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RESEARCH ARTICLE

IMPACT OF OWNERSHIP STRUCTURE ON R&D INTENSITY: THE STUDY OF INDIAN FIRMS

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Abstract

Investment in R&D has become one of the crucial factors in the survival and competitiveness of firms. Using a sample of 139 Indian firms, the study examines the significance of ownership structure concerning R&D intensity. Results indicate that indeed concentration, as well as, the identity of the investor matters when it comes to strategic decisions like investing in R&D. In that respect ownership concentration has a positive impact, whereas by identity, family shareholders and FIIs exert a positive impact on R&D identity, however, domestic institutional investors of both short—term and long—term have no such effect.

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Introduction:-

During the last few decades investment in R&D has assumed a critical role in the development and growth of firms. Today without active involvement in R&D and innovation, firms cannot compete successfully or even survive. Underscoring the significance of R&D intensity and its consequences for a firm's long-term survival and competitiveness, Hayes and Abernathy (1980) and Hill et al. (1988) have noted that reduction in R&D intensity during the 1970s and 80s are to blame for the loss of market share and declining competitiveness to German and Japanese by American firms. Similarly, Lee (2013) has noted that adaptation of differential technology and investment in R&D can partly explain the economic and technological success of South Korea, Singapore, Taiwan and Hong Kong. The study noted that countries like Korea and Singapore that have moved beyond middle-income to high-income status have continuously increased their R&D intensity proportionately with the income growth but countries like Malaysia, Mexico and Argentina which failed to do so got stuck in the middle-income trap (Lee, 2013, p. 15).

In this respect, national systems of innovation scholars emphasize country-specific factors to help explain the differences in innovation performance across countries (see e.g., Freeman 1995; Nelson, 1993; Choi et al., 2011). Context, culture and institutional differences across countries also lead to the differential impact of governance and ownership structures on innovation efforts (Hoskisson et al., 2002). While the characteristic features of the US and UK model consists of dispersed ownership structure, strongly protected shareholder rights, well-developed capital markets and as such the focus of governance is mainly on aligning executive interests with those of the shareholders (Sarkar and Sarkar, 2000; Roe, 2004), German and Japanese models are characterized by concentrated ownership structure, weakly protected shareholder rights, underdeveloped capital markets and long term bank financing and as such governance issues are mainly related to majority-minority conflict (Sarkar and Sarkar 2000; Sarkar,2010; La Porta et al., 1998).

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Institutional differences, divergence in governance issues and other specificities lend many of these models inapplicable to explain innovation efforts in emerging economies like India. Indian firms, for instance, have characteristics both of the Anglo-American model as well as the German-Japanese model. Sarkar and Sarkar's analysis of the ownership structure amongst the listed Indian firms reveals a concentrated ownership structure (Sarkar and Sarkar, 2000). In addition to large equity positions of corporate promoters, controlling equity ownership by corporate owners and foreign owners, moderate institutional ownership and higher leverage with a low equity base are some of the main characteristics of Indian corporations (Salerka, 2005, Sarkar and Sarkar 2000). While some studies have examined the relationship between ownership structure and R&D intensity of firms in emerging economies like India (e.g., Singh and Gaur, 2013; Ashwin et al., 2015; Ghosh, 2009; Sujit and Padhan, 2012; Mahmood and Mitchell, 2004). However, most of these studies have focused rather on a specific characteristic of ownership structure, for instance, family ownership and their involvement in management (Ashwin et al., 2015), family ownership and group affiliation (Singh and Gaur, 2013), business group affiliation (Sujit and Padhan, 2012; Mahmood and Mitchell, 2004) and so on, thus, the empirical evidence on the relationship between ownership structure and R&D intensity is somewhat fragmented and demand further insights in a holistic manner with due consideration of ownership and identity of the investor. In addition, effective governance mechanisms in emerging economies depend on an appropriate mix of ownership, control and monitoring to account for the institutional void (Wright et al., 2005). In that regard, the study attempts to analyze the significance of ownership structure concerning R&D intensity in a more comprehensive manner, considering both the magnitude of ownership concentration as well as the identity of the investor. Second, the study aims to analyze the R&D intensity of firms in India, which has elements of both the Anglo—American as well as the German—Japanese model.

This study is based on data from 2012 to 2018 for 139 Indian firms which are part of the larger S&P BSE 500 index representing almost all the major sectors of the Indian economy. Empirical results indicate that ownership concentration, as well as, the identity of the investor are significantly associated with the R&D intensity of firms in emerging economies. Ownership concentration, as well as the identity of the investor being family investor and foreign institutional investor, exerts a positive and significant impact on firms R&D intensity, however, domestic institutional investors whether short-term or long-term institutional investors fail to have any significant impact. This study makes the following principal contributions. First, unlike the earlier studies that have studied fragmented parts of capital structure, this study takes a holistic approach by considering all the major ownership types. Second, the study extends the literature on how R&D intensity is affected by ownership concentration as well as the identity of the shareholder. By providing evidence on the interplay of shareholder identity and their equity positions, this study helps understand the intricate ownership characteristics affecting the R&D intensity of firms in emerging economies. The rest of the paper is organized as follows: the second section gives an overview of the literature on the relationship and hypothesis development; section three gives research methodology, sample selection and variable description; section four presents the findings and discussion and finally section five concludes.

Literature Review and Hypothesis:-

A. Ownership concentration and R&D Intensity

Ownership concentration is argued to overcome the deficiencies of dispersed ownership structure by resolving the traditional agency conflict between managers and shareholders (Shleifer and Vishny, 1997; Sarkar and Sarkar 2000). Atomistic shareholders usually prefer to free-ride as monitoring costs usually outweigh the benefits. Returns from active monitoring benefit all the shareholders proportionately by the amount of ownership and as such these atomistic shareholders prefer to free-ride over active monitoring (Grossman and Hart, 1980; Claessens and Djankov, 1999; Sarkar, 2010). For R&D intensity, concentrated ownership seems even more important as these investments involve significant agency problems, in addition, to usual agency costs R&D intensity is subject to information asymmetry, firm specificity and asset intangibility which further adds to these costs. By internalizing monitoring benefits, concentrated ownership provides stronger incentives for large shareholders to indulge in active monitoring and control. However, studies have also noted either a negative or insignificant association between ownership concentration and R&D intensity. It is argued that large shareholders exploit minority interests by mechanisms like tunneling, cross-holdings, or pyramidal structures. Lack of diversification and the associated firm-specific risk affect the relationship negatively (Choi et al., 2011; Demsetz and Lehn, 1985).

Even so, concentrated ownership has been widely observed in firms of emerging economies (Claessens and Fan, 2002; Sarkar, 2010), and results show a positive impact of concentration on firm performance especially in emerging economies with weakly protected shareholder rights and underdeveloped capital markets (Salerka, 2005; Claessens and Djankov, 1999; Sarkar 2010). Concentrated ownership can also benefit firms' R&D efforts by

encouraging such investments. Large shareholders are argued to reduce the information gap usually found between insiders and outsiders regarding these projects by investing in firm-specific knowledge. Unlike short-term stock returns of atomistic shareholders, large shareholders have long investment horizons which enable firms to undertake investments like R&D. Studies, for instance, by Chang et al. (2006), Lee (2012), Lee and O'Neill (2003), and Baysinger et al. (1991) among others have documented a positive impact of ownership concentration on firms R&D intensity. Thus, by providing the patient capital and indulging in active monitoring, concentrated ownership seems to enhance a firm's R&D intensity. Hence, we hypothesize:

H1: Concentrated ownership has a positive impact on the R&D intensity of firms in emerging economies.

B. Family ownership and R&D Intensity

Investment in R&D involves higher uncertainty and risk and payoffs are only far in the future. Thus, these investments involve a tradeoff between immediate and future returns. Even though these long-term investments may add to the overall value of the firm, corporate executives may not like it. Managers who are evaluated on quantitative accounting performance like ROA rather than on qualitative investments have to risk their careers for these investments. And as such corporate executives exhibit some form of short-termism concerning these investments (Hill et al., 1988; Laverty 1996; Ashwin et al., 2015). However, shareholders differ in their attitude towards these investments, some may prefer them while others may not.

Family shareholders who are associated with the firm for generations and intend to conserve and pass on the business to future generations have a long investment horizon (Anderson and Reeb, 2003; James, 1999). Moreover, underdeveloped capital markets, weakly protected shareholder rights and ineffective enforcement of regulation in emerging economies like India enhances the significance and credibility of family owners viz-a-viz external actors. This credibility and brand name allow family firms to secure the necessary resources more easily specifically for R&D intensity (Anderson et al., 2003). In addition, the association with the family brand stimulates these family owners to indulge in active monitoring and guide the strategic orientation of the firm that ensures long-term competitiveness. Studies on family firms, for instance, by Lodh et al. (2014) and Singh and Gaur (2013) have documented a positive and significant effect of family ownership on R&D intensity. In a similar vein, Ashwin et al., (2015) noted a positive impact on the R&D intensity of family ownership and involvement of family members in management (family CEO and CEO duality). Thus, family ownership seems to support investments like R&D that have the potential to enhance the value of the firm in the long run. Hence, we hypothesize:

H2: Family ownership has a positive impact on the R&D intensity of firms in emerging economies

C. Institutional ownership and R&D Intensity

Institutional investors have become one of the main actors of corporate activism. By their professionalism, active monitoring and capacity to influence corporate decisions, these investors have induced positive firm performance (Grossman and Hart, 1980; Gillan and Starks, 2000). In that regard, Jensen and Meckling (1976) argue that powerful shareholders can significantly affect the firm's strategic decisions like R&D intensity, by their sophistication and expert guidance, institutional investors can reduce firm-specific risk by diversifying their portfolio more effectively than individual investors (Baysinger et al., 1991). Wahal and McConnell (2000) have documented a positive impact of institutional ownership on R&D intensity. Similarly, Kochhar and David (1996) have noted a positive impact of institutional ownership on new product development, however, the study noted that it was true only for retirement institutional investors and not for other types of institutional investors. In a similar vein, Cebula and Rossi (2015) have documented a positive impact of institutional investors on R&D intensity among Italian firms.

Nevertheless, institutional investors are not a homogeneous class with similar preferences for R&D intensity. According to Brickley et al. (1988) preferences regarding R&D intensity differ by the type of business relationship these investors have with the investee firm: they are unlikely to oppose the management decisions if they have other business relations with the firm—"pressure-sensitive"; stand up to the management decisions which are averse to shareholders interest if they are free from pressure-sensitive type business relations—"pressure-resistant"; and the third category of "pressure neutral" institutional investors which are less interested in firms strategic decision. Similarly, Chen et al. (2007) have classified institutional investors into "grey" and "independent" to differentiate between institutional investors concerning their preferences for R&D intensity. Grey investors are argued to vote with the management and consist of banking and non-banking financial institutions while as independent type is likely to oppose management's self-serving behavior and consist of retirement funds. In this respect, following

Brickley et al. (1988) and Chen et al. (2007) we make a distinction between institutional investors that are likely to vote with the management and oppose investments like R&D and those that are likely to stand up to managerial opportunism and support firm's investment in R&D. Hence, we hypothesize:

H3a: Long-term institutional investors act freely and because of their long-term investment horizons these investors have a positive impact on firms' R&D intensity.

H3b: Short-term institutional investors are unlikely to oppose managerial decisions and as such, they are unlikely to support R&D intensity.

As for the foreign institutional investors (FIIs), empirical research has shown these investors have a positive impact on focal firms R&D intensity, for instance, Shin and Park (2020) documented a positive impact of FIIs on R&D intensity among Korean firms and have noted that foreign institutions effectively stump managerial myopia and enhance corporate innovation; Similarly, Choi et al. (2012) have noted a similar result for 301 Korean firms; in the Indian context, Ashwin et al. (2015) have documented a positive impact of FIIs on R&D intensity amongst a sample of 172 Indian pharma firm. According to Aggarwal (2011), FIIs particularly from countries with strongly protected investor rights positively affect the governance practices of investee country's firms. Moreover, their global exposure and highly diversified portfolios allow them to encourage the focal firm's long-term value-enhancing investments like R&D intensity (Ferreira and Matos, 2008). Their study also shows that ownership by FIIs enhances firm valuation and operating performance. With fewer business relations with the focal firm, these investors are active in corporate monitoring. Thus, FIIs seem to enhance the focal firm's governance mechanisms and stimulate the management for strategic investments that have long-term consequences for the competitiveness and survival of the firm. Hence, we hypothesize:

H3c: Foreign institutional investors have a positive impact on focal firms R&D intensity

Research Methodology:-

Sample selection

This study is based on a sample of 139 firms listed on the Bombay stock exchange which are part of the larger index of S&P BSE 500. We started with all the 500 firms for seven years beginning in 2012 and ending in 2018. In the initial screening, we dropped all the financial firms because of differences in regulations applicable to financial and non-financial firms, we also dropped those firms that had data missing consecutively for four years or more. And finally, all those firms that were not part of the index during the whole study period of seven years or have foreign equity ownership more than 20 percent were also dropped from the sample. This data on the sample firms is obtained from the Centre for Monitoring Indian Economy (CMIE), a publicly available database that is considered one of the authentic sources of data on Indian firms.

Measures:-

1) R&D intensity.

This study uses the ratio of R&D expenditures to total assets (Brossard et al., 2013) as the measure of firms' R&D intensity during the year. While there are several choices for the scaling variable like sales, total assets or number of employees. However, sales are subject to seasonality and industry specificity, the number of employees is affected by the firm's capital intensity (Brossard et al., 2013) and as such the study uses total assets as the scaling variable.

2) Ownership structure:

Concentration (CON) is measured as the total equity held by promoters and persons acting in concert which have been described as corporate insiders in Indian corporate laws (Selarka, 2005), While family ownership (P_FAM) is measured as the equity ownership of individual and family members as reported in CMIE. As for the institutional ownership is concerned the study makes a distinction among the domestic institutional investors considering the investment horizon: ownership by banks, non-banking financial institutions and insurance companies constitute short-term institutional investors (ST_INS); ownership by mutual funds, pension funds, retirement funds and the like constitute long-term institutional investors (LT_INS). For the foreign institutional investors (F_INS) the study only considers the firms where foreign ownership is less than 20 percent, firms that have foreign holdings more than that are generally under foreign management and governance practices and as such these firms are dropped from the sample.

3) Control variables.

The study also includes several control variables to account for other factors that might affect a firm's R&D intensity. These control variables include firm age, size, leverage, investment opportunities and industry dummies. A firm's age is measured as the number of years since incorporation. Size is measured as the log of bookvalue of total assets. Leverage is measured as the ratio of the book value of long-term debt to total assets. Investment opportunities are measured using Tobin's Q ratio measured as the market value of equity plus book value of debt whole divided by total assets (Lee and O'Neill, 2003).

Estimation method

To test the hypothesis concerning the R&D intensity-ownership structure relation, we regress R&D intensity on the set of control variables and different classes of ownership variables to test hypothesis H1 through H3c. To estimate these relationships random effects instead of fixed effects model is used as the key explanatory variable-ownership structure, changes very slightly over time (Kennedy,1998).

Results And Discussion:-

Descriptive statistics and correlation analysis

Table 1 shows the descriptive statistics for the variables used in the study. R&D intensity (R&D) has a mean of 0.013 and a median of 0.002 implying that the variable is highly skewed. There are a few large firms with significantly large investments in R&D than the rest. For the ownership structure, concentration (CON) has a mean of 49.45 and a median of 51.24 implying that most of the firms are highly concentrated. On average family (P_FAM) ownership is about 13.8 however the range of 75 between minimum and maximum implies that there are wide differences among firms for family ownership. For the institutional investors, average ownership for long-term institutional investors (LT_INS) is 5.7, short-term institutional investors (ST_INS) 4.5 and foreign institutional investors (FIIs) 16.7. Furthermore, firms have on an average SIZE of 6.73, ROA of 4.25, Tobin's Q (TOBIN_Q) of 2.7, AGE of 44 years and leverage (LEV) of 109.

Table 2 reports the pairwise correlation for the study variables. R&D is positively correlated with ownership concentration (CON) and family ownership (P_FAM). Amongst the institutional investors, R&D is positively correlated with FIIs but negatively correlated with long-term institutional investors (LT_INS) and short-term institutional investors (ST_INS). Moreover, R&D is positively correlated with firm SIZE, TOBIN's Q and AGE but is negatively correlated with ROA and leverage (LEV). All the correlation coefficients are well below 0.50 and as such multicollinearity among the right-hand side variables is unlikely. To test for multicollinearity, we estimated variance inflation factor (VIF) for all the variables whereby results show that VIF is well below the standard level and as such multicollinearity should not be a major issue.

Table 1:- summary statistics.

Variables	Mean	Median	Std. Dev.	Min	Max
R&D	.013	.002	.028	0.000	.143
CON	49.448	51.240	17.108	0.000	75.0
P_FAM	13.821	2.170	21.039	0.000	74.790
LT_INS	5.740	4.000	5.533	0.000	23.670
ST_INS	4.503	2.520	5.772	0.000	30.10
FIIs	16.660	15.840	10.876	0.000	46.350
SIZE	6.730	6.662	1.317	4.163	10.652
ROA	4.250	6.283	7.509	-7.08	29.571
TOBIN_Q	2.701	1.980	1.998	.678	9.695
AGE	43.928	35.125	25.372	9.083	116.667
LEV	108.948	49.337	96.938	0.000	602.665

Table 2:- Pairwise correlation among the variables.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
R&D	1.00									
CON	0.14**	1.00								
P_FAM	0.16**	0.32***	1.00							
LT_INS	-0.19**	-0.29***	-0.07*	1.00						

ST_INS	-0.07*	-0.45***	-0.31***	0.04	1.00					
FIIIs	0.09**	-0.41***	-0.06	0.05	-0.02	1.00				
SIZE	0.16	-0.27***	-0.31***	-0.07*	0.44***	0.36***	1.00			
ROA	-0.14***	0.19***	0.20***	-0.10***	-0.04	0.13***	0.06	1.00		
TOBIN_Q	0.12**	0.19***	0.19***	-0.08*	-0.14***	0.25***	-0.03	0.49***	1.00	
AGE	0.19**	-0.38***	-0.25***	0.24***	0.43***	-0.11	0.16***	-0.12**	-0.05	1.00
LEV	-0.16***	-0.07*	-0.06	0.07*	-0.01	-0.18*	0.14***	-0.43***	-0.42***	-0.05

Stars indicate significance at *** $p < .01$, ** $p < .05$, * $p < .1$

Results for multivariate analysis:-

Table 3 reports the regression results for the relation between R&D intensity and ownership structure. The regression coefficient [Model (1)] for ownership concentration is positive and significant which seems to suggest that concentration favors investments that have value-creating potential for shareholders in the long run. This is consistent with prior research that concentrated ownership substitutes for the institutional void observed in emerging economies like India (Salerka, 2005; Claessens and Djankov, 1999; Sarkar, 2010). Moreover, concentrated ownership internalizes monitoring benefits and stimulates large shareholders for active monitoring and control of executive actions (Salerka, 2005). Furthermore, concentrated ownership is argued to overcome the information asymmetry problem usually found between corporate executives and outside shareholders concerning R&D intensity and the ensuing financial constraints (Hall, 2002), thus, it seems concentrated ownership minimizes all these agency issues and stimulates firms for R&D intensity.

For the second hypothesis concerning the impact of family ownership (P_FAM) on R&D intensity, Model (2) results show a positive and significant coefficient implying that family owners support R&D intensity which is value-enhancing, ensures the competitiveness and survival of the firm in the long run. This result is consistent with prior literature that family owners intend to pass on the firm to the next generation and as such, they have long-term investment horizons than other investors (Anderson and Reeb, 2003; James, 1999).

Among the institutional investors—Model (3,4 and 5), domestic institutional investors, both long-term (LT_INS) and short-term (ST_INS), don't seem to make any significant difference to the firm's R&D intensity. Regression coefficients [Model (3 and 4)] are insignificant and thus the hypothesis regarding their impact on R&D intensity is not supported. This is contrary to the studies that have documented a positive and negative impact of LT_INS and ST_INS on firms' R&D intensity respectively. Long term institutional investors are supposed to provide the patient capital to firms for investments like R&D and short-term institutional investors are supposed to favor short-term returns over long term investments (Brickley et al., 1988; Chen et al., 2007), however, the study results contradict with both the propositions.

As for the last hypothesis concerning the impact of FIIIs, regression results—Model (5), find support for this proposition. This result implies that R&D intensity increases with an increase in ownership by FIIIs. This is in line with the argument that FIIIs' global exposures and diversified portfolios allow them to support the focal firms' long-term investments like R&D (Ferreira and Matos, 2008). Their sophistication and expertise help improve the focal firm's governance mechanisms and reduce managerial short-termism concerning R&D intensity (Shin and Park, 2020; Choi et al., 2012; Ashwin et al., 2015).

Table 3:- Regression results.

	(1)	(2)	(3)	(4)	(5)
Dependent variable	R&D	R&D	R&D	R&D	R&D
SIZE	0.211 (0.779)	0.251 (0.453)	0.161 (0.678)	0.202 (0.901)	0.310 (0.548)
ROA	-0.038* (-1.744)	-0.021* (-1.652)	-0.240* (-1.687)	-0.280* (-1.769)	-0.021* (-1.736)
TOBIN_Q	-0.002** (-2.327)	-0.002** (-2.157)	-0.002** (-2.288)	-0.002** (-2.306)	-0.002** (-2.369)
AGE	0.023 (0.764)	0.031 (0.434)	0.023 (0.589)	0.026 (0.820)	0.035 (0.639)
LEV	-0.053* (-1.744)	-0.042** (-1.652)	-0.046 (-1.687)	-0.051*** (-1.769)	-0.045** (-1.736)

	(-1.804)	(-2.453)	(-1.537)	(-2.664)	(-2.533)
CON	0.021***				
	(2.722)				
P_FAM		0.002**			
		(1.991)			
LT_INS			0.035		
			(1.168)		
ST_INS				-0.021	
				(-1.546)	
FII					0.012**
					(2.301)
Adj R ²	12.15	12.59	13.59	15.11	12.25

Note: This table reports regression results for the ownership structure and R&D intensity using the random effects estimation method. Model (1) reports regression results for ownership concentration, Model (2) for family ownership, Model (3) for long-term institutional investors, Model (4) for short-term institutional investors and Model (5) for foreign institutional investments. t-values are in parentheses and stars indicate significance at *** p<.01, ** p<.05, * p<.1

Conclusion:-

This paper examines the significance of ownership structure-concentration as well as the identity of the investor, for long-term investments like R&D intensity. Building on the governance role of large shareholders in emerging economies, the study shows that ownership concentration, as well as the identity of the shareholders, are indeed the major determinants of R&D intensity in emerging economies like India. Ownership concentration exerts a positive influence on firms' R&D intensity by substituting for the institutional void. These large shareholders stomp the managerial short-termism and stimulate them for investments like R&D that have long-term consequences for the competitiveness and survival of the firm. By identity, family shareholders and foreign institutional investors exert a positive influence on R&D intensity while domestic institutional investors both long-term and short-term do not. Family shareholders' concern for future generations and FIIs' global exposure and diversified portfolio provide the patient capital for investments like R&D that have higher risk and uncertainty but at the same time have potential for creating positive shareholder value and ensuring the firms long term competitiveness and growth.

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