WORKING PAPER 122/2015

MERGERS AND ACQUISITIONS IN THE INDIAN PHARMACEUTICAL SECTOR

Santosh Kumar Sahu
Nitika Agarwal

MADRAS SCHOOL OF ECONOMICS
Gandhi Mandapam Road
Chennai 600 025
India

September 2015

Mergers and Acquisitions in the Indian Pharmaceutical Sector

Santosh Kumar Sahu
Assistant Professor, Madras School of Economics
santosh@mse.ac.in

and

Nitika Agarwal
Madras School of Economics
genitika@mse.ac.in

WORKING PAPER 122/2015

September 2015

Price : Rs. 35

MADRAS SCHOOL OF ECONOMICS
Gandhi Mandapam Road
Chennai 600 025
India

Phone: 2230 0304/2230 0307/2235 2157
Fax : 2235 4847/2235 2155
Email : info@mse.ac.in
Website: www.mse.ac.in

Mergers and Acquisitions in the Indian Pharmaceutical Sector

Santosh Kumar Sahu and Nitika Agarwal

Abstract

Mergers and acquisitions (M and A) are common strategies of firms to increase its performance. Although, the motives of M and A are different however, the determinants are discreet. This study tries to determine the factors affecting M and A activities in the Indian pharmaceutical sector. The empirical findings suggest; export intensity, import intensity, firm size and research and development intensity as the major determinants of M and A in the Indian pharmaceutical sector. In the context of acquisition, there is a riskiness associated with any business strategy, for to which a firm may choose to finance the deal either via cash, stock or assets. This study further looks at the firm's decision on the types of acquisitions and arrives at the determinants of such decisions. The factors such as capital intensity was found more important when acquisition by share was undertaken compared to others. The success of the M and A is observed by considering the financial performance of the firm measured in terms of profit margin at firm level. Using propensity score matching technique, this study concludes that M and A have positive effect on the profit margin in the post M and A scenario.

Keywords: *Mergers, Acquisitions, Indian Pharmaceutical Sector*
JEL Codes*: G34, L65, C13*

ACKNOWLEDGEMENT

We are thankful to Prof. N. S. Siddharthan, Dr. Kavi Kumar and Dr. Sunil Paul for their valuable comments and suggestions in the earlier draft of this paper. The usual disclaimer applies.

INTRODUCTION

For any business to thrive in the competitive scenario, a firm needs to grow in business either by internal expansion or by external expansion. Internal expansion is a gradual process over time when the firm acquires new assets, replaces obsolete technology and equipment and establishes new line of products. In external expansion, on the other hand, a firm collaborates with a running business and grows overnight through corporate combinations. These combinations are in the form of mergers, amalgamations, acquisitions and takeovers, and have become an important feature of corporate restructuring. The Pharmaceutical sector is one of the most organized sectors in the basket of hi-tech industries. Characterized by high level of competition, oligopolistic nature, patents regulations, higher research and development (R and D) expenditure and unexpected outcomes due to different product and process innovations; this sector is strategically highly active. However, the role of R and D and related expenses are one of the important features of this sector. Given the constraints and requirements, a common path taken by pharmaceutical firms are in the form of strategic alliances, mergers and acquisition.

The Indian Pharmaceutical Industry has witnessed an overhauling growth over the last decade. It has been growing at the rate of 23.9 percent per-year and estimated to be worth 55 billion dollars by 2020. It is expected that the domestic pharmaceutical market will grow at 10-12 percent in 2015 as compared to 9 percent in 2014. However, the growth rate of domestic pharmaceutical sector was 11.9 percent during October 2014. During 2014, an aggregated disclosed value of $422.6 billion was recorded, compared to $20.1 billion in 2013 for 674 Indian firms those were involved in M and A activities. Domestic deal activities continued to lead the Indian M and A landscape, accounting for 57 percent of the total number of deals in 2013-2014 while cross-border deals maintained their dominance on the value front with an aggregate

disclosed deal value of $17.8 billion accounting for more than three-fourths share. Inbound deals lead both in terms of value and volume, as foreign multinationals moved to take advantage of the falling Indian currency by buying domestic assets. Domestic M and A deals are largely due to the consolidation wave for example, Sun Pharma acquiring Ranbaxy. The current investment environment in India is also being made favorable by various initiatives taken up by the Government of India. Since the liberalization initiated in 1991 by the Government of India, significant policy changes have been made to boost research and development and to make intellectual property regime (IPR) secure[1]. The TRIPS agreement seeks to provide incentive to be first innovators. The New Companies Act 2013 contains several provisions that would help firms implement "schemes of arrangement" (i.e. M and A, or corporate restructuring)[2]. To benefit from spillovers and to improve their production processes, a wave of mergers and acquisitions has set in for pharmaceutical and biotech firms to become integrated pharmaceutical giants that are efficient both in introducing new drugs and have the ability to sell them in the fastest growing markets.

Based on the above discussions, we found that M and A is not only important for the growth of the particular firm but also for the economy as a whole, that essentially boosts the export behavior, technology transfer and competitiveness. In this line of thought, the present study focuses on understanding the major factors that

[1] The major change in IPR came with the Uruguay round of the General Agreement on Trade and Tariff (GATT) when the Trade-Related Aspects of Intellectual Property Rights (TRIPS) agreement was mandated to broaden the existing patent system of developing countries like India with weak IPR.

[2] However, according to Ramani and Maria (2005), "given the present state of competencies of Indian pharmaceutical firms and the national system of innovation, the major focus of innovative activity is going to be either on raising to be the first or lowest cost producer of off-patent products, or on being a link in the international division of labour supporting the creation of innovations by the Western multinationals". That is it would encourage Indian firms to increasing sell stakes to multinational enterprises so as to access their knowledge bank and benefit from knowledge spillovers.

determines the M and A activities for the sample of the pharmaceutical firms in India and also to verify whether these decisions affect the performance. Unlike previous available studies for the Indian context, we distinguish between mergers and acquisitions as two distinct strategies and arrive at the determinants respectively. Further, we have also separated between acquisition deals financed through share vis-à-vis asset-based to bring out the inter-firm differences of accusation based on each strategic alliance. The reminder of the paper is as follows. Next section describes related literature in the line of the research. Section three presents the data and variables, section four describes the empirical analysis, and section five concludes.

RELATED LITERATURE

Mergers and acquisitions are strategic decisions taken for maximization of a firms' growth through various revenue maximizing and cost-minimizing routes. A Merger is "the union of two firms to form a single new business. The firms are usually more similar in size and hence arrangement is more collaborative. According to Griffin and Ebert (1991), a merger is somewhat akin to a marriage. The identities of the two firms are merged into one with the full consent of the board of directors of the agreeing firms. Acquisition is an act of acquiring effective control by one firm over assets or management of another firm without any combination of firms. Thus, in an acquisition two or more firms may remain independent separate legal entities, but there may be a change in control of acquisition. An acquisition occurs when one firm uses its capital resources-such as stock. While mergers are carried forward with mutual consent, acquisition may take the form of a hostile takeover when it is forced. Under the Monopolies and Restrictive Practices Act, takeover meant acquisition of not less than 25 percent of the voting power in a firm. While in the Companies Act, a firm's investment in the shares of another firm in excess of 10 percent of the subscribed capital can result in takeovers. An acquisition or takeover does not necessarily entail full

legal control. A firm can also have effective control over another firm by holding a minority ownership.

Any M and A deal can be financed through two major channels such a as cash or stock. The payment mechanism used is affected and in turns effects the collaborating firm's growth synergies and riskiness associated with them. The firms may either close the deal via a one-time cash transaction or through stock offers. There has been a considerable shift in trend from cash deals to stock offer since 1990s. In case of the pharmaceutical industry, 51.51 percent of acquisitions deals that took place from 2001-2010 were in the form of substantial acquisition by shares while 17.57 percent were in the form of minority acquisition of shares and 30.9 percent are in the form of acquisition of assets (Vyas *et. al.*, 2012). The method of payment chosen by the acquirer not only reflects the riskiness of the firm, but also affects the value to the shareholders of both the acquirer and the target firm. While in cash deals, the roles of the two parties involved are clearly distinguished and the exchange of money for shares is completed in a single transfer of ownership, it is not so when stock offers are made. In a stock deal, there is ambiguity in the status of 'buyer' and 'seller' as many a times, the shareholders of the acquired firm may end up owning most of the firm that bought it. It is often noticed that shareholders of the target firm prefer cash transactions over stock offers because when firms pay for acquisition with stock, both value and risk of transactions are passed on to the shareholders of the acquired firm. Cash transactions impose entire risk on the acquiring shareholders. The risk is in the form of synergy risk, that is, the expected synergy value may not materialize as was expected and paid for, by the firm. While in stock the risk of failure of a premium to materialize is shared by the acquired shareholder. Hence, the way an acquisition is paid for determines how the risk is distributed between the buyer and seller. Thus, there are three key economic questions which are asked when deciding the method of payment (1) valuation of the

acquirer's share, (2) synergy risk, and (3) announcement effect. With these methods of payments a firm may figure out what channel to use to finance for its strategic alliance. If the managers believe that there is a substantial risk that adequate level of synergy may not be achieved, they are likely to hedge their bets by offering stock. This also explains why markets react favorably to cash deals than stock deals as the former signal a higher confidence in the merger and hence a higher value.

Given the theories of mergers and acquisitions, several attempts have been made by researchers to understand the motivations and determinants of merger and acquisition activities. Based on the study by Kumar (2000), 35 percent of acquisitions involved buying out local joint venture partners by multinationals, 5 percent acquisitions, are those that increased stakes in their affiliates or subsidiaries. 7 percent of mergers happen to the existing affiliates following merger of patents[3]. Danzon *et. al*. (2004) studied the determinants of M and A by separating the Worldwide Mergers and Acquisition database into small firms (enterprise value is at least $20 million but less than threshold of $1 billion in at least one year during 1988-2001) and large firms (enterprise value of $1 in at least one year during the same period). They used multinomial logistic regression model to determine if the firm will undergo merger activity given the variables such as excess capacity due to pipeline gaps, firms' size, Tobin's q, multinational affiliation, and cash to sales ratio. The determinants were slightly different for large and small firms. Large firms use mergers as a response to excess capacity due to anticipated patent expiration and gap in the firm's product pipeline, whereas small firms use mergers as an exit strategy when they are financially incompetent. The effects of mergers are seen using propensity scores to control for any

[3] For example, Hindustan Ciba-Geigy and Sandoz merged to form Novartis. Another example of such patent expiration was merger of Ponds with Hindustan Lever. For the pharmaceutical sector, a major motive is to extend the scope of existing operations or market share. For example, Glaxo India bought 3 pharmaceuticals firms of Biddle Sawyer Group to strengthen their presence in certain therapeutic market segments.

endogeneity. Large firms that merged experienced did not experience any significant change in enterprise value, sales, employees, and R and D relative to non-merged counterparts. Smaller firms that merged experienced slower growth in R and D relative to similar firms those did not merge, implying that post-merger integration may divert cash from R and D to others.

According to Pradhan and Abraham (2005) mergers and acquisitions activities in India were gradually and steadily increasing to involve foreign firms. The emergence of software in services sector and pharmaceuticals in industrial sector as two leading sectors on overseas M and A clearly reflected the growing global competitiveness of Indian economy in these sectors. Most of the Indian overseas M and A have been into developed countries as they offer large market for Indian software and pharmaceutical products. This study suggested that firms involved in overseas M and A tend to be large sized and research intensive. The size distribution of overseas M and A, revealed that a small number of M and A deals contributed largest chunk of total value of M and A. The study of the nature, structure and performance of the mergers and acquisitions in the pharmaceutical sector was analyzed by Beena (2006). This study attempted several aspects of drugs and pharmaceutical firms that separate them from the manufacturing firms. According to her, this sector "deserves special attention due to the inelastic demand for drugs, existence of a third party in deciding the demand for a particular drug. Thus, the actual consumers are obliged to obey the decisions of the third party. Hence, there is a tendency for increased market concentration in the hands of a few. With the industry being socially sensitive such a rise in power of supply side factors which leads to high prices is not acceptable. Mergers and acquisitions during 1992-1993 to 2003-2004 for 23 merging firms were studied in this case. Measures of profitability like the net profit margin, return on net worth

were higher for merged firms accompanied by higher advertisement intensity.

Given the high dependence of pharmaceutical industry on research and development Duflos and Pfister (2008) focused on the technological determinants of acquisition and target choices. This study used a duration model to relate the probabilities of being a purchaser or a target firms based on R and D and patent data. Three hypotheses: 'innovation gap', 'absorptive capacity' and 'patent portfolio', were empirically tested. The results were in support of the 'innovation gap' hypothesis as the targeted firms were found to hold a larger patent portfolio. Acquiring firms were seen to have a lower Tobin's q and a lower R and D stock than non-acquiring units, which are in support to the 'innovation gap' hypothesis. Secondly, acquiring firms have more diversified and larger patent portfolios than their non-acquiring counterparts. It is seen that, acquiring firms tend to increase their R and D expenditure in post acquisition. This is in support with the complementarity between internal R and D investment and R and D outsourcing that is the 'absorptive capacity'. Lastly, the insignificant evidence is found in favour of the 'patent portfolio' hypothesis as patent yield did not come out as an important factors in the model.

Beena (2008) used data from different sources such as CMIE and SEBI. The sample used consists of 115 M and A in the Indian manufacturing sector during 1995-2000, with 84 domestically owned acquiring firms and 31 foreign-owned acquiring firms. The objective was to check if there is any significant difference in performance of acquiring firms during 1990-2005 as compared to the average performance of the manufacturing sector. The significance of mean difference was tested using non-parametric, univariate Wilcoxon rank test. The performance was measured in terms of price-cost margin, rate of return, export intensity, research and development intensity, capacity utilization,

product market share and the Herfindahl Index of Concentration ratios. Most of these indicators showed a statistically significant stable or downward trend during the post-merger period. The declining debt-equity ratio implied that M and A strategy, was used by firms in order to make their capital structure more viable. R and D intensity was higher compared to private corporate manufacturing sector in the post-merger phase. Shareholders were paid better dividends in order to win their confidence in the post-merger phase. However, higher market concentration had mixed effect on prices. The price-cost margin had not gone up significantly although the product market share had gone up in a majority of firms in post-merger phase. Beena argued that the post-merger performance in terms of export intensity in India showed a significant upward trend, which coincides with the recent evidence form countries hit by financial crisis. The study also contradicts the 'expansionary motive' behind merger as capacity utilization during the post-merger phase shows a statistically significant downward trend. This study could not find any significant evidence of efficiency-related factors as primarily influencing the M and A that have occurred in the Indian corporate sector since the mid-1990s.

Saboo and Gopi (2009) carried a comparison of post-merger performance of firms involved in domestic and cross-border acquisition. The hypothesis that type of acquisition does not play an important role in the performance of the firms was rejected as it was found that significant differences existed in the financial ratios of the firm post-merger depending on whether it acquired a domestic firm or a foreign firm. Financial ratios like the debt-equity ratio, return on capital, profit after tax were considered and concluded that most of the indicators improved in one to two years post-merger in case of domestic firms. However, the same financial ratios were negative for firms acquiring foreign firms. The performance of these firms fell for two years continuously in the post

deals. Saboo and Gopi (2009) attributed this to the fact that firms financed mergers not only through debt but also with the help of equity. According to the EXIM Bank Report (2007), the changing Indian pharmaceutical sector can be explained due to "cost effective manufacturing being implemented by developed economies, growing importance of emerging markets, changing significance of India's domestic market". In the lines of the EXIM bank report, Vyas *et. al.* (2012) studied the determinants of mergers and acquisition in the Indian pharmaceutical industry from of 2001-2010 by using a logit analysis. Their results were consistent with the arguments above. Positive and significant signs for firm size and multinational affiliation indicate larger M and A activity for larger firms and those with the foreign affiliation. The logit result concluded that R and D intensity was positively related to M and A that implied that in-house R and D is complementary to technology acquisition via M and A route in high technology industries such as the pharmaceuticals.

Further, Vyas and Narayanan (2012), focused on the impact of mergers and acquisitions on R and D intensity of the Indian pharmaceutical firms. This paper used propensity scores as weights while estimating a weighted least square estimate to understand the relationship between M and A, and innovation activities of firms. The results showed that there is a time factor difference in the impact of M and A on R and D intensity of firms. Acquisitions appear to have a negative impact on R and D intensity in the immediate post-acquisition years but the magnitude of negative effect on R and D intensity of acquiring firms had a diminished effect over time. The authors suggested that at short run, the resources meant for research and development are diverted to absorbing the know-how acquired through M and A. Firms may avoid duplication of R and D inputs leading to a fall in expenditure. The effect on research and development taken by the firms post acquisition was different for embodied and disembodied technologies. M

and A allowed acquiring firms to acquire tacit knowledge and the need of disembodied technology imports was diminished. The study showed that embodied technology imports were complementary to technology acquired through M and A, and boosts in-house R and D expenditure. The effect of acquisition on R and D was affected by the level of leverage. The study concluded that leverage level tends to impact negatively the R and D intensity of acquiring firms, which suggests the possible debt financing of M and A. Based on the above discussions on the exiting review of empirical literature on the determinants of M and A, this study tries to find out the drivers of M and A for the Indian pharmaceutical sector. In line of the above reviews, this paper deviates in terms of identifying the strategies of M and A by classifying them in (1) 'mergers', (2) 'acquirers', (3) 'mergers and acquires', (4) 'mergers or acquires', and (5) 'types of acquisitions'.

DATA AND VARIABLES

According to Misra and Chandra (2010) the use of panel data not only helps in raising the sample size and hence the degrees of freedoms considerably, it also incorporates the dynamics of the firms' behavior in the market place. Unlike an unbalanced panel data this study uses a balanced panel that essentially increases a firm's behavior over a period of time. However, the use of such a structured data, restricts us to identify the entry and exit of firms in the same sector and thereby the M and A behavior of such firms. However, the advantage of this study allows someone to compare the results with other existing studies that have used unbalanced panel or cross-sectional data and relate the determinants. According to our knowledge such an exercise is not attempted for the Indian pharmaceutical industries. Data are collected from the Centre of Monitoring Indian Economy (CMIE) Prowess database, accessed during August, 2014. The collection of data involves two-step process. Firstly, the firm characteristics are collected from the annual audited balance sheet. Secondly, the information related to M and A are

collected from the M and A section of the CMIE Prowess. CMIE distinguishes acquisition based on mode of finance. Hence, data collected for firms' were classified into mergers, acquisition by share and acquisition by asset. Given all the M and A related activities at firm level across the sector and the economy are precisely not given in the database after combining both the information from the Prowess, we have arrived at the sample, that is, around 4 percent of the pharmaceutical industry in India. Firm specific data on net sales, firm age, capital, technology imports, advertisement and marketing expenditure, profits after tax, exports, imports, research and development expenditure, business group affiliation, foreign affiliation are chosen for the analysis. In order to compare the pre and post-mergers activities of firms in Indian pharmaceuticals, we use the balanced panel data that ensures the sample has data available for all the years that leaves 25 firms each year with 600 firm-year observations from 1991-2014. This study takes into account the financial pathway taken by the firm to undergo acquisition, namely acquisition by share and acquisition by asset.

Table 1: Definition of the Variables

Symbol	Variable Name	Definition
Size	Size	Natural log of net sales
CI	Capital Intensity	Ratio of capital to net sales
LI	Labour Intensity	Ratio of wages and salaries to net sales
PM	Profit Margin	Ratio of profit after tax to net sales
PMMNE	Profit Margin of the MNE affiliated firms	Takes value 1 for profit margin of the MNE affiliated firms, else 0
TI	Technology Import Intensity	Ratio of royalties, technical know-how fees, etc. to net sales
AMI	Marketing and Advertisement Intensity	Ratio of marketing and advertisement expenditure to net sales
RDI	R and D Intensity	Ratio of research and development expenditure to net sales
EXPI	Exports Intensity	Ratio of exports to net sales
IMPI	Imports intensity	Ratio of imports to net sales
Age	Firm Age	Difference between incorporation year and year of study
GTECH	Dummy for business group and technology imports	Takes value 1 if affiliated to business group and involves in technology imports, else 0
GA	Dummy for Business Group Affiliation	Takes value 1 if affiliated to business group, else 0
MNE	Dummy for Multinational Affiliation	Takes value 1 if affiliated to multinational (minimum equity of 10 percent), else 0
MER	Dummy for Merger	Takes value 1if the firm is merged else, 0
ACQ	Dummy for Acquisition by Either Asset or Share	Takes value 1 if the firm is acquired either by asset or by share or both, else 0
AQA	Dummy for Acquisition by Asset	Takes value 1 if firm is acquired by only asset, else 0
AQS	Dummy for Acquisition by Share	Takes value 1if firm is acquired by only asset, else 0
EITMA	Dummy for Either Merged or Acquired	Takes value 1if firm is either merged or acquired, else 0
MERACQ	Dummy for both Merged and Acquired	Takes value 1 firm is either merged and acquired, else 0

The trends in the mergers and acquisitions deals over the period are initially studied and it found that there is an increasing trend in the deals from 1991-2014. The explanatory table is presented in Table A1 in the appendix. Thus for all the categories we observed an increasing trend in the number of mergers and acquisition deals. In particular, an increasing trend can be observed few years after the New Industrial Policy (NIP). The NIP of 1991 was introduced for the pharmaceutical sector in 1994 through Modification in the Drug Policy 1986. This facilitated acquisition by multinationals. In January 2005, India amended its patent law in pharmaceuticals to bring them into conformance with the WTO TRIPs agreement. Under the new law, Indian drug makers could not manufacture and market reverse-engineered drugs patented by foreign pharmaceutical firms. Thus firms started looking for strategic alliances in the form of acquisition deals with domestic and foreign firms as seen by the increase in the number of deals post 2005[4]. The variables and definitions are presented in Table 1.

The cross tabulations in Table 2 shows the differences in firm characteristics of business group and standalone firms; MNE affiliated and domestic firms; and the merged and non-merged firms. In table 2, it can be seen that business group affiliated firms are not only bigger in size but also report higher profits, while standalone firms tend to have huge loses. To maintain their high profits, business groups are seen to spend heavily on marketing and advertisement and undertake high research and development in comparison to standalone firms. This can be due to size advantages, managerial expertise that large firms have and standalone firms lack. Business group firms have both higher export and import intensity in comparison to standalone firms. Comparing the MNE affiliated and domestics firms, the former are larger in size and capital intensive, owing to better access to foreign firms' resources. High

[4] Many multinational firms like GlaxoSmithKline (GSK), Baxter, Aventis, Pfizer, Novartis, Wyeth, and Merck have been active in India's pharmaceutical market mainly through subsidiaries especially after the new patent law of 2005.

import intensity and technology intensity can be interpreted as imports in the form of technology and capital imports. The characteristics of merger and non-merger firms are clearly brought out in Table 2. The profit intensity is higher for the merged firms than non-merged firms. Table 2 asserts the fact that firms that enter into acquisition deals are larger irrespective of the route they take, among which firms with acquisition by share are the largest. Stark differences are seen in the profit intensity for acquisition and non-acquisition firms in the sample under consideration. Firms that enter acquisition deals via shares show significantly high profit intensity in comparison to all other modes of acquisition. Also, both import and export intensity for firms with acquisition by share is more than acquisition by asset and non-acquisition. This is also seen for marketing and advertisement and R and D intensity which is higher for acquired firms than non-acquired firms.

Further, firms that are involved in both mergers and acquisition were distinguished from firms involved in either merger or acquisitions. The variable either merger or acquisitions is the same variable as taken in previous studies, as it considers merging and acquiring as the same strategy. The firms which are bigger and have higher profits are capable of using both mergers and acquisition as a corporate strategy in comparison to smaller firms which can use either of the two. Firms which involve in both mergers and acquisition spend more in R and D and technology generation and have high marketing expenses. Further, the summary statistics of the full sample is presented in the last row of Table 2. The total number of observations is 600 with firm age ranging from 30 to 91 years. Also, the correlation matrix is estimated to see the plausible relation between variables which is shown in table A2 in the appendix.

THE EMPIRICAL ANALYSIS

The empirical analysis of the paper is divided in three sections. The first section of the paper focus of determinants of M and A classifying for mergers, acquisition, types of acquisitions, both mergers and acquisitions and either merges and actuations. As stated earlier, most recent studies on Indian economy related to the pharmaceuticals sector only attempted to understand the determinants taking M and A as one group. This study distinguishes the differences for the types of deals. The second section of the empirical analysis is focused on the seminar exercise using an ordered probit framework, to distinguish between the types of the deals and their determinants at firm level. The third section deals with the post merger benefit by using Propensity score matching technique.

Determinants of M and A: Results from Probit Estimates

This section of the study focuses on the empirical settings and results using a Probit model for each of the dependent variables over a set of independent variables. The independent variables are mentioned in Table 1. The Probit model is estimated to arrive at the determinants that influence the probability of a firm undergoing merger, for which the dependent variable is a dummy variable that takes vale 1 if firms undergoes merger and 0 otherwise. The equation takes the following form to which a probit model is fit.

$$P(MER) = \alpha_{i,t} + \beta_1 Age_{i,t} + \beta_2 Size_{i,t} + \beta_3 Size^2_{i,t} + \beta_4 PM_{i,t} + \beta_5 AMI_{i,t} + \beta_6 LI_{i,t} + \beta_7 CI_{i,t} \\ \beta_8 TI_{i,t} + \beta_9 RDI_{i,t} + \beta_{10} EXPI_{i,t} + \beta_{11} IMPI_{i,t} + \beta_{12} GA_{i,t} + \beta_{13} MNE_{i,t} + u_{i,t} \quad (1)$$

Similar estimates were made for the other cases, with the following equations,

$$P(ACQ) = \alpha_{i,t} + \beta_1 Age_{i,t} + \beta_2 Size_{i,t} + \beta_3 Size_{i,t}^2 + \beta_4 PMMNE_{i,t} + \beta_5 AMI_{i,t} + \beta_6 LI_{i,t} + \beta_7 CI_{i,t}$$
$$\beta_8 TI_{i,t} + \beta_9 RDI_{i,t} + \beta_{10} EXPI_{i,t} + \beta_{11} IMPI_{i,t} + \beta_{12} GA_{i,t} + \beta_{13} MNE_{i,t} + u_{i,t} \quad (2)$$

$$P(AQA) = \alpha_{i,t} + \beta_1 Age_{i,t} + \beta_2 Size_{i,t} + \beta_3 Size_{i,t}^2 + \beta_4 PMMNE_{i,t} + \beta_5 AMI_{i,t} + \beta_6 LI_{i,t} + \beta_7 CI_{i,t}$$
$$\beta_8 TI_{i,t} + \beta_9 RDI_{i,t} + \beta_{10} EXPI_{i,t} + \beta_{11} IMPI_{i,t} + \beta_{12} GA_{i,t} + \beta_{13} MNE_{i,t} + u_{i,t} \quad (3)$$

$$P(AQS) = \alpha_{i,t} + \beta_1 Age_{i,t} + \beta_2 Size_{i,t} + \beta_3 Size_{i,t}^2 + \beta_4 PMMNE_{i,t} + \beta_5 AMI_{i,t} + \beta_6 LI_{i,t} + \beta_7 CI_{i,t}$$
$$\beta_8 TI_{i,t} + \beta_9 RDI_{i,t} + \beta_{10} EXPI_{i,t} + \beta_{11} IMPI_{i,t} + \beta_{12} GA_{i,t} + \beta_{13} MNE_{i,t} + u_{i,t} \quad (4)$$

$$P(MERACQ) = \alpha_{i,t} + \beta_1 Age_{i,t} + \beta_2 Size_{i,t} + \beta_3 Size_{i,t}^2 + \beta_4 PMMNE_{i,t} + \beta_5 AMI_{i,t} + \beta_6 LI_{i,t} + \beta_7 CI_{i,t}$$
$$\beta_8 TI_{i,t} + \beta_9 RDI_{i,t} + \beta_{10} EXPI_{i,t} + \beta_{11} IMPI_{i,t} + \beta_{12} GA_{i,t} + \beta_{13} MNE_{i,t} + u_{i,t} \quad (5)$$

$$P(EITMA) = \alpha_{i,t} + \beta_1 Age_{i,t} + \beta_2 Size_{i,t} + \beta_3 Size_{i,t}^2 + \beta_4 PMMNE_{i,t} + \beta_5 AMI_{i,t} + \beta_6 LI_{i,t} + \beta_7 CI_{i,t}$$
$$\beta_8 TI_{i,t} + \beta_9 RDI_{i,t} + \beta_{10} EXPI_{i,t} + \beta_{11} IMPI_{i,t} + \beta_{12} GA_{i,t} + \beta_{13} MNE_{i,t} + u_{i,t} \quad (6)$$

The above six equations were estimated, fitting a Probit model as stated in equations above. Table 3 presents the results of the Probit estimation for each and every cases as described in the above equations. From Table 3, we can observe that size has turned out to be one of the significant factors in determining the probability to enter in the M and A deals. Also the relationship of size with the decision to enter in the M and A deals has a non-linear relationship. The findings of the Table 3 suggest that decision to merge increases for firms that are big in size at a decreasing rate. According to Vyas and Narayanan (2012) large firms might have diversified capabilities that allow to, perform better than their smaller counterparts. Literature suggests that firm size is non-linearly related to export intensity which helps firms generate initial profits and enable M and A activity. However, Shepherd (1986) suggested that size

is direct proxy for market power which could develop x-inefficiencies causing poor performance. Hence, size could initially have positive effect on firms' decision to expand but later have a negative effect. Size is found to be non-linearly related to probability to acquire. However, a difference is observed in the pattern of non-linearity between probability to acquire by share and by asset.

Table 2: Firm Characteristics Based on Different Classifications

Variables	Size	CI	LI	PM	TI	MAI	RDI	EXPI	IMPI	Age
Standalone Firms	7.223	0.258	0.149	-0.007	0.004	0.058	0.007	5.613	0.063	55
Business group affiliated	8.131	0.088	0.104	0.147	0.000	0.070	0.020	23.764	0.255	56
Domestic Firms	7.227	0.247	0.125	0.036	0.002	0.062	0.013	16.435	0.176	56
MNE affiliation	8.427	0.051	0.131	0.122	0.003	0.067	0.013	10.575	0.119	54
Non-Merged firms	7.248	0.222	0.134	0.023	0.003	0.060	0.008	10.779	0.116	55
Merged firms	8.860	0.043	0.108	0.194	0.001	0.073	0.030	24.683	0.269	57
Firms with no acquisition deal	7.135	0.191	0.124	0.007	0.002	0.060	0.006	10.876	0.118	55
Firms with acquisition deal	8.756	0.146	0.134	0.193	0.002	0.071	0.028	21.542	0.234	57
Firms with no acquisition by share	7.248	0.212	0.132	0.025	0.002	0.060	0.007	10.534	0.114	55
Firms with acquisition by share	9.302	0.034	0.110	0.236	0.001	0.077	0.037	29.489	0.319	57
Firms with no acquisition by asset	7.218	0.184	0.124	0.012	0.002	0.060	0.007	11.731	0.127	55
Firms with acquisition by asset	8.729	0.159	0.136	0.199	0.002	0.072	0.029	20.625	0.224	57
Firms with neither acquisition nor merger deal	7.097	0.198	0.126	0.004	0.003	0.061	0.006	10.428	0.113	55
Firms with either merger or acquisition deal	8.629	0.138	0.129	0.176	0.001	0.068	0.026	21.057	0.229	57
Firms with merger or acquisition but not both	7.366	0.202	0.130	0.030	0.002	0.060	0.008	11.913	0.129	56
Firms with both merger and acquisition deal	9.257	0.036	0.111	0.265	0.001	0.083	0.041	27.478	0.300	56
Full sample	7.658	0.176	0.127	0.066	0.002	0.064	0.013	14.325	0.155	55

Note: for the abbreviations of the header in the first row of the table please refer to table-1; the values in the table are the average value for each indicator.

Source: Authors' calculation from Prowess Data.

Table 3: Probit Results for Merger and Acquisition Activities

Variables/ Groups	Merger Alone	Either Merger or Acquisition	Both Merger and Acquisition	Acquisition	Acquisition by Share	Acquisition by Asset
Age	-0.001	-0.003	-0.005	-0.001	-0.001	-0.003
Size	2.332***	-1.297***	6.789***	-1.568***	5.323 ***	-1.432***
Size square	-0.100**	0.156***	-0.316***	0.186***	0.236 ***	0.173***
PMMNE	-3.528***	1.820	-3.362**	2.951*	3.423 ***	2.470*
LI	-6.419***	3.149***	-6.617***	4.538***	-5.091 **	3.987***
TI	-13.751	-3.544	56.070*	0.346	18.317	0.826
CI	-4.973**	-0.325*	20.509***	-0.424**	24.782 ***	-0.363*
AMI	0.186	-2.416	3.753***	1.177	1.204	2.489
RDI	14.555***	16.422**	33.927***	18.215***	18.300 ***	31.995***
EXPI	-0.344***	-0.384***	-0.378***	-0.309***	0.268 ***	-0.312***
IMPI	31.139***	33.978***	30.822***	25.856***	22.710 ***	24.210***
GA	-.327*	-0.302*	0.006	-0.337*	0.371	-0.656***
MNE	-0.424*	-1.180***	-0.583	-1.166***	-0.330	-1.231***
Constant	-11.293	0.385	-34.053	-0.001	-26.985	-0.108
lnsig2u	-0.989	-0.108	0.381	0.323	0.161	0.317
mu sigma	0.610	0.947	1.210	1.175	1.084	1.172
Rho	0.271	0.473	0.594	0.580	0.540	0.579
Wald chi square	100.09***	104.89***	68.66***	99.86***	80.10***	96.36***
Observations	600	600	600	600	600	600

Note: *, **, *** relates to statistically significant at 1 percent , 5 percent and 10 percent respectively.

Source: Authors calculation from Prowess data.

The result however, confirms that larger firms have a higher probability to acquire by share. The mode of payment is based on the riskiness of synergies of the deal. Larger firms have the ability to take such risks upon themselves and hence can take the route of shares when entering an acquisition deal. Size is an important determinant in deciding the probability to merge or acquire. No matter what route the firm chooses to acquire, size is highly significant at 1 percent level of significance. For firms with acquisition by asset size has a positive relation which is important for the firm since assets of the firms would be

directly proportional to the size of the firm. A smaller firm would be unable to enter into a strategic alliance as a buyer due to financial incapability despite having high R and D investments and ability to innovate.

The multiplicative variable for profit margin and MNE affiliation is also considered in the model. The result of such an exercise has come up with a negative sign for mergers and for both M and A. This implies that foreign firms with lower profit have a tendency to merge and acquire. This is in consistent with the profit maximization motive of the firm to gain higher profits. In the Indian context it was found that in post deregulation period firms reinvest their profits on technological acquisitions (Narayanan, 2004). Recent studies suggest that foreign firms seek entry into the local market by way of acquisition and mergers. Multinational firms when expanding abroad via direct investment, face greater risk that local firms as they are not accustomed to the host market. Thus, they prefer the lower riskiness of acquisition to seek entry. One the firms establish themselves, the firms gain full control of the local firms in terms of management and manufacturing (Louri, 2001).

Labour and capital intensity are significant with a negative sign with merger and for both M and A. The firms with lower resource availability in terms of capital and labour but with well-established research and development will look for alliances so that their knowledge source can be sold in the market accordingly. In the pharmaceutical industry, the role of R and D is most important and smaller biotechnological firms with no experience in manufacturing and marketing often invest heavily and develop drugs after years of research, experiments, innovation and development. Hostile takeovers are sometimes due to this factor along with increasing market power. This clearly implies that availability of capital resources is important for any firm in the industry and hence, serves as a clear motive to allow

takeovers and mergers. It is interesting to note that the labour intensity, although significant for all cases, it has a positive sign for acquisition by asset while it has a negative sign for acquisition by share. Thus, there is some strategically differences in the firm characteristics of acquiring firm when it uses share mode and when it uses assets. The financial theories suggest that the acquisition by asset involves transfer of ownership by selling of firm's asset, the machinery, the buildings and all capital equipment. Thus, capital intensity is more important criterion when considering for acquisition by asset compared to labour in case of pharmaceutical industry. Like mergers, acquisitions also show a highly significant negative sign for capital intensity. Capital intensity is significant at 1 percent for acquisition by share, significant at 10 percent for acquisition by asset while it is significant at 5 percent when acquisition is not taken into account. The capital structure of the firm affects the leverage of the firm. To be able to have a strong leverage and debt capacity, the firms with low capital look for consolidation.

The nature of the firm and its affiliation to a business group is not a major determinant of mergers and acquisition decision as seen by the insignificant coefficient of variables group affiliation and multinational affiliation in case of 'meracq' as dependant variable. The firms which have the ability to both merge and acquire thus consider other important factors like resources, advertisement and marketing intensity, R and D intensity, and capability to export. Imports and exports intensity have come out to be extremely important determinants. The positive sign and highly significant coefficient of import intensity suggest that firms that have higher import intensity, have a higher probability to enter into strategic alliance. With greater penetration of imported goods, a firm can raise its market share and hence, profitability (Misra and Chandra, 2010). The highly technical nature of the industry can be seen by the high coefficient value of research and development intensity in all the cases. The R and D intensity of the industry exercises a consistent positive

effect, suggesting a larger entry size in technology intensive activities (Louri, 2001). Spending on research and development by pharmaceutical firms forms a major proportion of the firm's accounts. The R and D intensity is positive and significant at 1 percent for mergers and further, positively significant at 5 percent for either merger or acquisition as a dependant variable. A similar study of the Japanese pharmaceutical industry validates the fact that a decline in R and D productivity leads to increasing M and A activity. R and D expenditure in the pharmaceutical industry has increased rapidly both the number of new molecule entities entering the market has declined. Consequently in an attempt to address the deterioration of R and D productivity, Japanese pharmaceutical firms started pursing mergers and acquisitions since 1995 (Shimura *et. al.*, 2014). It is important for the pharmaceutical firms to maintain the flow of new drugs. If there is any gap in the pipeline of drugs by the firm, the firm will suffer huge loss at the hands of its competitors. Both mergers and acquisitions are a common pathway used by the pharmaceutical firms to maintain this smooth introduction of new drugs in the market. This is empirically proved by the highly positive significant coefficient values of the R and D intensity variables for all the cases into consideration. The coefficient of 'rdi' is significant at 1 percent level and is positively related to the probability of acquisition, both acquisition by share and acquisition by asset. Thus, firms which have a high investment in research and development and capabilities to innovate, look for sellers who can market their drugs and make profitable returns. If an integrated firm faces a significant shock to its earning flow, due to patent expirations and gaps in pipeline of follow-on products, merging may offer a strategy to obtain a firm with a more promising pipeline and inadequate marketing and sales capacity to optimally launch new drugs (Danzon *et. al.*, 2004). The firm characteristics distinguished on the basis of mergers and non-mergers in Table 3 validate the fact since merged firms not only have higher profit margins but also have higher research and development expenditure.

Determinants of M and A: Results from the Ordered Probit Regression

Many studies have been undertaken previously to understand the determinants of mergers and acquisitions and how these strategies effects the performance of the firms involved in the alliance. However, so far little literature and empirical evidence is available that takes into account the distinction between the financial pathways chosen by the firm to carry forward the deal. This study is one of the first attempts to understand the nature of the deal for the Indian case. The objective of this study also focuses on the financial pathway adopted by the firm involved in acquisition deals, for a comparison between the different modes of acquisition; by share and acquisition by assets, keeping the case acquisition by either mode as reference. We design a set of regression models based on the estimation of an ordered discrete choice model to evaluate how firm characteristics affect the likelihood of different strategies of M and A. In general, in a J-choice ordered probit model y is an ordered response where the values we assign to each outcome represent a specific order along a continuum, but not the magnitude of difference between the options. In our specification, y is an indicator of strategies of M and A at firm level ranging between zero and 2, with: $y = 1$ for acquisition by asset, $y = 2$ for acquisition by share and 0 otherwise. The fact that 2 indicate a better strategy than 1 (and 0) conveys useful information, even though the index itself has only an ordinal meaning. For such an ordinal dependent variable, using multinomial probit or logit would not be efficient, because these models would misspecify the data-generating process in assuming that there is no order in the different categories that the dependent variable can take. OLS regression estimation would also be inappropriate[5], since it would consider the difference in the dependent variable between 0 and 1 as

[5] Greene (2008) summarizes the previous remarks pointing out that when "the outcome is discrete, the multinomial logit or probit model would fail to account for the ordinal nature of the dependent variable.

equivalent to the difference between 1 and 2. The ordered probit model for y can be derived from a latent or unobserved continuous variable, y^*, related to a set of explanatory variables according to a standard linear model:

$$y^* = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + ... + \beta_k x_k + \varepsilon \quad (7)$$

Where, $x_{1...k}$ are the explanatory variables; which include firm characteristics, influencing the probability of different M and A activities; $\beta_{1...k}$ are the associated parameters, and ε, is a random error term drawn from a standardized normal distribution. Although y^* is unobserved, y is observed and related to y^* by the following relationship:

$$\begin{aligned} y &= 0 \quad \text{if } y^* \le \alpha_1 \\ y &= 1 \quad \text{if } \alpha_1 < y^* \le \alpha_2 \\ y &= 2 \quad \text{if } y^* > \alpha_2 \end{aligned} \quad (8)$$

Where, $\alpha_1 < \alpha_2$, are the unobserved *cut points* identifying the boundaries between the different levels of M and A activities. Therefore, given the standard normal assumption for the error term, we can derive each response probability of observing a sector as being "merged/ acquired" (i.e., the dependent variable *y* taking the value of 0) as:

$$\Pr[y=0]=\Pr\left[y^{*}\le\alpha_1\right]=\Pr\left[\beta_0+\beta_1x_1+\beta_2x_2+...+\beta_kx_k+\varepsilon\le\alpha_1\right]$$
$$=\Pr\left[\varepsilon\le\alpha_1-\left(\beta_0+\beta_1x_1+\beta_2x_2+...+\beta_kx_k\right)\right]=\Phi\left(\alpha_1-\beta_0+\beta_1x_1+\beta_2x_2+...+\beta_kx_k\right) \quad (9)$$
$$=\Phi\left(\alpha_1-x\beta\right)$$

Where, $\Phi(.)$, is the standard normal distribution function. Similarly, we can obtain the probability of y =1 and y = 2 in the following way:

$$\Pr[y=1]=\Pr\left[\alpha_1<y^{*}\le\alpha_2\right]=\Phi\left(\alpha_2-x\beta\right)-\Phi\left(\alpha_1-x\beta\right)$$
$$\Pr[y=2]=\Pr\left[y^{*}>\alpha_2\right]=1-\Phi\left(\alpha_2-x\beta\right) \quad (10)$$

The β parameters together with the threshold levels on the latent variable that characterize the transition from one observed categorical response to the next (cut points α) can be obtained by maximum likelihood estimation. In our empirical setting, the main specification adopted in the empirical analysis is the following:

$$y_{ij}^{h}=\beta_0+\beta_1PM_{ij}+\beta_2LI_{ij}+\beta_3TI_{ij}+\beta_4CI_{ij}+\beta_5AMI_{ij}+\beta_6RDI_{ij}+\beta_7Size_{ij}+$$
$$+\beta_8EXPI_{ij}+\beta_9IMPI_{ij}+\beta_{10}MNE_{ij}+\beta_{11}age_{ij}+\beta_{12}GTECH_{ij}+\varepsilon_{ij}^{h} \quad (11)$$

The estimated equation takes a dummy dependant variable where the dummy takes value 0 for no acquisition, value 1 for acquisition by asset, value 2 for acquisition by share and value 3 if both acquisition by share and acquisition by asset happen. Having drawn inferences from previously estimated probit models, the independent variables taken in this case differ slightly. The variables considered for the ordered probit model are: firm size, firm age, profit margin, labour intensity, capital intensity, technological intensity, advertisement and marketing intensity,

R and D intensity, exports and imports intensity, multinational affiliation dummy variable, and multiplicative dummy for group affiliation and technology intensity. Since, not much work has been done previously which takes into account the differences in the scenarios; this study will seek to verify the financial theories given to suggest one route over the other. The results of the ordered regression are shown in Table 4.

Interpretation of the ordered logit estimates is not dependent on the ancillary parameters; the ancillary parameters are used to differentiate the adjacent levels of the response variable. Therefore, we calculate the marginal effects of the factors on the dependant variable after the ordered probit model is estimated. This is done to understand the changes in the probability of a firm choosing acquisition by asset or acquisition by share on the basis of changes in its firm's specific characteristics. From the results in Table 4, it is noted that once the firm has decided to go for acquisition on the basis of various firm characteristics as suggested by the previous estimates, the factors determining the financial pathway to undertake the deal differs from the former. The profit margin of the firm becomes insignificant in this special case.

Table 4: Results from the Ordered Probit Regression Distinguished by Acquisition Deal Type

	Ordered Pribit Estimates			Marginal Effects	
	Coefficient	**Std. Err.**	**Z**	**oacq=1**	**oacq=2**
Size	0.5443***	0.0650	8.38	0.0762***	0.0261**
PM	0.4243	0.3364	1.26	0.0594	0.0204
LI	-2.0729*	1.2017	-1.73	-0.2902*	-0.0995**
TI	-1.1678	5.3898	-0.22	-0.1635	-0.0561
CI	1.1861***	0.3007	3.94	0.1661***	0.0569***
AMI	0.1982	1.5841	0.13	0.0278	0.0095
RDI	19.1192***	4.4473	4.3	2.6770***	0.9180***
EXPI	-0.1425***	0.0527	-2.7	-0.0199***	-0.0068***
IMPI	12.2499***	4.9331	2.48	1.7152***	0.5882**
MNE	-0.6099***	0.1503	-4.06	-0.0841***	-0.0274**
Age	-0.0020	0.0032	-0.61	-0.0003	-0.0001
GTECH	-289.3839*	156.1157	-1.85	-40.5190**	-13.8946*
/cut1	4.2046	0.5528			
/cut2	4.8120	0.5624			
/cut3	5.0275	0.5657			
No. of observations	600				

Note: *, **, *** relates to statistically significant at 1 percent , 5 percent and 10 percent respectively

Source: Authors calculation from Prowess data

A unit increase in labour intensity decreases the likelihood of acquisition by share by 29 percent and acquisition by asset by 9.9 percent respectively. On the other hand, one unit increase in capital intensity increases the probability to acquire by share by 16.6 percent and acquire asset by only 5.6 percent. Thus we can see that both labour and capital intensity of firm affects the share value of the firm. This is because the market valuation of the firm is affected by its resources. If a firm is constrained by resources, it would its hamper investment decisions, which will effect investor's dividends and share values. A low resource based firm, would need to compensate the target firms' shareholders adequately since the synergy risks are shared by both

target and acquirer in shares' financed deals. Hypotheses related to acquisitions in the pharmaceutical industry state the need for continuous introduction of new drugs in the market as an important reason for collaborations. Hence, research and development is found to be significant at 1 percent level in deciding which route the firm takes in undergoing acquisition. From Table 4, it is observed that a unit increase in R and D intensity, increases the probability of acquisition by share by over 200 percent whereas, the likelihood of acquisition by share is increases by 91.8 percent.

Imports and exports intensity are highly significant at 1 percent level but with opposite signs. One unit increase in exports intensity decreases the likelihood to acquire by share by 2 percent and acquisition by asset by 0.6 percent. The acquisition by share increases by 171 percent whereas, acquisition by asset increases by 60 percent with every unit increase in imports. Thus it can be suggested that, acquisition is used as an import-reduction policy since it's better to collaborate than incur huge expenditures on imports. Firm's decision to choose between acquisition by share or asset is influenced by its business affiliation. Hence, the marginal effects of 'MNE' show that firms that are foreign–owned, are less likely to go for acquisition by share by 8.4 percent and less likely to go for acquisition by asset by 2.7 percent. The variable 'gtech' is negative for both acquisition by share and acquisition by asset but is significant at 5 percent for the former and at 10 percent for the later. The results show that, firms which are part of business groups and have technology imports, are 41 percent less likely to go for acquisition by share and 14 percent less likely to go for acquisition by asset. Thus, for big business groups which have capability to bear risk factors opt for asset pathway and take full control of the target firm.

Post M and A Performance: Results from the Propensity Score Matching

The final objective of this study is to determine if the motives behind mergers and acquisitions discussed in the earlier sections are met and to see the changes in the firms' performance after it has undertaken a corporate restructuring through channels of mergers and acquisitions. Propensity score matching (PSM) is a technique of treatment evaluation[6]. In this study, the outcome of interest is the profit margins of the firms and the treatment variable is merger and acquisitions. Implementing propensity score matching in our analysis helps us to study the effect of mergers and acquisitions on the firm performance. The treatment group comprises of firms involved in corporate restructuring through M and A deals, while the control group is those firms which do involve in M and A deals.

Table 5 shows the average treatment effect (ATE) of the firm specific characteristics that are affected after merger and acquisition deals happened. In all cases of mergers and acquisitions, the performance of the firm is positively affected after M and A deals. Enhanced exports intensity comes out to be the main driver of growth. However, it can be seen that out of all the strategies, acquisitions have the maximum impact on the profit of the Indian pharmaceutical firms. The next important factors that enhance firm's profit are import and

[6] Treatment evaluation is the estimation of the average effect of a program or treatment on the outcome of interest. Propensity score matching (PSM) is used when a group of subjects receive a treatment and we would like to compare their outcomes with the outcomes of a control group. Propensity may be defined as an individual's probability of being treated with the intervention of interest given the complete set of all information about that individual. Individual subjects may have the same or similar propensity scores, yet some will have received the intervention of interest and others will not. An assumption of propensity score analysis is that a fair comparison of treatment outcomes can be made between subjects with similar propensity scores who either did or did not receive the treatment of interest. PSM employs a predicted probability of group membership e.g., treatment vs. control group-based on observed predictors, usually obtained from logistic regression to create a counterfactual group. The propensity score may be estimated for each subject from a logistic regression model in which treatment assignment is the dependent variable.

research and development intensity. As mentioned earlier, technology acquisition is an important pathway of the firm. Thus, research and development is an important factor that is enhanced by way of mergers and acquisitions through increasing technology imports and R and D expenditure. Firm size is a positive factor that improves the profitability of the firm to get into M and A for all the cases. Firm size has maximum effect for firms going for mergers.

CONCLUSION

The study seeks to add to the existing literature and empirical work done in the field of mergers and acquisitions, by not only looking at determinants that motivate a firm to merge and/or acquire but also if the decision of the firm is reflected positively in the firm's performance. The study concludes that export intensity is an important factor for the pharmaceutical firms in India since exports are a major proportion of firm's total sales. Technology transfers as technology imports and R and D conducted by the firm are both very important for the drug manufacturers. Any gap in the flow of drugs to the market would hamper the growth of the firm. The growth of the pharmaceutical industry depends on the close collaboration between small R and D units that lack resources to sell their work and large business houses, both domestic and foreign affiliated that will provide them the required market. However, all comprehensive work has been done in this study to cover all aspects of mergers and acquisitions including the financial pathway taken by the firm yet, the study has certain limitations as it does not take into account the entry and exit of firms from the industry.

Table 5: Propensity Score Matching Results for Post M and A Deal

	MER		ACQ		AQA		AQS		MERACQ		EITMA	
	ATE	**Z**	**ATE**	**Z**	**ATE**	**Z**	**ATE**	**Z**	**ATE**	**Z**	**ATE**	**Z**
expi	2.66***	4.76	1.82***	6.8	1.893***	4.72	3.876***	4.47	4.95***	3.31	0.169***	6.45
impi	0.028***	4.79	0.019***	6.19	0.02***	4.82	0.041***	4.42	0.053***	3.33	0.017***	6.6
rdi	0.004***	5.15	0.002***	7.31	0.003***	6.9	0.008***	3.55	0.01***	3.85	0.002***	7.51
li	0.005***	-4.99	0.009	1.06	0.009	1.14	0.006***	-3.94	0.005***	-4.4	0.008	0.38
ci	0.037***	-4.79	0.056	-0.46	0.059	-0.18	0.034***	-5.09	0.032***	-5.04	0.053	-0.89
size	0.129***	11.92	0.132***	11.18	0.139***	9.86	0.162***	11.88	0.175***	10.51	0.121***	11.65

Note: *, **, *** relates to statistically significant at 1 percent, 5 percent and 10 percent respectively
Source: Authors calculation from Prowess data

REFERENCES

Beena, P.L. (2008), "Trends and Perspectives on Corporate Mergers in Contemporary India", *Economic and Political Weekly*, 43(39), 48-56.

Beena, S. (2006), "Pharmaceutical Industry: Nature, Structure and Performance", *Centre for Development Studies Working Paper No. 434*, India, available at http://www.cds.edu/wp-content/uploads/2012/09/wp434.pdf

Danzon, P.M, A. Epstein, and S. Nicholson (2004), "Mergers and Acquisitions in the Pharmaceutical and Biotech Industries," *NBER, Working Paper No. 10536.*

Duflos, G. and E. Pfiste (2008), "Searching for Innovations? The Technological Determinants of Acquisitions in the Pharmaceutical Industry", *CES, Working Papers 57*, Centre d'Economie dela Sorbonne, Paris.

Export-Import Bank of India, (2007), "Indian Pharmaceutical Industry: Surging Globally", *Occasional Paper No. 119*, Quest Publications, available at http://s3.amazonaws.com/ zanran_storage / www. eximbankindia.com/ContentPages/17162160.pdf

Greene, W. H. (2008), "*Econometric Analysis*", Upper Saddle River, New Jersey: Pearson Education.

Griffin, R.W., and R. J. Egbert (1991) "*Business*", 2ed., Englewood, Prentice- Hill Inc.

Kumar, N. (2000), "Mergers and Acquisitions by MNEs: Patterns and Implications", *Economic and Political Weekly*, 35(32), 2851-2858.

Louri, H. (2001), "Entry through Acquisition: Determinants of Multinational Firm Choices", *Review of Industrial Organization*, 19, 199-209.

Mishra, P. and T. Chandra (2000), "Mergers, Acquisitions and Firms' Performance: Experience of Indian Pharmaceutical Industry", *Eurasian Journal of Business and Economics*, 3(5), 111-126.

Narayanan, K. (2004), "Technology Acquisition and Growth of Firms: Indian Automobile Sector Under Changing Policy Regimes", *Economic and Political Weekly*, 39, 5, 461-470.

Pradhan, J.P., and V. Abraham (2005), "Overseas Mergers and Acquisitions by Indian Enterprises: Patterns and Motivations", *Indian Journal of Economics*, 338.

Ramani, S.V., and A. Maria (2005), "TRIPS: Its Possible Impact on Biotech Segment of the Indian Pharmaceutical Industry", *Economic and Political Weekly*, 40(7), 675-683.

Saboo, S., and S. Gopi (2009), "Comparison of Post-Merger Performance of Acquiring Firms (India) Involved in Domestic and Cross-Border Acquisitions", *MPRA Paper No. 19274*, Available at http://mpra.ub.uni-muenchen.de/19274/1/ MPRA_paper_19274.pdf

Shepherd, W. G. (1986), "On the Core Concepts of Industrial Economics", in H.W. De Jong and W. G. Shepherd, Eds., *Mainstreams in Industrial Organization*. Martinus Nijhoff Publishers.

Shimura, H., S. Masuda, and H. Kimura (2014), "A Lesson from Japan: Research and Development Efficiency is a Key Element of Pharmaceutical Industry Consolidation Process", *Drug Discoveries and Therapeutics*, 8(1), 57-63.

Vyas, V., and K. Narayanan (2012), "Does M and A matter for R and D: Evidence from Pharmaceutical Market in India", Conference Paper in the IX Annual Conference of Knowledge Forum on the Theme *Technology: Corporate and Social Dimensions*, held at National Institute of Advanced Studies (NIAS), Bangalore, available at http://fgks.in/images/pdf/conf/Vidhisha-KNN.pdf

Vyas, V., K. Narayanan and A. Ramanathan (2012) "Determinants of Mergers and Acquisitions in Indian Pharmaceutical Industry," *Eurasian Journal of Business and Economics*, 5 (9), 79-102.

APPENDIX

Table A1: Trends in Mergers and Acquisition Deals

Year	Observations	No. of Mergers	No. of Acquisitions	No. of Acquisition by Asset	No. of Acquisition by Share	Both Mergers and Acquisition
1991	25	0	0	0	0	0
1992	25	0	0	0	0	0
1993	25	0	0	0	0	0
1994	25	0	0	0	0	0
1995	25	0	0	0	0	0
1996	25	4	0	0	0	0
1997	25	4	1	1	0	0
1998	25	5	2	2	0	0
1999	25	8	5	5	2	1
2000	25	8	8	8	4	4
2001	25	8	10	9	5	4
2002	25	8	10	9	5	4
2003	25	9	10	9	6	5
2004	25	9	11	10	6	5
2005	25	9	11	10	6	5
2006	25	9	13	10	9	6
2007	25	9	13	10	9	6
2008	25	9	13	11	9	7
2009	25	9	13	12	9	7
2010	25	9	14	12	10	7
2011	25	9	15	14	10	8
2012	25	9	15	14	10	8
2013	25	9	15	14	10	8
2014	25	9	15	15	10	9

Source: Authors calculation from Prowess data.

Table A2: Correlation Matrix

	Size	PM	LI	TI	CI	AMI	RDI	EXPI	IMPI	Age
Size	1									
PM	0.209	1								
LI	-0.171	-0.478	1							
TI	-0.114	-0.068	0.139	1						
CI	-0.368	-0.702	0.739	0.285	1					
AMI	0.284	0.069	0.061	-0.045	-0.173	1				
RDI	0.521	0.068	-0.032	-0.029	-0.094	0.2	1			
EXPI	0.538	0.084	-0.135	-0.057	-0.104	0.179	0.673	1		
IMPI	0.543	0.088	-0.135	-0.057	-0.108	0.185	0.681	0.997	1	
Age	-0.013	-0.006	-0.049	-0.016	-0.001	-0.039	-0.034	-0.009	-0.008	1

Source: Authors calculation from Prowess data.

MSE Monographs

* Monograph 22/2012
  A Macro-Fiscal Modeling Framework for forecasting and Policy Simulations
  D.K. Srivastava, K. R. Shanmugam and C.Bhujanga Rao
* Monograph 23/2012
  Green Economy – Indian Perspective
  K.S. Kavikumar, Ramprasad Sengupta, Maria Saleth, K.R.Ashok and R.Balasubramanian
* Monograph 24/2013
  Estimation and Forecast of Wood Demand and Supply in Tamilandu
  K.S. Kavi Kumar, Brinda Viswanathan and Zareena Begum I
* Monograph 25/2013
  Enumeration of Crafts Persons in India
  Brinda Viswanathan
* Monograph 26/2013
  Medical Tourism in India: Progress, Opportunities and Challenges
  K.R.Shanmugam
* Monograph 27/2014
  Appraisal of Priority Sector Lending by Commercial Banks in India
  C. Bhujanga Rao
* Monograph 28/2014
  Fiscal Instruments for Climate Friendly Industrial Development in Tamil Nadu
  D.K. Srivastava, K.R. Shanmugam, K.S. Kavi Kumar and Madhuri Saripalle
* Monograph 29/2014
  Prevalence of Undernutrition and Evidence on Interventions: Challenges for India
  Brinda Viswanathan.
* Monograph 30/2014
  Counting The Poor: Measurement And Other Issues
  C. Rangarajan and S. Mahendra Dev
* Monograph 31/2015
  Technology and Economy for National Development: Technology Leads to Nonlinear Growth
  Dr. A. P. J. Abdul Kalam, Former President of India
* Monograph 32/2015
  India and the International Financial System
  Raghuram Rajan
* Mongraph 33/2015
  Fourteenth Finance Commission: Continuity, Change and Way Forward
  Y.V. Reddy

MSE Working Papers

Recent Issues

* Working Paper 111/2015
  The Conundrum of Profitability Versus Soundness for Banks By Ownership Type: Evidence From the Indian Banking Sector
  Sreejata Banerjee and Malathi Velamuri

* Working Paper 112/2015
  Health Shocks and Short-Term Consumption Growth
  Sowmya Dhanaraj

* Working Paper 113/2015
  Efficiency in Elementary Education in Urban India: An Exploratory Analysis Using Dea
  Brijesh C. Purohit

* Working Paper 114/2015
  Price Rigidity, Inflation And The Distribution Of Relative Price Changes
  Sartaj Rasool Rather, S. Raja Sethu Durai and M. Ramachandran

* Working Paper 115/2015
  Money and Inflation: Evidence from P-Star Model
  Sunil Paul, Sartaj Rasool Rather and M. Ramachandran

* Working Paper 116/2015
  Determinants of Energy and Co2 Emission Intensities: A Study of Manufacturing Firms in India
  Santosh K. Sahu and Deepanjali Mehta

* Working Paper 117/2015
  Impact of Water and Sanitation on Selected Water Borne Diseases in India
  Brijesh C. Purohit

* Working Paper 118/2015
  Health Shocks and Inter-Generational Transmission of Inequality
  Sowmya Dhanaraj

* Working Paper 119/2015
  Productivity, Energy Intensity and Output: A Unit Level Analysis of the Indian Manufacturing Sector
  Santosh K. Sahu and Himani Sharma

* Working Paper 120/2015
  Health Shocks and Coping Strategies: State Health Insurance Scheme of Andhra Pradesh, India
  Sowmya Dhanaraj

* Working Paper 121/2015
  Efficiency in Education Sector: A Case of Rajasthan State (India)
  Brijesh C Purohit

---

* Working papers are downloadable from MSE website http://www.mse.ac.in

$ Restricted circulation