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R&D Intensity and Corporate Borrowings in Indian Pharmaceutical Firms

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Abstract: This study investigates the influence of research and development (R&D) intensity on corporate borrowing behaviour in the Indian pharmaceutical firms. Taking a sample of 97 pharmaceutical firms collected from the Prowess database covering a period of 10 years from 2015 to 2024, the regression evidence shows a significant negative impact of R&D intensity on corporate borrowings. This indicates that firms with higher R&D investments tend to rely less on debt financing. This outcome supports the pecking order theory, suggesting that firms choose internal financing over external financing due to the higher cost and elevated risk associated with R&D activities, as R&D is intangible and non-collateralisable. Additionally, firm size and cash flow negatively influence borrowings, emphasising the importance of internal sources in financing innovation. The findings contribute to the literature on corporate finance and pharmaceutical firms, highlighting the need for alternative financing mechanisms to support innovation-driven growth in emerging economies like India. This study also provides a more nuanced approach to corporate financial planning, where innovation goals are integrated into financial decision-making.

1. Introduction

In the current dynamic and competitive business environment, businesses are increasingly confronted with rapid technological advancements, shifting consumer expectations, regulatory changes, and global uncertainties (Gupta, 2014). These factors collectively necessitate continuous reassessment of strategies, processes, and business models (Pusparini et al., 2020). The ability to adapt to change is no longer optional but a critical determinant of structural resilience and long-term success (Duchek, 2020). Proactive adoption of innovation, digital transformation, and agile practices enables firms to respond effectively to emerging challenges and capitalise on new opportunities (Akpan et al., 2022; Duchek, 2020; Wang et al., 2022). In this context, embracing change is essential for maintaining competitiveness, ensuring operational efficiency, and sustaining growth. Research and development investment has emerged as a key driver of sustainable business performance (Wu et al., 2019). Now it is increasingly acknowledged as a fundamental pillar for fostering innovation, securing competitive advantage, and driving the long-term growth and sustainability (Coad & Rao, 2010; Hall, 2011). Today's rapidly evolving global economy, characterised by technological disruption, consumer sophistication, and intensified competition, firms are under pressure to innovate new products, processes, and services, to grow and stay sustainable in the transitional business environment (Brem et al., 2023; Nambisan et al., 2019). R&D is the engine through which firms develop new products, improve existing offerings, and enhance operational processes (Zaman & Tanewski, 2024). Firms allocate resources to R&D activities with the expectation that such expenditures will foster the development of new products, processes, and technologies, ultimately translating into increased sales and market share (Hagedoorn & Wang, 2012).

Within the constantly shifting macroeconomic framework, conventional indicators such as gross domestic product (GDP), exchange rates, inflation, and employment levels remain fundamental determinants of economic development (Guru & Yadav, 2019; Mensi et al., 2020). However, within the evolving paradigm of a digitally driven and innovation-centric economy, R&D investment has

gained significant prominence as a catalyst for sustainable economic growth. Recent scholarly studies emphasise the critical role of R&D in enhancing national competitiveness, fostering innovation, and ensuring long-term economic resilience (Dai et al., 2022; King & Levine, 1994; Sarpong et al., 2023). Now, firms are emphasising technology and in-house R&D (Li et al., 2022; Radicic & Balavac, 2019). This approach allows a firm to distinguish itself from competitors, fostering a unique market position (Zhang et al., 2022). Thus, firms are increasingly motivated to prioritise innovation to remain competitive and flourish in the global market (Bodhanwala & Bodhanwala, 2025). As a result, the firm can achieve a greater market share and increased profitability, thereby fulfilling its fundamental commercial objectives (Li et al., 2022; Lu, 2020). R&D intensive firms enjoy higher growth potential and thus are highly recognised by the investors (Hasan et al., 2022; Tsai & Wang, 2005). R&D financing is integral to the innovation process and the overall development of a firm (Zaman & Tanewski, 2024). Deliberate attention must be given to financing costs and funding sources when formulating R&D decisions (Broome et al., 2023), as financing R&D through external sources remains challenging and often expensive due to the substantial capital requirements and the inherent uncertain outcomes (Chiu et al., 2024; Giebel & Kraft, 2024; Kou et al., 2020; Moon, 2022).

Financing is essential for firms as it provides the resources to sustain day-to-day operations, pursue growth opportunities, invest in innovation, and effectively manage cash flow fluctuations (Dash et al., 2023). Since internal funds are often insufficient to meet all financial needs, borrowing becomes critical for accessing additional resources. Borrowing allows firms to utilise external funds without giving up ownership control, offering flexibility in addressing both short-term operational demands and long-term strategic goals (Behera & Sethi, 2024). Adequate financing empowers firms to acquire key assets, expand into new markets, and remain competitive, particularly in dynamic and innovation-driven sectors. Furthermore, timely access to finance supports business continuity, strengthens financial resilience, and enhances the firm's ability to respond to economic challenges (Brown et al., 2012). Without reliable financing options, firms risk missing out on profitable ventures and may face difficulty maintaining stability during uncertain times.

R&D investment is a critical factor shaping firm performance and influencing corporate borrowings. Access to external finance enables firms to engage in capital-intensive and innovation-driven activities, essential for enhancing productivity, competitiveness, and long-term value creation (Hall & Lerner, 2010). For firms with high R&D orientation, borrowings are an important funding source, especially when internal cash flows are insufficient or volatile (Brown et al., 2012). Despite the inherent risks associated with debt, judicious use of leverage can support innovation and operational growth (Murati-Leka & Ramadani, 2025). However, excessive borrowing may impose financial constraints, discouraging long-term R&D commitments due to repayment pressures and lenders' risk aversion (Chava et al., 2017). Therefore, an optimal capital structure that balances debt and innovation is essential for sustaining firm performance and fostering technological advancement.

India's pharmaceutical sector has emerged as a global leader, known for its massive production capacity, cost efficiency, and innovation. As of 2025, the industry is valued at approximately $66–$67 billion and is projected to reach between $88 and $130 billion by 2030 (Motilal Oswal, 2025). Moreover, it is ranked 3rd globally by volume and 14th by value, and fulfils over 50% of UNICEF's vaccine requirements, provides 50% of the world's vaccines, and supplies 40% of generic drugs in the U.S. and 25% of medicines in the U.K. (GOI, 2025). Additionally, it fulfils nearly 90% of the WHO's requirement for the measles vaccine (Ministry of Chemicals and Fertilizers, 2023; World Health Organisation, 2024). Its contributions are particularly significant in achieving fundamental SDG-3 targets such as universal health coverage, equitable access to essential medicines and vaccines, and the ongoing research and development of effective treatments for both communicable and non-communicable diseases (United Nations, 2015). Pharmaceutical firms play a vital role in promoting SDG-3 by supporting the development and distribution of affordable, safe, effective, and superior medicines and vaccines, especially for the general masses of developing countries (IBEF, 2025).

Therefore, understanding the influence of R&D intensity on corporate borrowings is essential for managers and policymakers seeking to optimise resource allocation and support sustainable business expansion. The firm's successful R&D initiatives drive the development of new products and enhance

production efficiency, empowering the firm to enter new markets or reduce the cost of production as corporate borrowings act as a critical driver in shaping firm performance and influencing the intensity of R&D investments. Access to external finance enables firms to engage in capital-intensive and innovation-driven activities, which are critical for enhancing productivity, competitiveness, and long-term value creation (Hall & Lerner, 2010). Thus, firms' R&D investment decisions are intrinsically linked to their corporate borrowing strategies, as access to financing plays a pivotal role in sustaining innovation efforts, particularly in innovation-intensive sectors like the pharmaceutical sector. With the rise of an industrialised and globalised economy, and the growing focus on technology and in-house R&D in developing countries like India, the relationship between corporate borrowings and firms' R&D intensity continues to be a compelling area of inquiry. The rest of the paper is organised as follows: Section 2 deals with literature review, Section 3 encompasses description of Data and methodology, Section 4 focuses on results and discussion, and Section 5 deals with conclusion.

2. Review of Literature

R&D investment is one of the critical activities that any business or corporation can use to produce and boost new products, services, and processes to enhance firm value (Gharbi et al., 2014). In the present scenario of rapid economic change, investment in R&D has become indispensable for fostering innovation, driving business growth, and sustainable success (Morina et al., 2025). R&D expenditure is the key factor in predicting firm innovation activities (Jaklic et al., 2014). Moreover, Da Silva et al. (2015) found that R&D is a critical factor toward corporate success, growth, and survival, and is called as a proxy for corporate innovation. In line with this study, Sharma (2012) and Wu et al. (2019) have demonstrated a positive relationship between R&D investment and firm performance. With the growing swiftness of technological change and the distribution of knowledge in most industrial environments, R&D investment has become crucial for prosperity and sustainability (Chun, 1990). Thus, in response to intense competition, firms engage in innovation and product diversification to capture growth prospects, enhance profitability, and outperform their competitors (Farida & Setiawan, 2022). Stakeholders have considered the importance of R&D initiatives (Gao et al., 2017). Thus, firms use R&D investment to respond to stakeholder demands and secure superior outcomes (Han & Manry, 2004). Previous studies have documented the positive influence of R&D investment on firm performance (Hall et al., 2013; Khanna & Sharma, 2018; Kim et al., 2018; Koutroumpis et al., 2020; O'Mahony & Vecchi, 2009; Sharma, 2012; Tsai & Wang, 2005). Daunfeldt & Elert (2013) investigate R&D expenditure from diverse industries; findings reveal a substantial heterogeneity in R&D intensity and innovation persistence among firms. Chung et al. (2019) validate that R&D intensity drives firm growth.

Given the above, assessing the value attributed to R&D as a key resource is increasingly important amid rapidly changing business conditions. R&D intensive policies are initiated through prevailing economic and social structures important for sustainable development (Nair et al., 2020; Zafar et al., 2019). Pioneer study of Solow (1957) documented that technological change is the force behind the productivity growth. While endogenous growth theorists acknowledge its significance, they contend that it arises internally, through purposeful resource investment by profit-oriented firms (Grossman & Helpman, 1991 & 1994). Through dedicated R&D investment, firms not only increase the value embedded in their offerings but also cultivate a culture of agility and continuous advancement. This strategic focus empowers organisations to anticipate and adapt to shifting market dynamics, meet emerging customer needs, and secure a lasting competitive edge. Rather than being a routine expense, R&D catalyses long-term profitability, industry leadership, and resilience in global competition (OECD, 2023).

Over the past few years, corporate R&D has garnered significant scholarly attention. Numerous studies have explored its relationship with various firm specific factors, including corporate governance and managerial discretion (Dong & Gou, 2010), government subsidies (Lee & Cin, 2010), firm size and intangible resources (Lai et al., 2015), family ownership structures (Sciascia et al., 2015), foreign ownership (Anwar & Sun, 2014), shareholder protection laws (Li et al., 2024), property rights (Lin et al., 2009), managerial incentives and CEO characteristics (Chen, 2013),

internationalisation (Filatotchev & Piesse, 2009; Hsu et al., 2015) foreign direct investment (Anwar, 2013; Usman et al., 2022), and corporate social responsibility (Jose et al., 2018).

Firms in technology-intensive sectors such as electronics, automotive, and innovative-intensive sectors such as pharmaceuticals, biotechnology, and computer manufacturing often experience a significant increase in sales volume after successfully commercialising innovations (Nieto Cubero et al., 2021). Similarly, the prior study of Demirel & Mazzucato (2012) demonstrated that R&D fosters growth in the pharmaceutical sector, primarily by creating high entry barriers that limit competition. Implementing the TRIPS Agreement in 2005 introduced substantial reforms to the intellectual property regime, particularly in intellectual property rights (Tyagi, 2024). R&D efforts by Indian pharmaceutical firms are primarily focused on developing processes and generic versions of high-potential drugs from developed countries with soon-to-expire patents (Sahasranamam et al., 2019). Remarkably, A higher rate of return on R&D investments is observed in emerging economies like India compared to developed countries (Shivdas & Ray, 2021). The Patent (Amendment) Act of 2005 catalysed increased investment in R&D and new drug development, compelling firms to improve efficiency and maintain growth within a highly price-sensitive environment, particularly following the implementation of the TRIPS-compliant product patent regime (Mahajan, 2019; Mahajan et al., 2015). In light of these developments, the emphasis on R&D investment is crucial for sustainable progress. In light of the above context, this paper aims to investigate the influence of R&D intensity on corporate borrowings of Indian pharmaceutical firms during 2015–2024. This study considers the impact of R&D intensity of pharmaceutical firms along with the additional control variables such as sales growth, firm age, cash flow, dividend payment, firm size, EPS, and market capitalisation.

3. Research Methodology

3.1. Data and methodology

Firms' data on the Indian Pharmaceutical sector are collected from the Prowess database provided by the Centre for Monitoring Indian Economy (CMIE) for 10 years from 2015 to 2024. The procedures for sample selection are as follows. Data on 149 Indian Pharmaceutical firms available on the database are collected, of which 52 firms with missing data are excluded, resulting in a final sample of 97 firms with 970 firm-year observations.

This study conducts an empirical investigation using panel data from Indian pharmaceutical firms. To analyse and interpret the data, the study begins with the application of summary statistics to provide an overview of the variables. Subsequently, correlation analysis is employed to explore the nature and strength of the associations between the variables. Finally, the study applies the ordinary least squares (OLS) regression technique to assess the impact of firms' R&D intensity on borrowings. Variables, along with their definitions, are outlined in Table 1.

3.2. Empirical Model

This study intends to investigate the influence of R&D intensity on corporate borrowings of the sample firms. To assess the connection between R&D intensity and corporate borrowings, estimate the baseline equation using the OLS regression. The regression model is as follows:

$$CB_{it}=\alpha_0+\beta_1 RDI_{it}+\beta_2 SG_{it}+\beta_3 FA_{it}+\beta_4 CF_{it}+\beta_5 DP_{it}+\beta_6 FS_{it}+\beta_7 EPS_{it}+\beta_8 MC_{it}+\varepsilon \quad \text{---------- (1)}$$

Regarding the dependent variable, this study uses corporate borrowings, defined as the ratio of the sum of short-term and long-term borrowings to total assets (Berg et al., 2021). The independent variable is R&D intensity, a proxy for the level of R&D investments, measured as the ratio of R&D expenditures to total sales in the same year (Wu et al., 2019). Based on Chung et al. (2019), Mahajan (2019), Sharma (2012), and Shivdas & Ray (2021), this study has the following control variables. Specifically, this study controls the sales growth, firm age, cash flow, dividend payment, firm size, EPS, and market capitalisation. Table 1 presents the description of the variables used in the analysis.

Table 1: Variable Description

Variable	Abbreviation	Description
Corporate Borrowing	CB	The ratio of the sum of short-term and long-term borrowings to total assets.
R&D Intensity	RDI	The ratio of R&D expenditures to the total sales in the same year.
Sales Growth	SG	The difference between sales in period t and period t-1 as a percentage of total assets.
Firm Age	FA	Number of years since incorporation.
Cash Flow	CF	The ratio of cash flow from operating, financing, and investing activities to total assets.
Dividend Paid	DP	The ratio of dividend payment to total assets.
Firm Size	FS	Natural logarithm of total assets.
Earnings Per Share	EPS	The ratio of a firm's net profit after tax to the number of outstanding equity shares.
Market Capitalisation	MC	The product of a company's share price and the total number of its outstanding equity shares.

Source: Authors' collection.

4. Results and Discussion

4.1. Summary Statistics

Table 2 presents the descriptive statistics of the variables employed in this study. The average borrowing level among the Indian pharmaceutical firms is approximately 46.9% of total assets, indicating a moderate reliance on external financing. However, the wide range from 5.7% to 381% suggests significant heterogeneity in capital structure, with some firms operating conservatively while others exhibit a higher external financing. With respect to R&D intensity, the data show a mean of 16.9%, but a much lower median of 1.6%, coupled with an exceptionally high standard deviation. This reveals a strongly right-skewed distribution, where a few firms invest heavily in R&D, while the majority allocate relatively minimal resources. This disparity underscores the uneven commitment to innovation within the pharmaceutical firms. Cash flow includes negative values and reflects the presence of firms facing liquidity constraints. Similarly, the dividend paid shows a low mean, with minimum values, suggesting that some firms have reduced or suspended dividends due to earnings volatility or strategic reinvestment decisions. The wide dispersion points to a divergence in dividend policies across firms in the sector. Firm size is fairly consistent across firms, though a few extreme values indicate the presence of very large and very small firms. Regarding Earnings Per Share (EPS), the high standard deviation and the gap between the mean and median reflect substantial variation in firm profitability. Market capitalisation shows skewness, which shows the disparity in investor valuation within the sector.

Table 2: Summary statistics

Variable	Mean	Median	S.D.	Min	Max
Borrowing	0.469	0.393	0.358	0.057	3.810
RD Intensity	0.169	0.016	2.740	0.000	82.300
Firm Age	36.200	33.000	18.600	0.000	88.000
Cash Flow	0.004	0.001	0.056	-0.484	0.493
Dividend Paid	0.010	0.002	0.044	-0.522	0.453
Firm Size	6.430	6.390	1.980	2.070	10.700
EPS	22.000	9.740	50.400	-379.000	662.000
Market Capitalisation	78.100	1.440	2.230	0.000	6.520

Source: Authors' calculation.

4.2.Correlation Matrix

Table 3 presents Karl Pearson's correlation coefficient among the study variables, offering the linear associations between corporate borrowings, R&D intensity, and other control variables. The correlation between corporate borrowings and R&D intensity is negative but negligible (r = -0.036), suggesting that the extent of R&D investment has minimal association with a firm's reliance on external financing in the Indian pharmaceutical sector. Borrowings exhibit a modest negative correlation with firm size (r = -0.223) and EPS (r = -0.213), indicating that larger and more profitable firms tend to rely less on external funding, due to their access to retained earnings or alternative funding sources. R&D intensity, on the other hand, shows very weak correlations with all other variables, with the highest being a positive but minimal relationship with firm size (r = 0.047), implying that larger firms marginally allocate more resources toward innovation activities. Firm age exhibits weak positive correlations with firm size (r = 0.100) and EPS (r = 0.196), suggesting that older firms enjoy some advantages in terms of scale and profitability. Dividend payments are positively associated with firm size (r = 0.124) and EPS (r = 0.133), indicating that larger and more profitable firms are more likely to distribute dividends. Notably, market capitalisation demonstrates a moderate negative correlation with firm size (r = -0.252), which may point to valuation inefficiencies or structural irregularities within the sector. Overall, the low correlation coefficients suggest no multicollinearity issue among the independent variables, which supports the robustness of subsequent regression analyses aimed at identifying the influence of R&D intensity on corporate borrowings of Indian pharmaceutical firms.

Table 3: Correlation matrix

Variables	1	2	3	4	5	6	7	8	9
1. Borrowing	1								
2. R&D Intensity	-0.036	1							
3. Sales Growth	0.007	-0.007	1						
4. Firm Age	0.054	-0.009	-0.017	1					
5. Cash Flow	-0.018	-0.050	0.006	-0.015	1				
6. Dividend Paid	-0.052	-0.035	-0.012	0.043	-0.029	1			
7. Firm Size	-0.223	0.047	-0.067	0.100	-0.033	0.124	1		
8. EPS	-0.213	-0.008	-0.046	0.196	0.005	0.133	0.304	1	
9. Market Capitalisation	0.021	-0.002	0.063	-0.003	-0.003	-0.008	-0.252	-0.015	1

Source: Authors' calculation.

4.3.Regression Results

This study adopts OLS regression approach, consistent with the methodology employed by Lechner et al. (2015), as it provides reliable and interpretable estimates. Table 4 depicts the results of the OLS regression analysis employed to examine the influence of firm-specific variables on corporate borrowings among Indian pharmaceutical firms. The regression results indicate that R&D intensity has a negative impact on corporate borrowings (coefficient = −0.0034, $p < 0.0001$). This suggests that firms with higher investment in R&D (R&D intensive) are less inclined to finance their operations through debt, due to the intangible and uncertain nature of R&D activities, which limits their suitability as collateral and makes lenders more cautious (Behera & Sethi, 2024). This finding aligns with existing theoretical expectations that R&D-intensive firms prefer internal financing or equity over debt to avoid financial distress and maintain operational flexibility (Sahoo et al., 2023). Firm size also negatively influences borrowings (coefficient = −0.0329) and is significant at the 5% level. This indicates that larger firms are likely to rely less on debt, due to better internal cash generation or greater access to non-debt sources of capital (Sethi & Swain, 2019b). Similarly, cash flow shows a significant negative effect, supporting the pecking order theory, which posits that firms with strong internal financial resources prefer to use them over external financing (Dash et al., 2023; Dash & Sethi, 2024). The coefficients for firm age, PAT, sales growth, and market capitalisation are statistically insignificant, suggesting that these variables don't substantially influence the borrowing

behaviour of indian pharmaceutical firms. These results imply that profitability, market performance, or firm maturity do not directly determine debt usage in Indian pharmaceutical firms. Finally, the OLS regression results underscore the significance of R&D intensity, firm size, and internal cash flow in influencing borrowing decisions, while highlighting the limited role of traditional indicators such as firm age and profitability in the Indian pharmaceutical context.

Table 4: Regression analysis

Variables	Coefficient	t-ratio	p-value
R&D Intensity	−0.0034***	−4.848	<0.001
Firm Size	−0.0329*	−1.985	0.050
Firm Age	0.0016	0.865	0.391
PAT	−0.3955	−1.383	0.169
Cash Flow	−0.2961**	−2.254	0.026
Sales Growth	−1.7710	−1.147	0.254
Market Capitalisation	−4.5312	−1.144	0.256
Intercept	0.6465***	4.851	<0.001
Adjusted R-squared	0.248		
F(7, 95)	52.206		
P-value(F)	8.000		
Observation	970		

Note: ***, **, and * indicate significant level at 1%, 5% and 10% respectively.
Source: Authors' calculation.

The empirical findings from both the correlation matrix and OLS regression provide valuable insights into the borrowing behaviour of Indian pharmaceutical firms concerning their R&D intensity. The correlation results reveal a negative association between R&D intensity and corporate borrowings, while the OLS regression confirms a statistically significant and negative relationship between the two. This finding suggests that firms emphasising R&D tend to rely less on debt financing. The result aligns with the theoretical premise that R&D investments, being intangible, risky, and long-term in nature, offer limited collateral value, thereby discouraging debt-based financing (Hall, 2002; Hall & Lerner, 2010). Similar evidence is presented by Brown et al. (2012), and Sahoo et al. (2023) who argue that innovative firms often face external financing constraints and thus prefer internal finacing to support R&D. The negative and significant impact of firm size and cash flow on borrowings further reinforces the applicability of the pecking order theory (Sethi et al., 2021), which posits that firms prefer internal sources of finance over external debt to avoid disclosure costs and financial distress (Myers & Majiuf, 1984). Due to economies of scale and better market access, larger firms may generate sufficient internal funds to finance R&D without debt (Zou & Ghauri, 2008). The significance of cash flow as a negative determinant of borrowings is also in line with the findings of Bhagat & Welch (1995), who observed that firms with strong internal cash flows are less dependent on external financing. Conversely, variables such as firm age, profit after tax, sales growth, and market capitalisation do not show significant associations with corporate borrowings, either in the correlation or regression models. This is consistent with findings of Czarnitzki & Hottenrott (2011 & 2012), who noted that traditional indicators of firm performance are not always reliable predictors of debt usage in innovation-intensive industries. These findings contribute to the growing body of literature on financing decisions in R&D driven sectors by emphasising the unique financing preferences of pharmaceutical firms in emerging markets like India. The observed patterns indicate that innovation-oriented firms strategically avoid debt, consistent with prior international studies. Aghion et al. (2004) highlighted the importance of strengthening internal resources or alternative financing mechanisms to sustain long-term innovation.

5. Conclusion

This study investigates the relationship between corporate borrowings and R&D intensity of Indian pharmaceutical firms, offering valuable insights into the financing behaviour of innovation-driven firms in an emerging economy like India. The findings of empirical analysis suggest that R&D

intensive pharmaceutical firms tend to rely less on debt financing, due to the intangible, risky, and high-cost non-collateralisable nature of R&D investments. The results reinforce the theoretical arguments of the pecking order theory and support existing literature (Brown et al., 2012; Hall, 2002; Myers & Majiuf, 1984; Sethi et al., 2021; Sethi & Swain, 2019), indicating a preference among R&D-intensive firms for internal financing mechanisms. Additional evidence showing negative impacts of firm size and cash flow on borrowings further underscores this financing hierarchy in determining borrowing behaviour, aligning with findings from studies on innovation-intensive sectors (Czarnitzki & Hottenrott, 2011). These findings contribute to the broader understanding of financing strategies in innovation-intensive sectors by highlighting the distinctive financial dynamics of Indian pharmaceutical firms.

As this study is confined to Indian pharmaceutical firms, future research can expand the scope by incorporating firms from all the manufacturing firms in India. Such an extension will allow for a more comprehensive and nuanced understanding of how R&D intensity influences corporate borrowings across diverse industries.

The study provides important managerial implications for Indian pharmaceutical firms. The negative association suggests that managers should prioritise internal financing over external financing to support innovation, given the intangible and high-risk nature of R&D activities. Strong internal cash flows and retained earnings become essential for sustaining long-term innovation strategies. In line with the pecking order theory, managers are encouraged to adopt financial practices that enhance liquidity and minimise reliance on debt. This calls for a more nuanced approach to financing planning, where innovation goals are integrated into financial decision-making. Moreover, firms should explore alternative financing sources such as government grants, venture capital, or strategic alliances to mitigate financing constraints and strengthen their innovation capacity without incurring financial risk.

References

Aghion, P., Bond, S., Klemm, A., & Marinescu, I. (2004). Technology and Financial Structure: Are Innovative Firms Different? *Journal of the European Economic Association*, *2*(2–3), 277–288. https://doi.org/10.1162/154247604323067989

Akpan, E. E., Al-Faryan, M. A. S., & Favour, I. J. (2022). Corporate Governance and Firm Innovation: Evidence from Indigenous Oil Firms in Sub-Saharan Africa. *Cogent Business and Management*, *9*(1). https://doi.org/10.1080/23311975.2022.2140747

Anwar, S. (2013). Presence of Foreign Firms and the Capital Structure of Domestic Firms: Evidence from China's Manufacturing Sector. https://ssrn.com/abstract=2314956

Anwar, S., & Sun, S. (2014). Entry of Foreign Firms and the R&D Behaviour: A Panel Data Study of Domestic and Foreign Firms in China's Manufacturing Sector. *Economics of Innovation and New Technology*, *23*(8), 739–757. https://doi.org/10.1080/10438599.2014.887179

Behera, S. N., & Sethi, M. (2024). Understanding Corporate Borrowings Literatures: A Systematic Literature Review and Bibliometric Approach. *Journal of Scientometric Research*, *13*(2), 349–364. https://doi.org/10.5530/jscires.13.2.28

Berg, T., Saunders, A., & Steffen, S. (2021). Trends in Corporate Borrowing. In *Annual Review of Financial Economics* (Vol. 13, pp. 321–340). Annual Reviews Inc. https://doi.org/10.1146/annurev-financial-101520-070630

Bhagat, S., & Welch, I. (1995). Corporate Research & Development Investments: International Comparisons. *Journal of Accounting and Economics*, *19*, 470. https://doi.org/10.1016/0165-4101(94)00391-H

Bodhanwala, S., & Bodhanwala, R. (2025). Beyond the boardroom: impact of diversity, inclusion and people development on firm performance-empirical evidence from India. *International Journal*

of Productivity and Performance Management, 1-29. https://doi.org/10.1108/IJPPM-12-2024-0831

Brem, A., Giones, F., & Werle, M. (2023). The AI Digital Revolution in Innovation: A Conceptual Framework of Artificial Intelligence Technologies for the Management of Innovation. *IEEE Transactions on Engineering Management*, *70*(2), 770–776. https://doi.org/10.1109/TEM.2021.3109983

Broome, T., Moore, W. R., & Alleyne, P. (2023). R&D Participation and Firm Performance in the Caribbean. *Applied Economics*, *55*(17), 1891–1907. https://doi.org/10.1080/00036846.2022.2100049

Brown, J. R., Martinsson, G., & Petersen, B. C. (2012). Do Financing Constraints Matter for R&D? *European Economic Review*, *56*(8), 1512–1529. https://doi.org/10.1016/j.euroecorev.2012.07.007

Chava, S., Nanda, V., & Xiao, S. C. (2017). Lending to Innovative Firms. *Review of Corporate Finance Studies*, *6*(2), 234–289. https://doi.org/10.1093/rcfs/cfx016

Chen, H. L. (2013). CEO Tenure and R&D Investment: The Moderating Effect of Board Capital. *Journal of Applied Behavioral Science*, *49*(4), 437–459. https://doi.org/10.1177/0021886313485129

Chiu, S. H., Lin, T. Y., & Pan, L. (2024). External financing sensitivities and inefficient R&D investment: Evidence from China. *Research in International Business and Finance*, *70*. https://doi.org/10.1016/j.ribaf.2024.102330

Chun, S. H. (1090). *Corporate Research and Development Expenditures and Share Value*. *Journal of Financial Economics*, *26*(2), 255-276. https://doi.org/10.1016/0304-405X(90)90005-K

Chung, H., Eum, S., & Lee, C. (2019). Firm growth and R & D in the Korean pharmaceutical industry. *Sustainability (Switzerland)*, *11*(10). https://doi.org/10.3390/su11102865

Coad, A., & Rao, R. (2010). Firm Growth and R and D Expenditure. *Economics of Innovation and New Technology*, *19*(2), 127–145. https://doi.org/10.1080/10438590802472531

Czarnitzki, D., & Hottenrott, H. (2011). Financial Constraints: Routine Versus Cutting Edge R&D Investment. *Journal of Economics & Management Strategy*, *20*(1), 121–157. https://doi.org/10.1111/j.1530-9134.2010.00285.x

Czarnitzki, D., & Hottenrott, H. (2012). Collaborative R&D as a Strategy to Attenuate Financing Constraints. *ZEW-Centre for European Economic Research Discussion Paper*, 12–49. http://dx.doi.org/10.2139/ssrn.2118558

Da Silva, R. B., Klotzle, M. C., Figueiredo, A. C., & da Motta, L. F. J. (2015). Innovative intensity and its impact on the performance of firms in Brazil. *Research in International Business and Finance*, *34*, 1–16. https://doi.org/10.1016/j.ribaf.2014.11.001

Dai, D., Fan, Y., Wang, G., & Xie, J. (2022). Digital Economy, R&D Investment, and Regional Green Innovation—Analysis Based on Provincial Panel Data in China. *Sustainability* , *14*(11), 6508. https://doi.org/10.3390/su14116508

Dash, S. R., & Sethi, M. (2024). ESG Footprint and Investment-cash Flow Sensitivity: The Role of Group Affiliation. *Vilakshan - XIMB Journal of Management*. https://doi.org/10.1108/xjm-06-2024-0094

Dash, S. R., Sethi, M., & Swain, R. K. (2023). Financial Condition, Working Capital Policy and Profitability: Evidence from Indian Companies. *Journal of Indian Business Research*, *15*(3), 318–355. https://doi.org/10.1108/JIBR-12-2020-0378

Daunfeldt, S. O., & Elert, N. (2013). When is Gibrat's law a law? *Small Business Economics*, *41*(1), 133–147. https://doi.org/10.1007/s11187-011-9404-x

Demirel, P., & Mazzucato, M. (2012). Innovation and Firm Growth: Is R&D Worth It? *Industry and Innovation*, *19*(1), 45–62. https://doi.org/10.1080/13662716.2012.649057

Dong, J., & Gou, Y. (2010). Corporate Governance Structure, Managerial Discretion, and the R&D Investment in China. *International Review of Economics and Finance*, *19*(2), 180–188. https://doi.org/10.1016/j.iref.2009.10.001

Duchek, S. (2020). Organisational resilience: a capability-based Conceptualisation. *Business Research*, *13*(1), 215–246. https://doi.org/10.1007/s40685-019-0085-7

Farida, I., & Setiawan, D. (2022). Business Strategies and Competitive Advantage: The Role of Performance and Innovation. *Journal of Open Innovation: Technology, Market, and Complexity*, *8*(3). https://doi.org/10.3390/joitmc8030163

Filatotchev, I., & Piesse, J. (2009). RD, Internationalization and Growth of Newly Listed Firms: European Evidence. *Journal of International Business Studies*, *40*(8), 1260–1276. https://doi.org/10.1057/jibs.2009.18

Gao, Y., Wu, J., & Hafsi, T. (2017). The Inverted U-Shaped Relationship between Corporate Philanthropy and Spending on Research and Development: A Case of Complementarity and Competition Moderated by Firm Size and Visibility. *Corporate Social Responsibility and Environmental Management*, *24*(6), 465–477. https://doi.org/10.1002/csr.1420

Gene M. Grossman, & Elhanan Helpman. (1991). Trade, knowledge spillovers, and growth. *European Economic Review*, *35*(2–3), 517–526. https://doi.org/10.1016/0014-2921(91)90153-A

Gharbi, S., Sahut, J. M., & Teulon, F. (2014). R&D Investments and High-tech Firms' Stock Return Volatility. *Technological Forecasting and Social Change*, *88*, 306–312. https://doi.org/10.1016/j.techfore.2013.10.006

Giebel, M., & Kraft, K. (2024). R&D investments under financing constraints. *Industry and Innovation*, *31*(9), 1141–1168. https://doi.org/10.1080/13662716.2024.2328008

Goedhuys, M., & Sleuwaegen, L. (2016). High-growth versus declining firms: the differential impact of human capital and R&D. *Applied Economics Letters*, *23*(5), 369–372. https://doi.org/10.1080/13504851.2015.1076139

GOI, P. I. B. (2025). *A Dose of Atmanirbhar Bharat(How Make in India is transforming India's Global Pharmaceutical Footprint)*.

Grossman, G. M., & Helpman, E. (1994). Endogenous Innovation in the Theory of Growth. *Journal of Economic Perspectives*, *8*, 23–44. https://doi.org/10.1257/jep.8.1.23

Gupta, A. (2014). *Business environment*. Sultan Chand & Sons.

Guru, B. K., & Yadav, I. S. (2019). Financial Development and Economic Growth: Panel Evidence from BRICS. *Journal of Economics, Finance and Administrative Science*, *24*(47), 113–126. https://doi.org/10.1108/JEFAS-12-2017-0125

Hagedoorn, J., & Wang, N. (2012). Is There Complementarity or Substitutability between Internal and External R&D Strategies? *Research Policy*, *41*(6), 1072–1083. https://doi.org/10.1016/j.respol.2012.02.012

Hall, B. H. (2002). The Financing of Research and Development. *Oxford Review of Economic Policy*, *18*(1).

Hall, B. H. (2011). *Innovation and Productivity*. (No. w17178). National bureau of economic research. http://www.nber.org/papers/w17178

Hall, B. H., & Lerner, J. (2010). The Financing of R&D and Innovation. In *Handbook of the Economics of Innovation* (Vol. 1, Issue 1 C, pp. 609–639). Elsevier B.V. https://doi.org/10.1016/S0169-7218(10)01014-2

Hall, B. H., Lotti, F., & Mairesse, J. (2013). Evidence on the Impact of R&D and ICT Investments on Innovation and Productivity in Italian Firms. *Economics of Innovation and New Technology*, *22*(3), 300–328. https://doi.org/10.1080/10438599.2012.708134

Han, B. H., & Manry, D. (2004). The Value-Relevance of R&D and Advertising Expenditures: Evidence from Korea. *International Journal of Accounting*, *39*(2), 155–173. https://doi.org/10.1016/j.intacc.2004.02.002

Hasan, F., Shafique, S., Das, B. C., & Shome, R. (2022). R&D intensity and firms dividend policy: evidence from BRICS countries. *Journal of Applied Accounting Research*, *23*(4), 846–862. https://doi.org/10.1108/JAAR-02-2022-0027

Hsu, C. W., Lien, Y. C., & Chen, H. (2015). R&D Internationalisation and Innovation Performance. *International Business Review*, *24*(2), 187–195. https://doi.org/10.1016/j.ibusrev.2014.07.007

Jaklic, A., Damijan, J. P., Rojec, M., & Kuncic, A. (2014). Relevance of innovation cooperation for firms' innovation activity: The case of Slovenia. *Economic Research-Ekonomska Istrazivanja* , *27*(1), 645–661. https://doi.org/10.1080/1331677X.2014.975513

Klette, T.J. (1996). R&D, Scope Economies, and Plant performance. *Source: The RAND Journal of Economics*, *27*(3), 502–522. https://doi.org/10.2307/2555841

Jose, S., Khare, N., & Buchanan, F. R. (2018). Customer Perceptions of CSR Authenticity. *International Journal of Organizational Analysis*, *26*(4), 614–629. https://doi.org/10.1108/IJOA-08-2017-1213

Khanna, R., & Sharma, C. (2018). Testing the Effect of Investments in IT and R&D on Labour Productivity: New Method and Evidence for Indian Firms. *Economics Letters*, *173*, 30–34. https://doi.org/10.1016/j.econlet.2018.09.003

Kim, W. S., Park, K., Lee, S. H., & Kim, H. (2018). R&D Investments and Firm Value: Evidence from China. *Sustainability (Switzerland)*, *10*(11). https://doi.org/10.3390/su10114133

King, R. G., & Levine, R. (1994). Capital Fundamentalism, Economic Development, and Economic Growth. *Conference Series on Public Policy*, *40*, 259–292.

Kou, M., Yang, Y., & Chen, K. (2020). The impact of external R&D financing on innovation process from a supply-demand perspective. *Economic Modelling*, *92*, 375–387. https://doi.org/10.1016/j.econmod.2020.01.016

Koutroumpis, P., Leiponen, A., & Thomas, L. D. W. (2020). Small is big in ICT: The impact of R&D on productivity. *Telecommunications Policy*, *44*(1). https://doi.org/10.1016/j.telpol.2019.101833

Lai, Y. L., Lin, F. J., & Lin, Y. H. (2015). Factors Affecting Firm's R&D Investment Decisions. *Journal of Business Research*, *68*(4), 840–844. https://doi.org/10.1016/j.jbusres.2014.11.038

Lee, E. Y., & Cin, B. C. (2010). The Effect of Risk-sharing Government Subsidy on Corporate R&D Investment: Empirical Evidence from Korea. *Technological Forecasting and Social Change*, *77*(6), 881–890. https://doi.org/10.1016/j.techfore.2010.01.012

Lechner, M., Rodriguez-Planas, N., & Fernández Kranz, D. (2016). Difference-in-difference estimation by FE and OLS when there is panel non-response. *Journal of Applied Statistics*, *43*(11), 2044-2052. https://doi.org/10.1080/02664763.2015.1126240

Li, C., Yan, C., Li, J., Xia, C., Xiao, Y., & Zheng, L. (2024). Multiple Large Shareholders, Agency Problem, and Firm Innovation. *Managerial and Decision Economics*, *45*(2), 734–747. https://doi.org/10.1002/mde.4032

Li, C., Zhang, C., Li, Y., & Lv, R. (2022). In-house or Outsourcing R&D? Manufacturer Technology Strategy in the Presence of Market Follower Encroachment. *Journal of Systems Science and Systems Engineering*, *31*(1), 64–88. https://doi.org/10.1007/s11518-021-5513-5

Lin, C., Lin, P., Song, F. M., & Li, C. (2009). *Managerial Incentives, CEO Characteristics and Corporate Innovation in China's Private Sector*. *Journal of comparative economics*, *39*(2), 176-190. https://doi.org/10.1016/j.jce.2009.12.001

Lu, S. (2020). The Explanatory Power of R&D for the Stock Returns in the Chinese Equity Market. *Pacific Basin Finance Journal*, *62*. https://doi.org/10.1016/j.pacfin.2020.101380

Mahajan, V. (2019). Structural Changes and Trade Competitiveness in the Indian Pharmaceutical Industry in Product Patent Regime. *International Journal of Pharmaceutical and Healthcare Marketing*, *13*(1), 21–39. https://doi.org/10.1108/IJPHM-12-2016-0066

Mahajan, V., Nauriyal, D. K., & Singh, S. P. (2015). Trade Performance and Revealed Comparative Advantage of Indian Pharmaceutical Industry in New IPR Regime. *International Journal of Pharmaceutical and Healthcare Marketing*, *9*(1), 56–73. https://doi.org/10.1108/IJPHM-05-2013-0030

Mensi, W., Hammoudeh, S., Tiwari, A. K., & Al-Yahyaee, K. H. (2020). Impact of Islamic Banking Development and Major Macroeconomic Variables on Economic Growth for Islamic Countries: Evidence from Panel Smooth Transition Models. *Economic Systems*, *44*(1), 100739. https://doi.org/10.1016/j.ecosys.2019.100739

Ministry of Chemicals and Fertilizers, G. (2023). *Department of Pharmaceuticals, Annual Report 2022-23*. https://pharmaceuticals.gov.in/sites/default/files/Annual%20Report%202022-23.pdf.

Monte, A. Del, & Papagni, E. (2003). R&D and the Growth of Firms: Empirical Analysis of a Panel of Italian Firms. *Research Policy*, *32*, 1003–1014. https://doi.org/10.1016/S0048-7333(02)00107-5

Moon, B. (2022). Unleash Liquidity Constraints or Competitiveness Potential: The Impact of R&D Grant on External Financing on Innovation. *European Research on Management and Business Economics*, *28*(3). https://doi.org/10.1016/j.iedeen.2022.100195

Morina, D., Lucas, H., & Heiden, S. (2025). Unraveling the impact of R&D investment on corporate growth: Empirical insights on intensity- and growth rate-based differences. *Finance Research Letters*, *74*. https://doi.org/10.1016/j.frl.2024.106722

Motilal Oswal. (2025). *Healthcare Monthly Report*. https://www.motilaloswal.com/site/rreports/638751218073593980.pdf

Murati-Leka, H., & Ramadani, V. (2025). Exploring the role of innovation ecosystem actors in shaping new product development and firm innovation performance. *International Journal of Technoentrepreneurship*, *5*(3), 276-305. https://doi.org/10.1504/IJTE.2025.146856

Myers, S. C., & Majiuf, N. S. (1984). *Corporate Financing and Investment Decisions When Firms Have Information the Investors Do Not Have*. *Journal of financial economics*, *13*(2), 187-221. https://doi.org/10.1016/0304-405X(84)90023-0

Nair, M., Pradhan, R. P., & Arvin, M. B. (2020). Endogenous dynamics between R&D, ICT and economic growth: Empirical evidence from the OECD countries. *Technology in Society*, *62*. https://doi.org/10.1016/j.techsoc.2020.101315

Nambisan, S., Wright, M., & Feldman, M. (2019). The Digital Transformation of Innovation and Entrepreneurship: Progress, Challenges and Key Themes. *Research Policy*, *48*(8). https://doi.org/10.1016/j.respol.2019.03.018

Cubero, J.N., Gbadegeshin, S. A., & Consolación, C. (2021). Commercialisation of disruptive innovations: Literature review and proposal for a process framework. *International Journal of Innovation Studies*, *5*(3), 127–144. https://doi.org/10.1016/j.ijis.2021.07.001

OECD. (2023). *Science, Technology and Innovation Outlook 2023* (OECD Science, Technology and Innovation Outlook). OECD. https://www.oecd.org/en/publications/oecd-science-technology-and-innovation-outlook-2023_0b55736e-en.html

O'Mahony, M., & Vecchi, M. (2009). R&D, Knowledge Spillovers and Company Productivity Performance. *Research Policy*, *38*(1), 35–44. https://doi.org/10.1016/j.respol.2008.09.003

Pusparini, E. S., Soetjipto, B.w., Rachmawati, R., Sudhartio, L., & Nikmah, U. (2020). Managing Eco-Friendly Strategy Implementation and its Impacts on Business Performance: The Role of Organizational Strategic Capabilities. *International Journal of Business and Society*, *21*(3), 1258–1276. https://doi.org/https://doi.org/10.33736/ijbs.3348.2020

Radicic, D., & Balavac, M. (2019). In-house R&D, External R&D and Cooperation Breadth in Spanish Manufacturing Firms: is There a Synergistic Effect on Innovation Outputs? *Economics of Innovation and New Technology*, *28*(6), 590–615. https://doi.org/10.1080/10438599.2018.1546557

Sahasranamam, S., Rentala, S., & Rose, E. L. (2019). Knowledge Sources and International Business Activity in a Changing Innovation Ecosystem: A Study of the Indian Pharmaceutical Industry. *Management and Organization Review*, *15*(3), 595–614. https://doi.org/10.1017/mor.2019.35

Sahoo, A. K., Behera, S. N., & Sethi, M. (2023). Cash Flow Sensitivity of R&D Expenditure in Indian Manufacturing Firms. *Business Practices and Sustainability: Reenvision Revive Retain*.

Sarpong, D., Boakye, D., Ofosu, G., & Botchie, D. (2023). The Three Pointers of Research and Development (R&D) for Growth-Boosting Sustainable Innovation System. *Technovation*, *122*. https://doi.org/10.1016/j.technovation.2022.102581

Sciascia, S., Nordqvist, M., Mazzola, P., & Massis, A.D. (2015). Family Ownership and R&D Intensity in Small- and medium-sized Firms. *Journal of Product Innovation Management*, *32*(3), 349–360. https://doi.org/10.1111/jpim.12204

Sethi, M., & Swain, R. K. (2019a). Cash Holdings & Its Determinants : A Study of Cotton & Textile Industry in India. *Orissa Journal of Commerce*, *40*(II), 1–19.

Sethi, M., & Swain, R. K. (2019b). Determinants of Cash Holdings: A Study of Manufacturing Firms in India. *International Journal of Management Studies*, *VI*(2(2)), 11. https://doi.org/10.18843/ijms/v6i2(2)/02

Sethi, M., Swain, R. K., & Dash, S. R. (2021). Ownership Structure and Cash Holdings: Insights from Manufacturing Firms. *Orissa Journal of Commerce*, *42*(3), 59–73. https://doi.org/10.54063/ojc.2021.v42i03.05

Sharma, C. (2012). R&D and Firm Performance: Evidence from the Indian Pharmaceutical Industry. *Journal of the Asia Pacific Economy*, *17*(2), 332–342. https://doi.org/10.1080/13547860.2012.668094

Shivdas, A., & Ray, S. (2021). Research and Development Efforts in Indian Pharmaceutical Industry: How Much Does it Matter? *International Journal of Pharmaceutical and Healthcare Marketing*, *15*(4), 534–549. https://doi.org/10.1108/IJPHM-01-2020-0004

Solow, R. M. (1957). Technical Change and the Aggregate Production Function. In *Source: The Review of Economics and Statistics.* 39 (3). https://doi.org/10.2307/1926047

Tsai, K. H., & Wang, J. C. (2005). Does R&D performance Decline with Firm Size? - A Re-examination in Terms of Elasticity. *Research Policy*, *34*(6), 966–976. https://doi.org/10.1016/j.respol.2005.05.017

Tyagi, R. (2024). Internet and Challenges for Intellectual Property Rights. *Journal Global Values*, *XV*(1), 7–18. https://doi.org/10.31995/jgv.2024.v15i01.02

United Nations. (2015). *Transforming our world: The 2030 Agenda for Sustainable Development*. https://sdgs.un.org/2030agenda

Usman, M., Shabbir, R., Ahmad, I., & Zubair, A. (2022). Host Countries' Institutional Environment and Multinational Enterprises: Does Home-Host Developmental Status Matter? *Journal of the Knowledge Economy*, *13*(4), 2640–2664. https://doi.org/10.1007/s13132-021-00826-6

Wang, S., Abbas, J., Sial, M. S., Álvarez-Otero, S., & Cioca, L. I. (2022). Achieving Green Innovation and Sustainable Development Goals Through Green Knowledge Management: Moderating Role of Organizational Green Culture. *Journal of Innovation and Knowledge*, *7*(4). https://doi.org/10.1016/j.jik.2022.100272

World Health Organization. (2024). *Medication Without Harm*. https://www.who.int/publications/i/item/9789240062764

Wu, H. Y., Chen, I. S., Chen, J. K., & Chien, C. F. (2019). The R&D Efficiency of the Taiwanese Semiconductor Industry. *Measurement*, *137*, 203–213. https://doi.org/10.1016/j.measurement.2019.01.053

Zafar, M. W., Shahbaz, M., Hou, F., & Sinha, A. (2019). From Nonrenewable to Renewable Energy and its Impact on Economic Growth: The Role of Research & Development Expenditures in Asia-Pacific Economic Cooperation countries. *Journal of Cleaner Production*, *212*, 1166–1178. https://doi.org/10.1016/j.jclepro.2018.12.081

Zaman, M., & Tanewski, G. (2024). R&D Investment, Innovation, and Export Performance: An Analysis of SME and large Firms. *Journal of Small Business Management*, *62*(6), 3053–3086. https://doi.org/10.1080/00472778.2023.2291363

Zhang, T., Shi, Z. Z., Shi, Y. R., & Chen, N. J. (2022). Enterprise Digital Transformation and Production Efficiency: Mechanism Analysis and Empirical Research. *Economic Research-Ekonomska Istrazivanja* , *35*(1), 2781–2792. https://doi.org/10.1080/1331677X.2021.1980731

Zou, H., & Ghauri, P. N. (2008). Learning Through International Acquisitions: The Process of Knowledge Acquisition in China. *Management International Review*, *48*(2), 207–226. https://doi.org/10.1007/s11575-008-0012-1