

Project Completion Report

R&D AND PATENTING BY FOREIGN FIRMS IN INDIA

Implemented by

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Executive Summary

The present project is undertaken to examine both pull and push factors governing the decentralisation of foreign R&D by MNEs in the Indian economy. More specifically the project is expected to cover the following key objectives:

1. To identify economically active foreign firms in India.
 2. To examine the patterns of foreign firms' R&D investment and patenting in India.
 3. To identify the determinants of R&D investment of foreign firms.
 4. To recognise the drivers of patenting by foreign firms in India.
 5. To examine the nature of innovation activities by foreign firms in India.
- Our conceptual framework to conduct the study is inspired by the previous works of Le Bas and Sierra (2002), De Beule and Van Beveran (2019), and Dezan Shera & Associates (2020) to identify the nature of foreign R&D investment by multinationals in the Indian markets. We also followed Ronstadt (1978) and Qi et al. (2014) to understand the role of R&D activities of the offshore subsidiary firms in the host country.
 - First, we categorize the patents filed by the firms at IPO and USPTO based on priority, assignee, and inventor level information in three categories i.e., technology creating, technology seeking, and technology exploiting. Further, we categorize the firms in the same three categories as per their patenting activities.
 - We prepared the database by exploring different sources as there is no structured database available that provides information on firm level indicators for unlisted and incorporated foreign firms in India. We find a few firms in the CMIE PROWESS data set but with missing information on key interest variables. Therefore, we shifted our analysis to industry level indicators.
 - We have collected company level information from the MCA21 database, industry level information from the CMIE PROWESS database, and innovation indicator (patent application) data from the PatSeer database.
 - We identified the drivers of R&D and patenting by foreign firms in India using panel data regression techniques with both fixed and random effects for our sample. In the case of the R&D equation, we applied logit and probit regression techniques, as the dependent variable is binary and the independent variables are continuous.

- We reported the results of the conditional fixed-effects logistic regression with odds ratios. For the patent equation, we estimated the results both ways using the patent (dependent variable) as a categorical variable as well as a count variable. We applied logit and probit regression techniques in the first case and negative binomial in the second case as per the type of dependent variable. We also analysed the firms based on cross tabulation i.e., market growth wise, technology intensity wise, and market concentration wise.

The key findings of the study are as follows:

1. Information on R&D investment made by foreign firms is rather limited.
2. Only 32% of foreign firms that are wholly owned subsidiaries invest in research related activities through these subsidiaries.
3. Almost 46.5% of WOS (from the same sample) are involved in filing patents either at IPO or USPTO or at both
4. The discrepancy in R&D investments and patenting highlights the potential use of the Indian market to exploit the technology developed elsewhere.
5. Competitive industries incentivize WOS to invest in R&D in India.
6. Similarly, in concentrated industry firms have less motivation to patent.
7. In terms of patents filed at IPO by WOS, most patents have priority outside India.
 - a. In case, the priority is India, assignees are also Indian, and, in such cases, the involvement of Indian investors is higher either as majority inventors or as first inventor.
 - b. Even when the priority is not India, most applications have a family patent in India.
 - c. There are certain cases with Indian assignees and Indian inventors when the priority country is not India. Clearly, these firms are looking for Indian talent to complement their innovations at the international level.
8. WOS patent applications at the USPTO also have mostly patents with priority outside India and without Indian assignees.
 - a. For cases, with priority in India, the assignee is not Indian but, the inventors are based in India. This is in line with a comment that to avoid the cost of a foreign filing license (FFL), companies may give India as a priority country and then use that for most international patents when Indian inventors are involved.

- b. In cases, where Indian inventors are not involved and the priority is India, an expert has noted that only for market considerations, the company will choose India as a priority case.
9. The majority of patents are for exploiting existing technology in Indian markets, however, in recent times there has been a boost in the technology seeking and creating activities of WOS.

Policy Recommendations

- There is no structured database available exclusively for foreign firms (wholly owned subsidiaries) in India. In this case, it is difficult to capture WOS related information with accuracy. There is a need for maintaining a structured database for foreign firms that provides all financial and other company related data. Providing such data to the researchers may improve the quality of research in the country.
- It was observed during the data collection process that there is a data reporting issue in the existing system. There is no mandatory regulation in India for companies to report yearly R&D expenditure related data. The column on R&D expenditure is not mandatory for all the companies to fill in the annual filing form. For any policy reforms data analysis for the past years is important. Therefore, relevant policymakers should work in this direction to strengthen India's innovation policy.
- The requirement of IPO to first file patents in India has been fruitful as this makes companies identify the contributions of Indian inventors and fill priority in India. We suggest that this aspect can be strengthened further by ensuring better compliance.
- Data related to patents of foreign firms can be made easily available and assessable for research purposes. The Indian Patent Office may learn from best international practices in terms of making data available like the USPTO.
- As we find that most patents could be filed merely to use internationally developed products in the Indian market, IPO can keep a strict watch on patents' commercialization through Form 27, particularly for patents filed by foreign firms, and non-residents, and devise a way to release patents for public use if not commercialized or manufactured in India for a certain time. However, policy design for such intervention requires careful consideration given the Indian commitment to WTO under TRIPS.

- Most experts pointed out the need to enhance research infrastructure which is costly for individual companies to develop. Building research infrastructure includes creating research intensive ecosystem that also requires supportive trade and industrial policies. It will be supportive for R&D activities if while importing any components relaxation can be given for firms engaged in research.
- Incentive schemes can be devised for products invented, designed, and produced in India in line with the PLI. The scheme may have gradation in incentives if it is (i) invented, designed, and produced; (ii) designed and produced and (iii) produced. The patent level information can be utilized to decide the level of gradation.

CHAPTER 1

Introduction

1.1 Background and Context

Innovation and technological improvements are two crucial factors that drive economic growth and human well-being by reducing the cost of production and increasing productivity. Innovation brings new and better goods and services that improve the overall quality of life. The Research and Development (R&D) efforts by firms aimed at innovation were conventionally expected to be mainly concentrated in the home country, designed to exploit its existing knowledge set and market structure (Le Bas & Sierra, 2002; Yang et al., 2019; De Beule & Van Beveren, 2019). But in the recent past multinational enterprises (MNEs) have increasingly found to expand their reach to emerging market economies (Feinberg & Majumdar, 2001; Le Bas & Sierra, 2002; Yang et al., 2019; Tyagi et al., 2018). The question that has promoted much debate in the recent past is the factors that motivate the MNEs to undertake technological activities in locations other than their home country. The two main hypotheses that got prominence include: whether it is the technological advantage acquired at home or the locational advantage of a host country that induces R&D outsourcing (Le Bas & Sierra, 2002). The capability of exploiting the motive of foreign MNEs has been the dominant view in conventional literature. This line of reasoning states that firms engage in host country R&D activities when they perceive their technological superiority over their competitors that can be effectively utilised internally from a foreign affiliate. This argument boils down to the role of foreign affiliates to supportive units primarily tasked to adopt the home-based technological niche to the market conditions of the host country (Rugman, 1982).

But this theory of centralised R&D is no longer a valid justification to predict and explain the increasing outreach of MNE especially to emerging markets (Feinberg & Majumdar, 2001; Le Bas & Sierra, 2002; Grosse, 2019). Multiple arguments have been quoted for this increasing diversification of R&D across advanced economies in general and emerging economies in particular. Accordingly, one of the prime motives that have been discussed at length holds that MNEs need to augment their knowledge base by tapping into advantageous foreign locations. Thus, in sum, it needs to be recognised that apart from firm-specific advantages that push the MNEs for foreign affiliates, there may also be pull factors inducing MNEs towards centres of

innovation with promise for more capabilities. Traditionally, the role played by a foreign affiliate in a host location is attributed primarily to the demand side factors like market structure, tastes, and preferences of customers besides intellectual property rights (IPR) protection (Le Bas & Sierra, 2019; Yang et al., 2019). An emerging alternative hypothesis suggests that expatriate R&D units are increasingly assuming the role of ‘surveillance outposts’ with an explicit motive to follow competitors’ engineering and styling activities (Miller, 1994; Florida, 1997). However, this distinction between the motives of foreign R&D is not so obvious given their evolutionary tendencies. This is because a market-oriented R&D subsidiary can evolve into a technology-oriented one under the changing market and survival strategies (Le Bas & Sierra, 2019).

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In the recent past, there is increasing attention to the contribution of emerging economies like China, the Philippines, Turkey, Vietnam, and India to global innovation. This change in the geography of R&D activities and the consequent innovation output of multinationals has made emerging economies like China, Brazil, and India the targeted destinations. In the last few decades, there has been a substantial increase in MNE-led R&D investment in emerging economies. For instance, R&D spending by major US parent companies in China increased from 4.3% to 6.3% from 2010 to 2015. For the reference period, the R&D investment by US MNEs increased from 3.7% to around 6 % (Grosse, 2019). The R&D investment by MNEs in developing countries is also increasing, for instance, the number of MNEs with R&D centres in India has grown at a compound annual growth rate (CAGR) of 4.57 percent from 721 in 2010 to 943 in 2016 (IBEF, 2017). Several studies indicate that India continues to be an attractive destination for foreign direct investment (FDI) in R&D in recent years (Mrinalini & Wakdikar, 2008; Basant & Mani, 2012; Grosse, 2019).

In contrast to the increasing R&D investment in India by foreign MNEs, the overall R&D investment is only 0.8 percent of the country’s total gross domestic product (GDP). This raises concerns about the innovation activity of firms in India, particularly, the foreign firms that are

economically active. In this project, we explore in detail the R&D and patenting activities of MNEs in India from a host country perspective. The key concerns are under what conditions MNEs engage in R&D and patenting, and what is the nature of such innovation activities. We have focused on wholly-owned subsidiaries of foreign firms to find the answers.

1.2 Definitional Framework

This section provides the definitional framework for this research report. First, it defines innovation then it offers a detailed description of the input indicator i.e., research and development (R&D) and output indicator i.e., patent application, of innovation in order to delineate the scope of this study. To define ‘innovation’ this study referred to *Oslo Manual*¹ (2018). The general definition of innovation as per the Oslo Manual is as follows:

Innovation is a new or improved product or process (or a combination thereof) that differs significantly from the unit’s previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process).

1.2.1 R&D

Various input and output indicators are used in the literature to measure innovation. R&D investment is one of the key indicators to measure the firm’s innovativeness. Foreign firms conduct R&D in the destination country either in-house or by establishing a separate R&D centre. The existing studies focusing on R&D by MNEs in India do not provide clear information on their R&D activity model (Mrinalini & Wakdikar, 2008; Basant & Mani, 2012; Kamat et al., 2020). In India, MNEs conduct R&D activities following different setups:

- **Unstructured R&D Centres:** Several companies treat activities like New Product development and product improvement as part of their routine work instead of conducting them separately as R&D activities. In such cases, companies conduct these activities lacking a proper structure, documentation and in a dedicated manner and without allocating a dedicated area to conduct them. Also, there is a lack of clarity to show the R&D and production facilities of those companies for their Indian subsidiary

¹ The Oslo Manual is an international resource that provides a common framework for measuring innovation in a more inclusive manner across the economy. It offers guidelines for collecting and interpreting data on innovation. It seeks to facilitate international comparability and provides a platform for research and experimentation on innovation measurement. Many countries and international organisations recognise the importance of innovation measurement and have developed capabilities to collect such data. It is jointly published by the OECD and Eurostat.

because a major part of their R&D is being conducted by the parent company. In short, the company's R&D activities are completely mixed up with production or other departments with no dedicated manpower for R&D. Most importantly, such companies do not maintain their R&D expenses separately and disclose the same in the Annual report, therefore it's very difficult to identify their R&D expenses which involve capital (equipment, fixed assets) and recurring expenses (manpower salary, raw material, utility etc).

- **In-house R&D Unit:** Any creative work undertaken within the firm to increase the stock of knowledge for developing innovations is considered in-house R&D (OECD Frascati Manual, 2015). As per Government of India regulations, the in-house R&D units of the companies are expected to be engaged in innovative research & development activities related to the line of business of the firm, such as the development of new technologies, design & engineering, process/product/design improvements, developing new methods of analysis & testing; research for increased efficiency in the use of resources, such as capital equipment, materials & energy; pollution control, effluent treatment & recycling of waste products or any other areas of research. However, market research, work & methods study, operations & management research, testing & analysis of routine nature for operation, process control, quality control, maintenance of day-to-day production, and maintenance of plant are not considered as R&D activities (DSIR, GoI). The other criteria for establishing an in-house R&D unit are as follows²:
 - A company should be registered under the Companies Act, 1956 or 2013.
 - A company should be engaged in manufacturing or production or in rendering technical services.
 - Companies may also be engaged fully in contract research provided independent infrastructure is available for research activities.
 - Independent infrastructure for research activities and adequate technically qualified manpower should be available (Minimum area for the R&D activities should be at least 1000 sq. ft.).

² See more details here: [Recognition of in-house R&D Units \(RDI\) | DSIR : Department of Scientific and Industrial Research | Government of India](#)

- The R&D unit(s) should not be located in residential areas but should be operating on-premises authorized by the relevant Central/State Government.
 - The in-house R&D unit(s) should be located outside the factory premises, or it may be located in a separate building within the factory premises or it may be located on a separate floor. In the case of small companies, the R&D unit may be located in a separate room or area. The R&D activities should be clearly demarcated from the manufacturing/quality control activities.
 - The company should reflect the R&D expenditure (both capital & revenue) in the Annual Report and Statement of Accounts of the company in separate schedules. The R&D expenditure incurred should be commensurate with the financial size of the company.
- **Independent R&D Centre:** MNEs may register their R&D unit and manufacturing unit separately in India under the Companies Act, 1956 or 2013. In such cases, manufacturing/production units can be registered under Company Identification Number (CIN) where the company's business activity comes under the National Industrial Classification Code (NIC) section C Manufacturing (Division 10 to 33). Whereas if the company registers a separate R&D unit under the Companies Act, 1956 or 2013, it falls under NIC division 72 i.e., Scientific Research and development (as per NIC 2008). For instance, IBM India Private Limited is an independent R&D unit of IBM located in Bengaluru. It is an unlisted company registered with CIN U72200KA1997PTC022382, here 72200 shows its industrial code that comes under the NIC division 72 i.e., Scientific Research and development. In the case of a separate R&D centre, it is easy to recognise R&D expenditure as all the expenses incurred during the financial year by the company is expenses under R&D.

In the present study, most of our data (binary) belong to within the firm R&D however during the search we realised that firms may have an operation in a different location with a manufacturing plant located in one state/location and an R&D facility located in another state/location. Thus, such R&D units may not be strictly located within a plant but have a presence within a firm. Considering that the initial selection of the companies based on CIN included only the manufacturing sector we refer to these as in-house R&D by the firms.

The earlier studies such as Mrinalini and Wakdikar (2008), Basant and Mani (2012), and Grosse (2019) also examine the MNCs' R&D. However, they do not specify the structure of the R&D facility held by the company. These studies potentially refer to standalone R&D centers that receive foreign direct investment to conduct R&D. Most such centers are established in the service sector. The present study distinguishes itself from these previous works and provides specific insights into the firm in-house R&D conducted by the foreign firms.

1.2.2 Patent

Griliches (1990) establishes that R&D is an input into the knowledge production function that leads to output in the form of patent. Griliches (1990) shows the relevance of the patent data vis-à-vis R&D expenditure in capturing the innovation activity. According to the Oslo manual (2005), "a patent is a legal property right to an invention, which is granted by national patent offices. A patent gives its owner sole rights (for a certain duration) to exploit the patented invention; at the same time, it discloses the details of the patent as a way to allow broader social use of the discovery." Patent statistics are increasingly used in various ways as indicators of the innovation output. The number of patents granted to a given firm or country may reflect its technological dynamism; an examination of the growth of patent classes can give some indication of the direction of technological change. The drawbacks of patents as innovation indicators are well-known. Many innovations are not patented, and some are covered by multiple patents; many patents have no technological or economic value, and others have very high value (Patent Manual, OECD, 1994). Thus, in this project, we complement R&D information with the patent level information to have a comprehensive picture of the innovation activities of foreign firms.

1.2.3 Wholly Owned Subsidiaries

Rao and Dhar (2011) and Joseph et al. (2019) expansively present the challenges in conceptualizing FDI that also lead to ambiguity in operationalizing the definition. However, Rao and Dhar (2011) argue that portfolio investors and round-tripping investments have been important contributors to India's reported FDI inflows thus blurring the distinction between direct and portfolio investors on one hand and foreign and domestic investors on the other. Thus, in this project, we conduct the analysis based on wholly-owned subsidiary (WOS) with 100% shares held by another corporation i.e., the parent company. In India a foreign company can incorporate a WOS company by making an investment in any sector in which FDI is

allowed, subject to the provision Reserve Bank of India (RBI)/Foreign Exchange Management Act (FEMA) and Companies Act, 2013. There are two popular entry modes adopted by MNEs to enter into the foreign markets i.e., joint ventures (JV) with local firms and setting up wholly owned subsidiaries as a means for local companies to acquire technology. WOS seeks country-specific advantages whereas JV seeks firm-specific advantages. The key motivation for MNEs to establish a WOS is cheap labor, natural resources, and other elements which are generally available in a host country. While JV seeks technology, marketing capabilities, and others which are specific factors available only to some prospective partner firms. In India, there are around 12000 wholly owned subsidiaries working in both the manufacturing and service sectors. The present study focuses only on the manufacturing sector. A separate section on literature related to wholly owned subsidiaries has been given in Chapter 2 of the report.

1.3 Motivation

The global market for novel merchandise products is evolving very fast. While demand for these products is increasing over time, there are also significant changes in how these products are produced and marketed. Also, the designs of the product and innovation are playing bigger roles in market penetration and survival. It is important that India should be an important part of this global development that is expected to create more growth opportunities within the country. The MNEs are playing a significant role in globalised innovation activities leading to novel products and configuring better ways of doing production and business. Thus, the localized innovation activities of MNEs in an economy bring immense “intangible capital” to the host country. As emerging economies like India have become an important destination for the innovation activities of such firms, it is pertinent to understand the nature of the innovation activities of foreign firms. This motivates the current research.

The current literature on foreign firms’ business activities in India mostly captures the service sector firms specifically IT firms. Also, there is no clear-cut structure (such as joint ventures or wholly owned subsidiaries) of such firms that has been presented by the scholars in the existing studies. Further, in the recent past, the focus of the government of India has shifted to the Indian manufacturing industry. The government has initiated several programs and schemes to promote MSMEs like Make in India, Invest India, etc. The existing literature also recognises the importance of innovation to promote the productivity of firms and industrial growth. The above facts motivate us to conduct the present study in the Indian context with a specific focus

on the manufacturing sector. This study captures the innovation strategies of foreign firms in the Indian manufacturing sector.

1.4 Objectives

The present project is undertaken to examine both pull and push factors governing the decentralisation of foreign R&D by MNEs in the Indian economy. More specifically the project is expected to cover the following key objectives:

- To identify economically active foreign firms in India.
- To examine the patterns of foreign firms' R&D investment and patenting in India.
- To identify the determinants of R&D investment of foreign firms.
- To recognise the drivers of patenting by foreign firms in India.

1.5 Data and Method

This study relies on secondary research and direct interaction with different stakeholders such as IP attorneys, innovation consultants, industry experts, R&D managers, etc. For the purpose of secondary research to understand evolving trends and the nature of innovation activities of foreign firms in India, an extensive literature review has been conducted. Attempts has also been made to review government policies to establish wholly owned subsidiaries in India. Further, different secondary data sources such as the Ministry of Corporate Affairs (MCA), CMIE PROWESS, company websites, magazine articles, google searches, etc, have been explored to gather company level information and information on their R&D activities in India. Patent application data has been collected from PatSeer database. Different econometric techniques have been applied to estimate the drivers of R&D and patenting such as logistic regression and negative binomial regression.

1.6 Organization of the Report

This project report is presented in six chapters. Chapter 2 provides the extensive literature related to international business and economics. It also discusses the literature related to internationalisation of R&D and innovation activities, their determining factors, and measurement. It also highlights the research gap that is addressed in this project.

Chapter 3 discusses the conceptual framework, methodology, identification strategy, and data used to examine the innovation activities of the MNEs in the Indian market along with data sources and construction of variables.

Chapter 4 evaluates the factors driving the innovation activities of wholly owned subsidiaries in India. It provides the descriptive statistics of R&D and patenting activities of 1674 firms followed by cross tabulation.

Chapter 5 presents the nature of the innovation activity of wholly owned subsidiaries using information available in the patent documents related to priority country, assignee, and inventors. It also shows the categorization of patents and firms as an outcome of technology exploiting, seeking, and creating activity of foreign firms using secondary data and inputs given by the experts during the online survey.

Chapter 6 summarizes the key findings of the study, followed by a discussion of key observations and policy recommendations. This chapter enlists the limitations and future directions for research. Finally, the chapter gives a concluding remark.

CHAPTER 2

Review of Literature

2.0 Introduction

The previous chapter is about the overall introduction of the research project. It also gives a definitional framework where the key terms used in the project have been discussed in detail. It also includes the motivation of the study and key objectives followed by a brief discussion of data and methods used for the study. Lastly, it gives details on chapter wise organisation of the study. This chapter captures the extensive literature related to international business and economics. It also discusses the literature related to innovation, its determining factors, and measurement. Each section highlights the research gap that we propose to attend to in this project.

2.1 Internationalization of R&D and Innovation by MNEs: Previous Literature

R&D investment contributes to countries' productivity growth. The recent decades witnessed a rapid increase in the internationalisation of R&D as it can improve the MNC's competitiveness. Dunning (1986) discussed the internationalisation of R&D in terms of location-specific advantages for the firm. There is a positive relationship between MNCs' expansion in the host country and R&D spending (Petit & Sanna-Randaccio, 2000). R&D spending by MNCs is a strategy-based business activity. Existing literature discusses the different motives of the MNCs to locate their R&D units in foreign countries. It can be used in adapting products suitable for the destination country's local market (Cantwell & Iammarino, 2000; Rama, 2008). In the case of a developing economy as a host country, foreign firms may be transferring their low value-added technology to the host country (Dunning, 1994). Another possibility is, that foreign firms may benefit from accessing the host country's public-funded R&D, thereby disadvantaging domestic firms (Mowery, 2001). According to Blomkvist et al. (2010), MNCs commonly place their foreign subsidiaries along with R&D units that help local manufacturing adopt home country-based technology. It is termed as home base exploiting or adaptive R&D. The other type of subsidiary called competence-creating subsidiaries contributes to the development of the MNCs' technological portfolio. It is termed as home-based augmenting or innovative R&D.

Another strand of the literature identified that the foreign subsidiaries of MNCs hold different types of R&D settings according to their needs, local resources, and local economic and

industrial environment. Ronstadt (1978) conducted a survey to capture the overseas R&D experience of seven US-based MNEs, securing information on the positioning and evolution of 55 such units. The key finding of his analysis was the clear explanation of the different roles that such laboratories could play. He observed that these laboratories' roles are not fixed or immutable. A key insight is that they can evolve along with the needs and capacities of an associated subsidiary, reflecting the development of its host economy and the progress and expectations of the parent MNE. Ronstadt (1978) identified such R&D settings are classified into four categories: (a) Global R&D Centre focusing on global R&D operations in specific areas (b) Global Integration Centre that coordinates/integrates global R&D efforts to accomplish global R&D projects for the global market (c) Local Adaption Centre that adapts global products to local markets, having weak link with host country R&D network (d) Local Development Centre that develops new products/processes for local markets (long term-oriented R&D projects). Similarly, Qi et al. (2014) identified four different types of local R&D subsidiaries i.e., Global Product unit, Corporate Technology Unit, Technology Transfer Units, and Indigenous Technology Units. Ronstadt (1978) classification was specifically for the US multinationals. The key motive of this study was to provide a better understanding of R&D investments made by US multinationals which have become increasingly important to them. Also, identification of the type, purpose, evolution over time and significance of such R&D investments. One general observation is that all parent organizations establish their foreign subsidiaries for reasons directly related to the performance of the R&D function. Thus, non-R&D goals-such as, monitoring foreign R&D activities, taking advantage of "cheap" R&D labor, or using "trapped" or "blocked" funds do not play any role in the vast majority of investment decisions and are of secondary importance in only a few instances.

Both Ronstadt (1978) and Qi et al. (2014) identified four different types of local R&D subsidiaries. Also, both studies stressed the local units' market exposure (global vs. local) but Qi et al. (2014) highlighted more about the local units' role in the MNC's global R&D network. As discussed above both studies identified two subsidiary types with a local geographical focus. First, where a local adaption unit (or technology transfer unit by Ronstadt) adapts global products to local markets and is weakly linked to the MNC's global R&D network. Second, is the local development center or subsidiary with a local market focus (indigenous technology unit), which also has weak links to the global R&D network but which is rather more engaged in developing new products for the local market as a result of often long-term oriented R&D projects. The remaining two types of subsidiaries have global market exposure and differ by

the role they play in the MNC's global R&D network, with global R&D centers (global product units) playing a passive role and global integration centers (corporate technology units) playing a more active role. Later, several studies inspired by the above two studies has been conducted using different terminologies for the R&D units (Cantwell & Mudambi, 2005; Cantwell & Piscitello, 2000; Hakanson & Nobel, 1993; Jha et al., 2018; Kuemmerle, 1999b; Lagerstrom et al., 2018; Medcof, 1997; Pearce, 1989; Qi et al., 2014; Vrontis & Christofi, 2021; Gassman & von Zedtwitz, 1998; Schweizer et al., 2020).

Later, De Beule and Van Beveren (2019) investigated the role of external knowledge sources on foreign affiliates' research efforts and innovation. They distinguish between different types of subsidiaries in order to clarify differences in the use of knowledge sources between technology-exploiting, seeking, and creating subsidiaries by using the Community Innovation Survey data for Belgium. We observed that the studies by Ronstadt (1978), Qi et al. (2014), and De Beule and Van Beveren (2019) have not used patent data as there is no such interest associated with these studies to locate or quantify the innovation. It is an important indicator to understand the type of R&D conducted by different subsidiaries. Several studies have tried to fill this gap using patent and patent citation data to evaluate the extent to which foreign-based firms rely on local knowledge. Cantwell and Noonan (2002) showed that MNE subsidiaries located in Germany between 1975 and 1995 sourced a relatively high proportion of knowledge (especially new, cutting-edge technology) from this host country. Altogether, these data lend support to the idea that foreign-owned technological activities undertaken in Germany are often asset-augmenting. In earlier studies, empirical evidence reaches conflicting conclusions. The patent data show little R&D internationalization (Patel & Pavitt, 1991; Patel, 1995; Archibugi & Michie, 1995). However, due to data limitations, these studies could not fully capture the increase in foreign R&D associated with mergers and acquisitions, which have historically represented a key element in the process of R&D internationalization. However, some research studies based on case studies or survey data acknowledged the different channels of cross-country R&D that had taken place in the early stages of MNEs expansion and account for a greater degree of internationalisation of innovative activities (Warrant, 1991; Granstrand et al., 1993; Kuemmerle, 1999a). It shows an ambiguity in the debate on internationalization of MNE R&D.

From an emerging country perspective, since the mid-1980s to gain access to R&D personnel and due to cost differentials, MNCs have started locating their R&D in some developing countries, thereby leading to the globalization of R&D (Reddy, 1997). Reddy (1997) discusses

that India is not only the R&D destination for adaptation and product development for the local market, but also for R&D activities related to new products and processes. Further, there are several India specific studies that focus on R&D centres of MNCs. These studies show that the R&D centres of MNCs in India play a crucial role in innovation activities. In 2010, India has about 851 such R&D centres. Those centres were extremely active in patenting the work done in India (Basant & Mani, 2012).

According to TIFAC (2005), almost 50 percent of MNCs R&D centres have been set up in Bangalore, followed by Delhi and Mumbai. The efforts of these centres are concentrated on information technology (IT), R&D software, engineering design (automotive, consumer durables, aerospace), chemical design (molecules, chemical structures), and agriculture and biotechnology (seeds, food, enzymes). Mrinalini and Wakdikar (2008) analysed the benefits of foreign R&D in India and argued that the country gains from the knowledge spillovers. But such effects depend on the ability and preparedness of the R&D and production system of local firms to extract benefits from the existing R&D centres in India. NISTADS (2011) identified 706 firms bringing FDI for R&D activities in India during 2003-2009. Out of 706 firms only 117 firms have formal linkages with the Indian institutions, indicating that most of the firms operate in isolation. The study finds that the linkages with educational institutions for recruitment of manpower and for training and skill development are the most prominent one. Further, the linkages with national research institutions are rare. Lastly, NISTADS (2011) find that R&D centres of MNCs associate with Indian firms for contract research.

Mrinalini, Nath and Sandhya (2012) revealed that foreign firms having R&D centre in India are not looking towards Indian production and R&D system for a new product development or for any scientific or technological research. Only the IT sector is linking with the university system and has invested almost around 50 per cent of the total investment in R&D, followed by the pharmaceutical and auto sector. The patent data indicates that the R&D activities undertaken by MNCs in India in comparison to their global R&D activities do not reflect much importance of their Indian set-ups, or their interest in high-end R&D initiatives. Ilavarasan (2014) observed that the linkages between R&D centres of foreign firms in information and communication technology (ICT) sector and the national science and technology system are weak, except in the circulation of the labour pool. Usually MNCs upgrade their R&D activities in India with the aim of changing former practice of local adaptation into local innovation. However, R&D investment enhanced the level of local laboratories by the transfer of advanced

technology from the parent companies and training of local scientists and engineers (Kathuria, 2001; Feinberg & Majumdar, 2001; Manral, 2001; Asakawa & Som, 2008).

We note that though emerging economy-based studies have attempted to understand the innovation activities of the MNEs R&D centre, they lack in using an appropriate framework for such activities. Moreover, these studies are focused on R&D centre while substantial literature highlight the contribution of in-house R&D units³. The present study is therefore inspired by the specification of the R&D units and taxonomy of their innovation activities given in the literature. Building on literature, we construct a classification of the MNCs R&D activities that is elaborated in the next Chapter. We also propose a novel way of using data from patent documents to then classify the innovation activities in the Indian market.

2.2 Wholly-Owned Subsidiaries and Innovation

There are many existing studies focusing on foreign entry modes in international business and strategic management literature. The ownership of affiliates by foreign firms has significant implications for the attainment of the economic objectives of the host country such as export promotion, technology transfer, creation of new jobs, efficient use of host country's factor endowment, and exchange control (Cao, 1976; Svejnar & Smith, 1984; Lall, 1985). Many studies have reported that large MNEs initially used joint ventures (JVs) to expand their business into emerging Markets (Meschi & Riccio, 2008; Sinha, 2008; Puck, Holtbrügge & Mohr, 2009). However, in late 1990s, the liberalization of emerging markets motivated many MNEs to convert their JVs into wholly foreign owned subsidiaries (WOSs), which ensured them total control of local operations and resources in the host countries instead shared control through JVs (Meschi & Riccio, 2008; Sinha 2008; Puck et al., 2009). Stämpfli and Vladimirov (2017) identified the reasons in case of Swedish firms why they convert their JVs into WOSs in emerging markets like India and China. They find two key reasons: first, India's increased trade with Sweden from US\$ 2 billion in 2009-2010 to US\$ 2.4 billion in 2014-2015 (Indian Embassy, 2016). Similarly, China as important trade market for Sweden with approximately 10,000 Swedish companies cultivating trade in the Chinese market and 500 of which are established in the China (Sweden Abroad, 2016). This depicts that India and China are two very important business markets for Swedish firms. Second, both India and China have liberalised their policies for foreign investment and many scholars have reported that this liberalization has motivated to foreign MNEs to convert their JVs into WOSs (Sinha, 2008;

³ Chapter 1 elaborates on the definition and operationalization aspects of in-house R&D units.

Puck et al., 2009). Choices of foreign entry mode are significantly influenced by isomorphic pressures⁴ embedded in foreign national environments, as well as by their cognitive limits regarding this choice (Yiu & Makino, 2002). The existing literature suggested that as the R&D intensity (as a proxy for asset specificity) of parent firm increases, the propensity for firms to form a wholly owned subsidiary, rather than a joint venture, increases (Erramilli & Rao, 1990; Kim & Hwang, 1992; Gatignon & Anderson, 1988; Delios & Henisz, 2000).

2.3 Innovation Activity: Previous Literature

Innovation as an advantage and an instrument of market survival has attracted prime attention in the recent past. The extent and intensity to innovate is reflected by the R&D function of a firm. The decision to undertake R&D is in turn dependent on a multitude of factors like cost conditions, intellectual property regime, market size, profitability and market share. There has been a concentration of such activities in highly industrialized countries. Though of late, MNEs have established increasing number of R&D laboratories and affiliates abroad with multiple motives (Florida, 1997). By the advent of 21st century multinationals have discovered compelling reasons that pull part of their research spending to the emerging economies like Brazil, China and India. This has prompted much debate about what determines the offshore R&D activities of multinationals.

There are both pull and push factors that incentivise multinationals to undertake R&D in offshore satellite units. Market signals like customer feedback and cost conditions along with distinctive technical skills have often been cited in literature as the prime pull factors in case of foreign affiliates to attract and conduct R&D activities (Florida, 1997). Apart from this, Cantwell (1994) argued that multinationals may look for new technological competencies in institutional settings that are qualitatively at variance with the home-based settings. In extreme, multinationals may establish research laboratories in foreign settings to neutralise the locational home disadvantages, if any. Similarly, increasing home competition and limited market access push these multinationals to establish competence creating subsidiaries in host country locations (especially emerging market economies).

Extant literature explores the nature, drivers, and the impact of the foreign firms' innovation activities in emerging market economies (Feinberg & Majumdar, 2001; Kachoo & Sharma,

⁴ Forces that influence and shape institutions in the society as well as the internal practices of firms within a given environment.

2016; Yang et al., 2019; De Beule & Van Beveren, 2019; Grosse, 2019). As established by the existing literature, advanced economies like USA, EU and Japan are found to increasingly transfer part of their R&D to Chinese and Indian markets. These multinationals invest not only to exploit the new markets but also to explore the possibilities of developing their products in-host country settings (Miller, 1992; Grosse, 2019). Evidently one may raise the query of what determines the transmission of MNE led R&D in emerging economies? The literature at length has cited many determinants governing the extent and pattern of foreign R&D in these economies. Among many, market size has been the most discussed determinant of foreign investment in the form of firm level R&D. Yang et al. (2019) argued that even with a weak intellectual property rights protection, the Japanese multinationals are increasingly investing in China primarily to enjoy access to vast Chinese markets. The foreign affiliates are increasingly found to value the market information like customer feedback, competitor's strategy, style of the product etc (De Beule & Van Beveren, 2019). Similarly, Le Bas and Sierra (2002) argued that market size induces multinationals to undertake cross border movement of FDI in R&D to tap-in the host country advantages.

Further, we bring together the literature on firm and industry specific determining factors of innovation activity. Lastly, we will discuss the measurement issues related to innovation.

Influence of market size on foreign multinationals inventive activities

Apart from the economies of scale, the multinationals setting up their affiliates in emerging markets are increasingly found to value the economies of agglomeration. As Grosse (2019) argued that foreign and united states companies increasingly investing in the Silicon Valley to undertake their own research and to learn from other competitors. Learning can be incorporated into the production function from a multitude of sources like hiring skilled and professional personal and experience attained over time. Moreover, bigger firms are expected to undertake higher amount of overseas R&D (Yang et al., 2019; Ambrammal & Sharma, 2014). Similar conclusions were arrived at by Kathuria (2001) in case of Indian manufacturing firms. Thus, age and experience are expected to play a dominant role as the prime drivers of foreign R&D.

Influence of parent firm size and the Indian market experience on innovation activity of foreign firms.

The favourable cost conditions under a strong protection for intellectual property rights in the emerging economies significantly pull the foreign R&D (Grosse, 2019). In countries like India

and China, with cost effective labour availability and skilled manpower, companies often found it interesting to establish their research units especially related to IT (Asakawa & Som, 2008; Jha et al., 2018). The host country cost efficiency is further expected to induce cost effectiveness of multinationals global operations. Thus, multinationals are increasingly seen to offset their home country weakness in terms of high production costs mainly emanating from high labour costs by directing part of their R&D to the destinations with cheaper labour force. Similarly, expected profitability and market share impact the decision of foreign MNE's to undertake R&D in emerging economies or not.

Apart from the market and firm specific externalities, the government in the emerging economies actively pursue policies to attract R&D by multinationals. As Feinberg and Majumdar (2001) argued that emerging economies are increasingly pursuing policies to attract foreign FDI in R&D to increase the growth rate and to grow up along the technological ladder. The government apart from congenial public policy towards foreign R&D, need to increasingly speed up spending in basic research. To test the relevance of these factors we may need to devise alternative hypothesis over time.

Influence of export intensity and import intensity on innovation activities of the firms

Export intensity: Firms invest in R&D to attain technological superiority over their competitors and to capture the market for long run survival. They invest to either capture domestic markets or both foreign and domestic markets. Accordingly, the firms that intend to capture foreign markets are expected to exhibit greater outward market orientation than the firms that specialise on domestic markets. These outward oriented enterprises are expected to have greater need for in-house R&D units. This is mainly on account of the fact that exports are likely to increase the returns for per unit of R&D undertaken (Kumar & Aggarwal, 2005). These outward oriented firms are expected to have better knowledge about technological advancement than inward industries (Zimmerman, 1987; Evenson & Joseph, 1999). These firms invest increasingly in imitative and adoptive technologies to enjoy better control over the advancements of demand in foreign market. There is increasing evidence both theoretical and empirical to the fact that outward oriented industries undertake greater amount of R&D per unit of expenditure than inward industries (Braga & Willmore, 1991). Similar conclusions as in Braga and Willmore (1991) were arrived at by Rao et al. (1994) in case of Canadian multinationals where-in the outward foreign industries were found to spend significantly higher sums on R&D activity than inward oriented. In case of Indian economy, Goldar and

Renganathan (1998) found that foreign orientation of Indian firms positively impacts the spending on R&D especially in post reform period.

Import intensity: Import intensity or alternatively import of high technology is the most prominent source of knowledge transfer from advanced to emerging economies. Indian firms are increasingly found to divert huge number of resources to import cutting edge technology from advanced countries (Braga & Willmore, 1991; Kumar & Aggarwal, 2005). The import of knowledge can be through either of the two forms viz embodied or disembodied. However, there is a debate in continuum whether this technology led knowledge imports complement domestic R&D or they substitute it. Fikkert (1993) reported a negative relationship between foreign technology imports and R&D expenditure. On the other hand, Kumar and Saqib, (1996) found neither complementary nor substituting relationship. Similarly, in case of Indian economy, we came across literature extending support to both the hypothesis though with a tilt in favour of complementarity hypothesis (Aggarwal, 2000; Kumar & Aggarwal, 2005). Furthermore, Kumar and Aggarwal (2005) argued at length that there is increasing evidence to the hypothesis that there exists a positive association between capital imports and R&D led innovation activities in Indian economy.

Inter-industry differences that impact decision to invest

Apart from the firm specific market-oriented determinants (export intensity and import intensity) that impact decision of foreign firms to undertake offshore R&D activity, there are some industry specific factors that impact the decision to invest in emerging economies. The prominent factors that have been discussed at length in literature include the level of competition in an industry and technological and knowledge intensity.

Level of competition: The relationship between level of competition and R&D spending by MNEs was addressed in the seminal work by Schumpeter (1947) proxied by market structure and innovation. The Schumpeterian hypothesis stated that concentrated markets where firms enjoy high market power facilitate risky investments and thus innovation. As against this Arrow (1962) argues that competitive environment leads to efficiency and thus innovation. Thus, there is a contradicting account of the relationship between competition and innovation in theoretical and empirical literature. Theoretical models predict an inverse relationship between level of competition and innovation while as empirical models hold contrary i.e. positive relationship (Aghion et al., 2005). Similar findings were arrived at by Hashmi (2013)

using the manufacturing data of US firms. Both these theories (market concentration theory and competition theory) will lead to contrastive policy implications. The concentration theory will imply that growth of monopoly power will induce technological innovation and hence economic growth. On the other hand, the competition theory holds that there should be least barriers to trade and market entry thus leading to innovative efficiency. In case of Indian economy, the thesis of competition led innovation seems to hold relevance as argued by Sandhya et al. (2014) and Joseph et al. (2019).

There are several indices that can be used to proxy the level of competition in an industry. The most prominent being the use of indexes designed to capture competition and innovation. For the level of competition, we can make use of various indicators such as Lerner index and HHI. Lerner index is a measure of the market power of a firm. It is formalized by the Russian-British economist Abba P. Lerner in 1934. This index measures the percentage markup that a firm is able to charge over its marginal cost. The index ranges from a low value of 0 to a high of 1. The higher the value of the Lerner index, the more the firm is able to charge over its marginal cost, hence the greater its monopoly power. Its use is largely restricted to theoretical studies because of the difficulty of accurately measuring costs in practice. The other measure, such as the Herfindahl-Hirschman index (HHI), is more commonly used to gauge monopoly power using real industry data. It is used to determine market competitiveness. But it fails to take into account the complexities of various markets. A market with an HHI of less than 1,500 is considered a competitive marketplace, an HHI of 1,500 to 2,500 is moderately concentrated, and an HHI of 2,500 or greater is highly concentrated. The present study relies on HHI to measure the level of competition in an industry.

Technological and knowledge intensity: Multinationals in advanced economies invest vast amount of resources aimed at developing new ideas and technology to attain the market superiority (Braga & Willmore, 1991). The incentive for more and more technological and knowledge explorations on part of these MNEs is governed by the expected returns from the vast domestic markets and an ever-increasing market base in the emerging economies. In OECD area, the high technology industries have experienced the highest growth as compared to the all other three combined. In 2006 the high technology industries account for more than 52% of total manufacturing; in US they account for more than 67% of manufacturing, 45% EU and more than 42% in Japan (OECD, 2009). Similarly, in case of India it's the high technology industry that has experienced strong growth (18%) during the time period 1997-2007

(Ambrammal & Sharma, 2014). However, it is to be noted here that an increase in the productivity of high-tech industries in industrially advanced economies is not same as an increase in the productivity of high-tech industry in emerging economies. An increase in the productivity of industries in advanced economies means an increase in the hard-core R&D spending and consequent technological advancement. On the other hand, an increase in technical productivity of industry in emerging economies is mainly on account of imported technology (Braga & Willmore, 1991; Kumar & Aggarwal, 2005).

Technical or knowledge intensity can be proxied by OECD classification (International Standard Industrial Classification). In case of Indian market, concordance of OECD classification and National Industrial Classification can be used.

2.4 Measurement of Innovation Activity

The innovative activity and the measures to capture it have been studied quite extensively especially post seminal work by Pakes and Griliches (1980). However, the results of these studies have not led to the development of a commonly accepted indicator of the innovative activity of a firm (Hagedoorn & Cloudt, 2003; Gupta et al., 2017). The indicators used to measure the innovative activities of a firm are further classified into the input and output-based measures. Spending on R&D, patent count, patent count weight by citations index, number of new products, skilled manpower (Engineers and Scientists), new processes and new methods to increase productivity are commonly used measures of innovation activity (Pakes et al., 1986; Trajtenberg, 1990; Albert et al., 1991; Aristodemou & Tietze, 2018). The simple patent count is the easiest and most frequently used parameter to measure the innovative activity of a firm. This is because patents contain highly detailed information about innovation, the technological area to which it belongs, and geographical information in terms of innovators and assignees (Hall et al., 2001). However, the researchers recognised the problem that simple patents are noisy indicators of innovative activity (Marco, 2007; Hagedoorn & Cloudt, 2003). Trajtenberg (1990) found that patent citation outperforms simple patent count as an indicator of the innovation activity of a firm.

Spending on R&D has been long advocated to be a fair representative of innovative activity in the firm related literature. There are two prime limitations of R&D being proxied as an indicator of the inventive aptitude of a firm. Firstly, in most cases and especially in emerging economies like India firms do not reveal the true extent of R&D undertaken as it is an optional choice either to reveal or not conceal. Second, all the R&D led innovations need not be patented thus

creating a vacuum between the level of input in the form of R&D undertaken and the amount of output produced in the form of patents. Patent count weighted by citations index has been in use to measure the level and effectiveness of inventive output of a firm (Carpenter et al., 1981; Albert et al., 1991; Harhoff et al., 1999; Fisch et al., 2017). However, citation-based indexes suffer limitations like truncation (Fisch et al., 2017). Since patents get cited over their life span, it is imperative on part of researchers to decide how many years one needs to take into consideration to make sure that the patent gets cited at least once.

Similarly, several new products or processes created have been addressed in many studies as indicators of the innovation activity of firms (Claudio et al., 2013). Firms either invest in the development of new products or processes or buy from other firms or follow a combined strategy. However, these resources and appropriability based measures are marred with shortcomings. The most striking criticism against the use of these parameters is their firm varying intensities and their overlapping contribution to the innovative performance (Hagedoorn & Cloudt, 2003).

From the above discussion, it is established that these indicators of innovative activity have shortcomings. For instance, R&D expenditure as an input does not capture the other inputs that contribute to the innovation process. Similarly, not all R&D led innovations lead to patenting (Joseph et al., 2019). Another study based on publication data states that 21 MNCs foreign R&D centers in India contributed 3040 papers, increasing annually from 82 to 429 from 2003 to 2012, with an annual average growth rate of 23.56 per cent (Gupta & Gupta, 2014). In the case of other measures like citations-based index, new products or processes, manpower etc. different challenges like unavailability of reliable data over longer horizons of time are not easily available and accessible. However, Hagedoorn and cloudt, (2003) found that the use of any of the above-cited indicators can be justified to arrive at valid conclusions with little variance in the results. In the case of the Indian economy, we do not have access to extensive data related to citations index, development of new products and processes, and knowledge about manpower of firms. This reduces the scope for the use of these measures to estimate the extent of innovative performance of foreign firms in Indian markets. So, like the conventional research, this study will mainly concentrate on the use of data related to R&D expenditure and the consequent patent activity to examine the innovative performance of firms. Of late, a number of publications have also been used as an important indicator of the innovation performance of firms (GII, 2016). However, the absence of time series data for the number of

publications in the case of the Indian economy limits its use for the current study. Thus, the current study will mostly rely on data for R&D spending and patenting activity to capture the innovate on performance of foreign firms. Spending on R&D will be taken as input and the patenting as an output-based measure with an explicit acknowledgement of the limitation that all R&D does not lead to patenting.

With respect to patenting, Licht and Zoz (2000) analysed patent application data of MNCs and observed that there is a tendency that firms apply for patents in the export destination country due to competitive pressures by exporters from other countries. Inkmann et al. (1998) examine the patenting behavior of German firms by adopting maximum-likelihood probit technique. Branstetter et al. (2014) attempt to analyse the patterns of China and India based on US patents. Patra and Krishna (2015) investigated the patterns of foreign firms in India from an in-house developed database in their study by using Social Network Analysis approach.

Data shows that majority of the patents filed in India are owned by MNC's/foreigners (IPO, 2019). But the interesting fact is that more than 50 per cent of R&D inflows for MNCs have come for non-core R&D activities namely design, development & testing, education, and training in emerging economies like India (Reddy, 1997; Pohit & Biswas, 2016; Shimizutani & Todo, 2008). The large numbers of investments (i.e., 86 per cent) are below US\$ 50 million from MNCs. It indicates that foreign firms with economic activity may not be investing in high-end R&D in India. This can be validated by patent information which indicates that R&D activities undertaken by MNCs in India, in comparison to their global R&D activities do not reflect much importance of their Indian set-up, or their interest in high-end R&D initiatives (Mrinalini et al., 2013).

CHAPTER 3

Conceptual Framework, Variables, Data, and Method

3.0 Introduction

The previous chapter discussed the extensive literature in the field of international business. It mainly discusses the innovation strategies of MNEs in host countries. It highlights the key factors that drives MNEs to establish their affiliates in other countries and conduct a part of their innovation activities. It also forms the hypothesis for the present study based on the existing literature and findings. In continuation to the last chapter this chapter provides a detailed conceptual framework about the project. It also discusses the method used to examine the innovation activities of the MNEs in Indian market along with data, its sources and construction of variables.

3.1 Strategies to Identify the Nature of R&D

The prime concern here is to identify the nature of foreign R&D investment by multinationals in the Indian markets. In other words, we are trying to answer the question: Do MNEs locate their knowledge activities because of their home country's advantage or host country's strengths? Before two decades this would have been a simple question addressed in numerous studies with a broad consensus that MNEs undertake R&D to cash-in their home country's technological advance (Grosse, 2019). However, by the advent of 21st century, there has been a visible change in the operations of MNEs and many have evolved over time from mere adaptive to innovation centres. Accordingly, firms are categorised into competence creating, and competence exploiting taking into consideration both host country market and product-specific aspects (De Beule & Van Beveren, 2019).

Extant literature has investigated technology exploiting and technological exploring foreign subsidiaries (Frost, 2001; Le Bas & Sierra, 2002; Grosse, 2019; De Beule & Van Beveren, 2019). Similarly, Kuemmerle (1999) argued that MNEs engage in FDI if they perceive that they possess certain technological advantages over their competitors in the host country. Following Le Bas and Sierra (2002), De Beule and Van Beveran (2019) and Dezan Shera & Associates (2020), this study is expected to divide this technology exploring and or exploiting behaviour into three categories considering both MNEs and host country. This will be based on the classical tool of management analysis i.e., permutation combination matrix based on

subsidiaries' strengths and weaknesses in the home-host setting (refer Figure 3.1, Table 3.2 and Table 3.3).

- **Type 1 Strategy - Technology Creating R&D Centre:** Multinationals expand their business activities abroad due to multiplicity of motives like sourcing-in low-cost factors, avoiding taxes and strategically follow their competitors. The motive that assumed prominence, though of late include the multinationals invest in overseas R&D to access new opportunities and skills to create new innovations. These types of MNE affiliates are primarily tasked to create new knowledge that is either not in the areas of their traditional strength or the host country enjoys a certain advantage (Le Bas & Sierra, 2002). These subsidiaries engage in research primarily aimed at the development of new innovations by incorporating the technical capabilities of emerging economies. There are a series of arguments used to justify this internationalisation of R&D by multinationals like creating competencies that can stand global operations, access to a wider range of innovative stimuli, domestic competition etc. (Miller, 1994).

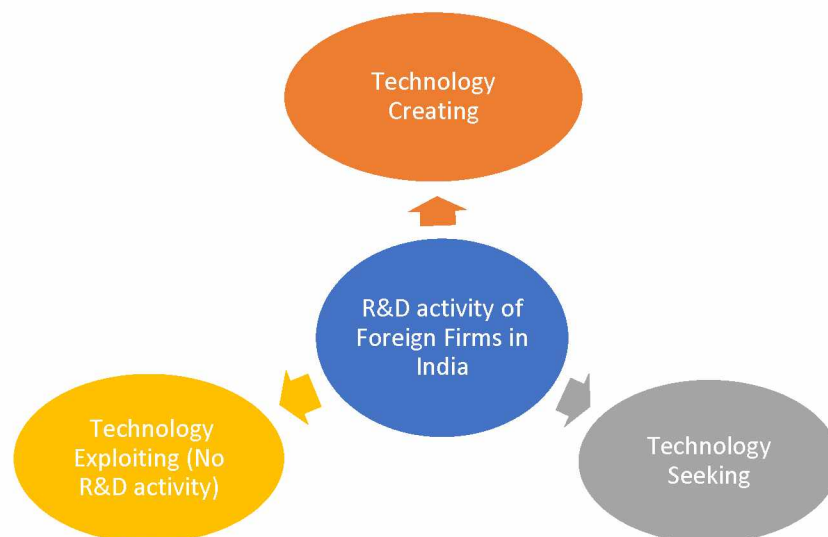


Figure 3.1: Types of R&D activities

These subsidiaries are established in the host locations to act as research laboratories for the multinationals to carry out new innovations. They are often found collaborating with research institutions and universities to produce new inventions (De Beule & Van Beveren, 2019). Thus, any MNE led R&D activity tasked to create new technologies (new to both host and home country markets) will be taken as technology or competence

creating R&D activity. This type of FDI led R&D is expected to contribute positively to both quality and quantity of patents filed by Indian nationals.

- **Type 2 Strategy - Technology Seeking R&D Centre:** The conventional hypothesis of concentrated R&D is under criticism and has paved way for decentralisation of R&D through instruments of foreign subsidiaries (Grosse, 2019). The foreign multinationals are increasingly directing their R&D to the emerging markets either to offset home country weakness or to learn from competitors in the foreign settings (Le Bas & Sierra, 2002). These types of subsidiaries are commonly categorised as technology seeking firms. New knowledge to the firm is not necessarily always from the inter-firm source or parent MNE source. This is most of the time from the peer subsidiaries or local markets where these MNC led satellite units operate (Zhang et al., 2015). In international business literature, it has been established that MNC's can enrich their pool of capabilities through the channel of reverse knowledge flow operating in the foreign locations (Schmid & Schurig, 2003). Thus, as against the technology creating foreign R&D, capability seeking investments are undertaken to learn from the host markets. Also, there are cases where the competing firms are often seen collaborating R&D to reduce costs and risk through economies of agglomeration.⁵ Besides agglomeration economies, the foreign subsidiaries can also learn about the technical competencies of host countries (De Beule & Van Beveren, 2019). Thus, MNC's are increasingly found to invest in foreign economies to learn from their competencies where-in their innovations may not be new to the host country but it is new to the investing firms. Unlike technology creating innovations (new to both home and host country), the technology seeking innovations are new to parent company or the home country. In these cases, market signals and availability of technical know-how are significantly going to decide the pattern of foreign R&D thus acting as the pull factors (Frost, 2001).

Foreign multinationals are seen increasingly invest in the areas where they can recruit high skilled professionals and managers at lower costs. This may be partially the reason of concentrated FDI led R&D in the ICT, engineering, drugs, and pharmaceuticals and

⁵ Agglomeration economies exist when production is cheaper because of this clustering of economic activity. As a result of this clustering it becomes possible to establish other businesses that may take advantage of these economies without joining any big organization.

in certain clusters like Bangalore, Hyderabad, Chennai, Mumbai and Delhi (Joseph et al., 2019). Similarly, Sandhya et al. (2014) have found that FDI led R&D is concentrated in three sectors namely software & IT, Pharmaceuticals, and automation. These sectors account for 69% of FDI led R&D and 83% of jobs generated thereupon. These skill seeking units invest in talented young professionals to integrate their knowledge in their production function to explore other markets with higher demand. Moreover, as argued by Sandhya et al. (2014) the availability of high skilled engineers and IT professionals reduces the cost of undertaking R&D.

Zhang et al. (2015) argued that contemporary MNC's undertake geographically dispersed competence creating explorations through their off-spring subsidiaries in distant markets. These offshore investments are mainly undertaken to exploit the markets in emerging economies. Multinationals from North America and Canada are increasingly found to invest in expanding markets of China and India even with poor IPR enforcement. Similarly, the global drug and pharmaceuticals industry has been increasingly investing in the Indian economy to cater for the ever-increasing pharmaceuticals market. The average R&D intensity of the Indian drugs industry has increased from 0.17 in 1990-94 to 4.21 in 2009-13 (Tyagi et al., 2018). However, the extent of gains from different locations depends on how firms seek and retrieve knowledge found in host countries (Alcacer et al., 2013). Thus, apart from skill induced technical advancements, the MNCs are increasingly found to invest in the market seeking business strategies, especially in emerging markets like India.

- **Type 3 Strategy - Technology Exploiting In-house R&D Unit:** As argued by both Kuemmerle (1999) and Le Bas and Sierra (2001), the capability exploiting nature of MNE led FDI in R&D has been the dominant view. Around 70 percent MNE's are found to locate their business activities abroad in technological areas where they enjoy superiority over the host country firms. Similar results have been arrived at by Patel and Vega (1999) in case of 220 US based most internationalised firms. The Indian economy has experienced a surge in FDI, but the proportion of R&D is meagre thus pointing to the fact that foreign multinationals mostly invest in imitative rather than innovative business activities (Joseph et al., 2019). Specifically, if an innovation carried out by MNE affiliate is not new to the firm but new to the Indian market, then the firm is exploiting its existing technological advantage. These subsidiaries are considered as

technology exploiting and act as advertising and selling units for MNE's. This may be because of market asymmetries and technological gaps between home and host country thus prompting the multinationals to exploit the advantage (Le Bas & Sierra, 2002). These foreign affiliates are supposed to transmit prevalent information about market knowledge and technical support to the parent firm in home country. Thus, customers and suppliers are considered as the prime source of information that may be of critical importance to these subsidiaries. Although these firms may not undertake primary R&D in Indian markets, but they do need to undertake imitative R&D in Indian markets to adjust for market and consumer needs.

We propose that by analysing the different attributes of a patent applied by the company in conjunction with the presence of R&D activity, it is possible to identify the type of technology activity undertaken by MNEs. The key argument is that information on priority country, assignee, and inventor can be used to elicit the nature of innovation activity and segregate into technology creating, seeking, and exploiting. Many studies use priority country, assignee, and inventor-based information to locate the invention in a specific country (Singh, 2007; De Rassenfosse et al., 2014; Wang & Li, 2019; De Rassenfosse & Seliger, 2020). We build on that literature and further relate it to the international economics literature on the internationalization of R&D by MNEs to identify the nature of technology activity undertaken by the firm. Based on the above discussion we prepared our initial framework to understand the MNEs' innovation strategies in host country given in Table 3.1.

Technology Type	R&D activity	Patents filed	Priority in India	Family patent in other countries
Technology Creating	Yes	Yes, with majority of inventors based in India including the lead inventor	Yes	Yes
Technology Exploiting	No	Yes	No	Indian patent is part of the family patent filed in other geographies
Technology Seeking	Yes	Yes, with few inventors in the team based in India	No	Indian patent is part of the family patent filed in other geographies
	Yes	Yes, with most or all inventors based outside India	No	Indian patent is part of the family patent filed in other geographies

Later, while analysing the data we find number of combinations of priority, assignee and inventor information in the patent application data. Further we extended our initial matrix considering all possible cases. After analysis of each patent further aggregation for each firm of all patents helps in identifying the overall technology strategy. Given below is the technical or legal meaning of these terms as per the PatSeer database:

Priority country: A country where the patent is first filed worldwide before being extended to other countries

Assignee: An assignee is often the organization employing the inventor of the technology. An assignee can also change at a later date. An applicant is an organization or individual that files the patent application is called the “applicant.” This could be the original inventor, or it could be the assignee

Inventor: An inventor is a person who contributes to the claims of a patentable invention. In some patent law frameworks, however, such as in the European Patent Convention (EPC) and its case law, no explicit, accurate definition of who exactly is an inventor is provided.

After analysing the existing data, we collated different possibilities that are present and accordingly classify each patent. The following table succinctly exhibits the different combinations and their classification into technology creating, seeking, and exploiting nature.

Table 3.2: Matrix presentation of nature of the companies based on their R&D and patenting activities based on IPO data

Priority Country India	Priority Country Not India	Indian in SFAM or WO	India Not in SFAM	Assignee Country India	Assignee Country Not India	First Assignee	Secondary Assignee	Majority Indian Inventors	Minority Indian Inventors	Indian Inventor	No Indian Inventor	First Inventor Indian
Yes				Yes		Yes		Yes				
Yes				Yes		Yes			Yes			Yes
Yes				Yes			Yes	Yes				Yes
Yes				Yes			Yes		Yes			Yes
Yes					Yes					Yes		Yes
Yes				Yes		Yes			Yes			
Yes				Yes			Yes	Yes				
Yes				Yes			Yes		Yes			
Yes					Yes					Yes		
	Yes	Yes		Yes								Yes
	Yes		Yes		Yes					Yes		
Yes					Yes						Yes	
	Yes	Yes		Yes								
	Yes	Yes			Yes						Yes	

Source: Authors' Compilation

Figure 3.3: Matrix presentation of nature of the companies based on their R&D and patenting activities based on USPTO

Priority Country India	Priority Country Not India	Indian in SFAM or WO	India Not in SFAM	Assignee Country India	Assignee Country Not India	First Assignee	Secondary Assignee	Majority Indian Inventors	Minority Indian Inventors	Indian Inventor	No Indian Inventor	First Inventor Indian
Yes				Yes		Yes		Yes				
Yes				Yes		Yes			Yes			Yes
Yes				Yes			Yes	Yes				Yes
Yes				Yes			Yes		Yes			Yes
Yes					Yes					Yes		Yes
Yes				Yes		Yes			Yes			
Yes				Yes			Yes	Yes				
Yes				Yes			Yes		Yes			
Yes					Yes					Yes		
	Yes	Yes		Yes								Yes
	Yes	Yes			Yes					Yes		
Yes					Yes						Yes	
	Yes	Yes		Yes								
	Yes	Yes			Yes						Yes	
	Yes		Yes									

Source: Authors' Compilation

3.2 Approach

(3.2a.) Definition of Foreign Company in India

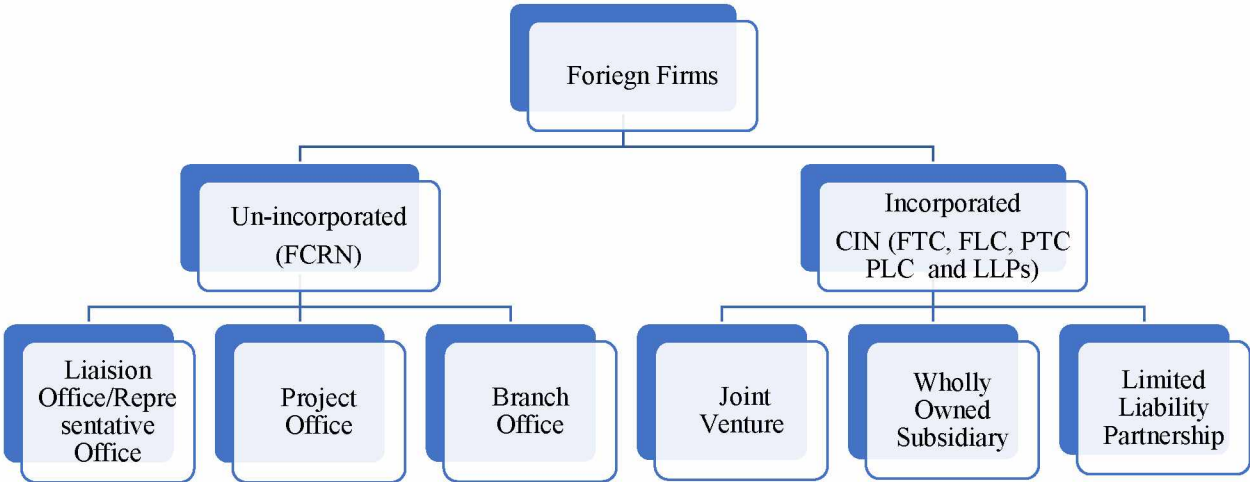
As per Section 2 (42) of the companies act 2013, a foreign company means any company or body corporate incorporated outside India that,

(a) Has a place of business in India whether by itself or through an agent, physically or through electronic mode; and

(b) Conducts any business activity in India in any other manner.

In India, a foreign company can be set up as an unincorporated entity and registered with the Foreign Company Registration Number (FCRN). Unincorporated entities permit a foreign company to do business in India by establishing a liaison office, branch office, project office, or a trust. To undertake various other economic activities like manufacturing, R&D etc., (that are not covered under unincorporated entity) in India, foreign companies have to undergo several regulations. They also have to be incorporated into the country. Here, incorporation means that the company can incorporate an affiliate in India (the parent firm is already incorporated in their home country). An incorporated entity means a limited liability partnership or a wholly-owned subsidiary is considered a separate legal entity, and has a more structured set-up. It can be registered with a Company Identification Number (CIN) (refer Figure 3.2 and Table 3.4). The focus of the present study is such wholly-owned subsidiaries.

Figure 3.2: Structure of foreign firms in India



I. Unincorporated Foreign Company

An unincorporated foreign company can be established on three different models:

1. Liaison Office/Representative Office: It facilitates and promotes the parent company's business activities in India and acts as a communicator between the foreign parent company and the Indian company as it is not allowed to conduct any business activity in India. Liaison offices are permitted to undertake the following activities:

- Represent the foreign parent company
- Promote export and import between the countries
- Establish technical and financial cooperation between the foreign and Indian companies
- Facilitate communication between the parent and Indian companies

2. Project Office: A project office can be established if a foreign company has received a contract from an Indian company to execute a project in India. The project is funded directly by inward remittance from the overseas head company. If not, the foreign company must make a specific request to the RBI for approval.

3. Branch Office: A branch office is an extension of the foreign company and can conduct the same business activities as that of its parent company. Retail trading activities are not allowed for a branch office in India. The branch office is not permitted to engage in manufacturing activities on its own these may be subcontracted to an Indian manufacturer. However, if a branch office is operating in a Special Economic Zone (SEZ), then it is permitted to undertake manufacturing and service activities in sectors with 100 percent FDI approval. Branch offices are permitted to undertake the following activities:

- Export/import of goods
- Rendering professional or consultancy services
- Research activities in which the parent company is engaged
- Promoting technical and financial collaborations between Indian companies and parent company
- Acting as buying/selling agent of parent company

The Foreign Exchange Management Act (FEMA) governs the application and approval process for the establishment of a liaison or branch office in India. Under the Act, foreign

enterprises must receive specific approval from the Reserve Bank of India's (RBI) Foreign Exchange Department to operate a liaison office in India. The approval process generally takes 40 days and permission to operate a liaison office is granted for a three-year period, which can be extended at a later date (maximum three-year extension). Once the validity period expires, the liaison office has to either close down or be converted into a joint venture/wholly-owned subsidiary in conformity with the FDI policy. Within 30 days of establishment, the liaison office must register with the Registrar of Companies (RoC) by filing e-form FC-1 through the Ministry of Corporate Affairs online portal.

II. Incorporated Foreign Company

1. Wholly Owned Subsidiary: A wholly-owned subsidiary (WOS) operates as an independent legal entity whose 100 percent common stock is owned by another company, the parent company. The WOS can be a part of the same industry as its parent company or a part of an entirely different industry. Wholly owned subsidiaries can be established in the industry where 100% FDI is allowed. WOS can be recognised as FTC ownership (as per MCA classification) firms in India.

2. Joint Ventures: Joint Venture is another way for foreign companies to enter the Indian market. In sectors where 100 percent FDI is not allowed, a foreign company may form a joint venture through an agreement with an Indian partner. Corporate joint ventures are regulated by the Companies Act, 2013 and the Limited Liability Partnership Act, 2008. Through joint ventures, foreign investors have access to distribution channels, financial resources, and contacts with the Indian partners. In MCA data, joint ventures are registered under PTC (private limited company) and PLC (public limited company) categories. As per MCA notification number G.S.R. 250 (E) dated 31st March 2014 under Companies Act 2013, rule number 8 (2)(b)(v), if a foreign company is incorporating its subsidiary company in India, then the original name of the holding company as it is maybe allowed with the addition of word India or name of any Indian state or city, if otherwise available. Therefore, in the first phase, we have identified foreign companies invested in a joint venture in India by the above logic such as companies having their names followed by 'India/name of any Indian state/city and private limited' e.g., Panasonic India Private Limited; Ota New Delhi Private Limited or 'India limited' e.g., Maruti Suzuki India Limited respectively. However, we cannot identify foreign companies in PTC and PLC categories if they had not registered their names same as holding companies.

3. Limited Liability Partnership: Foreign Investors can also form an incorporated company under the LLP structure. Foreign companies are allowed to make any downstream investment in any other company or LLP operating in sectors that permit foreign investment. It can be a combination of partnership firms and a company (private or public). Formation of LLP is less expensive compared to other office types. Features of setting up an LLP are:

- The minimum fee for incorporating an LLP is INR 500 (US\$7), depending on the capital contribution
- There is no minimum capital requirement for the registration of an LLP
- No accounts auditing is required until annual turnover exceeds INR 4 million or (US\$55,750)
- Partners are not liable to pay the company debts from their personal assets and can be entered into any legal contracts outside India
- A minimum of two partners are required for forming an LLP (no limit on the maximum no of partners), and at least one of them has to be a resident of India
- Any existing partnership firm and existing private and public company can be converted into an LLP
- Foreign LLPs are basically low budget companies e.g., law firms, consultancy firms

Foreign firms Ownership Category	Type	Type of Registration code	Company Name (examples)
Unincorporated	Branch Office	FCRN	Huawei Technologies Co. Ltd.
	Liaison Office	FCRN	Sierra Wireless Hong Kong Limited
	Project Office	FCRN	Traffic Co. Ltd.
Incorporated	Wholly Owned Subsidiary	CIN (FTC, FLC)	Pharmazz India Private Limited
	Joint Venture	CIN (PTC, PLC)	Maruti Suzuki India Limited
	Limited Liability Partnership	FLLPIN	Elmes-India Impex LLP

Source: Authors' compilation based on information collected from MCA, GoI.

Company data is reported by different Registrar of Companies (RoC) to MCA. There are 23 RoCs under MCA appointed under Section 609 of the Companies Act (India). They cover various States and Union Territories vested with the primary duty of registering companies and Limited Liability Partnership (LLPs) floated in the respective states and the Union Territories.

RoC ensure that such companies and LLPs comply with statutory requirements under the Act. These offices function as registry of records, relating to the companies registered with them.

As per MCA, all foreign firms are required to register in RoC Delhi however they can conduct their business activities anywhere in India. The state wise and year wise lists of companies registered in India are available on the website of MCA. State wise lists show all foreign and domestic companies operating in that state, but it does not mean that all companies are registered in RoC of that state. According to an expert from MCA the available company lists are state wise not RoC wise. To avoid this uncertainty, year wise lists of companies registered in India from year 1980 (includes up to 1980 companies registered) to 2019 are referred for the preliminary framework of the study.

MCA provides company identification number (CIN) and foreign company registration number (FCRN) to the firms at the time of registration in India under respected RoCs. MCA classify all the registered firms into two broad categories i.e., Indian firms that are registered with CIN and foreign firms that are registered with FCRN. Companies with FCRN number are registered in India under section 2 (42) of companies act which is exclusively for foreign firms. FCRN firms are unincorporated foreign firms. FCRN is a 6 digits alpha-numeric number starts with 'F0' e.g. TAICHI HOLDINGS LIMITED with FCRN - F04781 is a Japanese company located in Haryana. CIN is 21 digits alpha-numeric number with 16 ownership status categories of the firms (refer Figure 3.3 and Table 3.5).

S. No.	Ownership status code	Details
1	FLC	Financial Lease Company as Public Limited
2.	FTC	Subsidiary of a foreign company
3.	GAP	General Association Public
4.	GAT	General Association Private
5.	GOI	Company is owned by the Indian Government
6.	NPL	Not-for-profit companies
7.	OPC	One Person Company
8.	PLC	Public Limited Company
9.	PTC	Private Limited Company
10.	SGC	Companies owned by State Govt.

11.	ULL	Public Limited Company with Unlimited Liability
12.	ULT	Private Limited Company with Unlimited Liability
13.	NIL	Information not available
14.	ORB	Information not available
15.	PSI	Information not available
16.	PUN	Information not available
Source: MCA, GoI		

As per MCA, companies registered with CIN are incorporated and considered as Indian firms. However, a foreign investor can also set up an incorporated entity in India i.e., wholly owned subsidiary or joint venture registered with CIN. Therefore, incorporated foreign entities are important to answer the key research question of this study. Although, capturing these entities is a major challenge. There are 16 subcategories of ownership status in CIN, out of which one category clearly indicate foreign firms i.e., FTC which stands for subsidiary of a foreign company (private limited). Other category FLC stands for financial lease company as public limited also has some foreign companies though the number is very low. PTC and PLC ownerships also have foreign firms as joint ventures. PTC stands for private limited company. The name of foreign companies under PTC contains either India private limited or name of any Indian state/Union territory before private limited in their name. Similarly, in PLC (public limited company) category foreign firms can be identified with same logic. Apart from that, incorporated foreign firms can also be registered as Limited Liability Partnership (LLPs) with FLLPIN (foreign limited liability partnership identification number). These are mostly service sector small firms e.g., law firms, consultancy firms etc. We are not considering these firms for present study. According to Companies Act 2013, a foreign company can start full-fledged operation in India by registering a subsidiary company. Such a company is treated at par with any other Indian company for all legal purposes. As per law, a minimum of two shareholders is necessary hence apart from the parent company at least one share must be held by any other person. The initial information about number of companies in different categories registered in India has been collected from MCA website (see Table 3.6).

Table 3.6: No. of companies registered in India							
Year	FCRN	FLC	FTC	PTC	PLC	Others	Total
upto 1980	183	15	10	54471	16941	1876	73496
1981	10	2	4	7937	1365	100	9418
1982	10		1	9016	1535	63	10625
1983	11	2	1	9526	1957	94	11591
1984	20	2	4	10670	2013	141	12850
1985	13		2	12595	2342	83	15035
1986	36		5	13843	2283	107	16274
1987	15	1	2	15050	1829	84	16981
1988	16		3	19275	1884	96	21274
1989	20	2	2	19639	2205	93	21961
1990	13	1	7	19245	2428	97	21791
1991	12			22150	2942	106	25210
1992	22	6	7	21797	4295	90	26217
1993	24	6	7	24266	4344	111	28758
1994	39	7	12	33480	6600	103	40241
1995	38	3	21	48850	10066	139	59117
1996	48	4	19	40031	6684	119	46905
1997	73	5	14	32666	4581	97	37436
1998	52	1	17	25621	2406	91	28188
1999	57	2	14	26464	2244	130	28911
2000	66	4	19	28277	3006	139	31511
2001	93		22	20542	1326	147	22130
2002	75		19	21602	1228	138	23062
2003	27		23	26667	1345	174	28236
2004	48	5	51	35341	1570	195	37210
2005	55	6	77	49055	2020	235	51448
2006	129	21	250	46951	2240	230	49821
2007	220	5	443	59449	2718	344	63179
2008	184	2	535	66529	2927	336	70513
2009	234	7	444	58002	1989	394	61070
2010	184	5	538	103100	3573	45153	152553
2011	198	14	830	92239	3588	762	97631
2012	164	4	895	97604	3709	884	103260
2013	183	4	809	87302	2697	1041	92036
2014	183	1	726	64815	1765	2491	69981
2015	154	2	1050	72793	1629	5086	80714
2016	143	4	909	77532	1556	5794	85938
2017	151	1	1176	96210	2136	7964	107638
2018	102	4	1358	105645	2346	8444	117899
2019	138	10	1700	112135	2409	12310	128702
Total	3443	158	12026	1788382	126721	96081	2026811
Foreign	3443	56	12026	NA	NA	NA	15529

3.3 Selection of Foreign Firms for the study

The existing approach to identifying foreign firms in India is based on the equity shareholding of foreign promoters in the firms. It can be obtained from the CMIE PROWESS database, mostly 10% or more equity share criteria were followed in earlier studies. However, there are several shortcomings identified in the existing definition of foreign firms. First, CMIE captures information from around 50557 firms. Out of that only 1887 are foreign firms where R&D expenses data is available for only 357 firms (i.e., it includes all the firms having at least one entry of standalone R&D expenses from 2001 to 2018). The number of foreign firms (i.e., 1887) taken from CMIE is based on its indicator 'ownership group'. The ownership group classify the firms broadly into two categories i.e., private (Indian) and private (Foreign), else it shows the name of a group of companies (that one has to check individually to get the information about the ownership group). However, the MCA database claims that around 12 lakhs active firms (Indian and foreign both) exist in India.

Therefore, CMIE has an issue of non-availability of data or missing data. Second, in CMIE the firms such as Microsoft, and Accenture are termed as India private limited (these are foreign origin firms that are incorporated in India as subsidiaries) and are not listed on the Bombay stock exchange. However, these firms are considered Indian firms in the CMIE database as per the MCA definition. Third, CMIE does not give an origin-based definition of companies and does not contain clear information about their business activities in India. Therefore, we have selected the MCA21 database of the Ministry of Corporate Affairs, Government of India. MCA database has an advantage over the CMIE definition in that the ownership classification of the firm is much clear, and the source of information is also authentic.

This study follows MCA based definition of foreign firms i.e., a wholly owned subsidiary of a foreign firm that falls into the FTC ownership category. As per MCA December 2019 data, a total of 12026 FTC firms were registered in India. It includes both manufacturing and service sector firms. As per MCA, these firms are incorporated firms registered in India with a company identification number (CIN). A set of 1674 firms has been selected using different filters such as manufacturing/service sector firms, active/inactive status, availability of firm related indicators etc. Our data set includes only manufacturing firms.

3.4 Why only Manufacturing Firms?

India is one of the world's fastest-growing economies (Invest India, GoI, 2021), yet the share of manufacturing in the gross value added at constant prices remain 16.4 percent in 2018-19 (Economic Survey, 2019-20). India contributes only 2 percent of the world's manufacturing output, which is one-tenth of what China contributes. In most of the fast-growing developing Asian countries such as Thailand, Indonesia, Malaysia, Taiwan, Philippines, Korea and China, manufacturing has contributed 30 to 50 per cent of GDP, and thus has helped in eradicating poverty.

Also, the leading Indian manufacturing companies have taken a lot of effort to reduce manufacturing costs, improve quality, sweat the assets, and improve productivity. Most of the leading Indian manufacturing companies have adopted world-class manufacturing or manufacturing excellence practices. But an average manufacturing company in India is yet to adopt world-class manufacturing practices to compete in the global market. (Invest India, GoI, 2021)

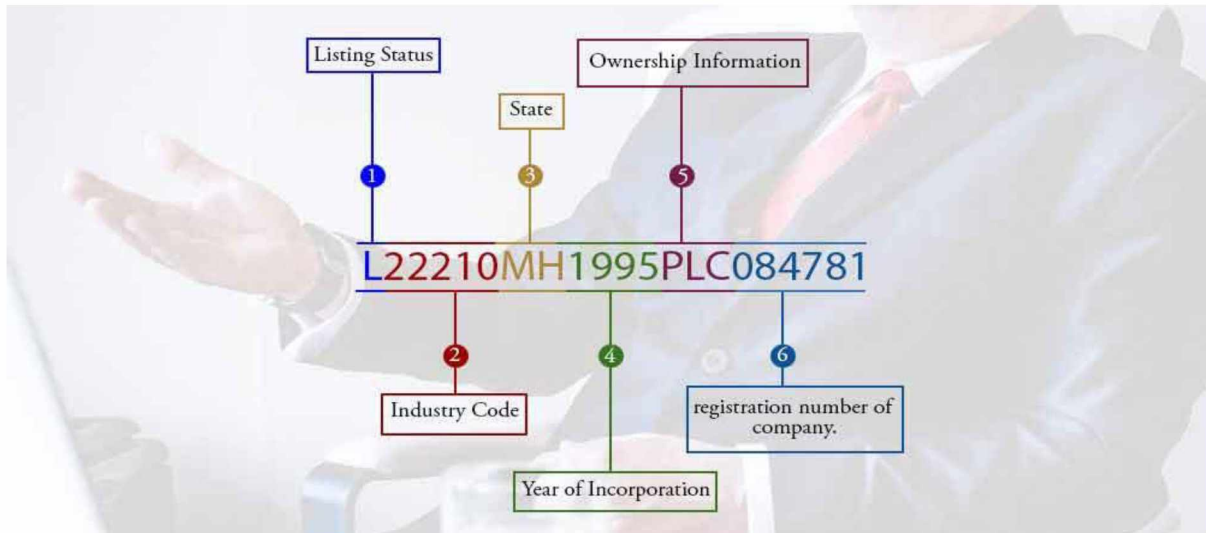
As existing literature shows that the global market is highly dominated by MNCs (Feinberg & Majumdar, 2001; Le Bas & Sierra, 2002; Yang et al., 2019; Tyagi et al., 2018). Furthermore, emerging economies such as China and India have become popular destinations for MNCs' business activities including R&D. Since innovation is a key driver of productivity and growth, it is crucial for the industrial growth of the country it is important to capture MNCs' innovation contribution in the manufacturing sector. However, existing studies do not give a clear picture of the innovation activities of foreign firms in India, particularly in the manufacturing sector. Most of the existing studies focusing on foreign firms in the Indian context revealed that mostly service sector (particularly the ICT sector) foreign companies are involved in innovation by holding their R&D units in India. Such companies are also highly active in the US patenting by Indian inventors (Basant & Mani, 2012). Therefore, a study on R&D and patenting by foreign firms in the Indian manufacturing sector is pertinent.

3.5 Industrial Classification and Concordance

The Corporate Identification Number (CIN) of a company gives an industrial code under which the company's business activities fall (refer Figure 3). It follows the national industrial classification (NIC) published by the Ministry of Statistics and Programme Implementation (MoSPI), the government of India. It was first published in the year 1970 after that several

amendments have been taken place. Therefore, it varies with the year of incorporation of the companies. The last amendment took place in 2008. In this study, we aligned the NIC codes of all the firms with the 2008 NIC. Further, we have aligned the companies with International Standard Industrial Classification (ISIC Revision 3).

Figure 3.3: Decoding CIN



Source: Based on information collected from MCA, GoI

3.6 Data

The present study is based on firm level data with several data limitations. There is no structured database available that provide information on firm level indicators for unlisted and incorporated foreign firms in India. We find few firms in CMIE PROWESS data set but with missing information of key interest variables. Therefore, we shifted our analysis to industry level indicators. We have collected company level information from MCA21 database, industry level information from CMIE PROWESS database and innovation indicator (patent application) data from PatSeer database. Table 3.7 shows the details about the data.

3.6.1 Model Specification

For empirical purpose, we use a panel data technique to analyse the relationship between existence of the R&D unit and patenting strategies of the firm in India.

$$R\&D_{it} = Age_{it} + Nol_{it} + HHI_{it} + MKTG_{it} + MKTS_{it} + GIA_{it-1} + \mu_{it} \quad (1)$$

$$PAT_{it} = Age_{it} + NoI_{it} + HHI_{it} + MKTG_{it} + MKTS_{it} + GIA_{it-1} + \mu_{it} \quad (2)$$

Here, i = firm ($i = 1, 2, 3, \dots, 1674$) t = time (in years). Our dependent variables are $R\&D_{it}$ denotes if firm holds a R&D unit in India or not. It is a binary variable 1 if firm holds a R&D unit otherwise 0. Also shows 1 from the year of incorporation of the firm in India before that it is 0. PAT_{it} denotes the year wise patent applications filed by a firm at IPO and USPTO. The description of the independent variables is given below.

3.6.2 Variable Construction

Dependent Variables

R&D investment: The R&D investment data is not available for the sample firms thus we followed an alternative approach to proxy R&D related information. We have created a dummy (binary) where we've given 1 if firm holds R&D lab or centre in India otherwise 0. The source of R&D centre information is firms' website, google search, newspaper articles, corporate magazine or reports, LinkedIn profile of people working in a firm's R&D division located in India etc. If the information was available at the very first source, it was further validated by visiting other sources to maintain the highest possible authenticity. We found that out of total 1674 firms, 544 holds R&D units in India.

Patent: Number of patent applications filed by each firm (yearwise) at IPO and USPTO has been collected separately. PatSeer database is used for the same by applying below filters:

Assignee Orig & Norm (ASN),

Application Year (APY),

Patent Office Code (IN and US) with sub-filters Application and Granted

Independent Variables

Firm Specific Variables

Age: Age of the firm is calculated from the year of incorporation in India provided by MCA 21 database till 2020.

Industry Specific Variables

Nature of Industry: We have classified all the firms as per their technology intensity in four categories: high technology, medium-high technology, medium-low technology, and low

technology. This classification is based on NIC 2008 aligned with ISIC revision 3. A dummy variable is created for all the categories. For example, its '1' the firm belongs to high technology category otherwise '0'.

HHI: We have computed the Herfindahl-Hirschman Index (HHI) to measure the market concentration and is used to determine market competitiveness. The closer a market is to a monopoly, the higher the market's concentration (and the lower its competition). We used year wise sales from CMIE PROWESS for the industries of our sample firms. It is calculated by squaring the market share of each firm competing in the market in the same NIC classification at 5-digit level and then summing the resulting numbers.

Market Size: Market size refers to the total amount of sales in a given industry over a given period of time. It is calculated year wise after adjusting the inflation using CMIE PROWESS data.

Market Growth: Year wise growth rate of each industry has been calculated by using sales data from CMIE PROWESS after adjusting the inflation.

Global Innovation Activity (with lag): Total patent applications filed by the firm (including parent firm, Indian subsidiary, other subsidiaries) at USPTO in the last year with following conditions: (1) India is not a priority country (2) India is not a part of SFAM and WO in a particular patent.

Table 3.7: Data and variables				
Type of Variables	Sub-Type of Variables	Variable Name	Data source	
Dependent Variable		R&D	Company website, newspaper articles, LinkedIn and Google search	
		Patent	PatSeer database	
Independent Variables	Firm specific variable	Age	MCA 21	
	Industry specific variables	Nature of industry	NIC 2008 (MoSPI, GoI) aligned with ISIC revision 3 (UN)	
			HHI	CMIE PROWESS
			Market Size	CMIE PROWESS
			Market Growth	CMIE PROWESS
		Global Innovation Activity	PatSeer	

3.6.3 Methodology

For estimation purpose, we applied logit and probit regression and negative binomial regression techniques. Estimates from a logit model are often expressed in odds ratios or log odds, a common measure of effect size for proportions. Given a proportion, fraction, or probability p , the corresponding odds are $p/(1-p)$, and an odds ratio for two fractions p and q is $p/(1-p)$ divided by $q/(1-q)$. Odds ratios are multiplied together, but log odds can be added for the same effect. Interpretation of logit estimates depends on whether coefficients are reported as effects on log odds or on odds ratios. For R&D equation, we used logit and probit regression technique as our dependent variable is binary and independent variables are continuous. We estimated the odds ratio to explain the possibility of a firm investing in R&D. For patenting equation, count data models are applicable as patent application data is count data. Poisson and negative binomial regression techniques are most common estimation techniques if the dependent variable is count data. In our case the data is overdispersed thus we applied negative binomial regression model. Further, we also estimated the patenting equation in terms of categorical variable because we have patenting data of two different jurisdictions i.e., IPO and USPTO. Therefore, we wished to know the drivers of patenting separately if firm is patenting at IPO or USPTO. For that, we applied the logit and probit regression techniques.

3.7 Validation through Expert Opinion

A primary objective of the present study was to observe, understand and analyse the motives of innovation activities offshoring to India by foreign firms. In this context, we aim to provide decision-makers from the manufacturing industry with useful insights while deciding on whether or not to offshore their R&D/innovation activities in India. We also highlighted the actual motives and status of innovating foreign firms that may help policymakers for further policy reforms.

In this study we also validated our findings through conducting online interaction with relevant stakeholders. Due to capacity, time and resources constraint we limit this work to a manageable number i.e., seven different organisations/companies. In our analysis through secondary data, few questions were remained unanswered and also the key findings required validation to make final conclusion and suggest policy recommendations. For this purpose, there was a need to take expert opinion.

We interacted with experts such as IP attorneys, Innovation consultants, R&D managers of foreign owned companies etc. either alone or with their teams. They provided valuable inputs for the survey to better reflect the ground realities for the foreign firms in India. We listed out experts from legal background as well as with industry experience. We also approached relevant stakeholders from the FTC companies captured for this study. All these firms had R&D interests in India. After their acceptance for the interaction, we scheduled the online meetings with them as per their convenience in the month of May 2022. During online meetings first we presented briefly about the project and then given the details about the data we collected. After that we explained the format of the interview and our expectations from the respondents. Individual talks lasted on and average one hour. The discussions were guided by a number of research questions in semi-structured questionnaire format.

3.8 Data Collection Approach and Major Challenges

- The R&D investment data of these 1674 firms is not available. We have explored different potential data sources that give company level information such as:

MCA;

CMIE-PROWESS;

CAPITALINE;

BLOOMBERG;

BUREAU VAN DIJK-ORBIS;

ECONOMIST

INTELLIGENCE UNIT;DSIR;

ACE ANALYSER;

RBI;

BOMBAY STOCK EXCHANGE;

CRISIL;

EMIS INTELLIGENCE;

DION INSIGHT;

ECONOMIC ADVISORY COUNCIL-PM;

ZINNOV;

NASSCOM;

REFINITIV EIKON (DATASTREAM);

Old project reports on foreign firms available online or provided by DST etc.

- As an alternative, we did another exercise to collect R&D investment data from annual reports of the firms. We find it difficult due to following reasons:
 - Annual reports are not available publicly for all the firms.
 - In most cases Annual Report are available for parent firm and information on R&D investment specifically in India is not given.
- Finally, we end up with creating dummy (binary) for R&D information. We give 1 if firms hold R&D lab or centre in India otherwise 0. Here, we have collected R&D centre information by visiting firm website, google search, newspaper articles, corporate magazine or reports, LinkedIn profile of people working in a firm's R&D division located in India etc.
- We have collected all possible firm specific and industry specific variables from MCA website and CMIE Prowess.
- We have collected patent data information from PatSeer data base to create different innovation related indicators.
- Information on patent data collection is given below:
 - Filters used – Assignee Orig & Norm (ASN),
Application Year (APY),
Patent Office Code (IN and US) with sub-filters Application and Granted
- We faced a lot of challenges listed below while collecting Patent data:
 - The name of the parent firm and subsidiary are not exactly same, therefore assuring the patents available in the database belongs to the firm or not was challenging. Also name related issues varies case to case.
 - For several cases where the name of the firm is in abbreviation form, there may be possibility that patents are given with the full name of the firm.
 - In many cases spelling of the firm's name was reported differently in database.
 - There are cases where issue of spacing in the name of the firm.
 - In many cases name of the other subsidiaries of the firm are given in their local languages so while filtering the patents, we confirmed all the relevant assignees should be captured for that particular firm data.
 - PatSeer database have per day and monthly data download limit, therefore it was challenging to manage data download within the limits as firms hold large number of patents at USPTO.

- Due to data download limit we had to drop the idea to capture country of origin patent office data of the firms as we assume that firms hold bulk patents in their home countries.

CHAPTER 4

Drivers of Innovation Activity of WOS

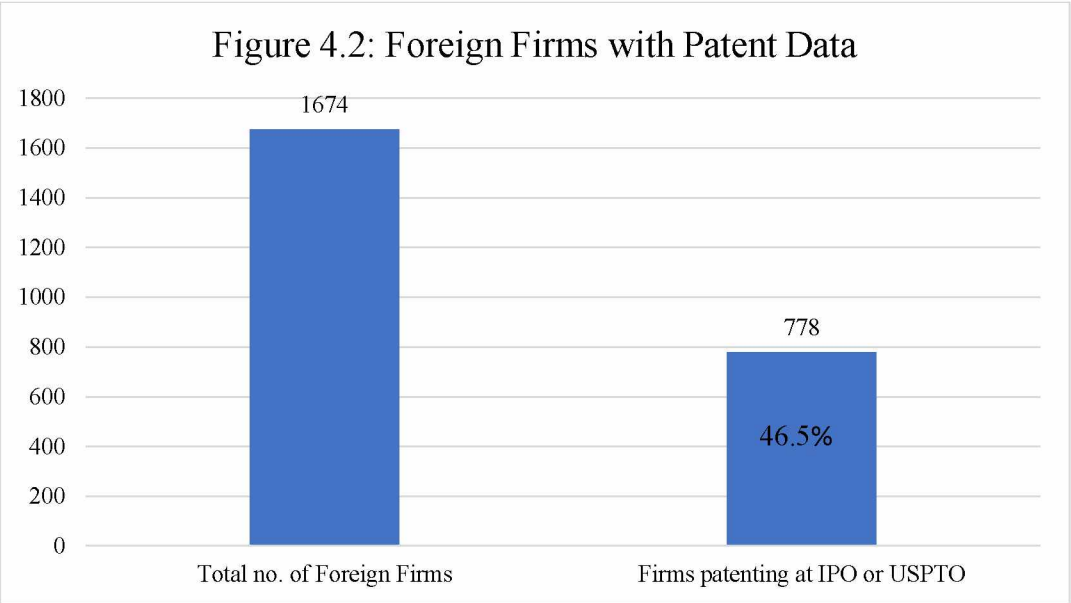
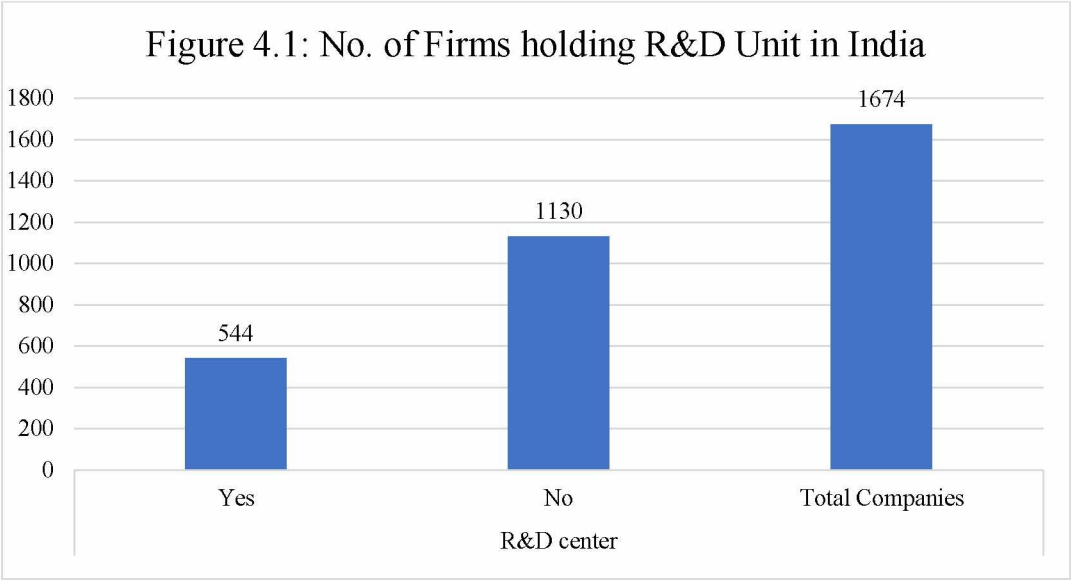
4.0 Introduction

The previous chapter is about the conceptual framework of the study along with variable discussion, data sources and estimation techniques. It explained the nature of R&D undertaken by foreign firms in host countries, variables used for empirical estimation in the present study with literature support, sources of the data used in the present study and detailed discussion about the estimation techniques used for empirical investigation. This chapter discusses the findings in terms of factors driving the innovation activities of wholly owned subsidiaries in India. Our analysis includes 1674 wholly owned subsidiaries of foreign origin manufacturing firms registered at Ministry of Corporate Affairs, India as on December 2019. These 1674 firms comprises both innovative and non-innovative firms. Here, we specified a firm innovating based on the information available with respect to its innovation activity pertaining to having R&D investment and/or patents at IPO or USPTO.

4.1 Investing in R&D or Not

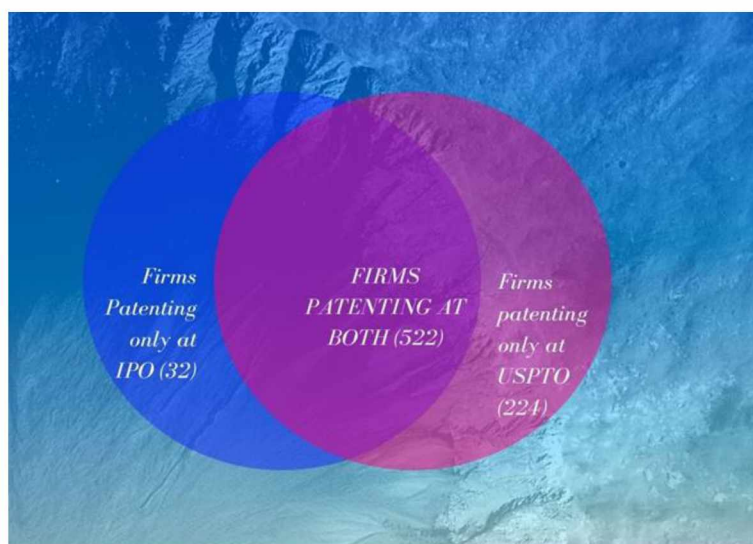
Due to R&D data limitation, we followed an alternative approach to proxy R&D related information. We have created a dummy (binary) where we've given 1 if firm holds R&D lab in India otherwise 0. The sources for R&D lab information are firms' website, google search, newspaper articles, corporate magazine or reports, LinkedIn profile of people working in a firm's R&D division located in India etc. If the information was available at the very first source, it was further validated by visiting other sources to maintain the highest possible authenticity. We found that out of total 1674 firms, 544 holds R&D units in India (Figure 4.1). Only 32% of firms invest in research related activities through their wholly owned subsidiaries. This information is further analysed in terms of country of origin, age, location in India of the firms etc. and discussed in the next chapter The R&D unit information was further used for identifying the factors influencing foreign firms investments in R&D in the Indian market.

Out of 1674 firms, 778 firms are involved in filing patents either at IPO or USPTO or at both which is 46.5 percent of total firms included in the sample (Figure 4.2). The relatively large numbers of firms patenting as compare to investing in R&D highlight that the subsidiaries of the multinational access new technology from different sources including the international R&D activity of the MNEs.



Out of the total 778 firms involved in patenting activity, 32 firms are patenting only at IPO, while 224 firms are patenting only at USPTO. 522 firms are patenting at both IPO and USPTO (Figure 4.3). Our analysis is based on total number of patent applications filed by 778 firms during the time period 2007-2020.

Figure 4.3: Patenting Firms



4.2 Descriptive Statistics

The present study is based on firm specific and industry specific independent variables. Apart from that we have created few dummy variables as per the modelling requirement. For first equation estimation our dependent variable is R&D which is temporal. We have given its value 1 if the firm was incorporated in India before our study time (2007-2020) and holds R&D unit in India. R&D variable value is zero for the years before the year of incorporation of the firm in India. In case the firm is not holding any R&D unit in India then R&D variable value is zero throughout. Age is our firm specific independent variable is calculated from the year of incorporation of the firm in India till 2020. HHI, market size and market growth rate are industry specific independent variables calculated on year wise sales data given in CMIE PROWESS. Rest of the variables are related to patent application data collected from PatSeer data base. For second equation estimation, patent applications count at IPO is dependent variable which is used in two different ways i.e., categorical variable and count variable.

Table 4.1 shows the descriptive statistics of the variables. In our sample the oldest companies incorporated in the year 1900 in India. There are 40 such companies with age 120 years in the sample such as Glaxosmithkline Consumer Private Limited. There are 268 companies with age only 1 year. In case of HHI, there are 149 companies with HHI value 0 and 284 companies with HHI value 10000 at least in one year. It is because either very less companies in that industry or due to missing data problem. Similarly, the market size of the industry code 29198 (manufacture of distilling and rectifying plants; heat exchangers; machinery for liquefying air or gas; producer gas or water gas and acetylene gas generators in the group manufacture of machinery and equipment) is lowest. The industry code 23201 (production of liquid or gaseous fuels, illuminating oils, lubricating oils or greases or other products from crude petroleum or bituminous minerals) belongs to highest market size. In case of market growth rate, the lowest is -100 percent, it is due to missing data problem for various industries. The highly growing industries are manufacture of special purpose machinery, manufacture of office, accounting and computing machinery and service activities incidental to oil and gas extraction. But high growth rate for these industries reported in the year 2007 to 2009 only. In case of patenting Japanese firms holds highest patents at both IPO and USPTO. Table 4.2 is the correlation matrix of different variables used for the analysis that highlights that there is single pair of variables with high correlation.

Table 4.1: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
RD	23436	.177	.381	0	1
Age	23436	5.46	17.504	0	120
HHI	23436	3761.288	2941.925	0	10000
MarketSize	23436	82.195	236.628	0	5093.565
MarketGrowthRate	22855	69.96	1174.202	-100	87760.439
USPTO	23436	18.926	159.786	0	5709
IPO	23436	1.664	11.418	0	390
GlobalInnovationActivity	23436	9.63	116.177	0	5128
PatentatUSPTO	23436	.255	.436	0	1
PatentatIPO	23436	.134	.341	0	1

Table 4.2: Correlation Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) RDinINDTemporal	1.000								
(2) Age	0.093	1.000							
(3) HHI	-0.058	-0.068	1.000						
(4) MarketSize	0.019	0.046	-0.100	1.000					
(5) MarketGrowthRate	-0.002	-0.012	0.089	-0.016	1.000				
(6) USPTOPatCount	0.042	0.010	0.021	-0.003	0.002	1.000			
(7) IPOPatCount	0.089	0.026	-0.038	0.017	-0.001	0.496	1.000		
(8) PatentatUSPTO	0.122	0.055	-0.040	0.012	0.010	0.203	0.236	1.00	
(9) PatentatIPO	0.114	0.031	-0.049	0.030	0.004	0.241	0.368	0.54	1.00

4.3 Cross Tabulation

In this section, we look at the variation in patenting activity of the firms with respect of industry concentration, industry type and growth. To do so we cross-tabulate the patenting data with industry level concentration, type of industry and market growth rate. Such cross-tabulation is done separately for firms conducting R&D and those that are not involved in R&D activities. Further, patent count data is analysed separately for patents at IPO and USPTO. The detailed tables are given in the Annexure I of this chapter. The line graphs highlight the broad trends that are discussed below.

Firstly, we segregate different industries based on the market growth that is divided into four groups of (i) growth rate higher than 8%, (ii) between 6-8%, (iii) between 4-6% and (iv) less than 4%. Figure 4.4 shows the patenting trends of the firms conducting R&D at USPTO from these set of industries experiencing different growth rates. It is evident that in case of high growth industries patenting is also high though volatile with a sharp upturn after global financial crisis in 2009. Similar trend is also witnessed with respect to patenting at IPO in Figure 4.5. As noticed earlier data has firms that may not be conducting R&D in India but have patents at USPTO and IPO. For such firms Figures 4.6 and 4.7 shows patenting trends for industries with different growth rates.

Figure 4.4: Industry growth wise presentation of USPTO patent by firms conducting R&D in India

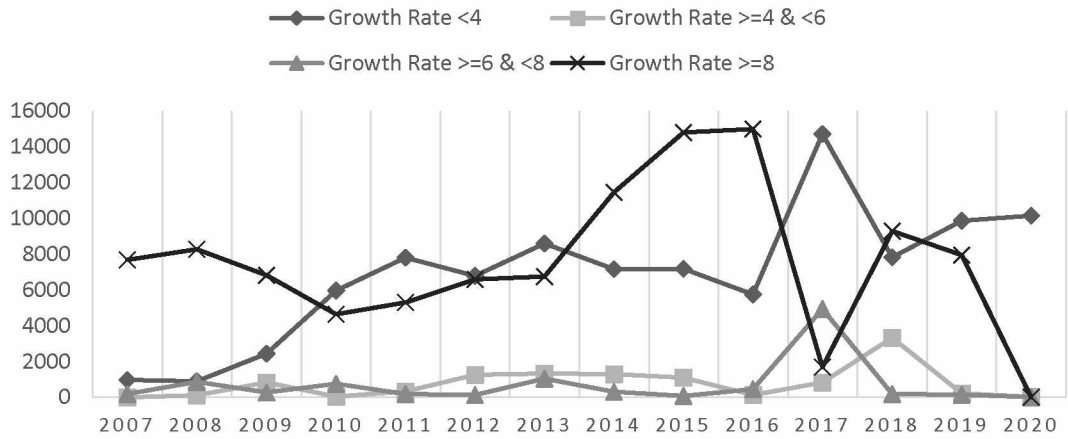
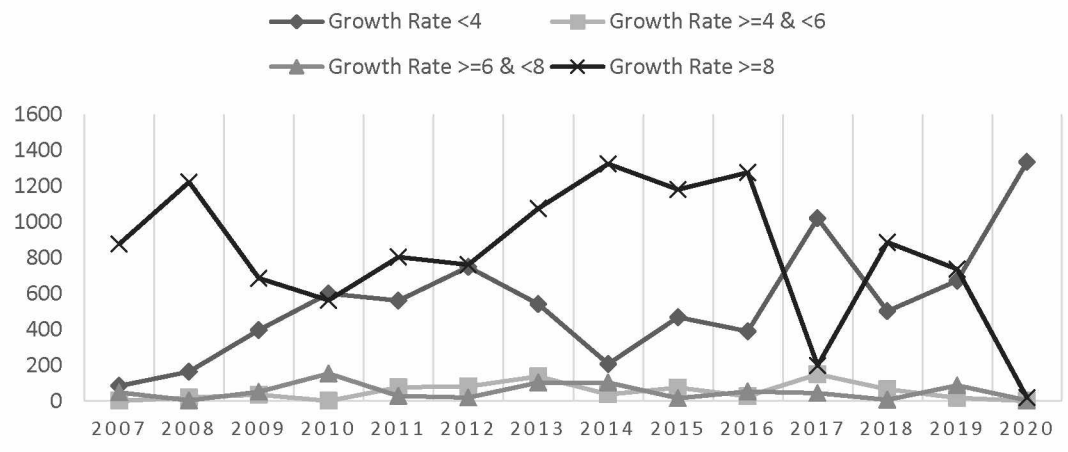
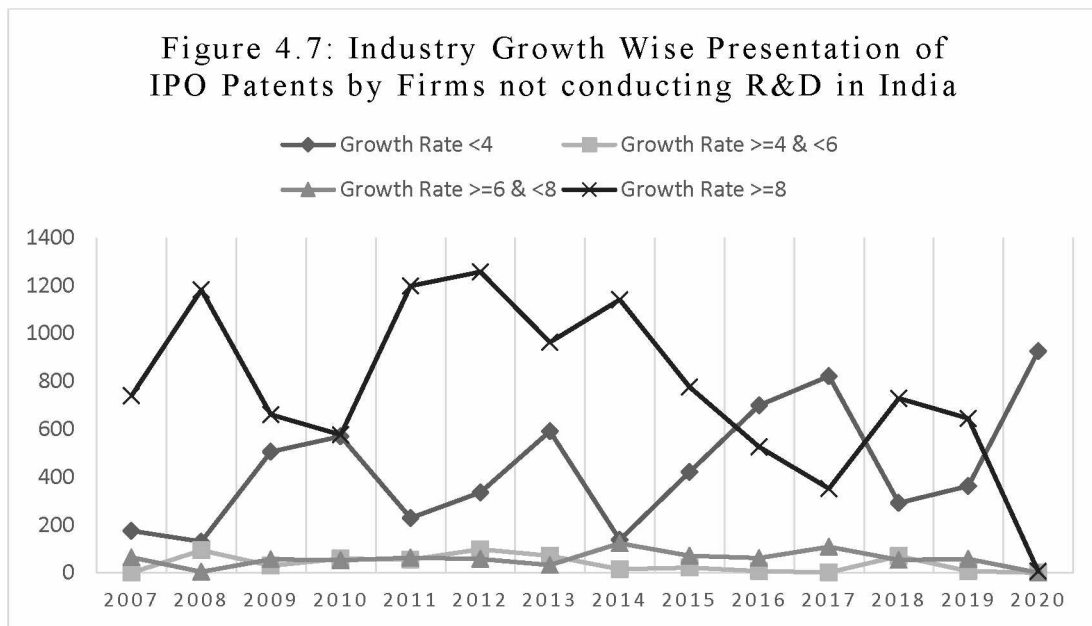
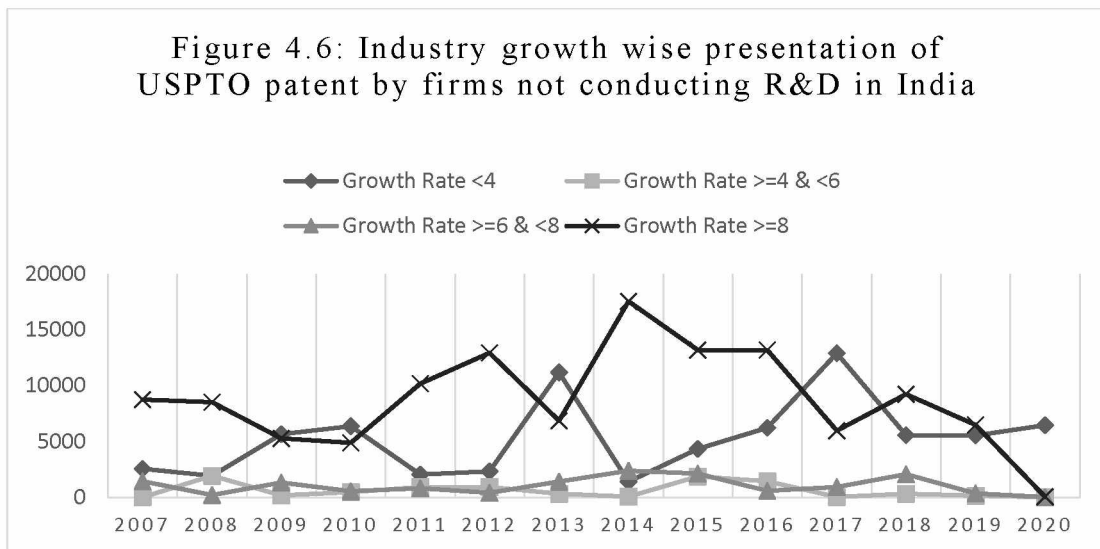


Figure 4.5: Industry Growth Wise Presentation of IPO Patents by Firms conducting R&D in India





Figures 4.8 to 4.11 reveal the patenting trend of firms from industries with different technology intensity. Most empirical studies highlight that there are industry specific differences in the propensity to patent. Such differences exist as varied means of appropriation are available to different industries and because of the strategic considerations of firms. Thus, based on OECD classification, we have been categorized industries as high-tech, medium-high tech, medium-low tech and low tech and others. Others includes industries like mining and quarrying; electricity, gas, steam, and air conditioning supply; warehousing and support activities for transportation;

professional, scientific, and technical activities; wholesale trade, except of motor vehicles and motorcycles; construction etc. Such industries come under service sector but in our sample a low number of these companies captured due to multiple reasons like if company was registered in service sector but later it has started dealing in manufacturing sector, company is dealing in multiple sectors but initially registered in one of these service sectors, amendments in NIC etc. As earlier, Figures 4.8-4.11 show the trend at USPTO and IPO for firms conducting and not-conducting R&D in India. As expected in all figures high-tech sector have more patents. However, interestingly at IPO the medium-high tech patents are very close and sometimes even higher than high-tech industries. It could be due to less numbers of firms in high-tech sector patenting at IPO. Also, with respect to computer software related patents rules are different in India and the US. Accordingly, firms are likely to patent in countries whereby the rules are clear and relatively relaxed.

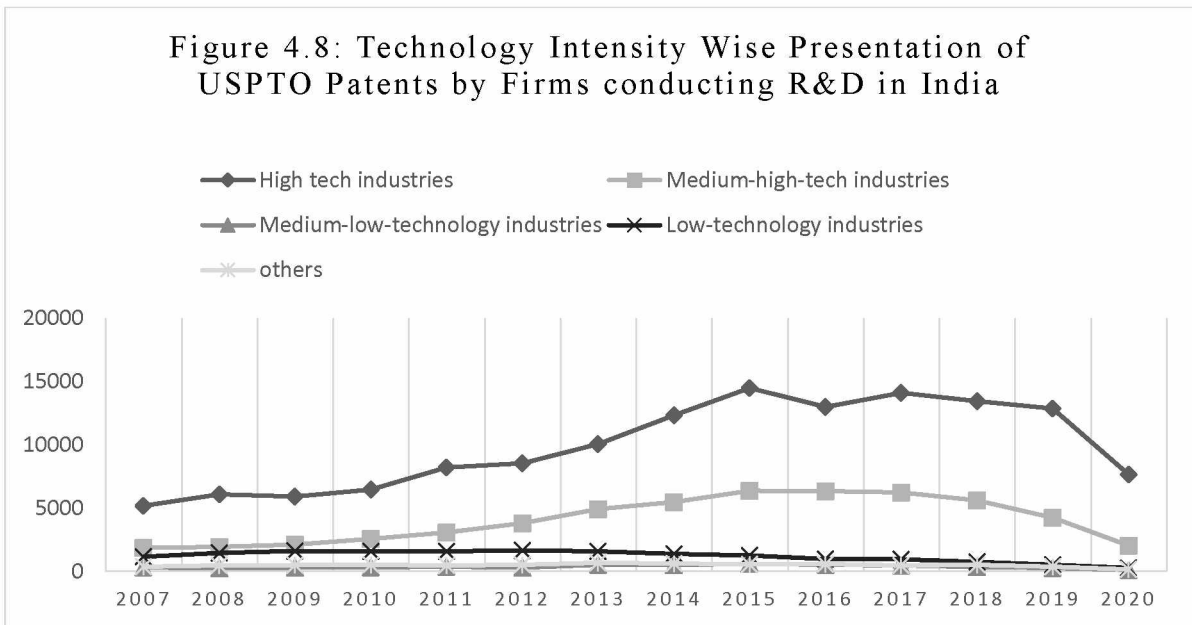


Figure 4.9: Technology Intensity Wise Presentation of IPO Patents by Firms conducting R&D In India

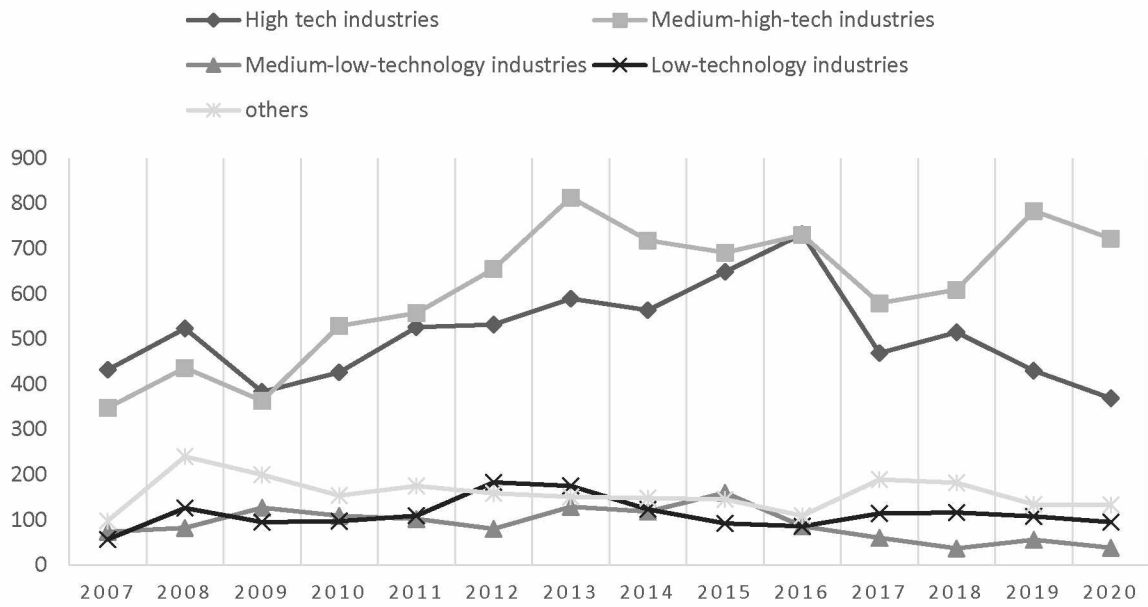
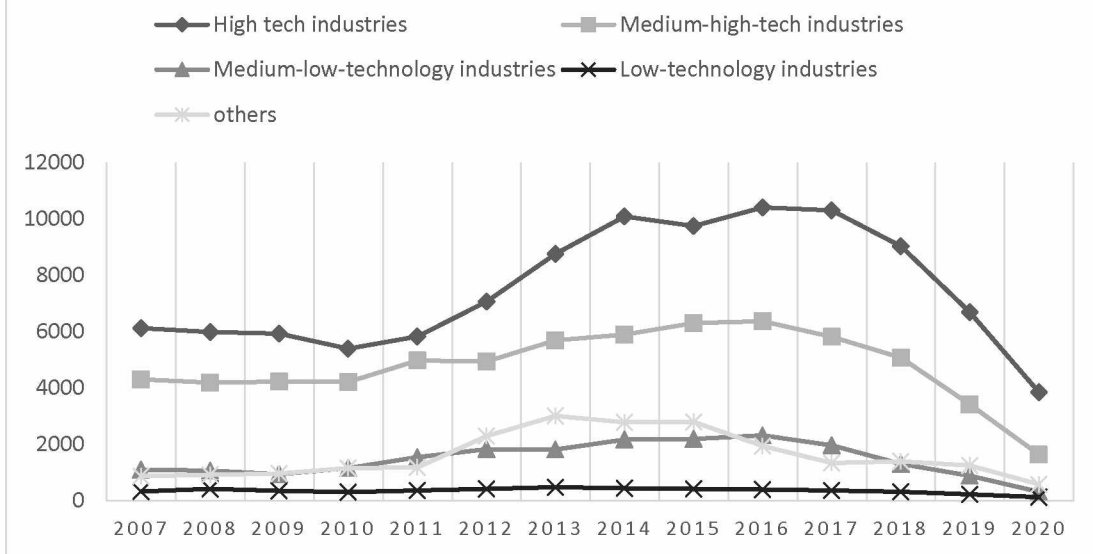
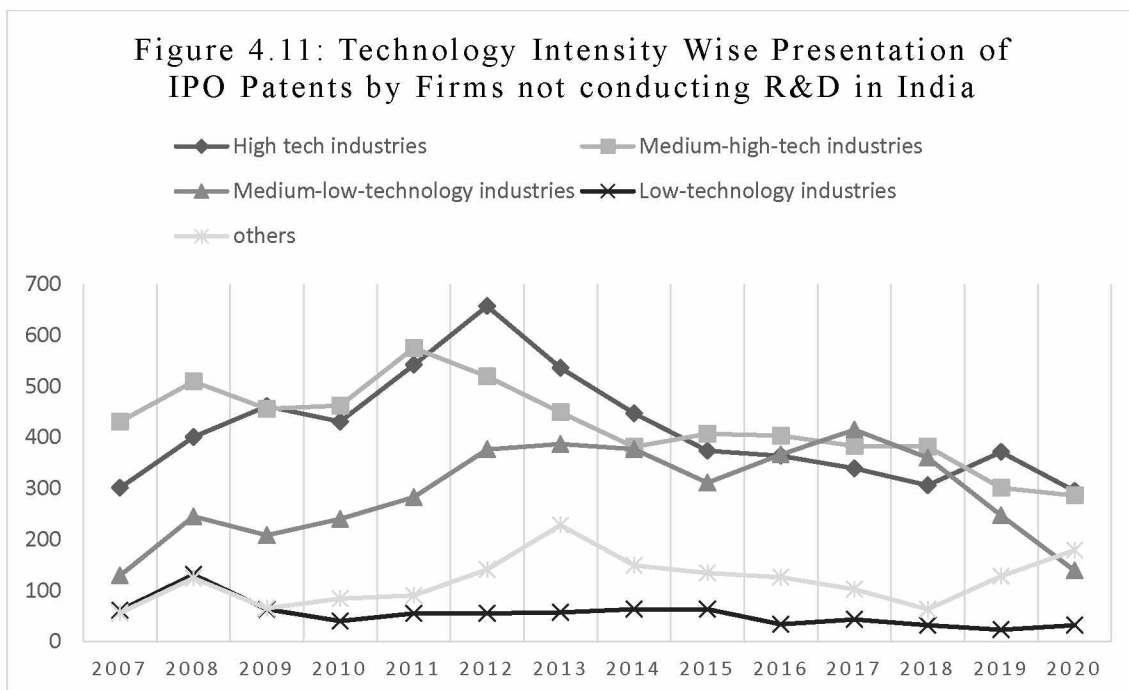


Figure 4.10: Technology Intensity Wise Presentation of USPTO Patents by Firms not conducting R&D in India





Figures 4.12-4.15 provide patenting trend of firms operating in industries with varied extent of market concentration. The debate on innovation and concentration can be traced to Schumpeter (1942) who propounded that the large firms have means and resources to finance additional investments for innovation. Such availability of resources along with the probable market power post innovation and the potential to scale the innovation by large firms spur innovation activity. Arrow (1962) introduced the well-known “replacement effect” highlighting that for a monopolist addition to its revenue from the innovation is the key decision-making factor. Thus, Arrow (1962, p. 619) concluded, “incentive to invent is less under monopolistic than under competitive conditions.” This debate has been further enriched theoretically and empirically over the years. Aghion and Tirole (1994) in fact call the relationship between R&D and the determining factors as “the second most tested hypothesis in industrial organization.” The empirical literature that focuses on the relationship between market structure and innovation is indeed vast. Some brilliant surveys by Baldwin and Scott (1987), Gilbert (2006), Cohen (2010), Damanpour (2010), and most recently Gilbert (2020), and Bryan and Williams (2021) bring together the historical research. The empirical record is mostly ambiguous as some studies find a positive relationship between market structure and innovation while others do not. This has motivated us to plot patenting trends of

firms over the years for industries classified as competitive, moderately concentrated, and highly concentrated based on HHI index. These trends are shown in Figures 4.12 to 4.15 for patenting at USPTO and IPO with or without conducting R&D in India. Figure 4.12 reveals that firms in concentrated industries are patenting more at USPTO. Interestingly, at IPO patenting is high for concentrated industries and later for competitive industries as well. This is in line with the ambiguity in relationship between innovation and concentration alluded to by earlier empirical studies. A comparison of Figure 4.14 and 4.15 shows that in terms of firms that do not have R&D in India, at USPTO most firms in concentrated industries are patenting whereas at IPO companies from competitive market are patenting more. Clearly, firm have differential preference with respect patent office choice. This has also been verified during the interviews with experts who mentioned that for WOS the choice of patent office is mostly done by headquarter and considering the ease of patent rules at USPTO and larger market size of the US, firms prefer to patent there.

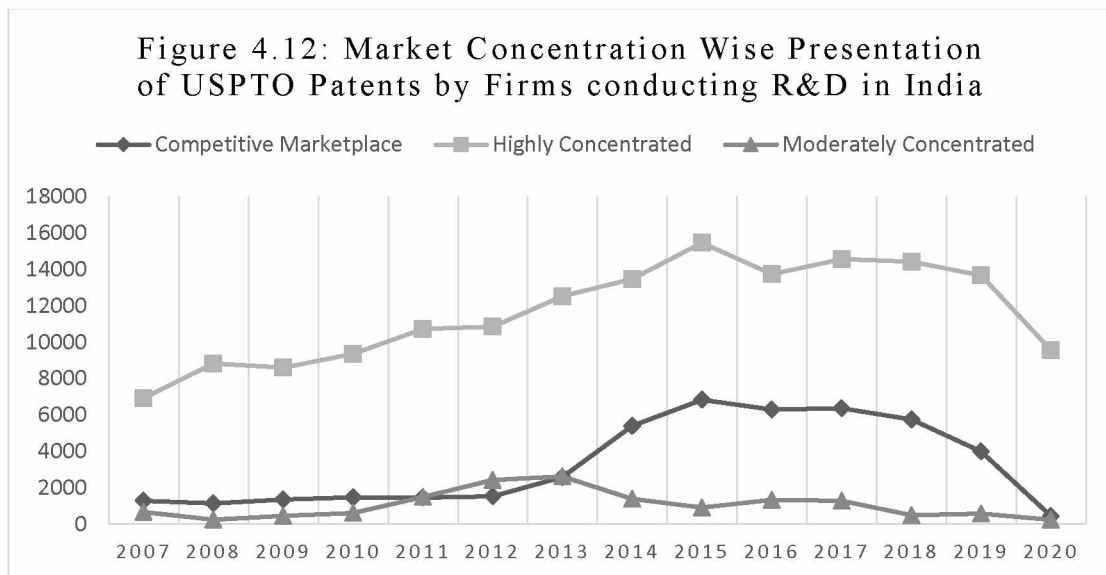


Figure 4.13: Market Concentration Wise Presentation of IPO Patents by Firms conducting R&D in India

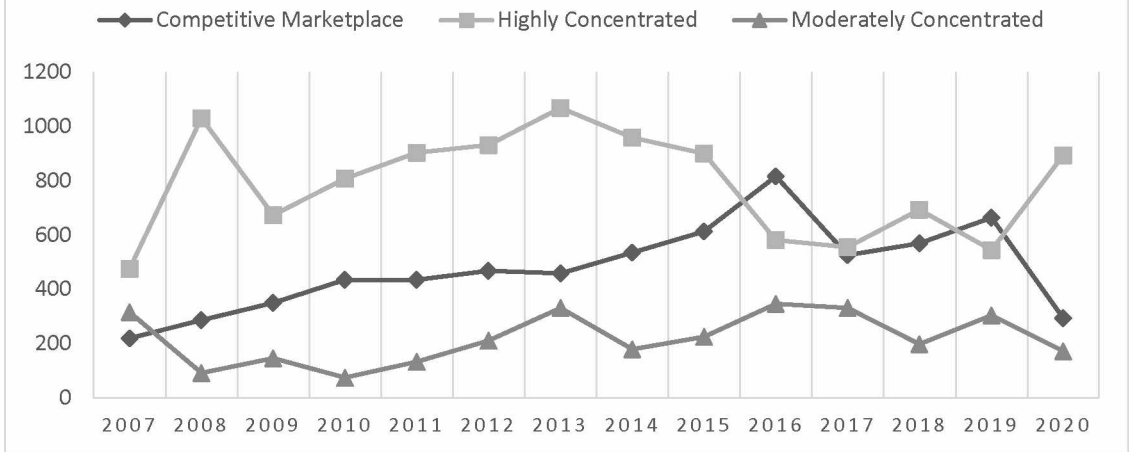
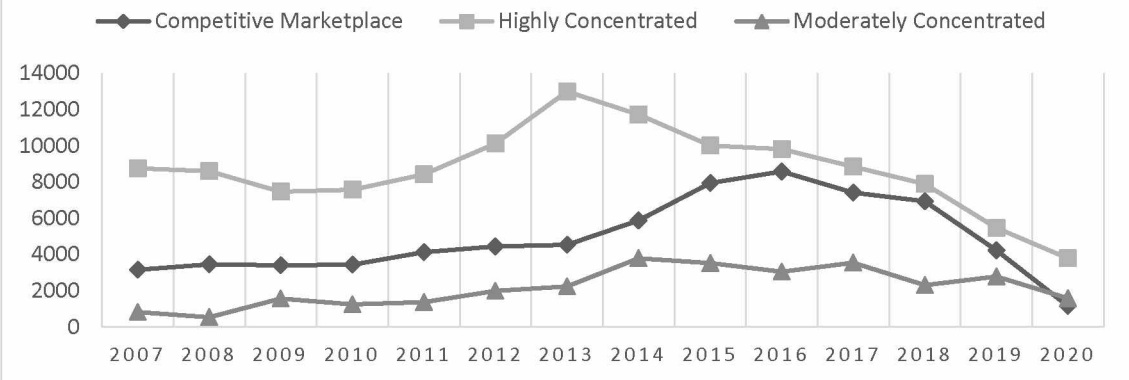
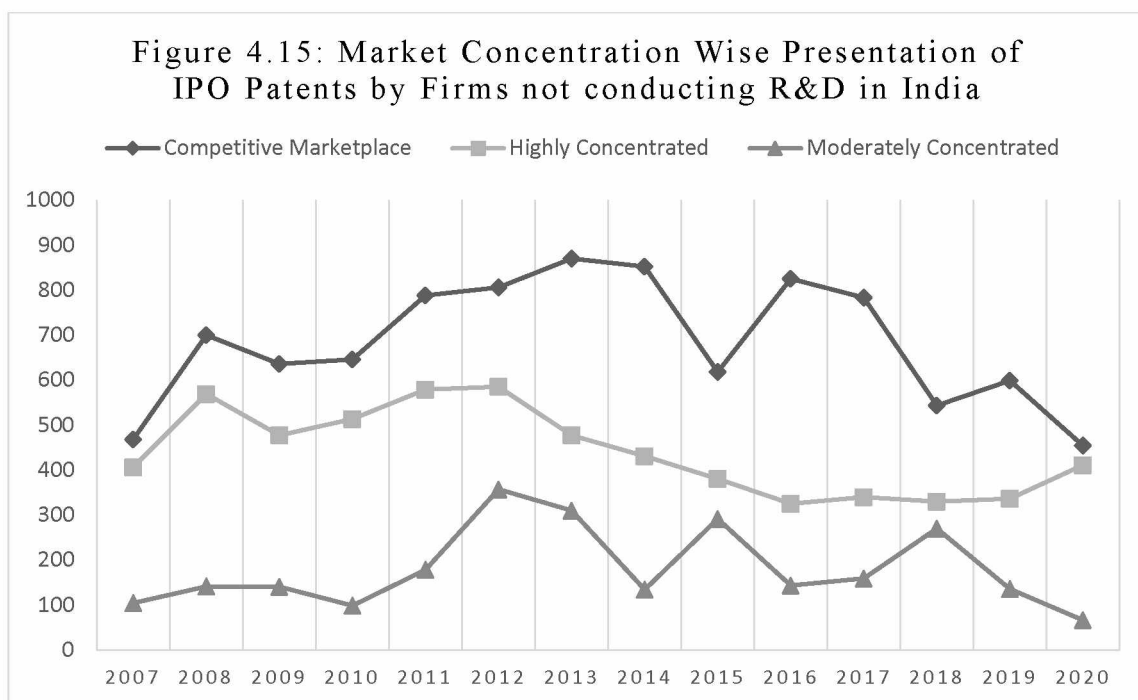


Figure 4.14: Market Concentration Wise Presentation of USPTO Patents by Firms not conducting R&D in India





4.4 Drivers of R&D

In chapter 3, we elaborate on the method, data and variables that are used to comprehend the drivers of R&D and patenting of WOS. We include both firm and industry specific variable with the prime constraint of data availability. Now, we present the results of estimations based on panel data regression with both fixed and random effects for our sample. We applied logit and probit regression techniques, as the dependent variable is binary and independent variables are continuous. Here, we report the results of the conditional fixed-effects logistic regression with odds ratios. To choose between the fixed and random effect model, we used Hausman test statistics (Hausman, 1978). The null hypothesis of the Hausman test is that there is no systematic difference in the variable coefficients with fixed and random effects (Greene, 2008). The result of the Hausman test (p-value is 0.00) rejects the null hypothesis (i.e., random effect model is appropriate) and accepts the alternative hypothesis (i.e., fixed effect model is appropriate). We interpret the binary logistic regression to explain how our independent variables predict which of the two groups of the binary dependent variable our firms end up falling into. To do this, we look at the odds ratio.

4.4.1 Odds Ratio

For a probability (π) of success, the odds can be defined as

$$\Omega = \pi / (1 - \pi)$$

The odds are positive (non-negative), it means that, $\Omega > 1.0$ when a success is more likely than a failure. When probability is 0.75, for instance, then odds are equal to $0.75/0.25 = 3.0$. It shows that a success is three times as likely as a failure. When $\Omega = 1/3$, a failure is three times as likely as a success (Agresti & Min, 2002). Simply, odds ratios show a one-unit increase in our continuous independent variable, the odds of the dependent variable being positive (=1) increase by factor x (the odds ratio value for that predictor variable). In other words, odds ratios that are greater than 1 indicate that the event is more likely to occur as the predictor increases. Odds ratios that are less than 1 indicate that the event is less likely to occur as the predictor increases. Note that for 50% probability odd ratio is 1.

4.4.2 Results of the R&D Equation

Table 4.2 reports the empirical results based on a conditional logistic regression model with FE estimations. In this model, we had to drop the age of the firm variable due to multicollinearity and the issue of convergence while running the model in STATA 15. The results show that the odds ratio value of HHI is 3.4 which is negative and significant. Here, the negative sign of the predictor shows a negative relationship between market concentration and R&D activity by a foreign firm in India. It implies that foreign firm in an industry where HHI increases will not invest in R&D. Similarly, the odds ratio of the market growth rate is also negative and significant and shows a similar relationship between R&D activity by a firm and market growth. However, for HHI and market growth rate the coefficient size of odd ratio is very different. For HHI, it is greater than 1, as mentioned earlier, it implies that the probability of firm not conducting R&D in concentrated market is rather high (more than 50%). However, for market size the coefficient is 0.3, thus the chances of firm not conducting R&D in growing market is rather low.

Our other variable of interest is the market size which is positive and significant. The positive and significant odds ratio indicates that with one unit increase in market size, the odds of doing R&D by a firm will increase by 0.2 units. We reported the result of the age variable in the conditional logistic regression model with RE. Though age is likely to influence firm to conduct R&D, the odds ratio of the age variable is less than one which implies that the positive impact of age is rather constrained and not much pronounced.

4.4.3 Results of the Patent Equation

Tables 4.3 to 4.5 present results of patenting equation whereby patent information is the dependent as categorical variables (Tables 4.3 and 4.4) and later as count data in Table 4.5. The appropriate techniques of logit and negative binomial have been employed keeping in mind the nature of dependent variable. The odds ratios as given in Table 4.3 and 4.4 for all variables are less than 1. It implies that all these variables are less likely (less than 50%) to change the probability of occurrence (i.e., patenting). In terms of direction of influences, only HHI i.e., market concentration reduces the patenting of firms at IPO and USPTO that is in line with the results of cross-tabulation discussed earlier. Note that as mentioned earlier, the negative effect is though not very prominent as the odds ratios are less than 1. Table 4.5 present the results of negative binomial that are also similar to results obtained earlier.

Table 4.2: Results of the R&D equation

	Logit_FE_OR	Logit_RE_OR	Logit_Age_RE_OR	Logit_RE_OR	Probit_Age_RE	Probit_RE
HI	-3.411*** (-5.80)	-1.974*** (-10.00)	-1.826*** (-8.86)	-1.974*** (-10.00)	-0.910*** (-8.39)	-1.380*** (-10.7)
MarketSizeBillion	0.208*** (7.90)	0.00633*** (7.89)	0.00647*** (8.69)	0.00633*** (7.89)	0.00292*** (5.68)	0.00703*** (12.19)
MarketGrowthRate	-0.338*** (-3.16)	-0.348*** (-4.61)	-0.327*** (-4.29)	-0.348*** (-4.61)	-0.185*** (-4.34)	-0.220*** (-4.86)
SPTOL1	-0.0689 (-0.42)	0.141 (1.57)	0.127 (1.38)	0.141 (1.57)	0.0578 (1.18)	0.0963 (1.73)
e			0.0987*** (4.82)		0.0596*** (11.95)	
ns		7.839*** (5.13)	5.989*** (3.69)	7.839*** (5.13)	2.906*** (3.44)	4.887*** (4.97)
g2u		4.603*** (42.96)	4.670*** (42.16)	4.603*** (42.96)	3.359*** (29.75)	4.026*** (38.62)
nsman Prob>chi2	0.0000					
likelihood- o test						
chi2	33.79					
p>chi2	0.0000					
	832	4116	4116	4116	4116	4116
Statistics in parentheses	* $p < .10$, ** $p < .05$, *** $p < .01$					

Table 4.3: Results of the IPO Patent (Categorical Variable) equation

	Logit FE OR	Logit RE OR	Logit Age RE OR	Logit RE OR	Probit Age RE	Pr
O (Categorical)	-0.485*** (-3.47)	-0.351*** (-4.12)	-0.362*** (-4.22)	-0.351*** (-4.12)	-0.206*** (-4.20)	-0
reBillion	-0.000399 (-0.55)	0.0000917 (0.24)	0.000112 (0.30)	0.0000917 (0.24)	0.0000797 (0.37)	0.0
GrowthRate	0.0441 (1.09)	0.0102 (0.27)	0.00908 (0.24)	0.0102 (0.27)	0.00526 (0.24)	0
L1	0.417*** (6.13)	0.727*** (15.66)	0.729*** (15.68)	0.727*** (15.66)	0.417*** (16.08)	0
			-0.00558 (-1.15)		-0.00302 (-1.10)	
		0.112 (0.17)	0.231 (0.34)	0.112 (0.17)	0.123 (0.31)	0
		1.416*** (12.40)	1.416*** (12.38)	1.416*** (12.40)	0.309*** (2.80)	0
Prob>chi2	0.0000					
d Ratio Test	1.33					
2	0.2480					
	2234	4116	4116	4116	4116	
s in parentheses	* $p < .10$, ** $p < .05$, *** $p < .01$					

Table 4.4: Results of the USPTO Patent (Categorical Variable) equation

	Logit FE OR	Logit RE OR	Logit Age RE OR	Logit RE OR	Probit Age RE	Probit
USPTO rical	-0.390** (-2.36)	-0.180** (-2.19)	-0.178** (-2.16)	-0.180** (-2.19)	-0.0980** (-2.10)	-0.09 (-2.1)
izeBilli	-0.00192* (-1.84)	-0.000320 (-0.92)	-0.000322 (-0.93)	-0.000320 (-0.92)	-0.000177 (-0.90)	-0.000 (-0.8)
tGrowt teradjus	-0.0363 (-0.76)	-0.0972** (-2.34)	-0.0971** (-2.34)	-0.0972** (-2.34)	-0.0567** (-2.40)	-0.05 (-2.4)
OL1	0.476*** (5.51)	0.961*** (17.80)	0.961*** (17.80)	0.961*** (17.80)	0.533*** (18.23)	0.53 (18.2)
			0.000885 (0.21)		0.000230 (0.10)	
		1.227* (1.88)	1.210* (1.84)	1.227* (1.88)	0.685* (1.84)	0.68 (1.8)
		1.004*** (5.93)	1.002*** (5.91)	1.004*** (5.93)	-0.0761 (-0.50)	-0.07 (-0.4)
	1587	4116	4116	4116	4116	4116

in parentheses * $p < .10$, ** $p < .05$, *** $p < .01$

Table 4.5: Results of the Patent (Count) Equation

	NB FE1	NB FE2	NB FE3
DV	PatIPO	PatUSPTO	PatTotal
lnHHI	-0.150*** (-3.38)	-0.00679 (-0.26)	-0.0161 (-0.63)
Age	0.00764* (1.94)	0.00561** (2.14)	0.00311 (1.30)
lnMarketSize Billion	0.0362 (1.47)	-0.0362** (-2.49)	-0.0442*** (-3.14)
lnMarketGrow thRateAfteradj ust	0.0181 (1.09)	-0.00394 (-0.40)	0.00234 (0.25)
2008.Year	0.245** (2.57)	-0.00551 (-0.09)	0.0265 (0.44)
2009.Year	0.167 (1.63)	0.0354 (0.54)	0.0835 (1.32)
2010.Year	0.264*** (2.63)	0.105 (1.59)	0.144** (2.26)
2011.Year	0.299*** (3.08)	0.213*** (3.43)	0.240*** (3.98)
2012.Year	0.289*** (2.96)	0.325*** (5.34)	0.363*** (6.12)
2013.Year	0.349*** (3.44)	0.381*** (5.96)	0.403*** (6.46)
2014.Year	0.184* (1.87)	0.569*** (9.62)	0.570*** (9.84)
2015.Year	0.224** (2.25)	0.577*** (9.62)	0.590*** (10.08)
2016.Year	0.0820 (0.78)	0.531*** (8.60)	0.562*** (9.34)
2017.Year	0.167	0.521***	0.552***

	(1.49)	(7.86)	(8.51)
2018.Year	0.0799 (0.74)	0.374*** (5.70)	0.419*** (6.56)
2019.Year	-0.0536 (-0.49)	0.0526 (0.75)	0.112* (1.66)
2020.Year	-0.288 (-0.86)	-0.885*** (-3.85)	-0.654*** (-3.19)
_cons	0.936** (2.35)	0.533** (2.23)	0.592** (2.56)
<hr/> <i>N</i>	<hr/> 4897	<hr/> 6815	<hr/> 7149

Notes: *t* statistics in parentheses * $p < .10$, ** $p < .05$, *** $p < .01$

Annexure I

Firm Distribution with Market Concentration, R&D and Patenting at USPTO

HHI Category (Year Wise)	R&D in India					No R&D in India				Total No. of Firms	
	No Patenting at USPTO		Patenting at USPTO		Total no. of Firms (having R&D in India)	No Patenting at USPTO		Patenting at USPTO			Total no. of Firms (No R&D in India)
	No. of Firms	Avg. Patents at USPTO	No. of Firms	Avg. Patents at USPTO		No. of Firms	Avg. Patents at USPTO	No. of Firms	Avg. Patents at USPTO		
2007	389	0	153	58	542	898	0	234	54	1132	1674
Competitive Marketplace	108	0	40	32	148	239	0	66	48	305	453
Highly Concentrated	237	0	97	71	334	554	0	143	61	697	1031
Moderately Concentrated	44	0	16	41	60	105	0	25	33	130	190
2008	390	0	152	67	542	893	0	239	53	1132	1674
Competitive Marketplace	99	0	44	26	143	237	0	77	45	314	457
Highly Concentrated	251	0	96	92	347	565	0	141	61	706	1053
Moderately Concentrated	40	0	12	19	52	91	0	21	25	112	164
2009	390	0	152	68	542	889	0	243	51	1132	1674
Competitive Marketplace	106	0	48	28	154	249	0	71	48	320	474
Highly Concentrated	247	0	93	92	340	540	0	147	51	687	1027
Moderately Concentrated	37	0	11	40	48	100	0	25	62	125	173
2010	382	0	160	71	542	875	0	257	48	1132	1674
Competitive Marketplace	100	0	50	29	150	233	0	78	44	311	461
Highly Concentrated	230	0	91	103	321	512	0	143	53	655	976
Moderately Concentrated	52	0	19	32	71	130	0	36	35	166	237
2011	390	0	152	90	542	869	0	263	53	1132	1674
Competitive Marketplace	90	0	44	33	134	224	0	77	54	301	435
Highly Concentrated	235	0	81	132	316	486	0	135	62	621	937
Moderately Concentrated	65	0	27	55	92	159	0	51	27	210	302
2012	375	0	167	88	542	854	0	278	60	1132	1674
Competitive Marketplace	70	0	45	34	115	205	0	82	54	287	402
Highly Concentrated	233	0	86	126	319	457	0	125	81	582	901
Moderately Concentrated	72	0	36	67	108	192	0	71	28	263	371
2013	389	0	153	116	542	858	0	274	72	1132	1674
Competitive Marketplace	107	0	52	50	159	272	0	97	47	369	528
Highly Concentrated	239	0	82	153	321	462	0	134	97	596	917
Moderately Concentrated	43	0	19	138	62	124	0	43	52	167	229
2014	363	0	179	113	542	834	0	298	72	1132	1674
Competitive Marketplace	116	0	67	81	183	319	0	118	50	437	620
Highly Concentrated	200	0	90	150	290	395	0	138	85	533	823
Moderately Concentrated	47	0	22	63	69	120	0	42	90	162	231
2015	362	0	180	129	542	837	0	295	73	1132	1674
Competitive Marketplace	119	0	66	103	185	320	0	119	67	439	624
Highly Concentrated	196	0	82	189	278	380	0	136	74	516	794
Moderately Concentrated	47	0	32	28	79	137	0	40	88	177	256
2016	362	0	180	119	542	843	0	289	74	1132	1674
Competitive Marketplace	115	0	70	90	185	312	0	117	73	429	614
Highly Concentrated	189	0	75	183	264	360	0	129	76	489	753
Moderately Concentrated	58	0	35	38	93	171	0	43	71	214	307
2017	370	0	172	129	542	826	0	306	65	1132	1674
Competitive Marketplace	113	0	65	98	178	285	0	123	60	408	586
Highly Concentrated	199	0	72	202	271	377	0	133	67	510	781
Moderately Concentrated	58	0	35	36	93	164	0	50	71	214	307
2018	364	0	178	116	542	844	0	288	60	1132	1674
Competitive Marketplace	116	0	70	82	186	306	0	120	58	426	612
Highly Concentrated	196	0	85	170	281	408	0	130	61	538	819
Moderately Concentrated	52	0	23	21	75	130	0	38	61	168	243
2019	396	0	146	125	542	863	0	269	46	1132	1674
Competitive Marketplace	118	0	51	78	169	274	0	98	43	372	541
Highly Concentrated	218	0	66	207	284	411	0	126	43	537	821
Moderately Concentrated	60	0	29	20	89	178	0	45	62	223	312
2020	416	0	126	81	542	928	0	204	32	1132	1674
Competitive Marketplace	59	0	22	20	81	105	0	37	31	142	223
Highly Concentrated	293	0	79	121	372	651	0	132	29	783	1155
Moderately Concentrated	64	0	25	9	89	172	0	35	45	207	296

Firm Distribution with Market Concentration, R&D and Patenting at IPO

HHI Category (Year Wise)	R&D in India					No R&D in India					Total No. of Firms
	No Patenting at IPO		Patenting at IPO		Total no. of Firms (having R&D in India)	No Patenting at IPO		Patenting at IPO		Total no. of Firms No R&D in India)	
	No. of Firms	Avg. Patents at IPO	No. of Firms	Avg. Patents at IPO		No. of Firms	Avg. Patents at IPO	No. of Firms	Avg. Patents at IPO		
2007	474	0	68	15	542	1010	0	122	8	1132	1674
Competitive Marketplace	129	0	19	12	148	262	0	43	11	305	453
Highly Concentrated	296	0	38	13	334	634	0	63	6	697	1031
Moderately Concentrated	49	0	11	29	60	114	0	16	7	130	190
2008	460	0	82	17	542	1001	0	131	11	1132	1674
Competitive Marketplace	121	0	22	13	143	269	0	45	16	314	457
Highly Concentrated	293	0	54	19	347	629	0	77	7	706	1053
Moderately Concentrated	46	0	6	15	52	103	0	9	16	112	164
2009	458	0	84	14	542	1012	0	120	10	1132	1674
Competitive Marketplace	130	0	24	15	154	282	0	38	17	320	474
Highly Concentrated	288	0	52	13	340	619	0	68	7	687	1027
Moderately Concentrated	40	0	8	18	48	111	0	14	10	125	173
2010	449	0	93	14	542	984	0	148	8	1132	1674
Competitive Marketplace	120	0	30	14	150	265	0	46	14	311	461
Highly Concentrated	269	0	52	16	321	574	0	81	6	655	976
Moderately Concentrated	60	0	11	7	71	145	0	21	5	166	237
2011	454	0	88	17	542	983	0	149	10	1132	1674
Competitive Marketplace	109	0	25	17	134	253	0	48	16	301	435
Highly Concentrated	272	0	44	21	316	542	0	79	7	621	937
Moderately Concentrated	73	0	19	7	92	188	0	22	8	210	302
2012	457	0	85	19	542	983	0	149	12	1132	1674
Competitive Marketplace	90	0	25	19	115	243	0	44	18	287	402
Highly Concentrated	279	0	40	23	319	506	0	76	8	582	901
Moderately Concentrated	88	0	20	11	108	234	0	29	12	263	371
2013	448	0	94	20	542	976	0	156	11	1132	1674
Competitive Marketplace	124	0	35	13	159	314	0	55	16	369	528
Highly Concentrated	272	0	49	22	321	517	0	79	6	596	917
Moderately Concentrated	52	0	10	33	62	145	0	22	14	167	229
2014	454	0	88	19	542	993	0	139	10	1132	1674
Competitive Marketplace	146	0	37	14	183	382	0	55	15	437	620
Highly Concentrated	250	0	40	24	290	471	0	62	7	533	823
Moderately Concentrated	58	0	11	16	69	140	0	22	6	162	231
2015	454	0	88	20	542	984	0	148	9	1132	1674
Competitive Marketplace	150	0	35	18	185	371	0	68	9	439	624
Highly Concentrated	243	0	35	26	278	460	0	56	7	516	794
Moderately Concentrated	61	0	18	13	79	153	0	24	12	177	256
2016	456	0	86	20	542	997	0	135	10	1132	1674
Competitive Marketplace	147	0	38	21	185	370	0	59	14	429	614
Highly Concentrated	233	0	31	19	264	435	0	54	6	489	753
Moderately Concentrated	76	0	17	20	93	192	0	22	7	214	307
2017	454	0	88	16	542	988	0	144	9	1132	1674
Competitive Marketplace	144	0	34	15	178	345	0	63	12	408	586
Highly Concentrated	235	0	36	15	271	449	0	61	6	510	781
Moderately Concentrated	75	0	18	18	93	194	0	20	8	214	307
2018	440	0	102	14	542	986	0	146	8	1132	1674
Competitive Marketplace	140	0	46	12	186	361	0	65	8	426	612
Highly Concentrated	240	0	41	17	281	473	0	65	5	538	819
Moderately Concentrated	60	0	15	13	75	152	0	16	17	168	243
2019	462	0	80	19	542	997	0	135	8	1132	1674
Competitive Marketplace	138	0	31	21	169	312	0	60	10	372	541
Highly Concentrated	252	0	32	17	284	481	0	56	6	537	821
Moderately Concentrated	72	0	17	18	89	204	0	19	7	223	312
2020	458	0	84	16	542	1013	0	119	8	1132	1674
Competitive Marketplace	65	0	16	18	81	118	0	24	19	142	223
Highly Concentrated	320	0	52	17	372	709	0	74	6	783	1155
Moderately Concentrated	73	0	16	11	89	186	0	21	3	207	296

Firm Distribution with Nature of Industry, R&D and Patenting at USPTO

Tech Intensity (Year Wise)	R&D in India				Total no. of Firms (having R&D in India)	No R&D in India				Total no. of Firms (No R&D in India)	Total No. of Firms
	No Patenting at USPTO		Patenting at USPTO			No Patenting at USPTO		Patenting at USPTO			
	No. of Firms	Avg. Patents at USPTO	No. of Firms	Avg. Patents at USPTO		No. of Firms	Avg. Patents at USPTO	No. of Firms	Avg. Patents at USPTO		
2007	389	0	153	58	542	898	0	234	54	1132	1674
High tech industries	171	0	77	67	248	360	0	104	59	464	712
Medium-high-tech industries	93	0	34	54	127	214	0	62	69	276	403
Medium-low-technology industries	61	0	17	19	78	132	0	39	28	171	249
Low-technology industries	36	0	13	87	49	139	0	13	25	152	201
others	28	0	12	31	40	53	0	16	55	69	109
2008	390	0	152	67	542	893	0	239	53	1132	1674
High tech industries	174	0	74	82	248	359	0	105	57	464	712
Medium-high-tech industries	92	0	35	55	127	217	0	59	71	276	403
Medium-low-technology industries	60	0	18	13	78	128	0	43	25	171	249
Low-technology industries	38	0	11	133	49	135	0	17	24	152	201
others	26	0	14	33	40	54	0	15	61	69	109
2009	390	0	152	68	542	889	0	243	51	1132	1674
High tech industries	177	0	71	83	248	357	0	107	55	464	712
Medium-high-tech industries	93	0	34	62	127	213	0	63	67	276	403
Medium-low-technology industries	56	0	22	13	78	126	0	45	21	171	249
Low-technology industries	39	0	10	159	49	137	0	15	24	152	201
others	25	0	15	33	40	56	0	13	74	69	109
2010	382	0	160	71	542	875	0	257	48	1132	1674
High tech industries	179	0	69	94	248	349	0	115	47	464	712
Medium-high-tech industries	85	0	42	61	127	208	0	68	62	276	403
Medium-low-technology industries	57	0	21	15	78	126	0	45	26	171	249
Low-technology industries	38	0	11	143	49	137	0	15	21	152	201
others	23	0	17	31	40	55	0	14	83	69	109
2011	390	0	152	90	542	869	0	263	53	1132	1674
High tech industries	176	0	72	114	248	345	0	119	49	464	712
Medium-high-tech industries	91	0	36	85	127	213	0	63	79	276	403
Medium-low-technology industries	60	0	18	20	78	129	0	42	37	171	249
Low-technology industries	37	0	12	131	49	127	0	25	15	152	201
others	26	0	14	33	40	55	0	14	84	69	109
2012	375	0	167	88	542	854	0	278	60	1132	1674
High tech industries	175	0	73	117	248	333	0	131	54	464	712
Medium-high-tech industries	84	0	43	88	127	207	0	69	72	276	403
Medium-low-technology industries	55	0	23	12	78	130	0	41	45	171	249
Low-technology industries	37	0	12	138	49	132	0	20	21	152	201
others	24	0	16	32	40	52	0	17	135	69	109
2013	389	0	153	116	542	858	0	274	72	1132	1674
High tech industries	178	0	70	144	248	336	0	128	68	464	712
Medium-high-tech industries	88	0	39	126	127	213	0	63	90	276	403
Medium-low-technology industries	58	0	20	26	78	123	0	48	38	171	249
Low-technology industries	40	0	9	175	49	132	0	20	24	152	201
others	25	0	15	45	40	54	0	15	201	69	109
2014	363	0	179	113	542	834	0	298	72	1132	1674
High tech industries	157	0	91	135	248	323	0	141	72	464	712
Medium-high-tech industries	91	0	36	152	127	211	0	65	91	276	403
Medium-low-technology industries	56	0	22	22	78	117	0	54	40	171	249
Low-technology industries	36	0	13	106	49	129	0	23	19	152	201
others	23	0	17	36	40	54	0	15	186	69	109
2015	362	0	180	129	542	837	0	295	73	1132	1674
High tech industries	163	0	85	170	248	328	0	136	72	464	712
Medium-high-tech industries	84	0	43	148	127	201	0	75	84	276	403
Medium-low-technology industries	55	0	23	26	78	126	0	45	49	171	249
Low-technology industries	37	0	12	104	49	131	0	21	20	152	201
others	23	0	17	31	40	51	0	18	156	69	109
2016	362	0	180	119	542	843	0	289	74	1132	1674
High tech industries	159	0	89	146	248	327	0	137	76	464	712
Medium-high-tech industries	89	0	38	166	127	207	0	69	92	276	403
Medium-low-technology industries	57	0	21	25	78	124	0	47	49	171	249
Low-technology industries	37	0	12	81	49	131	0	21	19	152	201
others	20	0	20	28	40	54	0	15	129	69	109
2017	370	0	172	129	542	826	0	306	65	1132	1674
High tech industries	165	0	83	170	248	327	0	137	75	464	712
Medium-high-tech industries	89	0	38	164	127	200	0	76	77	276	403
Medium-low-technology industries	56	0	22	21	78	117	0	54	37	171	249
Low-technology industries	37	0	12	79	49	130	0	22	17	152	201
others	23	0	17	27	40	52	0	17	79	69	109
2018	364	0	178	116	542	844	0	288	60	1132	1674
High tech industries	160	0	88	153	248	340	0	124	73	464	712
Medium-high-tech industries	89	0	38	147	127	206	0	70	72	276	403
Medium-low-technology industries	54	0	24	14	78	118	0	53	25	171	249
Low-technology industries	39	0	10	75	49	128	0	24	13	152	201
others	22	0	18	29	40	52	0	17	82	69	109
2019	396	0	146	125	542	863	0	269	46	1132	1674
High tech industries	177	0	71	181	248	342	0	122	55	464	712
Medium-high-tech industries	97	0	30	141	127	204	0	72	48	276	403
Medium-low-technology industries	59	0	19	13	78	128	0	43	21	171	249
Low-technology industries	38	0	11	47	49	132	0	20	11	152	201
others	25	0	15	25	40	57	0	12	104	69	109
2020	416	0	126	81	542	928	0	204	32	1132	1674
High tech industries	188	0	60	128	248	372	0	92	42	464	712
Medium-high-tech industries	94	0	33	62	127	226	0	50	33	276	403
Medium-low-technology industries	66	0	12	10	78	137	0	34	9	171	249
Low-technology industries	40	0	9	29	49	138	0	14	9	152	201
others	28	0	12	13	40	55	0	14	42	69	109

Firm Distribution with Nature of Industry, R&D and Patenting at IPO

Tech Intensity (Year Wise)	R&D in India					No R&D in India					Total No. of Firms
	No Patenting at IPO		Patenting at IPO		Total no. of Firms (having R&D in	No Patenting at IPO		Patenting at IPO		Total no. of Firms No R&D in India)	
	No. of Firms	Avg. Patents at IPO	No. of Firms	Avg. Patents at IPO		No. of Firms	Avg. Patents at IPO	No. of Firms	Avg. Patents at IPO		
2007	474	0	68	15	542	1010	0	122	8	1132	1674
High tech industries	222	0	26	17	248	415	0	49	6	464	712
Medium-high-tech industries	107	0	20	17	127	241	0	35	12	276	403
Medium-low-technology industries	69	0	9	8	78	146	0	25	5	171	249
Low-technology industries	43	0	6	10	49	147	0	5	12	152	201
others	33	0	7	14	40	61	0	8	7	69	109
2008	460	0	82	17	542	1001	0	131	11	1132	1674
High tech industries	211	0	37	14	248	408	0	56	7	464	712
Medium-high-tech industries	105	0	22	20	127	240	0	36	14	276	403
Medium-low-technology industries	69	0	9	9	78	149	0	22	11	171	249
Low-technology industries	43	0	6	21	49	144	0	8	16	152	201
others	32	0	8	30	40	60	0	9	14	69	109
2009	458	0	84	14	542	1012	0	120	10	1132	1674
High tech industries	209	0	39	10	248	418	0	46	10	464	712
Medium-high-tech industries	105	0	22	17	127	236	0	40	11	276	403
Medium-low-technology industries	67	0	11	12	78	148	0	23	9	171	249
Low-technology industries	43	0	6	16	49	149	0	3	21	152	201
others	34	0	6	33	40	61	0	8	8	69	109
2010	449	0	93	14	542	984	0	148	8	1132	1674
High tech industries	206	0	42	10	248	401	0	63	7	464	712
Medium-high-tech industries	100	0	27	20	127	236	0	40	12	276	403
Medium-low-technology industries	66	0	12	9	78	142	0	29	8	171	249
Low-technology industries	44	0	5	19	49	145	0	7	6	152	201
others	33	0	7	22	40	60	0	9	9	69	109
2011	454	0	88	17	542	983	0	149	10	1132	1674
High tech industries	213	0	35	15	248	404	0	60	9	464	712
Medium-high-tech industries	104	0	23	24	127	230	0	46	13	276	403
Medium-low-technology industries	63	0	15	7	78	142	0	29	10	171	249
Low-technology industries	43	0	6	18	49	145	0	7	8	152	201
others	31	0	9	19	40	62	0	7	13	69	109
2012	457	0	85	19	542	983	0	149	12	1132	1674
High tech industries	214	0	34	16	248	399	0	65	10	464	712
Medium-high-tech industries	101	0	26	25	127	235	0	41	13	276	403
Medium-low-technology industries	70	0	8	10	78	147	0	24	16	171	249
Low-technology industries	42	0	7	26	49	143	0	9	6	152	201
others	30	0	10	16	40	59	0	10	14	69	109
2013	448	0	94	20	542	976	0	156	11	1132	1674
High tech industries	209	0	39	15	248	392	0	72	7	464	712
Medium-high-tech industries	100	0	27	30	127	239	0	37	12	276	403
Medium-low-technology industries	66	0	12	11	78	142	0	29	13	171	249
Low-technology industries	43	0	6	29	49	145	0	7	8	152	201
others	30	0	10	15	40	58	0	11	21	69	109
2014	454	0	88	19	542	993	0	139	10	1132	1674
High tech industries	211	0	37	15	248	405	0	59	8	464	712
Medium-high-tech industries	101	0	26	28	127	240	0	36	11	276	403
Medium-low-technology industries	68	0	10	12	78	143	0	28	13	171	249
Low-technology industries	43	0	6	21	49	145	0	7	9	152	201
others	31	0	9	16	40	60	0	9	17	69	109
2015	454	0	88	20	542	984	0	148	9	1132	1674
High tech industries	214	0	34	19	248	404	0	60	6	464	712
Medium-high-tech industries	101	0	26	27	127	235	0	41	10	276	403
Medium-low-technology industries	66	0	12	13	78	147	0	24	13	171	249
Low-technology industries	42	0	7	13	49	137	0	15	4	152	201
others	31	0	9	16	40	61	0	8	17	69	109
2016	456	0	86	20	542	997	0	135	10	1132	1674
High tech industries	212	0	36	20	248	411	0	53	7	464	712
Medium-high-tech industries	101	0	26	28	127	238	0	38	11	276	403
Medium-low-technology industries	68	0	10	9	78	148	0	23	16	171	249
Low-technology industries	44	0	5	17	49	143	0	9	4	152	201
others	31	0	9	12	40	57	0	12	11	69	109
2017	454	0	88	16	542	988	0	144	9	1132	1674
High tech industries	212	0	36	13	248	403	0	61	6	464	712
Medium-high-tech industries	104	0	23	25	127	238	0	38	10	276	403
Medium-low-technology industries	67	0	11	5	78	146	0	25	17	171	249
Low-technology industries	41	0	8	14	49	144	0	8	5	152	201
others	30	0	10	19	40	57	0	12	9	69	109
2018	440	0	102	14	542	986	0	146	8	1132	1674
High tech industries	204	0	44	12	248	407	0	57	5	464	712
Medium-high-tech industries	100	0	27	23	127	231	0	45	8	276	403
Medium-low-technology industries	67	0	11	3	78	142	0	29	12	171	249
Low-technology industries	40	0	9	13	49	145	0	7	5	152	201
others	29	0	11	17	40	61	0	8	8	69	109
2019	462	0	80	19	542	997	0	135	8	1132	1674
High tech industries	216	0	32	13	248	403	0	61	6	464	712
Medium-high-tech industries	106	0	21	37	127	240	0	36	8	276	403
Medium-low-technology industries	70	0	8	7	78	147	0	24	10	171	249
Low-technology industries	40	0	9	12	49	146	0	6	4	152	201
others	30	0	10	13	40	61	0	8	16	69	109
2020	458	0	84	16	542	1013	0	119	8	1132	1674
High tech industries	211	0	37	10	248	417	0	47	6	464	712
Medium-high-tech industries	110	0	17	42	127	245	0	31	9	276	403
Medium-low-technology industries	66	0	12	3	78	148	0	23	6	171	249
Low-technology industries	39	0	10	10	49	142	0	10	3	152	201
others	32	0	8	17	40	61	0	8	22	69	109

Firm Distribution with Market Growth Rate, R&D and Patenting at USPTO

Growth Rate (in % , Year Wise)	R&D in India					No R&D in India					Total No. of Firms
	No Patenting at		Patenting at USPTO		Total no. of Firms (having R&D in	No Patenting at		Patenting at USPTO		Total no. of Firms (No R&D in India)	
	No. of Firms	Avg. Patents at USPTO	No. of Firms	Avg. Patents at USPTO		No. of Firms	Avg. Patents at USPTO	No. of Firms	Avg. Patents at USPTO		
2007	389	0	153	58	542	898	0	234	54	1132	1674
<4	89	0	35	28	124	211	0	52	49	263	387
>=4 & <6	8	0	2	1	10	16	0			16	26
>=6 & <8	8	0	4	50	12	14	0	10	143	24	36
>=8	284	0	112	69	396	657	0	172	51	829	1225
2008	390	0	152	67	542	893	0	239	53	1132	1674
<4	48	0	23	39	71	123	0	41	47	164	235
>=4 & <6	11	0	6	19	17	23	0	11	175	34	51
>=6 & <8	4	0	1	879	5	15	0	6	35	21	26
>=8	327	0	122	68	449	732	0	181	47	913	1362
2009	390	0	152	68	542	889	0	243	51	1132	1674
<4	148	0	58	42	206	370	0	83	68	453	659
>=4 & <6	15	0	7	119	22	61	0	13	13	74	96
>=6 & <8	30	0	10	28	40	63	0	22	60	85	125
>=8	197	0	77	89	274	395	0	125	42	520	794
2010	382	0	160	71	542	875	0	257	48	1132	1674
<4	139	0	64	93	203	325	0	108	59	433	636
>=4 & <6	8	0	3	13	11	22	0	5	91	27	38
>=6 & <8	28	0	13	59	41	70	0	18	31	88	129
>=8	207	0	80	58	287	458	0	126	39	584	871
2011	390	0	152	90	542	869	0	263	53	1132	1674
<4	107	0	47	166	154	244	0	69	29	313	467
>=4 & <6	29	0	10	33	39	53	0	14	65	67	106
>=6 & <8	8	0	3	65	11	22	0	5	158	27	38
>=8	246	0	92	58	338	550	0	175	58	725	1063
2012	375	0	167	88	542	854	0	278	60	1132	1674
<4	142	0	48	141	190	284	0	79	29	363	553
>=4 & <6	39	0	10	126	49	51	0	24	38	75	124
>=6 & <8	6	0	6	22	12	26	0	8	48	34	46
>=8	188	0	103	64	291	493	0	167	77	660	951
2013	389	0	153	116	542	858	0	274	72	1132	1674
<4	164	0	58	148	222	365	0	120	93	485	707
>=4 & <6	24	0	8	166	32	38	0	7	46	45	77
>=6 & <8	24	0	9	117	33	49	0	20	70	69	102
>=8	177	0	78	87	255	406	0	127	54	533	788
2014	363	0	179	113	542	834	0	298	72	1132	1674
<4	78	0	39	184	117	172	0	42	33	214	331
>=4 & <6	10	0	12	109	22	18	0	2	32	20	42
>=6 & <8	5	0	8	40	13	26	0	11	216	37	50
>=8	270	0	120	96	390	618	0	243	72	861	1251
2015	362	0	180	129	542	837	0	295	73	1132	1674
<4	92	0	50	144	142	251	0	84	51	335	477
>=4 & <6	39	0	12	93	51	62	0	10	186	72	123
>=6 & <8	12	0	4	22	16	19	0	7	304	26	42
>=8	219	0	114	130	333	505	0	194	68	699	1032
2016	362	0	180	119	542	843	0	289	74	1132	1674
<4	132	0	60	96	192	328	0	94	66	422	614
>=4 & <6	12	0	9	16	21	26	0	8	181	34	55
>=6 & <8	10	0	10	46	20	31	0	15	38	46	66
>=8	208	0	101	148	309	458	0	172	77	630	939
2017	370	0	172	129	542	826	0	306	65	1132	1674
<4	229	0	103	143	332	458	0	161	80	619	951
>=4 & <6	2	0	6	138	8	15	0	4	6	19	27
>=6 & <8	18	0	15	330	33	47	0	22	41	69	102
>=8	121	0	48	35	169	306	0	119	50	425	594
2018	364	0	178	116	542	844	0	288	60	1132	1674
<4	170	0	80	98	250	391	0	102	55	493	743
>=4 & <6	13	0	6	556	19	32	0	9	34	41	60
>=6 & <8	37	0	18	10	55	91	0	35	59	126	181
>=8	144	0	74	126	218	330	0	142	65	472	690
2019	396	0	146	125	542	863	0	269	46	1132	1674
<4	164	0	62	159	226	380	0	111	50	491	717
>=4 & <6	13	0	8	29	21	26	0	8	17	34	55
>=6 & <8	22	0	7	23	29	53	0	15	23	68	97
>=8	197	0	69	115	266	404	0	135	48	539	805
2020	416	0	126	81	542	928	0	204	32	1132	1674
<4	379	0	118	86	497	865	0	196	33	1061	1558
>=4 & <6	3	0	1	38	4	6	0	2	5	8	12
>=6 & <8	7	0	5	4	12	6	0	1	16	7	19
>=8	27	0	2	6	29	51	0	5	10	56	85

Firm Distribution with Market Growth Rate, R&D and Patenting at IPO

Growth Rate (in %, Year Wise)	R&D in India					No R&D in India					Total No. of Firms
	No Patenting at IPO		Patenting at IPO		Total no. of Firms (having R&D in India)	No Patenting at IPO		Patenting at IPO		Total no. of Firms No R&D in India)	
	No. of Firms	Avg. Patents at IPO	No. of Firms	Avg. Patents at IPO		No. of Firms	Avg. Patents at IPO	No. of Firms	Avg. Patents at IPO		
2007	474	0	68	15	542	1010	0	122	8	1132	1674
<4	109	0	15	6	124	241	0	22	8	263	387
>=4 & <6	10	0			10	16	0			16	26
>=6 & <8	10	0	2	24	12	19	0	5	13	24	36
>=8	345	0	51	17	396	734	0	95	8	829	1225
2008	460	0	82	17	542	1001	0	131	11	1132	1674
<4	56	0	15	11	71	142	0	22	6	164	235
>=4 & <6	13	0	4	5	17	27	0	7	13	34	51
>=6 & <8	4	0	1	3	5	20	0	1	4	21	26
>=8	387	0	62	20	449	812	0	101	12	913	1362
2009	458	0	84	14	542	1012	0	120	10	1132	1674
<4	172	0	34	12	206	411	0	42	12	453	659
>=4 & <6	19	0	3	12	22	67	0	7	4	74	96
>=6 & <8	37	0	3	17	40	71	0	14	4	85	125
>=8	230	0	44	16	274	463	0	57	12	520	794
2010	449	0	93	14	542	984	0	148	8	1132	1674
<4	163	0	40	15	203	377	0	56	10	433	636
>=4 & <6	11	0			11	23	0	4	15	27	38
>=6 & <8	36	0	5	31	41	76	0	12	4	88	129
>=8	239	0	48	12	287	508	0	76	8	584	871
2011	454	0	88	17	542	983	0	149	10	1132	1674
<4	125	0	29	19	154	278	0	35	7	313	467
>=4 & <6	33	0	6	13	39	58	0	9	6	67	106
>=6 & <8	8	0	3	9	11	25	0	2	32	27	38
>=8	288	0	50	16	338	622	0	103	12	725	1063
2012	457	0	85	19	542	983	0	149	12	1132	1674
<4	165	0	25	30	190	323	0	40	8	363	553
>=4 & <6	43	0	6	14	49	63	0	12	8	75	124
>=6 & <8	8	0	4	5	12	31	0	3	19	34	46
>=8	241	0	50	15	291	566	0	94	13	660	951
2013	448	0	94	20	542	976	0	156	11	1132	1674
<4	183	0	39	14	222	420	0	65	9	485	707
>=4 & <6	28	0	4	34	32	39	0	6	12	45	77
>=6 & <8	29	0	4	26	33	58	0	11	3	69	102
>=8	208	0	47	23	255	459	0	74	13	533	788
2014	454	0	88	19	542	993	0	139	10	1132	1674
<4	102	0	15	14	117	197	0	17	8	214	331
>=4 & <6	16	0	6	6	22	17	0	3	5	20	42
>=6 & <8	9	0	4	26	13	31	0	6	21	37	50
>=8	327	0	63	21	390	748	0	113	10	861	1251
2015	454	0	88	20	542	984	0	148	9	1132	1674
<4	119	0	23	20	142	294	0	41	10	335	477
>=4 & <6	47	0	4	19	51	70	0	2	11	72	123
>=6 & <8	13	0	3	5	16	22	0	4	18	26	42
>=8	275	0	58	20	333	598	0	101	8	699	1032
2016	456	0	86	20	542	997	0	135	10	1132	1674
<4	163	0	29	13	192	372	0	50	14	422	614
>=4 & <6	17	0	4	6	21	31	0	3	2	34	55
>=6 & <8	17	0	3	18	20	40	0	6	10	46	66
>=8	259	0	50	26	309	554	0	76	7	630	939
2017	454	0	88	16	542	988	0	144	9	1132	1674
<4	273	0	59	17	332	540	0	79	10	619	951
>=4 & <6	4	0	4	37	8	18	0	1	1	19	27
>=6 & <8	24	0	9	5	33	59	0	10	11	69	102
>=8	153	0	16	12	169	371	0	54	7	425	594
2018	440	0	102	14	542	986	0	146	8	1132	1674
<4	202	0	48	10	250	441	0	52	6	493	743
>=4 & <6	13	0	6	11	19	33	0	8	9	41	60
>=6 & <8	49	0	6	1	55	109	0	17	3	126	181
>=8	176	0	42	21	218	403	0	69	11	472	690
2019	462	0	80	19	542	997	0	135	8	1132	1674
<4	190	0	36	19	226	440	0	51	7	491	717
>=4 & <6	17	0	4	4	21	32	0	2	3	34	55
>=6 & <8	24	0	5	17	29	60	0	8	7	68	97
>=8	231	0	35	21	266	465	0	74	9	539	805
2020	458	0	84	16	542	1013	0	119	8	1132	1674
<4	417	0	80	17	497	945	0	116	8	1061	1558
>=4 & <6	4	0			4	8	0			8	12
>=6 & <8	10	0	2	2	12	7	0			7	19
>=8	27	0	2	10	29	53	0	3	2	56	85

CHAPTER 5

Nature of Innovation Activity of WOS

5.0 Introduction

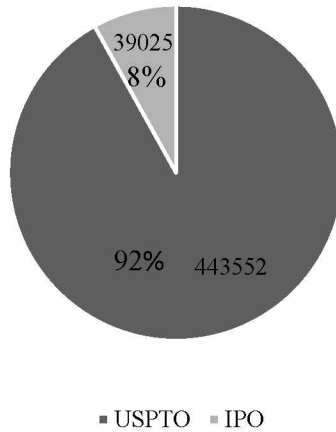
The previous Chapter presented data details and results regarding drivers of R&D and patenting by foreign firms. We find that competitive markets incentivise firms to spend on R&D and patent the outcome of their investment. An emerging country devises policies to attract foreign firms as those are expected to be a significant contributor to the host country's innovation system. Thus, it is very important for a host country to understand the nature of innovation activity conducted in-house by such firms. We present the result of an exercise designed and conducted to that end in this Chapter. As elaborated in Chapter 3, we use information available in the patent documents related to priority country, assignee, and inventors to categorize patent as an outcome of technology exploiting, seeking, and creating activity of foreign firms.

The rest of the Chapter is organized as follows: Sections 1 and 2 present the results of exercise at the broad level and then for disaggregated level.

5.1 Patents Information

Out of 1674 firms, 778 firms are involved in filing patents either at IPO or USPTO or at both which is 46.5 percent of total firms included in the sample. Out of the total 778 firms involved in patenting activity, 32 firms are patenting only at IPO, while 224 firms are patenting only at USPTO. 522 firms are patenting at both IPO and USPTO. Our analysis is based on total number of patent applications filed by 778 firms during the time period 2007-2020. Based on broad name search (details are given in Chapter 3), we find information for about 482577 patents. Out of 482577 patent applications 92% of patents were filed at USPTO while only 8% were filed at IPO (Figure 5.1). This data consists of patent applications filed by parent firm, Indian subsidiary and subsidiaries in other countries.

Figure 5.1: Share of Patents Applications



We conducted a broad search based on company names collected from MCA. The main motivation was to see the involvement of Indian subsidiary in the innovation activity of the MNEs at global level. Among the entire dataset, we find that only 42 Indian subsidiaries have been the first or second assignee of the patents. These subsidiaries have only 13 patents at USPTO and 720 at IPO. Table 5.1 list these subsidiaries. This is in line with the comment made by an expert regarding the patent strategy of MNEs.

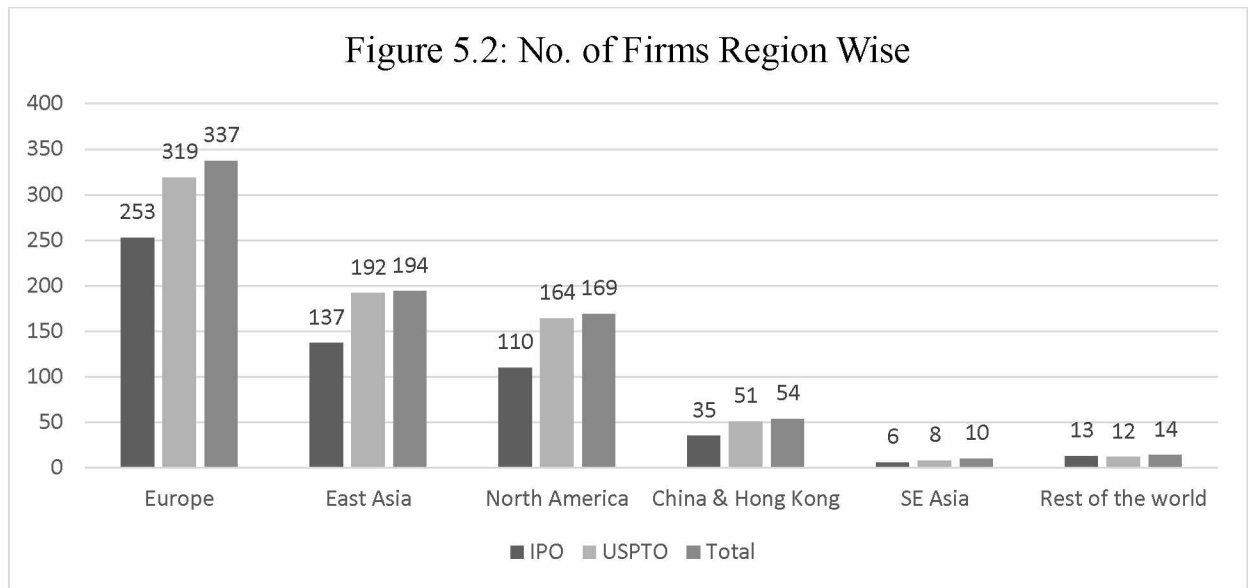
“So far as the choice of patent filing is concerned, most of the applications that deal with foreign filing is decided by the parent companies rather than the subsidiary companies. And the subsidiary companies are not independent in choosing patent filing.”

It is evident that subsidiary mostly rely on the guidance from the headquarters particularly with respect to patent related matters. In fact, it was pointed out that sometime, if an Indian legal firm is employed to patent, they are usually asked by the parent firm to get guidance from an attorney or legal counsel from the parent firm’s country. It was also pointed out that parent firm take most strategic decisions regarding the patenting matters. Note that Indian subsidiary as an assignee has limited presence but Indian inventors are involved in more patents. We present our discussion on this issue later in the Chapter.

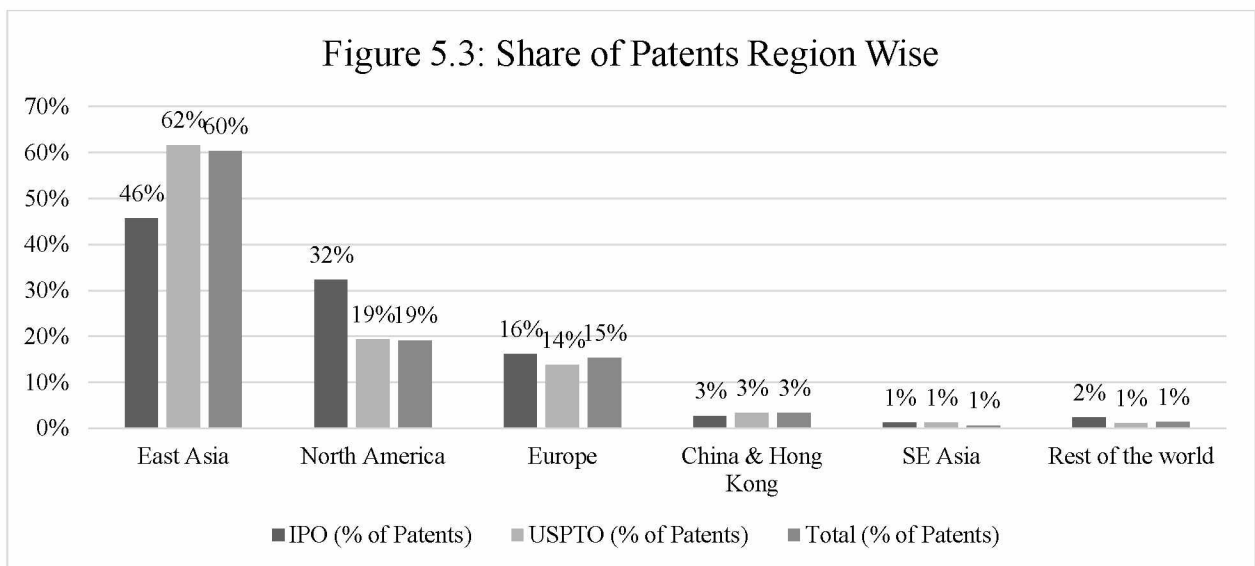
Table 5.1: List of Indian WOS as Assignees of Patents (both at IPO and USPTO)

S. No.	Company Name (Indian Subsidiaries filing patents at IPO/USPTO as assignee/applicant)	First Assignee	Secondary Assignee
1	Panasonic Life Solutions India Pvt. Ltd.	Yes	Yes
2	Metso India Pvt. Ltd.	Yes	
3	Marathon Electric India Private Limited	Yes	
4	Cummins Technologies India Pvt. Ltd.	Yes	
5	Milacron India Pvt. Ltd.	Yes	
6	Faurecia Emissions Control Technologies India Private Limited	Yes	Yes
7	Caterpillar India Private Limited		Yes
8	Nektar Therapeutics (India) Private Limited		Yes
9	Apicore Pharmaceuticals Private Limited	Yes	
10	Tatsuno India Private Limited	Yes	
11	Itt Corporation India Private Limited	Yes	
12	Ecobliss India Private Limited	Yes	
13	Dr. Oetker India Private Limited	Yes	
14	Scholle Packaging (India) Private Limited	Yes	
15	Terex India Pvt. Ltd.	Yes	
16	Kramski Stamping And Molding India Private Limited	Yes	
17	Kobelco Machinery India Private Limited	Yes	
18	Radio Design India Private Limited	Yes	
19	Unicharm India Pvt. Ltd.	Yes	
20	Ensto India Private Limited	Yes	
21	Volvo Auto India Pvt. Ltd.	Yes	
22	Thyssenkrupp System Engineering India Private Limited		Yes
24	Sartorius Weighing India Private Limited		Yes
25	Rotam Crop Protection Private Limited	Yes	
26	Bsh Household Appliances Manufacturing Private Limited	Yes	Yes
27	Carrier Midea India Pvt. Ltd.	Yes	
28	Omb Saleri Valves India Private Limited	Yes	
29	Lt Production India Private Limited	Yes	
30	Gmp Reels India Private Limited	Yes	
31	Kokuyo Riddhi Paper Products Private Limited	Yes	
32	Caraway Development Centre (India) Private Limited	Yes	
33	Maxxis Rubber India Private Limited	Yes	
34	Cypet Technologies India Private Limited	Yes	
35	Barsys India Private Limited	Yes	
36	Dynapac Road Construction Equipment (India) Private Limited	Yes	
37	Uquifa India Private Limited	Yes	
38	Moog Em Solutions (India) Private Limited	Yes	
39	Rb Hygiene Home India Private Limited	Yes	
40	Omya Healthcare India Private Limited	Yes	
41	Jcb Industries Private Limited	Yes	
42	Jabil India Manufacturing Private Limited	Yes	

Figure 5.2 shows the region wise distribution of the patenting firms. Most of firms filing patents belongs to Europe followed by East Asia and North America. It also shows that number of firms from Chinese origin are low. The figure shows that the number of firms filing patents at IPO are higher from Europe compare to other origins.



In contrast to Figure 5.2, in terms of number of patent applications, we find that firms from the East Asia i.e., Japan and South Korea contribute highest. Total filling to the extent of 46% is from the firms that are headquatered in Japan and South Korea. This highlight an interesting region based trend in terms of patenting by WOS of MNEs.



Our data consists of 30 attributes related to assignee, priority, inventors and patent family of each patent application. Such attributes were used to classify the patents in three categories i.e., technology creating, technology seeking and technology exploiting. This classification have been done first on patent level and then firm level. The categorisation has been done for patents filed at IPO as well USPTO (Figures 5.4 and 5.5).

Before we discuss the results, we present the opinions of the legal experts regarding the use of patent attributes to classify technologies as creating, seeking, and exploiting. Most experts agreed that this is an interesting lens that can be employed to understand what MNEs have been doing in terms of innovation in India. With respect to priority, experts opine that firms decide the priority based on: (i) product market considerations, (ii) ease of patent prosecution in the patent office and (iii) production related considerations. It was pointed out that:

“Priority country mentioned in the patent application would depend on where the biggest market is and what is that patent getting used for. There are certain innovations for that R&D has been taken place in some other markets such as US because historically the presence of such companies has a lot of people with very significant experience in that particular sector i.e., telecom sector. In India, we have operator experience but may not necessarily have telecom standards experience. Whereas countries in Europe, Finland or any of the Scandinavian countries or the US have very deep telecom technology development experience. Therefore, the innovation is being done there but it is assigned on a high priority to the market like India or anywhere in Southeast Asia because that is the market where that innovation will get preference. To some extent priority depends on what is the business model but how does the revenue realization.”

Another expert noted that:

“There are so many problems with the Indian law i.e., Software inventions Section 3 (K) is the biggest hurdle in Indian patent office as per the act wherein it clearly indicates that any mathematical method or business method or computable algorithms are not patentable whereas such criteria such conditions are not very rigid in the jurisdiction outside India. That is the reason why in spite of having good innovations emerging from India people prefer to filing outside India i.e., US, Canada, Australia, Korea etc.”

Regarding assignee order level information, it was noted that

“There is no legal significance of assignee order and inventor order, it just a list of inventors/applicants. It has no legal effect, although there is no difference in terms of their legal rights. However, the first assignee or first inventor are considered as lead assignee or lead inventor. The name of the lead inventor can be used to cite the patent somewhere just like a research article.”

All legal experts highlighted that according to the Indian patent law, the filing of patent applications outside the territory of India is not permitted unless a patent application is filed in India first. Under Section 39(1) of the Indian Patent Act, such a foreign patent application can be filed only after six weeks from the Indian filing provided no secrecy directions are imposed by the Patent Office within that period. An exception in the form of applying and receiving Foreign Filing License (FFL) is also provided in the act. Regarding, use of residential information, we find that:

“While filing the patent the current address of the inventor is considered by the attorneys. Section 39 also talks about the residence status. It says that residents not to apply for patents outside India it means that no person in resident in India make any application outside India and for the resident requirement, it is same as Income Tax filing. The work was performed in India or not can be inferred from this section while checking the resident status of the inventors at the time of application.

The nationality of the inventors is not the criteria to locate the invention, but the resident status is important in that case. It is same requirement as in ITR filing that for some specific time in the past the person should have resided in India. Similarly in case of patent filing if the resident status of the inventor is calculated in India at the time of filing, then inventors have to take permission from Indian Govt. however if they are not falling under this category, they can directly file the application in USPTO if US office allows that. In a group of inventors even if only one inventor falls in this category, then also, they have to take permission from Indian Govt. before filing the patent in other country if assignees are not Indian and priority is not India.”

However, it was also pointed out that if Indian inventors are involved, companies may file their application first in India just to avoid the cost of FFL.

In view of the observation regarding priority country, assignee level information and inventor, we employ a layered approach to locate the inventions in India. This layered approach includes segregating patents based on information related to priority country, assignee and then inventors (in that order). The results are presented in Figures 5.4 and 5.5 for patents at IPO and USPTO respectively. Figure 5.4 based on data from IPO reveals the following:

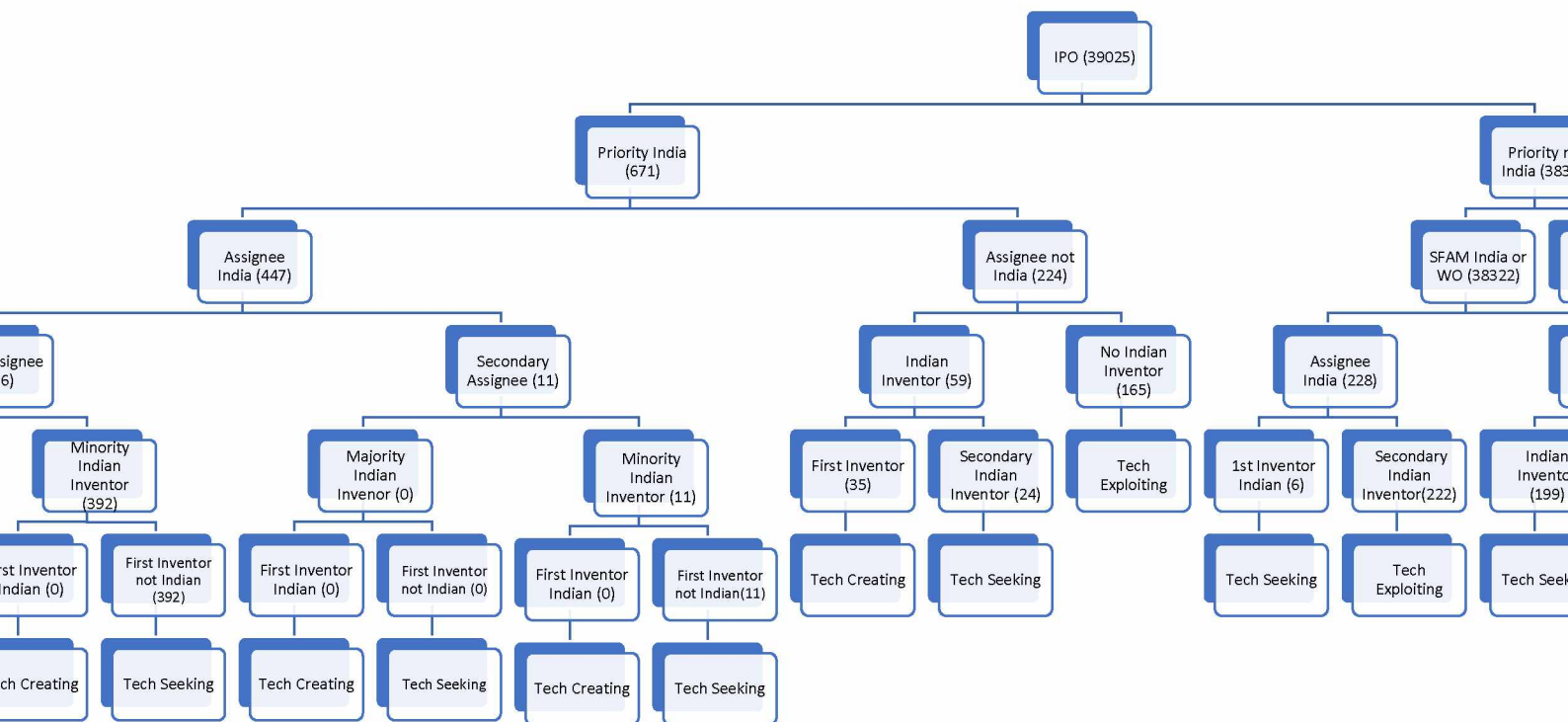
- (i) Most patents have priority outside India.
- (ii) In case, priority is India, assignees are also Indian, and, in such cases, involvement of Indian investors is high either as majority inventors or as first inventor.
- (iii) Even when priority is not India, most applications have a family patent in India.
- (iv) There are certain cases with Indian assignee and Indian inventors when priority country is not India. Clearly, these firms are looking for the Indian talent to complement their innovations at international level. And market, patenting and production related aspects have influenced the decision regarding the priority country.

Figure 5.5 is based on patent applications at USPTO and as expected:

- (i) Most patents are with priority outside India and without Indian assignees.
- (ii) For cases, with priority in India, assignee is not India, inventors are based in India. This is in line with a comment earlier that to avoid FFL, companies may give India as priority country and then use that for most international patents when Indian inventors are involved.
- (iii) In cases, if Indian inventors are not involved and priority is India, an expert has noted that only from market considerations, a company will choose India as a priority case.

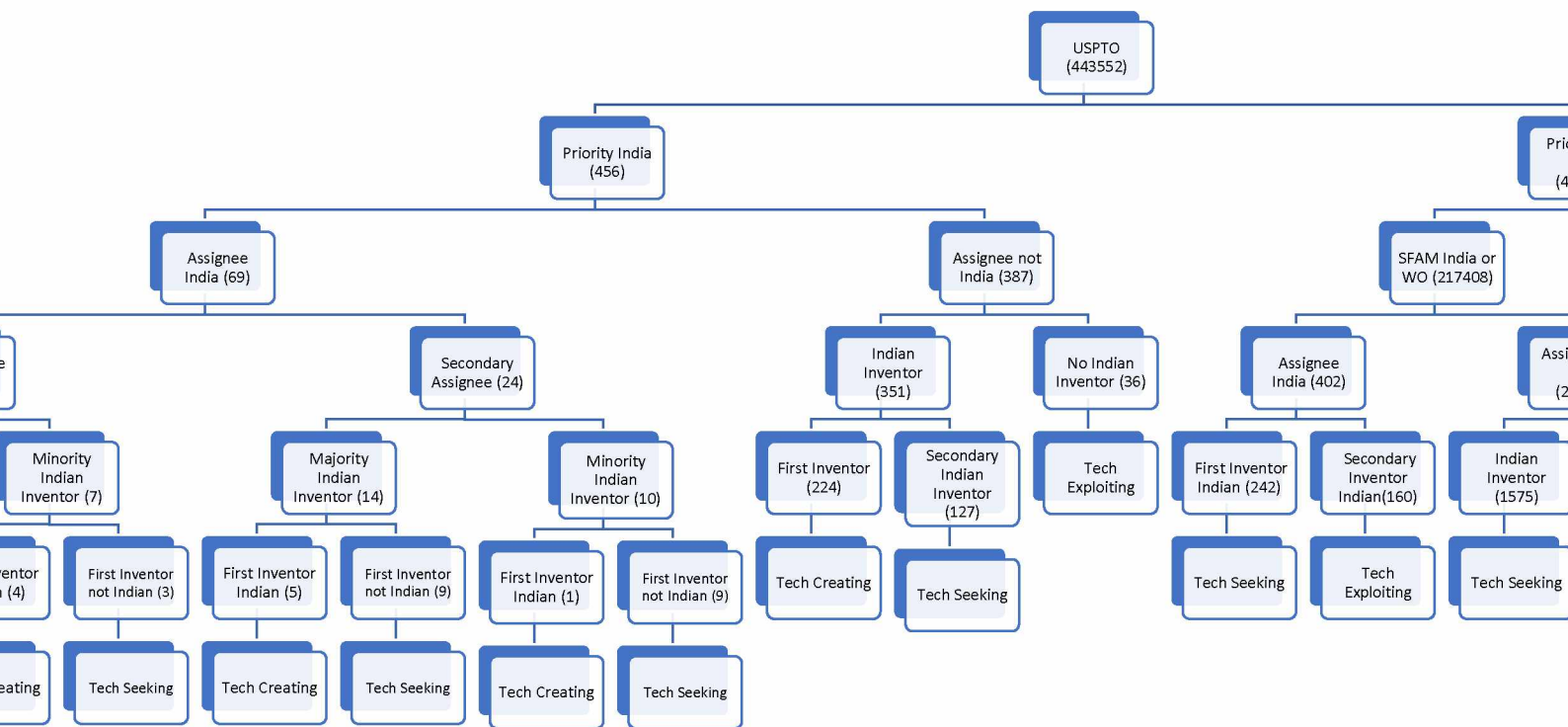
“Patents are expensive so most MNCs will patent in their home country as a manner of defensive patent tactics, they will patent in the subsidiary countries because of the law requirement like India has a similar law.”

Figure 5.4: Classification of IPO patent applications based on different attributes*



Numbers mentioned in the bracket shows number of patent applications

Figure 5.5: Classification of USPTO patent applications based on different attributes*



Numbers mentioned in the bracket shows number of patent applications

Further, we have analysed firm’s innovative activities classified into three categories i.e., Technology Creating, Technology Seeking and Technology Exploiting in terms of their age, location, industry code and business activity in India. These are given below showing the overall picture of the firms patenting behaviour. The data shows that most firms engage in technology exploiting, seeking, and creating activities in that order. Figure 5.6 shows that out of 778 firms involved in patenting activities, 759 are not at all involved in Tech Creation in India. Only 19 firms contribute to Technology Creation and for not more than 6 years out of the total 14 years (2007 to 2020) (See Table 5.2). This result highlight that this move of companies towards technology creating is relatively new. There has been increase in the technology seeking activities, but the numbers based on IPO filling are not very encouraging. Indian subsidiaries of the foreign firms have a long way to go before these become the independent creators on new products and processes. As of now they appear to be working in the shadow of their headquarters.

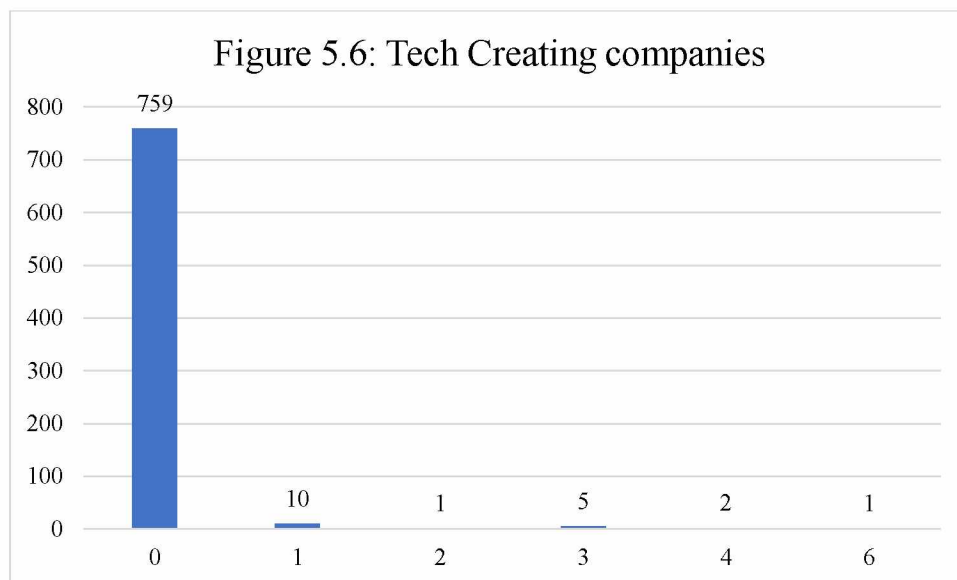
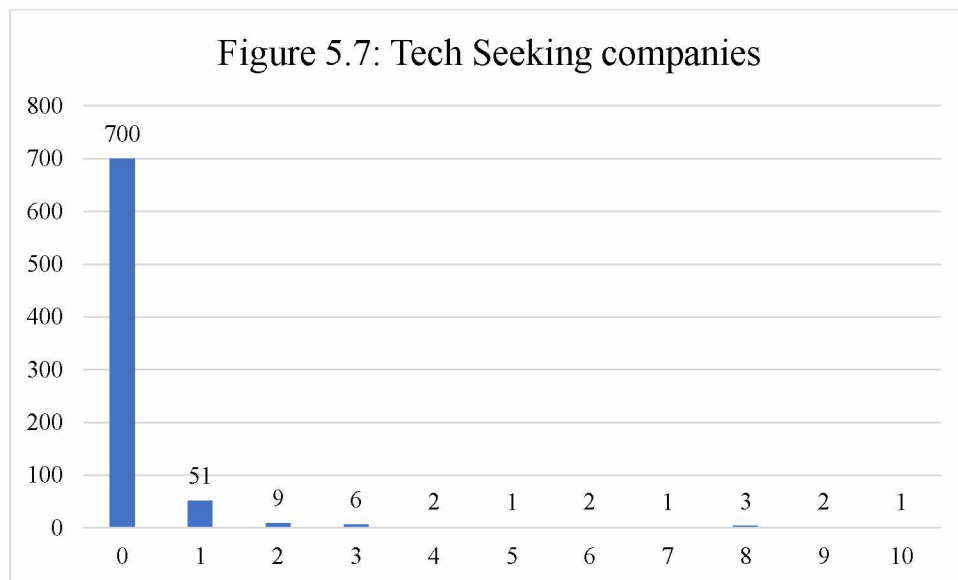


Table 5.2: Tech Creating firms with Number of Years	
No. of years when firms are Tech Creating	No. of firms
0	759
1	10
2	1
3	5
4	2
6	1

Mostly the focus of foreign firm is technology exploiting but most recently technology seeking as well. Table 5.3 shows that more than 50 firms have been engaged in technology seeking in recent years. Similar, information is presented in Venn Diagram format in Figures 5.7 and 5.8

Table 5.3: Tech Seeking firms with Number of Years	
No. of years when firms are Tech Seeking	No. of firms
0	700
1	51
2	9
3	6
4	2
5	1
6	2
7	1
8	3
9	2
10	1



Technology seeking activities have been noted by experts as well. For example,

“Recently for designing a product there was a collaboration between the XYZ Indian R&D team and XYZ France R&D team. So, in that case also, there was no particular order they wanted to assign, the patent was filed in India and the order was based on the contribution only. Most of the R&D was done in India like the testing and all that part so the Indian contributors were given the

preference more than the France contributors. Such collaborations are not very often. But it is due to the person sitting in France is very senior most who has experience in that particular field, so Indian inventors were taking the guidance from him but in few parts he also contributed. So that is how that went about but most of it the Indian inventions make most of it like it is completely based out of its Indian location only.”

“Many foreign companies come to India, invest very minimal and then they make patents out of it from here. It simply means that they get the benefit of the intellectual property that is very widely available in India.”

Another one noted:

“The industrialists (in India) have started realising the power of R&D. There is something called first level R&D which is there in Europe and US and companies like ABC are investing. Second is the R&D by imitation, so the last few years India was under that phase. After passing through that phase now is the time when India has availability of some resources like money, talent and have some better collaboration opportunities and willingness to do better. Next 5 to 10 years may be the investment by firms in R&D will be significantly high. Again, India may not have to invest like US and Europe because frugal approach is in the DNA of Indians.”

Figure 5.7: Classification of the firms patenting at IPO

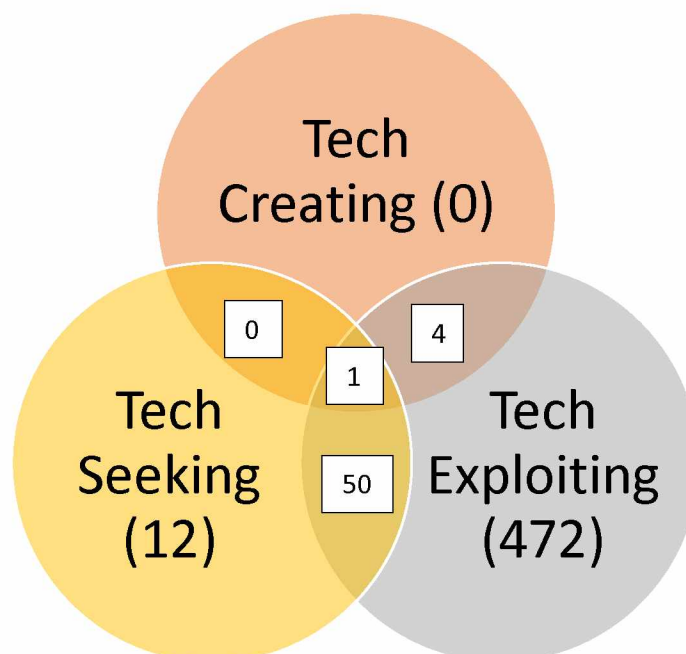


Figure 5.8: Classification of the firms patenting at USPTO

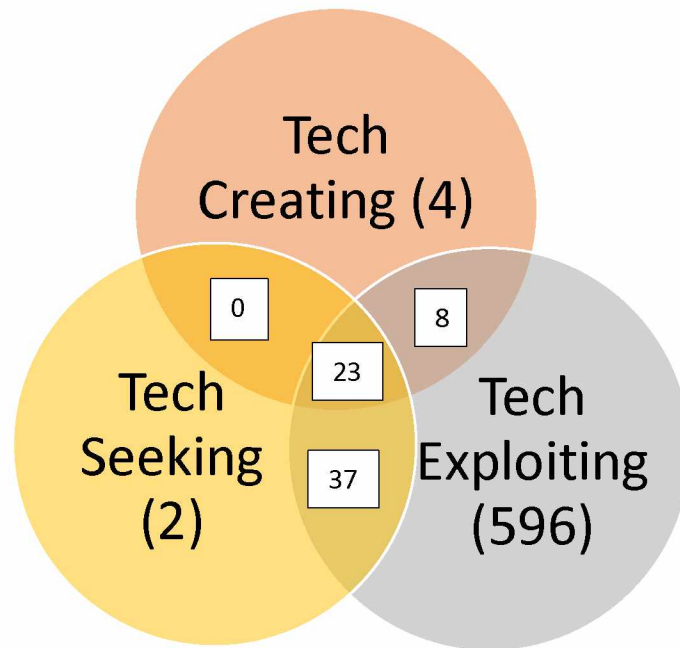


Table 5.4 shows that mostly technology creating activities have been associated with British and American firms. While Japanese, British, and American firms are using the talent pool available in India through its technically skilled labour and engage in technology seeking activities. Table 5.3 gives the state wise classification of such patents.

Country of Origin	USPTO				IPO			
	Global Innovation Activity	Tech Exploiting by USPTO patents	Tech Seeking by USPTO patents	Tech Creating by USPTO patents	Tech Exploiting	Tech Seeking	Tech Creating	Patents with missing information
Japan	101733	113683	65	11	17032	155	5	9
United States	38038	46231	1329	126	6076	136	17	8
South Korea	50794	2300	11	35	625	11		
Germany	10675	18711	7	21	3572	47	6	1
China	10401	4218	6		799	1		
Sweden	3124	7034	3	19	1517	6	6	2
United Kingdom	1186	5103	75	12	2331	152	37	2
Switzerland	1190	4252	5		2198	7		
Taiwan	4792	23			2			
Saudi Arabia	343	2842	560	36	615	50	3	6
France	777	2228	5	3	1058	4	4	

Malaysia	141	2161			217			
Israel	424	1118	45	5	355	16		2
Finland	209	971			369		1	
Georgia	305	763		2	272	1		2
Netherlands	726	391			45	1		
Austria	178	802	7		163			
Luxembourg	38	640	2		381	5		
Italy	248	289			152			
Canada	41	265			78			
Australia	61	193		1	79	1		
Iceland	13	321						
Denmark	26	272			24			
Singapore	117	171			23			
Hong Kong	25	151			107			
Spain	29	171			60	2		
Ireland	16	75			8			
Czech Republic	5	25			67			
Russian Federation	21	19			26	29		
Belgium	6	20			13			
Norway	4	8			6			
Bulgaria		8			2			
Poland		5			2			
Cyprus						6		
New Zealand		4			2			
Brazil	1	2			2			
Mexico		3			1			
South Africa	1	3						
Thailand		4						
Sri Lanka				1		1		
Kenya					1			
Philippines					1			
Slovakia						1		
Turkey					1			
Grand Total	225688	215480	2120	272	38282	632	79	32

Table 5.3: States wise foreign firms in India and percentage share in patenting			
State	No. of Companies	Companies involved in patenting	% of companies patenting
Maharashtra	525	242	46%
Delhi	268	126	47%
Karnataka	239	131	55%
Tamil Nadu	187	84	45%
Haryana	139	81	58%
Gujarat	99	42	42%
Telangana	52	20	38%
Uttar Pradesh	50	12	24%
Andhra Pradesh	29	14	48%
Rajasthan	23	10	43%
West Bengal	22	6	27%
Kerala	10	0	0%
Goa	9	6	67%
Punjab	8	1	13%
Chandigarh	4	1	25%
Himachal Pradesh	2	0	0%
Orissa	2	0	0%
Pondicherry	2	1	50%
Uttarakhand	2	0	0%
Dadar & Nagar Haveli	1	1	100%
Meghalaya	1	0	0%
Total	1674	778	46%

Temporal Trend

The patent level segregation was aggregated based on application year to decipher temporal level trends in technology creating, seeking, and exploiting activity. Figure 5.9 shows that both at IPO and USPTO, percentage of patent applications in the category of Technology Creating and Technology Seeking jointly have increased from 2011 to 2016 but it is decreasing since then. The possible reasons could be that India had witnessed high GDP growth rate just before the 2011 to 2016 period, which is from 2003 to 2011 with exception of 2008. Further, firms incorporated in India in the years 2012, 2013 and 2014 holds mostly technology exploiting patents. Thus, percentage share of technology creating and seeking has dropped. Since the

percentage of Creating and Seeking moves in similar direction for all three major regions, it suggests that there are some common factors influencing these firms' decisions.

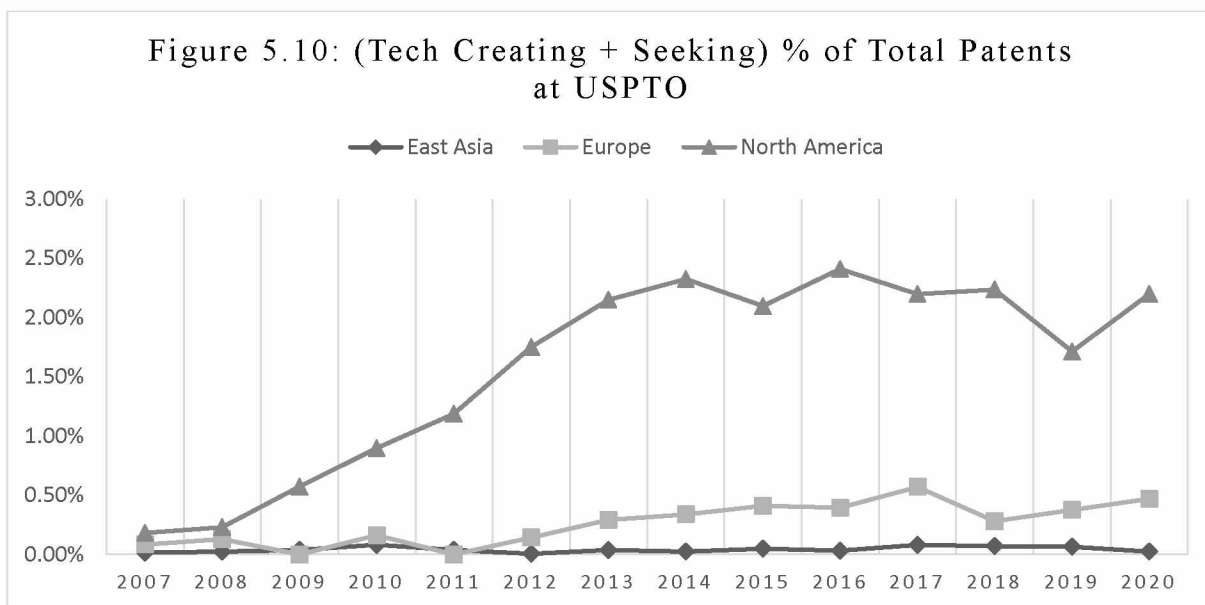
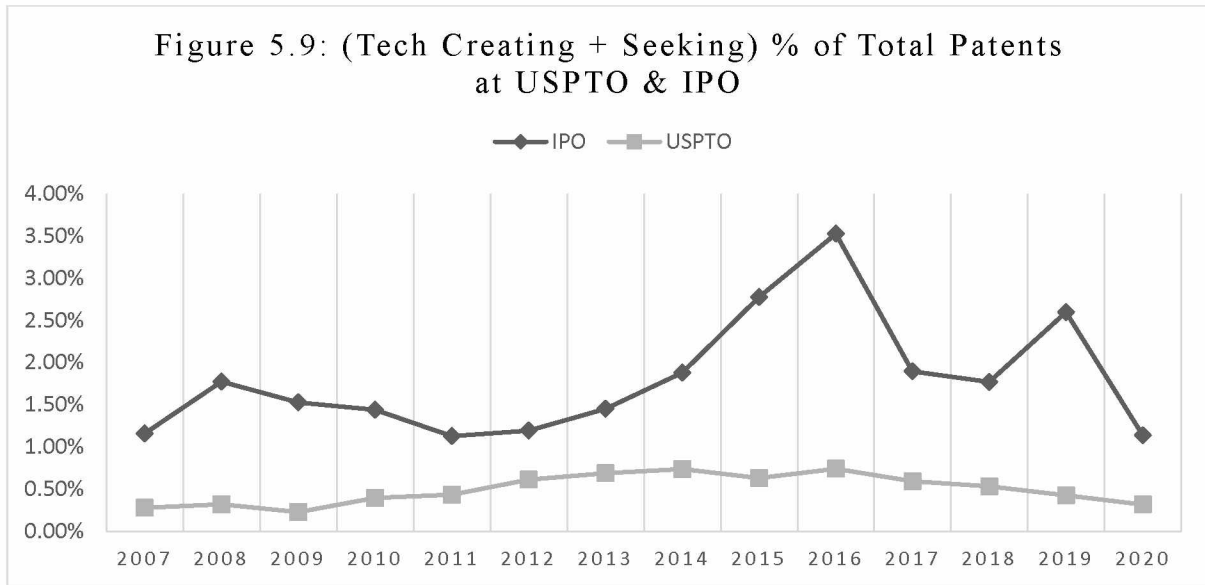
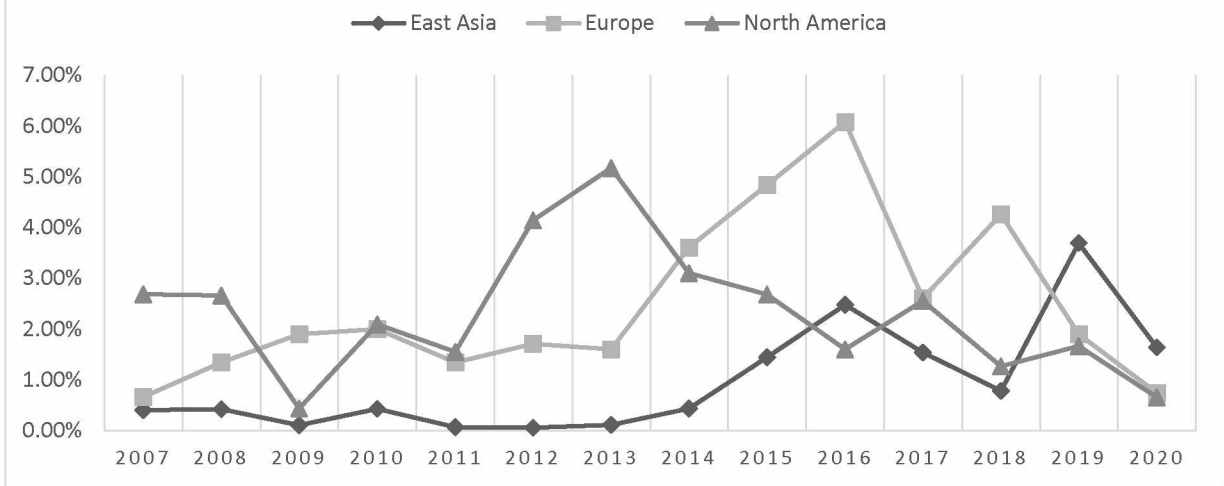


Figure 5.11: (Tech Creating + Seeking) % of Total Patents at IPO



Annexure B lists all companies and their patenting activities as technology exploiting, seeking, and creating based on their patent's application at IPO, USPTO and at both the patent offices. Annexure C list the non-patenting companies.

CHAPTER 6

Summary and Conclusion

6.0: Introduction

The previous Chapter presented the result of an exercise designed and conducted to understand the nature of innovation activity conducted in-house by foreign firms in India. We designed a framework for such innovation activities to classify them into three categories i.e., technology creating, technology seeking and technology exploiting as per the of nature of firm's R&D. Further, we presented the key findings from the patent data following the different criteria such as patent office wise distribution, country wise distribution of patents/firms, technology class wise distribution, state wise distribution of the firms. We also presented the supporting arguments given by the experts to our findings. This Chapter summarizes the overall findings of the study followed by key observations, policy recommendations, limitations of the study and concluding remarks.

6.1: Summary

In this research project, we explore in detail the R&D and patenting activities of foreign origin firms in India from a host country perspective. We attempt to answer a key research question i.e., under what conditions MNEs engage in R&D and patenting, and what is the nature of such innovation activities? We have focused on wholly owned subsidiaries of foreign firms to find the answers. The key motive of this study was to provide a better understanding of R&D investments made by US multinationals which have become increasingly important to them. Further, we contribute towards identification of the type, purpose, evolution over the time and significance of R&D investments made by MNEs. One general observation is that all parent organizations guide the R&D and patenting functions of their foreign subsidiaries.

We identified the drivers of R&D and patenting by foreign firms in India using panel data regression techniques with both fixed and random effects for our sample. In case of R&D equation, we applied logit and probit regression techniques, as the dependent variable is binary and independent variables are continuous. We reported the results of the conditional fixed-effects logistic regression with odds ratios. For patent equation, we estimated the results both ways using patent (dependent variable) as categorical variable as well as count variable. We applied logit and probit regression techniques in the first case and negative binomial in the

second case as per the type of dependent variable. We also analyzed firms' data by cross tabulating with market growth, technology intensity and market concentration.

Our conceptual framework to conduct the study is inspired by the previous works of Le Bas and Sierra (2002), and De Beule and Van Beveran (2019) to identify the nature of foreign R&D investment by multinationals in the Indian markets. We also followed Ronstadt (1978) and Qi et al. (2014) to understand the role of R&D activities of the offshore subsidiary firms in host country. First, we categorize the patents filed by the firms at IPO and USPTO on the basis of priority, assignee and inventor level information in three categories i.e., technology creating, technology seeking and technology exploiting. Further we categorize the firms in the same three categories as per their patenting activities.

We prepared the database exploring different sources as there is no structured database available that provide information on firm level indicators for unlisted and incorporated foreign firms in India. We find few firms in CMIE PROWESS data set but with missing information of key interest variables. Therefore, we shifted our analysis to industry level indicators. We have collected company level information from MCA21 database, industry level information from CMIE PROWESS database and innovation indicator (patent application) data from PatSeer database.

6.2: Key Findings and Synthesis

1. Information on R&D investment made by foreign firms is rather limited.
2. Only 32% of foreign firms that are wholly owned subsidiaries invest in research related activities through these subsidiaries.
3. Almost 46.5% WOS (from the same sample) are involved in filing patents either at IPO or USPTO or at both
4. The discrepancy in R&D investments and patenting highlight the potential use of Indian market to exploit the technology developed elsewhere.
5. Competitive industries incentivize WOS to invest in R&D in India.
6. Similarly, in concentrated industry firms have less motivation to patent.
7. In terms of patents filed at IPO by WOS, most patents have priority outside India.
 - a. In case, priority is India, assignees are also Indian, and, in such cases, involvement of Indian investors is higher either as majority inventors or as first investor.

- b. Even when priority is not India, most applications have a family patent in India.
 - c. There are certain cases with Indian assignee and Indian inventors when priority country is not India. Clearly, these firms are looking for the Indian talent to complement their innovations at international level.
8. WOS patent applications at USPTO also have mostly patents with priority outside India and without Indian assignees.
- a. For cases, with priority in India, assignee is not India but, inventors are based in India. This is in line with a comment that to avoid cost of foreign filing license (FFL), companies may give India as priority country and then use that for most international patents when Indian inventors are involved.
 - b. In cases, if Indian inventors are not involved and priority is India, an expert has noted that only for market considerations, company will choose India as a priority case.
9. Majority patents are for exploiting existing technology in Indian markets, however, in recent times there is a boost in the technology seeking and creating activities of WOS.
10. We find that only 42 Indian subsidiaries have been the first or second assignee of the patents. These subsidiaries have only 13 patents at USPTO and 720 at IPO.

6.3: Policy Implications

Empirical results of this study obtain its efficacy in policy making for India. We present the implications of the results for policies related to data, patent, and innovation. Basant (2021) presents a holistic approach to innovation policy whereby it is not restricted to merely devising tax credit scheme. This approach captures various policy instruments that are likely to influence generation, production, and diffusion of knowledge in an economy. We employ the similar approach while making policy recommendations. Table 6.1 present the recommendations succinctly:

Table 6.1 Policy Recommendations

Policy	Suggestions
Data	There is no structured database available exclusively for foreign firms (wholly owned subsidiaries) in India. In this case, it is difficult to capture WOS related information with accuracy. There is a need for

	<p>maintaining structured database for foreign firms that provide all financial and other company related data. Providing such data to the researchers may improve the quality of research in the country. Also providing it on paid basis can be a source of revenue generation for the government.</p> <p>It was observed during the data collection process that there is data reporting issue in the existing system. There is no mandatory regulation in India for the companies to report yearly R&D expenditure related data. The column of R&D expenditure is not mandatory for all the companies to fill in annual filing form. For any policy reforms data analysis for the past years is important. Therefore, relevant policy makers should work in this direction to strengthen India's innovation policy.</p>
<p>Patent Policy</p>	<p>The requirement of IPO to first file patent in India has been fruitful as this makes companies identify the contributions of Indian inventors and filling priority in India. We suggest that this aspect can be strengthen further by ensuring better compliance.</p> <p>Data related to patents of foreign firms can be made easily available and assessable for research purpose. The Indian Patent Office may learn from best international practices in terms of making data available like USPTO.</p> <p>As we find that most patents could be filed merely to use internationally developed products in the Indian market, IPO can keep a strict watch on patents' commercialization through Form 27 particularly for patents filed by foreign firms and non-residents and devise way to release patents for public use if not commercialized or manufactured in India for certain time. However, policy design for such intervention requires careful consideration given Indian commitment at WTO under TRIPS.</p>
<p>Innovation Policy</p>	<p>Most expert pointed at the need to enhance research infrastructure which is costly for individual companies to develop. Building research</p>

	<p>infrastructure include creating research intensive ecosystem that also requires supportive trade and industrial policies. For instance, an expert pointed out that:</p> <p><i>“The emerging fields like robotics or defence research needs to purchase many things from outside that is not manufactured in India. In those cases, they have to get clearances to import the material to India and then integrated with their systems and then execute the work. This is more common in the field of the aerial robotics e.g., quadcopter or drone technologies. In such cases when the things that are imported like lidar (sensor), the higher-grade sensors are required for higher precision. For such components, researchers face problems in importing, it takes time to get that at the ports. May be some leniency in that part with respect to R&D classification may help.”</i></p> <p>It will be supportive for R&D activities if while importing such components relaxation can be given for firms engaged in research.</p> <p>Incentives schemes can be devised for products invented, designed, and produced in India in line with the PLI. The scheme may have gradation in incentives if it is (i) invented, designed, and produced; (ii) designed and produced and (iii) produced. The patent level information can be utilized to decide the level of gradation.</p>
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6.4: Limitations and Concluding Remarks

In this research project, we started with the aim to capture most foreign firms. However, due to limitations in access to data we focused on WOS. However, the framework that we have devised in this project can be used to analyze the R&D centres of foreign companies and their outcome. This would also be in line with the comment made by an expert who mentioned that core and basic research is likely to be carried out in the R&D centres as compared to in-house R&D lab that may focus on more developmental and incremental work. In future, we may also find linkages and interactions of these WOS with the other stakeholders of the national innovation system.

Research Summary

R&D and Patenting by Foreign Firms in India, by Prof. Ruchi Sharma. Indian Institute of Technology, Indore. 2022

This work provides a quantitative and qualitative analysis of the wholly owned subsidiaries of foreign firms in Indian. Internationalization of R&D by MNEs has been a major area of study in international business and strategic management. Our study significantly contributes to this literature by bringing the focus to host country which is also an emerging economy. The role of FDI and MNEs in India's growth story since liberalization by bringing intangible capital and ensuing productivity gains have been the leading areas of research in India.

In this report, we study the drivers of wholly owned subsidiaries' research and patenting. The competitive forces in the domestic market are nudging the foreign firms into innovation activities. Further, patent data has been analysed to understand the nature of innovation activity (technology exploiting, seeking, and creating) carried out by these firms in India. We find that only 42 Indian subsidiaries have been the first or second assignee of the patents. These subsidiaries have only limited patents at USPTO and IPO. The analysis of broader dataset of patents reveal that Indian have been involved in relatively more R&D projects as inventors. This result imply that firms are looking for the Indian talent to complement their innovations at international level. Mostly the patenting activity of foreign firms are geared towards using the technology developed globally in Indian market. We suggest that incentive scheme needs to be devised on the lines of PLI for products invented, designed, and produced in India. Further, gradation can be introduced based on the extent of innovation conducted in India. This way firms will be motivated to conduct R&D locally and produce its outcome domestically. The framework based on patent details that is suggested in this report to analyse innovation activity is novel and can be employed by future studies.

End project deliverables

- a) Project Completion Report
- b) Two Research Articles for Journal Publication – in-process

How the outcome of this project will be beneficial to various stakeholders.

- The survey of the literature and the methodology shows that this field of research is important from the view point of policymakers and entrepreneurs but it is not much explored by researchers.

- The findings of this study highlight the strong policy implications of R&D activities and foreign patenting from developed to developing countries. Those policy implications would be important for both practitioners and policymakers in the future.

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Annexure A

Introduction Letter to Industry Personnels

Dr. Ruchi Sharma

Professor of Economics

Indian Institute of Technology Indore, India

Dear XXX,

I am writing to kindly ask you to have a one-to-one interaction regarding our on-going research project titled “R&D and Patenting by Foreign Firms in India” supported by Department of Science and Technology, Government of India (GoI).

The objective of the study is to investigate the investment made by foreign firms in developing location-bound assets (assets developed at Indian affiliate) in India. Further, does such an investment lead to outcome that can be patented? The proposed study is expected to provide an empirical justification for the motives, types of innovation and patenting by foreign firms in India. For this project, we are specifically focusing on manufacturing sector.

As a part of this project, we would like to conduct this interview to obtain detailed knowledge on R&D and innovation strategies of the firms to validate our findings. The survey is expected to take approximately 20 minutes, focusing on the items listed in the attached "Questions items". It will be held using online meeting platform.

I request for an appointment with you for an online meeting in second week of May 2022. Please let me know when you would prefer to have a meeting.

I am looking forward to hearing from you.

Yours sincerely,

Ruchi Sharma

Annexure B

Inputs by Industry Experts/Practitioners

1. Expert 1 (Industry)

Relevance of Priority, Assignee and Inventor

Product companies tend to have probably a 1:3 ratio between core R&D and support staff (QA, admin support, lab assistants). Some surveys have a puritanical view of how R&D is done in the companies and the numbers reported by the companies in the records are mostly aggregates. Any calculation based on that may mislead the findings. Information like priority, assignee, and inventor are not in all cases that can be indicative of locating the innovation. Because priority country mentioned in the patent application would depend on where is the biggest market and what is that patent being used for. There are certain innovations e.g., Vodafone, and Singapore Telecom that have tie-ups in India. Probably that invention or that R&D has taken place in some other markets such as the US because historically the presence of companies like AT MT, and Bell Labs, has a lot of people with very significant telecom experience. In India, we have operator experience but may not necessarily have telecom standards experience. Whereas countries in Europe, Finland, or any of the Scandinavian countries or the US have very deep telecom technology development experience. Therefore, the innovation is being done there but it is assigned on a high priority to the market like India or anywhere in South East Asia because that is the market where that innovation will get preference. To some extent, priority depends on what is the business model and how the revenue realization.

In the case of inventors in global companies, there is a lot of movement of people. So, work could get started in the US or Europe and move to India. And conversely, India could have people who start something but because the bulk of the team is sitting in some other location it is generally more efficient to keep that R&D team in one location.

If a WOS patent is either at IPO or at USPTO with priority in India, is it because of the thing that India is the major market for them?

Yes (as per his understanding)

If the patent is in the name of WOS but filed at USPTO, is it due to the preferable market? can we say that the invention happened in India?

No. If it's a wholly owned subsidiary it is completely indifferent because of initial filing will happen in the home country it doesn't happen in India. If it's a US company it will happen in the US or if it's a European company it will happen in Europe. Patents are expensive so most MNCs will patent in their home country as a manner of defensive patent tactics, they will patent in the subsidiary countries because of the law requirement like India has a similar law. But in such cases, it can be observed that the patent filed in the home country of the firm is a couple of months ahead of the patent filed in India.

Relevance of Inventor order

If there are Indian inventors in the patent application then they are the part of global R&D value chain of the company but most companies put the order of names of the inventors in descending order of the importance of the contribution and it is internationally accepted. It means that the inventor or the group of inventors who have contributed more will be listed upfront in the patent application document.

Technology Strategies of the Companies

If the WOS tries to do some R&D in India, what would be the key motives for them, and how it will fit into their international business strategy?

It involves three things. First, where do you find the talent? It is the first and most important criterion to look at. As we know R&D is disruptive in nature. Therefore, the specific market in which the R&D resources going to be deployed is not as important to developing the technology as much as where are those people located and who are they. Large international companies have both, the resources and the ability to gather information about the target markets and feedback. They have a fairly sophisticated market in organizations that can gather data. If it is required, they can take the team and bring it into that market for in-person experience. Most of these companies can do that. They could even have the team meet with customers. For example, they could fly the team of company Cisco into India and make them spend time with a Jio or a Bharti Airtel because certainly, the local subsidiary has customer relationships and commercial relationships. So, carrying an immersive experience of the local market for the R&D team is not a problem. So, it comes to where is that the technology going to be developed, it will be developed where the expertise is available, wherein the mind is a lot of this is collaborative work. So, if they find that a team of researchers in an academic institution has a significant body of knowledge in a particular sector they might want to keep the team reap that development out of India working in close collaboration with that institution.

But the converse could be true. If a company has a technology where the deep experience is in a country like Germany or the US, specific key people from that subsidiary could be moved to India. It's an intra-company transfer. Most of these R&D people have fairly cutting-edge skills so whether they are working out of Delhi or Bangalore or Chennai or Hyderabad or they are working in Boston or Frankfurt, its indifferent. Because the universal language is English and what they need to do is put these people and make sure that the island of experience, deep knowledge is available to these people. If it is collaborative work then they need to be as close to be academic center with whom they are collaborating.

Second, collaborate and compete at the same time, because the cost of technology development has become so expensive. For example, Philips has developed process technology for semiconductor manufacturing in a three-way collaboration between Philips (a Dutch company), ST Microelectronics (a Swedish company), and Freescale Semiconductors (an American company). It was formed "*Co-opetition*" (cooperate for the development of process technology to compete in the marketplace) because if one of them develops the basic technology up to a certain level and the next company goes to its engineering team's change it to whatever is their product requirements. Now in semiconductor technology STMicroelectronics for example had a whole line of extremely low ball (LB) pitch products in which Philips was not interested so Philips wouldn't go to extreme LB kind of products STMicroelectronics would so process technology was taken up to a certain level. Third, there is a great example in the automotive industry, there was a time when the 1.3-litre multijet CRDI diesel engine was developed by Bosch and it was used by Maruti, Tata Motors, Hyundai, and Fiat. The engine was the same but it was mated differently to gearboxes. So, whether it was the Maruti Swift Desire or Swift or Indica or Indigo or the Fiat Palio or Brezza, all of them had the same engine but the cars were completely different, the advertising was different, the positioning was different the prices are different. That is co-opetition.

2. Expert 2 (IP Law Firm)

Relevance of Priority, Assignee and Inventor in different situations

If WOS file a patent at IPO as first filing but priority is the US and it is going through the conventional or PCT route to US also.

Or

If the WOS of an American company based in India, shows priority India or priority US, does that reflect anything about the innovation activity or it reflects about something else?

Or

If WOS filing a patent with most Indian inventors and US as a priority instead of India, what does it mean?

It may be a situation where the US is a potential market for them, it is crucial for them to enter the US first otherwise that invention may come before their invention in the US market. The market plays an important role in such cases and it can be one of the reasons to put the US as a priority. This means that the company has to enter this market first otherwise they won't be able to make business. Under Section 39 of the Patent Act of India, there is a requirement that if the inventors (one or more) are Indian nationals then there is a requirement that they must first file the application in India, and then only they can file within six weeks after the date of application in any other country. If the company doesn't want to follow that route, then they have to obtain a first filing license (FFL) from the govt. of India. So, that is also a reason that mostly we see that any Indian inventors or applicants first file in India. However, most electronics companies like Siemens or Samsung at times what they do is they take permission from the government and file their application first in China or in Korea even if the inventors are Indian, they take the license, they file the application in another country and then they enter India. It only depends on the type of invention, type of the market, and other factors that the company considers.

If the company realize that India is also a potential market, it will be comfortable for them to go through the normal route?

Yes

However, China or the US are another market that will go through this entire process because it is a cumbersome and costly process. The very set that the company decides to go through means that the other market is more important than the Indian market. In that case, the priority doesn't matter.

Yes

In our data there are patents with crisscross priority information like patent filed in India but the priority is US. How to interpret this?

That can happen as the company might have filed other applications in the US but they are taking some matters from the US application, they are referring to that application thinking that ok we have filed this application and this data is already disclosed in that particular application so we are claiming the priority from the US application.

Relevance of Assignee order and Inventor order

There is no legal significance of the assignee order and inventor order, it is just a list of inventors/applicants. It has no legal effect, although there is no difference in terms of their legal rights. However, the first assignee or first inventor is considered as lead assignee or lead inventor. The name of the lead inventor can be used to cite the patent somewhere just like a research article.

If more than one assignee in the application, that should be considered as collaborative work?

Yes. Both/all assignees have equal patent rights.

WOS filed a patent at USPTO, putting India as a priority with no Indian Inventor.

It means that the company prepares the application, and files it in India first. Further, claiming priority from Indian application, filing the patent application in another country. In such cases, they must have filed other applications in India also and they must be linking the priority with that.

Can we also infer from that if in case that they gave priority to India, it is most likely that some amount of innovation would have happened in India from the company's point of view?

Or

Some R&D in India, some involvement of Indian inventors would have been there and some work would happen in India.

Some Japanese companies like Suzuki, hire Indian attorneys for patent application drafting purposes. So, they get their applications drafted in India only. Drafted in India means they may be saving their cost as drafting costs in India are lesser. They file their applications first in India only and claim priority from that from this priority they enter Japan. It is generally followed by Japanese WOS. Attorney costs along with some part of the work done in India can be one

of the reasons for this strategy. If Indian inventors are involved, it is quite straightforward because they are just wanting to avoid the cost of FFL.

What if no Indian inventors are involved or very few Indian Inventors are involved? Priority India filed at USPTO.

It can happen if they see the Indian market as favorable to them or because India is a developing country and there are many companies also investing in India these days. So, if there is a delay in filing a patent application and till that time that invention already enters the market, there will be no use for them to market that product. So, maybe that could be a reason that for the purpose of safety only of the commercialization they wanted to enter India first and then file in the home country.

If they are filing a patent at IPO and the priority is not India then can we say that essentially they must be using some information from the patent that they might have filed in the USPTO or some other country?

Yes

Note: It is very straightforward wherever the invention happens priority should be there, and the inventor should also be from there but the problem arises when we have these very complex findings.

It always depends upon the company's preferences and commerce because the patent field is all about the company's commerce. So, patent attorneys just take care of the company's commercial activities and accordingly make filing for them. In fact, sometimes what they do is they enter multiple countries at a time but then gradually they realize that the processing time is too much in all the countries and if they feel that they cannot make money in any of these countries then they amend that application that time or they do not take it forward.

When we look at the patent application filed in other offices like USPTO if we find the Indian inventor's name being there so in that case the Indian inventor would have taken permission under section 39 which you mentioned earlier?

Yes. Then only that patent application would have been filed in that country. Without that permission, it is not.

That would essentially mean if the company is going through these entire processes, application matters more in that other country from commercialization point of view rather than just filing a patent.

Technology strategies of the foreign firms (Tech creating, seeking, and exploiting)

If the patent application holds Indian applicants and Indian inventors then it can be said that the element of technology creation is there because they are Indian nationals and conducted their research in India and then they applied for the patent.

The other kind of application for example a PCT application where maybe one applicant is claiming priority for the Korean application or where all the inventors are Korean claiming priority from the Korean application and now entering India. Such filing can be considered as exploitative in nature.

The third type of application is where an applicant claims priority from some other country because applicants of the parent company or other subsidiary belonging to that country may be and inventors belong to India in that case there can be a chance that it has been made as technology seeking. These days this is becoming more common because what they do is they invest in Indian research institutions, on Indian researchers, they help them and then the invention they come up with, attorneys file for different applicants although the inventors are not Indians.

Nationality of inventor vs resident status

While filing the patent the current address of the inventor is considered by the attorneys. Section 39 also talks about the residence status. It says that residents not apply for patents outside India which means that no person resident in India make any application outside India and for the resident requirement, it is the same as Income Tax filing. Whether the work was performed in India or not can be inferred from this section while checking the resident status of the inventors at the time of application.

The nationality of the inventors is not the criteria to locate the invention but the resident status is important in that case. It is the same requirement as in ITR filing that for some specific time period in the past the person should have resided in India. Similarly in the case of patent filing if the resident status of the inventor is calculated in India at the time of filing, then inventors have to get permission from the Indian Govt. however if they do not fall under this category, they can directly file the application in USPTO if US office allows that. In a group of inventors

even if only one inventor falls in this category, then also, they have to get permission from the Indian Govt. before filing the patent in another country if the assignees are not Indian and the priority is not India.

3. Expert 3 (Industry)

Relevance of Priority, Assignee, and Inventor in different situations

With respect to the patents filed in Schneider Electric India Pvt. Ltd., it is mostly for IPO only, most of the patents are not applied outside India.

What makes the company choose the priority country while filing the patent application?

If they are choosing a specific country as a priority that means they have done their research and they know that in this country there are probably more opportunities to exploit the technology which could be one of the reasons.

Relevance of Inventor

This comes out as the quantum of work that is done by an individual in that particular innovation. So, in India itself with respect to inventor order we list down the names of the inventors in such an order the one on the top or first inventor is always the one who contributed the most to the patent. That is how we order it.

Cross-Location R&D work in the same company

Recently for designing a product, there was a collaboration between the Schneider Indian R&D team and the Schneider France R&D team. So, in that case, also, there was no particular order they wanted to assign, the patent was filed in India and the order was based on the contribution only. Most of the R&D was done in India like the testing and all that part so the Indian contributors were given the preference more than the France contributors. Such collaborations are not very often. But it is due to the person sitting in France being very senior most who having experience in that particular field, so Indian inventors were taking the guidance from him but in a few parts, he also contributed. So that is how that went about but most of it the Indian inventions make most of it like it is completely based out of its Indian location only.

When you say that they took help, was the actual product design and concept of it must have been developed there and was being implemented in India by Indian inventors was it something like that, or concept itself come from Indian inventors?

The concept came from Indian inventors and they took guidance from that particular person sitting in France for the implementation that how to go about the project.

What about the usage of R&D facilities?

We have all the set up in Indian center, so we do all our products in Indian facility only. The foreign center team visits the Indian center. For projects, they visit the center but are not sure about the patents. If there is a new product that has been developed in the Indian facility so in conjunction with the France headquarters and US offices. Both of them have frequent visits to Indian facilities.

For the Indian context you are saying for your company the choice is essentially India and after that, they may go for the international route may be through filing a similar patent across the world depending upon the market and deciding the priority accordingly.

Yes.

We have also found that there were Indian inventors in the patents which were filed by companies in other countries like the US. In such case, according to you, the contribution was made to that entire project by the person and that is why the name is there.

Yes.

What kind of support do you get from your parent company or headquarters in terms of research work?

In terms of the research work for example a factory automation department of Schneider Electric India Vadodara R&D facility, this department is responsible for doing R&D for manufacturing location industry 4.1. So, in the process if there is anything new with respect to fixturing or material feeder goods methodologies. The department is not responsible for the whole process, that is not possible. For that if you say that Schneider Electric India Pvt Ltd. is a subsidiary of Schneider Electric Global with their funds. So, they have separate funding that has been allocated for every department. Similarly, Schneider Electric India Vadodara R&D facility has a separate fund allocated for which the department works. In our department funding 35-40%, we give it to the new technology.

This is internally generated fund or coming from Parent company?

Not sure about the cash flow part.

Our understanding is that there is a complete value chain of R&D and a certain portion of the work is being done by the team in India and then another part of the work may be done by another team who may be located anywhere else and may have expertise in that area. Is this how it is going on?

Yes.

So, in such settings these companies identify which team can do what and according allocate the work, and then bring it together.

Yes.

This bringing together process happens where? Headquarters or a particular location?

We have a platform kind of thing inside our department where we can post any projects or any help that we are seeking outward. So majorly the collaboration happens in that particular platform. So let's say there is project A of the automation field and we need expertise in the fixturing part (automation on fixturing) in that case I would post a project kind of thing on that platform and anyone interested in that would try to communicate with me and will see the fit for the project and then will collaborate.

In the current situation where we see the globalisation or internationalisation of R&D can we see if is there any single product that newly came of your company (Schneider Electric India Pvt Ltd) that was conceptualised and completely done in India? Can we say that this kind of thing is no longer prevalent?

Yes. You could say to a certain extent.

Headquarters role to divide and allocate the work to different teams located in different countries.

Generally, headquarters don't specify anything, it is a completely departmental decision who handling the project and the team which is handling the project. The headquarters doesn't interfere with that. If they feel that they need expertise they will post to the platform and get the help. This platform is created just to bring them together and whosoever feels to seek help they use the platform.

How your R&D unit is linked to the manufacturing? Does the manufacturing also happen in the same plant? How both are connected?

The Vadodara R&D facility is completely focused on making products in the Vadodara manufacturing plant industry 4.1. So, our objective is to implement automation solutions to the current manual processes that they are following that's how we are directly interlinked. Other than that, if we take with respect to product design, how product design is linked with the manufacturing location is been resolving customer complaints is an integral part of the development team to test in the regulator. Sometimes they do go about iteration mode of testing. So, they change the parameters and at that time they go to the manufacturing plant produce a batch test on that batch and see the results, and depending on that they refine it. That is how product development is linked with manufacturing.

In literature there is a term called R&D Centre which is essentially designed to do R&D whereas our focus is that manufacturing is basically because of the so-called in-house R&D. We want to understand a bit more about how this so-called in-house R&D. These R&D units may or may not be located along with the plant, it could be anywhere else in the country also and then they can come to see that. What do you say on this?

It may not be an in-plant station but it is associated very closely with the plants which are manufacturing. Physically not be closed. It is always the case with us like the R&D or design and development center people, there are a set of people who sit with the manufacturing location itself so if they do not have any development project going on they support the people sitting in other offices (Powai Head Office). They coordinate with them and execute the testing and all that. So, it's like a collaborative work kind of thing across the offices.

Apart from testing the development also happens in India?

Yes.

Does the Indian facility also perform testing for the products developed outside India?

Yes. That could also be a case depending upon the testing expertise team. It completely depends upon the products that we are manufacturing. At our location we manufacture molded case circuit breakers and air circuit breakers, so for these two products, if there are developments from any other part of the world, we are open to implementing a testing those solutions. So they will put this testing requirement on the platform and we will be ready to accept that.

Locate the invention (by the patenting strategies)

Most of our activities come under the technology creation activity. Because right from the conceptualisation to the commissioning part of our projects we do it in-house. Patent filing is based on the product development under the project or the outcome of the project.

Few departments do have that collaborative work, in that case, it will be technology seeking which is the second category.

Suggestions for policymakers

No problems faced in terms of R&D facilities or infrastructure so far.

In emerging fields like robotics or defense research kind of things, we have to purchase many things from outside that are not manufactured in India. In those cases what they do is they have to get clearances to import the material to India and then integrate with their systems and then execute the work. This is more common in the field of aerial robotics e.g., quadcopter or drone technologies. In those cases it is mostly like when the things that are imported let's say lidar (sensor), those sensors are imported, and the higher-grade sensors are required for higher precision. For such components, researchers face problems in importing, it takes time to get them to the ports. Maybe some leniency in that part concerning R&D classification may help.

Linkages with academic institutions

There are a couple of linkages in terms of MoUs. Recently contacted IIT Bombay for the development of an AI-based vision tracking project. Whenever we seek some help related to our work and put that particular requirement on the platform but realise that much help is coming in case of that particular problem then we approach other institutions or academic institutions if we can find some solution within India. Yes, WOS is using the major components of the innovation ecosystem, particularly the universities and institutions. In terms of hiring also have campus recruitment for freshers like both B. Tech and M. Tech graduates as well as researchers. Generally, for researchers, go for experienced people.

Involvement of Foreigners in Indian Teams

In R&D, there are 7 levels in the hierarchy and up till the second level everyone is Indian. Some involvement of foreign people (employees from other locations) is also there but mostly in collaborative work.

4. Expert 4 (Industry)

Many foreign companies come to India, invest very minimally, and then they make patents out of it from here. It simply means that they get the benefit of the intellectual property that is very widely available in India.

Volvo Group is creating value for the emerging economies. Volvo is a great company that has the best of technological products available for developed countries such as Europe, and the US. But if we say the drivers of the economy, for more than the last 5-6 years the real drive is to economy is coming from Brazil, Russia, India, and China (BRIC). Typically, in these emerging economies the requirement for the products is very typical which is not there elsewhere in the country. In Layman's example, Volvo bus came to India in 2000-01. Before that actually in India, there were no buses. There were truck chassis with putting boxes on it and call it buses. Volvo brought the bus technology to India for the first time. It used to cost very heavily around 80 lakhs those days, today it costs around 1.2 to 2 crores. So, in emerging economies, people look for not the same quality but they want it at a very competitive price. It is something called frugal engineering, which means high value-low cost. Now high value-low cost is not a competency of every multinational company. While India was looking for a great technology from Volvo at the same time Eicher had its own setup of R&D in Pithampur Auto Cluster, Indore where 900+ engineers are working on core technology which includes electromobility, fuel cell, hydrogen, biofuel, CNG, having a complete range of such technologies. Which is totally developed on Indian soil, in Indian conditions for Indians and for the emerging economies. It is not only Volvo that is adding value to the Indian industry but at the same time, India is also adding huge value to Volvo for the emerging markets. Because they don't have that competence of high value and low cost. For Example, Eicher has one of Asia's best engine manufacturing plants in Pithampur that has been assembling engines for Euro 6 since 2013. Though Euro 6 and DS6 engines came to India in April 2020. But Eicher has been making Euro 6 engines for six years and exporting to the Volvo group. Now this particular engine plant was almost going to China with the investment of more than 1200 crores, which India did at 350 to 400 crores in India. That is an excellent example of frugal engineering. After that Volvo group changed its complete strategy that if Indians can make it at a very low cost why China needs so much investment? Indians are very great in making the products with high value and low cost though such products are not world class. It shows that emerging economies have a very typical price value deposition. Volvo-Eicher Pithampur plant has filed 100+ patents so far.

Does location matter for the innovation?

Yes.

General Electric came to India post-globalisation in 1991, in 1995, Ex CEO of General Electric said that more than the Indian market, I am impressed by the intellectual property that India has. Therefore, for at least the automotive sector India has the R&D centre of almost all the Multinationals worldwide, which excels this testimony of what kind of Innovation is going on in India. But innovation is something which is how fast a country can adapt and how fast that country can learn. It also depends on the Indian partners' keenness. One way is to go to the place where the technology originated, spend money, and get the technology. Another way is to work hard for the Indian conditions, learn from them, and modify the way as per Indian requirements.

There is something called gross vehicle weight (GVW). If a truck is designed for 6 tonnes GVW (the total weight along with the goods that are carried in the truck), it means if the truck weight is 2.5 tonnes, then one can load 3.5 tonnes on that. But in Indian conditions, 3.5 tonnes load practically means 8.5 tonnes load. That is the reason India had to come out of Mitsubishi and start developing its manufacturing of heavy vehicles.

“Japanese people are not able to understand such Indian requirements, in case of Excel shock failure, they used to ask why this failure, and how much was the load. I used to say 8.5 tonnes. The very next question from them was why you people load 8.5 tonnes on the truck with a capacity of 3.5 tonnes. But it is difficult to ask these questions to Indian customers.”

There are certain typical Indian conditions that the Indian industry needs to work on. There are locations for innovation where patents are important but it depends on the adaptability of an individual organisation and its culture.

What kind of support do you get from your international counterparts? Because their objective is very clear, they want to know about the Indian conditions. But what it is that they are bringing to the table which helps you in taking it forward?

First and foremost are the processes and systems of new product development. Indians have a typical strength that they know how to break something before how to make it. This is the only reason that India is an IT giant.

Why Indian software are so popular in the world? Because no one can think the way Indians can think. From every point of view of software, every possible failure mode Indians can take off. Because of the Indian talent in a very short period of time companies like TCS, Infosys,

Cognizant, Wipro, etc, are flying. Microsoft's 25% of the talent is Indian, same is true with IBM, Apple, and any other IT giant. Their contribution to India is first of all systems and processes. A general saying is innovative people are not so disciplined. This is also applicable to Indian talent. Japanese people say that Indians are so brilliant but only brilliance doesn't work for success. There is always a need to have a very disciplined, dedicated working team then only the sustainability and consistency can be shown. Why Japan is very far ahead to India? Because they work very silently and Japan is a highly disciplined country in the world.

First, they bring processes and systems. Second, the technology is very costly. But Indians have incomparable and smart brains. Indians can also learn things from advanced countries that actually they do not want to share with Indians. But definitely, in terms of the core R&D, they are far ahead of India. Today if we see how much of an Indian company is investing in its R&D, except for a few like Tata Motors, Reliance, etc., and some pharma companies due to covid 19, the investment is very low. But definitely Mr. Adar Poonawalla and his team have done a brilliant job by developing the vaccine at a very low cost. Again, it's an example of high value and low cost.

Volvo brings manufacturing technologies to India that they had it in Europe, The Indian team goes there, understands it, comes back, and suitably develops the technology that is suitable for Indian conditions. So, the basic thing Indians learn from there but they know that if we take it as it is from there it won't work for India. In such cases, platforms like NSTMIS plays a major role in bringing the industry, academia, policymakers, R&D centers, Government, and NITI Aayog to one place where we can work hard for initiatives like "Atmanirbhar Bharat" and come out of the silos.

If we say that foreign companies are far ahead of us in core R&D. What does it mean? In India what we are missing to move in that direction?

R&D is all about the investment. The more we invest the more we will get. Companies like Apple, Google, etc. invest heavily in their R&D activities. If a company invests in 10 projects related to R&D, only 2 or 3 may be success. The return on investment is something very high so companies like Tata Motors, and Reliance can afford it. India has created a Hydrogen mission, in the next 2-3 years India may replace fossil fuel with hydrogen or electricity. The industrialists started realising the power of R&D. There is something called first-level R&D which is there in Europe and the US and companies like Bosch are investing. Second is the R&D by imitation, so the last few years India was under that phase. After passing through that

phase now is the time when India has the availability of some resources like money, talent, and some better collaboration opportunities and willingness to do better. Next 5 to 10 years, the investment by firms in R&D will be significantly high. Again, India may not have to invest like the US and Europe because the frugal approach is in the DNA of Indians. Once the academia with very great theoretical knowledge comes forward to work with the industry that actually understands what is innovation.

How to define innovation in the Indian context? What type of innovations is the Indian market looking for?

Innovation is something that is technologically possible, economically viable, and can be offered to society at a cost they want. Unless these three elements work for this there is no other way than collaboration between R&D institutions, academia, and industry.

A product that is conceptualised, developed, and patented in India, selling across the world. That is the kind of product India should look for.

General Motors has closed their set up in India, MAN Truck has closed their shop in India, Scania came, did something, and went back, Daimler India is doing business but sustaining in a very cost-competitive market is not easy. So, these big giants of the auto industry failed to do business in India just because there is something typical about the Indian market.

We have many examples like Pizza Hut, KFC, McD, etc. such companies came to India with the thought that they would change the taste of India. But today KFC and McD have ended up selling vada pav burgers in Pune. McD's competition is not with pizza their competition is with vadapav. They had to modify and come up with Indian versions of their food to sustain in India. Their own specialty has been lost somewhere. They had to change their whole product strategy to survive in the Indian market.

The above examples show that Indian consumers will not pay them just for some fancy stuff like for fancy restaurants but these companies need to offer their products at very competitive prices.

So, that is something that Indian institutions should teach their students that is the “collective unconscious” about how we create things.

Thoughts on investment, DSIR schemes, R&D tax incentives

The fact is innovation doesn't happen by giving incentives. It is the mindset and passion to work for excellence. Incentives are there but if there is no innovative mindset then there is a big gap. Up till now, most Industrial people have a trader's mindset, so India needs to come out from that trader's mindset. Profit should be there but it has to come by offering such a great product and services to society. There India come up with the R&D mindset. Now this is the time when industrialists realised the importance of R&D and they started moving in that direction.

Now government is also pushing manufacturing because manufacturing generates employment. Earlier Indian market was more into trading. Jamshed Ji Tata was one of those industrialists who came with an entrepreneurial mindset. So, the incentive alone cannot do anything.

It should be propagated to government agencies like NITI aayog that only incentives will not work. We need more initiatives like "Aatmanirbhar Bharat", people actually responded to it. We need to equally work on changing the mindset to continuous innovation, improvement, and R&D. No other way than doing this. Not only in the auto sector or any other specific sector but in every sector. Every sector with that R&D attitude coupled with the incentives will definitely grow. Let people understand the power of R&D, it has just started in India.

Technology Strategies

As the data says prevalence of exploitative firms is also relevant to the present scenario. Because it takes some time to get a mature set of things. If we look back India was nowhere before 1991. Then at times when Narsimha Rao and Dr. Manmohan Singh came up with the concept of globalisation. From that point of time, things have changed a lot in all the sectors of the economy due to the opening up of the economy, competition, and exposure to new technologies. There is an example of the company "Hero" Despite of separating from Honda it's the world's number one. Foreign MNCs come to India and get the core activity that they do in their home countries but the low-ranking activities are done in India to a very large extent.

Academia has that classical knowledge and industry has that applied knowledge. Unless they come together it is difficult to achieve that stage of the knowledge creation industry. Indians are making miracles in outside companies like Microsoft. The question is what is not here in India so that it is not happening in India? The answer is remuneration and the kind of respect that they get in foreign countries. Talent needs respect. There are technical and behavioral subjects both India needs to work on.

When the same teams go abroad, the existing level of work and knowledge is already there, once they learn them, then they are able to take it forward from there. That is called maturity.

In India, people wait for the competition. They do not work for their own improvement which is the biggest problem. Unless other people are not improving Indians never thought to improve their own things. Competition has to be with our own performance.

R&D Centres vs In-house R&D (R&D work which is more closely linked with the manufacturing)

The application/implication R&D alone cannot work, there is something called design for manufacturing, design for assembly, and design for service. So, unless these three aspects are taken together with the different perspectives coming from, the robustness of design cannot be an issue. So as far as core R&D is concerned it may not be near the plant. For example, to develop a fuel cell, it doesn't need a manufacturing setup close by. The core R&D centre is generally set up near the mother plant.

If R&D personnel has to go to get some perspectives from manufacturing, manufacturing engineering, plant engineering, maintenance, quality, etc. he can go and get that easily.

In the case of core R&D, it is not that relevant to manufacturing because such teams are working for 10-15 years ahead of time. However, the capabilities built through application R&D are very important over a period of time for having a core R&D.

In Japan, entry to R&D happens for an engineer after 15 years unless he works in service, manufacturing, supply chain, and quality. These four departments are victims of R&D. After going through these four departments an engineer comes to R&D because after that training, they ensure that he will not make any mistake while working with R&D that will affect these four.

5. Expert 5 (IP Law Firm)

Relevance of Priority country, Assignee, and Inventor order

Indian patenting system along with all the legal and procedural aspects is slightly different than other countries. For example, if we compare it with Canadian or Australia patent offices, it is slightly different i.e., if we consider the inventor of the assignee order it has a specific critical importance with USPTO, each share of these particulars with respect to the assignee or applicant or the inventors are allocated at the time of filing itself which decides the stake of

each person who is involved in the project in terms of future licensing, possible sell or assignments from that perspective. However, in India unfortunately there are no specific criteria, and there is no specific rule that indicates that at the time of filing, we need to decide the order of the assignees applicants, or inventors. If there are two inventors or two applicants in the patent application, the rights of patents are assigned by default to the applicant and not the inventors. Though inventors and applicants could be the same in the application. As per the Indian patent laws inventors are used for or provided for credit purposes only. Because they do not have any specific stake as such on the patent application unless their name is included in the applicant's list. Whereas if we talk about the applicants the share is divided equally. For example, there are two applicants sequenced in chronological order really doesn't matter. Even the sequence of the applicants named, that also doesn't matter, rights are divided equally. For example, if there are 100 percent rights then, 50 percent is given to the first applicant and the remaining 50 is to the second applicant. Unless otherwise there is an explicit agreement that need not to be produced or provided to the patent office but it's to be provided internally between the applicants or the people who are involved in the applicant list. Unless otherwise there is no agreement, there is no such impact on the rights as such. The patent office by default allocates equal rights to each applicant.

Now relevance of the priority country depends on the perspective or the importance of the invention of a particular jurisdiction. It is completely dependent on the person who is filing a patent application. Normally Indian applicants are more focused on the Indian market, most of the companies you refer to the specific sector in the manufacturing domain, if you see the recent trend preferably after 2016-17 when make in India concept was introduced by Modi. So, you would note that there are so many companies that are into manufacturing nowadays registered under startups with DIPT certification, most of these companies have a specific core area of interest in the Indian market. They are least concerned about exporting their products outside India. They are very much interested in copying or bringing the technologies or products that are available outside India but they are not interested in filing a patent application outside India. That is one of the major trends that can be seen from 2016. Most cases related to patenting for startups emerged from West and South jurisdictions. For example, Maharashtra, Gujarat, and Karnataka are the hubs for startups. Most of the applications are filed in Mumbai and Bangalore offices. The priority country in applications originated in India or by Indian applicants is India for almost all the cases. But there are certain exceptional cases where there are a lot of manufacturing plants which are basically the branch offices/affiliates/associates offices in India

for the foreign applicants. One such example is Samsung or Apple, they may have their main head office somewhere outside India and have a branch office in India, such companies/assignees/applicants are more interested in securing their rights in the parent company in the country of origin/parent country. Local domestic clients are more interested in India but foreign clients investing in India are more interested in quoting priority in the foreign country or their parent country. The same goes for the companies (so many companies in Maharashtra that have their head offices in France or other places abroad) into manufacturing and having head offices in Sweden, Germany, and nearby jurisdictions, they are more interested in protecting it in their country and then enter via national physical India.

With respect to priority, it doesn't somewhere mention or highlight the location of the invention itself because it is more about securing the market rather than highlighting where the invention happened. Our point of view we want to distinguish particularly from the point of view of the wholly owned subsidiary of the foreign firms whether the invention happened in India or not.

The law is pretty much clear which indicates that if a person who is involved in any patent application filed, if he or she is resident (not citizen) of India it is a mandatory criterion for them to first file in India. Considering this as an important parameter while filing the application these companies always prefer filing the application in India for cases that actually are developed or innovated in India. There are two scenarios in this as well one is that the idea is developed in countries i.e., France or Germany and they are implemented in India whereas the second scenario is ideas emerge in India as well as developed in India. For such case scenario 2 it is always recommended that a priority application has to be filed in India whereas in Case 1 it is completely the call of the applicant where to file the application. There is another provision in the Patents Act that says that if you do not want to file the application in India first you can take a foreign filing license and then file anywhere outside India. There are many companies that take provision or advantage of that as well.

Does it mean that the choice of priority doesn't have anything to do with the location of the innovation?

Absolutely correct.

What about the inventor order? Does it matter from the point of view of the contribution made to the inventions?

In India, it really doesn't matter. It is always an equal right that is given. It is the kind of understanding or dilemma in the inventor's R&D specialists, whosoever is the first inventor on the list. But from the patent law perspective, there is no discrimination between the sequences of inventors.

Choice of the patent filing office

With regards to the choice of patent office, it is completely a call of the applicant or the assignee depending on the market or where the sale of that particular product is targeted. It is the most important deciding factor as to where the patent will be filed.

Indian patent law is considered as strictest possible law in comparison to the US, European, or any other patent laws. There are so many problems with the Indian law i.e., Software Inventions Section 3 (K) is the biggest hurdle in the Indian patent office as per the act wherein it clearly indicates that any mathematical method business method, or computable algorithms are not patentable whereas such criteria such conditions are not very rigid in the jurisdiction outside India. That is the reason why in spite of having good innovations emerging from India people prefer to file outside India i.e., the US, Canada, Australia, Korea, etc. If the time and financial conditions allow then they enter into India as a national phase application. From the perspective of a software invention related to electronics, electronics and telecommunication, etc. or anything that involves a kind of software are always this problem in Indian jurisdiction whether the patentee should file an application in India or not. That is one of the reasons why 60-90 percent of the cases from this area of technology i.e., computers, always prefer filing outside India first and then entering via national phase into India just to take a kind of charge that if the law allows and they get the control. However, this is not the case for mechanical inventions or mechanical manufacturing units. Indian laws are very well flexible from the perspective of allowing mechanical or manufacturing or instrumentation and electrical. Choice of patent filing if it is mechanical or any invention that is not directly associated with software is always welcomed by the Indian Patent office.

As per our understanding of the law, and the way it has been designed and has been applied, companies prefer USPTO, particularly for specific inventions. In case of granting of a patent in America is not going to help in its examination and grant in India in any context. That will be dealt with as per the rules of the Indian patent office. Does it add some amount of the examiner's point of view or from a controller's point of view that if the patent is granted at USPTO it can be granted at IPO as well?

Yes. It influences to an extent the judgment of the examiners at the patent office. One of the reasons why this is important to understand from the procedural prospects, there is a mandatory condition for filing 3 in the Indian Patent Office. This form is about submitting information to IPO for all the applications filed outside India for a particular invention. It is called as corresponding application. Secondly the information about the current status of that particular corresponding application outside India. As soon as the examiners of the Indian Patent Office see that if a patent application is granted in the US or Europe or Japan, the mindset of the controller is that yes, this invention has potential, has merits in it so it can be considered for that perspective as well. So indirectly though it is not specifically mentioned in the act that you need to refer or specify that the judgment or the decision of that particular patent application is based on the information about its foreign filings it is always an indirect influence on the respected controller or the examiner that after seeing the case granted in US or Europe, they always have a kind of soft corner for the cases. The most important point is, that there is always an exception, out of 100, 98 percent of the cases are inclined towards checking the foreign prosecution. For 2 percent of the cases, the examiners are really rigid and want to only focus on Indian law, and based on that they give the decision. In fact, as per hierarchy if the patent is granted in Europe and even if it is not granted in the US, Indian examiners are more inclined towards European prosecution than the USPTO. But if in certain cases where a European patent is not at all filed but a US patent is filed and it is either under the examination or under the clause of getting the grant, the Indian examiner tends to follow the US prosecution as well.

Do these prosecution details have to be provided by the applicant or do they seek on their own?

There are two ways as per the mandatory process form 3 has to be submitted always in every six months of any change in the status or any new filing of the application outside India for that particular Indian case or corresponding application. Sometimes if the examiner is really smart, he goes and checks the history on Google or the internet as it is all publicly available data but 99 percent of the time it is always dependent on the form 3 and the documents that are submitted.

As per law form 3 has to be updated every time whenever is a change in status or every six months.

As per the law, form 3 is referred to as a statement and undertaking (the name of the form). By statement, it means that what is the current status of the application outside India and by

undertaking it declares that whenever there is any change or any new application or new sister/corresponding application filed at the foreign patent office, the patentee is bound to update about the same within six months from that change happened. Earlier or 2 years back every six months patentee used to file this form 3. But now that has completely been changed so what is expected by the patent office is that only there is any new corresponding application filed for this case which was not filed before the filing of the Indian application only then it is expected to upgrade it via form 3.

Does more inclination of the Indian examiners towards the European prosecution show that the Indian law is closer to the European context as compared to the US law?

True. If we see the history of Indian patent law it is always derived from UK laws. So, it is obvious that but from the perspective of the standards that they have set in the examination, it is more from that perspective than the origin of the law. Similar to some sections of Indian patent law specifically section 3 where there are a lot of limitations that are provided in the patent act of IPO. Some similar kinds of concerns are also available in Europe. Maybe that is one of the reasons why Indian examiners are more inclined towards referring to the EPO prosecution than the US or any other jurisdiction.

But in the case of computer-related software patents European law is a bit more stringent as compared to US law.

True. But in the recent trend in the US the concept of 1 o 1 wherein they always say the abstract or the idea indirectly they also are trying to follow the Indian and European laws where they say that your software, abstract, ideas are not patentable but if you started following now you will see more rejections of the Indian application at the US. So, there are started following the stricter way now for examining the applications from India which earlier was not that strict.

There are two types of cases the IP attorneys come across in recent times one is when the patent is only granted and the second, is a prototype/working prototype/product that is already implemented. So just the filing of a patent application does not give any kind of leverage to the patentee who wants to proceed in the market for commercialization or licensing. Either it should be an implemented prototype or it should be at least a kind of workable prototype/demonstrable prototype that the patentee can show to the companies. They will encourage such purchasing.

Technology Strategies (Tech creating, Seeking and exploiting)

This is a valid classification. It is as per the requirement of the future perspective. This kind of information is actually required for the R&D specialists, the research scholars, and PhD pursuing students in this area who are not well aware of these particular things. So such classification is essential from the perspective of deciding what is to be done from the perspective of filing the application. One addition in that can be done is depending upon the technology, section 3 is the biggest problem in the Indian Patent Office which is not available in any of the other laws. So based on the technology also the judgment of a person is influenced by whether he/she should invest the time, effort, and money in the Indian market or whether he/she should go and directly file the application outside India. That is the deciding factor as well. Technology is also an important decision factor. Apart from just deciding whether the product is implemented or the process is implemented in India.

Action: For all those patents whereby most of the inventors are Indian but the priority is not India, the technology class should be checked. Since IPC classification is available in the data, it should be checked whether those patents belong to a certain category. That will help in justifying the results in terms of IPC class.

In the case of manufacturing, especially from the medical devices perspective, there is another section 3 (I) that says that any process of surgery, any medicinal, surgical, diagnostic, or therapeutic process that actually treating a human being or an animal such inventions are not patentable in India.

6. Expert 6 (IP Consultancy Firm)

Choice of Priority country and assignee order

Generally, the inventors prioritize filing the patent in nations like the USA, Japan, and China rather than India as the infrastructure of former nations is more conducive for innovation. Firstly, the advancement of technological capabilities such as the availability of advanced software knowledge attracts the most. Secondly, the commercial market matters in these aspects. For instance, due to better commercialization, automobile sectors prefer nations like Japan and America. Thirdly, the restriction stated in IPO also stands as a barrier in developing nations like India. But due to good manufacturing capabilities, the automobile sectors and pharmaceutical sectors prefer to invest in India.

Choice of Patent Filing

So far as the choice of patent filing is concerned, most of the application deals with foreign filing which is decided by the parent companies rather than the subsidiary companies. And the subsidiary companies are not independent in choosing patent filing. Besides, the key motives behind undertaking R&D are to optimize (minimize) expenditure and to achieve business objectives. According to him, foreign firms analyses all these along with observing skills and technology before filing a patent. But overall, the key motives of the industry are based on finding talent. So, foreign firms found some advantage in India in certain sectors like pharmaceutical and automobile sectors. However, the support of Indian subsidiaries to parent firms is not substantial for technological enhancement and innovation. Because still, most of the sectors still use conventional technology rather than upgraded technology. In the nation, foreign firms observe the void of untrained workers although they are qualified. So, technology-seeking is essential for patenting. In addition, Information Communication Technology (ICT) plays an important role in technology and software development.

Innovation Strategies of Indian Subsidiaries

As far as different innovation strategies applied by Indian subsidiaries is concerned, C R Jacob viewed that Indian subsidiary look into all three strategies such as technological creating, technological seeking and technology exploiting. So, industries specifically search for good talent and skilled persons. Manisha proposed that talent is there in the nation but it faces challenges in driving talent. And relative to Japan, China, and the USA; India lacks in potential knowledge and skill. The reason behind this might be the scarcity of investment in R&D. Another reason is that the developed countries have experienced 15 decades of global innovation culture where whereas India has completed only two decades of such culture. She also added that radical innovation is not visualised in extensive sectors in the nation. And the important challenge is the interaction gap between the researchers and industrialists or entrepreneurs. Mr. Abhai added that mostly the R&D expenditure is exploited for research purposes which is restraining up to publication. The ideas are not rigorously being utilised in the production process. In other words, the research, in most cases, is being conducted for publication purposes rather than commercialisation. In the concluding remarks, Mrs Manisha highlighted that the inventor does understand many things while going for patenting. So, misconduct and mismanagement like collaboration and cheating activities are taking place in filing patents.

7. Expert 7 (A Team of Patent & Trade Mark Attorneys)

When a client says the priority, what does it mean? Why do they give priority to a certain country and not to the other country?

We work for a few Chinese companies and their subsidiaries or R&D setup in India but the percentage is very low. Priority for the local clients, it could mean that ideally the invention has taken place in India in 90 percent of the cases but there would be cases where they would like to file in other countries for various reasons such as technology is not viable, they do not want to monetize in India but again India has a cheap filing jurisdiction so most companies would file in India for multiple innovations. First, they file the PCT application and then enter India. In such cases, it is not very reliable. Considering India, the PCT application is filed by Indian applicants. One can directly file the PCT application which wouldn't have priority so the PCT becomes their first filing and then they can enter India. So, there are several routes which are taken. But again, the percentage of such filings is very less generally the trend is when they make an invention and then they file the application in that particular country. Because most countries would have the requirement that it should have a leading inventor from the country where the invention took place or the applicant should be based there and research has taken place. As soon as in India if applicants are not interested in first file in India, they apply for foreign filing licenses but the cases are very low. In these cases, inventors are based in India and also R&D has taken place in India.

Can we use priority as information to locate the innovation?

One can use it as information but that is not the whole and sole information to decide. There are other factors also which could be there such as first filing through PCT and then entering India. Maybe the innovation is taking place in India but they file PCT applications in India as a receiving office.

We not only used the priority information but also the layered information including assignee and inventor information. So, assignee and inventor level information highlights some of those aspects?

Inventor would. Inventor is actually quite a reliable factor to assess whether the invention took place in that particular country. Because most countries have this requirement either the inventor decides the priority or where the invention took place. So, not all the time but in 85 percent of the cases inventor-level information highlights the location where the invention took place.

Other Jurisdictions also have similar things like FFL.

The US has it. Europe doesn't have.

A person who is a resident of India is an inventor working with US US-based company, then the company files a patent at USPTO the address which will be given is Indian, in that case, they would have taken an FFL.

Yes, if they want to enter India. Ideally, you should take permission from the IPO and there are cases where won't or they are not aware of it. It becomes a problem when you enter in India. So, when you enter India that could be a strategy, we haven't faced any such issues yet.

Priority essentially you are saying that it is mostly related to a market or whether they want to commercialize in that country or not, which will determine priority.

Not actually, it can be one of the factors but it cannot be very authentic e.g., if the invention took place possibly in India i.e., an Indian company who has subsidiaries abroad in Europe, Netherlands, etc. so they wanted to file in the name of that Dutch subsidiary, so we file a direct application in the Netherlands or the US subsidiary so we file direct there, the priority is filed there but the invention would have taken place here. So, it's not always but it is quite a fair determinant.

Data shows that WOSs of these foreign companies are filing patents with Indian inventors but the priority is US.

Yes, that could be possible. So, one has to check whether the inventors are Indian residents or not but again that is a problem because India is one of the few countries that requires the nationality of the inventors. In the pharmaceutical domain mostly, the inventions take place in India and it is filed in the name of one of their foreign subsidiaries Suppose Cipla has subsidiaries in the US maybe they want to file in the US for business reasons they could file as priority seeking application in the name of US subsidiaries having Indian inventor. In software patents also same thing will happen.

What kind of involvement of the parent company in terms of deciding whether to patent in India or not and their interventions in terms of how to deal with this patenting?

One thing here that can be added is working statements that could be a whole determinant but again those would be only available for granted patents. They exclusively mention whether the R&D/manufacturing is taking place in India or not. So, in the working statement you looked at

Form 27 there are like you have to first say how much revenue is generated and the volume of the product or service produced. Or if the requirement is meeting as per the population. They have explicitly another clause to mention on the product whether it is “made in India” or not. That would be helpful to find out such things.

In terms of the involvement of the parent company, it decides the patenting strategy and where to patent.

Yes, mostly parent company decides if the parent company is located in one of the developed countries. We have European clients with Indian subsidiaries in the pharma sector but again the

What about the choice of patent filing office whether to go for the Indian patent office first or USPTO EPO or any other office?

In most cases (specifically big pharma companies) it is decided by the applicant/assignee i.e., the local patent office of the headquarters firms.

If we focus on the name of the firm e.g., XYZ International, and its files with priority India that is very confusing in our case. How to deal with it?

In such cases, it is a high possibility that the invention took place in India. The other reason is that for foreign filing, you can either take the license or file somewhere else. Suppose there are Indian inventors involved and part of it took place in India or there could be Indian residents involved in the invention so they have to get permission. So, one way is to file a form and share a provisional application at IPO and wait about 3 weeks or so to get the license and file abroad wherever you want to file. The other way is to file a provisional basically the priority application in India, file a provisional wait for 6 months and you can file abroad. You need not to take any permission. So, if the name of a company with suffix international but the priority is India in the application, definitely there is a high possibility that it has happened in India.

We are trying to distinguish between R&D centers and so-called in-house R&D going by the DSIR definition (who gives tax credit). By this definition, the in-house R&D is aligned with R&D the manufacturing because the companies expect to have an R&D center for 3 years, within the plant but within the firm R&D. Whereas the R&D per se they might be like Apple, IBM, etc. Do you think when you deal with the clients this distinction is there?

I would presume that in the case of Chinese clients, the manufacturing is always in China. Because of the availability of raw materials and all the other business factors, for the European clients it could be in India because in the pharmaceutical market, the raw material and labor is cheaper in India. Because India has so many pharma companies and a big pharma market. But most of this big pharma if you look at the working statements the manufacturing is taking place as well. They just importing the product.

If they don't give the correct information in the working statements, are there any criminal liabilities also in such cases?

Yes.

What if they don't provide the information?

Yes, it also happens. The only implication we have seen so far and practices is that may be when you go to court to enforce your patent you won't get any favorable decision. That is the highest. Asian companies are very cautious they would try to provide all the information means they would go by the laws. But in the case of US companies, such cases are there where they do not disclose all the information. 35 to 40 percent of cases are there. But whatever information we get that will be authentic for sure.

Annexure C

Table I: Classification of the firms patenting at IPO		
S. No.	Name of the Company	Category
1	Dr. Oetker India Private Limited	Tech Seeking
2	John Keells Foods India Private Limited	Tech Seeking
3	Kobelco Machinery India Private Limited	Tech Seeking
4	Ifm Engineering Private Limited	Tech Seeking
5	Carrier Midea India Pvt. Ltd.	Tech Seeking
6	Gmp Reels India Private Limited	Tech Seeking
7	Mesha Energy Solutions Private Limited	Tech Seeking
8	Caraway Development Centre (India) Private Limited	Tech Seeking
9	Maxxis Rubber India Private Limited	Tech Seeking
10	Cypet Technologies India Private Limited	Tech Seeking
11	Uquifa India Private Limited	Tech Seeking
12	Chenfeng Tech Private Limited	Tech Seeking
13	Hoganas India Private Limited	Tech Exploiting
14	Man Diesel & Turbo India Pvt. Ltd.	Tech Exploiting
15	Deutz Engines (India) Private Limited	Tech Exploiting
16	Fuchs Lubricants India Pvt. Ltd.	Tech Exploiting
17	Oerlikon Friction Systems (India) Pvt. Ltd.	Tech Exploiting
18	Zoetis Pharmaceutical Research Private Limited	Tech Exploiting
19	Kathrein India Private Limited	Tech Exploiting
20	Stanley Works (India) Private Limited	Tech Exploiting
21	Faurecia Emissions Control Technologies India Private Limited	Tech Exploiting
22	Brillio Technologies Private Limited	Tech Exploiting
23	Khs Machinery Private Limited	Tech Exploiting
24	Suzuki Motorcycle India Pvt. Ltd.	Tech Exploiting
25	Fata Hunter India Private Limited	Tech Exploiting
26	Hi-Lex India Private Limited	Tech Exploiting
27	Schunk Metal And Carbon (India) Private Limited	Tech Exploiting
28	Alcon Laboratories (India) Private Limited	Tech Exploiting
29	Borgwarner Morse Tec India Private Limited	Tech Exploiting
30	Osi Systems Pvt. Ltd.	Tech Exploiting
31	S C Johnson Products Private Limited	Tech Exploiting
32	Huber+Suhner Electronics Private Limited	Tech Exploiting
33	Bard India Healthcare Private Limited	Tech Exploiting
34	Oberthur Technologies India Pvt. Ltd.	Tech Exploiting
35	Armacell India Private Limited	Tech Exploiting
36	Sefar Filtration (India) Private Limited	Tech Exploiting
37	Walvoil Fluid Power (India) Private Limited	Tech Exploiting
38	Verifone India Sales Private Limited	Tech Exploiting
39	Mecaplast India Pvt. Ltd.	Tech Exploiting
40	Biesse Manufacturing Company Private Limited	Tech Exploiting
41	Fresenius Medical Care India Private Limited	Tech Exploiting

42	Carraro Technologies India Private Limited	Tech Exploiting
43	Mothercare Sourcing India Private Limited	Tech Exploiting
44	Trumpf (India) Private Limited	Tech Exploiting
45	Kosan Crisplant India Private Limited	Tech Exploiting
46	Ursapharm India Private Limited	Tech Exploiting
47	Outokumpu India Private Limited	Tech Exploiting
48	Geico Paint Shop India Private Limited	Tech Exploiting
49	Med-El India Private Limited	Tech Exploiting
50	Nov India Private Limited	Tech Exploiting
51	Ppg India Private Limited	Tech Exploiting
52	Kerakoll India Private Limited	Tech Exploiting
53	Robatech India Private Limited	Tech Exploiting
54	Dactwyler Swisstec India Private Limited	Tech Exploiting
55	Hurco India Private Limited	Tech Exploiting
56	Amcor Flexibles India Private Limited	Tech Exploiting
57	Rohm India Private Limited	Tech Exploiting
58	Mando Automotive India Pvt. Ltd.	Tech Exploiting
59	Mavenir Systems Private Limited	Tech Exploiting
60	Baumer India Private Limited	Tech Exploiting
61	Emka India Panel Accessories Private Limited	Tech Exploiting
62	Cargotec India Private Limited.	Tech Exploiting
63	Yutaka Autoparts India Private Limited	Tech Exploiting
64	Harris Communications International India Private Limited	Tech Exploiting
65	Interfaceflor India Private Limited	Tech Exploiting
66	Mayekawa India Private Limited	Tech Exploiting
67	Georg Fischer Piping Systems Private Limited	Tech Exploiting
68	Eo Technics India Private Limited	Tech Exploiting
69	Sanmina-Sci Technology India Private Limited	Tech Exploiting
70	Sekisui Chemical India Private Limited	Tech Exploiting
71	Polymatech Electronics Private Limited.	Tech Exploiting
72	Samsung Heavy Industries India Private Limited	Tech Exploiting
73	Doosan Infracore India Private Limited	Tech Exploiting
74	G & W Electric Company India Private Limited.	Tech Exploiting
75	Dic Fine Chemicals Private Limited	Tech Exploiting
76	Ansorg India Private Limited	Tech Exploiting
77	Visplay India Private Limited	Tech Exploiting
78	Ashland India Private Limited	Tech Exploiting
79	Exel Finishing Private Limited	Tech Exploiting
80	Smw Autoblok Workholding Private Limited	Tech Exploiting
81	Glatt Systems Private Limited	Tech Exploiting
82	Kramer Electronics India Private Limited	Tech Exploiting
83	Ziehl-Abegg India Private Limited	Tech Exploiting
84	Adeka India Private Limited	Tech Exploiting
85	Hansgrohe India Private Limited	Tech Exploiting
86	Uei Electronics Private Limited	Tech Exploiting
87	Luxottica India Eyewear Private Limited	Tech Exploiting

88	Haimer India Private Limited	Tech Exploiting
89	Sts Titeflex India Private Limited	Tech Exploiting
90	Moen India Private Limited	Tech Exploiting
91	Ge Power Electronics (India) Private Limited	Tech Exploiting
92	Biosensors Interventional Technologies (India) Private Limite	Tech Exploiting
93	Ahresty India Pvt. Ltd.	Tech Exploiting
94	Elringklinger Automotive Components (India) Pvt. Ltd.	Tech Exploiting
95	Skoda Auto Volkswagen India Pvt. Ltd.	Tech Exploiting
96	Takata India Pvt. Ltd.	Tech Exploiting
97	Yokohama India Pvt. Ltd.	Tech Exploiting
98	Hypertherm (India) Thermal Cutting Private Limited	Tech Exploiting
99	Messer Cutting Systems India Private Limited	Tech Exploiting
100	Starcke Abrasives India Private Limited	Tech Exploiting
101	Polyplastics Marketing (India) Private Limited	Tech Exploiting
102	Seepex India Private Limited	Tech Exploiting
103	Tredegar Film Products India Private Limited	Tech Exploiting
104	Aluplast India Private Limited	Tech Exploiting
105	Fibro India Precision Products Private Limited	Tech Exploiting
106	Renold Chain India Private Limited	Tech Exploiting
107	Sakata Seed India Private Limited	Tech Exploiting
108	Gestamp Automotive India Private Limited	Tech Exploiting
109	Renolit India Private Limited	Tech Exploiting
110	Hommel-Etamic Metrology India Private Limited	Tech Exploiting
111	Yushiro India Company Private Limited	Tech Exploiting
112	Sdp Telecom (India) Private Limited	Tech Exploiting
113	Yamato Scale India Private Limited	Tech Exploiting
114	Norma Group Products India Private Limited	Tech Exploiting
115	Sigma-Tau India Private Limited	Tech Exploiting
116	Vicat Sagar Cement Private Limited	Tech Exploiting
117	Allflex India Private Limited	Tech Exploiting
118	Authentix India Private Limited	Tech Exploiting
119	Pioneer India Electronics Private Limited	Tech Exploiting
120	Anton Paar India Private Limited	Tech Exploiting
121	Kubota Agricultural Machinery India Private Limited	Tech Exploiting
122	Ferag India Private Limited.	Tech Exploiting
123	Furukawa Sangyo Kaisha India Private Limited	Tech Exploiting
124	Twin Disc Power Transmission Private Limited	Tech Exploiting
125	Ahlstrom Munksjo Fibercomposites India Pvt. Ltd.	Tech Exploiting
126	I A C International Automotive India Pvt. Ltd.	Tech Exploiting
127	Mikuni India Pvt. Ltd.	Tech Exploiting
128	Yachiyo India Mfg. Pvt. Ltd.	Tech Exploiting
129	Joil India Private Limited	Tech Exploiting
130	Huvepharma Sea (Pune) Private Limited	Tech Exploiting
131	Kokoku Intech India Private Limited	Tech Exploiting
132	Closure Systems International (I) Private Limited	Tech Exploiting
133	Piolax India Private Limited	Tech Exploiting

134	Calpeda Pumps India Private Limited	Tech Exploiting
135	Angang India Steel Private Limited	Tech Exploiting
136	Ssab Swedish Steel (India) Private Limited	Tech Exploiting
137	Franklin Fueling Systems India Private Limited	Tech Exploiting
138	Larox India Private Limited	Tech Exploiting
139	Galipoglu Hidromas India Manufacturing Private Limited	Tech Exploiting
140	Karl Mayer India Private Limited	Tech Exploiting
141	Cascade India Material Handling Private Limited	Tech Exploiting
142	Benteler Engineering Chennai Private Limited	Tech Exploiting
143	Enpay Transformer Components India Private Limited	Tech Exploiting
144	Isra Vision India Private Limited	Tech Exploiting
145	Tounetsu India Private Limited	Tech Exploiting
146	Getzner India Private Limited	Tech Exploiting
147	Motan-Colortronic Plastics Machinery (India) Private Limited	Tech Exploiting
148	Litens Automotive (India) Private Limited	Tech Exploiting
149	Ifm Electronic India Private Limited	Tech Exploiting
150	Knf Pumps+Systems (India) Private Limited	Tech Exploiting
151	Megger (India) Private Limited	Tech Exploiting
152	Ensto India Private Limited	Tech Exploiting
153	Kyocera Asia Pacific India Private Limited	Tech Exploiting
154	Olympus Medical Systems India Private Limited	Tech Exploiting
155	Buchiglas India Private Limited	Tech Exploiting
156	Pigeon India Pvt. Ltd.	Tech Exploiting
157	Finproject India Private Limited	Tech Exploiting
158	Mitsubishi-Hitachi Metals Machinery South Asia Private Limited	Tech Exploiting
159	Novus Animal Nutrition (India) Private Limited	Tech Exploiting
160	Roxul Rockwool Technical Insulation India Private Limited	Tech Exploiting
161	Caf India Private Limited	Tech Exploiting
162	Nipro Glass India Private Limited	Tech Exploiting
163	Meyer Burger India Private Limited	Tech Exploiting
164	Nipro India Corporation Private Limited	Tech Exploiting
165	A. Schulman Plastics India Private Limited	Tech Exploiting
166	Ampacet Speciality Products Private Limited	Tech Exploiting
167	Autonics Automation India Private Limited	Tech Exploiting
168	Kaneka India Private Limited	Tech Exploiting
169	Frama Systems India Private Limited	Tech Exploiting
170	Iwis Engine Systems India Private Limited	Tech Exploiting
171	Boge Compressors (India) Private Limited	Tech Exploiting
172	Nichiyu Forklifts India Private Limited	Tech Exploiting
173	Gg Cables and Wires India Private Limited	Tech Exploiting
174	Kemppi India Private Limited	Tech Exploiting
175	Nifco India Private Limited	Tech Exploiting
176	Weber Hydraulic India Private Limited	Tech Exploiting
177	Nifco South India Manufacturing Private Limited	Tech Exploiting
178	Jsp Foam India Private Limited	Tech Exploiting

179	Halton India Private Limited	Tech Exploiting
180	Yaskawa India Private Limited	Tech Exploiting
181	Murata Electronics (India) Private Limited	Tech Exploiting
182	Cts India Private Limited	Tech Exploiting
183	Fukoku India Private Limited	Tech Exploiting
184	Martin Engineering Company India Private Limited	Tech Exploiting
185	Akemi Technology India Private Limited	Tech Exploiting
186	Dole Fruits & Vegetables India Private Limited	Tech Exploiting
187	Rijk Zwaan India Seeds Private Limited	Tech Exploiting
188	Velan Valves India Private Limited	Tech Exploiting
189	Gedore (India) Private Limited	Tech Exploiting
190	Marini India Pvt. Ltd.	Tech Exploiting
191	Nihon Parkerizing (India) Pvt. Ltd.	Tech Exploiting
192	Takahata Precision India Pvt. Ltd.	Tech Exploiting
193	Torreco India Pvt. Ltd.	Tech Exploiting
194	Kendrion (Pune) Private Limited	Tech Exploiting
195	Klingelberg India Private Limited	Tech Exploiting
196	Hwacheon Machine Tool India Private Limited	Tech Exploiting
197	Gce India Private Limited	Tech Exploiting
198	Pinnacle Engines India Private Limited	Tech Exploiting
199	Oiles India Private Limited	Tech Exploiting
200	Mapei Construction Products India Private Limited	Tech Exploiting
201	Hexagon Composites India Private Limited	Tech Exploiting
202	Alpha Security Instruments (India) Private Limited	Tech Exploiting
203	Jujo Chemical (India) Private Limited	Tech Exploiting
204	Drm Filter Technology Private Limited	Tech Exploiting
205	Eastman Chemical India Private Limited	Tech Exploiting
206	Perto India Private Limited	Tech Exploiting
207	Midea Home Appliances (India) Private Limited	Tech Exploiting
208	Fanem Medical Devices India Private Limited	Tech Exploiting
209	Maschio Gaspardo India Private Limited	Tech Exploiting
210	Recticel India Private Limited	Tech Exploiting
211	Egston Electronics (India) Private Limited	Tech Exploiting
212	Buchi Operations India Private Limited	Tech Exploiting
213	Sk Lubricants & Oils India Private Limited	Tech Exploiting
214	Chugoku Paints (India) Private Limited	Tech Exploiting
215	Stemtech India Private Limited	Tech Exploiting
216	Wirtz Manufacturing India Private Limited	Tech Exploiting
217	Rotam Crop Protection Private Limited	Tech Exploiting
218	Scapa Tapes India Private Limited	Tech Exploiting
219	Famur India Mining Solutions Private Limited	Tech Exploiting
220	Endo Kogyo India Private Limited	Tech Exploiting
221	Otc Daihen India Private Limited	Tech Exploiting
222	Vega India Level And Pressure Measurement Private Limited	Tech Exploiting

223	Koike Cutting & Welding (India) Private Limited	Tech Exploiting
224	Motovario Gear Solutions Private Limited	Tech Exploiting
225	Gestamp Sungwoo Stampings And Assemblies Private Limited	Tech Exploiting
226	Santen India Private Limited	Tech Exploiting
227	Prima Machine Services India Private Limited	Tech Exploiting
228	Ptw Dosimetry India Private Limited	Tech Exploiting
229	Nisshinbo Mechatronics India Private Limited	Tech Exploiting
230	Nikki India Fuel Systems Private Limited	Tech Exploiting
231	Alps Electric (India) Private Limited	Tech Exploiting
232	Draeger Safety India Private Limited	Tech Exploiting
233	Npr Auto Parts Manufacturing India Private Limited	Tech Exploiting
234	Putzmeister Concrete Pumps India Private Limited	Tech Exploiting
235	Hitachi Chemical India Private Limited	Tech Exploiting
236	Micro Precision Gear Technology India Private Limited	Tech Exploiting
237	Foam Supplies India Private Limited	Tech Exploiting
238	Lion Idemitsu Composites India Private Limited	Tech Exploiting
239	Curtiss Wright Surface Technologies India Private Limited	Tech Exploiting
240	Stanley Electric Sales Of India Private Limited	Tech Exploiting
241	Aisin Automotive Haryana Pvt. Ltd.	Tech Exploiting
242	Greatoo (India) Pvt. Ltd.	Tech Exploiting
243	Scania Commercial Vehicles India Pvt. Ltd.	Tech Exploiting
244	Kobelco Plate Processing India Private Limited	Tech Exploiting
245	Sato Auto-Id India Private Limited	Tech Exploiting
246	Oriental Yeast India Private Limited	Tech Exploiting
247	Nitta Corporation India Private Limited	Tech Exploiting
248	Bloom Energy International (India) Private Limited	Tech Exploiting
249	Sanyo Special Steel India Private Limited	Tech Exploiting
250	Trelleborg Industrial Products India Private Limited	Tech Exploiting
251	AltioStar Networks India Private Limited	Tech Exploiting
252	Wanhua International (India) Private Limited	Tech Exploiting
253	Case-Mate India Private Limited	Tech Exploiting
254	Greenyug Specialty Chemicals India Private Limited	Tech Exploiting
255	Seiren India Private Limited	Tech Exploiting
256	Nordmeccanica India Private Limited	Tech Exploiting
257	Marcegaglia India Private Limited	Tech Exploiting
258	Fiberhome India Private Limited	Tech Exploiting
259	General Mills Food Products India Private Limited	Tech Exploiting
260	Eurobelt Belting Solutions Private Limited	Tech Exploiting
261	Somero India Private Limited	Tech Exploiting
262	Fischer Connectors India Private Limited	Tech Exploiting

263	Endress + Hauser Wetzer (India) Private Limited	Tech Exploiting
264	Sca Hygiene Products India Private Limited	Tech Exploiting
265	Daetwyler Graphics India Private Limited	Tech Exploiting
266	Imr India Private Limited	Tech Exploiting
267	Colorobbia Chemicals India Private Limited	Tech Exploiting
268	Mp Filtri India Private Limited	Tech Exploiting
269	Oji Jk Packaging Private Limited	Tech Exploiting
270	India Gci Resitop Private Limited	Tech Exploiting
271	Ube Industries India Private Limited	Tech Exploiting
272	Actuant India Private Limited	Tech Exploiting
273	Jowat Adhesives India Private Limited	Tech Exploiting
274	Koppert Biological Systems India Private Limited	Tech Exploiting
275	Michelman Chemicals Private Limited	Tech Exploiting
276	Shindengen India Private Limited	Tech Exploiting
277	Movomech Sunnex India Private Limited	Tech Exploiting
278	Ingenia Polymers India Private Limited	Tech Exploiting
279	Omb Saleri Valves India Private Limited	Tech Exploiting
280	Ingeteam Power Technology India Private Limited	Tech Exploiting
281	Fujikura Automotive India Private Limited	Tech Exploiting
282	Enza Zaden India Private Limited	Tech Exploiting
283	Central Glass Company India Private Limited	Tech Exploiting
284	Konvekta Refrigeration India Private Limited	Tech Exploiting
285	Thk India Private Limited	Tech Exploiting
286	Konvekta Bus Ac India Private Limited	Tech Exploiting
287	Daewoong Pharmaceutical (India) Private Limited	Tech Exploiting
288	Kinugawa Rubber India Private Limited	Tech Exploiting
289	Dalian Huarui Heavy Industry India Company Private Limited	Tech Exploiting
290	Getrag Transmissions India Pvt. Ltd.	Tech Exploiting
291	Hitachi Automotive Systems (India) Pvt. Ltd.	Tech Exploiting
292	Isuzu Motors India Pvt. Ltd.	Tech Exploiting
293	Yamaha Motor Electronics India Pvt. Ltd.	Tech Exploiting
294	Kyosan India Private Limited	Tech Exploiting
295	Stago India Private Limited	Tech Exploiting
296	Fronius India Private Limited	Tech Exploiting
297	Highly Electrical Appliances India Private Limited	Tech Exploiting
298	Bonatrans India Private Limited	Tech Exploiting
299	Shaklee India Private Limited	Tech Exploiting
300	Glanbia India Private Limited	Tech Exploiting
301	Hitachi High-Technologies India Private Limited	Tech Exploiting
302	Morgan Advanced Materials India Private Limited	Tech Exploiting
303	Botek India Private Limited	Tech Exploiting
304	Archroma India Private Limited	Tech Exploiting
305	Sanhua India Private Limited	Tech Exploiting
306	Fibox India Private Limited	Tech Exploiting
307	Shrieve Chemical India Private Limited	Tech Exploiting

308	Ceramtec India Innovative Ceramic Engineering Private Limited	Tech Exploiting
309	Corum India Private Limited	Tech Exploiting
310	Uchiyama India Private Limited	Tech Exploiting
311	Innovatec India Private Limited	Tech Exploiting
312	Studer Innotec India Private Limited	Tech Exploiting
313	Wolf Precision Tools India Private Limited	Tech Exploiting
314	Cepheid India Private Limited	Tech Exploiting
315	Granges India Private Limited	Tech Exploiting
316	Eu Yan Sang India Private Limited	Tech Exploiting
317	Gowan India Private Limited	Tech Exploiting
318	Genexis India Private Limited	Tech Exploiting
319	Longi Magnet India Private Limited	Tech Exploiting
320	Maco Pharma India Transfusion Solutions Private Limited	Tech Exploiting
321	Ma Extrusion India Private Limited	Tech Exploiting
322	Tencate Protective India Private Limited	Tech Exploiting
323	Minvasys India Private Limited	Tech Exploiting
324	Somar Corporation India Private Limited	Tech Exploiting
325	Angelantoni Test Technologies India Private Limited	Tech Exploiting
326	Alignment Systems Private Limited	Tech Exploiting
327	Toray Industries (India) Private Limited	Tech Exploiting
328	Standard Units Supply (India) Private Limited	Tech Exploiting
329	Bonfiglioli Renewable Power Conversion India Pvt. Ltd.	Tech Exploiting
330	Taiyo India Pvt. Ltd.	Tech Exploiting
331	Emmegi India Private Limited	Tech Exploiting
332	Universal Robots (India) Private Limited	Tech Exploiting
333	Fima India Private Limited	Tech Exploiting
334	Songwon Specialty Chemicals - India Private Limited	Tech Exploiting
335	Chugai Ro (India) Private Limited	Tech Exploiting
336	Oki India Private Limited	Tech Exploiting
337	Soufflet Malt India Private Limited	Tech Exploiting
338	Pyro Clark Reliance Level Solutions India Private Limited	Tech Exploiting
339	Ogura Clutch India Private Limited	Tech Exploiting
340	Futurepump (India) Private Limited	Tech Exploiting
341	Zetor India Private Limited	Tech Exploiting
342	Sugino Machine India Private Limited	Tech Exploiting
343	Glanbia Performance Nutrition (India) Private Limited	Tech Exploiting
344	Suntool India Private Limited	Tech Exploiting
345	Kraton Polymers India Private Limited	Tech Exploiting
346	Corbion India Private Limited	Tech Exploiting
347	Grimme India Private Limited	Tech Exploiting
348	Viking Fire Products (India) Private Limited	Tech Exploiting
349	Toray Kusumgar Advanced Textile Private Limited	Tech Exploiting
350	Stratasys India Private Limited	Tech Exploiting
351	Hueck Decent Engraving India Private Limited	Tech Exploiting
352	Barnes Industrial Group India Private Limited	Tech Exploiting

353	Global Water Solutions India Private Limited	Tech Exploiting
354	Wikus India Private Limited	Tech Exploiting
355	Reviva Pharmaceuticals India Private Limited	Tech Exploiting
356	Multimatic India Private Limited	Tech Exploiting
357	Vivo Mobile India Pvt. Ltd.	Tech Exploiting
358	Porite India Private Limited	Tech Exploiting
359	Daido D.M.S. India Private Limited	Tech Exploiting
360	Dukane Intelligent Assembly Solutions (India) Private Limited	Tech Exploiting
361	Atonarp Micro-Systems India Private Limited	Tech Exploiting
362	Dango & Dienenthal Hollerbach India Private Limited	Tech Exploiting
363	Inventec Manufacturing (India) Private Limited	Tech Exploiting
364	Toyota Industries India Private Limited	Tech Exploiting
365	Truking Technology India Private Limited	Tech Exploiting
366	London Pharma And Healthcare India Private Limited	Tech Exploiting
367	Tubacex India Private Limited	Tech Exploiting
368	Leistritz India Private Limited	Tech Exploiting
369	Op India Private Limited	Tech Exploiting
370	Comer Industries India Private Limited	Tech Exploiting
371	Tristone Flowtech India Private Limited	Tech Exploiting
372	Hitachi Terminal Solutions India Private Limited	Tech Exploiting
373	Nippon Oil Pump India Private Limited	Tech Exploiting
374	Suaval Lorven India Private Limited	Tech Exploiting
375	Penn Color India Private Limited	Tech Exploiting
376	Kyodo Yushi India Private Limited	Tech Exploiting
377	Ckd India Private Limited	Tech Exploiting
378	Haas Food Equipment India Private Limited	Tech Exploiting
379	Daemo Engineering India Private Limited	Tech Exploiting
380	Spectrumlabs India Private Limited	Tech Exploiting
381	Tongyu Technology India Private Limited	Tech Exploiting
382	Iconex (India) Private Limited	Tech Exploiting
383	Csm Machinery India Private Limited	Tech Exploiting
384	Soufflet Malt Alwar Private Limited	Tech Exploiting
385	General Kinematics India Private Limited	Tech Exploiting
386	Pacific Consolidated Industries (Pci)Gases India Private Limited	Tech Exploiting
387	Fogtec Fire Protection Private Limited	Tech Exploiting
388	Rockwell Medical India Private Limited	Tech Exploiting
389	Fischer Building Materials India Private Limited	Tech Exploiting
390	Pictor Diagnostics India Private Limited	Tech Exploiting
391	Ligabue Bigi Support India Private Limited	Tech Exploiting
392	Ariston Thermo India Private Limited	Tech Exploiting
393	Tekna Plasma India Private Limited	Tech Exploiting
394	Takemoto Yohki India Private Limited	Tech Exploiting
395	Performance Specialty Products (India) Private Limited	Tech Exploiting
396	Lenovo Global Technology (India) Private Limited	Tech Exploiting
397	Pinggao Group Power India Private Limited	Tech Exploiting

398	Leica Geosystems India Private Limited	Tech Exploiting
399	Sodecia Automotive Gujarat Privatelimited	Tech Exploiting
400	Eepos India Private Limited	Tech Exploiting
401	Weiss Automation Solutions India Privatelimited	Tech Exploiting
402	Boysen Exhaust Sysems Pune Privatelimited	Tech Exploiting
403	Transsion India Pvt. Ltd.	Tech Exploiting
404	Porvair Filtration India Private Limited	Tech Exploiting
405	Shuangma Machienry (India) Private Limited	Tech Exploiting
406	Moresco Hm&Lub India Private Limited	Tech Exploiting
407	Mens Polyurethanes India Private Limited	Tech Exploiting
408	Slm Solutions (India) Private Limited	Tech Exploiting
409	Porous Materials Scientific Private Limited	Tech Exploiting
410	Millennial Materials And Devices (India)Private Limited	Tech Exploiting
411	Sun Ace Chemical (India) Private Limited	Tech Exploiting
412	Hexagon Sgt India Private Limited	Tech Exploiting
413	Enshu India Private Limited	Tech Exploiting
414	Moretto Trading India Private Limited	Tech Exploiting
415	Renk Gears Private Limited	Tech Exploiting
416	Refratechnik (India) Private Limited	Tech Exploiting
417	Tensar Geosynthetics India Private Limited	Tech Exploiting
418	Kamax Automotive India Private Limited	Tech Exploiting
419	Linvatec India Private Limited	Tech Exploiting
420	Serac Packaging Solution Private Limited	Tech Exploiting
421	Hyundai Steel Anantapur Private Limited	Tech Exploiting
422	Nvh India Anantapur Auto Parts Private Limited	Tech Exploiting
423	Phicomm India Private Limited	Tech Exploiting
424	Nord-Lock (India) Private Limited	Tech Exploiting
425	America Fujikura India Private Limited	Tech Exploiting
426	Lmt Tools India Private Limited	Tech Exploiting
427	Byk India Private Limited	Tech Exploiting
428	Dorot Valves India Private Limited	Tech Exploiting
429	Kumi Supreme India Private Limited	Tech Exploiting
430	Tessengerlo Kerley India Private Limited	Tech Exploiting
431	Buen Manejo Del Campo India Private	Tech Exploiting
432	Kgs Diamond Tools (India) Private Limited	Tech Exploiting
433	Sensortec Innovation India Private Limited	Tech Exploiting
434	Otsuka Foods India Private Limited	Tech Exploiting
435	Innow Biowish Technologies Private Limited	Tech Exploiting
436	Petrochina International (India) Private Limited	Tech Exploiting
437	Fuji Seal India Private Limited	Tech Exploiting
438	Basf Colors & Effects India Private Limited	Tech Exploiting
439	F-Tech Automotive Components Private Limited	Tech Exploiting
440	Fujikoki India Private Limited	Tech Exploiting
441	Wolong India Technology Private Limited	Tech Exploiting
442	Lotte Advanced Materials India Privatelimited	Tech Exploiting
443	Pteris Global Integrated Solution(India) Private Limited	Tech Exploiting

444	Wolong Electric Private Limited	Tech Exploiting
445	Bejo Seeds India Private Limited	Tech Exploiting
446	Megmeet Electrical India Private Limited	Tech Exploiting
447	Vossloh Fastening Systems India Privatelimited	Tech Exploiting
448	Daiki Aluminium Industry India Privatelimited	Tech Exploiting
449	Karl Mayer Textile Machinery Indiaprivate Limited	Tech Exploiting
450	Romaco India Private Limited	Tech Exploiting
451	Tenneco Clean Air India Private Limited	Tech Exploiting
452	Bermad India Pvt. Ltd.	Tech Exploiting
453	Sumida Electric (India) Private Limited	Tech Exploiting
454	Nissei Electric India Private Limited	Tech Exploiting
455	Zuiko India Private Limited	Tech Exploiting
456	Orion Engineered Carbons India Private	Tech Exploiting
457	Poclain Powertrain Private Limited	Tech Exploiting
458	Miwon Specialty Chemical India Privatelimited	Tech Exploiting
459	Khvatec India Private Limited	Tech Exploiting
460	Gefit India Technologies Private Limited	Tech Exploiting
461	Hisense India Private Limited	Tech Exploiting
462	Eos Electro Optical Systems India Private Limited	Tech Exploiting
463	Kc Cottrell Engineering Services Private Limited	Tech Exploiting
464	Haitian Plastics Machinery India Private Limited	Tech Exploiting
465	Antares Vision India Private Limited	Tech Exploiting
466	Miyama Electric India Private Limited	Tech Exploiting
467	Smardtv Global Technology Privatelimited	Tech Exploiting
468	Sanitized Preservation India Privatelimited	Tech Exploiting
469	Isca Technologies India Private Limited	Tech Exploiting
470	Burgmann Power India Private Limited	Tech Exploiting
471	Kerrimo International Private Limited	Tech Exploiting
472	Samsung Display Noida Private Limited	Tech Exploiting
473	Smiths Interconnect India Private Limited	Tech Exploiting
474	Zentiva Private Limited	Tech Exploiting
475	Sg Shinagawa Refractories India Private Limited	Tech Exploiting
476	Electrolux Professional India Private Limited	Tech Exploiting
477	Sks Welding Systems Private Limited	Tech Exploiting
478	Batteroo India Private Limited	Tech Exploiting
479	Certoplast India Private Limited	Tech Exploiting
480	Kyokutoh Weld India Private Limited	Tech Exploiting
481	Suzhou Yili Technology (India) Private Limited	Tech Exploiting
482	Bosscs-India Enviro-Tech Private Limited	Tech Exploiting
483	Hmd Seal/Less Pumps Industrial (India) Private Limited	Tech Exploiting
484	Indian Explosives Pvt. Ltd.	Tech Exploiting
485	Metso India Pvt. Ltd.	TC + TS
486	Software A G India Sales Private Limited	TC + TS
487	Meiji India Private Limited	TC + TS
488	Perstorp Industries India Private Limited	TC + TS
489	Panasonic Life Solutions India Pvt. Ltd.	TC+ TS +TE

490	Cummins Technologies India Pvt. Ltd.	TC+ TS +TE
491	Caterpillar India Private Limited	TC+ TS +TE
492	Renault India Private Limited	TC+ TS +TE
493	Itt Corporation India Private Limited	TC+ TS +TE
494	A A M India Mfg. Corpn. Pvt. Ltd.	TC+ TS +TE
495	Volvo Auto India Pvt. Ltd.	TC+ TS +TE
496	Terumo India Private Limited	TC+ TS +TE
497	Glaxosmithkline Consumer Private Limited	TC+ TS +TE
498	Suzuki Motor Gujarat Pvt. Ltd.	TC+ TS +TE
499	Halliburton India Operations Privatelimited	TC+ TS +TE
500	Jcb Industries Private Limited	TC+ TS +TE
501	Osram Continental India Private Limited	TC+ TS +TE
502	Yanmar Engine Manufacturing Indiaprivate Limited	TC+ TS +TE
503	High Performance Plastics India Private Limited	TC+ TS +TE
504	Coca Cola India Pvt. Ltd.	TS + TE
505	Milacron India Pvt. Ltd.	TS + TE
506	Pfizer Products India Private Limited	TS + TE
507	Owens Corning Industries (India) Private Limited	TS + TE
508	Tevapharm India Pvt. Ltd.	TS + TE
509	Johnson Matthey Chemicals India Private Limited	TS + TE
510	Bristol-Myers Squibb India Private Limited	TS + TE
511	Nektar Therapeutics (India) Private Limited	TS + TE
512	Apicore Pharmaceuticals Private Limited	TS + TE
513	Tatsuno India Private Limited	TS + TE
514	K S P G Automotive India Pvt. Ltd.	TS + TE
515	Amgen Technology Private Limited	TS + TE
516	Firmenich Aromatics Production (India) Private Limited	TS + TE
517	Ecobliss India Private Limited	TS + TE
518	Scholle Packaging (India) Private Limited	TS + TE
519	Terex India Pvt. Ltd.	TS + TE
520	Daramic Battery Separator India Private Limited	TS + TE
521	Kramski Stamping And Molding India Private Limited	TS + TE
522	Radio Design India Private Limited	TS + TE
523	First Energy Pvt. Ltd.	TS + TE
524	Unicharm India Pvt. Ltd.	TS + TE
525	Sca South Asia Petrochemicals Private Limited	TS + TE
526	Fmc Technologies India Private Limited	TS + TE
527	Axon Interconnectors And Wires Private Limited	TS + TE
528	Maxim Integrated Products India Sales Private Limited	TS + TE
529	Nidec India Private Limited	TS + TE
530	Takeda Pharmaceuticals India Private Limited	TS + TE
531	Pharmazz India Private Limited	TS + TE
532	Heraeus Technologies India Private Limited	TS + TE
533	Nippon Steel & Sumitomo Metal India Private Limited	TS + TE
534	Ideal Industries India Private Limited	TS + TE

535	Thyssenkrupp System Engineering India Private Limited	TS + TE
536	Sartorius Weighing India Private Limited	TS + TE
537	Xylem Water Solutions India Private Limited	TS + TE
538	Bsh Household Appliances Manufacturing Private Limited	TS + TE
539	Insightra Medical India Private Limited	TS + TE
540	Lt Production India Private Limited	TS + TE
541	Kokuyo Riddhi Paper Products Private Limited	TS + TE
542	Globalfoundries Engineering Private Limited	TS + TE
543	Robert Bosch Starter Motors Generators India Private Limited	TS + TE
544	Barsys India Private Limited	TS + TE
545	Kia Motors India Private Limited	TS + TE
546	Dynapac Road Construction Equipment (India) Private Limited	TS + TE
547	Moog Em Solutions (India) Private Limited	TS + TE
548	Volvo Ce India Private Limited	TS + TE
549	Rb Hygiene Home India Private Limited	TS + TE
550	Omya Healthcare India Private Limited	TS + TE
551	Orion Nutritionals Private Limited	TS + TE
552	Arcelormittal Ventures India Private Limited	TS + TE
553	Jabil India Manufacturing Private Limited	TS + TE
554	Kone Elevator India Private Limited	TC+TS

Table II: Classification of the firms patenting at USPTO

S. No.	Name of the Company	Category
1	Job Industries Private Limited	Tech Creating
2	Brillio Technologies Private Limited	Tech Creating
3	John Keells Foods India Private Limited	Tech Creating
4	Barsys India Private Limited	Tech Creating
5	Marathon Electric India Private Limited	Tech Seeking
6	Pharmazz India Private Limited	Tech Seeking
7	Kloeckner Desma Machinery Private Limited	Tech Exploiting
8	Veka India Private Limited.	Tech Exploiting
9	Ceco Environmental India Private Limited	Tech Exploiting
10	Moba Mobile Automation (India) Private Limited	Tech Exploiting
11	Richard Wolf India Private Limited	Tech Exploiting
12	Eoc Polymers India Private Limited	Tech Exploiting
13	Marubeni-Itochu Steel India Private Limited.	Tech Exploiting
14	Saca (India) Private Limited	Tech Exploiting
15	Helukabel India Private Limited	Tech Exploiting
16	Brother International (India) Private Limited	Tech Exploiting
17	Francois Compressors India Private Limited	Tech Exploiting
18	Instrumentation Laboratory India Private Limited	Tech Exploiting
19	Okuma India Private Limited	Tech Exploiting
20	Meiko (Asia) Techcentre Private Limited	Tech Exploiting

21	Crest Ultrasonics India Private Limited	Tech Exploiting
22	Liugong India Private Limited	Tech Exploiting
23	Bbc World Service India Private Limited.	Tech Exploiting
24	Olaer Fawcett Christie Hydraulics (India) Private Limited	Tech Exploiting
25	Fromm Packaging Systems India Private Limited	Tech Exploiting
26	Imasen Manufacturing India Private Limited	Tech Exploiting
27	Quantum Clothing India Private Limited	Tech Exploiting
28	Williams Controls India Private Limited	Tech Exploiting
29	Hyundai Construction Equipment India Pvt. Ltd.	Tech Exploiting
30	Hanwa India Private Limited	Tech Exploiting
31	Yamazaki Mazak India Private Limited	Tech Exploiting
32	Wenzel South Asia Private Limited	Tech Exploiting
33	Emc2 India Private Limited	Tech Exploiting
34	Tomen Electronics India Private Limited	Tech Exploiting
35	Inabata India Private Limited	Tech Exploiting
36	Aggreko Energy Rental India Private Limited	Tech Exploiting
37	Jacobi Carbons India Pvt. Ltd.	Tech Exploiting
38	Bimeda India Private Limited	Tech Exploiting
39	Hirschvogel Components India Private Limited	Tech Exploiting
40	Xal Tool India Private Limited	Tech Exploiting
41	Miller Groundbreaking India Private Limited	Tech Exploiting
42	Jergens India Private Limited	Tech Exploiting
43	Ruhrpumpen India Private Limited	Tech Exploiting
44	Frech India Machinery Private Limited	Tech Exploiting
45	Digi M2m Solutions India Private Limited	Tech Exploiting
46	Kobold Instruments Private Limited	Tech Exploiting
47	Suminoe Teijin Techno Krishna India Private Limited	Tech Exploiting
48	Blastrac India Private Limited	Tech Exploiting
49	Technotrans India Private Limited	Tech Exploiting
50	Hanchang India Private Limited	Tech Exploiting
51	Ammeraal Beltech (India) Private Limited	Tech Exploiting
52	Fraenkische Industrial Pipes India Private Limited	Tech Exploiting
53	Tsubaki Hoover India Private Limited	Tech Exploiting
54	Hms Industrial Networks India Private Limited	Tech Exploiting
55	Topps India Sports & Entertainment Company Private Limited	Tech Exploiting
56	Maflow India Private Limited	Tech Exploiting
57	Bonna-Agela India Private Limited	Tech Exploiting
58	Monogram Aerospace Fasteners India Private Limited	Tech Exploiting
59	Scott Bader India Private Limited	Tech Exploiting
60	Weiss Technik India Private Limited	Tech Exploiting
61	Lamons Gasket And Bolt India Private Limited	Tech Exploiting
62	Cermex India Private Limited	Tech Exploiting
63	Keyence India Private Limited	Tech Exploiting
64	Liftec E&C India Private Limited	Tech Exploiting
65	Furukawa Rock Drill India Private Limited	Tech Exploiting

66	M. K. Morse Company India Private Limited	Tech Exploiting
67	Oriental Motor (India) Private Limited	Tech Exploiting
68	C V G Seating (India) Pvt. Ltd.	Tech Exploiting
69	Nichicon Electronics (India) Private Limited	Tech Exploiting
70	Inprocorp India Private Limited	Tech Exploiting
71	Willemin-Macodel (India) Private Limited	Tech Exploiting
72	Leuze Electronic Private Limited	Tech Exploiting
73	Toa Electronics India Private Limited	Tech Exploiting
74	Saraya India Private Limited	Tech Exploiting
75	Nexira India Private Limited	Tech Exploiting
76	Marel India Private Limited	Tech Exploiting
77	Darco Medical India Private Limited	Tech Exploiting
78	Mipox Abrasives India Private Limited	Tech Exploiting
79	Monster Energy India Private Limited	Tech Exploiting
80	Ampco Metal India Private Limited	Tech Exploiting
81	Citel Surge Protection Private Limited	Tech Exploiting
82	Middleby India Engineering Private Limited	Tech Exploiting
83	Frenzelit Expansion Joint Private Limited	Tech Exploiting
84	Sunpreme Solar India Private Limited	Tech Exploiting
85	Vollmer Technologies India Private Limited	Tech Exploiting
86	Uniflex Hose Assembly Machines India Private Limited	Tech Exploiting
87	Biodenta India Private Limited	Tech Exploiting
88	Enovation Controls India Private Limited	Tech Exploiting
89	Vantage Specialty Ingredients Private Limited	Tech Exploiting
90	Geo Semiconductor (India) Private Limited	Tech Exploiting
91	Redex India Private Limited	Tech Exploiting
92	Takii Seeds India Private Limited	Tech Exploiting
93	Mi Steel Processing India Private Limited	Tech Exploiting
94	Ingun India Private Limited	Tech Exploiting
95	Og Corporation India Private Limited	Tech Exploiting
96	Mi Electrical Steel Processing India Private Limited	Tech Exploiting
97	Linamar India Private Limited	Tech Exploiting
98	Innerworkings India Private Limited	Tech Exploiting
99	Middleby Celfrost Innovations Private Limited	Tech Exploiting
100	Niedax India Cable Management Systems Private Limited	Tech Exploiting
101	Mehler Texnologies India Private Limited	Tech Exploiting
102	Agru Plastic Technology Private Limited	Tech Exploiting
103	Arteche Smartgrid India Private Limited	Tech Exploiting
104	Pewag India Private Limited	Tech Exploiting
105	Apex Medicalcorp India Private Limited	Tech Exploiting
106	Canare Electric India Private Limited	Tech Exploiting
107	O.L.C.I. Engineering India Private Limited	Tech Exploiting
108	Gigatera India Private Limited	Tech Exploiting
109	Environmental Dynamics India Private Limited	Tech Exploiting
110	Tensa India Engineering Private Limited	Tech Exploiting

111	Sumitomo Forestry India Private Limited	Tech Exploiting
112	Eyenetra India Private Limited	Tech Exploiting
113	Knott Vortex Private Limited	Tech Exploiting
114	Voxeljet India Pvt. Ltd.	Tech Exploiting
115	Mtd Products India Private Limited	Tech Exploiting
116	Japan Elevator Service India Private Limited	Tech Exploiting
117	Dklok Fittings and Valve Systems Private Limited	Tech Exploiting
118	Arol India & Apac Private Limited	Tech Exploiting
119	Haarslev Pt India Private Limited	Tech Exploiting
120	Innowireless India Private Limited	Tech Exploiting
121	Cheetah Mobile India Private Limited	Tech Exploiting
122	Sensonics Technologies India Privatelimited	Tech Exploiting
123	Romeo Systems India Private Limited	Tech Exploiting
124	Topre India Private Limited	Tech Exploiting
125	Allmed Medical India Private Limited	Tech Exploiting
126	Kukdo Chemical India Private Limited	Tech Exploiting
127	Bierrebi Cutting Solutions Private Limited	Tech Exploiting
128	Viscotec India Private Limited	Tech Exploiting
129	Purina Petcare India Private Limited	Tech Exploiting
130	Mirapro India Private Limited	Tech Exploiting
131	Mobile Climate Control Thermal Systems India Private Limited	Tech Exploiting
132	Hyundai Dymos India Private Limited	Tech Exploiting
133	Haycarb Activated Carbon Private Limited	Tech Exploiting
134	Menon Renewable Resources (India) Private Limited	Tech Exploiting
135	Sungwoo Hitech Ap Private Limited	Tech Exploiting
136	Vanmark Food Equipment (India) Private Limited	Tech Exploiting
137	Clearone Innovation India Private Limited	Tech Exploiting
138	Comap India Private Limited	Tech Exploiting
139	Medipure Life Sciences India Private Limited	Tech Exploiting
140	Hydraulique Production Systems India Private Limited	Tech Exploiting
141	Standex Electronics India Private	Tech Exploiting
142	Hyperion Materials & Technologies India Private Limited	Tech Exploiting
143	Aisan Fiem Automotives India Private Limited	Tech Exploiting
144	Oring Industrial Networking Private Limited	Tech Exploiting
145	Coolpad Technologies India Private Limited	Tech Exploiting
146	Acco Brands India Private Limited	Tech Exploiting
147	Aekyung Chemtech India Private Limited	Tech Exploiting
148	Gimatic Automation India Private Limited	Tech Exploiting
149	Rix India Trading &Service Privatelimited	Tech Exploiting
150	Reutech India Private Limited	Tech Exploiting
151	Tech-Long Packagingmachinery Indiaprivate Limited	Tech Exploiting
152	G-Iii Apparel Indiaprivate Limited	Tech Exploiting
153	Ocem Airfield Indiaprivate Limited	Tech Exploiting
154	Antunes Nadi Manufacturing India Private Limited	Tech Exploiting
155	Sdgi India Private Limited	Tech Exploiting
156	Semitec Electronics India Private Limited	Tech Exploiting

157	Avary Technology (India) Private Limited	Tech Exploiting
158	Robert Bosch Packaging Technology India Private Limited	Tech Exploiting
159	Alltemp Sustainable Refrigerants India Private Limited	Tech Exploiting
160	Sdb Steel And Pipe Private Limited	Tech Exploiting
161	Dreamtech Electronics India Private Limited	Tech Exploiting
162	Birkenstock India Private Limited	Tech Exploiting
163	Ningbo Supreme Global India Private Limited	Tech Exploiting
164	Roechling Automotive India Private Limited	Tech Exploiting
165	Bukwang Tech India Private Limited	Tech Exploiting
166	Careray Digital Medical India Private Limited	Tech Exploiting
167	Bozhon Precision Industry India Private Limited	Tech Exploiting
168	Zorg Industries India Private Limited	Tech Exploiting
169	Huntkey India Private Limited	Tech Exploiting
170	Rulmeca India Private Limited	Tech Exploiting
171	Mean Well India Electronics Private Limited	Tech Exploiting
172	Metso India Pvt. Ltd.	Tech Exploiting
173	Meiji India Private Limited	Tech Exploiting
174	Perstorp Industries India Private Limited	Tech Exploiting
175	Suzuki Motor Gujarat Pvt. Ltd.	Tech Exploiting
176	Yanmar Engine Manufacturing Indiaprivate Limited	Tech Exploiting
177	Hoganas India Private Limited	Tech Exploiting
178	Man Diesel & Turbo India Pvt. Ltd.	Tech Exploiting
179	Deutz Engines (India) Private Limited	Tech Exploiting
180	Fuchs Lubricants India Pvt. Ltd.	Tech Exploiting
181	Oerlikon Friction Systems (India) Pvt. Ltd.	Tech Exploiting
182	Kathrein India Private Limited	Tech Exploiting
183	Stanley Works (India) Private Limited	Tech Exploiting
184	Khs Machinery Private Limited	Tech Exploiting
185	Suzuki Motorcycle India Pvt. Ltd.	Tech Exploiting
186	Fata Hunter India Private Limited	Tech Exploiting
187	Hi-Lex India Private Limited	Tech Exploiting
188	Schunk Metal and Carbon (India) Private Limited	Tech Exploiting
189	Alcon Laboratories (India) Private Limited	Tech Exploiting
190	Borgwarner Morse Tec India Private Limited	Tech Exploiting
191	Osi Systems Pvt. Ltd.	Tech Exploiting
192	S C Johnson Products Private Limited	Tech Exploiting
193	Huber+Suhner Electronics Private Limited	Tech Exploiting
194	Bard India Healthcare Private Limited	Tech Exploiting
195	Oberthur Technologies India Pvt. Ltd.	Tech Exploiting
196	Armacell India Private Limited	Tech Exploiting
197	Sefar Filtration (India) Private Limited	Tech Exploiting
198	Walvoil Fluid Power (India) Private Limited	Tech Exploiting
199	Verifone India Sales Private Limited	Tech Exploiting
200	Mecaplast India Pvt. Ltd.	Tech Exploiting
201	Fresenius Medical Care India Private Limited	Tech Exploiting
202	Carraro Technologies India Private Limited	Tech Exploiting

203	Mothercare Sourcing India Private Limited	Tech Exploiting
204	Trumpf (India) Private Limited	Tech Exploiting
205	Kosan Crisplant India Private Limited	Tech Exploiting
206	Ursapharm India Private Limited	Tech Exploiting
207	Outokumpu India Private Limited	Tech Exploiting
208	Geico Paint Shop India Private Limited	Tech Exploiting
209	Nov India Private Limited	Tech Exploiting
210	Ppg India Private Limited	Tech Exploiting
211	Robatech India Private Limited	Tech Exploiting
212	Daetwyler Swisstec India Private Limited	Tech Exploiting
213	Hurco India Private Limited	Tech Exploiting
214	Amcor Flexibles India Private Limited	Tech Exploiting
215	Mando Automotive India Pvt. Ltd.	Tech Exploiting
216	Baumer India Private Limited	Tech Exploiting
217	Emka India Panel Accessories Private Limited	Tech Exploiting
218	Cargotec India Private Limited.	Tech Exploiting
219	Yutaka Autoparts India Private Limited	Tech Exploiting
220	Harris Communications International India Private Limited	Tech Exploiting
221	Interfaceflor India Private Limited	Tech Exploiting
222	Mayekawa India Private Limited	Tech Exploiting
223	Georg Fischer Piping Systems Private Limited	Tech Exploiting
224	Eo Technics India Private Limited	Tech Exploiting
225	Sanmina-Sci Technology India Private Limited	Tech Exploiting
226	Sekisui Chemical India Private Limited	Tech Exploiting
227	Polymatech Electronics Private Limited.	Tech Exploiting
228	Samsung Heavy Industries India Private Limited	Tech Exploiting
229	Doosan Infracore India Private Limited	Tech Exploiting
230	G & W Electric Company India Private Limited.	Tech Exploiting
231	Dic Fine Chemicals Private Limited	Tech Exploiting
232	Ansorg India Private Limited	Tech Exploiting
233	Visplay India Private Limited	Tech Exploiting
234	Ashland India Private Limited	Tech Exploiting
235	Exel Finishing Private Limited	Tech Exploiting
236	Smw Autoblok Workholding Private Limited	Tech Exploiting
237	Glatt Systems Private Limited	Tech Exploiting
238	Kramer Electronics India Private Limited	Tech Exploiting
239	Ziehl-Abegg India Private Limited	Tech Exploiting
240	Adeka India Private Limited	Tech Exploiting
241	Hansgrohe India Private Limited	Tech Exploiting
242	Luxottica India Eyewear Private Limited	Tech Exploiting
243	Haimer India Private Limited	Tech Exploiting
244	Sts Titeflex India Private Limited	Tech Exploiting
245	Moen India Private Limited	Tech Exploiting
246	Biosensors Interventional Technologies (India) Private Limited	Tech Exploiting
247	Ahresty India Pvt. Ltd.	Tech Exploiting
248	Elringklinger Automotive Components (India) Pvt. Ltd.	Tech Exploiting

249	Yokohama India Pvt. Ltd.	Tech Exploiting
250	Hypertherm (India) Thermal Cutting Private Limited	Tech Exploiting
251	Messer Cutting Systems India Private Limited	Tech Exploiting
252	Starcke Abrasives India Private Limited	Tech Exploiting
253	Polyplastics Marketing (India) Private Limited	Tech Exploiting
254	Seepex India Private Limited	Tech Exploiting
255	Tredegar Film Products India Private Limited	Tech Exploiting
256	Aluplast India Private Limited	Tech Exploiting
257	Fibro India Precision Products Private Limited	Tech Exploiting
258	Renold Chain India Private Limited	Tech Exploiting
259	Sakata Seed India Private Limited	Tech Exploiting
260	Gestamp Automotive India Private Limited	Tech Exploiting
261	Renolit India Private Limited	Tech Exploiting
262	Hommel-Etamic Metrology India Private Limited	Tech Exploiting
263	Yushiro India Company Private Limited	Tech Exploiting
264	Yamato Scale India Private Limited	Tech Exploiting
265	Norma Group Products India Private Limited	Tech Exploiting
266	Sigma-Tau India Private Limited	Tech Exploiting
267	Vicat Sagar Cement Private Limited	Tech Exploiting
268	Allflex India Private Limited	Tech Exploiting
269	Authentix India Private Limited	Tech Exploiting
270	Pioneer India Electronics Private Limited	Tech Exploiting
271	Anton Paar India Private Limited	Tech Exploiting
272	Kubota Agricultural Machinery India Private Limited	Tech Exploiting
273	Ferag India Private Limited.	Tech Exploiting
274	Furukawa Sangyo Kaisha India Private Limited	Tech Exploiting
275	Twin Disc Power Transmission Private Limited	Tech Exploiting
276	Ahlstrom Munksjo Fibercomposites India Pvt. Ltd.	Tech Exploiting
277	Mikuni India Pvt. Ltd.	Tech Exploiting
278	Yachiyo India Mfg. Pvt. Ltd.	Tech Exploiting
279	Joil India Private Limited	Tech Exploiting
280	Huvepharma Sea (Pune) Private Limited	Tech Exploiting
281	Kokoku Intech India Private Limited	Tech Exploiting
282	Closure Systems International (I) Private Limited	Tech Exploiting
283	Piolax India Private Limited	Tech Exploiting
284	Ssab Swedish Steel (India) Private Limited	Tech Exploiting
285	Franklin Fueling Systems India Private Limited	Tech Exploiting
286	Larox India Private Limited	Tech Exploiting
287	Karl Mayer India Private Limited	Tech Exploiting
288	Cascade India Material Handling Private Limited	Tech Exploiting
289	Benteler Engineering Chennai Private Limited	Tech Exploiting
290	Isra Vision India Private Limited	Tech Exploiting
291	Tounetsu India Private Limited	Tech Exploiting
292	Getzner India Private Limited	Tech Exploiting
293	Motan-Colortronic Plastics Machinery (India) Private Limited	Tech Exploiting

294	Litens Automotive (India) Private Limited	Tech Exploiting
295	Ifm Electronic India Private Limited	Tech Exploiting
296	Knf Pumps+Systems (India) Private Limited	Tech Exploiting
297	Megger (India) Private Limited	Tech Exploiting
298	Ensto India Private Limited	Tech Exploiting
299	Olympus Medical Systems India Private Limited	Tech Exploiting
300	Buchiglas India Private Limited	Tech Exploiting
301	Pigeon India Pvt. Ltd.	Tech Exploiting
302	Finproject India Private Limited	Tech Exploiting
303	Mitsubishi-Hitachi Metals Machinery South Asia Private Limited	Tech Exploiting
304	Novus Animal Nutrition (India) Private Limited	Tech Exploiting
305	Roxul Rockwool Technical Insulation India Private Limited	Tech Exploiting
306	Nipro Glass India Private Limited	Tech Exploiting
307	Meyer Burger India Private Limited	Tech Exploiting
308	Nipro India Corporation Private Limited	Tech Exploiting
309	A. Schulman Plastics India Private Limited	Tech Exploiting
310	Ampacet Speciality Products Private Limited	Tech Exploiting
311	Autonics Automation India Private Limited	Tech Exploiting
312	Kaneka India Private Limited	Tech Exploiting
313	Iwis Engine Systems India Private Limited	Tech Exploiting
314	Boge Compressors (India) Private Limited	Tech Exploiting
315	Nichiyu Forklifts India Private Limited	Tech Exploiting
316	Gg Cables And Wires India Private Limited	Tech Exploiting
317	Kemppi India Private Limited	Tech Exploiting
318	Weber Hydraulic India Private Limited	Tech Exploiting
319	Jsp Foam India Private Limited	Tech Exploiting
320	Halton India Private Limited	Tech Exploiting
321	Yaskawa India Private Limited	Tech Exploiting
322	Murata Electronics (India) Private Limited	Tech Exploiting
323	Cts India Private Limited	Tech Exploiting
324	Fukoku India Private Limited	Tech Exploiting
325	Martin Engineering Company India Private Limited	Tech Exploiting
326	Dole Fruits & Vegetables India Private Limited	Tech Exploiting
327	Rijk Zwaan India Seeds Private Limited	Tech Exploiting
328	Velan Valves India Private Limited	Tech Exploiting
329	Gedore (India) Private Limited	Tech Exploiting
330	Marini India Pvt. Ltd.	Tech Exploiting
331	Nihon Parkerizing (India) Pvt. Ltd.	Tech Exploiting
332	Takahata Precision India Pvt. Ltd.	Tech Exploiting
333	Torreco India Pvt. Ltd.	Tech Exploiting
334	Kendrion (Pune) Private Limited	Tech Exploiting
335	Klingelberg India Private Limited	Tech Exploiting
336	Gee India Private Limited	Tech Exploiting
337	Pinnacle Engines India Private Limited	Tech Exploiting
338	Oiles India Private Limited	Tech Exploiting

339	Mapei Construction Products India Private Limited	Tech Exploiting
340	Hexagon Composites India Private Limited	Tech Exploiting
341	Alpha Security Instruments (India) Private Limited	Tech Exploiting
342	Drm Filter Technology Private Limited	Tech Exploiting
343	Eastman Chemical India Private Limited	Tech Exploiting
344	Perto India Private Limited	Tech Exploiting
345	Midea Home Appliances (India) Private Limited	Tech Exploiting
346	Maschio Gaspardo India Private Limited	Tech Exploiting
347	Recticel India Private Limited	Tech Exploiting
348	Egston Electronics (India) Private Limited	Tech Exploiting
349	Buchi Operations India Private Limited	Tech Exploiting
350	Sk Lubricants & Oils India Private Limited	Tech Exploiting
351	Chugoku Paints (India) Private Limited	Tech Exploiting
352	Stemtech India Private Limited	Tech Exploiting
353	Wirtz Manufacturing India Private Limited	Tech Exploiting
354	Rotam Crop Protection Private Limited	Tech Exploiting
355	Scapa Tapes India Private Limited	Tech Exploiting
356	Famur India Mining Solutions Private Limited	Tech Exploiting
357	Endo Kogyo India Private Limited	Tech Exploiting
358	Otc Daihen India Private Limited	Tech Exploiting
359	Vega India Level and Pressure Measurement Private Limited	Tech Exploiting
360	Koike Cutting & Welding (India) Private Limited	Tech Exploiting
361	Gestamp Sungwoo Stampings and Assemblies Private Limited	Tech Exploiting
362	Santen India Private Limited	Tech Exploiting
363	Prima Machine Services India Private Limited	Tech Exploiting
364	Nisshinbo Mechatronics India Private Limited	Tech Exploiting
365	Nikki India Fuel Systems Private Limited	Tech Exploiting
366	Alps Electric (India) Private Limited	Tech Exploiting
367	Draeger Safety India Private Limited	Tech Exploiting
368	Npr Auto Parts Manufacturing India Private Limited	Tech Exploiting
369	Putzmeister Concrete Pumps India Private Limited	Tech Exploiting
370	Micro Precision Gear Technology India Private Limited	Tech Exploiting
371	Foam Supplies India Private Limited	Tech Exploiting
372	Lion Idemitsu Composites India Private Limited	Tech Exploiting
373	Curtiss Wright Surface Technologies India Private Limited	Tech Exploiting
374	Stanley Electric Sales Of India Private Limited	Tech Exploiting
375	Greatoo (India) Pvt. Ltd.	Tech Exploiting
376	Scania Commercial Vehicles India Pvt. Ltd.	Tech Exploiting
377	Kobelco Plate Processing India Private Limited	Tech Exploiting
378	Sato Auto-Id India Private Limited	Tech Exploiting

379	Oriental Yeast India Private Limited	Tech Exploiting
380	Nitta Corporation India Private Limited	Tech Exploiting
381	Sanyo Special Steel India Private Limited	Tech Exploiting
382	Trelleborg Industrial Products India Private Limited	Tech Exploiting
383	Wanhua International (India) Private Limited	Tech Exploiting
384	Case-Mate India Private Limited	Tech Exploiting
385	Greenyug Specialty Chemicals India Private Limited	Tech Exploiting
386	Seiren India Private Limited	Tech Exploiting
387	Nordmeccanica India Private Limited	Tech Exploiting
388	Marcegaglia India Private Limited	Tech Exploiting
389	Fiberhome India Private Limited	Tech Exploiting
390	General Mills Food Products India Private Limited	Tech Exploiting
391	Eurobelt Belting Solutions Private Limited	Tech Exploiting
392	Somero India Private Limited	Tech Exploiting
393	Fischer Connectors India Private Limited	Tech Exploiting
394	Sea Hygiene Products India Private Limited	Tech Exploiting
395	Daetwyler Graphics India Private Limited	Tech Exploiting
396	Colorobbia Chemicals India Private Limited	Tech Exploiting
397	Mp Filtri India Private Limited	Tech Exploiting
398	Oji Jk Packaging Private Limited	Tech Exploiting
399	India Gci Resitop Private Limited	Tech Exploiting
400	Ube Industries India Private Limited	Tech Exploiting
401	Actuant India Private Limited	Tech Exploiting
402	Jowat Adhesives India Private Limited	Tech Exploiting
403	Koppert Biological Systems India Private Limited	Tech Exploiting
404	Michelman Chemicals Private Limited	Tech Exploiting
405	Shindengen India Private Limited	Tech Exploiting
406	Ingenia Polymers India Private Limited	Tech Exploiting
407	Ingeteam Power Technology India Private Limited	Tech Exploiting
408	Fujikura Automotive India Private Limited	Tech Exploiting
409	Enza Zaden India Private Limited	Tech Exploiting
410	Central Glass Company India Private Limited	Tech Exploiting
411	Konvekta Refrigeration India Private Limited	Tech Exploiting
412	Thk India Private Limited	Tech Exploiting
413	Konvekta Bus Ac India Private Limited	Tech Exploiting
414	Daewoong Pharmaceutical (India) Private Limited	Tech Exploiting
415	Dalian Huarui Heavy Industry India Company Private Limited	Tech Exploiting
416	Getrag Transmissions India Pvt. Ltd.	Tech Exploiting
417	Hitachi Automotive Systems (India) Pvt. Ltd.	Tech Exploiting
418	Isuzu Motors India Pvt. Ltd.	Tech Exploiting
419	Yamaha Motor Electronics India Pvt. Ltd.	Tech Exploiting
420	Kyosan India Private Limited	Tech Exploiting

421	Stago India Private Limited	Tech Exploiting
422	Fronius India Private Limited	Tech Exploiting
423	Highly Electrical Appliances India Private Limited	Tech Exploiting
424	Bonatrans India Private Limited	Tech Exploiting
425	Shaklee India Private Limited	Tech Exploiting
426	Glanbia India Private Limited	Tech Exploiting
427	Hitachi High-Technologies India Private Limited	Tech Exploiting
428	Morgan Advanced Materials India Private Limited	Tech Exploiting
429	Botek India Private Limited	Tech Exploiting
430	Sanhua India Private Limited	Tech Exploiting
431	Fibox India Private Limited	Tech Exploiting
432	Shrieve Chemical India Private Limited	Tech Exploiting
433	Ceramtec India Innovative Ceramic Engineering Private Limited	Tech Exploiting
434	Corum India Private Limited	Tech Exploiting
435	Uchiyama India Private Limited	Tech Exploiting
436	Innovatec India Private Limited	Tech Exploiting
437	Studer Innotec India Private Limited	Tech Exploiting
438	Wolf Precision Tools India Private Limited	Tech Exploiting
439	Cepheid India Private Limited	Tech Exploiting
440	Granges India Private Limited	Tech Exploiting
441	Eu Yan Sang India Private Limited	Tech Exploiting
442	Gowan India Private Limited	Tech Exploiting
443	Genexis India Private Limited	Tech Exploiting
444	Longi Magnet India Private Limited	Tech Exploiting
445	Maco Pharma India Transfusion Solutions Private Limited	Tech Exploiting
446	Ma Extrusion India Private Limited	Tech Exploiting
447	Tencate Protective India Private Limited	Tech Exploiting
448	Minvasys India Private Limited	Tech Exploiting
449	Somar Corporation India Private Limited	Tech Exploiting
450	Angelantoni Test Technologies India Private Limited	Tech Exploiting
451	Alignment Systems Private Limited	Tech Exploiting
452	Toray Industries (India) Private Limited	Tech Exploiting
453	Standard Units Supply(India) Private Limited	Tech Exploiting
454	Bonfiglioli Renewable Power Conversion India Pvt. Ltd.	Tech Exploiting
455	Taiyo India Pvt. Ltd.	Tech Exploiting
456	Emmegi India Private Limited	Tech Exploiting
457	Universal Robots (India) Private Limited	Tech Exploiting
458	Fima India Private Limited	Tech Exploiting
459	Songwon Specialty Chemicals - India Private Limited	Tech Exploiting
460	Chugai Ro (India) Private Limited	Tech Exploiting
461	Oki India Private Limited	Tech Exploiting
462	Soufflet Malt India Private Limited	Tech Exploiting
463	Pyro Clark Reliance Level Solutions India Private Limited	Tech Exploiting
464	Ogura Clutch India Private Limited	Tech Exploiting
465	Zetor India Private Limited	Tech Exploiting

466	Sugino Machine India Private Limited	Tech Exploiting
467	Glanbia Performance Nutrition (India) Private Limited	Tech Exploiting
468	Suntool India Private Limited	Tech Exploiting
469	Kraton Polymers India Private Limited	Tech Exploiting
470	Corbion India Private Limited	Tech Exploiting
471	Grimme India Private Limited	Tech Exploiting
472	Viking Fire Products (India) Private Limited	Tech Exploiting
473	Toray Kusumgar Advanced Textile Private Limited	Tech Exploiting
474	Stratasys India Private Limited	Tech Exploiting
475	Hueck Decent Engraving India Private Limited	Tech Exploiting
476	Barnes Industrial Group India Private Limited	Tech Exploiting
477	Global Water Solutions India Private Limited	Tech Exploiting
478	Wikus India Private Limited	Tech Exploiting
479	Reviva Pharmaceuticals India Private Limited	Tech Exploiting
480	Multimatic India Private Limited	Tech Exploiting
481	Vivo Mobile India Pvt. Ltd.	Tech Exploiting
482	Porite India Private Limited	Tech Exploiting
483	Daido D.M.S. India Private Limited	Tech Exploiting
484	Dukane Intelligent Assembly Solutions (India) Private Limited	Tech Exploiting
485	Inventec Manufacturing (India) Private Limited	Tech Exploiting
486	Truking Technology India Private Limited	Tech Exploiting
487	Tubacex India Private Limited	Tech Exploiting
488	Leistritz India Private Limited	Tech Exploiting
489	Op India Private Limited	Tech Exploiting
490	Comer Industries India Private Limited	Tech Exploiting
491	Tristone Flowtech India Private Limited	Tech Exploiting
492	Hitachi Terminal Solutions India Private Limited	Tech Exploiting
493	Nippon Oil Pump India Private Limited	Tech Exploiting
494	Suaval Lorven India Private Limited	Tech Exploiting
495	Penn Color India Private Limited	Tech Exploiting
496	Kyodo Yushi India Private Limited	Tech Exploiting
497	Ckd India Private Limited	Tech Exploiting
498	Haas Food Equipment India Private Limited	Tech Exploiting
499	Daemo Engineering India Private Limited	Tech Exploiting
500	Spectrumlabs India Private Limited	Tech Exploiting
501	Tongyu Technology India Private Limited	Tech Exploiting
502	Iconex (India) Private Limited	Tech Exploiting
503	Csm Machinery India Private Limited	Tech Exploiting
504	Soufflet Malt Alwar Private Limited	Tech Exploiting
505	General Kinematics India Private Limited	Tech Exploiting
506	Fogtec Fire Protection Private Limited	Tech Exploiting
507	Rockwell Medical India Private Limited	Tech Exploiting
508	Fischer Building Materials India Private Limited	Tech Exploiting
509	Pictor Diagnostics India Private Limited	Tech Exploiting
510	Tekna Plasma India Private Limited	Tech Exploiting
511	Takemoto Yohki India Private Limited	Tech Exploiting

512	Leica Geosystems India Private Limited	Tech Exploiting
513	Weiss Automation Solutions India Privatelimited	Tech Exploiting
514	Boysen Exhaust Sysems Pune Privatelimited	Tech Exploiting
515	Transsion India Pvt. Ltd.	Tech Exploiting
516	Porvair Filtration India Private Limited	Tech Exploiting
517	Shuangma Machienry (India) Private Limited	Tech Exploiting
518	Moresco Hm&Lub India Private Limited	Tech Exploiting
519	Mens Polyurethanes India Private Limited	Tech Exploiting
520	Slm Solutions (India) Private Limited	Tech Exploiting
521	Porous Materials Scientific Private Limited	Tech Exploiting
522	Millennial Materials And Devices (India)Private Limited	Tech Exploiting
523	Hexagon Sgt India Private Limited	Tech Exploiting
524	Enshu India Private Limited	Tech Exploiting
525	Moretto Trading India Private Limited	Tech Exploiting
526	Renk Gears Private Limited	Tech Exploiting
527	Refratechnik (India) Private Limited	Tech Exploiting
528	Tensar Geosynthetics India Private Limited	Tech Exploiting
529	Kamax Automotive India Private Limited	Tech Exploiting
530	Linvatec India Private Limited	Tech Exploiting
531	Serac Packaging Solution Private Limited	Tech Exploiting
532	Hyundai Steel Anantapur Private Limited	Tech Exploiting
533	Phicomm India Private Limited	Tech Exploiting
534	Nord-Lock (India) Private Limited	Tech Exploiting
535	America Fujikura India Private Limited	Tech Exploiting
536	Lmt Tools India Private Limited	Tech Exploiting
537	Byk India Private Limited	Tech Exploiting
538	Dorot Valves India Private Limited	Tech Exploiting
539	Kumi Supreme India Private Limited	Tech Exploiting
540	Tessengerlo Kerley India Private Limited	Tech Exploiting
541	Buen Manejo Del Campo India Private	Tech Exploiting
542	Kgs Diamond Tools (India) Private Limited	Tech Exploiting
543	Sensortec Innovation India Private Limited	Tech Exploiting
544	Innow Biowish Technologies Private Limited	Tech Exploiting
545	Petrochina International (India) Private Limited	Tech Exploiting
546	Fuji Seal India Private Limited	Tech Exploiting
547	Basf Colors & Effects India Private Limited	Tech Exploiting
548	F-Tech Automotive Components Private Limited	Tech Exploiting
549	Fujikoki India Private Limited	Tech Exploiting
550	Lotte Advanced Materials India Privatelimited	Tech Exploiting
551	Pteris Global Integrated Solution (India) Private Limited	Tech Exploiting
552	Bejo Seeds India Private Limited	Tech Exploiting
553	Megmeet Electrical India Private Limited	Tech Exploiting
554	Vossloh Fastening Systems India Privatelimited	Tech Exploiting
555	Daiki Aluminium Industry India Privatelimited	Tech Exploiting
556	Romaco India Private Limited	Tech Exploiting
557	Tenneco Clean Air India Private Limited	Tech Exploiting

558	Bermad India Pvt. Ltd.	Tech Exploiting
559	Sumida Electric (India) Private Limited	Tech Exploiting
560	Nissei Electric India Private Limited	Tech Exploiting
561	Zuiko India Private Limited	Tech Exploiting
562	Orion Engineered Carbons India Private	Tech Exploiting
563	Poclain Powertrain Private Limited	Tech Exploiting
564	Miwon Specialty Chemical India Privatelimited	Tech Exploiting
565	Khvatec India Private Limited	Tech Exploiting
566	Hisense India Private Limited	Tech Exploiting
567	Eos Electro Optical Systems India Private Limited	Tech Exploiting
568	Kc Cottrell Engineering Services Private Limited	Tech Exploiting
569	Haitian Plastics Machinery India Private Limited	Tech Exploiting
570	Antares Vision India Private Limited	Tech Exploiting
571	Miyama Electric India Private Limited	Tech Exploiting
572	Smardtv Global Technology Privatelimited	Tech Exploiting
573	Sanitized Preservation India Privatelimited	Tech Exploiting
574	Isca Technologies India Private Limited	Tech Exploiting
575	Burgmann Power India Private Limited	Tech Exploiting
576	Samsung Display Noida Private Limited	Tech Exploiting
577	Smiths Interconnect India Private Limited	Tech Exploiting
578	Zentiva Private Limited	Tech Exploiting
579	Sg Shinagawa Refractories India Private Limited	Tech Exploiting
580	Sks Welding Systems Private Limited	Tech Exploiting
581	Batteroo India Private Limited	Tech Exploiting
582	Certoplast India Private Limited	Tech Exploiting
583	Kyokutoh Weld India Private Limited	Tech Exploiting
584	Bosco-India Enviro-Tech Private Limited	Tech Exploiting
585	Caraway Development Centre (India) Private Limited	Tech Exploiting
586	Milacron India Pvt. Ltd.	Tech Exploiting
587	Owens Corning Industries (India) Private Limited	Tech Exploiting
588	Tatsuno India Private Limited	Tech Exploiting
589	K S P G Automotive India Pvt. Ltd.	Tech Exploiting
590	Ecobliss India Private Limited	Tech Exploiting
591	Scholle Packaging (India) Private Limited	Tech Exploiting
592	Kramski Stamping and Molding India Private Limited	Tech Exploiting
593	First Energy Pvt. Ltd.	Tech Exploiting
594	Unicharm India Pvt. Ltd.	Tech Exploiting
595	Axon Interconnectors and Wires Private Limited	Tech Exploiting
596	Thyssenkrupp System Engineering India Private Limited	Tech Exploiting
597	Bsh Household Appliances Manufacturing Private Limited	Tech Exploiting
598	Kokuyo Riddhi Paper Products Private Limited	Tech Exploiting
599	Robert Bosch Starter Motors Generators India Private Limited	Tech Exploiting
600	Dynapac Road Construction Equipment (India) Private Limited	Tech Exploiting
601	Omya Healthcare India Private Limited	Tech Exploiting
602	Jabil India Manufacturing Private Limited	Tech Exploiting

603	Cummins Technologies India Pvt. Ltd.	TC + TS + TE
604	Caterpillar India Private Limited	TC + TS + TE
605	Volvo Auto India Pvt. Ltd.	TC + TS + TE
606	Glaxosmithkline Consumer Private Limited	TC + TS + TE
607	Halliburton India Operations Privatelimited	TC + TS + TE
608	High Performance Plastics India Private Limited	TC + TS + TE
609	Faurecia Emissions Control Technologies India Private Limited	TC + TS + TE
610	Mavenir Systems Private Limited	TC + TS + TE
611	Toyota Industries India Private Limited	TC + TS + TE
612	Performance Specialty Products (India)Private Limited	TC + TS + TE
613	Tevapharm India Pvt. Ltd.	TC + TS + TE
614	Bristol-Myers Squibb India Private Limited	TC + TS + TE
615	Nektar Therapeutics (India) Private Limited	TC + TS + TE
616	Daramic Battery Separator India Private Limited	TC + TS + TE
617	Fmc Technologies India Private Limited	TC + TS + TE
618	Maxim Integrated Products India Sales Private Limited	TC + TS + TE
619	Nidec India Private Limited	TC + TS + TE
620	Takeda Pharmaceuticals India Private Limited	TC + TS + TE
621	Heraeus Technologies India Private Limited	TC + TS + TE
622	Sartorius Weighing India Private Limited	TC + TS + TE
623	Globalfoundries Engineering Private Limited	TC + TS + TE
624	Kia Motors India Private Limited	TC + TS + TE
625	Orion Nutritionals Private Limited	TC + TS + TE
626	Movik Networks India Private Limited	TS + TE
627	Panasonic Life Solutions India Pvt. Ltd.	TS + TE
628	Itt Corporation India Private Limited	TS + TE
629	Terumo India Private Limited	TS + TE
630	Zoetis Pharmaceutical Research Private Limited	TS + TE
631	Med-El India Private Limited	TS + TE
632	Rohm India Private Limited	TS + TE
633	Uei Electronics Private Limited	TS + TE
634	Takata India Pvt. Ltd.	TS + TE
635	Kyocera Asia Pacific India Private Limited	TS + TE
636	Nifco India Private Limited	TS + TE
637	Nifco South India Manufacturing Private Limited	TS + TE
638	Hitachi Chemical India Private Limited	TS + TE
639	Aisin Automotive Haryana Pvt. Ltd.	TS + TE
640	Bloom Energy International (India) Private Limited	TS + TE
641	Altiostar Networks India Private Limited	TS + TE
642	Endress + Hauser Wetzer (India) Private Limited	TS + TE
643	Archroma India Private Limited	TS + TE
644	Lenovo Global Technology (India) Privatelimited	TS + TE
645	Otsuka Foods India Private Limited	TS + TE
646	Wolong India Technology Private Limited	TS + TE
647	Wolong Electric Private Limited	TS + TE

648	Electrolux Professional India Private Limited	TS + TE
649	Pfizer Products India Private Limited	TS + TE
650	Johnson Matthey Chemicals India Private Limited	TS + TE
651	Apicore Pharmaceuticals Private Limited	TS + TE
652	Amgen Technology Private Limited	TS + TE
653	Firmenich Aromatics Production (India) Private Limited	TS + TE
654	Terex India Pvt. Ltd.	TS + TE
655	Sca South Asia Petrochemicals Private Limited	TS + TE
656	Nippon Steel & Sumitomo Metal India Private Limited	TS + TE
657	Ideal Industries India Private Limited	TS + TE
658	Xylem Water Solutions India Private Limited	TS + TE
659	Insightra Medical India Private Limited	TS + TE
660	Volvo Ce India Private Limited	TS + TE
661	Rb Hygiene Home India Private Limited	TS + TE
662	Arcelormittal Ventures India Private Limited	TS + TE
663	Software A G India Sales Private Limited	TC + TE
664	Renault India Private Limited	TC + TE
665	A A M India Mfg. Corpn. Pvt. Ltd.	TC + TE
666	Osram Continental India Private Limited	TC + TE
667	Atonarp Micro-Systems India Private Limited	TC + TE
668	Indian Explosives Pvt. Ltd.	TC + TE
669	Coca Cola India Pvt. Ltd.	TC + TE
670	Moog Em Solutions (India) Private Limited	TC + TE
671	Kone Elevator India Private Limited	TC+TS

Table III: Status of the Company at IPO and USPTO			
S. No.	Name of the Company	Category (IPO)	Category (USPTO)
1	Panasonic Life Solutions India Pvt. Ltd.	TC+ TS +TE	TS + TE
2	Kone Elevator India Private Limited	TC+TS	TC+TS
3	Hoganas India Private Limited	Tech Exploiting	Tech Exploiting
4	Man Diesel & Turbo India Pvt. Ltd.	Tech Exploiting	Tech Exploiting
5	Coca Cola India Pvt. Ltd.	TS + TE	TC + TE
6	Metso India Pvt. Ltd.	TC + TS	Tech Exploiting
7	Deutz Engines (India) Private Limited	Tech Exploiting	Tech Exploiting
8	Marathon Electric India Private Limited	Non-Patenting	Tech Seeking
9	Cummins Technologies India Pvt. Ltd.	TC+ TS +TE	TC + TS + TE
10	Fuchs Lubricants India Pvt. Ltd.	Tech Exploiting	Tech Exploiting
11	Oerlikon Friction Systems (India) Pvt. Ltd.	Tech Exploiting	Tech Exploiting
12	Zoetis Pharmaceutical Research Private Limited	Tech Exploiting	TS + TE
13	Kloeckner Desma Machinery Private Limited	Non-Patenting	Tech Exploiting
14	Milacron India Pvt. Ltd.	TS + TE	Tech Exploiting
15	Kathrein India Private Limited	Tech Exploiting	Tech Exploiting
16	Stanley Works (India) Private Limited	Tech Exploiting	Tech Exploiting

17	Pfizer Products India Private Limited	TS + TE	TS + TE
18	Faurecia Emissions Control Technologies India Private Limited	Tech Exploiting	TC + TS + TE
19	Brillio Technologies Private Limited	Tech Exploiting	Tech Creating
20	Khs Machinery Private Limited	Tech Exploiting	Tech Exploiting
21	Suzuki Motorcycle India Pvt. Ltd.	Tech Exploiting	Tech Exploiting
22	Fata Hunter India Private Limited	Tech Exploiting	Tech Exploiting
23	Owens Corning Industries (India) Private Limited	TS + TE	Tech Exploiting
24	Hi-Lex India Private Limited	Tech Exploiting	Tech Exploiting
25	Schunk Metal and Carbon (India) Private Limited	Tech Exploiting	Tech Exploiting
26	Alcon Laboratories (India) Private Limited	Tech Exploiting	Tech Exploiting
27	Caterpillar India Private Limited	TC+ TS +TE	TC + TS + TE
28	Tevapharm India Pvt. Ltd.	TS + TE	TC + TS + TE
29	Borgwarner Morse Tec India Private Limited	Tech Exploiting	Tech Exploiting
30	Osi Systems Pvt. Ltd.	Tech Exploiting	Tech Exploiting
31	Johnson Matthey Chemicals India Private Limited	TS + TE	TS + TE
32	Veka India Private Limited.	Non-Patenting	Tech Exploiting
33	Ceco Environmental India Private Limited	Non-Patenting	Tech Exploiting
34	Moba Mobile Automation (India) Private Limited	Non-Patenting	Tech Exploiting
35	Bristol-Myers Squibb India Private Limited	TS + TE	TC + TS + TE
36	S C Johnson Products Private Limited	Tech Exploiting	Tech Exploiting
37	Huber+Suhner Electronics Private Limited	Tech Exploiting	Tech Exploiting
38	Bard India Healthcare Private Limited	Tech Exploiting	Tech Exploiting
39	Oberthur Technologies India Pvt. Ltd.	Tech Exploiting	Tech Exploiting
40	Armacell India Private Limited	Tech Exploiting	Tech Exploiting
41	Nektar Therapeutics (India) Private Limited	TS + TE	TC + TS + TE
42	Sefar Filtration (India) Private Limited	Tech Exploiting	Tech Exploiting
43	Walvoil Fluid Power (India) Private Limited	Tech Exploiting	Tech Exploiting
44	Verifone India Sales Private Limited	Tech Exploiting	Tech Exploiting
45	Richard Wolf India Private Limited	Non-Patenting	Tech Exploiting
46	Renault India Private Limited	TC+ TS +TE	TC + TE
47	Mecaplast India Pvt. Ltd.	Tech Exploiting	Tech Exploiting
48	Eoc Polymers India Private Limited	Non-Patenting	Tech Exploiting
49	Biesse Manufacturing Company Private Limited	Tech Exploiting	Non-Patenting
50	Fresenius Medical Care India Private Limited	Tech Exploiting	Tech Exploiting
51	Marubeni-Itochu Steel India Private Limited.	Non-Patenting	Tech Exploiting
52	Carraro Technologies India Private Limited	Tech Exploiting	Tech Exploiting
53	Mothercare Sourcing India Private Limited	Tech Exploiting	Tech Exploiting
54	Trumpf (India) Private Limited	Tech Exploiting	Tech Exploiting
55	Saca (India) Private Limited	Non-Patenting	Tech Exploiting
56	Apicore Pharmaceuticals Private Limited	TS + TE	TS + TE
57	Kosan Crisplant India Private Limited	Tech Exploiting	Tech Exploiting
58	D&Y Technologies Private Limited	Non-Patenting	Non-Patenting
59	Ursapharm India Private Limited	Tech Exploiting	Tech Exploiting
60	Meneta Automotive Components Private Limited	Non-Patenting	Non-Patenting
61	Outokumpu India Private Limited	Tech Exploiting	Tech Exploiting

62	Geico Paint Shop India Private Limited	Tech Exploiting	Tech Exploiting
63	Med-El India Private Limited	Tech Exploiting	TS + TE
64	Nov India Private Limited	Tech Exploiting	Tech Exploiting
65	Ppg India Private Limited	Tech Exploiting	Tech Exploiting
66	Kerakoll India Private Limited	Tech Exploiting	Non-Patenting
67	Robatech India Private Limited	Tech Exploiting	Tech Exploiting
68	Helukabel India Private Limited	Non-Patenting	Tech Exploiting
69	Daetwyler Swisstec India Private Limited	Tech Exploiting	Tech Exploiting
70	Brother International (India) Private Limited	Non-Patenting	Tech Exploiting
71	Hurco India Private Limited	Tech Exploiting	Tech Exploiting
72	Amcor Flexibles India Private Limited	Tech Exploiting	Tech Exploiting
73	Francois Compressors India Private Limited	Non-Patenting	Tech Exploiting
74	Tatsuno India Private Limited	TS + TE	Tech Exploiting
75	Rohm India Private Limited	Tech Exploiting	TS + TE
76	K S P G Automotive India Pvt. Ltd.	TS + TE	Tech Exploiting
77	Mando Automotive India Pvt. Ltd.	Tech Exploiting	Tech Exploiting
78	Mavenir Systems Private Limited	Tech Exploiting	TC + TS + TE
79	Omp India Private Limited	Non-Patenting	Non-Patenting
80	Baumer India Private Limited	Tech Exploiting	Tech Exploiting
81	Emka India Panel Accessories Private Limited	Tech Exploiting	Tech Exploiting
82	Cargotec India Private Limited.	Tech Exploiting	Tech Exploiting
83	Instrumentation Laboratory India Private Limited	Non-Patenting	Tech Exploiting
84	Yutaka Autoparts India Private Limited	Tech Exploiting	Tech Exploiting
85	Amgen Technology Private Limited	TS + TE	TS + TE
86	Okuma India Private Limited	Non-Patenting	Tech Exploiting
87	Harris Communications International India Private Limited	Tech Exploiting	Tech Exploiting
88	Interfaceflor India Private Limited	Tech Exploiting	Tech Exploiting
89	Mayekawa India Private Limited	Tech Exploiting	Tech Exploiting
90	Georg Fischer Piping Systems Private Limited	Tech Exploiting	Tech Exploiting
91	Eo Technics India Private Limited	Tech Exploiting	Tech Exploiting
92	Firmenich Aromatics Production (India) Private Limited	TS + TE	TS + TE
93	Sanmina-Sci Technology India Private Limited	Tech Exploiting	Tech Exploiting
94	Meiko (Asia) Techcentre Private Limited	Non-Patenting	Tech Exploiting
95	Sekisui Chemical India Private Limited	Tech Exploiting	Tech Exploiting
96	Polymatech Electronics Private Limited.	Tech Exploiting	Tech Exploiting
97	Itt Corporation India Private Limited	TC+ TS +TE	TS + TE
98	Ecobliss India Private Limited	TS + TE	Tech Exploiting
99	Samsung Heavy Industries India Private Limited	Tech Exploiting	Tech Exploiting
100	Doosan Infracore India Private Limited	Tech Exploiting	Tech Exploiting
101	Crest Ultrasonics India Private Limited	Non-Patenting	Tech Exploiting
102	G & W Electric Company India Private Limited.	Tech Exploiting	Tech Exploiting
103	Dic Fine Chemicals Private Limited	Tech Exploiting	Tech Exploiting
104	Ansorg India Private Limited	Tech Exploiting	Tech Exploiting
105	Visplay India Private Limited	Tech Exploiting	Tech Exploiting
106	Ashland India Private Limited	Tech Exploiting	Tech Exploiting

107	Exel Finishing Private Limited	Tech Exploiting	Tech Exploiting
108	Smw Autoblok Workholding Private Limited	Tech Exploiting	Tech Exploiting
109	Liugong India Private Limited	Non-Patenting	Tech Exploiting
110	Glatt Systems Private Limited	Tech Exploiting	Tech Exploiting
111	Kramer Electronics India Private Limited	Tech Exploiting	Tech Exploiting
112	Ziehl-Abegg India Private Limited	Tech Exploiting	Tech Exploiting
113	Adeka India Private Limited	Tech Exploiting	Tech Exploiting
114	Bbc World Service India Private Limited.	Non-Patenting	Tech Exploiting
115	Dr. Oetker India Private Limited	Tech Seeking	Non-Patenting
116	Scholle Packaging (India) Private Limited	TS + TE	Tech Exploiting
117	Hansgrohe India Private Limited	Tech Exploiting	Tech Exploiting
118	Olaer Fawcett Christie Hydraulics (India) Private Limited	Non-Patenting	Tech Exploiting
119	Uei Electronics Private Limited	Tech Exploiting	TS + TE
120	Fromm Packaging Systems India Private Limited	Non-Patenting	Tech Exploiting
121	Luxottica India Eyewear Private Limited	Tech Exploiting	Tech Exploiting
122	Imasen Manufacturing India Private Limited	Non-Patenting	Tech Exploiting
123	Haimer India Private Limited	Tech Exploiting	Tech Exploiting
124	Sts Titeflex India Private Limited	Tech Exploiting	Tech Exploiting
125	Quantum Clothing India Private Limited	Non-Patenting	Tech Exploiting
126	Moen India Private Limited	Tech Exploiting	Tech Exploiting
127	Ge Power Electronics (India) Private Limited	Tech Exploiting	Non-Patenting
128	Biosensors Interventional Technologies (India) Private Limited	Tech Exploiting	Tech Exploiting
129	Williams Controls India Private Limited	Non-Patenting	Tech Exploiting
130	Ahresty India Pvt. Ltd.	Tech Exploiting	Tech Exploiting
131	Elringklinger Automotive Components (India) Pvt. Ltd.	Tech Exploiting	Tech Exploiting
132	Hyundai Construction Equipment India Pvt. Ltd.	Non-Patenting	Tech Exploiting
133	Skoda Auto Volkswagen India Pvt. Ltd.	Tech Exploiting	Non-Patenting
134	Takata India Pvt. Ltd.	Tech Exploiting	TS + TE
135	Terex India Pvt. Ltd.	TS + TE	TS + TE
136	Yokohama India Pvt. Ltd.	Tech Exploiting	Tech Exploiting
137	Hypertherm (India) Thermal Cutting Private Limited	Tech Exploiting	Tech Exploiting
138	Messer Cutting Systems India Private Limited	Tech Exploiting	Tech Exploiting
139	Hanwa India Private Limited	Non-Patenting	Tech Exploiting
140	Starcke Abrasives India Private Limited	Tech Exploiting	Tech Exploiting
141	Polyplastics Marketing (India) Private Limited	Tech Exploiting	Tech Exploiting
142	Daramic Battery Separator India Private Limited	TS + TE	TC + TS + TE
143	Seepex India Private Limited	Tech Exploiting	Tech Exploiting
144	Kramski Stamping and Molding India Private Limited	TS + TE	Tech Exploiting
145	Yamazaki Mazak India Private Limited	Non-Patenting	Tech Exploiting
146	John Keells Foods India Private Limited	Tech Seeking	Tech Creating
147	Tredeggar Film Products India Private Limited	Tech Exploiting	Tech Exploiting
148	Aluplast India Private Limited	Tech Exploiting	Tech Exploiting
149	Wenzel South Asia Private Limited	Non-Patenting	Tech Exploiting

150	Emc2 India Private Limited	Non-Patenting	Tech Exploiting
151	Fibro India Precision Products Private Limited	Tech Exploiting	Tech Exploiting
152	Renold Chain India Private Limited	Tech Exploiting	Tech Exploiting
153	Sakata Seed India Private Limited	Tech Exploiting	Tech Exploiting
154	Tomen Electronics India Private Limited	Non-Patenting	Tech Exploiting
155	Gestamp Automotive India Private Limited	Tech Exploiting	Tech Exploiting
156	Renolit India Private Limited	Tech Exploiting	Tech Exploiting
157	Movik Networks India Private Limited	Non-Patenting	TS + TE
158	Hommel-Etamic Metrology India Private Limited	Tech Exploiting	Tech Exploiting
159	Yushiro India Company Private Limited	Tech Exploiting	Tech Exploiting
160	Sdp Telecom (India) Private Limited	Tech Exploiting	Non-Patenting
161	Cryolor Asia Pacific Private Limited	Non-Patenting	Non-Patenting
162	Yamato Scale India Private Limited	Tech Exploiting	Tech Exploiting
163	Inabata India Private Limited	Non-Patenting	Tech Exploiting
164	Norma Group Products India Private Limited	Tech Exploiting	Tech Exploiting
165	Sigma-Tau India Private Limited	Tech Exploiting	Tech Exploiting
166	Vicat Sagar Cement Private Limited	Tech Exploiting	Tech Exploiting
167	Allflex India Private Limited	Tech Exploiting	Tech Exploiting
168	Aggreko Energy Rental India Private Limited	Non-Patenting	Tech Exploiting
169	Authentix India Private Limited	Tech Exploiting	Tech Exploiting
170	Pioneer India Electronics Private Limited	Tech Exploiting	Tech Exploiting
171	Kobelco Machinery India Private Limited	Tech Seeking	Non-Patenting
172	Anton Paar India Private Limited	Tech Exploiting	Tech Exploiting
173	Software A G India Sales Private Limited	TC + TS	TC + TE
174	Kubota Agricultural Machinery India Private Limited	Tech Exploiting	Tech Exploiting
175	Ferag India Private Limited.	Tech Exploiting	Tech Exploiting
176	Furukawa Sangyo Kaisha India Private Limited	Tech Exploiting	Tech Exploiting
177	Twin Disc Power Transmission Private Limited	Tech Exploiting	Tech Exploiting
178	Radio Design India Private Limited	TS + TE	Non-Patenting
179	A A M India Mfg. Corpn. Pvt. Ltd.	TC+ TS +TE	TC + TE
180	Ahlstrom Munksjo Fibercomposites India Pvt. Ltd.	Tech Exploiting	Tech Exploiting
181	First Energy Pvt. Ltd.	TS + TE	Tech Exploiting
182	I A C International Automotive India Pvt. Ltd.	Tech Exploiting	Non-Patenting
183	Jacobi Carbons India Pvt. Ltd.	Non-Patenting	Tech Exploiting
184	Mikuni India Pvt. Ltd.	Tech Exploiting	Tech Exploiting
185	Unicharm India Pvt. Ltd.	TS + TE	Tech Exploiting
186	Yachiyo India Mfg. Pvt. Ltd.	Tech Exploiting	Tech Exploiting
187	Joil India Private Limited	Tech Exploiting	Tech Exploiting
188	Huvepharma Sea (Pune) Private Limited	Tech Exploiting	Tech Exploiting
189	Bimeda India Private Limited	Non-Patenting	Tech Exploiting
190	Sea South Asia Petrochemicals Private Limited	TS + TE	TS + TE
191	Kokoku Intech India Private Limited	Tech Exploiting	Tech Exploiting
192	Closure Systems International (I) Private Limited	Tech Exploiting	Tech Exploiting
193	Piolax India Private Limited	Tech Exploiting	Tech Exploiting
194	Calpeda Pumps India Private Limited	Tech Exploiting	Non-Patenting
195	Angang India Steel Private Limited	Tech Exploiting	Non-Patenting

196	Ssab Swedish Steel (India) Private Limited	Tech Exploiting	Tech Exploiting
197	Franklin Fueling Systems India Private Limited	Tech Exploiting	Tech Exploiting
198	Hirschvogel Components India Private Limited	Non-Patenting	Tech Exploiting
199	Larox India Private Limited	Tech Exploiting	Tech Exploiting
200	Fmc Technologies India Private Limited	TS + TE	TC + TS + TE
201	Glidepath India Private Limited	Non-Patenting	Non-Patenting
202	Xal Tool India Private Limited	Non-Patenting	Tech Exploiting
203	Galipoglu Hidromas India Manufacturing Private Limited	Tech Exploiting	Non-Patenting
204	Miller Groundbreaking India Private Limited	Non-Patenting	Tech Exploiting
205	Karl Mayer India Private Limited	Tech Exploiting	Tech Exploiting
206	Cascade India Material Handling Private Limited	Tech Exploiting	Tech Exploiting
207	Benteler Engineering Chennai Private Limited	Tech Exploiting	Tech Exploiting
208	Enpay Transformer Components India Private Limited	Tech Exploiting	Non-Patenting
209	Jergens India Private Limited	Non-Patenting	Tech Exploiting
210	Isra Vision India Private Limited	Tech Exploiting	Tech Exploiting
211	Ruhrpumpen India Private Limited	Non-Patenting	Tech Exploiting
212	Tounetsu India Private Limited	Tech Exploiting	Tech Exploiting
213	Frech India Machinery Private Limited	Non-Patenting	Tech Exploiting
214	Afriso India Private Limited	Non-Patenting	Non-Patenting
215	Getzner India Private Limited	Tech Exploiting	Tech Exploiting
216	Motan-Colortronic Plastics Machinery (India) Private Limited	Tech Exploiting	Tech Exploiting
217	Litens Automotive (India) Private Limited	Tech Exploiting	Tech Exploiting
218	Ifm Electronic India Private Limited	Tech Exploiting	Tech Exploiting
219	Axon Interconnectors and Wires Private Limited	TS + TE	Tech Exploiting
220	Knf Pumps+Systems (India) Private Limited	Tech Exploiting	Tech Exploiting
221	Megger (India) Private Limited	Tech Exploiting	Tech Exploiting
222	Ensto India Private Limited	Tech Exploiting	Tech Exploiting
223	Kyocera Asia Pacific India Private Limited	Tech Exploiting	TS + TE
224	Digi M2m Solutions India Private Limited	Non-Patenting	Tech Exploiting
225	Olympus Medical Systems India Private Limited	Tech Exploiting	Tech Exploiting
226	Kobold Instruments Private Limited	Non-Patenting	Tech Exploiting
227	Buchiglas India Private Limited	Tech Exploiting	Tech Exploiting
228	Pigeon India Pvt. Ltd.	Tech Exploiting	Tech Exploiting
229	Volvo Auto India Pvt. Ltd.	TC+ TS +TE	TC + TS + TE
230	Finproject India Private Limited	Tech Exploiting	Tech Exploiting
231	Mitsubishi-Hitachi Metals Machinery South Asia Private Limited	Tech Exploiting	Tech Exploiting
232	Novus Animal Nutrition (India) Private Limited	Tech Exploiting	Tech Exploiting
233	Roxul Rockwool Technical Insulation India Private Limited	Tech Exploiting	Tech Exploiting
234	Caf India Private Limited	Tech Exploiting	Non-Patenting
235	Nipro Glass India Private Limited	Tech Exploiting	Tech Exploiting
236	Meyer Burger India Private Limited	Tech Exploiting	Tech Exploiting
237	Nipro India Corporation Private Limited	Tech Exploiting	Tech Exploiting

238	A. Schulman Plastics India Private Limited	Tech Exploiting	Tech Exploiting
239	Ampacet Speciality Products Private Limited	Tech Exploiting	Tech Exploiting
240	Autonics Automation India Private Limited	Tech Exploiting	Tech Exploiting
241	Kaneka India Private Limited	Tech Exploiting	Tech Exploiting
242	Frama Systems India Private Limited	Tech Exploiting	Non-Patenting
243	Iwis Engine Systems India Private Limited	Tech Exploiting	Tech Exploiting
244	Suminoe Teijin Techno Krishna India Private Limited	Non-Patenting	Tech Exploiting
245	Blastrac India Private Limited	Non-Patenting	Tech Exploiting
246	Boge Compressors (India) Private Limited	Tech Exploiting	Tech Exploiting
247	Nichiyu Forklifts India Private Limited	Tech Exploiting	Tech Exploiting
248	Gg Cables and Wires India Private Limited	Tech Exploiting	Tech Exploiting
249	Technotrans India Private Limited	Non-Patenting	Tech Exploiting
250	Kemppi India Private Limited	Tech Exploiting	Tech Exploiting
251	Nifco India Private Limited	Tech Exploiting	TS + TE
252	Ifm Engineering Private Limited	Tech Seeking	Non-Patenting
253	Weber Hydraulic India Private Limited	Tech Exploiting	Tech Exploiting
254	Nifco South India Manufacturing Private Limited	Tech Exploiting	TS + TE
255	Jsp Foam India Private Limited	Tech Exploiting	Tech Exploiting
256	Infinova (India) Private Limited	Non-Patenting	Non-Patenting
257	Halton India Private Limited	Tech Exploiting	Tech Exploiting
258	Yaskawa India Private Limited	Tech Exploiting	Tech Exploiting
259	Hanchang India Private Limited	Non-Patenting	Tech Exploiting
260	Murata Electronics (India) Private Limited	Tech Exploiting	Tech Exploiting
261	Cts India Private Limited	Tech Exploiting	Tech Exploiting
262	Fukoku India Private Limited	Tech Exploiting	Tech Exploiting
263	Ammeraal Beltech (India) Private Limited	Non-Patenting	Tech Exploiting
264	Martin Engineering Company India Private Limited	Tech Exploiting	Tech Exploiting
265	Akemi Technology India Private Limited	Tech Exploiting	Non-Patenting
266	Fraenkische Industrial Pipes India Private Limited	Non-Patenting	Tech Exploiting
267	Toyota Material Handling India Private Limited	Non-Patenting	Non-Patenting
268	Maxim Integrated Products India Sales Private Limited	TS + TE	TC + TS + TE
269	Dole Fruits & Vegetables India Private Limited	Tech Exploiting	Tech Exploiting
270	Rijk Zwaan India Seeds Private Limited	Tech Exploiting	Tech Exploiting
271	Nidec India Private Limited	TS + TE	TC + TS + TE
272	Tsubaki Hoover India Private Limited	Non-Patenting	Tech Exploiting
273	Velan Valves India Private Limited	Tech Exploiting	Tech Exploiting
274	Gedore (India) Private Limited	Tech Exploiting	Tech Exploiting
275	K B Autotech India Pvt. Ltd.	Non-Patenting	Non-Patenting
276	Marini India Pvt. Ltd.	Tech Exploiting	Tech Exploiting
277	Nihon Parkerizing (India) Pvt. Ltd.	Tech Exploiting	Tech Exploiting
278	Takahata Precision India Pvt. Ltd.	Tech Exploiting	Tech Exploiting
279	Torrecid India Pvt. Ltd.	Tech Exploiting	Tech Exploiting
280	Kendrion (Pune) Private Limited	Tech Exploiting	Tech Exploiting
281	Klingelberg India Private Limited	Tech Exploiting	Tech Exploiting
282	Hms Industrial Networks India Private Limited	Non-Patenting	Tech Exploiting

283	Hwacheon Machine Tool India Private Limited	Tech Exploiting	Non-Patenting
284	Takeda Pharmaceuticals India Private Limited	TS + TE	TC + TS + TE
285	Gce India Private Limited	Tech Exploiting	Tech Exploiting
286	Topps India Sports & Entertainment Company Private Limited	Non-Patenting	Tech Exploiting
287	Clim Leather Manufacturing Private Limited	Non-Patenting	Non-Patenting
288	Pinnacle Engines India Private Limited	Tech Exploiting	Tech Exploiting
289	Oiles India Private Limited	Tech Exploiting	Tech Exploiting
290	Mapei Construction Products India Private Limited	Tech Exploiting	Tech Exploiting
291	Maflow India Private Limited	Non-Patenting	Tech Exploiting
292	Hexagon Composites India Private Limited	Tech Exploiting	Tech Exploiting
293	Pharmazz India Private Limited	TS + TE	Tech Seeking
294	Alpha Security Instruments (India) Private Limited	Tech Exploiting	Tech Exploiting
295	Heraeus Technologies India Private Limited	TS + TE	TC + TS + TE
296	Jujo Chemical (India) Private Limited	Tech Exploiting	Non-Patenting
297	Nippon Steel & Sumitomo Metal India Private Limited	TS + TE	TS + TE
298	Drum Filter Technology Private Limited	Tech Exploiting	Tech Exploiting
299	Eastman Chemical India Private Limited	Tech Exploiting	Tech Exploiting
300	Ideal Industries India Private Limited	TS + TE	TS + TE
301	Perto India Private Limited	Tech Exploiting	Tech Exploiting
302	Midea Home Appliances (India) Private Limited	Tech Exploiting	Tech Exploiting
303	Fanem Medical Devices India Private Limited	Tech Exploiting	Non-Patenting
304	Maschio Gaspardo India Private Limited	Tech Exploiting	Tech Exploiting
305	Recticel India Private Limited	Tech Exploiting	Tech Exploiting
306	Meiji India Private Limited	TC + TS	Tech Exploiting
307	Egston Electronics (India) Private Limited	Tech Exploiting	Tech Exploiting
308	Buchi Operations India Private Limited	Tech Exploiting	Tech Exploiting
309	Bonna-Agela India Private Limited	Non-Patenting	Tech Exploiting
310	Sk Lubricants & Oils India Private Limited	Tech Exploiting	Tech Exploiting
311	Thyssenkrupp System Engineering India Private Limited	TS + TE	Tech Exploiting
312	Chugoku Paints (India) Private Limited	Tech Exploiting	Tech Exploiting
313	Monogram Aerospace Fasteners India Private Limited	Non-Patenting	Tech Exploiting
314	Stemtech India Private Limited	Tech Exploiting	Tech Exploiting
315	Sartorius Weighing India Private Limited	TS + TE	TC + TS + TE
316	Wirtz Manufacturing India Private Limited	Tech Exploiting	Tech Exploiting
317	Xylem Water Solutions India Private Limited	TS + TE	TS + TE
318	Rotam Crop Protection Private Limited	Tech Exploiting	Tech Exploiting
319	Bsh Household Appliances Manufacturing Private Limited	TS + TE	Tech Exploiting
320	Scapa Tapes India Private Limited	Tech Exploiting	Tech Exploiting
321	Famur India Mining Solutions Private Limited	Tech Exploiting	Tech Exploiting
322	Endo Kogyo India Private Limited	Tech Exploiting	Tech Exploiting
323	Otc Daihen India Private Limited	Tech Exploiting	Tech Exploiting

324	Vega India Level and Pressure Measurement Private Limited	Tech Exploiting	Tech Exploiting
325	Koike Cutting & Welding (India) Private Limited	Tech Exploiting	Tech Exploiting
326	Scott Bader India Private Limited	Non-Patenting	Tech Exploiting
327	Weiss Technik India Private Limited	Non-Patenting	Tech Exploiting
328	Motovario Gear Solutions Private Limited	Tech Exploiting	Non-Patenting
329	Gestamp Sungwoo Stampings and Assemblies Private Limited	Tech Exploiting	Tech Exploiting
330	Lamons Gasket and Bolt India Private Limited	Non-Patenting	Tech Exploiting
331	Santen India Private Limited	Tech Exploiting	Tech Exploiting
332	Prima Machine Services India Private Limited	Tech Exploiting	Tech Exploiting
333	Cermex India Private Limited	Non-Patenting	Tech Exploiting
334	Keyence India Private Limited	Non-Patenting	Tech Exploiting
335	Liftec E&C India Private Limited	Non-Patenting	Tech Exploiting
336	Ptw Dosimetry India Private Limited	Tech Exploiting	Non-Patenting
337	Nisshinbo Mechatronics India Private Limited	Tech Exploiting	Tech Exploiting
338	Nikki India Fuel Systems Private Limited	Tech Exploiting	Tech Exploiting
339	Alps Electric (India) Private Limited	Tech Exploiting	Tech Exploiting
340	Furukawa Rock Drill India Private Limited	Non-Patenting	Tech Exploiting
341	Insightra Medical India Private Limited	TS + TE	TS + TE
342	Tenryu Saw India Private Limited	Non-Patenting	Non-Patenting
343	Ensysyex Pest Management Systems Private Limited	Non-Patenting	Non-Patenting
344	China Steel Corporation India Private Limited	Non-Patenting	Non-Patenting
345	Draeger Safety India Private Limited	Tech Exploiting	Tech Exploiting
346	Apex Power Tools India Private Limited	Non-Patenting	Non-Patenting
347	M. K. Morse Company India Private Limited	Non-Patenting	Tech Exploiting
348	Npr Auto Parts Manufacturing India Private Limited	Tech Exploiting	Tech Exploiting
349	Putzmeister Concrete Pumps India Private Limited	Tech Exploiting	Tech Exploiting
350	Hitachi Chemical India Private Limited	Tech Exploiting	TS + TE
351	Oriental Motor (India) Private Limited	Non-Patenting	Tech Exploiting
352	Micro Precision Gear Technology India Private Limited	Tech Exploiting	Tech Exploiting
353	Foam Supplies India Private Limited	Tech Exploiting	Tech Exploiting
354	Lion Idemitsu Composites India Private Limited	Tech Exploiting	Tech Exploiting
355	Curtiss Wright Surface Technologies India Private Limited	Tech Exploiting	Tech Exploiting
356	Stanley Electric Sales of India Private Limited	Tech Exploiting	Tech Exploiting
357	Aisin Automotive Haryana Pvt. Ltd.	Tech Exploiting	TS + TE
358	C V G Seating (India) Pvt. Ltd.	Non-Patenting	Tech Exploiting
359	Carrier Midea India Pvt. Ltd.	Tech Seeking	Non-Patenting
360	Greatoo (India) Pvt. Ltd.	Tech Exploiting	Tech Exploiting
361	Scania Commercial Vehicles India Pvt. Ltd.	Tech Exploiting	Tech Exploiting
362	Kobelco Plate Processing India Private Limited	Tech Exploiting	Tech Exploiting
363	Nichicon Electronics (India) Private Limited	Non-Patenting	Tech Exploiting
364	Sato Auto-Id India Private Limited	Tech Exploiting	Tech Exploiting

365	Oriental Yeast India Private Limited	Tech Exploiting	Tech Exploiting
366	Nitta Corporation India Private Limited	Tech Exploiting	Tech Exploiting
367	Bloom Energy International (India) Private Limited	Tech Exploiting	TS + TE
368	Sanyo Special Steel India Private Limited	Tech Exploiting	Tech Exploiting
369	Inprocorp India Private Limited	Non-Patenting	Tech Exploiting
370	Trelleborg Industrial Products India Private Limited	Tech Exploiting	Tech Exploiting
371	Altiostar Networks India Private Limited	Tech Exploiting	TS + TE
372	Wanhua International (India) Private Limited	Tech Exploiting	Tech Exploiting
373	Hallite Sealing Solutions India Private Limited	Non-Patenting	Non-Patenting
374	Case-Mate India Private Limited	Tech Exploiting	Tech Exploiting
375	Greenyug Specialty Chemicals India Private Limited	Tech Exploiting	Tech Exploiting
376	Seiren India Private Limited	Tech Exploiting	Tech Exploiting
377	Nordmeccanica India Private Limited	Tech Exploiting	Tech Exploiting
378	Willemin-Macodel (India) Private Limited	Non-Patenting	Tech Exploiting
379	Leuze Electronic Private Limited	Non-Patenting	Tech Exploiting
380	Marcegaglia India Private Limited	Tech Exploiting	Tech Exploiting
381	Fiberhome India Private Limited	Tech Exploiting	Tech Exploiting
382	General Mills Food Products India Private Limited	Tech Exploiting	Tech Exploiting
383	Eurobelt Belting Solutions Private Limited	Tech Exploiting	Tech Exploiting
384	Somero India Private Limited	Tech Exploiting	Tech Exploiting
385	Toa Electronics India Private Limited	Non-Patenting	Tech Exploiting
386	Fischer Connectors India Private Limited	Tech Exploiting	Tech Exploiting
387	Endress + Hauser Wetzler (India) Private Limited	Tech Exploiting	TS + TE
388	Sea Hygiene Products India Private Limited	Tech Exploiting	Tech Exploiting
389	Saraya India Private Limited	Non-Patenting	Tech Exploiting
390	Daetwyler Graphics India Private Limited	Tech Exploiting	Tech Exploiting
391	Imr India Private Limited	Tech Exploiting	Non-Patenting
392	Colorobbia Chemicals India Private Limited	Tech Exploiting	Tech Exploiting
393	Mp Filtri India Private Limited	Tech Exploiting	Tech Exploiting
394	Oji Jk Packaging Private Limited	Tech Exploiting	Tech Exploiting
395	Nexira India Private Limited	Non-Patenting	Tech Exploiting
396	India Gci Resitop Private Limited	Tech Exploiting	Tech Exploiting
397	Marel India Private Limited	Non-Patenting	Tech Exploiting
398	Ube Industries India Private Limited	Tech Exploiting	Tech Exploiting
399	Actuant India Private Limited	Tech Exploiting	Tech Exploiting
400	Darco Medical India Private Limited	Non-Patenting	Tech Exploiting
401	Mipox Abrasives India Private Limited	Non-Patenting	Tech Exploiting
402	Jowat Adhesives India Private Limited	Tech Exploiting	Tech Exploiting
403	Koppert Biological Systems India Private Limited	Tech Exploiting	Tech Exploiting
404	Lee Spring Company India Private Limited	Non-Patenting	Non-Patenting
405	Michelman Chemicals Private Limited	Tech Exploiting	Tech Exploiting
406	Shindengen India Private Limited	Tech Exploiting	Tech Exploiting
407	Monster Energy India Private Limited	Non-Patenting	Tech Exploiting

408	Movomech Sunnex India Private Limited	Tech Exploiting	Non-Patenting
409	Nan Pao Resins India Private Limited	Non-Patenting	Non-Patenting
410	Ingenia Polymers India Private Limited	Tech Exploiting	Tech Exploiting
411	Ampco Metal India Private Limited	Non-Patenting	Tech Exploiting
412	Citel Surge Protection Private Limited	Non-Patenting	Tech Exploiting
413	Omb Saleri Valves India Private Limited	Tech Exploiting	Non-Patenting
414	Middleby India Engineering Private Limited	Non-Patenting	Tech Exploiting
415	Ingeteam Power Technology India Private Limited	Tech Exploiting	Tech Exploiting
416	Frenzelit Expansion Joint Private Limited	Non-Patenting	Tech Exploiting
417	L.K. Machinery India Private Limited	Non-Patenting	Non-Patenting
418	Fujikura Automotive India Private Limited	Tech Exploiting	Tech Exploiting
419	Enza Zaden India Private Limited	Tech Exploiting	Tech Exploiting
420	Sunpreme Solar India Private Limited	Non-Patenting	Tech Exploiting
421	Central Glass Company India Private Limited	Tech Exploiting	Tech Exploiting
422	Konvekta Refrigeration India Private Limited	Tech Exploiting	Tech Exploiting
423	Thk India Private Limited	Tech Exploiting	Tech Exploiting
424	Konvekta Bus Ac India Private Limited	Tech Exploiting	Tech Exploiting
425	Daewoong Pharmaceutical (India) Private Limited	Tech Exploiting	Tech Exploiting
426	Kinugawa Rubber India Private Limited	Tech Exploiting	Non-Patenting
427	Vollmer Technologies India Private Limited	Non-Patenting	Tech Exploiting
428	Innerspec Technologies India Private Limited	Non-Patenting	Non-Patenting
429	Uniflex Hose Assembly Machines India Private Limited	Non-Patenting	Tech Exploiting
430	Dalian Huarui Heavy Industry India Company Private Limited	Tech Exploiting	Tech Exploiting
431	Getrag Transmissions India Pvt. Ltd.	Tech Exploiting	Tech Exploiting
432	Hitachi Automotive Systems (India) Pvt. Ltd.	Tech Exploiting	Tech Exploiting
433	Isuzu Motors India Pvt. Ltd.	Tech Exploiting	Tech Exploiting
434	Triumph Motorcycles (India) Pvt. Ltd.	Non-Patenting	Non-Patenting
435	Yamaha Motor Electronics India Pvt. Ltd.	Tech Exploiting	Tech Exploiting
436	Biodenta India Private Limited	Non-Patenting	Tech Exploiting
437	Kyosan India Private Limited	Tech Exploiting	Tech Exploiting
438	Stago India Private Limited	Tech Exploiting	Tech Exploiting
439	Fronius India Private Limited	Tech Exploiting	Tech Exploiting
440	Highly Electrical Appliances India Private Limited	Tech Exploiting	Tech Exploiting
441	Enovation Controls India Private Limited	Non-Patenting	Tech Exploiting
442	Bonatrans India Private Limited	Tech Exploiting	Tech Exploiting
443	Shaklee India Private Limited	Tech Exploiting	Tech Exploiting
444	Vantage Specialty Ingredients Private Limited	Non-Patenting	Tech Exploiting
445	Geo Semiconductor (India) Private Limited	Non-Patenting	Tech Exploiting
446	Glanbia India Private Limited	Tech Exploiting	Tech Exploiting
447	Hitachi High-Technologies India Private Limited	Tech Exploiting	Tech Exploiting
448	Morgan Advanced Materials India Private Limited	Tech Exploiting	Tech Exploiting
449	Botek India Private Limited	Tech Exploiting	Tech Exploiting
450	Fastenal India Wholesale Private Limited	Non-Patenting	Non-Patenting
451	Finder India Private Limited	Non-Patenting	Non-Patenting

452	Archroma India Private Limited	Tech Exploiting	TS + TE
453	Sanhua India Private Limited	Tech Exploiting	Tech Exploiting
454	Fibox India Private Limited	Tech Exploiting	Tech Exploiting
455	Redex India Private Limited	Non-Patenting	Tech Exploiting
456	Takii Seeds India Private Limited	Non-Patenting	Tech Exploiting
457	Mi Steel Processing India Private Limited	Non-Patenting	Tech Exploiting
458	Shrieve Chemical India Private Limited	Tech Exploiting	Tech Exploiting
459	Ceramtec India Innovative Ceramic Engineering Private Limited	Tech Exploiting	Tech Exploiting
460	Rigibore India Private Limited	Non-Patenting	Non-Patenting
461	Corum India Private Limited	Tech Exploiting	Tech Exploiting
462	Uchiyama India Private Limited	Tech Exploiting	Tech Exploiting
463	Innovatec India Private Limited	Tech Exploiting	Tech Exploiting
464	Studer Innotec India Private Limited	Tech Exploiting	Tech Exploiting
465	Lt Production India Private Limited	TS + TE	Non-Patenting
466	Wolf Precision Tools India Private Limited	Tech Exploiting	Tech Exploiting
467	Terumo India Private Limited	TC+ TS +TE	TS + TE
468	Ingun India Private Limited	Non-Patenting	Tech Exploiting
469	Gmp Reels India Private Limited	Tech Seeking	Non-Patenting
470	Og Corporation India Private Limited	Non-Patenting	Tech Exploiting
471	Cepheid India Private Limited	Tech Exploiting	Tech Exploiting
472	Mi Electrical Steel Processing India Private Limited	Non-Patenting	Tech Exploiting
473	Linamar India Private Limited	Non-Patenting	Tech Exploiting
474	Granges India Private Limited	Tech Exploiting	Tech Exploiting
475	Burri India Private Limited	Non-Patenting	Non-Patenting
476	Eu Yan Sang India Private Limited	Tech Exploiting	Tech Exploiting
477	Gowan India Private Limited	Tech Exploiting	Tech Exploiting
478	Genexis India Private Limited	Tech Exploiting	Tech Exploiting
479	Longi Magnet India Private Limited	Tech Exploiting	Tech Exploiting
480	Maco Pharma India Transfusion Solutions Private Limited	Tech Exploiting	Tech Exploiting
481	Innerworkings India Private Limited	Non-Patenting	Tech Exploiting
482	Ma Extrusion India Private Limited	Tech Exploiting	Tech Exploiting
483	Middleby Celfrost Innovations Private Limited	Non-Patenting	Tech Exploiting
484	Tencate Protective India Private Limited	Tech Exploiting	Tech Exploiting
485	Minvasys India Private Limited	Tech Exploiting	Tech Exploiting
486	Kokuyo Riddhi Paper Products Private Limited	TS + TE	Tech Exploiting
487	Niedax India Cable Management Systems Private Limited	Non-Patenting	Tech Exploiting
488	Mehler Texnologies India Private Limited	Non-Patenting	Tech Exploiting
489	Somar Corporation India Private Limited	Tech Exploiting	Tech Exploiting
490	Angelantoni Test Technologies India Private Limited	Tech Exploiting	Tech Exploiting
491	Alignment Systems Private Limited	Tech Exploiting	Tech Exploiting
492	Toray Industries (India) Private Limited	Tech Exploiting	Tech Exploiting
493	Standard Units Supply (India) Private Limited	Tech Exploiting	Tech Exploiting

494	Bonfiglioli Renewable Power Conversion India Pvt. Ltd.	Tech Exploiting	Tech Exploiting
495	Taiyo India Pvt. Ltd.	Tech Exploiting	Tech Exploiting
496	Emmegi India Private Limited	Tech Exploiting	Tech Exploiting
497	Agro Plastic Technology Private Limited	Non-Patenting	Tech Exploiting
498	Universal Robots (India) Private Limited	Tech Exploiting	Tech Exploiting
499	Fima India Private Limited	Tech Exploiting	Tech Exploiting
500	Dopag India Private Limited	Non-Patenting	Non-Patenting
501	Songwon Specialty Chemicals - India Private Limited	Tech Exploiting	Tech Exploiting
502	Chugai Ro (India) Private Limited	Tech Exploiting	Tech Exploiting
503	Oki India Private Limited	Tech Exploiting	Tech Exploiting
504	Soufflet Malt India Private Limited	Tech Exploiting	Tech Exploiting
505	Pyro Clark Reliance Level Solutions India Private Limited	Tech Exploiting	Tech Exploiting
506	Arteche Smartgrid India Private Limited	Non-Patenting	Tech Exploiting
507	Mesha Energy Solutions Private Limited	Tech Seeking	Non-Patenting
508	Ogura Clutch India Private Limited	Tech Exploiting	Tech Exploiting
509	Pewag India Private Limited	Non-Patenting	Tech Exploiting
510	Futurepump (India) Private Limited	Tech Exploiting	Non-Patenting
511	Zetor India Private Limited	Tech Exploiting	Tech Exploiting
512	Sugino Machine India Private Limited	Tech Exploiting	Tech Exploiting
513	Glanbia Performance Nutrition (India) Private Limited	Tech Exploiting	Tech Exploiting
514	Suntool India Private Limited	Tech Exploiting	Tech Exploiting
515	Kraton Polymers India Private Limited	Tech Exploiting	Tech Exploiting
516	Corbion India Private Limited	Tech Exploiting	Tech Exploiting
517	Astrophysics India Private Limited	Non-Patenting	Non-Patenting
518	Grimme India Private Limited	Tech Exploiting	Tech Exploiting
519	Apex Medicalcorp India Private Limited	Non-Patenting	Tech Exploiting
520	Viking Fire Products (India) Private Limited	Tech Exploiting	Tech Exploiting
521	Toray Kusumgar Advanced Textile Private Limited	Tech Exploiting	Tech Exploiting
522	Stratasys India Private Limited	Tech Exploiting	Tech Exploiting
523	Matrix Vision India Private Limited	Non-Patenting	Non-Patenting
524	Hueck Decent Engraving India Private Limited	Tech Exploiting	Tech Exploiting
525	Barnes Industrial Group India Private Limited	Tech Exploiting	Tech Exploiting
526	Glaxosmithkline Consumer Private Limited	TC+ TS +TE	TC + TS + TE
527	Global Water Solutions India Private Limited	Tech Exploiting	Tech Exploiting
528	Wikus India Private Limited	Tech Exploiting	Tech Exploiting
529	Caraway Development Centre (India) Private Limited	Tech Seeking	Tech Exploiting
530	Reviva Pharmaceuticals India Private Limited	Tech Exploiting	Tech Exploiting
531	Multimatic India Private Limited	Tech Exploiting	Tech Exploiting
532	Suzuki Motor Gujarat Pvt. Ltd.	TC+ TS +TE	Tech Exploiting
533	Vivo Mobile India Pvt. Ltd.	Tech Exploiting	Tech Exploiting
534	Porite India Private Limited	Tech Exploiting	Tech Exploiting
535	Daido D.M.S. India Private Limited	Tech Exploiting	Tech Exploiting
536	Canare Electric India Private Limited	Non-Patenting	Tech Exploiting

537	Dukane Intelligent Assembly Solutions (India) Private Limited	Tech Exploiting	Tech Exploiting
538	Maxxis Rubber India Private Limited	Tech Seeking	Non-Patenting
539	Atonarp Micro-Systems India Private Limited	Tech Exploiting	TC + TE
540	Dango & Dienenthal Hollerbach India Private Limited	Tech Exploiting	Non-Patenting
541	Inventec Manufacturing (India) Private Limited	Tech Exploiting	Tech Exploiting
542	Toyota Industries India Private Limited	Tech Exploiting	TC + TS + TE
543	Globalfoundries Engineering Private Limited	TS + TE	TC + TS + TE
544	Truking Technology India Private Limited	Tech Exploiting	Tech Exploiting
545	London Pharma and Healthcare India Private Limited	Tech Exploiting	Non-Patenting
546	O.L.C.I. Engineering India Private Limited	Non-Patenting	Tech Exploiting
547	Tubacex India Private Limited	Tech Exploiting	Tech Exploiting
548	Gigatera India Private Limited	Non-Patenting	Tech Exploiting
549	Leistritz India Private Limited	Tech Exploiting	Tech Exploiting
550	Environmental Dynamics India Private Limited	Non-Patenting	Tech Exploiting
551	Op India Private Limited	Tech Exploiting	Tech Exploiting
552	Comer Industries India Private Limited	Tech Exploiting	Tech Exploiting
553	Tristone Flowtech India Private Limited	Tech Exploiting	Tech Exploiting
554	Tensa India Engineering Private Limited	Non-Patenting	Tech Exploiting
555	Hitachi Terminal Solutions India Private Limited	Tech Exploiting	Tech Exploiting
556	Healthcubed India Private Limited	Non-Patenting	Non-Patenting
557	Sumitomo Forestry India Private Limited	Non-Patenting	Tech Exploiting
558	Nippon Oil Pump India Private Limited	Tech Exploiting	Tech Exploiting
559	Suaval Lorven India Private Limited	Tech Exploiting	Tech Exploiting
560	Eyenetra India Private Limited	Non-Patenting	Tech Exploiting
561	Foxconn Hon Hai Technology India Mega Development Private Limited	Non-Patenting	Non-Patenting
562	Penn Color India Private Limited	Tech Exploiting	Tech Exploiting
563	Knott Vortex Private Limited	Non-Patenting	Tech Exploiting
564	Kyodo Yushi India Private Limited	Tech Exploiting	Tech Exploiting
565	Ckd India Private Limited	Tech Exploiting	Tech Exploiting
566	Voxeljet India Pvt. Ltd.	Non-Patenting	Tech Exploiting
567	Haas Food Equipment India Private Limited	Tech Exploiting	Tech Exploiting
568	Mtd Products India Private Limited	Non-Patenting	Tech Exploiting
569	Citic Heavy Industries Co India Private Limited	Non-Patenting	Non-Patenting
570	Japan Elevator Service India Private Limited	Non-Patenting	Tech Exploiting
571	Dklok Fittings and Valve Systems Private Limited	Non-Patenting	Tech Exploiting
572	Robert Bosch Starter Motors Generators India Private Limited	TS + TE	Tech Exploiting
573	Arol India & Apac Private Limited	Non-Patenting	Tech Exploiting
574	Daemo Engineering India Private Limited	Tech Exploiting	Tech Exploiting
575	Spectrumlabs India Private Limited	Tech Exploiting	Tech Exploiting
576	Haarslev Pt India Private Limited	Non-Patenting	Tech Exploiting
577	Tongyu Technology India Private Limited	Tech Exploiting	Tech Exploiting
578	Iconex (India) Private Limited	Tech Exploiting	Tech Exploiting
579	Innowireless India Private Limited	Non-Patenting	Tech Exploiting

580	Csm Machinery India Private Limited	Tech Exploiting	Tech Exploiting
581	Cheetah Mobile India Private Limited	Non-Patenting	Tech Exploiting
582	Soufflet Malt Alwar Private Limited	Tech Exploiting	Tech Exploiting
583	Teco Electrical Industries Private Limited	Non-Patenting	Non-Patenting
584	General Kinematics India Private Limited	Tech Exploiting	Tech Exploiting
585	Pacific Consolidated Industries (Pci)Gases India Private Limited	Tech Exploiting	Non-Patenting
586	Fogtec Fire Protection Private Limited	Tech Exploiting	Tech Exploiting
587	Rockwell Medical India Private Limited	Tech Exploiting	Tech Exploiting
588	Fischer Building Materials India Private Limited	Tech Exploiting	Tech Exploiting
589	Pictor Diagnostics India Private Limited	Tech Exploiting	Tech Exploiting
590	Ligabue Bigi Support India Private Limited	Tech Exploiting	Non-Patenting
591	Ariston Thermo India Private Limited	Tech Exploiting	Non-Patenting
592	Tekna Plasma India Private Limited	Tech Exploiting	Tech Exploiting
593	Takemoto Yohki India Private Limited	Tech Exploiting	Tech Exploiting
594	Performance Specialty Products (India) Private Limited	Tech Exploiting	TC + TS + TE
595	Sensonics Technologies India Private Limited	Non-Patenting	Tech Exploiting
596	Lenovo Global Technology (India) Private Limited	Tech Exploiting	TS + TE
597	Pinggao Group Power India Private Limited	Tech Exploiting	Non-Patenting
598	Leica Geosystems India Private Limited	Tech Exploiting	Tech Exploiting
599	Romeo Systems India Private Limited	Non-Patenting	Tech Exploiting
600	Sodecia Automotive Gujarat Private Limited	Tech Exploiting	Non-Patenting
601	Halliburton India Operations Private Limited	TC+ TS +TE	TC + TS + TE
602	Cypet Technologies India Private Limited	Tech Seeking	Non-Patenting
603	Eepos India Private Limited	Tech Exploiting	Non-Patenting
604	Weiss Automation Solutions India Private Limited	Tech Exploiting	Tech Exploiting
605	Boysen Exhaust Systems Pune Private Limited	Tech Exploiting	Tech Exploiting
606	Transsion India Pvt. Ltd.	Tech Exploiting	Tech Exploiting
607	Omnipol Equipments India Private Limited	Non-Patenting	Non-Patenting
608	Porvair Filtration India Private Limited	Tech Exploiting	Tech Exploiting
609	Barsys India Private Limited	TS + TE	Tech Creating
610	Shuangma Machinery (India) Private Limited	Tech Exploiting	Tech Exploiting
611	Topre India Private Limited	Non-Patenting	Tech Exploiting
612	Moresco Hm&Lub India Private Limited	Tech Exploiting	Tech Exploiting
613	Mens Polyurethanes India Private Limited	Tech Exploiting	Tech Exploiting
614	Slm Solutions (India) Private Limited	Tech Exploiting	Tech Exploiting
615	Porous Materials Scientific Private Limited	Tech Exploiting	Tech Exploiting
616	Tpp Techno Plastic Products India Private Limited	Non-Patenting	Non-Patenting
617	Allmed Medical India Private Limited	Non-Patenting	Tech Exploiting
618	Perstorp Industries India Private Limited	TC + TS	Tech Exploiting
619	Millennial Materials and Devices (India) Private Limited	Tech Exploiting	Tech Exploiting
620	Sun Ace Chemical (India) Private Limited	Tech Exploiting	Non-Patenting
621	Kukdo Chemical India Private Limited	Non-Patenting	Tech Exploiting
622	Hexagon Sgt India Private Limited	Tech Exploiting	Tech Exploiting
623	Enshu India Private Limited	Tech Exploiting	Tech Exploiting

624	Kia Motors India Private Limited	TS + TE	TC + TS + TE
625	Moretto Trading India Private Limited	Tech Exploiting	Tech Exploiting
626	Dynapac Road Construction Equipment (India) Private Limited	TS + TE	Tech Exploiting
627	Bierrebi Cutting Solutions Private Limited	Non-Patenting	Tech Exploiting
628	Renk Gears Private Limited	Tech Exploiting	Tech Exploiting
629	Refratechnik (India) Private Limited	Tech Exploiting	Tech Exploiting
630	Uquifa India Private Limited	Tech Seeking	Non-Patenting
631	Viscotec India Private Limited	Non-Patenting	Tech Exploiting
632	Tensor Geosynthetics India Private Limited	Tech Exploiting	Tech Exploiting
633	Purina Petcare India Private Limited	Non-Patenting	Tech Exploiting
634	Kamax Automotive India Private Limited	Tech Exploiting	Tech Exploiting
635	Sewoong Machinery India Private Limited	Non-Patenting	Non-Patenting
636	Foxlink Technical India Private Limited	Non-Patenting	Non-Patenting
637	Glorytek Science India Private Limited	Non-Patenting	Non-Patenting
638	Linivatec India Private Limited	Tech Exploiting	Tech Exploiting
639	Mirapro India Private Limited	Non-Patenting	Tech Exploiting
640	Serac Packaging Solution Private Limited	Tech Exploiting	Tech Exploiting
641	Mobile Climate Control Thermal Systems India Private Limited	Non-Patenting	Tech Exploiting
642	Hyundai Dymos India Private Limited	Non-Patenting	Tech Exploiting
643	Haycarb Activated Carbon Private Limited	Non-Patenting	Tech Exploiting
644	Moog Em Solutions (India) Private Limited	TS + TE	TC + TE
645	Hyundai Steel Anantapur Private Limited	Tech Exploiting	Tech Exploiting
646	Nvh India Anantapur Auto Parts Private Limited	Tech Exploiting	Non-Patenting
647	Phicomm India Private Limited	Tech Exploiting	Tech Exploiting
648	Nord-Lock (India) Private Limited	Tech Exploiting	Tech Exploiting
649	Menon Renewable Resources (India) Private Limited	Non-Patenting	Tech Exploiting
650	America Fujikura India Private Limited	Tech Exploiting	Tech Exploiting
651	Sungwoo Hitech Ap Private Limited	Non-Patenting	Tech Exploiting
652	Flood Control International (India) Private Limited	Non-Patenting	Non-Patenting
653	Vanmark Food Equipment (India) Private Limited	Non-Patenting	Tech Exploiting
654	Clearone Innovation India Private Limited	Non-Patenting	Tech Exploiting
655	Lmt Tools India Private Limited	Tech Exploiting	Tech Exploiting
656	Daeha Plastic Compound India Private Limited	Non-Patenting	Non-Patenting
657	Byk India Private Limited	Tech Exploiting	Tech Exploiting
658	Dorot Valves India Private Limited	Tech Exploiting	Tech Exploiting
659	Comap India Private Limited	Non-Patenting	Tech Exploiting
660	Kumi Supreme India Private Limited	Tech Exploiting	Tech Exploiting
661	Medipure Life Sciences India Private Limited	Non-Patenting	Tech Exploiting
662	Hydraulique Production Systems India Private Limited	Non-Patenting	Tech Exploiting
663	Tessengerlo Kerley India Private Limited	Tech Exploiting	Tech Exploiting
664	Buen Manejo Del Campo India Private	Tech Exploiting	Tech Exploiting
665	Standex Electronics India Private	Non-Patenting	Tech Exploiting
666	Atp Electronics India Private Limited	Non-Patenting	Non-Patenting

667	Hyperion Materials & Technologies India Private Limited	Non-Patenting	Tech Exploiting
668	Kgs Diamond Tools (India) Private Limited	Tech Exploiting	Tech Exploiting
669	Sensortec Innovation India Private Limited	Tech Exploiting	Tech Exploiting
670	Otsuka Foods India Private Limited	Tech Exploiting	TS + TE
671	Aisan Fiem Automotives India Private Limited	Non-Patenting	Tech Exploiting
672	Optrascan India Private Limited	Non-Patenting	Non-Patenting
673	Innow Biowish Technologies Private Limited	Tech Exploiting	Tech Exploiting
674	Volvo Ce India Private Limited	TS + TE	TS + TE
675	Petrochina International (India) Private Limited	Tech Exploiting	Tech Exploiting
676	Fuji Seal India Private Limited	Tech Exploiting	Tech Exploiting
677	Tacoma Pharmsolutions Private Limited	Non-Patenting	Non-Patenting
678	Oring Industrial Networking Private Limited	Non-Patenting	Tech Exploiting
679	Basf Colors & Effects India Private Limited	Tech Exploiting	Tech Exploiting
680	Rb Hygiene Home India Private Limited	TS + TE	TS + TE
681	Coolpad Technologies India Private Limited	Non-Patenting	Tech Exploiting
682	Xiaoyi India Technology Private Limited	Non-Patenting	Non-Patenting
683	Omya Healthcare India Private Limited	TS + TE	Tech Exploiting
684	Acco Brands India Private Limited	Non-Patenting	Tech Exploiting
685	Orion Nutritionals Private Limited	TS + TE	TC + TS + TE
686	F-Tech Automotive Components Private Limited	Tech Exploiting	Tech Exploiting
687	Fujikoki India Private Limited	Tech Exploiting	Tech Exploiting
688	Jcb Industries Private Limited	TC+ TS +TE	Tech Creating
689	Aekyung Chemtech India Private Limited	Non-Patenting	Tech Exploiting
690	Oshima Paint India Private Limited	Non-Patenting	Non-Patenting
691	Osram Continental India Private Limited	TC+ TS +TE	TC + TE
692	Dongyang Electric and Power Indiaprivate Limited	Non-Patenting	Non-Patenting
693	Wolong India Technology Private Limited	Tech Exploiting	TS + TE
694	Gimatic Automation India Private Limited	Non-Patenting	Tech Exploiting
695	Lotte Advanced Materials India Privatelimited	Tech Exploiting	Tech Exploiting
696	Yanmar Engine Manufacturing Indiaprivate Limited	TC+ TS +TE	Tech Exploiting
697	Pteris Global Integrated Solution (India) Private Limited	Tech Exploiting	Tech Exploiting
698	Wolong Electric Private Limited	Tech Exploiting	TS + TE
699	Bejo Seeds India Private Limited	Tech Exploiting	Tech Exploiting
700	Megmeet Electrical India Private Limited	Tech Exploiting	Tech Exploiting
701	Rix India Trading &Service Privatelimited	Non-Patenting	Tech Exploiting
702	Vossloh Fastening Systems India Privatelimited	Tech Exploiting	Tech Exploiting
703	Daiki Aluminium Industry India Privatelimited	Tech Exploiting	Tech Exploiting
704	Walsin Electronics India Private Limited	Non-Patenting	Non-Patenting
705	Karl Mayer Textile Machinery Indiaprivate Limited	Tech Exploiting	Non-Patenting
706	Romaco India Private Limited	Tech Exploiting	Tech Exploiting
707	Tenneco Clean Air India Private Limited	Tech Exploiting	Tech Exploiting
708	Bermad India Pvt. Ltd.	Tech Exploiting	Tech Exploiting
709	Sumida Electric (India) Private Limited	Tech Exploiting	Tech Exploiting
710	Chenfeng Tech Private Limited	Tech Seeking	Non-Patenting
711	Reutech India Private Limited	Non-Patenting	Tech Exploiting

712	Nissei Electric India Private Limited	Tech Exploiting	Tech Exploiting
713	Song Chuan Automotive Parts (India)	Non-Patenting	Non-Patenting
714	Zuiko India Private Limited	Tech Exploiting	Tech Exploiting
715	Orion Engineered Carbons India Private	Tech Exploiting	Tech Exploiting
716	Pei-Genesis Connectivity Solutions Indiaprivate Limited	Non-Patenting	Non-Patenting
717	Monin India Privatelimited	Non-Patenting	Non-Patenting
718	Poclain Powertrain Private Limited	Tech Exploiting	Tech Exploiting
719	Luxshare India Private Limited	Non-Patenting	Non-Patenting
720	Miwon Specialty Chemical India Privatelimited	Tech Exploiting	Tech Exploiting
721	Tech-Long Packagingmachinery Indiaprivate Limited	Non-Patenting	Tech Exploiting
722	G-Iii Apparel Indiaprivate Limited	Non-Patenting	Tech Exploiting
723	Ocem Airfield Indiaprivate Limited	Non-Patenting	Tech Exploiting
724	Khvatec India Private Limited	Tech Exploiting	Tech Exploiting
725	Gefit India Technologies Private Limited	Tech Exploiting	Non-Patenting
726	Hisense India Private Limited	Tech Exploiting	Tech Exploiting
727	Raydiall Automotiveindia Privatelimited	Non-Patenting	Non-Patenting
728	Eos Electro Optical Systems India Private Limited	Tech Exploiting	Tech Exploiting
729	Kc Cottrell Engineering Services Private Limited	Tech Exploiting	Tech Exploiting
730	Noxmat Combustion Technology Private Limited	Non-Patenting	Non-Patenting
731	Haitian Plastics Machinery India Private Limited	Tech Exploiting	Tech Exploiting
732	Antares Vision India Private Limited	Tech Exploiting	Tech Exploiting
733	Miyama Electric India Private Limited	Tech Exploiting	Tech Exploiting
734	Zapi India Private Limited	Non-Patenting	Non-Patenting
735	Lianchuang Electronic India Private Limited	Non-Patenting	Non-Patenting
736	High Performance Plastics India Private Limited	TC+ TS +TE	TC + TS + TE
737	Smardtv Global Technology Privatelimited	Tech Exploiting	Tech Exploiting
738	Sanitized Preservation India Privatelimited	Tech Exploiting	Tech Exploiting
739	Isca Technologies India Private Limited	Tech Exploiting	Tech Exploiting
740	Arcelormittal Ventures India Private Limited	TS + TE	TS + TE
741	Younghwa Tech India Private Limited	Non-Patenting	Non-Patenting
742	Antunes Nadi Manufacturing India Private Limited	Non-Patenting	Tech Exploiting
743	Burgmann Power India Private Limited	Tech Exploiting	Tech Exploiting
744	Sdgi India Private Limited	Non-Patenting	Tech Exploiting
745	Semitec Electronics India Private Limited	Non-Patenting	Tech Exploiting
746	Avary Technology (India) Private Limited	Non-Patenting	Tech Exploiting
747	Kerrimo International Private Limited	Tech Exploiting	Non-Patenting
748	Samsung Display Noida Private Limited	Tech Exploiting	Tech Exploiting
749	Robert Bosch Packaging Technology India Private Limited	Non-Patenting	Tech Exploiting
750	Alltemp Sustainable Refrigerants India Private Limited	Non-Patenting	Tech Exploiting
751	Sdb Steel and Pipe Private Limited	Non-Patenting	Tech Exploiting
752	Smiths Interconnect India Private Limited	Tech Exploiting	Tech Exploiting
753	Zentiva Private Limited	Tech Exploiting	Tech Exploiting
754	Sg Shinagawa Refractories India Private Limited	Tech Exploiting	Tech Exploiting
755	Electrolux Professional India Private Limited	Tech Exploiting	TS + TE

756	Dreamtech Electronics India Private Limited	Non-Patenting	Tech Exploiting
757	Sks Welding Systems Private Limited	Tech Exploiting	Tech Exploiting
758	Birkenstock India Private Limited	Non-Patenting	Tech Exploiting
759	Auto Motive Power Mobility Private Limited	Non-Patenting	Non-Patenting
760	Batteroo India Private Limited	Tech Exploiting	Tech Exploiting
761	Ningbo Supreme Global India Private Limited	Non-Patenting	Tech Exploiting
762	Roechling Automotive India Private Limited	Non-Patenting	Tech Exploiting
763	Bukwang Tech India Private Limited	Non-Patenting	Tech Exploiting
764	Dmege Chengji Electronics India Private Limited	Non-Patenting	Non-Patenting
765	Careray Digital Medical India Private Limited	Non-Patenting	Tech Exploiting
766	Bozhon Precision Industry India Private Limited	Non-Patenting	Tech Exploiting
767	Certoplast India Private Limited	Tech Exploiting	Tech Exploiting
768	Kyokutoh Weld India Private Limited	Tech Exploiting	Tech Exploiting
769	Zorg Industries India Private Limited	Non-Patenting	Tech Exploiting
770	Huntkey India Private Limited	Non-Patenting	Tech Exploiting
771	Foxx Life Sciences Private Limited	Non-Patenting	Non-Patenting
772	Suzhou Yili Technology (India) Private Limited	Tech Exploiting	Non-Patenting
773	Rulmeca India Private Limited	Non-Patenting	Tech Exploiting
774	Mean Well India Electronics Private Limited	Non-Patenting	Tech Exploiting
775	Bosscos-India Enviro-Tech Private Limited	Tech Exploiting	Tech Exploiting
776	Hmd Seal/Less Pumps Industrial (India) Private Limited	Tech Exploiting	Non-Patenting
777	Jabil India Manufacturing Private Limited	TS + TE	Tech Exploiting
778	Indian Explosives Pvt. Ltd.	Tech Exploiting	TC + TE

Annexure D

Table I: Classification of the firms patenting at IPO		
S. No.	Name of the Company	Category
554	Kone Elevator India Private Limited	Non-Patenting
555	Marathon Electric India Private Limited	Non-Patenting
556	Kloeckner Desma Machinery Private Limited	Non-Patenting
557	Veka India Private Limited.	Non-Patenting
558	Ceco Environmental India Private Limited	Non-Patenting
559	Moba Mobile Automation (India) Private Limited	Non-Patenting
560	Richard Wolf India Private Limited	Non-Patenting
561	Eoc Polymers India Private Limited	Non-Patenting
562	Marubeni-Itochu Steel India Private Limited.	Non-Patenting
563	Saca (India) Private Limited	Non-Patenting
564	D&Y Technologies Private Limited	Non-Patenting
565	Meneta Automotive Components Private Limited	Non-Patenting
566	Helukabel India Private Limited	Non-Patenting
567	Brother International (India) Private Limited	Non-Patenting
568	Francois Compressors India Private Limited	Non-Patenting
569	Omp India Private Limited	Non-Patenting
570	Instrumentation Laboratory India Private Limited	Non-Patenting
571	Okuma India Private Limited	Non-Patenting
572	Meiko (Asia) Techcentre Private Limited	Non-Patenting
573	Crest Ultrasonics India Private Limited	Non-Patenting
574	Liugong India Private Limited	Non-Patenting
575	Bbc World Service India Private Limited.	Non-Patenting
576	Olaer Fawcett Christie Hydraulics (India) Private Limited	Non-Patenting
577	Fromm Packaging Systems India Private Limited	Non-Patenting
578	Imasen Manufacturing India Private Limited	Non-Patenting
579	Quantum Clothing India Private Limited	Non-Patenting
580	Williams Controls India Private Limited	Non-Patenting
581	Hyundai Construction Equipment India Pvt. Ltd.	Non-Patenting
582	Hanwa India Private Limited	Non-Patenting
583	Yamazaki Mazak India Private Limited	Non-Patenting
584	Wenzel South Asia Private Limited	Non-Patenting
585	Emc2 India Private Limited	Non-Patenting
586	Tomen Electronics India Private Limited	Non-Patenting
587	Movik Networks India Private Limited	Non-Patenting
588	Cryolor Asia Pacific Private Limited	Non-Patenting
589	Inabata India Private Limited	Non-Patenting
590	Aggreko Energy Rental India Private Limited	Non-Patenting
591	Jacobi Carbons India Pvt. Ltd.	Non-Patenting
592	Bimeda India Private Limited	Non-Patenting
593	Hirschvogel Components India Private Limited	Non-Patenting
594	Glidepath India Private Limited	Non-Patenting
595	Xal Tool India Private Limited	Non-Patenting

596	Miller Groundbreaking India Private Limited	Non-Patenting
597	Jergens India Private Limited	Non-Patenting
598	Ruhrpumpen India Private Limited	Non-Patenting
599	Frech India Machinery Private Limited	Non-Patenting
600	Afriso India Private Limited	Non-Patenting
601	Digi M2m Solutions India Private Limited	Non-Patenting
602	Kobold Instruments Private Limited	Non-Patenting
603	Suminoe Teijin Techno Krishna India Private Limited	Non-Patenting
604	Blastrac India Private Limited	Non-Patenting
605	Technotrans India Private Limited	Non-Patenting
606	Infinova (India) Private Limited	Non-Patenting
607	Hanchang India Private Limited	Non-Patenting
608	Ammeraal Beltech (India) Private Limited	Non-Patenting
609	Fraenkische Industrial Pipes India Private Limited	Non-Patenting
610	Toyota Material Handling India Private Limited	Non-Patenting
611	Tsubaki Hoover India Private Limited	Non-Patenting
612	K B Autotech India Pvt. Ltd.	Non-Patenting
613	Hms Industrial Networks India Private Limited	Non-Patenting
614	Topps India Sports & Entertainment Company Private Limited	Non-Patenting
615	Clim Leather Manufacturing Private Limited	Non-Patenting
616	Maflow India Private Limited	Non-Patenting
617	Bonna-Agela India Private Limited	Non-Patenting
618	Monogram Aerospace Fasteners India Private Limited	Non-Patenting
619	Scott Bader India Private Limited	Non-Patenting
620	Weiss Technik India Private Limited	Non-Patenting
621	Lamons Gasket And Bolt India Private Limited	Non-Patenting
622	Cermex India Private Limited	Non-Patenting
623	Keyence India Private Limited	Non-Patenting
624	Liftec E&C India Private Limited	Non-Patenting
625	Furukawa Rock Drill India Private Limited	Non-Patenting
626	Tenryu Saw India Private Limited	Non-Patenting
627	Ensystem Pest Management Systems Private Limited	Non-Patenting
628	China Steel Corporation India Private Limited	Non-Patenting
629	Apex Power Tools India Private Limited	Non-Patenting
630	M. K. Morse Company India Private Limited	Non-Patenting
631	Oriental Motor (India) Private Limited	Non-Patenting
632	C V G Seating (India) Pvt. Ltd.	Non-Patenting
633	Nichicon Electronics (India) Private Limited	Non-Patenting
634	Inprocorp India Private Limited	Non-Patenting
635	Hallite Sealing Solutions India Private Limited	Non-Patenting
636	Willemin-Macodel (India) Private Limited	Non-Patenting
637	Leuze Electronic Private Limited	Non-Patenting
638	Toa Electronics India Private Limited	Non-Patenting
639	Saraya India Private Limited	Non-Patenting

640	Nexira India Private Limited	Non-Patenting
641	Marel India Private Limited	Non-Patenting
642	Darco Medical India Private Limited	Non-Patenting
643	Mipox Abrasives India Private Limited	Non-Patenting
644	Lee Spring Company India Private Limited	Non-Patenting
645	Monster Energy India Private Limited	Non-Patenting
646	Nan Pao Resins India Private Limited	Non-Patenting
647	Ampco Metal India Private Limited	Non-Patenting
648	Citel Surge Protection Private Limited	Non-Patenting
649	Middleby India Engineering Private Limited	Non-Patenting
650	Frenzelit Expansion Joint Private Limited	Non-Patenting
651	L.K. Machinery India Private Limited	Non-Patenting
652	Sunpreme Solar India Private Limited	Non-Patenting
653	Vollmer Technologies India Private Limited	Non-Patenting
654	Innerspec Technologies India Private Limited	Non-Patenting
655	Uniflex Hose Assembly Machines India Private Limited	Non-Patenting
656	Triumph Motorcycles (India) Pvt. Ltd.	Non-Patenting
657	Biodenta India Private Limited	Non-Patenting
658	Enovation Controls India Private Limited	Non-Patenting
659	Vantage Specialty Ingredients Private Limited	Non-Patenting
660	Geo Semiconductor (India) Private Limited	Non-Patenting
661	Fastenal India Wholesale Private Limited	Non-Patenting
662	Finder India Private Limited	Non-Patenting
663	Redex India Private Limited	Non-Patenting
664	Takii Seeds India Private Limited	Non-Patenting
665	Mi Steel Processing India Private Limited	Non-Patenting
666	Rigibore India Private Limited	Non-Patenting
667	Ingun India Private Limited	Non-Patenting
668	Og Corporation India Private Limited	Non-Patenting
669	Mi Electrical Steel Processing India Private Limited	Non-Patenting
670	Linamar India Private Limited	Non-Patenting
671	Burri India Private Limited	Non-Patenting
672	Innerworkings India Private Limited	Non-Patenting
673	Middleby Celfrost Innovations Private Limited	Non-Patenting
674	Niedax India Cable Management Systems Private Limited	Non-Patenting
675	Mehler Texnologies India Private Limited	Non-Patenting
676	Agru Plastic Technology Private Limited	Non-Patenting
677	Dopag India Private Limited	Non-Patenting
678	Arteche Smartgrid India Private Limited	Non-Patenting
679	Pewag India Private Limited	Non-Patenting
680	Astrophysics India Private Limited	Non-Patenting
681	Apex Medicalcorp India Private Limited	Non-Patenting
682	Matrix Vision India Private Limited	Non-Patenting
683	Canare Electric India Private Limited	Non-Patenting
684	O.L.C.I. Engineering India Private Limited	Non-Patenting

685	Gigatera India Private Limited	Non-Patenting
686	Environmental Dynamics India Private Limited	Non-Patenting
687	Tensa India Engineering Private Limited	Non-Patenting
688	Healthcubed India Private Limited	Non-Patenting
689	Sumitomo Forestry India Private Limited	Non-Patenting
690	Eyenetra India Private Limited	Non-Patenting
691	Foxconn Hon Hai Technology India Mega Development Private Limited	Non-Patenting
692	Knott Vortex Private Limited	Non-Patenting
693	Voxeljet India Pvt. Ltd.	Non-Patenting
694	Mtd Products India Private Limited	Non-Patenting
695	Citic Heavy Industries Co India Private Limited	Non-Patenting
696	Japan Elevator Service India Private Limited	Non-Patenting
697	Dklok Fittings And Valve Systems Private Limited	Non-Patenting
698	Arol India & Apac Private Limited	Non-Patenting
699	Haarslev Pt India Private Limited	Non-Patenting
700	Innowireless India Private Limited	Non-Patenting
701	Cheetah Mobile India Private Limited	Non-Patenting
702	Teco Electrical Industries Private Limited	Non-Patenting
703	Sensonics Technologies India Privatelimited	Non-Patenting
704	Romeo Systems India Private Limited	Non-Patenting
705	Omnipol Equipments India Private Limited	Non-Patenting
706	Topre India Private Limited	Non-Patenting
707	Tpp Techno Plastic Products India Private Limited	Non-Patenting
708	Allmed Medical India Private Limited	Non-Patenting
709	Kukdo Chemical India Private Limited	Non-Patenting
710	Bierrebi Cutting Solutions Private Limited	Non-Patenting
711	Viscotec India Private Limited	Non-Patenting
712	Purina Petcare India Private Limited	Non-Patenting
713	Sewoong Machinery India Private Limited	Non-Patenting
714	Foxlink Technical India Private Limited	Non-Patenting
715	Glorytek Science India Private Limited	Non-Patenting
716	Mirapro India Private Limited	Non-Patenting
717	Mobile Climate Control Thermal Systems India Private Limited	Non-Patenting
718	Hyundai Dymos India Private Limited	Non-Patenting
719	Haycarb Activated Carbon Private Limited	Non-Patenting
720	Menon Renewable Resources (India) Private Limited	Non-Patenting
721	Sungwoo Hitech Ap Private Limited	Non-Patenting
722	Flood Control International (India) Private Limited	Non-Patenting
723	Vanmark Food Equipment (India) Private Limited	Non-Patenting
724	Clearone Innovation India Private Limited	Non-Patenting
725	Daeha Plastic Compound India Private Limited	Non-Patenting
726	Comap India Private Limited	Non-Patenting
727	Medipure Life Sciences India Private Limited	Non-Patenting
728	Hydraulique Production Systems India Private Limited	Non-Patenting
729	Standex Electronics India Private	Non-Patenting

730	Atp Electronics India Private Limited	Non-Patenting
731	Hyperion Materials & Technologies India Private Limited	Non-Patenting
732	Aisan Fiem Automotives India Private Limited	Non-Patenting
733	Optrascan India Private Limited	Non-Patenting
734	Tacoma Pharmsolutions Private Limited	Non-Patenting
735	Oring Industrial Networking Private Limited	Non-Patenting
736	Coolpad Technologies India Private Limited	Non-Patenting
737	Xiaoyi India Technology Private Limited	Non-Patenting
738	Acco Brands India Private Limited	Non-Patenting
739	Aekyung Chemtech India Private Limited	Non-Patenting
740	Oshima Paint India Private Limited	Non-Patenting
741	Dongyang Electric And Power Indiaprivate Limited	Non-Patenting
742	Gimatic Automation India Private Limited	Non-Patenting
743	Rix India Trading &Service Privatelimited	Non-Patenting
744	Walsin Electronics India Private Limited	Non-Patenting
745	Reutech India Private Limited	Non-Patenting
746	Song Chuan Automotive Parts (India)	Non-Patenting
747	Pei-Genesis Connectivity Solutions Indiaprivate Limited	Non-Patenting
748	Monin India Privatelimited	Non-Patenting
749	Luxshare India Private Limited	Non-Patenting
750	Tech-Long Packagingmachinery Indiaprivate Limited	Non-Patenting
751	G-Iii Apparel Indiaprivate Limited	Non-Patenting
752	Ocem Airfield Indiaprivate Limited	Non-Patenting
753	Raydiall Automotiveindia Privatelimited	Non-Patenting
754	Noxmat Combustion Technology Private Limited	Non-Patenting
755	Zapi India Private Limited	Non-Patenting
756	Lianchuang Electronic India Private Limited	Non-Patenting
757	Younghwa Tech India Private Limited	Non-Patenting
758	Antunes Nadi Manufacturing India Private Limited	Non-Patenting
759	Sdgi India Private Limited	Non-Patenting
760	Semitec Electronics India Private Limited	Non-Patenting
761	Avary Technology (India) Private Limited	Non-Patenting
762	Robert Bosch Packaging Technology India Private Limited	Non-Patenting
763	Alltemp Sustainable Refrigerants India Private Limited	Non-Patenting
764	Sdb Steel And Pipe Private Limited	Non-Patenting
765	Dreamtech Electronics India Private Limited	Non-Patenting
766	Birkenstock India Private Limited	Non-Patenting
767	Auto Motive Power Mobility Private Limited	Non-Patenting
768	Ningbo Supreme Global India Private Limited	Non-Patenting
769	Roechling Automotive India Private Limited	Non-Patenting
770	Bukwang Tech India Private Limited	Non-Patenting
771	Dmegc Chengji Electronics India Private Limited	Non-Patenting
772	Careray Digital Medical India Private Limited	Non-Patenting
773	Bozhon Precision Industry India Private Limited	Non-Patenting
774	Zorg Industries India Private Limited	Non-Patenting
775	Huntkey India Private Limited	Non-Patenting

776	Foxx Life Sciences Private Limited	Non-Patenting
777	Rulmeca India Private Limited	Non-Patenting
778	Mean Well India Electronics Private Limited	Non-Patenting

Table II: Classification of the firms patenting at USPTO		
S. No.	Name of the Company	Category
671	Kone Elevator India Private Limited	Global Innovation Activity (USPTO)
672	D&Y Technologies Private Limited	Non-Patenting
673	Meneta Automotive Components Private Limited	Non-Patenting
674	Omp India Private Limited	Non-Patenting
675	Cryolor Asia Pacific Private Limited	Non-Patenting
676	Glidepath India Private Limited	Non-Patenting
677	Afriso India Private Limited	Non-Patenting
678	Infinova (India) Private Limited	Non-Patenting
679	Toyota Material Handling India Private Limited	Non-Patenting
680	K B Autotech India Pvt. Ltd.	Non-Patenting
681	Clim Leather Manufacturing Private Limited	Non-Patenting
682	Tenryu Saw India Private Limited	Non-Patenting
683	Ensysyex Pest Management Systems Private Limited	Non-Patenting
684	China Steel Corporation India Private Limited	Non-Patenting
685	Apex Power Tools India Private Limited	Non-Patenting
686	Hallite Sealing Solutions India Private Limited	Non-Patenting
687	Lee Spring Company India Private Limited	Non-Patenting
688	Nan Pao Resins India Private Limited	Non-Patenting
689	L.K. Machinery India Private Limited	Non-Patenting
690	Innerspec Technologies India Private Limited	Non-Patenting
691	Triumph Motorcycles (India) Pvt. Ltd.	Non-Patenting
692	Fastenal India Wholesale Private Limited	Non-Patenting
693	Finder India Private Limited	Non-Patenting
694	Rigibore India Private Limited	Non-Patenting
695	Burri India Private Limited	Non-Patenting
696	Dopag India Private Limited	Non-Patenting
697	Astrophysics India Private Limited	Non-Patenting
698	Matrix Vision India Private Limited	Non-Patenting
699	Healthcubed India Private Limited	Non-Patenting
700	Foxconn Hon Hai Technology India Mega Development Private Limited	Non-Patenting
701	Citic Heavy Industries Co India Private Limited	Non-Patenting
702	Teco Electrical Industries Private Limited	Non-Patenting
703	Omnipol Equipments India Private Limited	Non-Patenting
704	Tpp Techno Plastic Products India Private Limited	Non-Patenting
705	Sewoong Machinery India Private Limited	Non-Patenting
706	Foxlink Technical India Private Limited	Non-Patenting

707	Glorytek Science India Private Limited	Non-Patenting
708	Flood Control International (India) Private Limited	Non-Patenting
709	Daeha Plastic Compound India Private Limited	Non-Patenting
710	Atp Electronics India Private Limited	Non-Patenting
711	Optrascan India Private Limited	Non-Patenting
712	Tacoma Pharmsolutions Private Limited	Non-Patenting
713	Xiaoyi India Technology Private Limited	Non-Patenting
714	Oshima Paint India Private Limited	Non-Patenting
715	Dongyang Electric And Power Indiaprivate Limited	Non-Patenting
716	Walsin Electronics India Private Limited	Non-Patenting
717	Song Chuan Automotive Parts (India)	Non-Patenting
718	Pei-Genesis Connectivity Solutions Indiaprivate Limited	Non-Patenting
719	Monin India Privatelimited	Non-Patenting
720	Luxshare India Private Limited	Non-Patenting
721	Raydiall Automotiveindia Privatelimited	Non-Patenting
722	Noxmat Combustion Technology Private Limited	Non-Patenting
723	Zapi India Private Limited	Non-Patenting
724	Lianchuang Electronic India Private Limited	Non-Patenting
725	Younghwa Tech India Private Limited	Non-Patenting
726	Auto Motive Power Mobility Private Limited	Non-Patenting
727	Dmege Chengji Electronics India Private Limited	Non-Patenting
728	Foxx Life Sciences Private Limited	Non-Patenting
729	Biesse Manufacturing Company Private Limited	Non-Patenting
730	Kerakoll India Private Limited	Non-Patenting
731	Ge Power Electronics (India) Private Limited	Non-Patenting
732	Skoda Auto Volkswagen India Pvt. Ltd.	Non-Patenting
733	Sdp Telecom (India) Private Limited	Non-Patenting
734	I A C International Automotive India Pvt. Ltd.	Non-Patenting
735	Calpeda Pumps India Private Limited	Non-Patenting
736	Angang India Steel Private Limited	Non-Patenting
737	Galipoglu Hidromas India Manufacturing Private Limited	Non-Patenting
738	Enpay Transformer Components India Private Limited	Non-Patenting
739	Caf India Private Limited	Non-Patenting
740	Frama Systems India Private Limited	Non-Patenting
741	Akemi Technology India Private Limited	Non-Patenting
742	Hwacheon Machine Tool India Private Limited	Non-Patenting
743	Jujo Chemical (India) Private Limited	Non-Patenting
744	Fanem Medical Devices India Private Limited	Non-Patenting
745	Motovario Gear Solutions Private Limited	Non-Patenting
746	Ptw Dosimetry India Private Limited	Non-Patenting
747	Imr India Private Limited	Non-Patenting
748	Movomech Sunnex India Private Limited	Non-Patenting
749	Omb Saleri Valves India Private Limited	Non-Patenting
750	Kinugawa Rubber India Private Limited	Non-Patenting
751	Futurepump (India) Private Limited	Non-Patenting
752	Dango & Dienenthal Hollerbach India Private Limited	Non-Patenting

753	London Pharma And Healthcare India Private Limited	Non-Patenting
754	Pacific Consolidated Industries (Pci) Gases India Private Limited	Non-Patenting
755	Ligabue Bigi Support India Privatelimited	Non-Patenting
756	Ariston Thermo India Private Limited	Non-Patenting
757	Pinggao Group Power India Privatelimited	Non-Patenting
758	Sodecia Automotive Gujarat Privatelimited	Non-Patenting
759	Eepos India Private Limited	Non-Patenting
760	Sun Ace Chemical (India) Private Limited	Non-Patenting
761	Nvh India Anantapur Auto Parts Private Limited	Non-Patenting
762	Karl Mayer Textile Machinery Indiaprivate Limited	Non-Patenting
763	Gefit India Technologies Private Limited	Non-Patenting
764	Kerrimo International Private Limited	Non-Patenting
765	Suzhou Yili Technology (India) Private Limited	Non-Patenting
766	Hmd Seal/Less Pumps Industrial (India) Private Limited	Non-Patenting
767	Dr. Oetker India Private Limited	Non-Patenting
768	Kobelco Machinery India Private Limited	Non-Patenting
769	Ifm Engineering Private Limited	Non-Patenting
770	Carrier Midea India Pvt. Ltd.	Non-Patenting
771	Gmp Reels India Private Limited	Non-Patenting
772	Mesha Energy Solutions Private Limited	Non-Patenting
773	Maxxis Rubber India Private Limited	Non-Patenting
774	Cypet Technologies India Private Limited	Non-Patenting
775	Uquifa India Private Limited	Non-Patenting
776	Chenfeng Tech Private Limited	Non-Patenting
777	Radio Design India Private Limited	Non-Patenting
778	Lt Production India Private Limited	Non-Patenting

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