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Are acquirers different? Identifying firm precursors to acquisitions

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Abstract

Purpose – The authors propose and test a theoretical framework that develops and analyzes precursors to firm acquisitions to determine if acquirers differ from other firms.
Design/methodology/approach – The authors use longitudinal, archival data from a sample of the largest firms in the global pharmaceutical industry from 1991 to 2012 with 1,327 firm-year observations.
Findings – The authors integrate prior research to show that the firm characteristics involving (1) R&D investment, (2) prior experience and (3) network centrality influence the likelihood that a firm will complete an acquisition.
Originality/value – In contrast to research focusing on the performance of acquiring firms, the authors show that firm characteristics predict acquisition activity by highlighting that acquiring firms differ from other firms. The authors also develop how network synergies can be realized by acquirers that have information advantages from more central network positions.

Keywords Acquisitions, R&D investment, Network centrality
Paper type Research paper

1. Introduction

Acquisitions are everyday strategic actions that require preparation (Bannert and Tschirky, 2004), but most research focuses on completed acquisitions (Welch *et al.*, 2020). There are two reasons why there is a need to examine firm-level differences in acquisitions. First, there is a wide variance in the performance of firms that complete acquisitions. A consistent focus of research has been to examine factors associated with predicting differences in performance (e.g. King *et al.*, 2021). While progress has been made, a second concern is that research broadly only examines completed acquisitions (Welch *et al.*, 2020). This problem is compounded by research examining acquisitions in isolation despite recognizing that they are used in conjunction with internal development and alliances (e.g. Achtenhagen *et al.*, 2017). As a result, it is essential to identify whether firms that make acquisitions are different from firms using other forms of corporate development and restructuring.

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One reason is that firm acquisition decisions may result from internal processes that make acquiring firms different from other firms, or acquirers may display inherent differences. While progress has been made in predicting acquisition performance (Das and Kapil, 2012; King *et al.*, 2021), a continuing need exists to understand acquisition decisions better. For example, Welch *et al.* (2020, p. 859) state a need for an "examination of the processes and associated activities and decisions" before firms make acquisitions. To answer whether acquiring firms differ, we examine firm characteristics that influence the likelihood that a firm will complete an acquisition.

Our selection of precursors to firm acquisition decisions stems from firm characteristics associated with path dependence (e.g. Anand *et al.*, 2016; D'Oria *et al.*, 2021) and prior acquisition research. For example, we confirm that R&D investment and experience are associated with acquisition activity (e.g. Farhadi and Tovstiga, 2010; Hagedoorn and Duysters, 2002; King *et al.*, 2008; Villalonga and Mcgahan, 2005), but limited research includes these variables. Despite its confirmed importance, in a recent meta-analysis, only 21 studies out of 220 (9.5% of acquisition research) measured acquiring firm R&D (King *et al.*, 2021). Further, we extend prior research to consider acquiring firm centrality. Additionally, while research has developed that firms more central to alliance networks are more attractive targets (e.g. Hernandez and Menon, 2018; Vasudeva *et al.*, 2013), we show that more central firms are also more likely to acquire.

As a result, our research offers several contributions. First, our results confirm that firms making acquisitions have different identifiable strategic attributes and that precursors to acquisitions are associated with different firm resources and experience. For example, prior use of acquisitions is a significant predictor of acquisition activity (Hagedoorn and Duysters, 2002). While acquisition experience is often used as a measure of acquisition learning to predict performance with mixed support (King *et al.*, 2021; Vinocur *et al.*, 2022), it does indicate that a firm will complete an acquisition again. Second, identifying firm precursors to acquisitions confirms that acquiring firms differ from other firms. For example, acquiring firms display lower investment in R&D or use acquisitions as a substitute for internal R&D (King *et al.*, 2008, de Leeuw *et al.*, 2019). As a result, firm precursors to acquisitions, including acquirer firm R&D, represent needed research controls that are largely absent in extant research. Third, we develop how network centrality can provide acquiring firms information advantages for screening and completing acquisitions. This develops how acquirers can realize network synergies (Feldman and Hernandez, 2021).

2. Theory and hypothesis development

Within resource-based theory (Barney, 1991), resource orchestration describes how managers leverage and allocate a firm's resources, and associated decisions develop processes that can contribute to inertia (Leonard-Barton, 1992; Sirmon *et al.*, 2011). This reflects that a firm's history of actions can develop path dependence in firm decisions (e.g. Beyer, 2009; D'Oria *et al.*, 2021). As firms tend to repeat activities where they experience success, time, and consistent behavior, they create routines (Anand *et al.*, 2016; Helfat and Peteraf, 2003; Villalonga and Mcgahan, 2005; Zollo and Reuer, 2010). Once started down a path, embedded routines can constrain firm decisions (McDonald and Madhavaram, 2007; Stern, 2010). However, firms following different paths contribute to heterogeneity (Greve, 2021). In considering what predicts firm acquisition activity, we focus on firm-level characteristics and investment decisions (Barney, 1991; Villalonga and Mcgahan, 2005), see Figure 1.

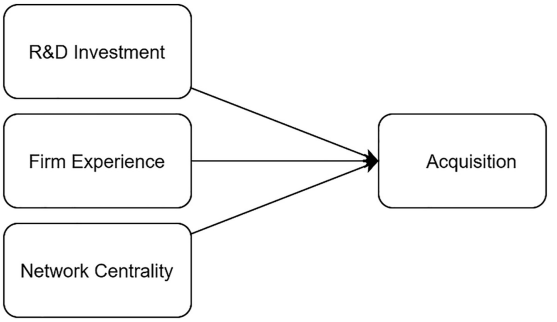

Figure 1.
Precursors to acquisitions

Source(s): Author's own creation/work

2.1 R&D investment

Research and development (R&D) establish an absorptive capacity for external technology (Cohen and Levinthal, 1989). This is particularly important in the global pharmaceutical industry, as R&D represents a cost of doing business that creates an entry barrier (Porter, 1980). As a result, R&D investment is partly fixed because it requires minimal continued investment to retain scientific personnel (Dushnitsky and Lenox, 2005; Savage and Waldman, 2009). While the extent that firms invest in R&D is discretionary, increasing R&D spending is less efficient than stable funding (Lev and Zarowin, 1999). This suggests that firms select a level of R&D investment or display path dependence. For example, differences in R&D investment create persistent heterogeneity in firms' technology resources (Dutta *et al.*, 2005). Still, it can be detrimental for firms to be at the top or bottom in R&D investment (Barry Jaruzelski and Bordia, 2005). We anticipate that lower levels of R&D investment are associated with acquisitions. We purposefully focus on lower levels of R&D investment for two reasons.

First, stable funding of R&D continues to be more efficient, as it requires consistent funding to maintain labs and researchers. Not investing in R&D in technology-dependent industries (such as pharmaceutical) threatens firm growth and survival (Gomez-Mejia *et al.*, 2011), as it relates to an innovation capability that results in patents (Li *et al.*, 2010). Patents and innovation capability result from sustained funding over multiple years. For example, while an older study, a comprehensive examination of R&D funding and patents showed that 70% of patents occurred after three years of funding (Pakes, 1985). Second, a consistent finding of acquisition research is that acquiring firms spend less on R&D (Heeley *et al.*, 2006; de Leeuw *et al.*, 2019) and this is interpreted as acquisitions of external technology substituting for internal R&D. However, firms still need to maintain some level of R&D funding to maintain an awareness of technology to the acquirer and then have an absorptive capacity to integrate it (e.g. Cohen and Levinthal, 1990; Heeley *et al.*, 2006).

Lower levels of R&D investment can serve as an option that facilitates acquisitions (Benson and Ziedonis, 2009; Bresman *et al.*, 2010; King *et al.*, 2008; McGrath and Nerkar, 2004; Warner *et al.*, 2006), and this relationship has been observed in the pharmaceutical industry (Higgins and Rodriguez, 2006). While R&D investment is required to evaluate a target and provide an absorptive capacity (Chen and Hennart, 2004; Veugelers, 1997), R&D investment for acquirers can remain below industry averages and substitute for internal R&D (King *et al.*, 2008). Further, challenges from increasing R&D due to moving into new areas can make it easier to acquire knowledge externally through an acquisition (Weinzimmer *et al.*, 1998). For example, Merck cut staff and reduced investment in R&D as it shifted to acquiring other companies (Walker and Loftus, 2013). Therefore, we predict that:

H1. R&D investment below the industry average is a predictor of additional acquisition activity.

2.2 Firm experience

Acquisitions are significant investments by firms that are followed by several years of integration. The acquisitions process requires sensemaking that is associated with reflection and development of acquisition capabilities through codification (Schweizer *et al.*, 2022; Vaara, 2003). This can facilitate organizational routines that can reinforce prior decisions and lead to additional acquisitions (e.g. Ellis *et al.*, 2011; Hagedoorn and Duysters, 2002; Thywissen *et al.*, 2018). Completing an acquisition requires relevant knowledge and experience to be effective (Stern, 2010; Teerikangas and Välikangas, 2021). However, prior experience can create momentum or inertia to repeat prior strategic actions (Amburgey and Miner, 1992; Di Guardo and Harrigan, 2016). Prior acquisition experience influences subsequent actions by developing associated resources and routines (Ellis *et al.*, 2011). As a result, the use of acquisitions by firms can become self-reinforcing (Amburgey and Miner, 1992; King, 2018; Villalonga and Mcgahan, 2005). For example, following a public shift in strategy by Merck in 2009 to acquire rival companies (Rockoff, 2009), Merck completed 16 acquisitions between 2010 and 2020 (Merck, 2020). Therefore, we predict:

H2. Prior firm experience with acquisitions is a predictor of additional acquisition activity.

2.3 Network centrality

Firms also have access to resources through ties with partner firms, and firms more central to a network can derive more benefits (Feldman and Hernandez, 2021; Kirkham *et al.*, 1991; Uzzi, 1996; Wassmer, 2010). Network centrality provides a positional advantage for resource access (Anjos and Fracassi, 2015; Gilsing *et al.*, 2008; Hernandez and Menon, 2021; Yang *et al.*, 2011). For example, increased network centrality makes a firm more attractive, offering access to resources and lowering opportunism-related risks (Mani and Luo, 2015; Saxton, 1997; Vasudeva *et al.*, 2013). For acquisitions, alliance networks can also provide information that increases the probability of acquisition completion (Katila *et al.*, 2008; Lin *et al.*, 2009). For example, Yang *et al.* (2011) show on a dyadic level of analysis that high levels of alliance network centrality are positively associated with the subsequent acquisition of alliance partners. Acquisitions within an alliance network can also be self-reinforcing as they improve an acquirer's position in an alliance network (Hernandez and Menon, 2021; Hernandez and Shaver, 2019). Further, it can enable an acquirer to benefit from network synergies (Feldman and Hernandez, 2021). Therefore, we predict:

H3. Network centrality is a predictor of additional acquisition activity.

3. Methods

The first author collected data from multiple databases as part of their dissertation research. The focus on the pharmaceutical industry was theory-driven, as it is known for investment barriers and active alliance and acquisition formation. The industry depends on patents that expire, driving continued innovation that depends on external knowledge (Hess and Rothaermel, 2011) and significant investment (Yu *et al.*, 2016). For example, the pharmaceutical industry is an established knowledge-intensive industry with worldwide revenue exceeding 1 trillion dollars since 2014 (Mikulic, 2020). Data on acquisition activity comes from the Pharma Intelligence (Citeline) database, and acquisitions reflect investments granting over 50% ownership. The database contains archival data from 68 top pharmaceutical firms that completed 12,030 alliances and 1,851 acquisitions between January 1, 1991, and December 31, 2012, to provide 1,327 firm-year observations. The largest

pharmaceutical firms perform significant R&D and reflect most industry revenue (Mikulic, 2022) enabling financial data collection. Financial data were retrieved from Compustat, and Datastream supplied annual report information. In selecting measures for our variables, we build on prior research that establishes validity from logical arguments based on theory and supporting empirical evidence (Miller *et al.*, 2021).

3.1 Dependent variable

We use a dichotomous variable to predict whether a focal firm completed an *acquisition* each year. For each firm and year, a panel is created with zero value assigned for no activity and one assigned if an acquisition occurred (Heeley *et al.*, 2006). Acquisitions are typically infrequent activities, so making a dichotomous variable is appropriate. Alternate models predicting acquisitions (i.e. multinomial models) also provide similar results.

3.2 Independent variables

Acquisition experience is calculated as the sum of acquisitions formed by the firm over the most recent five years (*t-5* and *t-1* discounted by 0.95; Cuypers *et al.*, 2017).

R&D investment is measured using a firm's *R&D* expenses over total assets to compare the intensity of a firm's R&D investment (Cohen and Levinthal, 1989). To further recognize differences in investment, we separate whether a firm's R&D ratio is above (RDAI) or below (RDBI) industry peers for the last two years. Hence, RDAI has positive and zero values, whereas RDBI has negative and zero values. Negative values for measures below the industry average require a reverse interpretation of coefficient direction. We examine linear effects, as R&D is often path dependent, and there is continued pressure to innovate due to patent expiration.

Network centrality is modeled each year as a separate alliance network. We formally characterize it as a symmetric weight matrix to measure the interaction intensity between any two actors (i.e. zero if no link exists) consistent with network literature (De Montis *et al.*, 2007). The result is 22 symmetric 68×68 matrices that measure the network centrality of firms for the given period over a five-year moving window period (i.e. 1991–1995, 1992–1996, 1993–1997) given that the traditional lifecycle of an alliance is usually five years (Soda *et al.*, 2004). We adopt betweenness, one of the most used network indicators in this context (Baum *et al.*, 2005; Gilsing *et al.*, 2008; Wincent *et al.*, 2010). It represents the shortest paths between any two actors passing through a specific actor modified to consider that in weighted networks, the actors with the highest actor strength are more likely to be connected in networks from a range of different domains (Shijaku *et al.*, 2016). Alternative network indicators, such as degree, provide similar results (see Appendix). Matrices and yearly *betweenness* measures are computed via R and Ucinet software.

3.3 Control variables

We include additional variables to control extraneous effects (King *et al.*, 2021). First, we control for *firm performance* by applying the approach used by (Bromiley, 1991) to distinguish industry aspirations ($A_{it} = IndustryPerformance_{it-1}$) for firms below industry performance to slightly better than prior self-performance ($A_{it} = 1.05SelfPerformance_{it-t}$) from firms performing above industry performance. Such inclusion is prompted by the fact that R&D investment and acquisitions can be conceptualized as forms of search (local vs distant) following performance relative to aspirations (Iyer *et al.*, 2019). Specifically, we computed performance relative to aspirations as the difference between the current firm's performance and its aspirations separately for firms that *perform above aspiration*, and for firms that *perform below aspiration* using Return on Equity (ROE) to measure performance for the preceding year. Performance above aspirations has positive and zero values, whereas performance below aspirations has only negative and zero values. Like our measure of *R&D investment*, negative values for measures performance below aspiration require reverse

interpretation of coefficient direction. Results are robust to alternative aspiration measures, and problems of ratio correlation from using firm assets in multiple measures are minimized by using different periods.

Second, we measure a firm's *sales and administration* expenses over total assets ratio and separate it into whether a firm's investment is above (SAAI) or below (SABI) industry peers for the last two years, as this expense represents a trade-off with different effects than R&D (King and Slotegraaf, 2011). Third, we control for liquidity as the current assets to current liabilities ratio. Fourth, we control for leverage with a debt-to-total assets ratio, as debt can provide a form of external governance (Himmelberg *et al.*, 1999). Fifth, we control whether a firm is in Asia, as Japan and Korea have a greater tradition of firm interlocks to form business groups (i.e. Keiretsu and Chaebol) that limit acquisitions. Sixth, we control for *firm size* using the logarithm of total assets and *firm age* using the year the firm was founded, as these characteristics can influence a firm's risk-taking and resource attributes (e.g. King *et al.*, 2003; Trahms *et al.*, 2013).

3.4 Analysis

We examine firm-level acquisition activity over 22 years for the top 68 firms in the pharmaceutical industry. We rely on logistic regression and discard fixed effects as firms in our dataset change little across time. In our model, we apply robust standard errors adjusted for firm-year groups, and we specify the average marginal effects (AME) to interpret our results, as it estimates the average behavior of our sample. Even though several variables in the models depend on total assets (although in different forms and dates), collinearity does not appear to be a problem due to the stability of coefficient values across models (Barnett *et al.*, 1975).

4. Results

The descriptive statistics and correlations for our chosen variables are shown in Table 1 and Table 2. Correlations are broadly consistent with our expectations. Further, there is a strong correlation between acquisition experience and network centrality ($r = 0.470$, p-value $= 0.00$). Controlling for firms located in Asia is sound, as firms in that region negatively correlate with acquisition activity ($r = -0.190$, p-value $= 0.000$).

Table 3 displays the results of our analysis predicting acquisitions in hierarchical models with controls alone and then with variables for the hypothesized effects. We find that R&D

	Variables	N	Mean	SD	Min	Max
1	Acquisition	1327	0.561	0.496	0	1
2	R&D Above Industry	1187	0.044	0.580	0	19.709
3	R&D Below Industry	1187	−0.037	0.048	−0.291	0
4	Acquisition Experience	1267	5.605	7.108	0	52.408
5	Performance Above Aspirations	821	0.056	0.402	0	8.447
6	Performance Below Aspirations	821	−0.126	0.304	−5.664	0
7	Network Centrality	1076	8.307	5.845	0	26.959
8	Sales and Admin. Above Industry	1070	0.107	0.559	0	8.328
9	Sales and Admin. Below Industry	1070	−0.108	0.133	−0.685	0
10	Liquidity	1182	2.881	2.763	0.174	44.007
11	Leverage	1209	1.062	3.450	−87.103	71.761
12	Asia	1327	0.150	0.357	0	1
13	Firm Size	1246	8.504	1.701	2.447	12.269
14	Firm Age	1252	1923.196	68.570	1668	2005

Note(s): SD - standard deviation
Source(s): Author's own creation/work

Table 1.
Variable descriptive statistics

Table 2.
Variable correlations
(*p*-values)

	1	2	3	4	5	6	7	8	9	10	11	12	13
2	−0.05 (0.26)												
3	−0.02 (0.57)	0.24 (0.00)											
4	0.34 (0.00)	−0.16 (0.00)	0.05 (0.23)										
5	−0.09 (0.03)	0.04 (0.38)	0.01 (0.72)	−0.05 (0.27)									
6	0.15 (0.00)	−0.02 (0.64)	−0.01 (0.76)	0.07 (0.08)	0.08 (0.05)								
7	0.34 (0.00)	−0.05 (0.21)	0.17 (0.00)	0.47 (0.00)	−0.06 (0.12)	0.08 (0.05)							
8	−0.11 (0.01)	0.22 (0.00)	0.16 (0.00)	−0.09 (0.02)	0.03 (0.45)	−0.07 (0.09)	0.05 (0.26)						
9	−0.06 (0.17)	0.20 (0.00)	0.38 (0.00)	0.03 (0.46)	0.02 (0.66)	−0.07 (0.07)	0.26 (0.00)	0.36 (0.00)					
10	−0.09 (0.03)	0.13 (0.00)	0.10 (0.02)	−0.23 (0.00)	0.05 (0.19)	−0.02 (0.57)	−0.17 (0.00)	0.13 (0.00)	0.07 (0.10)				
11	0.00 (0.99)	−0.10 (0.01)	−0.11 (0.01)	0.08 (0.06)	−0.01 (0.77)	−0.02 (0.62)	0.08 (0.06)	0.06 (0.13)	−0.02 (0.61)	−0.25 (0.00)			
12	−0.19 (0.00)	0.09 (0.04)	0.17 (0.00)	−0.24 (0.00)	0.12 (0.00)	−0.22 (0.00)	−0.08 (0.05)	0.29 (0.00)	0.19 (0.00)	0.11 (0.01)	−0.11 (0.01)		
13	0.23 (0.00)	−0.18 (0.00)	−0.05 (0.23)	0.47 (0.00)	0.01 (0.78)	0.04 (0.29)	0.58 (0.00)	−0.11 (0.01)	0.24 (0.00)	−0.39 (0.00)	0.18 (0.00)	−0.18 (0.00)	
14	−0.00 (1.00)	0.13 (0.00)	−0.01 (0.89)	−0.23 (0.00)	−0.02 (0.56)	0.02 (0.62)	−0.07 (0.09)	0.14 (0.00)	0.10 (0.02)	0.26 (0.00)	−0.10 (0.01)	−0.12 (0.00)	−0.31 (0.00)

Note(s): Instead of variable names, Indexes are reported for space reasons. Table 1 shows the correspondence between indexes and variable name
Source(s): Author's own creation/work

Variables		Model 1	Model 2
R&D Above Industry	AME		0.219
	Clustered SE		(0.263)
R&D Below Industry (H1)	AME		−0.061**
	Clustered SE		(0.030)
Acquisition Experience (H2)	AME		0.026***
	Clustered SE		(0.005)
Network Centrality (H3)	AME		0.019***
	Clustered SE		(0.004)
Performance Above Aspirations	AME		−0.154**
	Clustered SE		(0.060)
Performance Below Aspirations	AME		0.344**
	Clustered SE		(0.161)
Sales and Admin. Above Industry	AME	−0.201	−0.249
	Clustered SE	(0.196)	(0.183)
Sales and Admin. Below Industry	AME	−0.052	−0.268***
	Clustered SE	(0.199)	(0.090)
Liquidity	AME	−0.023**	−0.005
	Clustered SE	(0.011)	(0.010)
Leverage	AME	−0.025	−0.015
	Clustered SE	(0.020)	(0.013)
Asia	AME	−0.213*	−0.051
	Clustered SE	(0.123)	(0.072)
Firm Size	AME	0.028***	−0.013
	Clustered SE	(0.007)	(0.009)
Firm Age	AME	−0.000	−0.001*
	Clustered SE	(0.001)	(0.000)
Pseudo R-Squared		0.0495	0.1794

Note(s): Independent variables in italics. $N = 587$ for both models; Coefficients of variables containing total assets are stable across perturbations, suggesting collinearity is not an issue; *$p < 0.1$; **$p < 0.05$; ***$p < 0.001$
Source(s): Author's own creation/work

Table 3.
Acquisition precursors

below industry average is associated with increased acquisition activity (AME = −0.061, $p = 0.042$), supporting H1. Here the interpretation of a negative coefficient for R&D below industry (RDBI) average is reversed, as all values for RDBI are negative, and two negatives result in a positive. Figure 2 graphically depicts estimated odds ratios at sample means that show a decreasing probability of completing an acquisition for firms reaching R&D industry levels. H2 predicts a significant relationship between prior acquisition experience and subsequent acquisitions, which is supported by our results (AME = 0.026, $p = 0.000$).

Figure 3 depicts the estimated odds ratio at sample means that show an increasing probability of completing an acquisition as a firm reaches performance aspirations. Note: values of performance below aspirations on the left represent lower performance compared to aspiration. H3 anticipates a positive relationship between network centrality (betweenness) and acquisition activity and is strongly supported (AME = 0.018, $p = 0.000$). Firms with favorable network positions appear to have information advantages for completing acquisitions (e.g. Kwon *et al.*, 2020) and maintaining centrality (e.g. Feldman and Hernandez, 2021; Hernandez and Menon, 2021).

4.1 Supplemental analysis

We conducted sensitivity analyses to test the robustness of our results. For example, we consider an alternative timeframe of 8 years for acquisition experience, and the results remain the same (see Table A1 in Appendix). We also consider alternative centrality measures, more

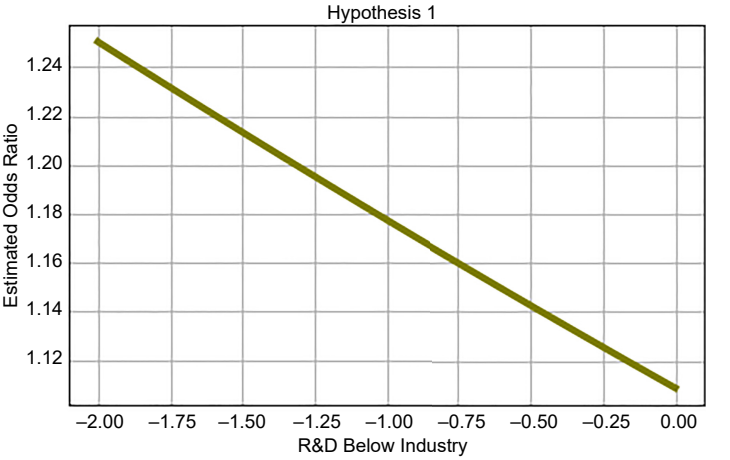

Figure 2.
R&D investment effects

Note(s): Variables other than R&D Below Industry at their sample mean
Source(s): Author's own creation/work

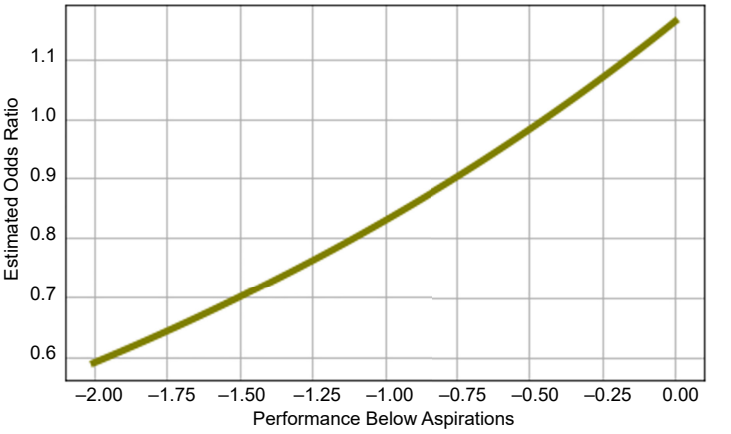

Figure 3.
Performance aspiration effects

Note(s): Variables other than R&D Below Industry at their sample mean
Source(s): Author's own creation/work

specifically degree centrality (i.e. the number of ties a firm has with its partners), and findings are stable (see Table A2 in Appendix). We also estimated probit instead of logit, and again results are consistent (see Table A3 in Appendix). We also tested potential non-linear relationships (Greve, 2011), and we found slight evidence of quadratic effects of organizational aspirations on acquisition activity (see Table A4 in Appendix). The quadratic effect examines whether slack pushes firms performing well above aspiration levels to engage in further acquisitions (Kim *et al.*, 2015). However, alternative approaches to measuring organizational aspirations are consistent with our results. Specifically, a weighted model that optimally combines both historical and social dimensions of performance feedback (Dothan and Lavie, 2016) or using ROE as an alternative performance measure

provides similar results (see Table A5 in Appendix). Finally, we tested for potential problems of selection bias by running several Heckman probit models on potential problematic variables, such as network centrality, and no issues were identified.

5. Discussion

We provide greater insight into how firm strategies reflect prior decisions and demonstrate that acquiring firms differ from other firms. For example, our findings confirm that R&D investment below industry average is associated with a firm's acquisition activity (e.g. Heeley *et al.*, 2006). Additionally, acquisition experience providing learning has mixed research support (King *et al.*, 2021; Vinocur *et al.*, 2022) and our results suggest it is a significant indicator that a firm will complete an acquisition again. This supports firms in developing processes that lead to path dependence. Further, our results demonstrate the importance of network centrality. Prior research has identified that network centrality makes firms more attractive targets (e.g. Hernandez and Menon, 2018), and we have developed how network centrality can facilitate acquisitions. Our results have additional implications for theory, research and management practice.

5.1 Research implications

Our research has implications for resource-based research. The resource-based theory holds that differences across firms exist because they own different assets (Barney, 1991), and subsequent research has developed that differences result from firms making different investment decisions and developing different processes that can result in path dependence (D'Oria *et al.*, 2021; Sirmon *et al.*, 2011). Our results support path dependence and acquisitions relying on distinct firm characteristics and experience (e.g. Stern, 2010) or that firms making acquisitions differ from other firms.

Meanwhile, acquisitions occur in a networked environment where centrally positioned firms can access the resources of connected firms and create synergy (Feldman and Hernandez, 2021; Kirkham *et al.*, 1991; Paruchuri, 2010). Acquisition activity is significantly influenced by a central network position, reflecting information benefits from strategic collaborations (Hernandez and Menon, 2021; Hernandez and Shaver, 2019). In addition to making a centrally located firm an acquisition target (Hernandez and Menon, 2018), we show that network centrality also represents a valuable resource for acquiring firms in evaluating and completing acquisitions.

5.2 Managerial implications

Validating that a firm's characteristics, including R&D investment and experience, serve as precursors to firm acquisition activity has important managerial implications. For example, managers may develop cognitive models that can decrease flexibility (Smith *et al.*, 1991). Additionally, acquisitions allow for lower R&D investment. An advantage is that firms can acquire technology at lower risk than developing it. However, a disadvantage is that firms making lower R&D investment may become more reliant on acquisitions, as developed routines can reinforce prior decisions (Ellis *et al.*, 2011). This may have greater impact in the pharmaceutical industry where stable funding is needed to maintain innovation. For example, in 2009, Merck signaled a change in its strategy from an internal development to acquisitions (Rockoff, 2009) that, by 2013, contributed to Merck laying off 20% of its employees to focus more on acquisitions (Walker and Loftus, 2013). Finally, a firm's central position in an alliance network may provide information on acquisitions (Yang *et al.*, 2011). In this sense, managers may obtain insights when pursuing acquisitions by tracking the position of firms in an alliance network.

5.3 Limitations and future research

As with all research, our study required multiple trade-offs associated with limitations, and we discussed several. A primary limitation is that we consider firm characteristics as drivers of strategic actions without considering the subsequent performance implications. However, acquisitions in the pharmaceutical industry have been observed to display positive performance (Higgins and Rodriguez, 2006). An opportunity for future research is to examine whether different precursors of acquisitions have different or similar performance implications. Additionally, there is a need to develop and test additional precursors to firm acquisition decisions conceptually. For example, while we identify that performance aspirations influence managerial decisions, there is growing interest in behavioral implications for acquisitions (Devers *et al.*, 2020). This research stream may identify additional acquisition precursors.

Another limitation is that we focus on the characteristics of an acquiring firm and do not consider the impact of target selection (Yu *et al.*, 2016). A consistent focus of management research on acquisitions involves the fit between acquiring and target firms. For example, a prior alliance with a target firm can be a precursor to an acquisition (Porrini, 2004). Identifying additional precursors associated with combining firms, such as board interlocks, can be explored in future research. Further, the type of a firm's prior experience may matter. For example, experience has greater relevance when subsequent acquisitions display similarities in size, industry, and location (Ellis *et al.*, 2011). Additional research can examine how acquisition capabilities develop from prior experience and investment (e.g. Srivastava and D'Souza, 2020). For example, in addition to path dependence, research identifies that organizational processes can generate change from reflection and improvisation (Feldman and Pentland, 2003; Garud *et al.*, 2011). Future research is needed to outline positive and negative implications of organizational processes.

Our archival data ended in 2012. While we agree that newer data would be helpful, it is known that the pharma industry is relatively stable (Fitch Wire, 2021). As a result, we maintain that the observations from the data remain relevant. Further, we examine pre-acquisition relationships that remain understudied (Welch *et al.*, 2020) and, for network centrality, have not been previously tested for acquirers.

A final notable limitation is our focus on a single industry, pharmaceuticals. While alliances and acquisitions are common in this industry, examining a single industry enables a better focus on firm-level differences that serve as precursors to acquisitions, our results may not generalize to other industries. For example, the pharmaceutical industry offers greater patent protection than other industries (James *et al.*, 2013). Additionally, our data range between 1991 and 2012 does not include more recent acquisition activity. While the underlying conditions in the pharmaceutical industry that contribute to acquisitions persist, confirming our results and expanding them to identify additional precursors or their performance implications represents a research opportunity.

In closing, we demonstrate that firm characteristics serve as precursors to acquisition activity, confirming strategic choices display path dependence and create differences between firms (Barney, 1991; Sirmon *et al.*, 2011). For example, it appears that firms pursuing acquisitions risk having less strategic flexibility as prior use of acquisitions leads to more acquisitions. However, an area representing a significant research opportunity is to develop what enables firms to use both alliances and acquisitions successfully (Achtenhagen *et al.*, 2017), so research needs to examine how a balance of different strategic options (e.g. alliances, acquisitions, internal development) can be achieved. We also confirm network centrality as a valuable resource (e.g. Hernandez and Menon, 2021). There is a need for further research into other network antecedents to strategic decisions (Zaheer and Soda, 2009) and how that impacts acquisition performance (Feldman and Hernandez, 2021).

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Appendix

Variables		Model 1	Model 2
R&D Above Industry	AME		0.200
	Clustered SE		(0.291)
R&D Below Industry	AME		−0.048
	Clustered SE		(0.030)
Acquisition Experience	AME		0.019***
	Clustered SE		(0.003)
Performance Above Aspirations	AME		−0.150**
	Clustered SE		(0.068)
Performance Below Aspirations	AME		0.340**
	Clustered SE		(0.151)
Network Centrality	AME		0.020***
	Clustered SE		(0.004)
Sales and Admin. Above Industry	AME	−0.201	−0.229
	Clustered SE	(0.196)	(0.196)
Sales and Admin. Below Industry	AME	−0.052	−0.346***
	Clustered SE	(0.199)	(0.080)
Liquidity	AME	−0.023**	−0.005
	Clustered SE	(0.011)	(0.010)
Leverage	AME	−0.025	−0.016
	Clustered SE	(0.020)	(0.013)
Asia	AME	−0.213*	−0.043
	Clustered SE	(0.123)	(0.071)
Firm Size	AME	0.028***	−0.015*
	Clustered SE	(0.007)	(0.009)
Firm Age	AME	−0.000	−0.001**
	Clustered SE	(0.001)	(0.000)
Pseudo R-Squared		0.0495	0.1785

Note(s): $N = 587$ for both models; 8 most recent years instead of 5 are used for *Acquisition Experience*; *$p < 0.1$; **$p < 0.05$; ***$p < 0.001$. SE - standard errors
Source(s): Author's own creation/work

Table A1.
Acquisition precursors

Variables		Model 1	Model 2
R&D Above Industry	AME		0.249
	Clustered SE		(0.266)
R&D Below Industry	AME		−0.075***
	Clustered SE		(0.025)
Acquisition Experience	AME		0.027***
	Clustered SE		(0.005)
Performance Above Aspirations	AME		−0.165***
	Clustered SE		(0.062)
Performance Below Aspirations	AME		0.369**
	Clustered SE		(0.168)
Network Centrality	AME		0.920***
	Clustered SE		(0.218)
Sales and Admin. Above Industry	AME	−0.201	−0.235
	Clustered SE	(0.196)	(0.199)
Sales and Admin. Below Industry	AME	−0.052	−0.226**
	Clustered SE	(0.199)	(0.089)
Liquidity	AME	−0.023**	−0.005
	Clustered SE	(0.011)	(0.010)
Leverage	AME	−0.025	−0.018
	Clustered SE	(0.020)	(0.014)
Asia	AME	−0.213*	−0.043
	Clustered SE	(0.123)	(0.074)
Firm Size	AME	0.028***	−0.010
	Clustered SE	(0.007)	(0.008)
Firm Age	AME	−0.000	−0.001**
	Clustered SE	(0.001)	(0.000)
Pseudo R-Squared		0.0495	0.1780

Note(s): $N = 587$ for both models; Network Centrality is measured by *degree centrality* instead of *betweenness*; *$p < 0.1$; **$p < 0.05$; ***$p < 0.001$

Source(s): Author's own creation/work

Table A2.
Acquisition precursors

Variables		Model 1	Model 2
R&D Above Industry	AME		0.225
	Clustered SE		(0.268)
R&D Below Industry	AME		−0.056*
	Clustered SE		(0.030)
Acquisition Experience	AME		0.026***
	Clustered SE		(0.005)
Performance Above Aspirations	AME		−0.153***
	Clustered SE		(0.058)
Performance Below Aspirations	AME		0.342**
	Clustered SE		(0.152)
Network Centrality	AME		0.019***
	Clustered SE		(0.004)
Sales and Admin. Above Industry	AME	−0.211	−0.239
	Clustered SE	(0.201)	(0.180)
Sales and Admin. Below Industry	AME	−0.050	−0.280***
	Clustered SE	(0.202)	(0.073)
Liquidity	AME	−0.023**	−0.005
	Clustered SE	(0.011)	(0.010)
Leverage	AME	−0.024	−0.016
	Clustered SE	(0.018)	(0.013)
Asia	AME	−0.215*	−0.056
	Clustered SE	(0.125)	(0.074)
Firm Size	AME	0.029***	−0.013
	Clustered SE	(0.007)	(0.009)
Firm Age	AME	−0.000	−0.001*
	Clustered SE	(0.001)	(0.000)
Pseudo R-Squared		0.0498	0.1799

Note(s): $N = 587$ for both models; Probit instead of logit link is used; *$p < 0.1$; **$p < 0.05$; ***$p < 0.001$
Source(s): Author's own creation/work

Table A3.
Acquisition precursors

Variables		A	B
R&D Above Industry	AME		0.225
	Clustered SE		(0.267)
R&D Below Industry	AME		−0.051
	Clustered SE		(0.032)
Acquisition Experience	AME		0.026***
	Clustered SE		(0.005)
Performance Above Aspirations	AME		−0.126
	Clustered SE		(0.155)
Performance Below Aspirations	AME		0.059
	Clustered SE		(0.237)
Performance Above Aspirations*Performance Above Aspirations	AME		−0.005
	Clustered SE		(0.057)
Performance Below Aspirations*Performance Below Aspirations	AME		−0.427
	Clustered SE		(0.300)
Network Centrality	AME		0.019***
	Clustered SE		(0.004)
Sales and Admin. Above Industry	AME	−0.211	−0.245
	Clustered SE	(0.201)	(0.174)
Sales and Admin. Below Industry	AME	−0.050	−0.285***
	Clustered SE	(0.202)	(0.064)
Liquidity	AME	−0.023**	−0.004
	Clustered SE	(0.011)	(0.010)
Leverage	AME	−0.024	−0.015
	Clustered SE	(0.018)	(0.013)
Asia	AME	−0.215*	−0.056
	Clustered SE	(0.125)	(0.074)
Firm Size	AME	0.029***	−0.016*
	Clustered SE	(0.007)	(0.009)
Firm Age	AME	−0.000	−0.000*
	Clustered SE	(0.001)	(0.000)
Pseudo R-Squared		0.0498	0.1816

Table A4.
Acquisition precursors

Note(s): $N = 587$ for both models; *Quadratic Aspirations* included; *$p < 0.1$; **$p < 0.05$; ***$p < 0.001$
Source(s): Author's own creation/work

Variables		Model 1	Model 2
R&D Above Industry	AME		0.198
	Clustered SE		(0.269)
R&D Below Industry	AME		−0.051
	Clustered SE		(0.032)
Acquisition Experience	AME		0.025***
	Clustered SE		(0.005)
Performance Above Aspirations	AME		−0.283***
	Clustered SE		(0.032)
Performance Below Aspirations	AME		0.208*
	Clustered SE		(0.122)
Network Centrality	AME		0.020***
	Clustered SE		(0.004)
Sales and Admin. Above Industry	AME	−0.233	−0.268
	Clustered SE	(0.198)	(0.180)
Sales and Admin. Below Industry	AME	−0.020	−0.263**
	Clustered SE	(0.202)	(0.112)
Liquidity	AME	−0.021*	0.000
	Clustered SE	(0.013)	(0.011)
Leverage	AME	−0.024	−0.014
	Clustered SE	(0.018)	(0.012)
Asia	AME	−0.209*	−0.072
	Clustered SE	(0.126)	(0.077)
Firm Size	AME	0.029***	−0.015*
	Clustered SE	(0.007)	(0.008)
Firm Age	AME	−0.000	−0.000**
	Clustered SE	(0.001)	(0.000)
Pseudo R-Squared		0.0479	0.1762

Note(s): $N = 583$ for both models; *Aspirations* calculated as a weighted model that optimally combines both historical and social dimensions of performance; *$p < 0.1$; **$p < 0.05$; ***$p < 0.001$
Source(s): Author's own creation/work

Table A5.
Acquisition precursors

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