Mergers and Acquisitions, Technological Efforts and Exports: A Study of Pharmaceutical Sector in India

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Abstract

This report attempts to examine the role of Mergers and Acquisitions (M&A) and technological efforts in determining the export competitiveness of firms belonging to Indian Pharmaceutical Industry. M&A provides synergistic gains to firms and new competitive advantages arises from the complementarities of merging and acquiring firm specific intangible assets like production skills, brand names and better management capabilities. These gains could affect positively the export behaviour of domestic firms and could increase their degree of internationalization. In this study we also considered technological efforts in terms of in-house R&D, import of embodied technology, import of disembodied technology and import of raw material. Other export determinants like firm size, age, MNE affiliation capital intensity etc. are also considered for the study.

Studies dealing with export behaviour of firms using censored sample data have used Tobit specification model (Kumar and Siddharthan, 1994; Bhaduri and Ray, 2004; Siddharthan and Nollen, 2004). Some Studies (Wakelin, 1998; Sterlacchini, 1999; Basile, 2001; Bhat and Narayanan, 2009) has used Double Specification Model (Probit + Truncation) to compare with Tobit model. This study also considered two different econometric models, namely Tobit and Double specification model for estimation and the results have been compared. For a censored sample from Indian pharmaceutical industry double specification model is more appropriate and robust. The results of econometric exercise confirm that M&A, technological efforts, size and other firm specific characteristics are important in explaining export behaviour of firms. In M&A performing subsample of firms, results indicate that cross-border M&A appears to boost exports.

Keywords: Mergers and Acquisitions; Export Competitiveness; Pharmaceutical Sector; India; Tobit and Double Specification Model

JEL Classification: F14, G34, L1, L65

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1. Introduction

The role of technological efforts in explaining international competitiveness of firms is well documented in literature in the context of both developed and developing economies (empirically as well as theoretically). It is evident from the literature that trade theories explaining country specific variables are insufficient to explain trade pattern and competitiveness. To fulfil this lacuna, firm and market specific characteristics draw the attention. No single theory is adequate to explain inter-firm differences of export behaviour. A number of firm specific characteristics have been identified in determining the trade and competitive behaviour of firms. These include firm size, age, choice of technology, imports etc.

Many studies on export competitiveness have explained the relationship between technological efforts and export behaviour (Posner, 1961; Vernon, 1966, Krugman, 1979 Faberger, 1988). Several studies have empirically validated that there exist a relationship between technological strategies and international competitiveness (Kumar and Siddharthan, 1994; Wignaraja, 2002; Siddharthan and Nollen, 2004; Bhat and Narayanan, 2009, Wakelin, 1998). All these studies have by and large agreed that inter industry and inter firm variations could be explained to a great extent by difference in technological strategies.

In post reform period strategic decisions taken by firms, influence their competitiveness. The global economic activities, increasing foreign as well as domestic competition pushed firms to reconfigure their organizational structure and strengthen their core competencies (UNCTAD, 2000). Last two decades have experienced several waves of mergers and acquisitions (M&A) activity[2]. In post liberalisation period particularly in a country like India the wave of industrial consolidation was unprecedented in terms of its size, sector involved, geographical coverage etc. (Kumar, 2000; Beena, 2004; Pradhan, 2007).

M&A helped firms to improve their position in domestic market and has given a fair chance to expand their business beyond the geographical boundaries. Firms acquire new competitive advantages by reaping synergistic gains, like complementarity of firm specific intangible assets

[2] Years like 1995, 2000, 2004 and 2007 witnessed strong wave of M&A both in terms of numbers and deal values (Pradhan, 2007).

such as production skills, marketing capabilities as well as enhanced and more efficient management capabilities. M&A also provide a firm with ample opportunities to capture new market gains overseas (Bertrand, 2007).

These different motives assert that M&A could affect positively the export behaviour of the firms and their international presence could drive them towards being national champion. The possible impact of M&A on exports and competitiveness will determine whether policy maker should or should not facilitate consolidation and the formation of national champions. It could be said that export enhancement should be the ultimate aim of national competitive policy (Geroski, 2005; Bertrand, 2007).

The pharmaceutical industry is chosen for the study as it is one of the oldest industries in India. Preliminary analysis shows that in Indian manufacturing industry, maximum number of M&A has taken place in pharmaceutical sector. The industry is classified as high-technology industry (OECD, 2011)[3] with the firms mainly producing generic drugs (branded and non-branded), intermediates, and active pharmaceutical ingredients (APIs). Several technological activities are taking place in this industry. Therefore, this industry holds a strategic position in Indian manufacturing sector and expected to be technologically active.

The inward oriented policy regime (1970-1991) and regulatory measures which largely includes- abolition of product patents on food, chemicals, and drugs in 1970 allowed only patents for production processes fostering the development of a domestically competitive pharmaceutical industry. The imposition of price controls on certain formulations and bulk drugs discouraged the foreign participants who later abandoned Indian market making way for the domestic industry. Forty years of protection has enabled this industry to grow significantly and to develop efficiently its research and manufacturing capabilities (Vyas et. al. 2012).

Deregulation and new product patent law of 2005 forced pharmaceutical firms to compete from within as well as outside. Firms are forced to become dynamic to remain competitive and

[3] www.oecd.org

improve considerably their performance. Firms are adopting different corporate strategies like M&A and are putting huge efforts to acquire technological capabilities. In 1995 when India became member of WTO, its pharmaceutical exports were valued at less than $600 million which has grown to $5.19 billion by 2010. Hence there is a need to undertake a study investigating the relative importance of M&A and technological efforts in determining competitiveness of the firms in this leading industry.

Recent empirical works has used limited dependent variable estimation technique to prepare the model of export behaviour of firms. These studies are broadly classified as Tobit model, censored regression models or Double Specification models (based on two- part model suggested by Craig, 1971). In India most of the studies examining export competitiveness at firm level have used Tobit model and few have tried double specification model as well.

The objectives of this study are to:

a) Analyse the trends related to M&A activity in the pharmaceutical sector in India.
b) Identify the determinants of inter-firm variations in export intensity.
c) Examine the export behaviour of firms in terms of M&A and technological efforts.

The data is collected on Indian pharmaceutical industry for the period of 11 years (from 2000 to 2010) from CMIE Prowess database. We have carried out the analysis and compared the results obtained using two models, that is, Tobit model and double specification model (Probit + Truncation regression).

The rest of the paper is organised as follows. Theoretical background and pertinent review of literature is discussed in section 2. Section 3 presents overview of Pharmaceutical sector in India highlighting recent trends of M&A and exports in pharmaceutical sector. Section 4 would give a description of the data and variables being used in the study. Section 5 would explain the methodology being used in the present paper including the econometric model being tested and the hypotheses. The results of the econometric exercise would be discussed in section 6 and the final section would deal with the summary and conclusions.

2. Theoretical Background and Review of Literature

2.1 Mergers and Acquisitions and Exports

The present study attempts to investigate the impact of M&A on export behaviour of firms in Indian pharmaceutical industry. The linking of M&A and export is closely related to two main strands of the literature. An ample amount of literature is available on international trade and competitiveness directly dealing with export intensity. In particular numerous works focus on the relationship of firm size and export intensity (Wagner, 2001; Kumar and Siddharthan, 1994; Bhat and Narayanan, 2009). Recent studies emphasize the role of firm heterogeneity in understanding the export behaviour. Export behaviour vitally depends on heterogeneity of productivity among firms. In these lines it could be said that experience and firms' home market performance are important for export activities. Firms even require some particular knowledge and skills to enter foreign market. Cost of exports could be lowered by advanced technological skills. Enhanced performance of firms in domestic market could transfer their local competitive advantages to foreign markets and boost exports (Bertrand, 2007).

There is a parallel literature in industrial organisation dealing with the incidence of M&A. Most of the studies examining the performance of merging and acquiring firms reached mixed conclusion ranging from slightly positive to significantly negative. Theoretically describing M&A allow firms to obtain synergies, in particular, financial synergies, operational synergies, and managerial synergies. Financial synergies are the one which lowers the cost of the capital for merged entities. They lower the systematic risk of a company's investment portfolio. M&A could lead to increase in the size of a firm giving it a better access to capital in comparison to small separate entities. Operational synergies develop by combining operation of two entities lead to economies of scale and scope. Economies of scale can be achieved by having a joint sales force or decrease in production cost or enable firm to offer unique products and services in the market by technology and knowledge transfers (Porter, 1987). Managerial synergies can be realized if acquirer's managers possess superior managerial capabilities to monitor and plan which improvise performance of the integrated units. M&A also provide incentives for technological progress by spill over effects as well as increasing R&D incentives. One more

argument of M&A and export is market power consideration, which could encourage merging firms to increase their profit by supplying less domestically and export more.

Though M&A provides efficiency gains but post integration organizational problem thwart merging firms to reap the exact benefits. Firms could be plagued with longer delays with excessive cost of knowledge transfer and high rates of worker attrition. M&A can divert the manager's attention from vital activities like in-house R&D projects (Bertrand, 2007). In the light of the above argument it is difficult to state the clear effect of M&A.

In Indian context structural adjustment program was taking place in 1980's and economy followed complete liberalisation and globalisation path in 1991.During this period tariff rates were drastically declined along with reduction in quantitative restrictions. Trade liberalisation was followed by relaxation in FDI Policy. This led to the tremendous growth of FDI[4] inflow along with foreign technology (Aggarwal, 2002). Globalisation compelled firms to restructure their operations in various ways and M&A played a significant role for firms in reconfiguration of their production and managerial operations. M&A provided firms an opportunity to avail economies of scale and scope by integrating assets, marketing and production strategies. This strengthened their core competencies in global/ export oriented markets. FDI (also in the form of M&A) allowed firms to shift their focus from market seeking to efficiency seeking export oriented production (Aggarwal, 2002).

A limited number of studies have explored the international dimension of M&A (Bertrand, 2007; Mishra and Jaiswal, 2012). Bertrand (2007) investigated the effect of domestic merger on export intensity in French manufacturing industry for the period of 1992-1999. He concluded that export intensity of merging firms is not affected by domestic acquisitions. He also found that export intensity of buyer firms could improve but only in highly competitive industries. Mishra and Jaiswal (2012) using a panel of 33 Indian manufacturing industries for the period of 2000-2008 examined the impact M&A on export competitiveness of firms. Their findings suggest that industries with more M&A deals have more penetration in international markets. The above

[4] FDI comes to the country in the form of Greenfield investment (fresh investment in new projects) and Brownfield investment (this includes M&A)

literature specifies that there exists some relationship between M&A and export performance. As explained by national championship argument there could be a positive relationship between export intensity and M&A (Bertrand, 2007). Synergistic gains (in terms of cost) are usually specified by industrial organisation literature and therefore M&A could affect export behaviour of firms explained in broadest sense.

2.2. Technological Efforts and Export

Departing away from the traditional Heckscher-Ohlin theory of trade with identical technologies among trading partners, Posner (1961) proposed technology gap theory .He asserted that countries with similar factor endowment can form differences in technical know-how as basis of trade. Extending to this work Vernon (1966) proposed product cycle theory and explained that countries can have comparative advantage in manufactured products by investing in new technologies and introducing new products to the market. Both these models predict that developed countries with high innovative capabilities would enjoy greater exports to developing countries. Nevertheless, with standardisation of the products the direction of the trade will reverse. Similar argument was also proposed by Krugman (1979) explaining technological edge of developed countries over developing countries. He asserts that technology intensive firms should continuously focus on better R&D efforts in order to innovate new product and processes which in turn will help them in maintaining their export competitiveness.

In case of developing countries, they were considered to be beneficiary of technologies from developed countries and labour cost was basis of their comparative advantage. But this phenomenon was rejected on Japan's capabilities of inventing around a given technology, which tremendously boosted its competitiveness (Bhaduri and Ray, 2004). Hence technological capabilities acquired through various technological efforts turned out to be a major determinant of comparative advantage for developing countries (Siddharthan and Rajan, 2002). Since technological capabilities are displayed majorly at firm level we tried to present a firm level model of export competitiveness in a high technology industry, namely pharmaceuticals. Indian pharmaceutical industry has acquired tremendous technological capabilities. The reverse engineering capabilities acquired by pharmaceutical firms has enabled the country to be self

reliant in health drugs as well as major exporter of generic drugs in overseas market of developed world (Bhaduri and Ray, 2004).

The ways in which technological capabilities can be acquired by developing countries is through in-house R&D efforts, embodied and disembodied technology imports, collaborations with foreign firms and very recently via M&A route. It is explained in literature that development of technology is a cumulative endogenous process which is influenced by past innovative experience (Dosi, 1988; Wakelin, 1998). Developed countries firms invest in R&D which leads to new products and process development, which in turn boost export competitiveness of firms. But in the case of developing countries due to lack of sufficient investment in R&D project they are not innovators, nevertheless, there are firms which do put efforts into in- house R&D. This R&D is of rather adaptive nature than innovative (Siddharthan and Nollen, 2004).

The empirical evidences considering the effect of in-house R&D on exports is mixed. Few studies (Basile, 2001; Wakelin, 1998 Bhat and Narayanan, 2009; Aggarwal, 2002) found R&D to be positively and significantly impacting the export intensity. Basile (2001) studied the impact of innovation on export behaviour in Italian manufacturing industries for different exchange rate regime between the periods of 1989-1997. He found that product or process R&D has positive and significant impact on exports. Wakelin (1998) for the sample of UK manufacturing firms during the time period of 1998-1992 found R&D to be positively significant for decision to export in case of non innovative exporters and have negative effect on export intensity of innovative as well as non- innovative firms. Another study in similar lines is Zhao and Zou (2002) who studied Chinese manufacturing industry on export behaviour and find that R&D activity affects positively the decision to export and negatively the export intensity.

Bhat and Narayanan (2009) found in their study of Indian basic chemical industry for the period of 2001-2007 that in- house R&D affect positively and significantly the decision to export as well as the propensity to export. In context of Indian pharmaceutical industry and electronics and electrical industry Bhaduri and Ray (2004) found R&D has a strong positive impact on exports. They asserted that large firms have large R&D stock which is an important determinant of export performance. Some studies like Narayanan (2006) and Willmore (1992) found R&D to be

insignificant in determining export intensity of firms. Willmore (1992) studied large cross sectional sample of Brazilian manufacturing firms using data of year 1980 for finding export determinants and found R&D dummy variable to be insignificant.

Lall (2000) specified that developing countries like India gain competitive advantages in trade by importing technologies. To understand the export behaviour it is important to know the way of international technology transfer to Indian firms. Technologies can be imported either in embodied or disembodied form. Explicit or disembodied technologies are largely acquired by import of designs, drawings, blueprints and formulae by paying royalty and technical fees. This acquired knowledge can be immediately used for production purposes.

The empirical findings with regard to disembodied technology suggest mixed results again. Sterlacchini (1999) examined impact of innovation on export behaviour of non R&D performing firms in Italian supplier dominated industries for the data of 1996. He found disembodied technology exerting positive and significant impact on exports. Siddharthan and Nollen (2004) examined the relation between MNE affiliation and exports for Indian information technology industry for the sample period of 1994-1998, and found disembodied technology variable positive and statistically significant. However, for Indian chemical industry, Bhat & Narayanan (2009) and Kumar & Siddharthan (1994) do not find any statistically significant relationship between disembodied technology imports and export performance.

Another way of acquiring foreign technology is embodied technology through import of capital goods and raw material. The imported machines, new equipments and quality raw materials are considered to be embedded source of latest technology and modern designs. This helps firms to improve their production process and produce quality products matching international standards.

In the case of Italian manufacturing firms Basile (2001) found that firms that achieved product and process innovation by importing new capital equipments have favourable impact on export performance. He confirmed that Italian manufacturing firms have higher impact of innovation on foreign market as compared to domestic market. Sterlacchini (1999) on the similar lines studied the export behaviour of sub sample of innovating firms in Italian manufacturing industry and

find that expenditure in embodied technology exerts positive and significant impact on export intensity. Bhat & Narayanan (2009) examined the effect of technological efforts on exports in Indian basic chemical industry. They studied impact of embodied technology and found that capital goods imports are positively and significantly associated with export intensity. Siddharthan and Nollen (2004) found that embodied technology imports are one of the export determinants for domestic firms and unimportant for MNE affiliates. Aggarwal (2002) studied impact of liberalisation and MNE affiliation on export performance in 33 Indian manufacturing industries for the period of 1996-2000. She found positive relationship between import of embodied technology and exports for medium- high technology industries in post reforms era.

Import of raw material is another significant determinant of export behaviour for developing countries. Indian exports were adversely affected in pre liberalisation regime due to high tariff rates on imports of inputs. It could be considered that low tariff in post liberalisation period facilitate import of raw materials which could make firms export competitive (Agarwal, 2002). Import of raw material from varied sources with different price and quality specifications can affect positively the exports to price competitive markets of developing countries and quality conscious markets of developed countries. Bhaduri and ray (2004) studied the impact of various technological variables on exports for Indian pharmaceutical and electronics/electrical industry. Their results confirmed that imports of raw material contribute positively and significantly to export intensity of pharmaceutical industry but find no impact on electronics/electrical industry. Aggarwal (2002) also found positive and significant impact of imports of raw material in high technology industries as well as in medium-high and medium-low technology industries. Bhat and Narayanan (2009) concluded that import of raw material affect positively and significantly both decision to export as well as quantity of exports.

2.3 Other Firm specific Export Determinants

The following firm specific determinants are considered as control variables in the present study.

Firm Size: Size is one of the most commonly used variables in analysing export competitiveness. Size allows firms to achieve scale economies in production, marketing, R&D expenditure and international transaction cost. Large size firms with greater market power, better

accessibility to resources and lower cost of financing the projects have advantage over smaller firms to exploit domestic as well as international markets. Large firms are more efficient in terms of division of labour, superior information network, branding and has more risk bearing capacities.

Although empirical research reaches mixed conclusions, a positive relationship between firm size and exports is expected. Bonaccorsi (1992) reported mixed results in his review of research studies on size and exports relationship but, most studies emphasize on positive relationship between the two. He asserted in his study non linear relationship between size and exports. Other international studies like Basile (2001) for Italian manufacturing industry, Zhao and Zou (2002) for Chinese manufacturing industry, Bertrand (2007) for French manufacturing industry found positive impact of size on export performance. In case of Indian studies Aggarwal (2002) for Indian medium and low technology industries, Bhadauri and Ray (2004) for pharmaceuticals and electronics/electrical industries, Dholakia & Kapur (2004), Narayanan (2006) for automobile industry and Bhat and Narayanan (2009) for basic chemical industry obtained significant positive relationship between firm size and exports.

However Athukorala et. al. (1995) for Sri Lankan manufacturing industry obtained the result showing positive impact of firm size on decision to export but no significant effect on propensity to export. In similar line Wignaraja (2002) also did not find statistically significant coefficient for firm size. Siddharthan and Nollen (2004) in a study for Indian IT industry have obtained different results for different kind of firms. For domestic firms size turned out to be positively significant while that for MNE affiliated firms size is affecting negatively and licensee firms has no impact of size on their export performance.

Firm Age: Another standard determinant considered for empirical studies on exports is age of the firm. Age specifies firms experience and also determines accumulated capabilities by firm over the period of time (Bhat and Narayanan, 2009). Therefore, firm's age can positively affect export performance. But considering developing nations like India, younger firms have to compete with well established older firms for market share. In such situation they prefer entering foreign market aggressively instead of competing in domestic market. The empirical findings suggest

mixed conclusion on relationship of age and export behaviour. Roberts and Tybout (1997) in case of Colombian manufacturing industries and Majocchi et. al. (2005) for Italian firms obtained a positive relationship between age and exports implying that older firms perform better in export sectors. Fryges (2006) for the studies of Germany and UK observed that newer firms are more export intensive. For Indian cases Bhaduri and Ray (2004) for Indian electronics/ electrical industry found younger firms exporting more than older firms. Bhat and Narayanan (2009) study depicted that younger firms are more export intensive but at the same time age is not significant for influencing the decision to export. There are some studies like Iyer (2010) for New Zealand agriculture and forest industry, Bhaduri and Ray (2004) for Indian pharmaceutical industry and Wignaraja (2002) for the sample of Mauritian garment industry, where no significant evidence concerning the age and export performance was observed.

Advertising Intensity: Advertisement help firm to create new market for their products as well as strengthen their position in existing markets. Firms create brand names by maintaining quality standards and enter foreign markets (Kumar and Siddharthan, 1994). Kumar and Siddharthan (1994) and Willmore (1992) for Brazilian manufacturing firms found positive relationship between advertisement intensity and exports but Bhat and Narayanan (2009) found that advertisement intensity affect negatively the export behaviour of firms in basic chemical industry.

Capital Intensity: Role of factor intensity is also important in explaining export behaviour of firms. Capital intensity gives comparative advantage to firms by helping them to produce better quality and technologically superior products. But in country like India which is labour abundant firm might get competitive advantage in export market by adopting labour intensive technique of production. The empirical evidences suggest mixed results for India as well as for other countries. Bernard and Wagner (1996) for the case of developed country like Germany has found capital intensity to be positive for exporting firms in comparison to non-exporting firms. Similarly, Athukorala et al. (1995) for Sri Lankan manufacturing industry, Robert and Tybout (1997) for the case of Colombian manufacturing industry and Ozcelik & Taymaz (2004) in case of Turkish manufacturing industry and Siddharthan & Nollen (2004) for Indian IT industry find capital intensity to be positively impacting the export performance. On the other hand Kumar

and Sidharthan (1994) for six low and medium technology industry, Zhao and Zou (2002) for Chinese manufacturing industry and Bhat and Narayanan (2009) for Indian chemical industry obtained negative and significant relationship between capital intensity and export behaviour.

MNE Affiliation: Affiliation of firms to multinational enterprises gives them added advantage in export markets. MNE affiliated firms gain comparative advantage because of foreign parent's R&D capabilities, marketing & supplier network and global brand names. Foreign partners possess better managerial skills as well as financial resources (Siddharthan and Nollen, 2004). These characteristics allow MNE affiliated firms to exploit scale and scope economies and find new export markets. Siddharthan and Nollen (2004) found positive relationship between MNE affiliates and export intensity for Indian IT industry on the contrary Bhat and Narayanan (2009) obtained significant negative impact of MNE affiliates on decision to export as well as on levels of exports for basic chemical industry in India. While Athukorala et. al. (1995) does not find any significant relation between MNE affiliation and degree of export orientation of exporting firms.

Leverage: Availability of credit affects producers of different industries in different ways. Considering technological reasons certain industries require more external funds for boosting exports. Credit affect both fixed and variable costs associated with exports (Manova, 2008). Therefore it could be argued that firm with higher leverage tend to export more, provided they have borrowed from the market for the activities related to production and exports.

3. Indian Pharmaceutical Industry: An Overview

Over the past 50 years, the Indian pharmaceutical industry has undergone a massive makeover. They covered the journey from being followers to become strategic partners of MNEs particularly in their drug discovery research and development efforts. The Indian pharmaceutical industry ranked 3rd in the world in terms of production volume (10 percent of global share) and 13th in domestic consumption volume is one of the leading drug industries of developing countries. Over the last 30 years, India's pharmaceutical industry has evolved from almost being nonexistent to a world leader in the production of high quality generic drugs. It has been valued at $5.3 billion in 2005 accounting for approximately one percent of global pharmaceutical industry. Currently India produces 20-22 percent (in volume) of world's generic drug.

At the time of independence in 1947 approximately 99 percent of all pharmaceutical products under patent in India were held by foreign companies and domestic Indian drug prices were among the highest in the world. To encourage domestic production of pharmaceutical products, the government of India established 5 state-owned pharmaceutical companies. At the same time several policy initiatives supported the development of indigenous pharmaceutical industry. The policy and regulatory measures includes- abolition of product patents on food, chemicals, and drugs in 1970.The new patent act allowed only patents for production processes fostering the development of a competitive pharmaceutical industry, making inexpensive drugs accessible to Indian masses. The imposition of price controls on certain formulations and bulk drugs discouraged the foreign participants who later abandoned Indian market making way for the domestic industry. Forty years of protection has enabled this industry to grow significantly and to develop efficiently its research and manufacturing capabilities. The leading companies avail the opportunity to move up in the value added chain. India is leading other developing countries in process R&D capabilities and the range of technologically complex medicines manufactured domestically (Kale and Little, 2007).

According to FICCI (Federation of Indian Chambers of Commerce and Industries), by 2005 there are 20,000 firms operating in pharmaceutical industry and 6,000 firms participating in the formal sector that have received drug manufacturing licenses from the Indian government. The domestic Indian pharmaceutical industry consists of both domestic companies and subsidiaries of MNCs. India's pharmaceutical firms can be well differentiated by size, annual sales, export markets, and R&D capabilities. The largest 250 companies control nearly 70 percent of the domestic market with the top 10 controlling approximately 40 percent (Greene, 2007).

In January 2005, India amended its patent laws governing pharmaceuticals, bringing them into conformance with the WTO TRIPs agreement. Under the new patent law, Indian drug makers can no longer manufacture and market reverse-engineered drugs patented by foreign pharmaceutical firms. This law forced Indian firms to change their business strategies and they focus on the generics market in Europe and the USA, invest more in innovative R&D and target contract manufacturing market. Firms started performing more mergers and acquisitions deals,

and form other alliances with domestic and foreign pharmaceutical firms. Nearly 97 percent of India's drug market consists of second-and-third generation drugs no longer subject to patent protection in the developed countries (Kale, 2007). Multinational pharmaceutical firms have entered India after 2005 and using the same resource base as that of Indian firms to compete in the Indian domestic market. This forced Indian firms to make several strategic changes in order to remain competitive in domestic and global market as well as to sustain increasing pressure on profit margins.

The contract research and manufacturing services (CRAM) market presents huge opportunity for the Indian pharmaceutical industry. Indian firms are well equipped to cater for the requirements of outsourcing markets, still India accounts for barely 1.5% of the global CRAM industry. Due to untested patent protection law and lack of data protection MNC firms are reluctant to outsource initial R&D work to Indian firms. It is expected that India will capture around 15 % of CRAM market by 2009-2010 (Greene, 2007). Therefore Indian firms are trying to increase their share in the outsourcing market by moving closer to the market.

Leading Indian pharmaceutical manufacturers: India's leading pharmaceutical companies are facing stiff competition, not only in the domestic Indian market, but also in the global market for both generic drugs and original products. By 2005, 9 of the top 10 Indian drug makers were Indian-owned firms who capture roughly 44 percent of total industry sales (Greene, 2007). India's top five pharmaceutical companies, in terms of sales, are Ranbaxy Laboratories (now subsidiary of Japanese firms Daiichi-Sankyo), Dr. Reddy's Laboratories, Aurobindo Pharmaceutical, GSK-India, and Cipla. These companies manufacture a wide range of generic drugs (branded and non-branded), intermediates, and active pharmaceutical ingredients (APIs).

MNC presence in India: Many of the world's leading pharmaceutical companies have subsidiaries or other operations in India. Multinational companies like GlaxoSmithKline (GSK) Baxter, Aventis, Pfizer, Novartis, Wyeth, and Merck have been active in India's pharmaceutical market mainly through subsidiaries especially after new patent law of 2005.

3.1 Mergers and Acquisitions in Indian Pharmaceutical Industry

Liberalization facilitated Indian firms to market generics drugs to the US and other Western European countries. Indian drug manufacturers currently export their products to more than 65 countries worldwide; the US being the largest customer. At the same time around $80 billion worth of drugs are moving towards generic way by 2012. For example firms like GSK and Pfizer alone faced seven patent expirations each in 2010. R&D pipeline has been growing weak for the past several years of these large pharmaceutical firms. And many large economies are curbing their health care expenses. Indian pharmaceutical market is changing under the light of the below three arguments (EXIM Bank Report, 2007):

1. Cost effective manufacturing being implemented by developed economies
2. Growing importance of emerging markets
3. Changing significance of India's domestic market

However, Indian firms face some challenges such as non tariff barriers, decreasing profits in the generics market, competitive threats from big pharmaceutical MNEs, fierce competition from Chinese and Eastern European manufacturers. Indian firms are aiming to move up the value chain by developing capabilities to produce super generics[5] and branded generics[6]. Indian companies have realized that to compete with the global pharmaceutical companies, even domestically; will involve new strategies and more innovation.

But India, with advantages of having a large domestic market and having the highest number of US FDA approved plants outside the US which offer a low cost manufacturing base is trying to capture the opportunity through strategic alliances and mergers and acquisitions. Identifying domestic and foreign demand most Indian pharmaceutical companies aimed at expanding their manufacturing capacities mostly by means of M&A. At the same time, Indian companies with the aim to gain competitive advantages have been increasing their R&D expenditure and focusing on building a product pipeline. M&A activities by Indian Pharmaceutical industries are being concluded with the objective of complimenting the strengths of two entities to get market access, new technologies as well as new products. Drive to enhance the size and thereby

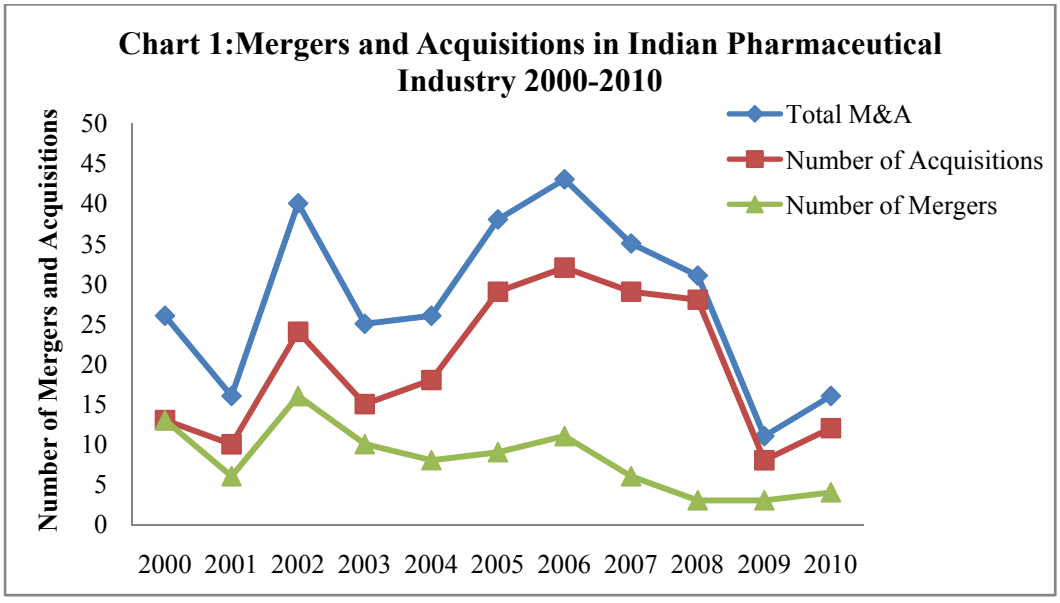
[5] Specialty generic drugs are some time called as super generic.

[6] Beginning in late 1992, several producers of drugs with soon-to-expire patents introduced, or authorizing the introduction of, generic versions of their important products just prior to patent expiration. Such products are referred as branded generic or authorized generic drugs.

attaining higher economies of scale could be considered as key motivations for M&A in pharmaceutical sector. According to (KPMG, 2006), it could be mentioned that Indian pharmaceutical firms are pursuing foreign acquisitions with the following goals:

- Improve global competitiveness
- Move up the value chain
- Creation and entry to new markets
- Increase their product portfolio
- Acquire assets (including research and contract manufacturing firms, in order to boost their outsourcing capabilities) and new products
- Consolidate their market shares
- Compensate for continued sluggishness in their home market.

In Indian pharmaceutical industry 307 M&A deals has been undertaken in the given time period of 2000-2010. Out of the total deals number of mergers is 89 (29 percent) and number of acquisitions is 218 (71 percent). Share of pharmaceutical industry is also highest among all the other industries participating in M&A in manufacturing sector during this period.



Source: Own calculation based on CMIE Prowess Database for the period of 2000-2010

Chart 1 shows the year to year fluctuations in number of M&A deals that took place during the period of 2000-2010. The chart depicts that the fluctuations are more in terms of acquisitions in

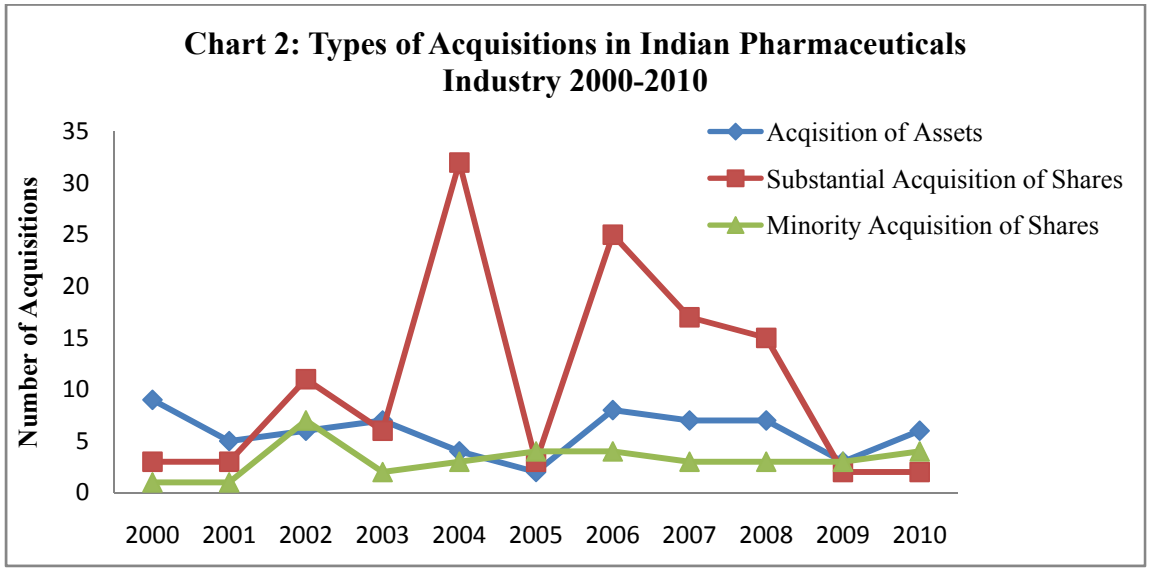
comparison to mergers. The number of mergers are highest in 2002 (16 deals) and the number of acquisitions are highest in 2006 (32 deals). The deal value of total acquisitions for the period of 2000-2010 is Rs. 47850.80 million[7].

Within M&A acquisition activity is undertaken by three different modes[8]:

a) Substantial acquisition of shares

b) Minority acquisition of shares

c) Acquisition of assets



Source: Own calculation based on CMIE Prowess Database for the period of 2000-2010

Chart 2 depicts that in pharmaceutical industry out of the total acquisitions happened in the study period of 2000-2010, 54.58 percent (119 deals out of total acquisitions) are in the form of substantial acquisition of shares while 16 percent (35 deals) are in the form of minority acquisition of shares and 29.35 percent (64 deals) are in the form of acquisition of assets. The possible reason behind such type of behaviour could be that acquiring substantial shares of the target firm facilitates the change of management control of the firm in the favour of acquirer as compared to minority acquisition of shares which simply provides firm with the voting rights.

[7] Deal value is not reported for all acquisitions deals in CMIE Prowess database.

[8] CMIE (Centre for Monitoring Indian Economy) segregates mergers and acquisitions data in the form of substantial acquisition of shares by acquirers (when 15% or more stake is purchased), minority acquisition of shares by acquirers (5% or more shares are purchased), Acquisition of assets (acquire either a brand of the company or one of its plants or divisions or intangible assets) and Merging with another companies.

3.1.1 Type Wise Classification of Mergers and Acquisitions

Mergers and Acquisitions are majorly classified in three types:[9]

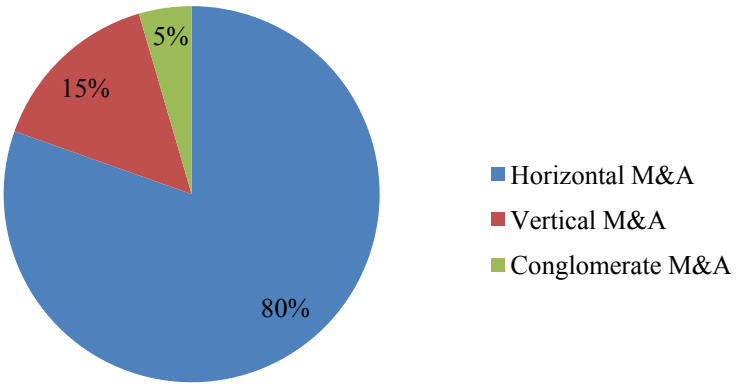
a) Horizontal M&A

b) Vertical M&A

c) Conglomerate M&A

Examining the given data set for M&A it is observed that Indian pharmaceutical firms prefer to get consolidated in the same industry.

Chart 3: Types of M&A in Indian Pharmaceutical Industry 2000-2010



Source: Own calculation based on CMIE Prowess Database for the period of 2000-2010.

Table: 1 Percentage Distributions of M&A in Terms of Type Wise Classification 2000-2010

Type Wise Classification	% Share of Total M&A	% Share of Mergers	% Share of Acquisitions
Horizontal	80.13%	87.64%	77.06%
Vertical	14.9%	8.98%	17.43%
Conglomerate	4.56%	3.37%	5.04%

Source: Own calculation based on CMIE Database for the period of 2000-2010.

Table 1 show that most of the mergers and acquisitions are horizontal in nature. 80 percent of M&A deals show horizontal consolidation. This explains that horizontal consolidation results in

[9] Horizontal merger is defined as the merger between firms in the similar line of business activity whereas those of Vertical mergers occur between firms in buyer seller relationship. Conglomerate merger occur between firms, which are totally unrelated.

better synergistic gains in pharmaceutical industry. Horizontal M&A allow firms to reap benefits of economics of scale, increased market share, reduced cost and lower competition (Basant, 2000). Though horizontal deals dominates both mergers and acquisitions but 17% of deals in acquisitions are vertical in nature indicating that pharmaceutical industry participate in M&A also with the motive of forward and backward linkages.

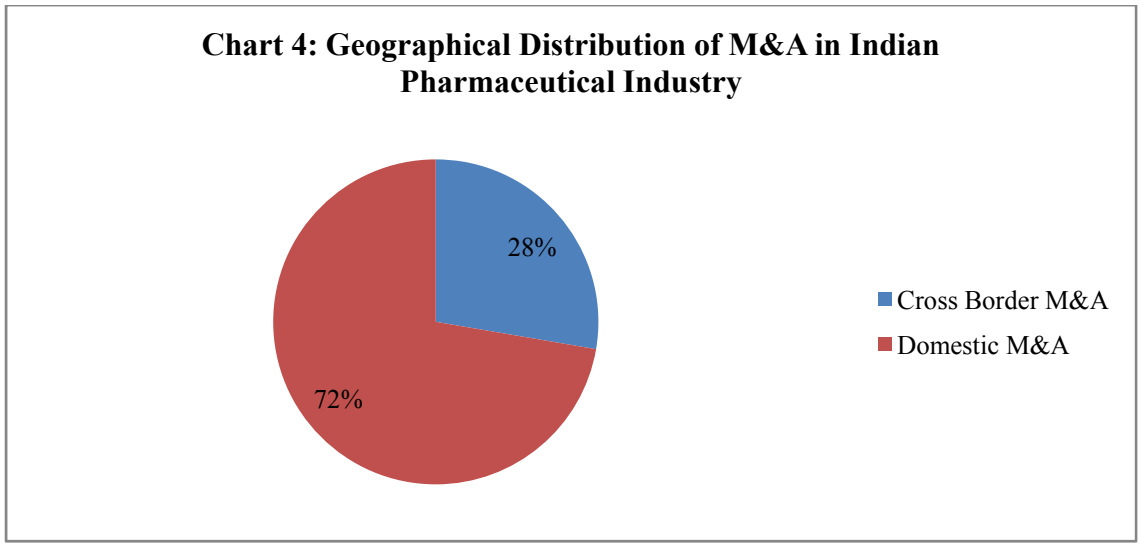
3.1.2 Classification of M&A in Indian Pharmaceutical Sector by Geographical Distribution

Table 2: Classification of M&A in Indian Pharmaceutical Sector by Geographical Distribution

Classification by Geographical Distribution	Total Acquisitions	Mergers	Total M&A
Cross-Border Deals	85 (39%)	0	85 (27.6%)
Domestic Deals	133 (61%)	89 (100%)	222 (72.4%)
Total	218	89	307

Source: Own Calculations based on CMIE Prowess Database for the period of 2000-2010.

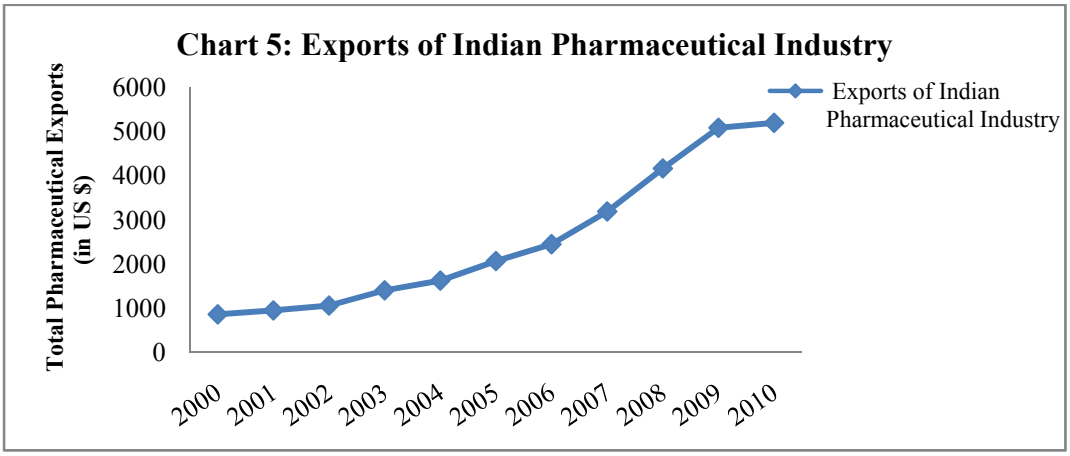
Economic reforms and deregulation of various government policies intensified the restructuring activities by undertaking different types of consolidation strategies. In the first half of 90's these activities are dominated by domestic M&A. But cross border transactions started becoming more prominent as there is unprecedented rise in their numbers since mid 1990's, which is still continuing (WIR, 2010). The Indian corporate sector is no exception to the same phenomenon. Table 2 specifies pharmaceutical firms merge in the domestic market only and cross border deals is the trend of acquisitions. 39 percent of the acquisitions are in the form of cross border deals and 61 percent are domestic deals. While in case of mergers 100 percent deals are domestic in nature. The desire to increase market presence and to gain market power in foreign markets could be considered as an important factor for firms' inclination towards cross-border deals.



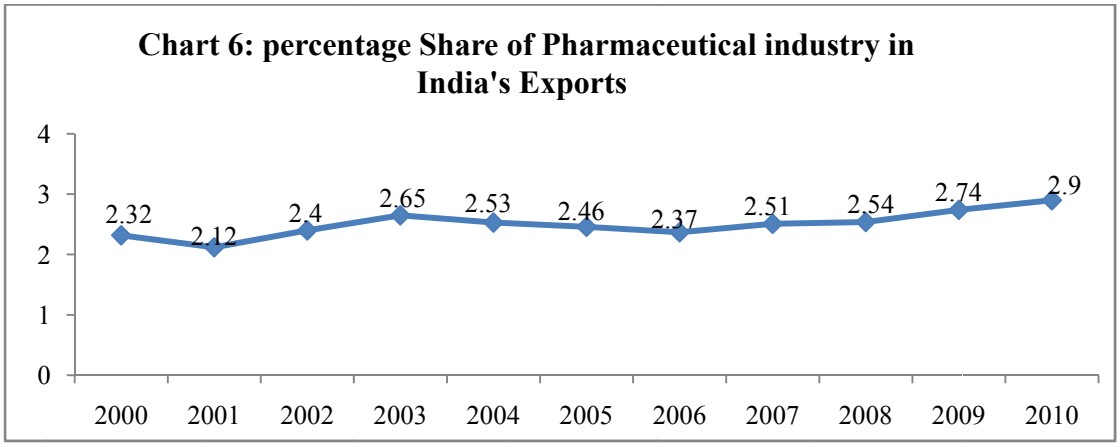
Source: Own calculation based on CMIE Prowess Database for the period of 2000-2010

3.2 Exports in Indian Pharmaceutical Industry

Over 60 per cent of India's bulk drug production is exported. The latest data specifies that the amount of exports has increased to $5.1billion in 2010. The export of pharmaceutical industry has grown at a CAGR of 14% in last decade (EXIM Bank Report, 2007). Chart 5 shows the rising trend of absolute amount of pharmaceutical exports over the study period. Chart 6 depicts the share of pharmaceutical industry in total exports of India. It shows that pharmaceutical industry contributes more than 2 percent in total exports for entire study period of 2000-2010. There are some fluctuations in initial year of study but the share is continuously rising since 2006 and it is highest in the year 2009 (2.9%).

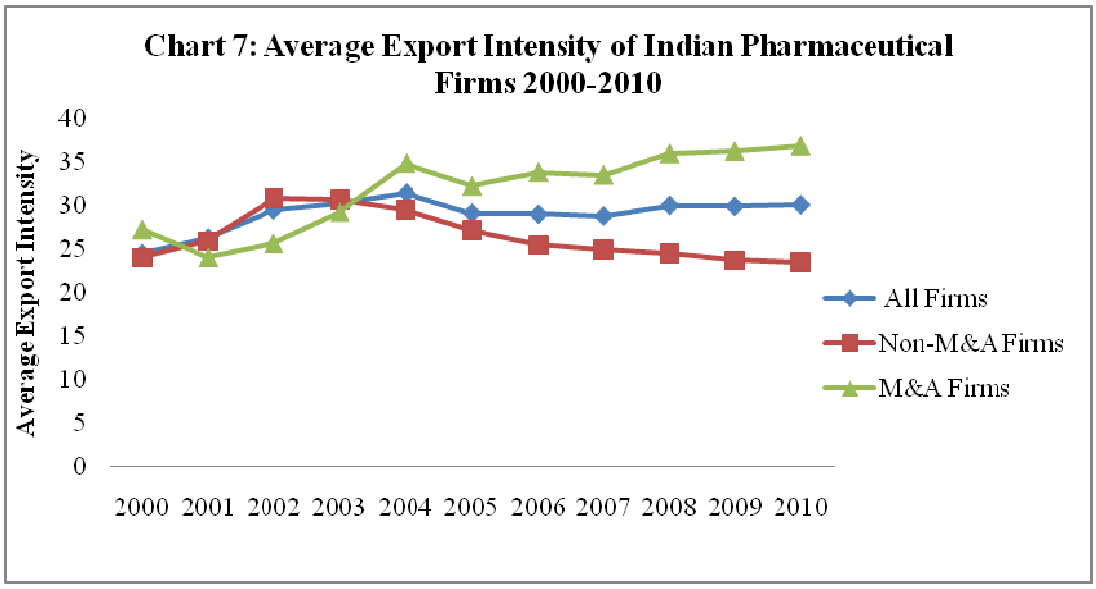


Source: Own Compilation based on the data available on the website of the Department of commerce, Ministry of Commerce & Industry, Government of India (http://commerce.nic.in/eidb/default.asp)



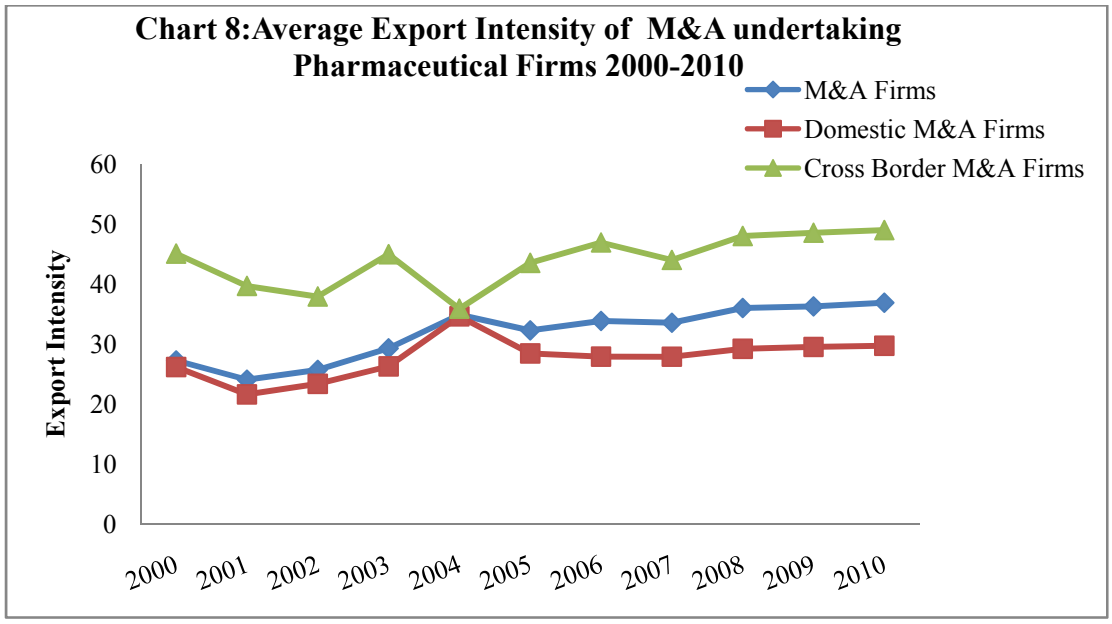
Source: Own Compilation based on the data available on the website of the Department of commerce, Ministry of Commerce & Industry, Government of India (http://commerce.nic.in/eidb/default.asp)

3.2.2 Export Intensity of Sample Firms



Source: Own calculation based on CMIE Prowess Database for the period of 2000-2010.

Chart 7 depicts that the average export intensity for the sample as a whole has been almost constant after 2005 but those of non M&A firms is declining and that of M&A firms is increasing over the period of time. It is also interesting to observe that export intensity of M&A firms is nearly double to that of non-M&A firms in the year 2010.



Source: Own calculation based on CMIE Prowess Database for the period of 2000-2010.

It is interesting to note from chart 8 that export intensity is fluctuating for M&A firms but the fluctuations are more in the case of cross-border M&A firms. Export intensity of cross border declined steeply in the year 2004 but increased for those of domestic M&A undertaking firms. After 2004 export intensity of domestic M&A firms remain almost constant but there were fluctuation in the behaviour of cross border M&A performing firms. This explains the impact of global economic environment on firms participating in cross-border M&A events. It is also interesting to note that the value of export intensity of cross-border M&A participating firms remains almost double than that of domestic M&A undertaking firms except for the year 2004.

4. Sample Variables and Methodology

4.1 Sample

This section presents the data description of variables and the methodology used in the analysis. The firm characteristics, their definition and the analytical technique used for the study are highlighted. The study uses pooled cross-sectional data, for the period from 2000 to 2010 for Indian pharmaceutical industry. The source of data for the firm characteristics is CMIE Prowess database version 4.0 accessed in the month of April 2012. The sample includes 161 firms, with a

total of 1771 observations for 11 years. The sample size is approximately 26 percent of total industry.

Table 3 provides the definition of the variables used in the study. The variables have been constructed using firm level data from Prowess database.

Table: 3 Definition of Variables

Sl. No.	**Variable**	**Symbol**	**Definition Used in the Study**
1	Export Intensity	EXPI	(FOB Value of Exports / Net Sales of the firm)*100
2	R&D Intensity	RDI	(Expenditure on R&D / Net Sales of the firm)*100
3	Import of embodied technology (capital goods) Intensity	ETI	(Expenditure on import of capital goods / Net Sales of the firm)*100
4	Import of Raw Material	MRI	(Expenditure on import of raw material/Net Sales of the firm)*100
4	Import of disembodied technology Intensity	DTI	(Lump sum, royalty, and technical fees payments in foreign currency / Net Sales of the firm)*100
5	Age of the firm	AGE	Difference between the year in the study and the year of incorporation
6	Firm Size	Size	Natural log of the Net Sales
7	Advertisement Intensity	ADVT	(Expenditure on advertisements/ Net Sales of the firm)*100
8	Leverage	LEV	(Total borrowings of the firm /Total Assets of the firm)*100
9	Capital Intensity	CI	(Total Assets/ Net Sales)*100
11	Dummy for Merger and Acquisition Deals	DMA	Dummy = 1 for firms undertaking M&A activity ,0 otherwise
12	Dummy for MNEA	DMNEA	Dummy = 1 for multinationals affiliated

	Affiliation		firms ,0 otherwise

4.2 Methodology

The methodology adopted is descriptive statistics, cross-tabulations and econometric analysis of censored regression.

Athukorala (1995), Wakelin (1998), Sterlacchini (1999), Basile (2001) and Bhat and Narayanan (2009) explained in their respective papers that export behaviour of a firm involves two decisions. The first decision is to choose between being exporters or non exporters. The second is to fix on what proportion of output to be exported. To understand both the aspects of export behaviour a complete sample of firms including both exporters and non-exporters should be taken into consideration. This further implies that dataset will includes number of firms which are not exporting. The dependent variable i.e. export intensity will frequently take a value of zero. For such a censored sample, OLS regression may not be the most suitable estimation procedure as coefficients will be biased towards censoring point (zero in present case).

A generally used approach to deal with the censored sample is Tobit model (Gujarati, 2007; Greene, 2008; Kumar and Siddharthan, 1994; Narayanan, 2006). In Tobit model, the change in expected value of the dependent variable Y i.e. exports intensity with respect to each regressor includes two components.

A) By changing the conditional mean of Y (intensity to export)

B) By changing the probability of observation being positive (participation in export market).

However, the Tobit model constraints the participation equation and the intensity equation to have similar set of explanatory variables and parameters. The Tobit model may be misspecified in this case leading to undesirable consequences for estimates. This constraint can be relaxed by involving two separate equations. Craig (1971) proposed two stage specification model which assumes that decision to export is first to be taken followed by quantity of exports.

The first part of double specification model using whole set of data consider the probability to export. Probit model is appropriate for such kind of study. The dependent variable here is binary taking value 1 if firm exports and zero otherwise.

For the second part only the subset of sample selling abroad are considered. Truncated regression is an appropriate model where dependent variable is observed only if it is greater than zero. This double specification model can be tested as unrestricted model against Tobit model. Given the same set of variables affecting the decision to export and quantity to export a likelihood ratio test (Greene, 2008) can be used to test which of the two models is better. Wakelin (1998), Sterlacchini (1999) and bhat and Narayanan (2009) have used this statistics to make a choice between Tobit and Double Specification model. The present study compares the results on export performance of Indian pharmaceutical firms using Tobit model and Craig's double specification model.

Tobit Model can be expressed as:

$Y_i^* = \alpha_0 + \alpha_1 X_{1i} + ...\alpha_n X_{ni} + u_i,$

$Y_i = 0 \qquad \text{if } Y_i^* \leq 0$

$= Y_i^* \qquad \text{if } Y_i^* > 0$

Y_i^* is the unobserved regressand or latent variable, Y_i is the actual observed variable and X_{1i} to X_{ni} are n regressors.

The Tobit Model for export competitiveness can be specified as:

$$EXPI^* = \alpha_0 + \alpha_1 AGE + \alpha_2 SIZE + \alpha_3 RDI + \alpha_4 ETI + \alpha_5 DTI + \alpha_6 PROF + \alpha_7 ADVI + \alpha_8 LEV + \alpha_9 CI + \alpha_{10} DMA + \alpha_{11} DMNEA + u_1 \qquad (1)$$

$EXPI = EXPI^* \quad \text{if } EXPI^* > 0$

$= 0 \qquad \text{if } EXPI^* \leq 0$

The double specification model nests the Tobit model as a special case.

Probit Model can be expressed as:

$$dY_i = \beta_0 + \beta_1 X_{1i} + ...+ \beta_n X_{ni} + u_i,$$

$dY_i = 0 \qquad \text{if } Y_i^* \leq 0,$

$= 1 \qquad \text{if } Y_i^* > 0.$

Where subscript i stands for the particular observation, Y_i^* is the latent variable under study, and dY_i is a binary variable that takes a value of 1 whenever Y_i^* is greater than zero else dY_i is zero.

The Probit model for decision to export can be expressed as follows:

$$DEXPI = \beta_0 + \beta_1 AGE + \beta_2 SIZE + \beta_3 RDI + \beta_4 ETI + \beta_5 DTI + \beta_6 PROF + \beta_7 ADVI + \beta_8 LEV + \beta_9 CI + \beta_{10} DMA + \beta_{11} DMNEA + u_2 \quad (2a)$$

DEXPI = 0 if firm does not export

DEXPI = 1 if firm exports

The second stage of double specification model i.e. Truncation model can be specified as:

$$Y_i = \square_0 + \square_1 X_{1i} + \square_n X_{ni} + u_i$$

if $dY_i = 1$

$$EXPI = \square_0 + \square_1 AGE + \square_2 SIZE + \square_3 RDI + \square_4 ETI + \square_5 DTI + \square_6 PROF + \square_7 ADVI + \square_8 LEV + \square_9 CI + \square_{10} DMA + \square_{11} DMNEA + u_3 \quad (2b)$$

Equation (2b) is estimated when DEXPI = 1

4.3 Empirical Analysis

In this section we discuss firm characteristics using descriptive statistics and correlation coefficients. Later we present the results of econometric models followed by interpretation. The empirical analysis of unbalanced panel is presented in the appendix of the report.

4.3.1 Descriptive Statistics

The differences in the mean of firm characteristics are highlighted for exporters and non exporters in table 4. Since the authors are expecting differences in the structure and behaviour of firms undertaking M&A and those not going for M&A, their means and standard deviations are highlighted separately in table 5.

Table 4 highlights that mean export intensity of the sample is 21 percent but those of exporters is higher than that of full sample. The observations in the sample are fairly experienced with mean age of firms being 27 years. The mean intensity for technology variables is highest for raw material import intensity and lowest for disembodied technology intensity.

Table 4: Descriptive Statistics for Full Sample and Exporting & Non Exporting Firms

Variables	Full Sample	Exporters	Non-Exporters
EXPI	21.30 (25.55)	28.99 (25.81)	-
Age (in years)	26.67 (19.69)	28.36 (20.86)	21.97 (15.08)
Size (in Rs. Millions)	519.04 (8.13)	1012.32 (5.98)	79.83 (5.41)
ADVI	1.078 (3.66)	1.11 (3.24)	0.986 (4.63)
RDI	1.831 (4.35)	2.26 (3.76)	0.635 (5.50)
MRI	9.77(13.56)	12.37 (14.31)	2.60 (7.50)
ETI	1.04 (4.79)	1.19 (4.99)	0.62 (4.17)
DTI	0.102 (0.57)	0.088 (0.397)	0.13 (0.88)
LEV	29.94 (34..34)	27.52 (22.30)	36.65 (54.86)
CI	230.49 (626.62)	152.89 (123.52)	445.31 (1173.30)
DMA	Number of Observations that are performing M&A=527 (30%)	Number of Observations that are performing M&A=476 (36.58%)	Number of Observations that are performing M&A= 51 (11%)
DMNEA	Number of Observations that have Foreign Affiliation = 165 (9.37%)	Number of Observations that have foreign Affiliation =130 (10%)	Number of Observations having foreign affiliation =35 (7.44)
No. Of Observations	1771	1301	470

Source: Own calculation based on CMIE Prowess database for the period of 2000-2010. Standard Deviations are in parentheses.

Discussing the differences between exporters and non-exporters, we can observe that exporting firms are more experienced than non exporting firms. The R&D intensity and advertisement intensity is higher for exporters. This shows that exporting firms invest more in advertisement to showcase their products in international markets. It is clear from table 4 that exporters have higher raw material imports and higher embodied technology imports. The comparative higher R&D investment by exporters explains that in-house R&D facilitates faster the assimilation of technological imports. Non exporting firms have higher leverage and they are more capital intensive as compared to exporting firms.

Table 5 presents the differences of firm characteristics between M&A and Non M&A firms

Table 5: Descriptive Statistics for M&A and Non M&A Performing Firms

Variables	Full Sample	M&A Firms	Non M&A Firms
EXPI	21.30 (25.55)	29.90 (25.86)	17.65 (24.54)
AGE (in years)	26.67 (19.69)	33.37 (20.41)	23.82 (18.67)
SIZE (in Rs. Millions)	519.04 (8.13)	7.98 (1.64)	5.52 (1.81)
ADVI	1.078 (3.66)	1.93 (4.57)	0.71 (3.13)
RDI	1.831 (4.35)	3.38 (4.50)	1.17 (4.11)
MRI	9.77(13.56)	11.08 (11.83)	9.22 (14.20)
ETI	1.04 (4.79)	1.28 (2.51)	0.94 (5.48)
DTI	0.102 (0.57)	0.063 (0.22)	0.118 (0.66)
LEV	29.94 (34..34)	25.94 (20.19)	31.64 (38.69)
CI	230.49 (626.62)	231.12 (627.12)	230.23 (626.66)
DMNEA	Number of Observations that have Foreign Affiliation = 165 (9.37%)	Number of Observations that have foreign Affiliation = 99 (18.78%)	Number of Observations having foreign affiliation = 58 (4.66%)
No. Of Observations	1771	527	1244

Source: Own calculation based on CMIE Prowess database. Standard Deviations are in parentheses.

Table 5 clearly specifies that M&A firms are more export intensive than non M&A performing firms. M&A undertaking firms are more experienced as well as larger in size. Such firms have higher advertisement and in –house R&D expenditure and they also tend to import more raw material and embodied technology. Also the percentage of firms having foreign affiliation is more in M&A group. Non M&A performing firms are more capital intensive and have higher leverage in comparison to M&A firms.

4.3.2 Correlation Matrix

Table 6: Correlation Matrix

Variable	EXPI	AGE	SIZE	ADVI	RDI	MRI	ETI	DTI	LEV	CI
EXPI	1									
AGE	-0.07*	1								
SIZE	0.34*	0.29*	1							
ADVI	-0.13*	0.15*	0.08*	1						
RDI	0.24*	0.003	0.32*	-0.012	1					
MRI	0.45*	-0.02	0.32*	-0.06*	0.10*	1				
ETI	0.107*	-0.008	0.059*	-0.02	0.07*	0.004	1			
DTI	-0.02	0.009	-0.05*	-0.01	-0.01	-0.05*	-0.02	1		
LEV	0.005	-0.18*	-0.11*	-0.12*	-0.04	-0.02	-0.005	-0.02	1	
CI	-0.07*	0.04	-0.27*	0.06*	-0.0004	-0.10*	0.05*	-0.01	0.03	1

Values with stars show significance level at 1% or more. Source: Own calculation based on CMIE Prowess database.

The correlation matrix in Table 6 reveals low levels of pair-wise correlation values among the variables. Technology variables have significant positive correlation with export intensity but of low order. Other firm characteristics like age, advertisement intensity, and leverage and capital intensity have statistical significant negative correlation coefficient with export intensity. The mean variance inflation factor (VIF) of is 1.26 (close to 1) implying that sample is not suffering from high order multicollinearity problem.

However, it is generally found that cross-sectional studies suffer from the problem of heteroscedasticity (Gujarati, 2007). The Breusch-Pagan/Cook-Weisberg test reveals that the sample suffers from the problem of heteroscedasticity[10]. Therefore, to get rid of this problem we have estimated the models using the robust option available in the STATA 10 statistical package.

4. Econometric Analysis Results and Discussion

Table 7 presents the results for the two models discussed above. The likelihood ratio test[11] (Greene, 2008; Sterlacchini, 1999; Bhat and Narayanan, 2009) conducted for the selection of the model suggests that, the double specification model (Probit + Truncation) is more appropriate than Tobit model for the present case. We could infer from the result table that coefficients of double specification differ substantially from Tobit specification, both in terms of signs and significance.

The results reinforce the idea that the effects of explanatory variable differ on the probability to export and on export intensity. For example the disembodied technology coefficient (DTI), Tobit model specifies that coefficient of the variables is statistically insignificant whereas this variable is statistically significant for truncated regression of two part model. Another variable like capital intensity is also insignificant and have negative sign for Tobit specification but it is statistically significant for double specification model and has different effects on decision to export and intensity to export. Thus, we have evidence that double specification has advantage over Tobit model in explaining export behaviour.

[10] The value of Breusch-Pagan/Cook-Weisberg test (for balanced panel) is $chi^2 = 90.70$
$Prob > chi^2 = 0.0000$

[11] Likelihood Ratio Test $\lambda = 2(Ln\ Probit + LnTruncation - Ln\ Tobit)$ where Ln is Log Likelihood Ratios. If λ is greater than the critical value of the chi-square distribution for the relevant degree of freedom, the unrestricted model specification based on the combination of Probit and Truncated regressions is more suitable than the restricted Tobit model.

Table 7 also discusses the results of sub sample of firms performing M&A and we found that for this subsample also double specification is more appropriate in comparison to Tobit model. Therefore the focus of the discussion would be on the results obtained using double specification model. The difference in the findings of full sample and those of M&A firms sample would be explained.

Table 7: Tobit, Probit and Truncated model results for full sample and M&A performing firms

	Full Sample			Mergers and Acquisitions		
Models / Variables	Tobit (Robust)	Double Specification		Tobit (Robust)	Double Specification	
		Probit (Robust)	Truncated (Robust)		Probit (Robust)	Truncated (Robust)
Constant	-19.78[a] (-6.26)	-1.78[a] (-10.71)	-50.48[a] (-4.61)	8.14 (1.26)	-1.45[a] (-3.10)	25.70[b] (2.42)
MA	6.90 (4.27)[a]	0.186[c] (1.65)	15.11[a] (3.59)	-	-	-
CBMA	-			5.14[b] (2.17)	-	7.65[a] (2.59)
MNEA	-17.80[a] (-8.12)	-1.20[a] (-7.62)	-28.90[a] (-2.64)	-4.38[c] (1.93)	-0.93[b] (-2.27)	-6.71 (-1.38)
AGE	-0.122[a] (-3.38)	0.0024 (1.10)	-0.28[b] (-2.43)	-0.063 (-1.44)	0.038[a] (3.70)	-0.172[b] (-2.40)
SIZE	4.91[a] (8.48)	0.40[a] (12.23)	2.41[c] (1.72)	0.420 (0.51)	0.061 (0.64)	-1.55 (-1.39)
ADVI	-0.60[a] (-3.86)	0.012 (1.44)	-9.92[a] (-5.76)	-0.241 (-1.63)	0.132[a] (4.52)	-3.10[a] (-4.19)
RDI	0.63[b] (2.06)	0.008 (0.88)	2.47[a] (6.93)	1.370[a] (5.90)	0.337[b] (2.07)	1.47[a] (5.23)
MRI	0.80[a] (13.49)	0.035[a] (6.35)	1.32[a] (12.38)	1.257[a] (12.95)	0.080[a] (2.60)	1.31[a] (11.53)
ETI	0.48[b] (2.39)	0.006 (0.82)	0.384[c] (1.83)	0.922[a] (3.07)	-0.015 (-0.60)	1.27[a] (4.23)
DTI	1.52 (0.92)	0.007 (0.15)	9.32[a] (2.96)	-3.90 (-1.22)	0.431 (0.96)	-31.72[c] (-1.83)
LEV	-0.03 (-0.87)	-0.004[b] (-2.20)	0.56 (0.52)	0.038 (0.76)	0.018[a] (3.08)	-0.079 (-1.02)
CI	-0.002 (-1.63)	-0.0001[a] (-2.71)	0.096[a] (7.27)	-0.0059[b] (-2.56)	-0.0009[a] (-4.50)	0.013 (1.45)
No. of Observations	1771	1771	1301	527	527	476
Log Likelihood Ratio	-6391.231	-670.327	-5483.390	-2095.223	-85.040	-1917.90

Values in the parentheses are t-statistics for Tobit Model and z-statistics for Probit and Truncated Models. [a,b,c] represents significance level at 1%, 5%, and 10% respectively. Source: Own calculation based on CMIE Prowess database for the period of 2000-2010.

5.1 Determinants of Decision to Export

This is evident from table 7 that firms who participate in M&A activity behaves differently from rest of the firms. The results indicates that coefficient of M&A is negative and significant. The variable M&A is capturing all M&A activities of the firm in domestic as well as in other countries and majority of M&A are in domestic market. Therefore, they could be directed to capture domestic market share and not for boosting exports per se. The negative sign on M&A variable in full sample indicates that domestic deals help firms to reduce competition and capture fully the domestic market instead of looking outward for selling their products. But if we consider only the subsample of firms performing M&A we have observed from the sample that all the firms going for cross border M&A are exporters[12].

Discussing the technological variables, results show that in- house R&D (RDI) favourably affects decision to export for full sample as well as for M&A firms though the results are insignificant in case of full sample. Import of raw material plays a positive and significant role in firms' decision to export for full sample as well as for M&A performing firms. Imports of embodied and disembodied technology have no effect on firms' decision to export in pharmaceutical industry.

As postulated and in line of findings of many other studies, size (SIZE) of the firm positively determines whether a firm will export or not. In pharmaceutical industry production of generic drugs in bulk enable large firms to reap benefits of economies of scale. The firms that undertake large scale production may find it necessary to expand to the overseas markets as production might be more than the domestic demand. Effect of size is insignificant in case of M&A firms. Age specifies firms experience and also determines accumulated capabilities by firm over the period of time. The coefficient of age (AGE) is positive but statistically significant only for merging and acquiring firms. It is evident from the results that older and more experienced firms generally decide to sell abroad. Our results differ with those of previous studies like Bhat and Narayanan (2009) and Fryges (2006) but matches with those of Roberts and Tybout (1997) and Majocchi et al. (2005).

[12] Variable CBMA has not been used in Probit model of M&A sub-sample because all firms participating in cross-border M&A are present in export market.

MNE affiliation of firms (MNEA) is negatively impacting firms' decision to export for full sample as well as for M&A firms. Affiliated firms are in a better position to capture large shares in domestic markets itself, i.e. affiliation promotes firms to become inward looking. Also, MNEs may be entering India through the collaborative route to capture domestic market. These collaborations, as a result may compel the domestic firms to increase domestic market share at the cost of exports. Advertisement intensity (ADVI) is having no impact on full sample but for M&A firms advertisement investment helps firm to enter in overseas market as it help in creating brand value for the firm. Advertisement intensity is also a proxy for product differentiation and thus helps firms in showcasing their products internationally.

Leverage (LEV) deters firms to enter international market but for M&A firms it plays a positive significant role in decision to export. Positive sign on leverage specifies that, post M&A firms might have better access to financial market. M&A provide firms opportunities to reap benefits of scale and scope which can make them internationally competitive. Thus, they require funds in order to enter international markets. Capital intensity (CI) is negatively affecting firms' decision to export.

5.2 Determinants of Export Intensity

The results clearly indicate that M&A is not contributing to improve the propensity to export. The coefficient of M&A is negative and statistically significant for full sample. As explained earlier, the bulk of M&A investment in Indian pharmaceutical industry takes place in domestic market which helps firms to increase their market share and sell more in domestic market instead of boosting exports. This result is contradictory to those of Mishra and Jaiswal (2012) who found in their study positive impact of M&A on exports. Beena (2008) also found positive impact of M&A on export intensity in post M&A period. Bertrand (2007) in his study of French manufacturing industry concluded no impact of domestic M&A on export intensity. However, in case of only M&A performing firms the result concludes that cross border acquisitions boost exports significantly. Cross border M&A provide firms an opportunity to capture international markets by acquiring the target's tacit knowledge, brand names, access to better financial

resources and managerial skills. Hence, the synergies offered by foreign targets boost exports of the firms.

Considering the impact of technological variables, in-house R&D effort (RDI), import of raw materials (MRI) and embodied technological imports (ETI) turn out more vital for the firms that have entered the export market. It could be inferred that firms' rigorous in-house R&D along with import of latest technology can enable them to launch new and better products in the market. Indian pharmaceutical industry produces and exports majorly generic drugs and active pharmaceutical ingredients (API). Production of these drugs largely depends on process development and reverse engineering which is supported by in-house R&D. For pharmaceutical industry raw materials in the form of basic chemical is most important ingredient to produce API and generic drugs. At the same time new ready to use plant and machinery can enable firms to produce improved quality of products. In post liberalized era pharmaceutical firms can import raw materials as well as capital goods from varied sources at different prices and of different quality. Therefore, in-house R&D, import of raw materials and embodied technology boost pharmaceutical exports to quality seeking developed countries as well as to price sensitive markets of emerging economies (Bhaduri and Ray, 2004).

However, disembodied technology imports (DTI) seem to affect positively and significantly the export intensity for the full sample but it is negatively and significantly affecting the export intensity of M&A firms. It is expected that M&A firms acquiring abroad also acquire tacit knowledge as well as R&D and production capabilities of the target firms. Such firms by reaping the benefits of synergies can use the target location for exports. Thus, the results suggest that M&A firms do not require imports of disembodied technology to improve their export performance; rather it could be used to improve domestic sales (Siddharthan and Nollen, 2004). At the same time full sample also includes non M&A performing firms therefore import of disembodied technology assist them in production of quality drugs using new and improved chemical compositions and formulas which later contributes in increasing export quantity.

The age of the firm (AGE) appears to be an important factor in determining export intensity of pharmaceutical firms. The double specification model suggests that younger firms are more export intensive as compared to older firms. In liberalized regime where full capacity production

is now permitted, many established firms undertake high scale production. This leads to excess supply in domestic market. Therefore, newer firms entering the industry with latest technology and better production skills find it easier to penetrate export market than to supply domestically (Bhat and Narayanan, 2009). Another significant variable affecting export intensity is size (SIZE). For full sample large size firm boosts exports because they can take advantage of economies of scale. But size turns out to be insignificant in affecting export behaviour of M&A undertaking firms.

Though advertisement and sales promotion is required for firms to showcase their products in international market, but for exporting firms in pharmaceutical industry, higher investment on advertisement (ADVI) do not lead to improved export performance. Indian pharmaceutical industry produce generic drugs and API in bulk, which are sold in international market by names of chemical composition, therefore, there is less scope of product differentiation. Hence, an aggressive advertisement strategy will only add to cost of production which will have a negative impact on exports. At the same time advertisement expenditure can create demand in the domestic market and therefore in order to reduce export related costs firm may choose to sell more in domestic market.

MNE affiliation (MNEA) turns out to be negatively impacting export performance. Foreign firms collaborate with Indian firms keeping in view market seeking motive rather than efficiency seeking (Kumar, 2000). Indian pharmaceutical firms have expertise in producing generic drugs via reverse engineering; therefore, it is possible that MNE enter Indian market with the motive of producing generic version of some branded drugs whose patents are soon to expire. This probably increases the dominance of affiliated firms in domestic market and may drive unaffiliated firms to seek new markets in foreign countries. Leverage (LEV) is having no impact on export behaviour of pharmaceutical firms while capital intensity (CI) is positively influencing export intensity of firms in pharmaceutical industry but have no impact on firms going for M&A.

6. Summary and Conclusions

This study attempts to explore the role of corporate strategy (M&A) and technological factors to establish the determinants of manufactured exports from developing country like India and in a

high technology industry like pharmaceuticals. It could be asserted that technological advantages in exports for developing countries rest on imported and adaptive technological capabilities rather than on breakthrough inventions. The export behaviour of firm is captured under two aspects, the decision to export or not and if participating in export market then how much to export. This study attempted to capture how mergers and acquisitions and technological efforts enhance export competitiveness of pharmaceutical firms. The results of analysis are presented for full sample and M&A firms using two different models, namely, Tobit model and Double Specification model (Probit + Truncation). Likelihood ratio test suggests that for analysing export behaviour of the firms double specification model has an edge over widely used Tobit model.

Mergers and acquisitions (M&A) appeared to affect significantly the export behaviour of pharmaceutical firms. Considering the full sample it is evident that M&A do not boost exports but probably provide an opportunity to tap domestic market and increase their market share. At the same time for a subsample of M&A performing firms cross border deals drive firms to participate in export market as well as they significantly boost their export intensity. Therefore we can suggest that cross-border M&A enhances pharmaceutical firms' efficiency and their export competitiveness in international market.

The present study found the evidence that acquisition of technological capabilities either by in-house R&D expenditure or through imports of embodied or disembodied technology is an important determinant of firms' competitiveness in international market. In pharmaceutical industry only acquisition of technological capabilities will not ensure better export performance unless it is acquired and assimilated efficiently (Bhaduri and Ray, 2004). Here sustained R&D is required for performing reverse engineering (for producing mainly generic drugs) to contend effectively in price competitive export market. The results also reflect that Indian pharmaceutical firms export to both price aware and quality sensitive segments of foreign markets. Based on the source of procurement, import of embodied technology in the form of capital equipments and import of raw material help Indian pharmaceutical firms to take advantage of both price and quality competitiveness. In case of disembodied technology, it affects favourably the export

performance but for the subsample of M&A firms it deteriorates exports. It is possible that in post acquisition period firms cater largely to domestic markets.

Apart from M&A and technological variables we observed that firm size boosts export intensity by reaping economies of scale. Another significant impact is of age on exports. There is clear evidence that younger firms are more successful in export markets. Since the domestic market is already being captured by more experienced firms, newer firms look forward towards foreign market to remain in the industry. In case of M&A sample firms' age has positive impact on decision to export. Advertisement intensity and MNE affiliation also influence significantly though negatively the export behaviour of firms in pharmaceutical industry. Capital intensity influences negatively the exports.

It is also to be mentioned that Prowess database provide information usually on financial statements of large and medium firms and most of them are listed. So, the database could be biased towards them. However, we strongly feel that this constraint will not affect much the result of the present analysis on export behaviour because of the following reasons.

a) Small firms have resource constraints, hence it is a remote possibility that such firms will invest on technological imports and will incur required cost of exports. Therefore it could be said that the affect of the technological variables on exports will remain same despite the inclusion of small firms.
b) M&A activity require huge investment whether buying any firm domestically or internationally, therefore large firm can only impact export performance through this route.

As a concluding remark it could be mentioned that in order to promote exports and to improve international competitiveness of domestic firms, competition policy (especially for M&A) should be formulated in such a way that it supports the argument of national champion. Another way of boosting exports is by subsidising the technological efforts of firm in emerging areas of industry. The government must provide incentive to those firms which are venturing into new product R&D jointly with research institutions and other firms. Since, capital intensity has negative impact on decision to export and have no impact on quantity of exports, efforts should be made to design policy which supports development of indigenous capital equipment and facilitate

training and development of human resource. Similar studies should be conducted for other high technology intensive firms for better understanding the impact of M&A and role of technological efforts in determining exports in those industries as well as for generalising the results.

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