

# Determinants of Profitability in Indian Pharmaceutical Firms in the New Intellectual Property Rights Regime

Shilpi Tyagi, D. K. Nauriyal

**Abstract**—This study investigates the firm level determinants of profitability of Indian drug and pharmaceutical industry. The study uses inflation adjusted panel data for a period 2000-2013 and applies OLS regression model with Driscoll-Kraay standard errors. It has been found that export intensity, A&M intensity, firm's market power and stronger patent regime dummy have exercised positive influence on profitability. The negative and statistically significant influence of R&D intensity and raw material import intensity points to the need for firms to adopt suitable investment strategies. The study suggests that firms are required to pay far more attention to optimize their operating expenditures, advertisement and marketing expenditures and improve their export orientation, as part of the long term strategy.

**Keywords**—Indian drug and pharmaceutical industry, trade related intellectual property rights, research and development, food and drug administration.

## I. INTRODUCTION

INDIAN Drug and Pharmaceutical Industry (ID&PI) has been one of the most debated industry for many reasons, the major ones being its high level of competitiveness, winning maximum number of FDA approvals and also for poor historical record of not honouring intellectual property rights of others (prior to 1995). The industry which has recorded unprecedented growth after 1973 has moved up leaps and bounds even after the implementation of Trade Related Intellectual Property Rights (TRIPS). In this regard, it may be stated that ID&PI had never been new drug development oriented and has historically banked upon the weak patent regime in India for generic R&D. Thus the firm-level profitability was largely administered by the production and marketing of good quality yet low cost drugs and formulations. The large domestic market and export competitiveness of this industry kept it firmly growing up. However, with TRIPS coming into existence in 2005, the economic and operational settings for Indian drug and pharmaceutical firms has significantly changed. Notably, ID&PI is the world's third-largest pharmaceutical industry in terms of volume yet stands ranked at 13<sup>th</sup> position in terms of value [1]. The intensifying preferences for generic and bio-similar in regulated markets to combat rising health care costs, growing dossier-licensing and supply contracts with multinationals, and enough ready capacity, and patent

expiries, are the factors that are likely to keep ID&PI in good stead in times to come. Against this backdrop, it would be interesting to investigate the firm level determinants of Profitability in ID&PI for more recent time period i.e. 2000 to 2013, when the radical shift in operating environment became obvious. This study intends to provide insight into the factors determining profitability in ID&PI showcasing effect of introduction of the Patents (Amendment) Act, 2005 on firm level profit earnings.

The rest of the paper is organized as follows: Section II discusses profit scenario of Indian pharmaceutical sector. Section III encompasses description of databases, methodology and the conceptual framework. Section IV focuses on results and discussion, while Section V concludes the study.

## II. TRENDS IN PROFITS IN INDIAN D&P INDUSTRY

The common understanding is that there could be a close association between profit and profit intensity *per se*, which is also borne by Fig. 1. The year 2000 appears to be a threshold point after which there seems to be a constant rise in the profit as well as profit intensity. The rise in foreign direct investment, contract manufacturing/outsourcing, value added joint ventures and overseas acquisitions, all buoyed by the TRIPs enforcement prospects since 1995, seem to be the prime reasons for the same. This was further supplemented by the greater focus on the export of generic drugs and specialty products to regulated markets such as US and Western markets by substantially enhancing front-end marketing capabilities. Conforming to quality and regulatory compliance of FDA, UK's MHRA, European Medicines Agency (EMA) and similar agencies have also helped in this regard. It may be noted that India shared 49 per cent of all drug master filings with USFDA in 2013. As a consequence, its sales amplified from US \$6 billion in 2005 to US \$11.3 billion in 2011 and finally to US \$20 billion by 2015. The exceptional rise in profits in 2011 over 2010 can also be attributed to a massive 22% fall in the value of Rupee, as big pharmaceutical companies earn their larger share of revenues from export markets.

Interestingly, a steep decline in the profit after tax and profit intensity of the pharmaceutical firms can be observed post-2011 with some signs of recovery after 2013. Increased competition and aggressive price pressures from MNCs in both the acute and chronic therapeutic segments, substantive rise in the field forces resulting in much expenditure on

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marketing, appeared to have contributed to this. The implementation of the National Pharmaceutical Policy 2012, by Govt. of India, probably has also acted as additional factor as it has resulted in margins erosion from 20% and 10% to 16% and 8% for retailers and stockists respectively [2]. The rising concern over genuineness of clinical trial data of Indian pharmaceutical firms by USFDA, exacerbated by suspension of market approvals for 25 drugs by regulators in Europe in 2014 has also posed a serious challenge to them as these doubts and actions probably had resulted in significant loss of

business. The brighter part is that Indian pharma industry has started initiating innovations such as developing combinational and controlled released products in-licensing and forging alliances with other Indian and foreign companies, besides improving operational efficiencies and building synergies.

It may also be worthwhile to examine if the grim economic outlook has also impacted Indian pharmaceutical industry throughout the study period. The relevant information is summed up in Fig. 2.

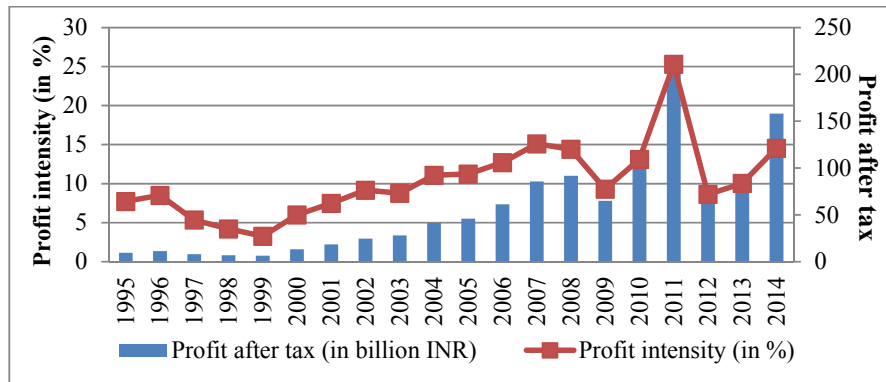


Fig. 1 Profit after Tax and Profit Intensity in Indian Pharmaceutical Industry [3]

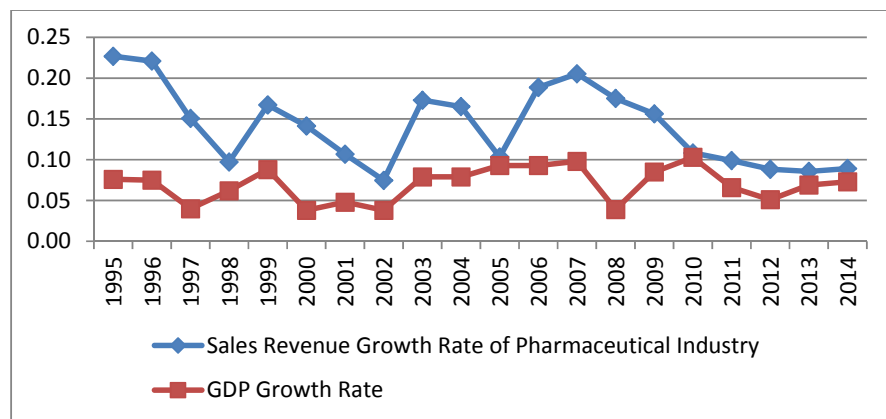


Fig. 2 Growth Rates of India's GDP and Sales Revenue of Indian Pharmaceutical industry

Given that the correlation between sales revenue growth and GDP growth was weak ( $r=0.3093$ ), economic outlook for the economy did not seem to have been a factor important enough to exercise significant impact on the sales revenue of Indian pharmaceutical industry. It could possibly be so because rise in exports might have compensated for any slow growth in the domestic market. This appears to be plausible in view of the fact that exports constitute over 54 per cent of total turnover of the industry going up from US\$7.8 billion in 2009 to US\$15.6 billion by 2013-14 [2].

### III. DATABASE AND METHODOLOGY

#### A. Database

The sample for this study comprises top (as per sales revenue) 91 Indian drug and pharmaceutical companies listed on the Bombay Stock Exchange (BSE) over the period 2000-2013. The time span selected for this study aims at examining the profitability determinants' dimensions of this industry during the pre and post-product patent time periods. The data on firm's financial variables have been obtained from the Prowess Database of Centre for Monitoring Indian Economy (CMIE). These firms demonstrate promising profit earnings, and their share of total profit after tax in pharmaceutical industry ranges from 80% in 2000-01 to 72.8 per cent by 2012-13.

### B. Conceptual Framework

The conceptualization of determinants of firm-level profits holds significant research interest as such study may help policy makers to devise and implement public policies that may stimulate and support the management strategies to maximize profits in this dynamic and globally competitive industry. The findings may also be of direct relevance to the firms under reference.

The dependent variable in our study is the profit, measured as Return on Assets (ROA), of Indian Drugs and Pharmaceutical (D&P) firms. It is calculated as a ratio of net income to total assets in the given year.

Table I presents dependent and independent variables that are postulated to be affecting the profitability of Indian pharmaceutical firms. Independent variables are categorized as industry specific and firm specific effects variables.

TABLE I  
DETERMINANTS OF FIRM-LEVEL PROFITABILITY

Variables	Symbol	Description
<b>Dependent Variable</b>		
Firm-Level Profitability	ROA	Net income as a percentage of total assets in the given year
<b>Independent Variables</b>		
<b>Industry Effects Variables</b>		
Industrial Concentration	HHI	Sum of squares of particular firm's output share in total industrial output.
Dummy for Stronger Patent Regime	SPR	Taken as dichotomous variable i.e., attributing the value of 1 for period after 2005, 0 otherwise.
<b>Firm Effects Variables</b>		
Advertising and Market Intensity	AMI	Advertising and Marketing expenditure as percentage of total sales in the given year
R&D Intensity	RDI	R&D expenditure as percentage of total sales in the given year
Firm's size	LFSZ	Log of total assets of the firm at time $t$
	LFSZSQ	Squared demeaned Log of total assets of the firm at time $t$
Market Share	MSH	Ratio of total sales of a firm to the aggregate sales of the industry (in %) at time $t$
	MSHSQ	Squared demeaned ratio of total sales revenue of a firm to the aggregate sales revenue of the industry at time $t$
Export Intensity	XI	Ratio of firm's exports to total sales revenue (in %) at time $t$
Raw Material Import Intensity	RMII	Ratio of firm's import of raw materials to total raw materials purchased (in %) at time $t$
Firm's Age	FAGE	Difference between the year of incorporation and year of study (2013)
Capital Intensity	KI	Net fixed assets of the firm as percentage of total sales of the firm in the given year
Operational Efficiency	OE	Operating expenditure as percentage of total assets in the given year

Source: Authors' elaboration

The variables are briefly discussed below.

#### Industry Effects Variables

##### Industrial Concentration

The present work examines the impact of industrial concentration on profitability by using *Herfindahl–Hirschman Index (HHI)*, as a proxy. HHI is also used by other studies to analyze profitability determinants in various industries [4]–[6]. It measures firm size in relation to the industry and acts as an indicator of the amount of competition among them. HHI is calculated as sum of squares of particular firm's output share in total industrial output.

##### Dummy for Stronger Patent Regime

The impact of stronger protection of IPRs on the industrial profit has been a long debated issue, with sizable empirical evidences on both the sides. While stronger IPRs appears to be impacting profits of any firm positively through appropriate price setting strategy, it is shown to be harming competition and general welfare due to exclusive rights granted to the IPRs holder. While, exclusive rights help the firms to recover their R&D expenses and earn reasonable profit, they also block diffusion of innovation by creating a kind of temporary monopoly situation [7]. Stronger patent regime is expected to have a positive impact on industrial profits in ID&PI as enactment of this law and its effects on competitiveness, innovations in products and drug delivery mechanisms, and

management practices due to global outreach, are expected to open up new opportunities and markets to ID&PI. The effect of stronger patent regime, in this study has been accounted for, through the application of dichotomous variable i.e., attributing the value of 1 for period after 2005 (the year when Indian patent Act was amended in favour of product patent), 0 otherwise. It is hypothesized that stronger patent regime may have a positive impact on profits.

#### Firm Effects Variables

##### Advertising and Marketing Intensity

Research studies undertaken over a period of time suggest a positive relationship between advertising expenditure and profitability [8]. To study the effect of advertising on profitability with reference to pharmaceutical industry is very important because this industry follows typical model of advertising. It invests heavily in making direct contacts to medical practitioners and chemists as they can help in manipulating demand to the higher levels, and secondly, it also targets direct consumers to create a brand image to reap out the benefit of loyalty. Nevertheless, basing upon prior art, it is hypothesized that advertising and marketing intensity (AMI) may have positive impact on profitability.

##### R&D Intensity

Earlier studies indicate that R&D expenditure has a positive influence and affect profitability significantly in

pharmaceutical firms [9] owing to the possibility that R&D may lead to innovative products, which, depending upon their reception in the market, may add tremendously to company's profits [10]. Nevertheless, few research studies have also reported a negative relationship between firm level profitability and R&D expenditure [11], [12] for the possibility that when firms decide to go for such long term investment, they forego some current investment and stock market results which may show unfavorable impact. The literature has further highlighted that the negative relationship between R&D investment and profitability could also be due to time lag between such an investment and its operationalization, at least in the short run [13]-[15]. Taking these findings on the role of R&D activity into consideration, present study proposes to examine possible relationship of R&D intensity (RDI) with profitability. Given that R&D efforts of domestic pharmaceutical firms are geared towards meeting specific requirements of the overseas markets, and that R&D output may result in greater exports, R&D investment is hypothesized to exercise positive impact on company's profits.

#### Firm's Size

The relationship between size and profitability and market power of a firm dates back to Baumol's sales revenue maximization theory [16]. The common logic is that larger firms have more resources than small firms and they clearly enjoy the benefits of investing in large scale production strategies. Against this backdrop, we hypothesize that the firms having larger firm size may secure higher rate of profits. The variable 'firm size' is reflected by total assets of the firm. Specifically, log of firm size (LFSZ) and demeaned log of firm size squared (LFSZSQ) have been included in the estimation of model.

#### Market Share

Market share-profitability relationship is very extensively studied in management literature. The literature suggests that market power may have more to do with firm's share as the high market share is largely an offshoot of high customer awareness and market penetration [17]-[19]. Thus, market share of the firm can be taken as a viable proxy for market power. Previous studies found out a significant and direct relationship between market share and firm-level profitability [35], [39]-[42]. The market share of the firm is calculated as the share of firm's sales in total industrial sales. This study includes market share (MSH) of the firm and its demeaned quadratic term (MSHSQ) as explanatory variables to explore the direction and magnitude of relationship between market share and profitability of Indian drug and pharmaceutical firms.

#### Export Intensity

Existing studies have reported that export intensity is directly associated with profitability [44]-[47]. Some researchers found this relationship to be inconclusive in nature [20], [21]. However, export intensity reflects international competitive structure of an industry which affects R&D

investment on process and product developments because of the need for product adaptation [22]. Thus basing on a common notion of exporting firms being more profitable and drawing from the prior art, it is hypothesized that export intensity (XI) may have positive impact on the profitability.

#### Raw Material Import Intensity

Few research studies have analyzed impact of raw material imports on profitability and performance [23]-[25]. Firms, using raw material imports, are supposed to have the superior quality of products, especially in developed countries' quality conscious markets [26]. Import intensity of raw materials is calculated as raw material imports as a percentage of total sales of the firm. It is hypothesized that raw material import intensity (RMII) may have negative impact on the profitability.

#### Firm's Age

The relationship between *firm's age* and profitability, with respect to the direction of the relationship, seems to be equally vague in the Indian context [33]. Older firms are more experienced, have the learning benefits, not prone to the liabilities of newness, and, therefore, are more profitable. Hence, it is expected that firm's age (FAGE), *ceteris paribus*, is likely to affect firm level profitability. Firm's age is calculated in years as the difference between the year of incorporation and the last year of the study i.e., 2013.

#### Capital Intensity

Existing literature suggests positive and significant impact of capital intensity on firm-level profitability [25]-[28]. Thus, it is hypothesized that higher capital intensity (KI), represented by net fixed assets as percentage of total sales in the given year, leads to higher profitability.

#### Operational Efficiency

*Operating expenses to total assets ratio* is a measure of management efficiency which demonstrates the quality of management [29], [30]. Earlier studies indicate that the ratio of operating expenses to total asset is found to be negatively associated with profitability [31], [32]. Thus, in this study, we assume the relationship between operational costs and firm-level profitability to be negative. This study includes operating expenses to total assets ratio as an explanatory variable to explore the relationship between operational efficiency (OE) and profitability of Indian D&P firms.

#### C. Methodology

In order to study the firm level determinants of profitability in Indian D&P industry, the study uses two alternative models to deal with the problem of autocorrelation and heteroscedasticity. Firstly, we apply pooled OLS regression model with Driscoll-Kraay standard errors.

Descriptive statistics of all variables have been presented in Table II. As could be discerned, there is a wide heterogeneity among the sample units with respect to almost all the variables.

TABLE II  
DESCRIPTIVE STATISTICS OF DEPENDENT AND INDEPENDENT VARIABLES

Variable	Mean	Std. Dev.	Min	Max
ROA	0.43	4.32	0	146.33
HHI	224.77	36.82	191.41	326.24
SPR	0.61	0.48	0	1
AMI	4.12	4.50	0	40.53
RDI	1.76	3.03	0	26.32
FSZ	3.42	0.71	1.44	5.31
FSZSQ	1.12	2.40	1.07	13.76
MS	0.92	1.53	0	12.43
MSSQ	2.34	9.20	0	132.25
XI	30.10	29.46	0	92.47
RMII	28.74	42.40	0	69.08
FAGE	25.98	16.94	0	94
KI	81.28	1083.53	0	33200
OE	75.61	43.36	0	276.11

Source: Authors' computations from [3]

An empirical analysis was carried out with an estimation of the specified econometric models to find out the determinants of firm-level profits in ID&PI. However, before proceeding to the estimation, the data were examined for the unit root and Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) were estimated. The relevant results are presented in Table III. All the variables are found containing no unit roots.

TABLE III  
FISHER-TYPE UNIT-ROOT TEST FOR ROA BASED ON AUGMENTED DICKEY FULLER (ADF) AND PHILLIPS-PERRON (PP) TESTS

Variables	ADF test statistic		PP test statistic	
	Inverse chi-squared P	Inverse normal Z	Inverse chi-squared P	Inverse normal Z
ROA	526.95*	-7.37*	515.57*	-7.34*
AMI	342.93*	-5.11*	307.05*	-3.99*
RDI	241.61*	-2.92**	342.93*	-5.11*
LFSZ	444.51*	-1.75*	444.51*	-1.75*
LFSZSQ	703.84*	-9.80*	703.84*	-9.80*
MSH	355.05*	-0.88**	355.05*	-0.88*
MSHSQ	437.69*	-3.37*	437.69*	-3.37*
XI	358.59*	-2.50**	355.91*	-2.23*
RMII	408.46*	-7.54**	403.75*	-7.12*
KI	307.05*	-3.99*	307.05*	-3.99*
OE	336.49*	-3.57*	336.49*	-3.57*

Note: (i) All tests use one lag.(ii) \* and\*\* and indicates significance at 1% and 5%.

Source: Authors' calculations

Further, variance inflating factors (VIF) have been computed for detecting multicollinearity in the data variables. Collinearity diagnostics are presented in Table IV. To identify the problem of multicollinearity in firm size, market share and their quadratic terms, the quadratic terms FSZSQ and MSHSQ have been considered after demeaning the LFSZ and MSH and squaring the demeaned value respectively. Problem of multicollinearity is resolved after demeaning the data because this normalization makes LFSZ, MSH and their squares FSZSQ, MSHSQ orthogonal [33]. High VIF values have been found for firm size and market share variables, when all the variables were tested together, VIF was re-estimated after dropping collinear variables. It can be observed that all VIFs

are below 4 and are nowhere near to the rule of thumb for models 1 to 4. The presence of strong collinearity, therefore, is not found.

TABLE IV  
COLLINEARITY DIAGNOSTICS

Variable	All variables		Specification 1		Specification2	
	VIF	Tolerance	VIF	Tolerance	VIF	Tolerance
HHI	1.1	0.91	1.01	0.96	1.01	0.99
AMI	1.26	0.79	1.22	0.82	1.21	0.83
RDI	1.5	0.67	1.47	0.68	1.47	0.68
LFSZ	11.89	0.08	3.74	0.27	-	-
LFSSQ	8.17	0.12	3.24	0.31	-	-
MSH	12.93	0.08	-	-	4.05	0.25
MSHSQ	6.11	0.16	-	-	4.01	0.20
XI	1.51	0.66	1.48	0.68	1.24	0.81
RMII	1.1	0.91	1.09	0.92	1.09	0.92
FAGE	1.18	0.84	1.14	0.88	1.14	0.88
KI	1.03	0.97	1.01	0.92	1.01	0.99
OE	2.01	0.50	1.73	0.58	1.14	0.88
Mean VIF	3.96		1.76			1.89

Source: Authors' computations from [3]

Next, two econometric specifications have been estimated using two models each to investigate the determinants of profitability. Model 1 excludes MSH and MSHSQ variables; model 2 drops firm size related variables. The estimation of these different models was necessitated by high degree of multicollinearity among the independent variables. Both equations are specified as:

$$\text{Model1: } ROA_{it} = \alpha + \beta_1 HHI_{it} + \beta_2 SPRDUM + \beta_3 AMI_{it} + \beta_4 RDI_{it} + \beta_5 LFSZ_{it} + \beta_6 LFSZSQ_{it} + \beta_7 XI_{it} + \beta_8 RMII_{it} + \beta_9 FAGE_{it} + \beta_{10} KI_{it-1} + \beta_{11} OE_{it} + \mu_{it}$$

$$\text{Model2: } ROA_{it} = \alpha + \beta_1 HHI_{it} + \beta_2 SPRDUM + \beta_3 AMI_{it} + \beta_4 RDI_{it} + \beta_5 MSH_{it} + \beta_6 MSHSQ_{it} + \beta_7 XI_{it} + \beta_8 RMII_{it} + \beta_9 FAGE_{it} + \beta_{10} KI_{it-1} + \beta_{11} OE_{it} + \mu_{it}$$

Above stated equations have been estimated using both models.

#### IV. RESULTS AND DISCUSSIONS

Empirical findings are presented in Table V. The reported Chi-square statistics for all models depict that the estimated models are statistically significant. The significance and performance of independent variables are discussed below.

HHI is observed as negatively related to profitability contrary to the traditional wisdom, although it emerged as insignificant. One recent study [5] also came out with similar findings with regard to firm level profitability in ID&PI. This study indicated that the low value of HHI in Indian pharma sector could be responsible for this finding as its low value suggests cut-throat competition.

TABLE V  
DETERMINANTS OF PROFITABILITY- OLS MODEL WITH DRISCOLL-KRAAY  
STANDARD ERRORS (ECONOMETRIC SPECIFICATION 1 AND 2)

Independent Variables	Specification-1	Specification-2
HHI	-0.00176 (0.00110)	-0.00120 (0.00096)
SPR	0.12302* (0.04803)	0.14748* (0.05345)
AMI	0.01233* (0.0016)	0.00947* (0.00193)
RDI	-0.01319* (0.00441)	-0.01119* (0.01171)
LFSZ	0.09913* (0.04225)	-
LFSZSQ	0.08204* (0.03354)	-
MSH	-	0.06852* (0.00953)
MSHSQ	-	-0.00758* (0.00135)
XI	0.00270* (0.00102)	0.00169* (0.00071)
RMII	-0.00024** (0.00023)	-0.00046** (0.00024)
FAGE	0.00376 (0.00227)	0.00523 (0.00292)
KI	0.00363* (0.00089)	0.00362* (0.00089)
OE	0.00521* (0.01407)	0.00329* (0.00059)
R-squared	0.82*	0.83*
Root MSE	1.83	1.83

Note: (i) Figures in parentheses are respective standard errors, and (ii) \* and \*\* indicate significance at 1% and 5%.

Source: Authors' estimations

*Stronger patent regime dummy* has emerged as significant variable exercising positive impact on the profitability of the pharmaceutical firms. It implies that post-TRIPS, stronger patent protection have positively influenced the profitability of Indian pharmaceutical firms. It appears to be contrary to the popular belief that stronger patent protection may severely damage the competitive strength of Indian drug and pharmaceutical firms.

*Advertising and market intensity* bears a strongly positive and significant impact on the firm's profitability. Besides, maintaining a strong field force in the form of medical representatives, pharmaceutical firms also offer gifts, free samples, trips to conferences, sponsorship of educational events to the medical specialists as part of the advertising and marketing. Advertisements in medical journals informing about the incremental benefits over other drugs in terms of better potency, safety and efficacy also build firm's public image of a responsible drug innovator/manufacturer/marketer. All these methods facilitate the firms to reduce price elasticity of demand for their differentiated drugs and help to build and encash intangible assets such as brand name. These methods also help to occupy mind space of medical practitioners and distributors/retailers which may boost up sales, expand market share, and consequently, profitability [22], [34].

Contrary to expectations, *R&D intensity* has exercised a negative yet significant influence on ROA though it is consistent with earlier studies [5] on firm-level profitability in the Indian pharmaceuticals sector [36]. It may be noted that

R&D angle is somewhat new to Indian pharmaceutical firms which, prior to 1995, were known more for preparing the copycats than coming up with their own innovative pharma products. The investment in R&D was expected to improve innovation capacity but R&D in pharmaceuticals is a very uncertain investment. Pharmaceutical firms require huge R&D expenditure to develop one new drug and this cost reduces firm-level profitability. Further, R&D investment may offset advertising and marketing expenditure and may bring down profits of a firm.

Relationship between *firm size* and profitability is observed to be positive and significant for both LFSZ and its quadratic term LFSZSQ for sample firms. This is in consonance with theoretical literature on the subject as size is directly related to economies of scale. A higher rate of return has also found to be achieved by large firms even in the absence of barriers to entry [21], [22], [37], [38]. Further, bigger companies may have more resources to explore and venture into new markets.

*MSH* and its quadratic term *MSHSQ* are positively and significantly related to profitability in Indian pharmaceutical firms is consistent with earlier studies on market share and profitability [21]-[25], [43]. The bigger market share entails well-differentiated products line with greater efficacy, less toxicity, and strong field force.

*Export Intensity* showed a positive and highly significant relationship with pharmaceutical profits in all the models. This finding is consistent with earlier studies [5], [26], [27], [31]-[46]. The most plausible explanation could be that exports not only offer much more remunerative prices as compared to domestic market but also induce firms to adopt the best manufacturing practices and upgrade product quality to the global standard that in the long run help them to have access to many more markets apart from gaining in terms of credibility.

The firms with higher *RMII* remain negative yet insignificant in one model. High *RMII* also hints towards low entry barriers and that tend to negatively impact pharmaceutical firm's profitability [60]. Our findings imply that the firms, which are extensively importing, have lower technological and financial capabilities and, therefore, rely much more on the imports, bulk of which comprise Active Pharmaceutical Ingredients (APIs) and other intermediaries, for meeting their upgradation requirements. The importance of imports seems to have declined in the recent years for ID&PI due to increasing availability of such supplies in the domestic market from MNC vendors.

*Firm's age* is positively yet insignificantly related to profitability in all models. This finding is in synchronization with the theory that age contributes to accumulate learning which reflects in efficiency. Older firms in the industry have the competitive advantages of technological learning, market experience and brand image, as compared to new entrants.

*Capital intensity* exhibits positive and significant association with pharmaceutical firm's profitability. Earlier studies have also reported similar findings [5], [35], [48]. Although, capital investment in Indian D&P industry is increasing over the years but whole pharmaceutical sector is

found to be much less capital intensive as compared to the manufacturing sector [5].

## V. CONCLUSIONS

This paper contributes to the empirical literature by improving our understanding of profitability determinants in the context of Indian pharmaceutical industry. This study has found that export intensity, A&M intensity, patent dummy, market share, R&D intensity, raw material import intensity, capital intensity and size as important variables that tend to influence firm's profit earnings, although they differ in terms of direction of influence and strength. All these turn out as major determinants as they provide powerful tools to the firms to improve their performance and profitability by expanding to global markets, increasing A&M expenditure productively even under strong patent protection regime. This study further indicates towards Mergers and Acquisitions (M&As) as probable equipment for high profit earning because firms can increase their market power this way and bigger market leaders may emerge as high profit earners. While external factors such as exports and economic environments are not within the control of the firm, it could always enhance its revenue generating capacity by working far more pragmatically on A&M and operating expenditures, and debts. However, firm is likely to gain more in the long term if it has significant export orientation. The negative and statistically significant influence of raw material imports and R&D intensity hints towards need for better and strategic utilization of resources to ensure higher profitability.

## REFERENCES

- [1] Government of India, 2015, 'Indian Pharmaceutical Industry - A Global Industry' Department of Pharmaceuticals. Accessed on Dec. 24, 2015 from <http://pharmaceuticals.gov.in/pharma-industry-promotion>
- [2] Confederation of Indian Industry (2014), 'India Pharma Inc.: Changing Landscape of Indian Pharma Industry', Mumbai. Downloaded on Jan.17, 2016 from <https://www.pwc.in/assets/pdfs/publications/2013/changing-landscape-of-the-indian-pharma-industry.pdf>
- [3] CMIE Prowess database, 2014
- [4] Apte, P. G., & Vaidyanathan, R. (1982). 'Concentration, controls and performance in twenty-nine manufacturing industries in India'. *Indian Economic Review*, 241-262.
- [5] Mazumdar, M. (2013). *Performance of Pharmaceutical Companies in India*, Springer.
- [6] Goddard, J., McMillan, D., & Wilson, J. O. (2006). 'Do firm sizes and profit rates converge? Evidence on Gibrat's Law and the persistence of profits in the long run'. *Applied Economics*, 38(3), 267-278.
- [7] Tirole, J. (1995), *The Theory of Industrial Organisation*, Cambridge, Massachusetts, MIT Press.
- [8] Bhagwat, Yatin and DeBruine, Marinus (2011). R&D and Advertising Efficiencies in the Pharmaceutical Industry. *International Journal of Applied Economics*, 8(1), pp. 55-65.
- [9] Simanjuntak, Destrina Grace and Tjandrawinata, Raymond R. (2011), 'M&A of Generic Pharmaceutical Companies Increases Productivity', Available online <http://dx.doi.org/10.2139/ssrn.194676>
- [10] Mank, D. A., & Nystrom, H. E. (2000). The Relationship Between R&D Spending and Shareholder Returns in the Computer Industry. Engineering Management Society, 2000. Proceedings of the 2000 IEEE, 501-504.
- [11] Caves, R. E. (1996). *Multinational enterprise and economic analysis*. (2nd ed.). Cambridge: Cambridge University Press
- [12] Branch, B. (September. 1974). Research and Development Activity and Profitability: A Distributed Lag Analysis. *Journal of Political Economy*, 999-1011.
- [13] Aboody, D. and B. Lev. 2001. R&D productivity in the chemical industry. Working paper, New York University.
- [14] Jefferson, G., Huamao, B., Xiaojing, G., Xiaoyun, Y. (2006). R&D Performance in Chinese Industry. *Economics of Innovation and New Technology*, Vol 15(4/5), June/July, pp. 345-366.
- [15] Scherer, Frederic M. (2001), 'The link between gross profitability and pharmaceutical R&D spending', *Health Affairs*. 20:5, pp. 216-220.
- [16] Baumol, W. J. (1958). On the theory of oligopoly. *Economica*, 187-198.
- [17] Bloom, Paul N. and Philip Kotler (1975). 'Strategies for High Market-Share Firms'. *Harvard Business Review*. 53 (6), pp. 63-72.
- [18] Hussinger, K. (2008). 'R&D and Subsidies at the Firm Level: An Application of Parametric and Semiparametric Two-Step Selection Models'. *Journal of Applied Econometrics*. 23, pp. 729-747.
- [19] Raymond, W., Mohnen, P., Palm, F., Van Der Loeff, S. (2010). 'Persistence of Innovation in Dutch Manufacturing: Is It Spurious?'. *The Review of Economics and Statistics*. 92:3, pp. 495-504.
- [20] Kongmanila, X., & Takahashi, Y. (2009), 'Inter-firm cooperation and firm performance: An empirical study of the Lao garment industry cluster' *International Journal of Business and Management*, 4(5), p3.
- [21] Grazi, M. (2012), 'Export and Firm Performance: Evidence on Productivity and Profitability of Italian Companies. *Journal of Industry, Competition and Trade*', 12(4), 413-444. <http://dx.doi.org/10.1007/s10842-011-0102-9>
- [22] Kumar, N. and Pradhan, J.P. 2003. 'Export Competitiveness in the Knowledge-based Industries: A Firm-level Analysis of Indian Manufacturing.' RIS Discussion Paper. No. RIS-DP43/2003. RIS, New Delhi
- [23] Aggarwal, A. (2002), 'Liberalisation, Multinational Enterprises and Export Performance: Evidence from Indian Manufacturing', *The Journal of Development Studies*, 38:3, 119-137, DOI: 10.1080/00220380412331322371.
- [24] McDonald, J. T. (1999). The determinants of firm profitability in Australian manufacturing. *Economic Record*, 75(2), 115-126
- [25] Feeny, S. (2000), 'Determinants of profitability: an empirical investigation using Australian tax entities', Melbourne Institute of Applied Economic and Social Research.
- [26] Lall, S. (1986), 'Technological development and export performance in LDCs: Leading engineering and chemical firms in India'. *Weltwirtschaftliches Archiv*, 122(1), 80-92.
- [27] Glen, J., Lee, K., & Singh, A. (2001), 'Persistence of profitability and competition in emerging markets'. *Economics Letters*, 72(2), 247-253.
- [28] Kambhampati, U. S., & Parikh, A. (2003), 'Disciplining firms: the impact of trade reforms on profit margins in Indian industry', *Applied Economics*, 35(4), 461-470.
- [29] Abreu, M., and Mendes, V. (2001), 'Commercial bank interest margins and profitability: evidence for some EU countries'. In *Pan-European Conference Jointly Organised by the IEFIS-UK & University of Macedonia Economic & Social Sciences, Thessaloniki, Greece, May* (pp. 17-20).
- [30] Molyneux, P., & Thornton, J. (1992), 'Determinants of European Bank Profitability: A Note', *Journal of Banking & Finance*, 16(6), 1173-1178.
- [31] Athanasoglou, P. P., Brissimis, S. N., & Delis, M. D. (2008), 'Bank-specific, industry-specific and macroeconomic determinants of bank profitability', *Journal of international financial Markets, Institutions and Money*, 18(2), 121-136.
- [32] Said, R. M., & Tumin, M. H. (2011), 'Performance and financial ratios of commercial banks in Malaysia and China', *International Review of Business Research Papers*, 7(2), 157-169.
- [33] Majumdar, S. K. (1997), 'The impact of size and age on firm-level performance: some evidence from India', *Review of industrial organization*, 12(2), 231-241.
- [34] Comanor, W. S., & Wilson, T. A. (1972), 'Advertising market structure and performance', *J. Reprints Antitrust L. & Econ.*, 4, 25.
- [35] Shepherd W.G. (1972), 'The Elements of Market Structure', *Review of Economics and Statistics*, Vol. 54, No. 1. (Feb., 1972), pp. 25-37.
- [36] Jayadev, A. and Stiglitz, J. E. (2009), 'Two ideas to increase innovation and reduce pharmaceutical costs and prices. *Health Affairs*, 28 (1) pp. 165-168.
- [37] Hall, M., & Weiss, L. (1967), 'Firm size and profitability', *The Review of Economics and Statistics*, 49(3), pp. 319-331.
- [38] Gale B.T. (1972), Market Share and Rate of Return, *Review of Economics and Statistics*, 54: 412-423.
- [39] Buzzell, R. D., Gale, B. T., & Sultan, R. G. (1975). Market share-a key to profitability. *Harvard Business Review*, 53(1), 97-106.

- [40] Nakao, T. (1993). Market share, advertising, R&D, and profitability: An empirical analysis of leading industrial firms in Japan. *Review of Industrial Organization*, 8(3), 315-328.
- [41] Szymanski, D. M., Bharadwaj, S. G., and Varadarajan, P. R. (1993), 'An analysis of the market share-profitability relationship'. *The Journal of Marketing*, 1-18.
- [42] Mukhopadhyaya, J. N., Roy, M., and Raychudhuri, A. (2012), 'Determinants of Market Share, Profitability and Market Power at the Firm Level in the Cement Industry of India'. *Vilakshan: The XIMB Journal of Management*, 9(1).
- [43] Chu, W., Chen, C. N., & Wang, C. H. (2008), 'The market share-profitability relationships in the securities industry', *The Service Industries Journal*, 28(6), 813-826.
- [44] Beleska-Spasova, E., Glaister, K. W., and Stride, C. (2012), 'Resource determinants of strategy and performance: The case of British exporters', *Journal of World Business*, 47(4), 635-647.
- [45] Vogel, A., & Wagner, J. (2011), 'Robust estimates of exporter productivity premia in German business services enterprises', *Economic and Business Review*, 13(1-2), 7-26.
- [46] Wagner, J. (2012). Exports, imports and profitability: First evidence for manufacturing enterprises. *Open Economies Review*, 23(5), 747-765.
- [47] Vu, H., Holmes, M., Lim, S., & Tran, T. (2014), 'Exports and profitability: a note from quantile regression approach', *Applied Economics Letters*, 21(6), 442-445.
- [48] Demir, F. (2013), 'Growth under exchange rate volatility: Does access to foreign or domestic equity markets matter?'. *Journal of Development Economics*, 100(1), 74-88.