of the power distribution sector. Power distribution is largely controlled by central government owned or state government owned companies, with a few exceptions of private players in Delhi and Mumbai. The amendment, if passed, will pave the way for private players in the industry. The level of concentration will be affected, the direction and magnitude of which can be seen only a few years from now. As of Period VI, Reliance (Anil Ambani), Tata Group, Adani Group and Torrent Group are the major private players in the electricity industry (on the basis of calculation based on CMIE ProwessIQ data). The 2020 bill and the way regulatory bodies work thereafter can make major changes in the electricity sector in near future.

Table 2.7: Sector-wise Installed Power Generation Capacity

Sector	**MW**	**% of Total**
Central Sector	98,547	25.1
State Sector	1,04,384	26.5
Private Sector	1,90,459	48.4
Total	**3,93,389**	**100**

Note: As on 31.12.2021.
Source: *Ministry of Power, Government of India*

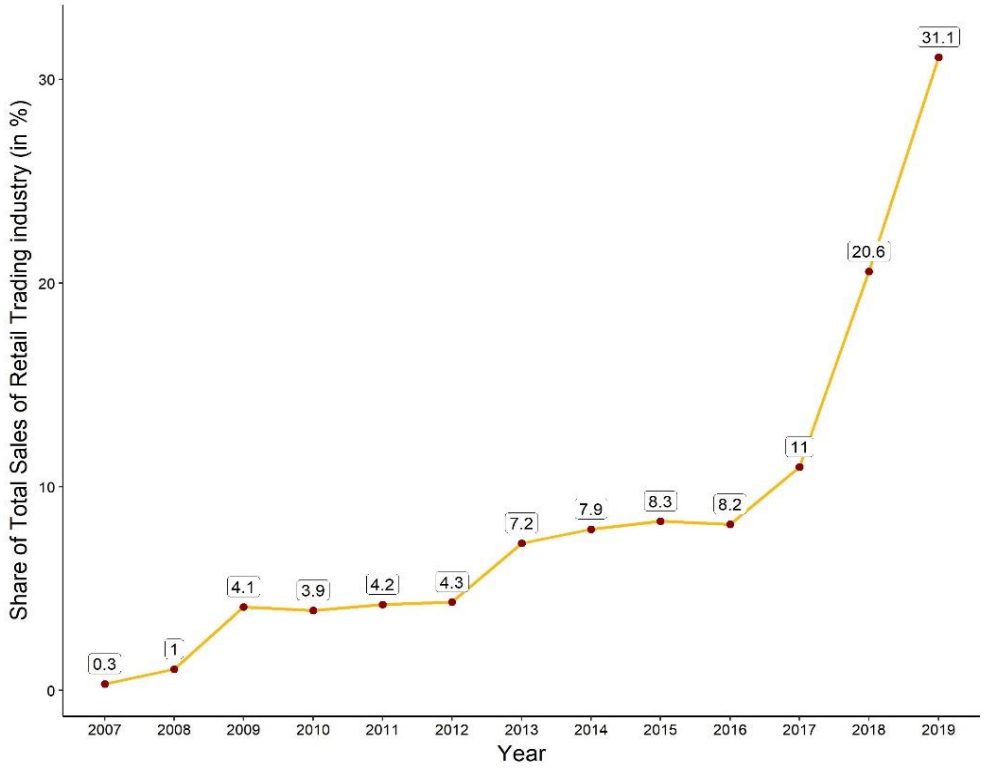
2.4.11 Non financial services

Fours industries – Hotels & Tourism, Retail Trading, Telecommunication Services and Information technology – have been considered under this category. Hotels & Tourism and Information Technology industries have been unconcentrated throughout. Both the industries are competitive. In both of these industries, the number of companies have increased tremendously (Table 2.2), showing low barriers in entry. On the other hand, Retail Trading and Telecommunication Services industry have been industries with high level of concentration, and the level of concentration has declined. The HHI value have fell between Period I and Period V for Telecommunications industry and have risen in period VI. The number of products within the telecommunications industry have expanded in recent years with new

[4] The website of the NPCIL (https://www.npcil.nic.in/content/328_1_AboutNPCIL.aspx) gives the ownership structure and the production capacity of the company.

technology and innovation (such as 2G to 3G to 4G and now 5G, wireless internet, wifi services, etc). Different companies specialise in different products. Currently, Reliance Jio and Airtel are the predominant private players in the mobile networks business (more discussed in Chapter 4). The industry is moving from a government monopoly to becoming increasingly concentrated by few private players.

Figure 2.6: Market Share of Reliance Retail Ltd. in the Retail Trading industry between 2007 and 2009



Source: Constructed by author from CMIE ProwessIQ Database

The HHI value in the Retail Trading industry decreased between Period I and Period IV and has increased thereafter. Reliance Retail Ltd. has emerged as the largest player in the Retail Trading industry. With Reliance Retail Ltd. expanding its retail business across all major consumption needs such as grocery, consumer electronics, fashion and lifestyle, the trajectory of Reliance Retail might determine the level of market concentration in the industry very soon.[5] Reliance Retail Ltd. held 31.1% of the total sales of the retail industry in 2019 (Figure 2.6).

[5] The website of Reliance Retail (https://www.relianceretail.com/our-business.html) has an exhaustive list of all markets Reliance Retail has entered.

2.5 Conclusion

The CMIE ProwessIQ database has certain limitations. One of the limitations is the coverage of companies by Prowess. Over the years, Prowess has increased its coverage of companies. This increase does not necessarily mean that the number of companies has increased at a similar level. Prowess may have started covering a particular company in 2004, despite it being operational since 1994. This leads to a bias in the calculation of indices of concentration. This bias is not done knowingly, but it happens due to the limitation of the database. Another limitation of the Prowess database is the way each company is mapped to a certain industry group. For example, a company might produce organic chemicals, inorganic chemicals, alkali, polymers, dyes & pigments, and 50% of the company's sales comes for, say, organic chemicals. In such as case, Prowess will map the company to the industry group 'organic chemicals'. It is quite possible that the company manufactures polymers and is a significant player in the polymers industry, but Prowess database does not capture this. A real example is that of Reliance Industries Ltd. RIL is classified under the industry group 'petroleum products'. However, RIL is a significant player in polymer industry and crude oil & natural gas industry also. In the analysis of polymer industry, RIL's sales cannot be factored in for due to this limitation.

Despite these limitations, Prowess is the best database available and it has given useful insights into the level of market concentration. Researchers working on market concentration in industries in India have used CMIE ProwessIQ database extensively.[6] The present analysis has shown that concentration has increased or is on the path of increasing in industries which require access to natural resources. For example, petroleum products industry, polymers industry, telecommunication services industry, mining and non-ferrous metal industry are relatively more concentrated. The government's monopoly in the electricity industry might end after the proposed Electricity Amendment Bill 2020, and the industry might move towards being concentrated at the hands of private players. Petroleum products and telecommunications services industries are examples that opening up the industry for private players and bringing in policies to make the sector more competitive does not necessarily lead to more competition, but leads to the industry gradually moving

[6] Mehta (2005; 2006), Mishra et. al. (2011) and Saraswathy (2019) has based their study on CMIE ProwessIQ database

towards being concentrated with private players. Consumer goods, food products, beverages and tobacco industries has relatively lower concentration. While automobile ancillaries is an industry with low concentration, tyres & tubes industry, which is a part of the automobile ancillaries industry, is highly concentrated. This gives an indication that while studying concentration, defining industries narrowly might give a better picture.

The level of concentration can be really understood by studying the ownership patterns of the companies holding maximum market share in any particular industry. The ownership structure is a complicated web with one company being the holding company of another company and a subsidiary of yet another. The conglomerate which is at the top of this structure is the ultimate owner of all the subsidiaries and holding companies and other units. The Reliance Industries Limited, the Tata Group, the Aditya Birla Group, the Adani Group, the Vedanta Resources Limited are the groups associated with many companies which has considerable market share in many industries. For example, a few subsidiaries of RIL are Reliance Retail, Reliance Industrial Infrastructure Limited, Network 18, Reliance Jio Infocomm Limited, Reliance Solar, Jio Platforms Limited, Reliance Life Science and Reliance Logistics. The Tata Group owns Tata Consumer Products, Tata Power, Tata Communications, Tata Digital, Tata Chemicals, among many other companies. A few of the subsidiary companies of the Aditya Birla Group are Aditya Birla Chemicals, Grasim Industries Limited, Hindalco Industries Limited, UltraTech Cement Limited, Thai Rayon and Vodafone Idea Limited. The Adani Groups owns Adani Ports and SEZ Ltd, Adani Total Gas Ltd, Adani Transmission Ltd, Adani Power Ltd, to name a few. Sterlite Copper, ESL Steels, Bharat Aluminum Company, Hindustan Zinc, Cairn India are few companies owned by Vedanta Group. At multiple stages in the value chain of different products, companies owned by these groups have a significant market share, leading to the market being concentrated at the hands of a few conglomerates.

Market concentration indices can give an indication on the level of market concentration in individual industries. However, the complex web of ownership has to be discerned to understand the extent of concentration at the level of the entire economy.

CHAPTER 3

DETERMINANTS OF MARKET CONCENTRATION

3.1 Introduction

The level of competition in the market is one of the key determinants of market structure. There is no exact measure of market competition, and therefore, market concentration index is used to indicate the level of competition in the market. A market with lower levels of concentration is said to be more competitive, and vice versa.

The present chapter is an inquiry into the reasons for the change in level of market concentration. The change in the HHI value is considered here. CR4 is not considered in the analysis as it represents the market share held by largest four firm, while the explanatory variables considered have been calculated at the industry level, taking all firms within that industry. The factors which contribute to changes in market concentration are analysed. This chapter focuses primarily on measurable or quantifiable factors affecting market concentration. The Structure-Performance-Conduct paradigm is discussed, along with multiple empirical studies which explores the relationship between the structure, performance and conduct of the market.

The review of literature indicates the study towards specific explanatory variables. The required data is extracted from CMIE Prowess Database. A panel data analysis is done using the R Studio Open Source Software. The reasons behind changes in market concentration is explored, giving an overview of the way it is affected by various factors.

While this empirical study is necessary, it is not sufficient to understand changing market concentration in a post 1990 economy. This aspect is explored in the next chapter.

3.2 Literature Review

The first phase of Industrial Organisation came with the work of Edward Mason and Joe Bain. While both focused on empirics to analyse the structure-

conduct-performance of an industry, Mason had a 'case study' approach, while Bain had an approach of 'cross-section data analysis using large samples of industries'. The works of both Mason and Bain became the foundation of the structure-conduct-paradigm which suggested that the structure of the market affects the conduct of firms in the market, which in turn affects the performance of the industry. Bain (1964) traces the parentage of Industrial Organisation to the work of Edward Chamberlin. Bain opines that Chamberlin's *Theory of Monopolistic Competition* laid the theoretical framework for the economy to be seen as constructed of varied industries with different structures, 'with market conduct and performance tending to differ significantly with differences in structure'. Before Chamberlin's work, the study of price theory was essentially the study of the theory of perfect competition. But with the *Theory of Monopolistic Competition*, a sophisticated analysis of markets was presented and the linkage between markets and price theory, and how with change in structure of market, the price policy of firms or industries changed (Bain, 1964).

Table 3.1: Variables of the Structure-Conduct-Performance Paradigm

Structure	**Conduct**	**Performance**
• Number of sellers (which determines whether a market tends towards a monopoly or towards perfect competition, thus determining the level of competition in the market) • Degree of product differentiation • Cost Structure • Degree of vertical or horizontal integration	• Price • Cost of advertising • Expenditure on R&D	• Profit margin • Efficiency

Note: made after a study of existing literature; not an exhaustive list

The study of Industrial Organisation is in essence the study of markets and how firms behave and interact in the market ecosystem. Within the superset of the study of market lies the subset of study of prices and subset of study of price policy.

Mason (1939) underlined that the emphasis on price policy vis-a-vis prices, as an object of study, represents "economic reflection on the significance of expectations, uncertainties, market control, and the position of price as among many selling terms". That a price policy is put in place by firms, for whatsoever reasons ranging from taking into consideration a probable move from a rival firm to anticipating effect of current prices on future prices, requires a degree of market control on part of the firm. In case of a perfectly competitive market, a price policy is of no use since firms do not have the degree of control over a market required to set prices. Price policy of a firm is the 'conduct' of the firm in the face of the given market structure. This makes the market structure as exogenous. Both relative market size (size of firm's sales and purchases compared to the total volume of transactions in the market) and absolute size (determined by value of assets, number of assets, and absolute value of sales) determine the market structure. Mason criticized those who thought market size as irrelevant to determining market power, and considered the elasticity of the firm's demand curve as being solely capable of determining market power (which determines the market structure). Theoretically, comparing individual demand and cost curves with price and marginal cost gives the degree of monopoly power, and therefore the extent of competition in the market. However, empirical application of this theory is not possible due to lack of reliable and robust data. Here comes the importance of market concentration, determined by the relative size of firms in the market. The extent of market concentration determines the level of market competition.

Mason (1939) also criticizes the "statistical approach to price policy" which attempts to correlate changes in price with other economic variables such as concentration or product durability. Buyers and sellers in different markets settle on a price after negotiation on multiple and varied terms. Taking price as an index to generalise all such negotiations leads to loss of significance of the processes underlying the determination of price. Correlating price with other economic variables does not give a proper understanding of the firm's price policy, which is important to analyse the conduct of the firm in the face of a given market structure. Mason, therefore, undertakes industry-wise analysis of the structure-conduct-performance paradigm, and advocates the same.

However, Bain, a student of Mason, started the tradition of cross-section analysis using large sets of samples of industries. Bain (1950) forwarded a hypotheses regarding variables affecting market structure (such as seller concentration, buyer concentration, condition of entry and degree of product differentiation) and their impact on market conduct and market performance (such as profits, selling costs and relative efficiency of scale and capacity). Bain (1951) made a cross-section analysis of American manufacturing industries between 1936 and 1940 to analyse the relationship between average profit rate of firms and market concentration. He hypothesized a positive relation between average profit rate and market concentration - that is, "average profit rate of firms in oligopolistic industries of a high concentration will tend to be significantly larger than that of firms in less concentrated oligopolies or in industries of atomistic structure". Bain found that a positive relation was found only for firms whose net worth was more than 5 million dollars. For other firms, no concrete relationship could be established. Bain (1954) analysed, using cross-section analysis, the relation between different variables affecting market structure - economies of scale, concentration and entry barriers.

Both Mason's 'case-study approach' and Bain's 'cross-section approach' to Industrial Organisation attempted to put forward a generalised understanding of all the industries based on either detailed case studies of specific industries or cross-section analysis of large data sets. This gave way to industry-specific approach using econometric tools. As opposed to earlier efforts, both by Mason and Bain, in order to formulate generalized rules about Structure-Conduct-Performance of all industries from, "the industry-specific econometric analyses of the 1970s seem to have been more concerned with understanding the particular industry at hand than with developing or testing simple propositions that might apply to all markets" (Schmalensee, 1980).

Kamerschen (1968) studied the relationship between market growth (indicator of market performance) and industry concentration (indicator of market structure), in which he analysed 198 US industries for 1954-63 and 212 industries for 1958-63. Mueller and Hamm (1974) sought to find out the reasons for market concentration. They analysed 166 4-digit SIC industries (given by US Bureau of Census) between 1947 and 1970 and 292 4-digit industries between 1958 and 1970. The dependent

variable in their study was weighted and unweighted CR-4 and CR-8 ratios. Their study concluded that the coefficient of beginning level of concentration was statistically significant and had negative impact on CR-4 and CR-8; the coefficient of growth rate of industry was statistically insignificant and had negative impact on the dependent variable; the size of industry had negative impact on the dependent variable, but the magnitude was not large, but was statistically significant; different degree of product differentiation had different impact on the dependent variable (high product differentiation was associated with steep increase in CR, moderate product differentiation was associated with high positive influence on CR, while low product differentiation did not yield anything conclusive). The study concluded that the effect of the level of product differentiation on CR offset the effect of other factors, leading to rising concentration. Metwally (1977) analysed relationship between market concentration and advertising intensity for consumer goods industries of Australia, and concluded that market concentration and advertising intensity are both important determinants of each other. In the model with market concentration as a dependent variable, advertising intensity has strong positive impact on market concentration, coefficient of technological barriers to entry is statistically significant and it has a positive association with market concentration. The positive association of technological barriers to entry with market concentration is more for luxury and semi luxury consumer goods industries in Australia than in other industries. Mueller and Rogers (1980) built on the Mueller-Hamm (1974) study to analyse the reasons behind market concentration using a sample of 167 4-digit SIC industries and concluded that various factors acted upon market concentration. However, the average level of market concentration showed moderate and consistent rise between 1958 and 1972. In consumer goods industries, advertising intensity led to overall rise in market concentration, offsetting all other negative factors. Advertising via television had significant effect on concentration in consumer goods industries with high level of product differentiation. Kessides (1990) used the theory of contestability to analyse the relationship between sunk cost and market concentration using a sample of 339 4-digit US manufacturing industries.

Among recent studies, Mishra (2008) analysed the relationship between concentration and markup using CMIE dataset for 119 product groups of the Indian economy.

Schmalensee (1980) mentions that industry specific studies using econometric tools were done by MacAvoy (1962) for the natural gas industry of US, MacAvoy (1965) for the railroad cartels industry of US, Joskow (1973) for insurance markets of US, Smallwood (1975) for insurance markets of US and Douglas & Miller (1975) for the airline industry of US. Eickhoff and Padberg (1963) studied the effect of consolidation in milk processing plants in the US on market concentration. Brester and Goodwin (1993) studied the effect of rising market concentration in the US wheat milling industry on vertical and horizontal price linkages. Nyman (1994) studied the effect of market concentration on pricing of nursing home care in the US. Greco (2000) studied market concentration levels in the US consumer book industry. Schneider et al (2008) studied the commercial health insurance market, analysing the relation between concentration in the market for health plan and physician organisations and their impact on insurance pricing. Singh & Zhu (2008) analysed the relationship between prices and market concentration for the auto rental industry in the US, factoring in the endogeneity of the market structure. Njegomir and Stojic (2011) tested the validity of the SCP paradigm in the context of the non-life insurance industry of 11 countries of Eastern Europe between 2004 and 2008. Ahamed (2012) investigates the SCP paradigm in context of the Bangladesh banking industry. Luo, Fan and Wilson (2014) studied the relationship between market growth and concentration in the shipping container industry in Hong Kong.

The industry specific studies do not just investigate or analyse the SCP paradigm in context to specific industries in specific countries, but studies the industries in context of mergers, acquisitions and collusions. Market concentration gives significant market power to a few firms, which in turn can affect the welfare of consumers. Mergers and acquisitions can lead to rise in market concentration and therefore, decrease in consumer welfare and efficiency. The industry specific studies, thus, are essentially a comment on policy formulation for these industries such as to reduce inefficiency. Policy formulation here refers to industry specific regulations, and not an overarching competition law or antitrust law. An antitrust law or competition law sees the entire economy as a homogenous entity and makes the same law for all based on existing theory of competition, without understanding that each industry is different and has different factors affecting market concentration.

In terms of mathematical formulation, the SCP paradigm would be as given below.

$$performance = f(conduct)$$

$$conduct = f(structure)$$

$$therefore, performance = f(conduct) = f(f(structure)$$
$$= f(structure)$$

In the initial days of research in this field, a typical regression had a characteristic of performance of the industry (such as profit, markup or efficiency) as the dependent variable, while explanatory variables were the level of market concentration (indicative of level of competition in the market) and barriers to entry (determined by variables such as sunk cost, value of fixed capital investment, etc.) as the explanatory. Thus, SCP paradigm was unidirectional, with market structure as exogenous or given.

However, developments in the study of Industrial Organisation put back the exogenous treatment of market structure in the SCP paradigm, and sought to treat market structure as endogenous. Market structure, to a large extent, is influenced by the basic conditions related to demand and supply, such as the material inputs required, economies of scale and scope, market size, price elasticity of demand and heterogeneity of consumers' needs and preferences. Further, these basic conditions also depend on market structure and firms' conduct. Also, the relationship between structure, conduct and performance is not necessarily unidirectional (Mishra, 2008).

Kamerschen (1968) analysed the two way relationship between concentration (market structure) and industry growth rates (market performance). Mueller & Hamm (1974) analysed the reasons behind market concentration. Market concentration was not an explanatory variable as proposed in the traditional SCP paradigm, but was taken as the dependent variable which is influenced by beginning level of concentration, industry growth, size of industry, net firm entry and level of product differentiation, all of which are variables indicating either market structure or performance. Mueller & Rogers (1980) built on the Mueller-Hamm study, considering market concentration as the dependent variable. Metwally (1977) concluded that

market concentration is an important determinant of advertising, and vice versa, advertising is an important determinant of market concentration.

Kessides (1990) concluded that the variables which determine the degree of contestability of markets - rate of depreciation of capital, intensities of rental and resale markets and technological factors - affect market concentration. This study shows that market structure is not exogenous, but is affected by the functioning of various components of the market. Mishra (2008) explores the concentration-markup relationship in a multidimensional and dynamic SCP-policy framework, using lagged values of profit margin to control for the problem of simultaneity.

While there has been multiple studies to explore the reasons behind market concentration with regard to industries in the US, such studies with respect to industries in India are lacking. Sparing a few studies (Mishra 2008, Deodhar & Pandey 2008, Kathuria & Bera, Saeed & Vincent 2012), neither industry specific nor cross section analysis exist in the market for analysing SCP paradigm in context of Indian economy. It is this gap that this study intends to fulfil. For a developing country like India, studying its industries to understand how structure - conduct - performance interact can help policy makers in making decisions with regard to regulation of specific industries or competition laws.

3.3 Data Source & Methodology

3.3.1 Note on Panel Data Analysis

Panel data, also known as longitudinal data, is a dataset where there is data on multiple cross-sections at different points of time. The cross-section unit can be either individuals or cities or states or firms or companies or industries. A cross sectional data is defined by a set of observations on randomly selected individuals at one point of time, and a time series data is defined by observation on a particular variable across time. The panel data can be understood as a cross-sectional data measured repeatedly over a period of time,

A panel data can either be balanced or unbalanced. A balanced panel data is where there are observation for all units at all time periods. An unbalanced panel data is where observation for all units at all time periods are not available.

The primary motive of using panel data is to solve the problem of omitted variables. When observing a cross-section unit over a period of time, there will be factors that influence the change in variable of interest but do not change over time (or are time invariant) or do not change across the various cross-section units (or are entity invariant). The effects of these factors cannot be measured, that is, they are unobserved effects. The unobserved effects capture the effect of the omitted variables which are constant over time or constant across entities.

A panel data can be expressed in the following equation:

$$y_{it} = \boldsymbol{x_{it}\beta} + c + \mu_{it}; i = 1, \dots, N; t = 1, \dots, T$$

Here, i represents a cross-section unit while t represents the time period. y_{it} is the value of the dependent variable for i at time t. $\boldsymbol{x}$ is a matrix of values of explanatory variables, that is, $x \equiv (1,2, \dots K)$, where K is the number of observable variables. $\boldsymbol{\beta}$ is a matrix of coefficients of the explanatory variables. Each β estimates the effect of corresponding x (explanatory variable) on y, while controlling for the effects of entity fixed effects, time-fixed effects and other independent variables. c is the unobserved effect or unobserved heterogeneity. c is not a parameter to be estimated.

The unobserved effect, given by c, can be either a fixed effect or a random effect. Whether the unobserved heterogeneity in a panel regression is correlated with the explanatory variable determines whether the model is a fixed effects model or a random effects model. The unobserved heterogeneity is treated differently in a fixed effects and a random effects model.

If $cov(x_j, c) \neq 0 \ \forall for\ any\ j \in 1, \dots, K$, that is, the unobserved heterogeneity is correlated with any of the explanatory variables, then the model is fixed effects model. In this case, c cannot be considered as part of the error term, since c affects y through its effect on x_j. If, on the other hand, $cov(x_j, c) = 0 \ for\ all\ j \in 1, \dots, K$, that is, the unobserved heterogeneity is uncorrelated with any of the explanatory variables, then the model is random effects model. In this case, c can be considered as part of the error term, as the effect of c on y cannot be accounted for through any of the explanatory variables, and therefore is truly random in nature.

Fixed Effects Panel Regression:

Assuming that a panel data regression with fixed effects has only one explanatory variable, it can be written as

$$y_{it} = \beta_0 + \beta_1 x_{it} + \alpha_i + \lambda_t + u_{it}$$

α_i is the entity fixed effects which is constant over time but differs across entities. It is time invariant. λ_t is the time fixed effects which differs over time but is constant across entities. The time fixed effects and the entity fixed effects are considered endogenous to the model. α_i and λ_t are correlated with the explanatory variable x_i. u_{it} is the idiosyncratic error. A panel data model can have only entity fixed effects (in which case $\lambda_t = 0$) or only time fixed effects (in which case $\alpha_i = 0$) or both. An OLS regression is performed on an entity demeaned or a time demeaned or both entity and time demeaned function to obtain the estimates.

For example, there is a panel data model with only entity fixed effects and one explanatory variable.

$$y_{it} = \beta_1 x_{it} + \alpha_i + u_{it}$$

At first, y_{it}, x_{it} and u_{it} are entity demeaned, that is, mean for each entity across all time periods are obtained and entity demeaned equation $\overline{y_i} = \beta_1 \overline{x_i} + \alpha_i + \overline{u_i}$ is obtained. Here, $\overline{y_i} = \frac{1}{T}\sum_{t=1}^{T} y_{it}$, $\overline{x_i} = \frac{1}{T}\sum_{t=1}^{T} x_{it}$, $\overline{u_i} = \frac{1}{T}\sum_{t=1}^{T} u_{it}$. Then the entity demeaned equation is subtracted from the original equation, giving $y_{it} - \overline{y_i} = \beta_1(x_{it} - \overline{x_i}) + (u_{it} - \overline{u_i})$. a_i gets subtracted, that is, the fixed effects is cancelled out. An OLS regression is run on this and the parameter β_1 is estimated.

Similarly, panel data models with only time fixed effects and with both time fixed and entity fixed effects are calculated.

Random Effects Panel Regression:

Assuming that a panel data regression with random effects has only one explanatory variable, it can be written as

$$y_{it} = \beta_1 x_{it} + \alpha_i + u_{it}$$

The unobserved heterogeneity, α_i, is assumed to be random and thus, uncorrelated with the explanatory variable. The error term$(\alpha_i + u_{it})$ is serially correlated within each entity. The random effects regression equation is transformed to a partially demeaned equation like $(y_{it} - \theta\overline{y_i}) = \beta_1(x_{it} - \theta\overline{x_i}) + (1-\theta)\alpha_i + (u_{it} - \theta\overline{u_{it}})$. Here,

$$\theta = 1 - \left(\frac{\sigma_\alpha}{\sqrt{\sigma_\alpha^2 + \sigma_u^2}}\right)$$

σ_α and σ_u are the standard error of the unobserved heterogeneity and the idiosyncratic error respectively. If $\theta = 0$, then the partially demeaned equation resembles a pooled OLS regression, and if $\theta = 1$, then the partially demeaned equation resembles fixed effects. In random effects regression, the θ is between 0 and 1. The estimators are obtained by running an OLS regression on the partially demeaned equation.

3.3.2 Note on the Dataset

As discussed in the previous chapter, the data used in this dissertation has been sourced from CMIE ProwessIQ Database. The datafield **'Sales'** has been used to calculate the indices. The datafields which have been used to construct the independent (or explanatory variables) are defined here.[7]

1. **Total Income:** Total income is the sum total of all income generated by a firm during an accounting period. It is inclusive of income coming from continuing operations and discontinuing operations, income from normal course of business and extraordinary income and income from sale of goods and services, income from investment activity. Irrespective of whether the income is a cash flow or not, it is included in this datafield if it is the income accruing to the concerned firm.

2. **Total Expenses:** Total expense is the sum total of all revenue expenses incurred by a firm during an accounting period. It includes expenses for raw materials, store & spares, packaging and packing, purchase of finished goods, power, fuel & water charges, compensation to employees, indirect taxes, royalties & technical-know how fees, rent & lease rent, repairs & maintenance, insurance

[7] The ProwessIQ Database Dictionary (CMIE, 2020) has defined the datafields.

premium paid, outsourced manufacturing jobs, outsourced professional jobs, non-executive directors' fees, selling & distribution expenses, travel, communication, printing & stationery, miscellaneous, other operational expenses of industrial enterprises & non-financial services enterprises, financial services, provisions, depreciation, amortisation, write-offs, prior period and extra-ordinary expenses and provision for direct tax.

3. **Selling & Distribution Expenses:** Selling & Distribution Expenses include advertising expenses, marketing expenses and distribution expenses. It includes the cost of promoting goods or services of the firm, to secure customers and ensure delivery of products to the customers.

4. **Profit after Tax:** Profit after tax is obtained by deducting total expenses from the sum of total income and change in stocks.

5. **Total Assets:** Total assets is the sum of all current and non-current assets held by a firm on the last day of an accounting period.

From the above discussed datafields and after a review of literature, the following independent variables have been constructed:

1. ***num_firms:***

This variable refers to the number of firms in an industry in a year. As number of firms rise, concentration should fall; thus, *num_firms* and *hhi* should have a negative relation. It is also to be noted that that the number of firms across industries have risen. This can partly be attributed to the actual rise in number of firms and partly to the increased coverage by CMIE.

2. ***profit_sales:***

This variable refers to the total profit of each industry to total sales of the industry. As this ratio rises, the concentration index should rise. Profit more than normal profit (which is obtained when there is perfect competition in the market) is possible when the company has market power. It is possible for a few companies, or even one company, to gain monopoly profits, at the cost of profits of other companies, thereby rising overall industry profit. However, it is the market power which enables a company to keep on raising profits. Thus, rising profit to sales ratio should be positively related to market concentration.

3. ***adv_sales:***

This variable refers to the ratio between advertising & distribution expenses and total sales of a firm. More expenditure on advertisement should lead to rise in market concentration. When companies are unable to compete with each other via prices, non-price competition takes place. One such non-price competition is advertising. Aggressive advertising exists in industries with product differentiation. Here, the variable is a proxy for product differentiation. The more a company is able to capture a market via advertising, the more concentrated the industry will become. More expenditure on advertising by a company leads to the company capturing more market share, and therefore, rise in value of concentration index. Therefore, this variable and HHI should be positively related. However, it is to be noted that *Selling & Distribution Expenses* do not cover the advertising expenses exclusively, but include marketing and distribution expenses. The CMIE ProwessIQ database does not contain the *advertising expense* solely for majority of the firms. Therefore, the *Selling & Distribution Expense* had to be taken into consideration while constructing this index.

4. ***cap_intensity:***

This variable refers to the ratio between total assets and total sales. Increasing total asset per unit of sale would mean that the firm is able to translate its earnings into further investment opportunities. Increasing assets per unit of sale means that the firm has increasing amount of resources to generate more economic benefits in the future. The economic benefits which the firm can get in the future does not necessarily need to come from only sales. The assets, such as land, inventory, machines, patent, trademark, stocks etc., used to generate more economic benefit leading to greater economic power, and thus ability to dominate a market. A rise in this ratio should be positively related to rise in market concentration.

5. ***growth_ind:***

This variable is obtained by dividing the difference between total sales of two consecutive years by the total sales of the initial year.

$$growth\_ind = \frac{total\ sales\ in\ a\ year - total\ sales\ in\ previous\ year}{total\ sales\ in\ previous\ year}$$

An increase in the growth rate of an industry means that the year on year growth of total value of sales is increasing, which means that at least a few firms are able to sell more, thus capturing more market power and therefore, increasing the index of concentration.

There are many other factors discussed in the literature review which has shown to have impact on the level of market concentration. However, lack of reliable and exhaustive data on such fields have prevented them to be included in the study. For example, multiple studies have shown the important of product differentiation as an important factor. Many studies have used advertising intensity as a proxy to product differentiation. Mueller & Rogers (1980) categorised consumer goods industries into low, moderate and high based on the proportion of advertising cost out of total sales. The present study has considered only advertising cost to sales ratio. However, CMIE data does not give data of break up of sales for each company as per each product. One company might produce multiple products but CMIE relates each company to a particular product or product group only when sales from that product or product group exceeds 50% of total sales of the company (which includes sales of the company from each product it manufactures). The break-up of advertising cost for each product is also unavailable. Also, the advertising cost is the sum total of selling and distribution expenses, which has many other components other than advertising cost solely. The industries taken into consideration couldn't be divided into use based categories such as consumer goods, capital goods, intermediate goods and primary groups explicitly since there are multiple products under each industry which has different uses. A 5-digit NIC classification could have solved this problem, but it would lead to other issues such as lack of data on other factors at such narrow level of product classification. Therefore, a trade off had to be made which led to considering 38 industries.

Company level data was first extracted from the Prowess IQ database. Then that was aggregated into industry level data. A dataset with 27 years and 38 industries was finally made.

This dataset is a panel data. It has data on 38 industries (cross-section units) over 28 years (time periods). In the dataset, we have both time fixed effects and

individual fixed effects. The panel data is a two-way panel data model since it has both time fixed and individual fixed effect.

National competitions laws, national GDP, political situation in the country, state of economy in the country, unemployment rate, and legal system are some of the time fixed effects since they are constant across various industries, but vary over time. The effect of these variables of the value of the concentration index, *hhi*, cannot be measured or are unobserved. These can also be correlated with the explanatory variables. For example, the state of economy in the country will affect the capital intensity ratio. National level laws on competition, such as the Competition Act 2002, can affect the advertising intensity. The Competition Act was brought in to prevent abuse of dominant position of a firm in an industry. Thus a firm, which would earlier resort to predatory pricing to increase market share would have to increase expenditure on advertising in order to increase sales. Though these effects cannot be measured, there are extremely important in determining the value of the concentration index, and therefore, must be accounted for in the model.

There are industry specific laws, regulatory bodies for different industries are some of the industry fixed effects since they are constant over time but differ across industries. The effect of these on HHI cannot be measured, but they do affect the dependent variable. For example, regulatory bodies can control the entry and exit of firms in an industry, effectively controlling the number of firms in an industry, and thus affecting the dependent variable. Therefore, the unobserved heterogeneity across industry is correlated with the explanatory variables.

Even after including both industry fixed effects and time fixed effects, the model cannot control for firm-specific characteristics which vary over time. This can still be a source of omitted variable bias, and is absorbed in the error term.

3.3.3 Building the Regression Model

In the entire process of building the regression model, the open source software R Studio has been used. 38 industries were chosen based on study of existing literature. Company level data for each industry on multiple indicators – Company Code, Company Name, Year, Yearly Income, Yearly sales, Income from Financial Sources, Total Expenditure, Compensation of Employees, Selling & Distribution

Expenditure, Total Profits and Total Assets – was extracted for the years 1991 to 2019. The total number of observations stood at 197660. The steps involved in building the model have been discussed here.

1. Dealing with missing values:

Since *Total Sales* was to be used to calculate the market concentration indices, any company where the data for *Total Sales* was unavailable was dropped from the dataset. After this, the total number of observations stood at 174355, a drop of 11.79% of the initial observations.

Table 3.2: Number & Percentage of Missing Values in various variables after dropping observation with missing values in 'Total Sales'

Variables	Number of Missing Values	Percentage of Missing Values
inc	1	0.000573542485159588
inc_fin	37831	21.6976857560724
exp	36	0.0206475294657452
coe	3296	1.890396031086
adv_exp	23251	13.3354363224456
profit	131	0.0751340655559061
assets	27	0.0154856470993089

Since the percentage of missing values in the variables *inc*, *exp*, *coe*, *profit* and *assets* is very low, we drop the observations with missing values in any of these. According to existing literature, expenditure on advertising is important to understand the effect of product differentiation on market concentration. Thus, it is decided to drop the observations with missing values in *adv_exp*, instead of dropping the entire variable. The number of observations now stands at 150497, a 13.67% drop from 174355 number of observations. Even after this, there were 17.68% observations where the data for *Income from financial sources* was missing. It was decided to drop the entire variables instead of losing more observations by removing all observations where the datafield was missing.

2. Aggregating data at industry level:

Thereafter, the data was aggregated at the industry level. The data was aggregated to have data for the 5 datafields discussed in section 3.1 of this chapter for 38 industries across 28 time periods (1992-2019).

3. The dependent variables:

HHI is the dependent variable. The HHI for each industry for each year have been calculated.

4. Making the independent variables:

The independent variables were constructed thereafter. This has been discussed in Section 3.3.1.

5. Necessary variable transformations:

Variables are transformed to stabilize the variance of the error term and to bring the variables within a comparable range. In doing this, the assumption of normality of error term is also fulfilled.

Only 3 variables – *HHI*, *num_firms* and *cap_intensity* – need to be transformed. The other variables are in a comparable range. Table 3.3 gives the range of all the variables.

Table 3.3: Minimum and Maximum Values of the variables

Variables	*HHI*	*num_firms*	*profit_sales*	*adv_sales*	*growth_ind*	*cap_intensity*
Minimum Value	109.3821	5	-1.682	0.002	-0.71	0.396
Maximum Value	7497.442	1001	0.241	0.26	3.138	5.528

The log transformation of *HHI*, *num_firms* and *cap_intensity* is taken to bring them within a comparable range.

6. Fixed Effects model or Pooled OLS model:

The pooled OLS model is similar to running a simple OLS regression, without accounting for the data having year and entity components. This comparison is done using the F test. The null hypothesis is that the pooled OLS model is

consistent. The alternate hypothesis is that the fixed effects model is consistent.

7. Fixed Effects model or Random effects model:

Results of both twoway fixed effects model and random effects model are obtained. The Hausman Test is run to statistically check which model is better suited for the dataset used here. The null hypothesis of the Hausman Test is that there is no correlation between the unobserved heterogeneity and the explanatory variables and thus random effects model should be used. The alternate hypothesis is that there is correlation between the unobserved heterogeneity and the explanatory variables and thus fixed effects model should be used. If the p-value is less than the chosen level of significance, then the null hypothesis should be rejected in favour of the alternate hypothesis.

8. Analysing the selected model:

Once the model selection is finalised, the model is analysed and interpreted. As far as the coefficients are concerned, the p-values, the signs and the value of the coefficients are analysed. The null hypothesis that a particular independent variable does not have any effect on the dependent variable is rejected in favour of the alternate hypothesis that the independent variable has significant effect on the dependent variable when the p-value is less than the level of significance (which can be at 1%, 5% or 10%). The signs of the independent variables are checked to analyse if they are in accordance with or refutes existing theory. The coefficients of the independent variables are analysed to know the degree to which the independent variables affect the dependent variable.

After this, the value of $adjusted\ R^2$ and the $p\text{-}value$ of the $F\text{-}statistic$ is checked. The $F\text{-}statistic$ tells whether a group of independent variables are jointly significant, that is, whether they collectively affect the dependent variable. If the $p\text{-}value$ of the $F\text{-}statistic$ is less than the level of significance, then the null hypothesis that the independent variables jointly do not affect the dependent variable is rejected in favour of the alternate hypothesis that the dependent variable is jointly affected by the independent variables.

A model which minimizes the Residual Sum of Squares (RSS) is better. RSS is the difference between Total Sum of Squares (TSS) and Explained Sum of Squares (ESS). TSS refers to the total variation between the actual value and the predicted value of the dependent variable. ESS refers to the amount of variation explained by the model. RSS refers to the amount of variation in the dependent variable which couldn't be explained by the model. RSS is also the difference between the actual value of dependent variable and the predicted value. A good model is one with minimum RSS.

Some of these criteria have been discussed here. $Goodness\ of\ fit\ (R^2)$ and $adjusted\ R^2$ are two criterion to check the fit of model

$\underline{Goodness\ of\ fit\ (R^2)}$: R^2 or $Goodness\ of\ Fit$ represents the proportion of variation in the dependent variable explained by the independent variables out of the total variation in the dependent variable.

$$R^2 = \frac{ESS}{TSS} = 1 - \frac{RSS}{TSS}\ ,\quad 0 \le R^2 \le 1$$

The closer R^2 is to 1, the model is the better fit. However, R^2 can be increased by simply adding variables to a model, which in turn can lead to increase in variance of the error term. In order to overcome this, Henry Theil developed the $adjusted\ R^2$.

$$\underline{Adjusted\ R^2\ (\overline{R^2})}$$

$$\overline{R^2} = 1 - \frac{\frac{RSS}{n-k}}{\frac{TSS}{n-1}} = 1 - (1 - R^2)\left(\frac{n-1}{n-k}\right)$$

where, n is total number of observations

k is the number of parameters in the model, including the intercept term

$n-k$ and $n-1$ are the degrees of freedom associated with RSS and TSS respectively. The R^2 is adjusted for the degrees of freedom of RSS and TSS. $\overline{R^2}$ is less than R^2, and therefore it can be understood that it adjusts for the additions in the independent variables. $\overline{R^2}$ increased only if the absolute t-value of the added variable is more than 1. Higher value of $\overline{R^2}$ shows that a model is a better fit.

Models with higher value of $adjusted\ R^2$ are better. However, obtaining extremely high value of R^2 in a panel data model is rarely possible.

9. Regression Diagnostics:

(i) Test for time-fixed effects, individual-fixed effects and joint time-fixed and individual-fixed effects: The Breusch-Pagan (BP) Lagrange Multiplier (LM) test is done in panel data to check whether there are time effects or individual effects or joint effects of both in the model which should be included. The null hypothesis in each case is that there are no time fixed effects or no individual effects or no joint effects.

(ii) Cross-sectional dependence test: Cross-sectional dependence or contemporaneous correlation is a problem in panel data with long time series. The null hypothesis of the Pasaran Cross-Sectional Dependence (CD) test is that the residuals across individuals are not correlated.

(iii) Serial Correlation Test: Panel data with long time series can have the problem of serial correlation. The Breusch-Godfrey-Wooldridge test for serial correlation has the null hypothesis that there is no serial correlation.

(iv) Heteroscedasticity Test: When the variance of the error term is not equal, that is, the actual value of the dependent variable are scattered around the predicted line. When the variance of the error term is same throughout, then it is known as homoscedasticity. Heteroscedasticity gives biased standard errors, thus leading to drawing wrong conclusions about significance of estimators. The null hypothesis in the Breusch Pagal Test is that there is homoscedasticity.

10. Controlling for heteroscedasticity and serial correlation:

If a model has heteroscedasticity and serial correlation, it needs to be controlled for. Robust standard errors are calculated which gives unbiased standard errors of coefficients.

3.4 Data Analysis

The dataset, variables and methodology have already been discussed. In this section, the results from R Studio are reproduced. Five panel data regression models – pooled OLS model, random effects model, individual fixed effects model, time fixed effects model, and twoways fixed effects model - are run in the software to obtain the results. The results are given in Table 3.4.

Table 3.4: Panel Data Regression Results

	HHI - index of market concentration				
			log(HHI)		
	Pooled OLS	Random Effects	Entity Fixed Effects	Time Fixed Effects	Twoways Fixed Effects
	(1)	(2)	(3)	(4)	(5)
log(num_firms)	-0.637***	-0.564***	-0.559***	-0.656***	-0.661***
	(0.016)	(0.018)	(0.019)	(0.018)	(0.034)
profit_sales	1.512***	0.718***	0.712***	1.616***	0.709***
	(0.216)	(0.123)	(0.123)	(0.225)	(0.129)
adv_sales	-0.037	-0.818	-0.945	-0.121	-1.000
	(0.536)	(0.612)	(0.631)	(0.542)	(0.645)
growth_ind	-0.052	-0.016	-0.013	0.015	0.005
	(0.087)	(0.044)	(0.044)	(0.093)	(0.046)
log(cap_intensity)	0.025	0.142***	0.152***	0.022	0.163***
	(0.041)	(0.047)	(0.048)	(0.042)	(0.051)
Constant	9.436***	9.163***			
	(0.084)	(0.120)			
Observations	999	999	999	999	999
R^2	0.609	0.507	0.503	0.593	0.314
Adjusted R^2	0.607	0.505	0.481	0.580	0.265
F Statistic	309.304*** (df = 5; 993)	1,023.044***	193.446*** (df = 5; 957)	281.821*** (df = 5; 967)	85.184*** (df = 5; 931)
Significance Levels				*p<0.1; **p<0.05; ***p<0.01	

Before moving on to the interpretation of the regression models, it is important to select between them. The first step is to determine whether a fixed effects or a pooled OLS model applies in this case. This is done using the F test. In R Studio, the *pFtest* command is used. Table 3.5a, 3.5b and 3.5c reproduces the result of the command to test between pooled OLS and entity fixed effects model, between pooled OLS and time fixed effects model and between pooled OLS and twoways fixed effects model respectively.

Table 3.5a: Pooled OLS versus Entity Fixed Effects

F test for individual effects data: log(HHI) ~ log(num_firms) + profit_sales + adv_sales + growth_ind + log(cap_intensity) F = 90.583, df1 = 36, df2 = 957, p-value < 2.2e-16 alternative hypothesis: significant effects

Table 3.5a reproduces the result of the F test for individual effects. The p-value is less than 0.01, and therefore, the null hypothesis that the pooled OLS method is consistent is rejected in favour of the alternate hypothesis that the Entity Fixed Effects model is consistent.

Table 3.5b: Pooled OLS versus Time Fixed Effects

F test for time effects data: log(HHI) ~ log(num_firms) + profit_sales + adv_sales + growth_ind + log(cap_intensity) F = 0.50038, df1 = 26, df2 = 967, p-value = 0.9832 alternative hypothesis: significant effects

Table 3.5b reproduces the result of the F test for time effects. The p-value is more than 0.01, and therefore, the null hypothesis that the pooled OLS method is consistent cannot be rejected. Therefore, between pooled OLS and Time Fixed Effects model, the pooled OLS must be chosen.

Table 3.5c: Pooled OLS vs Twoways Fixed Effects Model

F test for twoways effects

data: log(HHI) ~ log(num_firms) + profit_sales + adv_sales + growth_ind + log(cap_intensity)

F = 52.669, df1 = 62, df2 = 931, p-value < 2.2e-16

alternative hypothesis: significant effects

Table 3.5c reproduces the result of the F test for twoways effects. The p-value is less than 0.01, and therefore, the null hypothesis that the pooled OLS method is consistent is rejected in favour of the alternate hypothesis that the Twoways Fixed Effects model is consistent.

The next step is to determine whether a fixed effects or a random effects model applies in this case. The Hausman Test helps to do the same. Tables 3.6a, 3.6b and 3.6c reproduces the results of the Hausman tests (done using the *phtest* command in R Studio) done to compare between the random effects model and entity fixed effects model, between the random effects model and time fixed effects model, and between the random effects model and twoway fixed effects model respectively.

Table 3.6a: Random Effects model or Entity Fixed Effects model

Hausman Test

data: log(HHI) ~ log(num_firms) + profit_sales + adv_sales + growth_ind + log(cap_intensity)

chisq = 6.8284, df = 5, p-value = 0.2337

alternative hypothesis: one model is inconsistent

In Table 3.6a, the p-value is equal to 0.2337. Therefore, even at a significance level of 10%, the null hypothesis cannot be rejected. Therefore, the random effects model must be chosen over entity fixed effects model.

Table 3.6b: Random Effects model or Time Fixed Effects model

Hausman Test data: log(HHI) ~ log(num_firms) + profit_sales + adv_sales + growth_ind + log(cap_intensity) chisq = 199.86, df = 5, p-value < 2.2e-16 alternative hypothesis: one model is inconsistent

In Table 3.6b, the p-value is less than 0.01. Therefore, the null hypothesis can be rejected at a significance level of 1%. Thus, the time fixed effects model must be chosen over the random effects model.

Table 3.6c: Random Effects model or Twoway Fixed Effects model

Hausman Test data: log(HHI) ~ log(num_firms) + profit_sales + adv_sales + growth_ind + ... chisq = 14.029, df = 5, p-value = 0.01543 alternative hypothesis: one model is inconsistent

In Table 3.6c, the p-value is less than 0.05. Therefore, at a significance level of 5%, the null hypothesis that the random effects model is consistent is rejected in favour of the alternated hypothesis that the twoway fixed effects model is consistent.

From the preceding discussion based on the results of the F test and the Hausman test, it can be said that the twoway fixed effects model should be chosen. In the theoretical discussion in previous section, it has been established that a twoway fixed effects model is applicable to the dataset in question. Statistical results and theoretical analysis complement each other for reaching an effective conclusion. Therefore, the twoway fixed effects model is taken to be the true model in the present case.

For further confirmation of the choice of twoway fixed effects model, the Lagrange Multiplier (Breusch-Pagan) Test is done. Table 3.7 reproduces the results of

the LM-BP Test which tests for the presence of two ways effects in the panel data model.

Table 3.7: Testing presence of Twoways Fixed effects in the panel data

Lagrange Multiplier Test - two-ways effects (Breusch-Pagan) for balanced panels
data: log(HHI) ~ log(num_firms) + profit_sales + adv_sales + growth_ind + log(cap_intensity)
chisq = 7196.9, df = 2, p-value < 2.2e-16
alternative hypothesis: significant effects

The p-value in Table 3.7 is less than 0.01. Therefore, the null hypothesis that there is no two way fixed effects can be rejected at a significance level of 1%. Thus, the panel data has joint presence of both entity and time effects.

In accordance to the preceding discussion, the twoway fixed effects model is chosen. The interpretation of each of the explanatory variable is given hereafter.

Number of firms: The coefficient of the explanatory variable *log(num_firms)* is *-0.661*. This means that a 1% rise in the number of firms in an industry leads to a decrease in *HHI* by 0.0661%. This is in accordance with existing literature that with rise in number of firms in an industry, the level of concentration declines. The p-value of the coefficient is less than 0.01, which means that the null hypothesis that -*log(num_firms)* does not have any significant effect on *log(HHI)* can be rejected. It is to be noted that this variable was taken as a proxy to the net entry of firms in each year. Getting the data of the actual number of firms which entered the market in each industry in each year is difficult due to the nature of the CMIE data. Over the years, CMIE Prowess database has expanded its coverage, and this doesn't give a true picture of the actual number of new entrants in the market.

Profit to sales ratio: The coefficient of the explanatory variable *profit_sales* is 0.709, which means that with a rise in the ratio by 1 unit, *HHI* increases by 0.709%. Profit in an industry can rise due to a few firms making super-normal profit (the profit made by firms when the market is perfectly competitive), and that is possible when those few firms have relatively greater market control than the remaining firms. With

more profit in the hands of few firms (or one or two firms in many cases), it is possible for those firms to use it for greater market control leading to greater concentration. Monopoly profit by few firms leads to rise in concentration. The more the profit to sales ratio rises, the scope for further concentration also increases. The p-value of this coefficient is less than 0.01, which means that the null hypothesis that *profit_sales* does not have any significant effect on *log(HHI)* can be rejected.

Advertising to sales ratio: The p-value of the coefficient of *adv_sales* is greater than even 0.10, which means that even at a significance level of 10%, the null hypothesis that the coefficient does not have significant effect on *log(HHI)* cannot be rejected. There are two possible reasons why the coefficient of advertising to sales ratio is not statistically significant. The first one is that this is the ratio of sum of advertising, marketing and distribution expenses to total sales, and not solely of advertising expenses to total sales. The data for advertising expenses solely was not available for most companies, and therefore, *Selling & Distribution Expenses* was taken into consideration. The second possible reason is that in different types of industries, advertising intensity can have varied relation with market concentration. Exploring this angle is beyond the plausibility of the current study.

Growth rate of industry: The coefficient of *growth_ind* is positive, but is statistically insignificant.

Capital intensity: The coefficient of *log(cap_intensity)* is positive and statistically significant at a significance level of 1%. This means that a 1% rise in capital intensity is associated with a 0.163% rise in HHI. Capital intensity is defined by the ratio of total assets to total sales. Rise in total assets in relation to total sales leads to rise in concentration level. The more asset to sales ratio of a company or few companies, the more it can be invested to capture more market power, leading to rising level of concentration.

The p-value of the F-test, which tells whether the coefficients of all the explanatory variables are jointly significant, is less than 0.01. Thus, at a significance level of 1%, the null hypothesis that the explanatory variables together do not explain changes in the dependent variable is rejected. The explanatory variables, taken together, does explain changes in the dependent variable. The adjusted R^2 is 26.5%,

meaning that the explanatory variables explain 26.5% of overall changes in the dependent variable.

Table 3.8: Cross-sectional dependence test

Pesaran CD test for cross-sectional dependence in panels data: log(HHI) ~ log(num_firms) + profit_sales + adv_sales + growth_ind + log(cap_intensity) z = -2.1315, p-value = 0.03305 alternative hypothesis: cross-sectional dependence

Table 3.8 gives the result of the Pesaran test for checking for cross-sectional dependence in the panel data model. The p-value of the test is less than 0.05, which means that the null hypothesis is rejected at a significance level of 5%. This means that there is cross sectional dependence in the panel data. Many industries are dependent on each other. For example, if the crude oil and natural gas industry is concentrated, then it will affects the level of concentration of industries like petroleum products which source their raw materials from the crude oil and natural gas industry. Presence of cross-sectional dependence cannot be avoided with the data that is being dealt here.

Table 3.9: Test for presence of serial correlation

Breusch-Godfrey/Wooldridge test for serial correlation in panel models data: log(HHI) ~ log(num_firms) + profit_sales + adv_sales + growth_ind + log(cap_intensity) chisq = 577.2, df = 27, p-value < 2.2e-16 alternative hypothesis: serial correlation in idiosyncratic errors

Table 3.9 gives the result for the Breusch-Godfrey/Wooldridge test to check for presence of serial correlation in the twoway fixed effects model. The p-value is less than 0.01, which means that the null hypothesis can be rejected in favour of the alternate hypothesis. This suggests the presence of serial correlation in the model.

Table 3.10: Test for Presence of Heteroscedasticity

Breusch-Pagan test

data: log(HHI) ~ log(num_firms) + profit_sales + adv_sales + growth_ind + log(cap_intensity) + factor(year) + factor(industry_names)

BP = 488.48, df = 67, p-value < 2.2e-16

Table 3.10 shows the results for Breusch-Pagan test for checking for the presence of heteroscedasticity in the model. The p-value is less than 0.05. Therefore, the null hypothesis that there is no heteroscedasticity is rejected. The result suggests the presence of heteroscedasticity in the model.

Table 3.11: Heteroscedasticity and autocorrelation correct standard errors

t test of coefficients:

	Estimate Std.	*Error*	*t value*	*Pr(>|t|)*
log(num_firms)	*-0.6610616*	*0.1025074*	*-6.4489*	*1.807e-10 ****
profit_sales	*0.7087365*	*0.4261269*	*1.6632*	*0.09661 .*
adv_sales	*-0.9997217*	*1.5412942*	*-0.6486*	*0.51674*
growth_ind	*0.0048933*	*0.0611459*	*0.0800*	*0.93623*
log(cap_intensity)	*0.1632928*	*0.1274466*	*1.2813*	*0.20042*

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*Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1*

Due to the presence of serial correlation and heteroscedasticity in the twoway fixed effects panel data model, robust standard errors, corrected for both serial correlation and heterocedasticity, is obtained. The results are produced in Table 3.11. This correction leads to a certain degree of loss in statistical significance for the coefficients.

In the previous chapter, it was seen that, for most industries, there has been a decreasing trend in the level of market concentration. The explanatory variable *num_firms*, which is the number of firms used in the calculations for a year for an industry, overshadows the effects of the other explanatory variables. It has been discussed earlier that over the years, the coverage of companies by CMIE has increased, and that this can be a cause for a bias in the trend. However, controlling for this particular variables, the other relation between the other explanatory variables with the dependent variable does not change.

The relation between the explanatory variables and HHI is important. For example, if government regulations and policies lead to a decrease in the number of firms, the HHI will increase. If the profit to sales ratio gets a boost due to some government policy, say tax cuts, leading to monopoly profits in the hands of a few firms, the HHI will rise. If the total assets of a particular firm increases, due to the government giving land to the firm at throwaway prices, leading to an overall increase in the capital intensity of the industry, then HHI will increase. While studying this relationship is necessary, the inquiry into the extent and implications of concentration has to go beyond this. Therefore, study of individual industries and government policies and regulations is important to understand the implication of the market concentration.

3.5 Conclusion

The regression analysis shows that the regression coefficients of *number of firms*, *profit to sales ratio* and *capital intensity* are statistically significant. While the *number of firms* and *HHI* are negatively related, *profit to sales ratio* and *capital intensity* are positively related to *HHI*. The coefficients of the remaining two explanatory variables, *advertising intensity* and *growth of industry*, are not statistically significant. All the explanatory variables, taken together, have statistically significant effect on the dependent variable.

The downward trend of market concentration which was seen in Chapter 2 can be explained by the dominance of the effect of the variable *number of firm*, which in turn comes from the gradual increase in the coverage of companies by CMIE over the years. There is a bias inherent in the way the data has been collected. Another major

shortcomings of the CMIE database comes from the way CMIE maps each company to one product or product group depending on 50% of total sales of the company coming from that particular product or product group, and break up of sales data by products is not given. Also, data for advertising expenses only is lacking for most companies.

The regression analysis gives an indication about the possible reasons for change in market concentration across all industries and time periods. The changes in the measurable determinants such as the number of firms in any industry, the profit to sales ratio, the capital intensity, etc. are affected by government policies, which in turn are determined by the nature of the State. Every industry is affected in different ways. This chapter has gave useful insights into the factors which determine market concentration, despite the caveats in the data. Going forward, industry specific analysis and an inquiry into the nature of State is required to understand how, why and with which companies and business groups concentration is happening.

CHAPTER 4

MARKET CONCENTRATION: ROLE OF STATE REGULATION AND INDUSTRIAL POLICY (CASE STUDY OF PETROLEUM AND INDUSTRIAL POLICY)

4.1 Introduction

As discussed in the previous chapter, the econometric model is able to explain only a portion of the reasons for changes in market concentration. The analysis of level of concentration across industries in Chapter 2 revealed that a few conglomerates held considerable market share in many industries, especially in those industries which rely on natural resources for raw materials, those industries such as chemical, metals, petroleum products which are used as inputs in almost all other industries. Together, there is a trend of concentration of capital within a few conglomerates. However, this concentration is not explained fully by the laws of the market, as seen in Chapter 3.

In order to make sense of the unexplained, it is necessary to examine each industry individually. However, given the scope of the present discussion, it is not possible to study all the industries individually. Therefore, two industries are selected – the Telecommunications industry and the Petroleum Products industry – for further analysis.

There are a few features common to both the industries. Firstly, before the advent of neoliberal policies in India in 1991, both of these industries had monopoly of the State. However, as will be discussed in the present chapter, this condition has changed for both. Secondly, the government has created market for natural resources such as for the spectrum and for the oil and natural gas basins for both of these industries. Neoliberalism, while advocating minimum state intervention does require the state to create markets where they do not exist and define property rights for even common resources. Finally, both of these industries are core industries and of strategic importance, and are used as inputs in almost all other industries.

Neoliberalism has argued that state intervention leads to inefficiency – one of the key reason for which is rent seeking. Therefore, neoliberal policies aim toward

decreasing government intervention to remove inefficiency. It is argued by advocates of neoliberal policies that, by doing so, the problem of rent seeking will diminish, leading to efficiency in production and distribution and rise in economic growth. Ultimately, consumers will benefit. With India adopting neoliberal policies, competition laws were also changed over time with the aim to curtail concentration and promote competition. Many other policies were made with the stated objective of doing away with rent seeking and providing level playing fields for all businesses. The aim of the present chapter is to explore whether the ushering of policies in line with neoliberalism has led to restricting concentration and promoting competition, and what implication does the state of concentration and competition in industrial sector in India has on the nature of State and economy in the country.

The case studies attempt to provide a methodology for further inquiry into individual industries. However, since these two are core industries which go as input in almost all other industries, the level of concentration in these industries will have impact in the functioning of other industries. Suppose that products of industry A are used as inputs in multiple other industries and that it has only 2 dominant players. Therefore, companies of the other industries has the option for only 2 suppliers for the input from industry A. These two suppliers can impose certain conditions on companies or firms in other industries which can decide the fate of those companies. The market for input goods does not remain competitive in such a case, and the 2 players of industry A can affect decision making in other industries in order to raise their own profits. Therefore, even though case studies of only two industries has been presented, it will be useful in understanding the general trend in the economy with regards to neoliberal reforms.

This chapter starts with case studies of the two industries, where an analysis of the changes in the level of concentration since 1991 is done. The cases of scams and corruption in obtaining licenses for spectrums and oil and natural gas fields and how they have led particular corporate houses controlling the market are discussed. The chapter then goes on to explore the concepts of rent seeking and crony capitalism and whether the neoliberal reforms have delivered its promise of minimising rent seeking and maximising efficiency. The chapter then discusses how concentration and centralization of capital is happening, and how the State is actively extending a

helping hand to conglomerates in gaining control of more and more capital. It ends with a discussion on the nature of State and economy in India in present times.

4.2 Case Study – The Telecommunication Industry

> *"If the existing financial stress in the sector is not addressed within a short period, it could result in further bankruptcy and exit of TSPs from the market, leading to a state of virtual monopoly and absence of fair competition in the market."*
>
> -Vodafone Idea Limited in its written submission to TRAI in March 2020 (Business Standard India, 2020, March)

The above statement from one of the giants of the telecom industry in India became big news in the month of March 2020 for the industry, the government, economists and policy makers. This statement encompasses the true level of market concentration in the telecommunication industry in India in the present time. The telecommunication services industry started as a monopoly with the government being the single largest player in the market in the 1990s. It went on to be an industry with many public and private players, and once again the industry is looking towards a 'virtual monopoly'. The market share, once concentrated in the hands of the government, is now concentrated in the hands of a few private players. The analysis for changing market concentration has to go beyond the discussion in Chapter 3 to explain this shift in market concentration in the industry and the recent disruption in the market with the entry of the latest player – Reliance Jio Infocomm Ltd. It requires an analysis of government intervention in the market and with individual players.

The telecommunication industry can be divided into two sub-sectors – telecommunications equipment sector (which includes core transmission equipment, switches, routers and other equipments) and telecommunications services sector (including wired services, wireless services, internet services). In the discussion here, the focus will be on the telecommunication services sector.

The TechARC-COAI (Cellular Operators Association of India), in its report *India Telecoms Amidst & Beyond COVID-19* (2021), claims that alongside contributing 6% directly to India's GDP, the telecom sector has enabled 30-35% of GDP during the COVID lockdown. As office workspaces, education, many medical consultation went online and almost every industry required telecommunication

services, the demand for it went up. Even before the new demand for telecommunication services came in with COVID induced lockdown, the industry used to contribute significantly to national income. The *Telecom Statistics India* – 2019, published by the Department of Telecommunications, reports that in 2014-15, the telecom industry contributed 1.29% of total GVA of India. The share rose to 1.35% by 2016. However, it subsequently fell to 1l.17% in 2017 and to 0.95% in 2018. At the end of July 2019, India was the world's second largest telecommunications market with a subscriber base of 1189.28 million (including 20.96 million landline telephone connections). The teledensity for India was 90.10 (159.66 for urban and 57.50 for rural) in 2019. Internet density for India was 48.48 in 2019 – 97.94 for urban and 25.36 for rural. Telecommunication services have a vital role to play in the economy with its importance for consumers directly and as an input in many industries.

In Chapter 2, it has been seen that the telecommunication industry had high level of concentration in the 1990s, and saw a steady decline till 2015. From 2015, there has been an increase in the level of concentration. In 1993, only 2 companies – Mahanagar Telephone Nigam Ltd. (MTNL) and Videsh Sanchar Nigam Ltd. (VSNL) – together held a market share of 89.60%. Both of these 2 companies were owned by the Government of India. The government had monopoly over the telecommunication market. After the introduction of the National Telecom Policy 1994, many private players such as Reliance Communications, Tata Indicom, Vodafone, Loop Mobile, Airtel, Idea, Uninor and others entered the market. Bharat Sanchar Nigam Limited (BSNL) – a state owned firm - was also established in 2000. Policies were undertaken by the government to make the telecom industry competitive.

The HHI rose from Period I to Period II, then fell till Period V and the rose again in Period VI (Figure 2.1). Apart from Period V when CR4 fell below 60%, the CR4 in this industry was always more than 60% (Figure 2.2). This means that the telecom industry has always been highly concentrated. There has been many entry and exit in this industry, but few companies have continued to dominate the industry. While the government owned companies dominated the market in 1992, a few private companies dominated the market till around 2016. With the entry of Reliance Jio Infocomm Ltd. in 2016, the telecom market has started moving towards a 'virtual

monopoly'. In 2019, 3 players – Bharti Airtel Ltd., Reliance Jio Infocomm Ltd. and Vodafone Idea Ltd. – had control over 80% of market share (author's own calculation from ProwessIQ Database). The entry of Jio has forced multiple mergers and exits, making the industry highly concentrated.

The entry of Reliance Jio in 2016 started a price war among existing telecom service providing companies and it has left the telecom sector in India crumbling. Coupled with it, a long legal battle to determine the licence fees and spectrum usage charges owed to the government by the telecom firms ended in the firms losing the battle, with the firms owing the government in crores.

The Indian government adopted the policies of liberalisation, privatisation and globalisation in 1990. As part of it, the telecom sector was also gradually opened up to the private players. However, the telecom sector has always been a highly regulated one. Providing telecom service requires the use of existing resources such as spectrum, the allocation of which has always been regulated by the government. The Department of Telecommunication, under the Ministry of Communications, is entrusted with the job of giving out licensing and spectrum allocations. In 1994, the National Telecom Policy was adopted which paved the way for entry of private players in the telecom industry in order to increase teledensity. Bidding for spectrum and telecom service provider licence was allowed for private players by DoT from 1995. High licence fee and inability to recover the amount from subscribers led to telecom service providers defaulting on licence fee payments. This led to the New Telecom Policy, 1999, which made a shift from the Fixed Licence Fee Regime to Revenue Arrangement Scheme. Under this new policy, telecom service providers had to pay a proportion of their revenue as licence fee as opposed to earlier where they had to pay a fixed fee. In 1998, the Telecom Regulatory Authority of India (TRAI) was set up which regulated fees and tariffs (Ghosh, n.d.). The National Telecom Policy 2012, in order to achieve the objective "One Nation-One License", brought in the era of Unified Licensing Regime, whereby all services (such as data, voice, etc.) were converged under one license (Department of Telecommunications, Ministry of Communications, Government of India, n.d.). Policies were being brought in to give entry to private players, to ease the process of acquiring spectrum and license in order to achieve higher penetration of telecom services in the country. However, the high

cost of spectrum and license and need for infrastructure to operate meant high barriers of entry for telecom service providers. Therefore, the market has always remained oligopolistic in nature. However, within the limited number of firms operating in this industry, there has been always a tight battle for greater market share.

However, with the latest entry of Reliance Jio in the market, the tight battle became more intense leading to a price war in the industry. Jio led this price war. Jio was launched with much fanfare and schemes which literally reduced calling rates (to any network) and internet charges to zero in the initial months after its launch. There was a network in the market now which became cheap enough to be affordable for everyone. Threatened with huge reduction in subscriber base, the other telecom firms also cut down its prices. This price war went to the extent that the players, except Jio, reported huge losses. Many firms shut down, while some merged to keep itself from being drowned.

Vodafone and Idea merged on 31 August 2018 to form the Vodafone Idea Limited. In October 2017, Bharti Airtel merged with Tata Teleservices and acquired Tata Docomo. The acquisition was completed in July 2019. In 2018, Airtel acquired Telenor (India) Communications Pvt. Ltd. (which operated by the name of Uninor). Reliance Communications (*not Reliance Jio which is a different firm)* had acquired Sistema Shyam TeleServices Limited (MTS in India) in 2016. In the same year, it attempted a merger with Aircel, but it failed. Reliance Communications closed its telecommunication service in 2019, and filed for bankruptcy. After failure to merge with Reliance Communications, Aircel was also forced to close its operations in 2018. The mergers and acquisitions were a bid to keep oneself afloat amidst the 'race to the bottom price war'. As of 2020, only 3 private players were operating in India - Bharti Airtel, Reliance Jio and Vodafone-Idea; alongwith 2 state-owned players - BSNL and MTNL.

Since Jio entered the market, it has expanded its subscriber base at the cost of other service providers, especially that of Vodafone. Out of total subscriber base, Jio garnered a share of 9.09% by March 2017, which increased to 15.40% by March 2018, increasing it to 25.92% by March 2019. Vodafone and Idea had a subscriber share of 17.51% and 16.35% respectively as of March 2017, 18.40% and 17.43% respectively as of March 2018. Vodafone Idea Limited (post merger) had a share of

33.39% as of March 2019. Bharti Airtel's subscriber share increased from 23.22% in 2017 to 25.43% in 2018 to 27.83% in 2019. Airtel had acquired Tata Docomo and Uninor during this period. The subscriber share of BSNL was 9.63% in 2017, 10.92% in 2018 and 10.72% in 2019, whereas MTNL maintained a share of 0.58% in this period (*Telecom Statistics India – 2019*, 2019, p. 59).

Apart from the price war which has forced multiple players out of the market, the Supreme Court judgement on the Adjusted Gross Revenue (AGR) case have further threatened the existence of the remaining players, except RJio, which eventually made VIL give the statement of the telecom sector moving towards a 'virtual monopoly'.

After liberalisation of the telecom sector in 1994, many private players - both domestic and foreign - entered the market. In the initial years, the Department of Telecommunications (DoT) charged fixed fee for the spectrum allocated to the various players. However, since 1999, this fixed charges were changed to a revenue sharing model, wherein telcos were asked to pay a share of their gross revenue to the government as annual spectrum charges and licence fee. The problem arose with differential understanding of the Adjusted Gross Revenue (AGR) by the telcos and by the DoT. While the telcos wanted AGR to be interpreted as revenue from their core business, that is, revenue arising from their usage of the spectrum, the DoT defines Gross Revenue to be "inclusive of installation charges, late fees, sale proceeds of handsets (or any other terminal equipment etc.), revenue on account of interest, dividend, value added services, supplementary services, access or interconnection charges, roaming charges, revenue from permissible sharing of infrastructure and any miscellaneous revenue, without any set-off for related item of expense, etc." (*License Agreement for Unified License*, n.d.). The AGR will be calculated by subtracting "PSTN/PLMN/GMPCS related call charges (Access Charges) actually paid to other eligible/ entitled telecommunication service providers within India, roaming revenues actually passed on to other eligible/ entitled telecommunication service providers and service tax on provision of service and sales tax actually paid to the government if gross revenue had included as component of Sales Tax and Service Tax" (*License Agreement for Unified License*, n.d.). Essentially, AGR according to the DoT's definition is much larger than the AGR according to the AGR definition by the telcos.

Thus began a long legal battle. The telcos had initially approached the Telecom Disputes Settlement and Appellate Tribunal (TDSAT). In 2015, the TDSAT had ruled in favour of the AGR definition given by DoT, which was challenged in the Supreme Court by the telcos. The SC, on 24 October 2019, upheld the DoT's definition of AGR and gave the telcos 3 months to clear their AGR fees, including spectrum charges, interest and fines. Bharti Airtel, Vodafone Idea and Reliance Jio faced AGR payments of Rs. 36,000 crore, Rs. 58,000 crore and Rs. 195 crore respectively. With huge cuts in revenue arising due to extremely low prices charged to customers (due to price competition), the AGR fees has put Bharti AIrtel and Vodafone Idea Limited in difficult financial situation, despite the SC giving them a period of 10 years to pay their fees. Bharti Airtel is in a relatively better position as it had already paid around 40% of its dues. VIL, on the other hand, had paid only 13% of its dues. RJio, being a late entrant, did not get burdened by the ruling. In December 2019, the 3 private players agreed to raise their prices by 40%-45%. Despite this, it has become difficult for VIL to survive in the market (*Telecom Tariffs War*, 2019).

The rise of RJio at the cost of VIL can be understood by the recent reports of India Ratings. As of July 2020, Reliance Jio is the largest player - by Revenue Market Share (RMS) and by Subscriber Market Share (SMS).

> *"RJio continues to garner share largely at the expense of VIL. RJio holds SMS of 35% in July 2020 and RMS of 38.3% in 1QFY21. While BAL has shown resilience and its overall wireless SMS increased, albeit moderately to 28.0% in July 2020 from 27.8% in June 2020, VIL continues to lose SMS (July 2020: 26.3%; June 2020: 26.7%). RJio also had a dominant market share of 58.7% in the broadband segment (as against 16.8% for VIL and 22.7% for BAL), since all of RJio customers are in the broadband category. VIL is losing market share, with the broadband subscriber base as well (July 2020: 16.8%; June 2020: 17.2%)."*
>
> - (Bansal, 2020)

The telecom industry has a high barrier to entry. Given this, the question of how Reliance Jio managed to capture the telecom market in a period of 3 years, while multiple incumbents were forced to exit or merge to keep themselves afloat, remains. Rising concentration in the telecom industry since 2016 cannot be explained by the factors discussed in Chapter 3 merely.

Reliance Jio Infocomm Limited (RJIL) is a subsidiary of Reliance Industries Limited (RIL). It was incorporated as Infotel Broadband Services Private Limited (IBSPL) on 15 February 2007, and changed to Infotel Broadband Services Limited (IBSL) in July 2010. It finally changed its name to RJIL in January (Indian Audit and Accounts Department, 2017, p. 67). RJIL had obtained the Unified Licence (for all services across the country except Global Mobile Personal Communication by Satellite Service) on 21 October 2013 (Indian Audit and Accounts Department, 2017, p. 67). RJIL had also obtained spectrum allocations much before starting operations (Indian Audit and Accounts Department, 2017, p. 68). In May 2015, the Comptroller & Auditor General (CAG) reported that RJIL got an undue benefit of about Rs. 33.67 billion after the Indian government allowed it to offer voice services over wireless broadband spectrum it had won in 2010. In 2010, RIL had bought the telecom unit and was then the only firm in the country to have a license for wireless broadband spectrum across the country. Reliance Jio started commercial services much later in 2016. The DoT had allowed Reliance Jio to convert into a service provider for all services from being a mere broadband service provider at prices much lower than existing market prices (Indian Audit and Accounts Department, 2017). In 2014, CAG had also suggested cancelling nationwide broadband spectrum allocated to IBSPL in 2007. The Economics Times reported that the CAG had sent a draft report to the DoT which said that the fact that a small Internet Service Provider such as IBSPL could win the pan-India broadband spectrum which was 5000 times its net worth was a glaring sign of auction rigging, which the DoT overlooked. A company with a net worth of Rs. 2.5 crore was able to pay the bid amount of Rs. 12,847.77 crore within 10 days! Coupled with this fact, it was also the case that IBSPL sold the company on the day of completion of the auction (The Economic Times, 2014). In 2016, the Cellular Operators Association of India (COAI), representing the then incumbent players such as Vodafone, Bharti Airtel, Idea Cellular, had accused the TRAI of publishing consultation papers on key policies in quick succession in order to benefit the new entrant – Reliance Jio. The policy papers, COAI accused, were timed with the launch of Jio. One of the key policies discussed in these papers were – removal of inter-connection usage charges (IUC). While TRAI had reduced this charge from 20 paise to 14 paise in 2015, the suggestion for complete removal was seen as benefitting Reliance Jio which was then yet to start its service (The Financial Express, 2016; Venu, 2016).

This way of policies being tweaked to favour certain corporate houses is nothing new. The famous 2G Spectrum Scam is another case in point. The CAG, in a report to the Supreme Court in 2010, had held then Telecom Minister A Raja responsible for causing a loss of Rs. 1,76,379 crore to the State exchequer by allocating 2G spectrum licenses at cheap prices, instead of allocating spectrum licenses via free and fair auction (India Today, 2017). Raja had allocated 122 2G spectrum licenses in 2008 at very low prices favouring certain telecom companies. He tweaked rules to deny many genuine telecom companies a fair chance to compete the buying of spectrum. Many ineligible companies with no history in telecom industry were also allocated the spectrum. The 2G spectrum scam also brought into light the power held by political lobbyists such as Niira Radia. The Radia tapes were first published in the *Open* magazine. The tapes refer to phone conversations recorded on Niira Radia's phone by the CBI between 2007 and 2009. The records were leaked into the media. The conversation happened between Niira Radia and powerful people in the government including then Telecom Minister A Raja, business tycoons such as Ratan Tata, Mukesh Ambani and many journalists. The conversations expose how media's opinion was managed in order for A Raja to become the Telecom Minister (Kumar, 2018). In June 2009, Niira Radia was recorded to have said to senior IAS office Sunil Arora how her client Tata Teleservices was a beneficiary of the 2G scam (Khetan, 2013). Even in 2010, Tata Teleservices was allocated spectrum at 2001 prices. The net worth of Tata Teleservices had increased after the deal. It had to pay a mere Rs. 1600 crore for the 4.4 MHz spectrum due to A Raja's rules as opposed to anything between Rs. 9000 crore and Rs. 20,000 crore if auction had taken place. The CBI had also accused Reliance ADA Group (of Anil Ambani) of using Swan Telecom Pvt Ltd (STPL) as a front for getting hold of 2G spectrum (The Economic Times, 2015).

At different times, different government and lobbyists have helped different corporate houses get a larger market share than the other players by tweaking rules, making new policies or giving prior information about new changes. Though multiple policies and acts have been made to restrict concentration, certain capitalists have such influence over the government that they can get rules and regulations made to favour only themselves. Telecom industry is an example of the same.

4.3 Case Study – The Petroleum Products industry

The Petroleum Product industry is a natural resource based industry. This industry, according to the CMIE, contains the following products – light distillates (Liquefied Petroleum Gas (LPG), Naphtha, Motor gasolene (Petrol), Special boiling point spirit, reformate, hexane and other light distillates), middle distillates (aviation turbine fuel, kerosene, mineral turpentine oil, high speed diesel oil, light diesel oil, jute batching oil and other middle distillates), heavy ends (fuel oils, lube oils & lubricants, paraffins, grease, carbon black feed stocks and other heavy ends) and other petroleum products. Petroleum products, in turn, are classified under mineral fuel-based products which include products from coal, petroleum products and natural gas liquid.

The Indian Petroleum and Natural Gas Statistics 2019-20 reports that India has a share of 5.8% of the World's primary energy consumption, making it the third largest consumer of energy after China and USA. This energy requirement is fulfilled by Coal, Crude Oil, Natural Gas and Renewable Energy. Oil and gas fulfils around one-third of the energy requirement. India imported Rs. 7,17,001 crore worth of Oil, Rs. 1,25,742 crore worth of Petroleum products and Rs. 67,383 crore worth of LNG in the year 2019-20, making the share of the Oil & Gas sector in total commodity imports to be 27.1%. As on 01.04.2020., the refining capacity of India stood at 249.87 MMTPA, while the domestic consumption was 214.13MMT in 2019-20, making India a net exporter of petroleum products.

Refinery Products (or Petroleum Products) is one of the Eight Core Industries (comprising Coal, Crude Oil, Natural Gas, Refinery Products, Fertilizers, Steel, Cement and Electricity). The Eight Core Industries has a combined weight of 40.27% of the weight of items in the Index of Industrial Production (IIP). The Press Release – *Index of Eight Core Industries (Base: 2011-12=100 for November* – dated 31 December 2021 reported the combined Index of Eight Core Industries in 2020-21 was 123.2. The weightage of Petroleum Refinery Products in the Index of Eight Core Industries is 28.0376%, making it the industry with the highest weightage out of the 8 industries. The Index of Refinery Products in 2020-21 was 114.9, showing a decline from 129.4 in 2019-20.

The importance of the industry of Petroleum Products in being one of the core economic activities in the country makes it a desirable candidate for further analysis on the status of competition and concentration in the industry. The production of petroleum products happens in refineries. Crude oil or petroleum is a natural resource, which is extracted from underground reserves. After extraction, petroleum undergoes refining into petroleum products. Therefore, two processes – (i) petroleum (or crude oil) exploration and production and (ii) refining – are linked with each other. The petroleum industry, thus, has two parts – (i) oil exploration and production industry upstream and (ii) refinery industry downstream. Most oil producers own refineries. However, not all refinery owners are into oil exploration and production, and they buy crude oil from companies that are into production.

Figure 4.1: Market Share of 4 corporations in the Petroleum Products industry

Source: Based on author's calculation from ProwessIQ database of CMIE

In the quantitative analysis in the preceding chapters, Petroleum Products industry had been taken into consideration. According to HHI, the industry was highly concentrated in Period I, II and III and then fell slightly thereafter. It still remains a moderately concentrated industry (Table 2.5). The CR4 has been very high throughout (Table 2.6). Therefore, it can be said that the petroleum products industry has always been a highly concentrated industry. 4 companies – Indian Oil Corporation Ltd., Bharat Petroleum Corporation Ltd., Hindustan Petroleum Corporation Ltd., and Reliance Industries Ltd. – have dominated the market (in terms of control over market share) since the 1990s. While the first three are public sector corporations, the last is a private sector corporation. The change in control over market share between these 4 corporations are telling of how this control shifts from the public to the private sector, and especially to one particular private sector corporation – the Reliance Industries Limited. Figure 4.1 shows that the market share of Indian Oil Corporation declines, while that of RIL increases.

As the two industries – the crude oil exploration and production industry and the petroleum products industry – are connected, and since RIL is involved in both, the following discussion will include both. Securing exploration sites, gaining production advantages are important for an industry which also deals with refining crude oil to produce petroleum products.

Petroleum and Natural Gas are natural resources and are the wealth of a nation. Therefore, the custodian of this wealth is the government of the nation. Since the Petroleum and Natural Gas industry is heavily based on this natural resource, it is a highly regulated industry. The Ministry of Petroleum & Natural Gas (MoPNG)[8] is concerned with the exploration and production of Oil & Natural Gas, refining, distribution and marketing, import, export and conservation of petroleum products. In 1993, the Directorate General of Hydrocarbons (DGH)[9] was established under the administrative control of the MoPNG to promote sound management of the oil and natural gas resources having a balanced regard for environment, safety, technological and economic aspects of petroleum activity.

[8] The website of MoPNG (https://mopng.gov.in/en/about-us/about-the-ministry) gives information about the jurisdiction of the ministry.
[9] The website of the DGH (https://www.dghindia.gov.in/) has detailed information on their functioning.

Up until 1979, the Indian Exploration & Production (E&P) Industry was dominated by two National Oil Companies – Oil & Natural Gas Commission (ONGC) and Oil India Private Limited (OIL). Production & Exploration Licenses (PELs) were given to these companies based on nomination. It was only in 1979 that the E&P industry was opened for foreign investment for the first time. The government started offering exploration blocks via bidding. Between 1980 and 1986, 3 rounds of bidding of exploration blocks were held, but none of them were successful. In 1981, OIL was taken over by the GoI and became a PSU. The third round of bidding in 1986 saw participation from a few foreign companies; however, no committed exploration or new discovery happened. On the other hand, the two government owned companies – ONGC and OIL – continued their efforts resulting in two major discoveries – gas was discovered by 1989 by OIL in Tanot (Mata Temple) in Rajasthan and by ONGC in south Heera in Mumbai offshore. It was only in 1990, during the fourth round of bidding, in which Indian private companies was allowed to participate. The LPG policies of the GoI in the 1990s led to de-licensing of the petroleum sector and disinvestment of government owned companies. This led to reorganization of ONGC from Oil & Natural Gas Commission to Oil & Natural Gas Corporation. The efforts of the government to open up the oil and gas sector led to the formation of the DGH, an independent upstream regulatory body, in 1993. This LPG regime also led to the formation of New Exploration Licensing Policy (NELP) in 1997. The NELP became effective from 1999. Under this, licenses started to be awarded only through a competitive bidding system, where even National Oil Companies had to compete.[10]

In our analysis of Petroleum Products industry, ONGC did not feature since ONGC is primarily an upstream company. On the other hand, Reliance Industries Limited is primarily a downstream company. CMIE categorises RIL under Petroleum Products Industry since more than 50% of RIL's sales come from Petroleum Products. However, RIL is involved in both upstream and downstream activities. The major raw material for the Petroleum Products Industry comes from the E&P Industry. Therefore, a grip over the E&P Industry can go a long way in securing the market in Petroleum Products. Therefore, in order to understand the story behind RIL's rising

[10] A detailed history of the Indian Oil & Gas Industry is given here. https://www.dghindia.gov.in/index.php/page?pageId=56&name=E&P%20Regime

market power in the Petroleum Products industry, RIL's stand in the upstream industry needs to be analysed.

After the launch of NELP in 1998, 48 exploration blocks were offered in the first round ("Indian Oil and Gas Industry", DGH, Ministry of Petroleum & Natural Gas, Government of India). ONGC, which up until the launch of NELP, could lease blocks from the government by selecting them, had to bid. This round saw 21 bidders, including state-owned ONGC and private player RIL (which was till then not split between Anil Ambani and Mukesh Ambani). The Caravan (2014) reports that in an internal meeting of ONGC, the corporation had finalised the decision to bid for KG-DWN 9 8/3, a deep-water block in the Krishna-Godavari Basin, 30 kilometres off the coast of Andhra Pradesh. This block has popularly come to be known as KG D6 basin. They had finalised a bid of one and half times the minimum work programme for the block – the least amount of surveying and drilling that ONGC would guarantee to carry out. Despite being confident that no one else would bid so vigorously, ONGC was outbid by 2 companies – RIL and Cairn Energy. The ONGC director of exploration accused that the bids were leaked. ONGC managed to secure a neighbouring block, KG D5, and accused RIL of siphoning off gas from KG D5 illegally. However, ONGC lost the case (BusinessToday, 2018). On multiple other occasions, RIL has benefited at the expense of ONGC. Corrupt practices were at the core of RIL securing blocks and able to do exploration and production at the cost of state owned oil companies.

As discussed earlier, petroleum and natural gas exploration and production are monitored by the government since they are the wealth of the nation. Therefore, the government enters into a Production Sharing Contract (PSC) with the winning bidders. "PSC is an agreement between Contractor and the Government of India whereby Contractor bear all exploration risks, production and development costs in return for its stipulated share of production resulting from this effort. These costs are recoverable in case of commercial discovery" ("Supervision of PSCs (E&P Blocks, Producing Fields, CBM Blocks)", DGH, Ministry of Petroleum & Natural Gas, Government of India). The DGH monitors the PSC. After RIL won the contract for E&P for KG D6 basin, in 2000, a PSC was signed between the government and RIL and its minority partner, Niko Resources Limited. Two key features of the PSC were

– (i) gradual relinquishing area apart from where gas has been discovered, and (ii) profit sharing with the government based on an Investment Multiplier criteria, where the share of the government in the profit rises with rise in the Investment Multiplier (IM) (DGH, Ministry of Petroleum & Natural Gas, GoI). The IM is an index of the capital-intensive nature of the E&P project. In other words, IM is the amount of capital expenditure on exploration and development activities relative to income. The slabs for profit sharing are such that the more capital intensive (low IM) a project is, the lower share the government will have (between 5%-10%). With lower capital intensity (higher IM), the share of the government in profit could rise to as high as 85% (*Performance Audit of Hydrocarbon Production Sharing Contracts of Union Government, Ministry of Petroleum and Natural Gas*, 2011). In June 2004, National Thermal Power Corporation Limited (NTPC), a GoI owned PSU, signed a Letter of Intent (LoI), including a Gas Sales and Purchase Agreement (GSPA) with RIL, after RIL won the bidding process (The Financial Express, 2005). According to the contract, RIL had to supply 13 million standard cubic metres of gas per day to its two plants in Kawas and Gandhar in Gujarat for $2.94 per million British thermal units by end of 2007 (Rediff.com, 2005).

In 2011, the CAG submitted its report on Performance Audit of Hydrocarbon PSCs, in which it found discrepancies in fulfilling the commitments of the PSC by RIL. The CAG also reported RIL to have challenged the scope, extent and coverage of the audit by CAG on multiple occasions. The CAG found that RIL did not follow the clause of gradual surrender of the contract area. While only 5% of the entire area was the 'Discovery Area', RIL gave some data which showed 'continuity of discovery' in the remaining area. In February 2009, the GoI approved the entire area of 7645 sq. km. was approved to be treated as 'Discovery Area', which effectively meant that RIL would not have any requirement to relinquish any area thereafter (*Performance Audit of Hydrocarbon Production Sharing Contracts of Union Government, Ministry of Petroleum and Natural Gas*, 2011).

The IM-based profit sharing formula between the contractor and the government disincentives lower capital intensity on part of the contractor. The CAG 2011 Performance Audit reported that RIL violated the PSC by not submitting any appraisal programme for 14 out of 19 discoveries, including D1-D3 gas discoveries

and D-26 oil discovery in the KG-DWN 9 8/3 basin. The appraisal programme is one whereby the contractor notifies the Management Committee of the discovery being of potential commercial interest, and then the committee 'appraises' the discovery and determines the quantity of oil which can be produced from the discovered area. RIL moved from discovery to commercial discovery in the D1-D3 gas discoveries and the D-26 oil discovery without any appraisal programme. Thereafter, RIL submitted an Initial Development Plan (IDP) in May 2004 with a target to produce gas amounting to 40 million standard cubic metres per day (mmscmd) and an estimated capital expenditure of US$ 2.39 billion, with an additional capacity of 80mmscmd. The first gas production was to start by August 2006. Not only did RIL fail to follow the timeline of production, but it submitted an Addendum to the IDP (AIDP) in October 2006 with a capital expenditure of US$ 5.2 billion for Phase-I and a production rate of 80 mmscmd starting mid-2008. The capital expenditure for Phase-II (after 2008-09) was put at US$ 3.6 billion, with a capacity to upgrade production rate to 120 mmscmd. In contrast to the IDP with capital expenditure at US$ 2.39 billion and production rate of 40 mmscmd, the AIDP put them at US$ 8.8 billion and 120 mmscmd respectively. However, CAG observed that production had come down to 43 mmscmd around the time the report was published, which was close to the projection in the IDP, which raised questions on whether a 80 mmscmd was even possible. Also, the production started only in April 2009 (*Performance Audit of Hydrocarbon Production Sharing Contracts of Union Government, Ministry of Petroleum and Natural Gas*, 2011). The rise in capital expenditure only led to decline in IM, and therefore decline in the government's share in profit.

Benefit also accrued to RIL from the pricing policy. While RIL retained the right to market the natural gas produced as it chose to as per it's PSC with the GoI, the government's gas utilisation policy would decide which sectors would have the first right of purchase. The allocation priority as per this policy was as follows: fertiliser production, liquefied petroleum gas (LPG) production, petrochemicals, power production, urban gas supply and, lastly, petroleum refineries. Reliance Natural Resources Limited (RNRL) was set up by the Anil Ambani-led group for two planned gas-based power projects—a 7,480 MW unit in Dadri (UP) and a 2,800 MW plant at Shahpur (Maharashtra). As per a MoU signed between RIL and RNRL, the latter was entitled to purchase 28 million metric standard cubic metres per day (mmscmd) over a

17 year period from the former at $2.34 (₹112.32) per million metric British thermal (mmbtu). This was the same price at which RIL was selling to NTPC for similar gas-based energy production. RIL refused to recognise this MoU. It offered a sale of $4.2 (₹201.6) per mmbtu subject to price revisions every five years. It explained the increased price due to the cost inflation during the recovery stage in KG D-6 and failure to recover the amount of gas estimated initially estimated. It argued that under the PSC, the GoI retained the ownership of natural assets like gas and no private company could lay claim over any future discovery, as would be the case under the terms of the MoU over a 17 year period. Moreover, RNRL's power plants in Dadri and Shahpur existed only on paper and diverting the quantity of gas mentioned in the MoU would fly in the face of the GoI's gas allocation policy. After multiple political turnabouts, the GoI under sided with RIL in the matter. This led to, what RNRL termed, a 'super profit' to the tune of over ₹50,000 crore to RIL. Beyond the share of profits among RIL-RNRL, the gas pricing controversy ultimately rested on the question of ownership of gas: who owns the natural resource being recovered by RIL or sold to RNRL? The government retained sovereignty by setting gas allocation policy under the PSC but at the cost of accruing super profits to RIL, allowing the private sale gas at prices above what it was selling to NTPC for similar purposes. (Guha Thakurta et al., 2017).

The Central Government has also forced ONGC, a Central PSU, to bail out GSPC, a loss-laden state run oil company, thus depleting the resources of ONGC. Guha Thakurta (2016) explains the story of the loss-laden company GSPC. GSPC was set up as the Gujarat State Petrochemicals Corporation Limited in 1979. The Gujarat government held nearly 90% of the company’s equity capital. It was re-incorporated in 1994 as Gujarat State Petroleum Corporation Limited and expanded operations into oil and gas exploration, recovery, trading, distribution and power generation. With its major assets in the KG basin, GSPC was announced to have discovered the 'India's largest had reserves' in 2005, upward of 20 trillion cufts (and worth more than ₹2,20,000 crore). More than eleven years later, commercial gas production could not begin in GSPC—in actuality, the gas in existence was found to be a tenth of what was initially announced and extremely difficult to extricate. According to a PSC signed between GSPC, GeoGlobal and Jubilant group for the KG-OSN-2001/3 block, the latter would have investments of 10% each. The CAG found both companies to have

poor track records in oil and gas exploration and that they had been unduly benefitted from the partnership under various clauses and ultimately the partnership with GeoGlobal was terminated. Moreover, the CAG found that the GSPC had given permissions for oil exploration in the adjacent KG-D3 block by RIL within its own OSN-2001/3 block, without taking the GoI's consent, leading to an escalation in its survey costs and delays in exploration. In 2011, GSPC's borrowings stood at ₹7,149.08 crore of which ₹2,710.32 crore were in the form of short-term loans from public sector banks. By 2015, borrowings shot up to ₹19,716.27 crore. In 2017, the GoI approved ONGC taking over GSPC's stake in the KG-OSN-2001/3 for ₹7,783 crore—a move seen as a 'bailout' for the loss-laden state-run oil company (The Telegraph Online, 2017).

RIL flouted every rule to become one of the top producers of crude oil and natural gas. This put RIL at an advantage even in the Petroleum Products industry, which uses the products of the E&P Industry as raw materials. CAG found that the MoPNG and the DGH did not keep proper track of the doings of RIL which led to loss of money to the public exchequer. On multiple occasions, the government actively supported RIL in its business even though it was not in accordance with the prescribed laws and rules.

Market concentration is affected by the variables discussed in Chapter 3. However, the story doesn’t end there. In reference to the Petroleum Products industry, a highly concentrated industry, it is seen that within the few companies that dominate the market, one certain company has been gaining more market share at the expense of others due to their ability to influence players of the State and regulatory bodies. If the market is to become more concentrated, it wouldn’t be on account of the reasons discussed in earlier chapters, but due to the nexus between RIL and different actors of the State who have helped RIL to secure many deals, get away with non-compliance, make and tweak policies to ensure super profits for RIL and put public sector units at a disadvantage. The market does not appear to be free and fair as is usually assumed in mainstream theory. This is often the premise to argue and defend the benefits of competition, one of which is economic efficiency.

4.4 Market Concentration: Beyond Econometric Modelling?

The above two case studies show that how in both the telecommunications and the petroleum products industry, the State played an active role in extending benefits to a certain corporate house. Policies have been tweaked at crucial times to the benefit of particular corporate houses. At different points of time, different corporate houses have benefitted. Currently, the biggest beneficiaries in both the industries are Reliance Industries Limited, which is controlled by Mukesh Ambani, India's richest person. As of 5 October 2021, Mukesh Ambani had a net worth of $92.7 billion (Forbes, 5 October 2021). RIL has interests in telecommunications, petrochemicals, oil and natural gas and retail.

In the telecommunications industry, the government owned companies such as VSNL, MTNL, BSNL had largest market share up until 2003. This equation changed thereafter. The market share of private companies such as Bharti Airtel Ltd. and Reliance Communication Ltd. rose substantially. Eventually, the market share of BSNL started to drop from 2008 and in 2018, it stood at a mere 9.38%. BSNL is no longer a competitor to the privately owned companies such as Airtel, Jio and Vodafone. Meanwhile, this industry has seen many new entries, exits, mergers and acquisitions. The industry is now controlled by Jio and Airtel majorly. While it can be argued that the neoliberal policies of opening up this sector, setting up the TRAI in 1997 and the enactment of the Competition Act in 2002 led to the ending of the government monopoly in this sector and to intense competition and to relative decline in concentration, leading to benefiting of consumers in the form of price cuts, the active role of the State in extending benefits to a certain corporate housse in the industry tell a different story - one of rent seeking. The case study has revealed how Jio benefitted from the actions of the government and the regulatory bodies. With only two companies – Jio and Airtel – thriving and Vodafone (now Vi, following Vodafone-Idea merger) managing to stay afloat, consumers do not have any real choice anymore. Prices, which had reduced drastically, after Jio entering the market, is seeing continuous rise. In benefitting Jio, the public exchequer has lost crores of money.

In the petroleum products industry, RIL had a market share between 5% and 8% in the 1990s. Throughout 2000s and 2010s, the market share of RIL has been

consistently increasing, and in 2018, it held the second highest market share, just after IOC Ltd. Due to extremely high sunk cost, this industry has not seen many private entrants. However, the gradual rise of RIL, simultaneous with corrupt practices and bypassing the law, again, tells a story of rent seeking. RIL increased its market share, not just because of opening up of this industry after neoliberal reforms, but also by rent seeking. The level of concentration has gone down slightly in this industries. However, the reason behind this is not the neoliberal reforms, but the ability of RIL to increase its market share by engaging in rent seeking and capturing natural resources without giving the due prices, thereby increasing profit massively. The ultimate loss is of the public exchequer. In other words, the taxpayers of the country bore the cost of RIL's profit.

The trajectory of both the industries show a move away from the market being concentrated with the government owned companies to the market being concentrated with privately owned companies. While this transformation is complete in the telecommunications industry, it has been partially achieved in the petroleum products industry. The Department for Promotion of Industry and Internal Trade, released a press note on 29 July 2021, allowing 100% FDI in oil and natural gas PSUs in which disinvestment has already been allowed. This would lead to privatization of BPCL, where the government is selling its entire shareholding of 52.98%. Vedanta, a mining and oil conglomerate, is in the race to buy BPCL, among a few others (Business Today, 2021). The process for disinvestment of oil and natural gas PSUs has already started. The transformation from a market concentrated with government owned companies to one with privately owned companies will follow.

One of the early advocates of the argument that government control of the economy in India, and especially the public sector enterprises owned by GoI, are inefficient and this inefficiency can be corrected only by the '*lazzeiz-faire*' model of economy was Jagdish N. Bhagwati. Bhagwati has been an advocate of liberalising the economy, removing of government controls in industrial sector and opening up of the economy to ensure efficiency. It was argued that public sector enterprises had low productivity levels. Also, low rate of private returns, corruption and bureaucratic red tape, and political involvement in finalising projects, recruiting unskilled labour at wages higher than that in the private sector and giving lower remuneration to skilled

workers in comparison to the private sector were reasons for inefficiency in the public sector (Bhagwati & Desai, 1970). Also, government policies of Industrial Licensing had led to monopolistic tendencies in the economy, and the economy was not competitive as the 'possibility of entry' was not very low (Bhagwati & Desai, 1970). This argument is till date forwarded by the advocates of neoliberal policies, and that has been the reason for increasing move towards disinvestment, policies to ensure 'free and fair competition' and the government, in general, withdrawing from economic activities.

When costs are incurred by an entity to secure transfers from the government, it is known as rent-seeking (Tollison, 2012). Tollison (2012) argues that lobbyists divert valuable resources and efforts to win specific transfers from the government, which otherwise could be used for productive activities and therefore, there is an opportunity cost in rent seeking which leads to zero social benefit or social losses. He also argues that this is possible in a setting where there is government intervention in an economy leading to creation of artificial rent. For example, if an entity lobbies for a specific legislation which can give it monopoly power, then the entity will keep lobbying to ensure that its monopoly power is not taken away. Thus, Tollison (2012) says that government is creating an aritifical rent, which needs to be given by the entity to ensure its monopoly power throughout. He also argues that rent seeking is not possible in a private economy as any activity in the private economy, which can be conceived as rent-seeking, either adds value to the person at the receiving end of the activity or it exists due to the presence of government regulation. Tollison gives an example of competition for inheritance among siblings in which the parents received valued services from the children, and therefore, it cannot be seen as rent-seeking. He further argues that if oligopolists engage in competitive advertising which maintains the market share of each entity, it can be seen as rent-seeking, but this arises due to presence of anti-trust laws.

Ushering of neoliberal reforms in India has led to two things (among many other reforms) – one, disinvestment, that is, giving up of ownership of enterprises owned by the government, and two, the government refraining from intervening in the economy and setting up regulatory bodies instead to oversee specific facets of economic activity. Giving away of government ownership was argued to make the

enterprises efficient. Withdrawal of the government from economic activities was also supposed to deal with the issue of corruption. However, the case studies done in the chapter show otherwise. Lobbying and manipulation are rampant in order to secure market power.

Neoliberalism advocates that the economy should be left to the private players and the government should be involved only in maintaining law and order. Maintaining law and order requires the government make laws in the first place. Therefore, capitalists require the state to function to make laws to suit its goal of garnering more profit and capital accumulation.

Neoliberalism argues for the State to create market in areas where market does not exist and creation of property rights even over resources common to the citizens of the country such as the spectrum and oil and natural gas fields. Thereafter, rules need to be made, laws need to be put in place and regulatory bodies need to be set up to ensure that the rules of free and fair competition applies in the market. According to advocates of neoliberal policy, this would effectively lead to utmost efficiency, and arrest growth of monopolistic tendencies which threaten efficient working of a market. The case studies done in this chapter show that this is never the case. Capitalists intervene in the law making process to suit their needs of gaining market power to ensure greater profits. Rent seeking, therefore, is a result of the inherent need of a capitalist to ensure greater market power.

One form of rent seeking is 'crony capitalism'. The Cambridge Dictionary defines 'crony' as "a friend, or a person who works for someone in authority, especially one who is willing to give and receive dishonest help" (Cambridge Dictionary, *Crony*). The term 'crony capitalism' emerged as an explanation to the East Asian Crisis of 1997-99. The IMF argued that the Asian economies were plagued with poor corporate governance, lack of competition and a nexus between government and particular businesses (International Monetary Fund, 1998). Crony capitalism is argued to be an undesirable kind of capitalism which leads to inefficiency by advocates of neoliberalism and capitalism. Holcombe (2013) defines crony capitalism as "an economic system in which the profitability of business depends on political connections". He argues that crony capitalism is a result of more and more government intervention in the economy. Aligica & Tarko (2015) argued that rent-

seeking is a result of setting up of regulatory bodies as these bodies raise the cost of entry to competitors of incumbents as it is easier for large incumbents to navigate the bureaucracy much more easily than competitors, leading to less competition. They argue that a 'crony' relationship between the rent seeker and the politician guiding the policies related to the regulatory body make the phenomenon of 'crony capitalism'. Aligica & Tarko (2015) also argue that crony capitalism is the second best solution to weak institutions. In other words, if institutions such as those protecting private property, enforcing contracts, impartial judiciary exist, there wouldn't be any crony capitalism. Rubin (2016) also argues that government intervention in economy leads to crony capitalism.

Neoliberalism argues for minimum government intervention in economy and setting up of regulatory bodies to oversee specific sections of the economy, while advocates of capitalism argue for lesser regulatory bodies. This is paradoxical! Advocates of capitalism argue for the need for the government to intervene in various aspects of the economy such as in making laws to guide economic activities, creating private property where none exists and the like; however, they also argue that government intervention leads to crony capitalism, which is undesirable and reduces inefficiency! This cycle of argument begs the question of whether crony capitalism is a distinct kind of capitalism or an inherent operating mode of capitalism.

Mazumdar (2008a) argues that crony capitalism is not a distinctive feature of capitalism which exhibits itself in certain specific economic policy regime, but crony capitalism defines contemporary global capitalist order. He argues that the term 'crony capitalism' is used to 'caricaturise' the relation between two spheres of a capitalist society – the market and the State, wherein the State has a role to play in the working of the economic aspect of the capitalist society to ensure its functioning. The various types of relation and the interaction between these two spheres of capitalist society has given different nomenclature for various kinds of capitalism; two of which are – arm's-length capitalism and crony capitalism. Arm's length capitalism is defined by depersonalised relationship between the actors of the market (capitalists, managers, etc.) and the actors of the State (government officials, regulatory bodies, politicians, bureaucrats, etc.), where all parties are guided by the motive of maximising self-interest. Crony capitalism is the polar opposite of arm's length capitalism and is

characterised by personalised relationship between the market and the State. While arm's length capitalism is characterised by individuals pursuing one's own self-interest, crony capitalism is characterised by behavior reflecting the attachment of individuals to some larger social groups. However, Mazumdar argues that both arms' length capitalism and crony capitalism has elements of behavior reflecting both self-interest and attachment to some larger social group; the difference between both lies in the pattern of the co-existence between self-interested behaviour and behaviour reflecting attachment to a larger social group. According to him, while on one hand, in arm's length capitalism, the necessity for the State to play a role in the economy arises from the tendency of few people to deviate from pure self-interested behaviour; on the other hand, in crony capitalism, a large part of the behaviour is guided by the use of personal relations for pursuing self-interests. It is possible that, in crony capitalism, some of the personal relationships are built on self-interest pursuing behaviours. Mazumdar argues that "a false dichotomy" is created "between depersonalised self-interest driven and personalised relation-based market interaction by ignoring the essential connection between depersonalisation and self-interested behaviour".

The motive of any capitalist is to make more and more profit. In a capitalist economy, pursuing one's own interest is the primary motivation behind any decision. However, it is not necessary that these decisions not be based on any social relations the individuals might have. Social relations are used in the pursuit of self-interests. Given this, crony capitalism is not different from other forms capitalism. Social relations can exist between any two individuals. These individuals may be from the same family, may be friends, may have political relations, or may have relations based on exchange of favours outside the economic realm. For example, an individual holding a political office can agree to give certain economic advantage to another individual for his or her company in lieu of money for a political campaign. The market forces of free and fair competition are definitely flouted. However, both actors are acting in their self-interest. This exchange, outside the realm of pure economy, does have an effect in the economic situation, and can be used to the advantage or disadvantage of certain individuals.

Crony capitalism is not a distinctive phase of capitalism, but an inherent tendency of capitalism. Individual capitalist make use of their 'crony' relations outside the economic domain of the capitalist society in their pursuit for increasing their profit. In the case studies of the telecommunication industry and the petroleum products industry in India, we have seen this. Capitalism in India is defined by individual capitalists using their crony relations in their pursuit for profit. The question now is whether the use of crony relations leads to concentration or vice versa.

Using of social relations or 'social capital', relations built outside the realm of economy in a capitalist society, to further individual capitalist's profit does explain concentration in the hands of certain capitalists. Given that the aim of any capitalist is to increase their profit, everyone would want to cut the costs by evading taxes, by not complying with labour laws or environmental regulations or competition laws or other policies. Mere existence of laws cannot ensure that a capitalist does not engage in such activities to cut costs and increase profits. The political regime of the time would be the determining factor behind compliance by capitalists of such laws. In other words, the State, with its actors such as politicians, bureaucrats, judiciary and others, would be the determining factor. In turn, the powers vested in with the State would decide whether the State can ensure that capitalists do not engage in activities which undermine existing laws. Whether or not capitalists will follow the competition laws would depend on the powers vested on the State. The powers of the State depends on the social, political and economic regime. In the neoliberal regime, the State has withdrawn significantly from the economic realm; the powers of the State, in terms of what it can do, how much public expenditure it can do, whether it can run industries, is very limited. This tilts the balance against the State in favour of the market. However, the market is not a homogeneous entity. Different actors have various powers with them. The workers have much less power vis-à-vis their employers. Owner of small capital have less power vis-à-vis owners of big capital. Individual capitalists who own large capital wield the most power. These individual capitalists can influence the State to work in their favour. This is what we have seen in the two case studies. In both the telecommunication industry and the petroleum products industry, Mukesh Ambani was able to tilt policies in its favour using the crony relations with various actors in the State, which has led to Reliance Jio as the single

largest control over the telecom market and RIL as the emerging dominant private player among the top 4 players. Neoliberalism has created conditions for the use (or abuse) of crony relations by individual capitalists. For example, till the time the telecom industry was a government monopoly, there was no requirement for creating a market for spectrum allocation or for regulations. However, with the opening up of the telecom industry for private players, the government also had to make regulations, open regulatory bodies and create market for spectrum allocation. These led to some individual capitalists using their crony relations to ensure that the regulations or the regulatory bodies or spectrum allocation process work in such a way that it benefits them over other capitalists. The petroleum products industry shows a similar trend. Mukesh Ambani used his 'social capital' to ensure that it won auctions of specific gas basins, and punitive action wasn't taken against RIL for breaching contracts. If the government had continued its activities in these two industries, the avenues for use of crony relations wouldn't have cropped up in the first place. Thus, crony relations between players in the market and the actors in the State does lead to rise in concentration in a neoliberal regime.

4.5 Competition and Concentration: Implications for the Indian State

Crony relations are a reason for rising concentration. The question now is how this concentration impacts the nature of Indian economy. Before moving further, it is necessary to explore the concept of 'concentration' further through a political economy lens.

Mazumdar (2017) has referred to two kinds of concentration – *oligopolistic concentration*, which refers to seller concentration in individual industries, and *aggregate concentration*, which refers to concentration in the hands of few firms at the level of the entire economy. He further argues that in the Indian context, few business families exercise control over multiple industries producing unrelated products, and at the level of the entire economy, concentration happens within these business families. In current times, this has taken the form of conglomerates. Investopedia defines conglomerates as "A conglomerate is a corporation of several different, sometimes unrelated, businesses. In a conglomerate, one company owns a controlling stake in several smaller companies, conducting business separately and independently" (Investopedia, *What Is a Conglomerate?*). Kim, Kandemir and

Cavusgin (2004) gave the term ‘family conglomerates (FCs)’ and argued that the FCs have significant dominance over emerging markets such as those of India, Indonesia, Korea, Mexico, Phillipines, Taiwan, Thailand and Turkey. They argue that FCs are different from family business and business groups in a number of ways. While FCs are owned by a family, business groups are not necessarily owned by a family even though they can be owned by a group connected by some social relations. While both FCs and family businesses can be owned by a family, FCs are a large network of corporations which may be diversified in the products they deal in. The authors characterise a FC by ownership and control by a single family, a single founder who is in a dominant positions and other family members is executive positions, and major controlling rights are owned by the family. In the discussions preceding this section, it has been seen that the market of the telecommunication industry and the petroleum products industry is concentrated with Reliance Jio and RIL respectively, which in turn are controlled by Reliance Group, which is controlled by the Mukesh Ambani family. RIL has stakes in many other industries such as textiles, retail, investor relation, etc. In our discussion in the previous chapters, many conglomerates have been talked about – RIL, Vedanta Group, Tata Group, Aditya Birla Group, Adani Group. Most of the capital is concentrated with these large conglomerates.

Oligopolistic concentration happens in individual industries, such as by Reliance Jio Infocomm Ltd in the telecommunication industry and by RIL in the petroleum products industry. Large conglomerates, in turn, have investments in these companies. Discerning the complex structure of ownership needs further analysis. However, what can be said from our current study is that a few family conglomerates control much of what is produced in the economy, and controls much of the capital, therefore reiterating the presence of aggregate concentration in the Indian economy.

However, through concentration of economic power within these conglomerates, they also control the realm of the State in a capitalist society. In other words, policy making and implementation, legal processes are all affected by the conglomerates. In our case studies, it has been seen how time and again, policies and legal processes were bent to help Reliance. All the while, this compromises free competition, as promised by neoliberal regime. However, the motive behind conglomerates’ intervention in the State is the pursuit of profit. The neoliberal regime

has increased the scope of intervention by the conglomerates in the functioning of the State. In the pre-neoliberal regime in India, with the MRTP Act restricting concentration in the private sector and the existence of state owned monopolies, the big business houses had become so omnipresent that it could affect the functioning of the State. Of course there were cases of corruption even then. However, in the neoliberal regime, it was not mere corruption, but a dominance of the conglomerates over the State and an over-bearing presence of the conglomerates in every industry and every aspect of life.

Chibber (2003) does a comparative analysis of the economic trajectories of South Korea and India between 1949 and 1970. Chibber opines that while South Korea, with a policy of export led industrialisation (ELI), succeeded in achieving the goals of planned industrialisation, India, with a policy of import substitution industrialisation (ISI) on the other hand, failed to do so. He argues that, though both the countries started with the policy of ISI, South Korea could move towards ELI as it was successful in disciplining its capitalist class. However, in India, the State could not discipline the more aggressive capitalist class, and in the process lost its own autonomy, and therefore, the goal of development via planned industrialisation could not be achieved. ELI meant that capital had to depend on the State for subsidies and credit to be able to compete in the international market; which meant that in effect, capital in South Korea was dependent on the State for its own benefit, and therefore could be disciplined (Chibber, 2003). Development in India led by ISI meant that the capital supported subsidies for industries but did not support any disciplining on its performance, which meant that the State had to give in to capital's demand for less and less state intervention (Chibber, 2003). The inability of the State to discipline the capitalist class led to a few capitalists dominating the State, and using the State to make policies to ensure ever growing profit for those few individual capitalists.

Kohli (2006) argues that the rapid economic acceleration in India is a result of the pro-business tilt of the Indian State rather than the result of the liberalisation in the 1990s. This could be substantiated with three evidences – "first, growth acceleration around 1980 coincided with the striking but the less noticed shift in the state's economic role initiated by Indira Gandhi; second, the aggregate economic performace since liberalisation, especially industrial growth, has not improved over the 1980s;

and finally, the inter-state variation in economic growth in in the 1990s also seems to follow the same pattern, with pro-business state governments succeeding handsomely in attracting private investment and thus growing rapidly" (Kohli, 2006). There is also a distinction between pro-business and pro-market policies of economic development, with the pro-market policies promoting decentralisation of market supporting democracy which in turn promotes competition by creating level playing fields, whereas the pro-business policies which is based on "a narrow ruling alliance of the political and the economic elite" (Kohli, 2006).

India's economic growth has been driven by pro-business policies of the State, as can be seen by the case studies discussed in this chapter. These pro-business policies were made possible by the dominance of a few capitalists over the State. These pro-business policies, or the alliance between the dominant players in the economic realm of capitalism and the players in the political realm, is termed 'crony capitalism' by advocates of neoliberalism and capitalism to salvage capitalism from its criticism that capitalism has led to accumulation of capital in the hands of few. In reality, this is how capitalism operates – by a close nexus of a few capitalists with the State to garner ever growing profits; and this is how capitalism operates in India also.

Rising concentration in the hands of family conglomerates has led to the State losing its autonomy in policy making and in legal processes, leading to further rise in concentration. The Indian economy, thus, is defined by conglomerates using their crony relations with actors in the State to further their pursuit of profit and in this process, becoming so large and powerful that it affects the very functioning of the State.

4.6 Conclusion

This chapter started with brief case studies of how concentration changed in two industries – the telecommunication industry and the petroleum products industry. The telecommunication industry was concentrated in the hands of the government before the ushering of neoliberal policies, and has moved on to being an oligopoly dominated by private players. The petroleum products industry is slowly moving away from being concentrated in the hands of state owned companies. The Reliance Group is the most dominant player in both the industry. Crony relations with the

government has been used time and again to bend regulatory bodies, to bend laws and to get away if laws or contracts were broken. All these led to Reliance emerging as the biggest player in these markets, at the cost of other players.

The chapter went on to discuss the concepts of rent seeking and crony capitalism. Crony capitalism is not some phase of capitalism, but is the inherent working mode of capitalism. Individual capitalists, in their pursuit for profit, engage in using their relations with actors in the State. With the neoliberal reforms, the scope for using such relations has expanded. Also, with increasing concentration, the conglomerates have grown powerful, even more powerful than the State, and therefore can influence the State to further their own self-interest of profit.

The cycle thus goes on. Conglomerates use their crony relations to expand their accumulation of capital and then continues to grow more powerful and bend laws and policies to continue capital accumulation. This has become possible in the neoliberal regime which demands that the government withdraw from the economic realm of the society which limits the powers of the government to control the economic realm. However, the private conglomerates become so powerful that they control the State to suit their own interest. This is what is happening with the Indian economy, where a few conglomerates are controlling not just the economic, but also other aspects of the society. Further study of the society and politics would be required to understand the extent and depth of the impact of the conglomerates in the society, but the fact that they are manipulating government policies and the laws of the land are clear.

CHAPTER 5

CONCLUSION

The study is an inquiry into the extent of concentration in the industrial sector in India, the reasons behind the changes in concentration and a political economy analysis of the causes and implications of concentration in the Indian economy. The dissertation is divided into three chapters, with each chapter delving into each question – the trend and extent of concentration in various industries, the reasons behind concentration, political economy analysis behind causes and implications of concentration.

The concepts of market concentration and market competition evolved with changing patterns of globalisation and trade, which in turn evolved with emerging of new political and economic ideologies. With this evolution, the competition laws in India also changed – from the MRTP Act which was brought in to restrict concentration to the Competition Law which was brought in to promote competition. While restricting concentration and promoting competition cannot be exclusive of each other, political and economic ideas shaped by the neoliberal regime portrayed both as exclusive. With rising competition, concentration declines. Low level of competition is related with high levels of concentration. Having said that, the neoliberal regime portrayed an industry where the market was captured by a few companies, say 3 companies, and a competition between them as a competitive industry. However, this kind of competition between few large companies leaves no space for entry of new companies or the possibility for other companies to thrive. There is no real competition in such as sense.

Evolving political and economic ideas – from Keynesianism to Monetarism – and the eventual rise of neoliberalism (propagated by the Chicago School) which argued for withdrawal of the government intervention in the economy and opening up the economy to the private sector in order to ensure efficiency of the market, meant going back to the ideas of Classical economy which says that the ‘invisible hand’ of the market will ensure optimum efficiency. Neoliberalism argued that competition in the economy will lead to efficiency.

With the rise of neoliberalism internationally, India also adopted neoliberal policies in the 1990s. This also meant a change in the way the Indian State viewed concentration and competition, and therefore a change in the Competition laws. In the pre-neoliberal era, the MRTP Act was in effect. The major objective of the Act was to restrict the emergence of monopolies. Post the reforms of 1990s, the objective changed to promoting competition, and led to the enactment of the Competition Act 2002. With withdrawal of government from the economy and with change in competition policies, the extent of concentration changed. The political economy of the way the industrial sector is organised saw massive changes, with capital accumulation happening in the hands of conglomerates, especially family conglomerates.

The first chapter of the present study deals with the trend in the level of concentration in various industries in India since 1991. The CMIE ProwessIQ database was used to calculate the HHI. Given the limitations of the Prowess database – one of them being the issue with the coverage of industries which has increased over time, but not necessarily due to increase in the actual number of companies, but due to CMIE's attempt to bring more companies under its fold and another issue being the way in which each company is classified into an industry group which again creates a bias when companies are highly diversified. Despite these limitations, Prowess database is still the best available database and thus has been used here. It does give some useful insights. Industries which require access to natural resources such as petroleum products industry, polymers industry, telecommunication services industry, mining and non-ferrous metal industry are relatively more concentrated. Consumer goods industry, food products industry, beverages and tobacco industry are relatively less concentrated. Also, narrower definition of industries give better picture of oligopolistic concentration as can be seen from the example of automobile ancillaries industry which have low concentration whereas tyres and tubes (part of automobile ancillaries industry) has high concentration. The ownership pattern of companies also reveals aggregate concentration. The ownership pattern is a pyramidal structure, where multiple companies, often diverse, are owned by some large companies, which in turn have investments by larger conglomerates. In India, some of the conglomerates having investment in some big companies are the Reliance

Industries Limited, the Tata Group, the Aditya Birla Group, the Adani Group and the Vedanta Resources Limited.

The second chapter explores the reasons behind changes in market concentration. This chapter does a regression analysis with *HHI* as the dependent variable and *number of firms*, *profit to sales ratio*, *capital intensity*, *advertising intensity* and *growth of industry* as explanatory variables. The coefficients of the explanatory variables *number of firms*, *profit to sales ratio* and *capital intensity* are statistically significant and are related to *HHI* negatively, positively and positively respectively. The model, overall, is statistically significant. The negative relation between the *number of firms* and *HHI* explains the downward trend of market concentration. This bias comes from one of the limitations of CMIE data – increase in coverage of firms over the years. While the panel data analysis gives an insight into the reasons behind the changes in market concentration, further analysis into individual industries are important to understand the reasons and impact of concentration.

In the third chapter, the task of further inquiry into the political economy reasons behind changes in market concentration is carried forward. This chapter does case study on two industries – the telecommunication services industry and the petroleum products industry – and chalks out the changes in concentration over time and the role of the conglomerates and their crony relations with the actors in the State to increase their dominance in the market. In these two industries, the Reliance Industries Limited and its subsidiaries play dominant roles. Taking this analysis further, the interaction between the big players in the realm of the economy in a capitalist society and the actors in the realm of the State were explored. Exploiting crony relations define the neoliberal economic regime. However, crony capitalism is not some distinct phase of capitalism, but inbuilt in the very functioning of capitalism. Nevertheless, not every capitalist has relations with actors in the State. It is only the big capitalists, conglomerates in the case of India, which has the power to maintain such relations and use such relations to make the market more concentrated in their hands.

Competition is not in the interest of capital searching for monopoly profits. Those individual capitalists who become large enough to control the State apparatus

does so in their pursuit to never ending growth of profit. The working of capitalism in India has led to lesser and lesser control of the State. The least control of the State has been marked by the neoliberal regime. This has expanded the scope of the emergence of conglomerates, which in turn has limited the functioning of the government further. A State, with relatively much lower power over capital, has failed in restricting concentration. The Indian economy is, thus, marked by conglomerates overpowering the State to bend laws and policies in their favour and make the capital concentrated with a handful of individual capitalists.

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