Does the acquirer's complexity affect the market reaction to M&A decisions?

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Abstract

We examine whether and how acquiring firms' complexity affects investor perception at the announcement of M&A decisions. Using well-established data of firm complexity developed through combining machine learning and a lexicon of words, we find a significant positive relationship between acquiring firm complexity and cumulative abnormal returns (CAR), indicating that more intricate firms are viewed as more valuable or competent in mergers and acquisitions. This association is stronger for acquirers with high operating risk, organizational capital, R&D intensity, large and independent boards, and larger targets. We also present evidence that high-complexity bidders offer higher takeover premiums. Our study contributes to the existing literature by showing that the complexity of acquirers positively impacts the market's reaction to merger and acquisition announcements. Overall, our findings suggest that firm complexity influences various facets of corporate finance, including capital structure, risk management, and investment decisions, which merit further investigation.

Keywords: Firm complexity; Merger & Acquisition, Diversification, Takeover premium

JEL Classification: G30, G32, G32

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1. INTRODUCTION

The time it is legally required for firms to file 10-K reports depends on their size. Firms with a public float of at least $700 million are required to file 10-K reports within sixty days of the end of their fiscal year, while other firms have ninety days. Therefore, it may be argued that by the time a firm submits its 10-K report, most of the relevant information is already publicly available, and consequently, investors may disregard the formal 10-K documents for their investment decisions. However, there are certain types of information that may not be immediately captured during the earnings announcements and conference calls and may take additional time until the formal 10-K statements are available. Loughran and McDonald (2023) capitalize on the 10-K statements to determine firm complexity by combining machine learning and a lexicon of words from the business description in 10-K filings. Previously, scholars used the number of firm segments, readability, diversity of XBRL tags, the relative level of intangibles, presence of foreign sales, and firm age as proxies for firm complexity (Ge & McVay, 2005; Gomes *et al.*, 2007; Li, 2008; You & Zhang, 2009; Loughran & McDonald, 2014; Hoitash & Hoitash, 2018). Loughran and McDonald (2023) argue that a one-dimensional measure of complexity may not adequately capture its multidimensional aspect. Further, from the standpoint of mergers and acquisitions (M&A) literature, while studies have focused on deal characteristics and both the acquirer and target firms' characteristics in evaluating the effect of merger announcements (Travlos, 1987; Fuller *et al.*, 2002; Martin & Shalev, 2017), the finance literature lacks conclusive empirical evidence of the effects of acquiring firms' complexity on the acquirers' announcement period cumulative abnormal returns (CAR). Therefore, in this paper, we address this gap in the literature by exploiting the comprehensive measure of firm complexity determined by Loughran and McDonald (2023).

Mergers and acquisitions have received substantial attention from scholars over the last several decades. It can be argued that the attention is mainly driven by the enormous amount of wealth involved in those deals. For example, according to the Thomson database, while in 2002, the amount of US deal value was $500 billion, the amount rose to about $1 trillion in 2004. In 2022, this amount further rose to a staggering $2.5 trillion[1]. The market's reactions to the announcements of these M&A deals depend on the perceived wealth effect of the strategic moves associated with these M&As, such as growth, entering new markets, synergies, and economies of scale – to mention a few. Scholars have examined the effect of target firms' complexity, based on the length of target firms' 10-K statements, on acquirers' abnormal returns and identified that longer 10-K statements reduce information acquisition costs, leading to positive acquirer M&A return (Chircop & Tarsalewska, 2020). However, longer 10-K statements are also associated with higher processing costs as they are less readable and more complex. In fact, Loughran and

[1] https://www.reuters.com/markets/us/global-ma-volumes-hit-record-high-2021-breach-5-trillion-first-time-2021-12-31/

McDonald (2014) suggest that larger 10-K files may be associated with the increased obscurity of corporate valuation.

There may be two contradictory effects of firm complexity on abnormal returns. On the one hand, with the disclosed complexity, investors of more complex acquirers may assume that the announced merger would introduce further complexity to the existing intricate operations, which will be augmented with the introduction of additional potential operational risk, resulting in subsequent inefficiency. This may have negative consequences for the customers (McFadden & Hosmane, 2001), employees (Brown, 1996), and other stakeholders (Winter & Steger, 1998). It may also result in higher perceived challenges in effectively integrating target firms. Therefore, the disclosure of complexity may prompt investors to aggressively sell the acquirer's stock in fear of a high information gap and greater uncertainty. A high level of uncertainty may also arise from the investors' assessment of higher managerial complexities associated with layers of management and the bureaucratic structure of complex firms, adversely affecting the speed of decision-making and integration process (Li *et al.*, 2018a).

On the other hand, since managerial ability is positively associated with the quality of financial reporting, the disclosure of firm complexity through the 10-K statements may signal the strength and higher capability of management (García-Meca & García-Sánchez, 2018; Daradkeh *et al.*, 2023) in creating wealth. Investors may perceive a higher capability and transparency of the management as an assurance for successfully streamlining the organizational processes and smooth integration of the target firm (Cui & Leung, 2020). Further, Li (2010) finds that optimism in corporate disclosure is positively associated with future firm performance. In other words, it may be argued that disclosing complexity may indicate management with strong leadership and operational expertise, which could reduce overall business risk and create new growth opportunities for the merged entities.

To construct a broad and multifaceted quantitative measure of complexity, Loughran and McDonald (2023) use 10-K filings to identify 374 complexity-related words that imply business or information complexity. They argue that these words are useful in identifying the complexity of estimating future cash flow and preparing financial statements. Then, using a penalized regression method, they identify 53 words that are expected to consistently represent difficulty in projecting a firm's future operations. They measure complexity as the sum of the count of these fifty-three words scaled by the total number of words in the 10-K filing.

Using a sample of 10,469 deals between 1996 and 2021, we find that firm complexity is positively associated with announcement period abnormal returns (five days surrounding the announcement date, where day zero is the announcement date). The results indicate the importance of acquirers' complexity, expressed through specific complexity-related words in the acquirers' 10-K statements, in influencing the markets' perceptions in response to M&A announcements. The results suggest that firm complexity, which is associated with risk factors, might affect investors' perceptions about acquirers' wealth-creating deals. These risk factors may also encompass how the external risks related to regulatory compliance, market competition, and geopolitical factors contribute to the overall complexity of firms, thus leading to a better assessment of the success of M&A transactions.

We perform a series of supplementary tests to assess the impact of firm complexity on the abnormal returns of acquirers during the announcement period. First, we examine the effect of acquirers' operational risk on the positive relationship between complexity and abnormal returns and identify a statistically and economically significant effect of firm complexity only in the case of firms with higher operational risks. Examining the effect of broad characteristics, we find a more pronounced effect of complexity in firms with larger and more independent boards. Therefore, the findings indicate that disclosing firm complexity in 10-K filings bolsters the firm's credibility and investor trust, a relationship strengthened by robust corporate governance practices.

We extend our examination of the effect of acquirer complexity on the announcement period returns by examining whether our baseline results hold in the context of organizational capital and find that the effect of complexity on abnormal returns is more pronounced in firms with high organizational capital. These results appear to be consistent with investors' positive perception with regard to mergers' smooth transition, cultural integration, and better productivity associated with organizational capital.

Further analysis reveals a more pronounced valuation effect of complexity in firms with less diversified businesses. We also examine the role of innovation and find that complex firms with high R&D intensity generate significant positive abnormal returns compared to low R&D-intensive firms. When focusing on the effect of target size and geographical locations (domestic vs. international), as well as the acquirers' source of funds, since these characteristics may explain the market's reaction to M&A announcements (Offenberg, 2009; Chakrabarti & Mitchell, 2013; Fischer, 2017), our results indicate a favorable market reaction to the acquisition announcements of large and international targets. Our results also show that acquisitions financed by acquirers' own sources receive a positive response from investors.

In the final sections of the paper, we examine the effect of managerial ability on the baseline relationship and find, as expected, that the effect of firm complexity on abnormal returns is higher in firms run by high-ability managers. Previous studies find that CEO attributes affect financial reporting quality (García-Meca & García-Sánchez, 2018). Our findings provide evidence that the effect of CEO attributes on the quality of financial reporting extends to influence investors' reactions to M&A announcements through better assessment of the potential hurdles and integration issues that may arise in the merged firms.

Collectively, our findings suggest that investors perceive complex firms to be better equipped to benefit from mergers and acquisitions as these firms appear to have the capacity to manage potential changes through better risk management practices. Further, merger announcements by complex firms may be viewed as a broader strategy to accelerate growth and create value. Thus, our results suggest that researchers and practitioners can gain a more nuanced understanding of financial behaviors and outcomes by accounting for firm complexity.

The paper contributes to the literature examining the economic consequences of firm structure and operational intricacies on investors' perception of strategic decision-making. Previous studies, such as Travlos (1987) and Carow *et al.* (2004), to mention a few, have examined the drivers of M&A abnormal returns by focusing on the deal characteristics to determine the potential market reactions. However, the literature lacks direct evidence of the consequences of the acquiring firm's complexity on the market's reaction to merger announcements. To this extent, the significant positive relationship between acquirers' complexity and the announcement period abnormal returns documented in our study offers a new dimension of M&A research. Thus, our results indicate the importance of considering firm complexity in empirical corporate finance.

Second, our study bridges the gap between firm complexity and the market's response to corporate M&A decision announcements. The findings of this paper help us understand how firm complexity plays a crucial role in determining investors' perceptions of major corporate events and other strategic decisions. It also provides evidence that helps investors formulate informed investment decisions and predict stock market reactions. The findings may also guide policymakers and regulators about the implications of firm complexity in M&A activities, potentially paving the way for more nuanced disclosure requirements. Our findings may also provide guidance to managers on the importance of financial disclosure quality in shaping market reactions to crucial strategic decisions.

Third, our evidence of the effect of managerial ability on abnormal returns reiterates the importance of managerial traits on corporate strategic decisions. Scholarly studies, such as Chen and Lin (2018), Cui and Leung (2020), Doukas and Zhang (2020), and Feng and Doukas (2021) show that acquirers run by high-ability managers experience higher short-term and long-term abnormal returns. Literature suggests that high-ability managers are more capable of identifying good deals, achieving higher levels of synergies, and reducing information asymmetry (Holcomb *et al.*, 2009; Baik *et al.*, 2018). To this extent, our evidence may suggest the importance of managerial ability in effectively leveraging complex resources to reduce the risk associated with the integration of merging firms and ensure a smooth transition to better post-merger prospects.

The rest of the paper is organized as follows. The next section discusses the existing literature and develops our hypothesis. Section 3 discusses the empirical model and sample used in the study. Section 4 discusses the empirical results and the implications. Section 5 concludes the paper.

2. Literature review and hypothesis development

2.1. Firm complexity

Firm complexity is a multifaceted concept that may need to be accounted for in nearly every aspect of a firm's decision-making process, irrespective of whether such decisions are operational, performance-related, or strategic. Over the last few decades, research on the effect of different dimensions of 10-k filings has gained significant momentum. Griffin (2003) finds that the absolute value of the excess return is greater during the two days immediately after filing the 10-Ks. Extending this finding, Asthana *et al.* (2004) show that small investors react more significantly, in terms of trading volume, surrounding the 10-K filings. You and Zhang (2009) provide evidence in support of Asthana *et al.* (2004) and also find that the average absolute value of stock return is very high during the four days after the filing date. More recently, Cohen *et al.* (2020) provide strong evidence of the association between the information content of 10-k filings and future firm performance.

Loughran and McDonald (2014) posit that the length of 10-K filings provides a simple but powerful proxy for the readability of these financial documents. They argue that it is crucial to identify whether the information in the 10-K statement is incorporated into the current stock price since managers may try to hide the possibility of poor future earnings from investors (Li, 2008). Other studies, such as Miller (2010) and Lawrence (2013), also emphasize the importance of financial statement readability in investors' decision-making processes.

Loughran and McDonald (2014) argue that the readability of financial statements is linked to firm complexity. Based on this argument, Loughran and McDonald (2023) develop a new method that combines both machine learning and an application-specific lexicon to provide a text-based measure of firm complexity. While some scholars, such as You and Zhang (2009) and Bloomfield (2008) use median 10-K word count and the length of the annual report, respectively, as proxies for firm complexity, other scholars use 10-K file size and total word counts as proxies for complexity (Bratten *et al.*, 2017; Ertugrul *et al.*, 2017; Chakrabarty *et al.*, 2018). At the same time, a third group of authors use firm age (Ge & McVay, 2005), the number of accounting items disclosed in the XBRL segments of 10-K filings (Hoitash & Hoitash, 2018), and the number of firm segments (Botosan *et al.*, 2021) as measures of firm complexity. While these measures are widely used in existing studies, Loughran and McDonald (2023) argue against the validity of these measures because they are biased, limited by the availability of data, and likely to capture only specific aspects of firm complexity.

2.2. M&A announcement period wealth effects

The existing studies focusing on the short-term wealth effect of acquisitions on the acquirers have found that the overall wealth effect resulting from announcement period abnormal returns is economically insignificant. (Yaghoubi *et al.*, 2016). Scholars have identified a number of acquirers' characteristics that may potentially affect the abnormal returns. For example, Lang *et al.* (1991) show that for the acquirers with low Tobin's Q, the relationship between cash flow and acquirers' returns is significantly negative compared to high Tobin's Q acquirers. Bhagat *et al.* (2005) suggest that Tobin's Q is likely to be negatively associated with abnormal returns due to a lack of synergies between acquirers and targets. Harford (1999) indicates that firms with high abnormal cash holdings are likely to engage in value-destroying acquisitions and declining stock returns. However, Gorton *et al.* (2009) find a positive relationship between acquirer size and abnormal returns.

A number of studies have examined the consequences of M&A announcements on acquiring firms and identified the conditions in which acquirers experience significant abnormal returns after the announcement. For example, Myers and Majluf (1984) find that in the presence of information asymmetry between managers and shareholders, cash acquisitions lead to positive abnormal returns; Bradley *et al.* (1988) document that in the absence of competition, acquiring firms earn significant positive abnormal returns; Chang (1998) show that in the case of privately held target firms, stock acquisition leads to positive abnormal returns. More recently, Masulis *et al.* (2007) find that, in the context of the quality of corporate governance, acquiring firms with higher corporate governance practices – such as separation of the positions of CEO and chairman, and firms that operate in more competitive industries are likely to experience higher announcement-period abnormal stock returns. However, merger announcements can also generate negative market reactions under certain circumstances. For example, Fuller *et al.* (2002) document that serial acquirers earn significantly negative returns when they acquire a public target; Ahn *et al.* (2010) show that investors of acquiring firms in which directors hold multiple outside board positions react more negatively to acquisition announcements.

Surprisingly, existing studies have overlooked a crucial dimension of acquirers' characteristics, i.e., complexity, in determining the announcement period abnormal returns. Loughran and McDonald (2023) indicate that firm complexity is a multi-dimensional character. Therefore, it might be difficult to establish a direct relationship between firm complexity and abnormal returns without exploring the various channels through which the complexity of the acquirer may influence the market's perception of potential gain from M&As. Campbell *et al.* (2016) argue that "market participants likely perceive and evaluate M&As as complex configurations of interdependent factors ….we assert that the market reaction represents the aggregated result of investor perceptions and interpretations of said configurations (p.164)".

M&As are among the most complex strategic events in the lives of firms that are expected to improve their performance and sustainability. Complex firms are likely to have diverse operations that require higher capability and expertise to manage. When a more complex firm makes an acquisition announcement, it may signal to the market its higher capability to integrate new organizations. Larsson and Finkelstein (1999) argue that the success of an M&A depends on the similarity and complementarity of the parties involved. In fact, Harrison *et al.* (2001) find that resource complementarity creates better performance for the combined firm. As such, an announcement of an acquisition by a perceived highly capable, more complex firm may signal higher compatibility between the acquirer and the target. Further, more complex firms may have a wide range of more specialized resources (Barney, 1988), and the value of these resources is unlikely to be target-specific (Chatterjee, 1986). Therefore, more complex acquirers may benefit by properly exploiting targets' different resources without additional investments in resource acquisitions. This also creates a higher bargaining position and an opportunity for more complex firms to select a potential target from a broader group of firms. In sum, acquisition announcements by more complex firms may create a higher perceived synergy and send a positive signal about the wealth effect of the merger.

On the other hand, acquisition announcements by more complex firms may not significantly benefit those firms. For example, Singh and Montgomery (1987) find that the value created in related acquisitions is higher than the value created in unrelated acquisitions, and the shareholders of related targets may gain more from such acquisitions than unrelated acquisitions. Based on these findings, Capron and Pistre (2002) argue that if the market credits the perceived synergistic gain to the target, the acquiring firm's shareholders may not gain much from such a merger. We also argue that the shareholders of the acquiring firms may not benefit from mergers due to the difficulties in synergy arising from the complexity of the acquirers, as the market may attribute the synergistic gain to the targets. In such cases, more complex acquirers are likely to experience negative announcement period abnormal returns.

The findings of previous studies on whether M&As can successfully reduce firm risk are contradictory. Lewellen *et al.* (1989) have documented that managers make investment decisions that reduce firm risks, as such investment decisions, in turn, reduce the riskiness of their personal portfolios. Furfine and Rosen (2011) find that such investment decisions, particularly merger decisions involving risk-reducing motives, increase default risks. In the context of complex acquirers, M&As may increase or decrease firm risk. On the one hand, the decision to acquire may create difficulties in integrating different corporate cultures, systems, and processes (Bereskin *et al.*, 2018), increase strategic risk by attracting regulatory scrutiny (Balogh *et al.*, 2022), and induce reputational risk (Boone & Uysal, 2020), to mention a few, that are likely to generate negative abnormal returns. On the other hand, as more complex firms may have a more specialized and broader selection of resources, an announcement to acquire a target may send a positive signal about the potential ease of integration after the merger and obtain better synergy, which is difficult to duplicate by the less complex competitors (Barney, 1988; Chatterjee, 1992).

In complex firms, organizational capital may be crucial in determining the market's reaction to merger announcements. Eisfeldt and Papanikolaou (2013) define organizational capital as "a durable input in production that is distinct from physical capital….the distinguishing features of organization capital are that its efficiency is partly firm-specific and that it is embodied in the firm's key talent (p. 1035)." This indicates that organizational capital is inherent in a firm's culture, management practices, internal processes, and employee skills. Lev and Radhakrishnan (2005) indicate that organizational capital is a combination of different factors and is difficult to imitate. In complex firms, which are expected to have more diverse segments and multiple layers of management, the presence of high organizational capital may ensure efficient coordination of various business units. Li *et al.* (2018b) show that firms with high organizational capital realize higher announcement period abnormal returns. Further, Li *et al.* (2018c) find that acquiring firms benefit when the targets have high organizational capital. This suggests that a merger announcement by a more complex acquirer may receive positive market reactions if the investors believe that the resulting organizational capital of the merged firm is likely to create a more dynamic and competitive environment to foster better operations, investments, and innovations by leveraging its diverse resources and knowledge base. However, if the market perceives that the acquirer's complexity may create a barrier to enriching the organization due to bureaucratic ideology, resistance to change, and resource misallocation, it may react negatively to such a merger announcement. In sum, the market's reaction to the merger announcement by a more complex firm can be either positive or negative.

Another possible channel through which firm complexity may influence announcement period abnormal returns is the innovativeness of the acquirer. The existing studies focusing on the effect of firm complexity on innovations are contradictory and conditional in their definition of complexity. For example, while Zmud (1984) argues that structural complexity is positively associated with innovation, Aldrich and Auster (1986) suggest that firm size is negatively associated with innovation. More recently, Huvaj and Johnson (2019) find that firm complexity, proxied by firm size and multi-divisional structure, is negatively associated with radical innovative output but positively associated with incremental innovative output. If investors perceive that the complexity of the acquirer may negatively affect the innovativeness of the merged firm, announcement period abnormal returns are likely to be negative (Dorling, 2017). On the other hand, if investors expect that the complexity of the acquirer may facilitate diverse perspectives and expertise, adequate and efficient resource availability and allocation, better employee development and engagement, and exploit the differences in the resources of the acquiring and target firms, the announcement of a merger may attract a positive investor reaction (Creasy *et al.*, 2009; Cao *et al.*, 2019).

Taken together, based on the above discussion, our hypothesis in a null form:

H1: The acquiring firm's complexity does not affect the announcement period abnormal return.

3. Empirical model, sample, and variable definitions

In this paper, we examine the effect of acquiring firm complexity on acquisition profitability. Masulis *et al.* (2009) examine the effect of excess control on acquisition profitability. We augment the empirical model of Masulis *et al.* (2009) to examine the effect of acquirer complexity on the announcement period abnormal returns. Specifically, we use the following model:

$$CAR = \beta_0 + \beta_1 * Firm\ Complexity + \beta_2 * Tobin's\ Q + \beta_3 * ROA + \beta_4 * Leverage + \beta_5 * log(Total\ Assets) + \beta_6 * Relative\ Deal\ Size + \beta_7 * Diversifying\ Dummy + \beta_8 * Hostile\ Dummy + \beta_9 * Public\ Target + \beta_{10} * Subsidiary\ Target + \beta_{11} * All\ Cash\ Dummy + \beta_{12} * Public\ Target * Stock\ Deal\ Dummy + \beta_{13} * Public\ Target * All\ Cash\ Dummy + \beta_{14} * Private\ Target * Stock\ Deal\ Dummy + \beta_{15} * Private\ Target * All\ Cash\ Dummy + \beta_{16} * \beta_{16} Subsidiary\ Target * All\ Cash\ Dummy + \varepsilon \quad (1)$$

Here, *CAR* is the acquirer's cumulative abnormal return around the event date (-2,+2), where the M&A announcement date is the event day (0). We use the CRSP equally weighted return as the market return and estimate the market model parameter over the period from announcement date -210 to announcement data -11, using at least 30 non-missing daily returns data. *Firm Complexity* is the measure of firm complexity as developed by Loughran and McDonald (2023). *Tobin's Q* is the market value of total assets over book value of total assets; *ROA* is the net income over the book value of total assets; *Leverage* is the sum of all debt scaled by the market value of total assets; *Log(Total Assets)* is the natural logarithm of the book value of total assets; *Relative Deal Size* is the dollar value of a deal scaled by the acquirer's market value of total assets; *Diversifying Dummy* is a dummy variable that takes a value of 1 if the acquirer and target do not share a Fama–French industry, and 0 otherwise; *Hostile Dummy* is a dummy variable that takes a value of 1 if the deal is a hostile deal, and 0 otherwise; *Public Target* is a dummy variable that takes a value of 1 if the target is a public firm, and 0 otherwise; *Subsidiary Target* is a dummy variable that takes a value of 1 if the target is a subsidiary firm, and 0 otherwise; *All Cash Dummy* is a dummy variable that takes a value of 1 if the deal is purely cash-financed, and 0 otherwise; *Stock Deal Dummy* is a dummy variable that takes a value of 1 if the deal is at least partially stock financed, and 0 otherwise; *Private Target* is a dummy variable that takes a value of 1 if the target is a private firm, and 0 otherwise. Appendix A provides a detailed definition of all the variables.

We obtain the data for this paper from several sources. We collect the deal information from the SDC Platinum database and the firm complexity data from the University of Notre Dame website[2], as calculated by Loughran and McDonald (2023). Since the SEC required all firms to submit their periodic filing beginning in 1996, our sample period covers 1996-2021. We match the filing date for each firm with the corresponding fiscal year from the SEC Analytic Suite database. To calculate the firm-level variables, we use the Standard and Poor Compustat database. For the

[2] The firm complexity data is available at: https://sraf.nd.edu/complexity/

sub-sample test, the data is collected from the ISS director and Execucomp. We winsorize all the continuous variables at the 1st and 99th percentile. We exclude utilities (SIC 4900-4999) and financial companies (SIC 6000-6999). The final sample includes 3,407 firms with 10,469 M&A announcements. The sample of acquisitions satisfies the following conditions:

a) The deals are announced between 1st January 1996 and 31st December 2021.
b) The acquirers are US public companies, and the complexity data of these companies are available in the firm complexity data as calculated by Loughran and McDonald (2023)[3].
c) After the acquisition, the acquirer owns 100% of the target's share.
d) The deal value is at least $1 million.
e) The deal has been completed.

4. Empirical Results

4.1 Summary Statistics

Table 1 reports the descriptive statistics for all the variables used in the baseline analyses. Appendix A provides the detailed definitions of all the variables in this study. Panel A shows the summary statistics of the variables. We find that the mean value of CAR(-2,2) is 0.009%, and the median value is 0.005%. The previous studies vary widely with respect to the value gain of acquirers CAR(-2,2). For example, Walker (2000) finds a mean (median) abnormal return of -0.84% (-1.40%) for a sample period between 1980 and 1996 with 276 acquisitions; Fuller *et al.* (2002) find that during the period from 1990 to 2000, the mean (median) abnormal return for serial acquirers is 1.77% (1.07%) for 3,135 acquisitions and Ahn *et al.* (2010) report a mean value gain for acquirers of -1.463% for 1,207 acquisitions from 1998 to 2003. The average book value of the total assets of our sample firms is $7158.34 million, whereas the average book value of Masulis *et al.* (2007) is $9,005 million and Masulis *et al.* (2009) is $1,808 million. When we focus on firm leverage, the mean (median) leverage ratio is consistent with Masulis *et al.* (2007). However, the return on assets (*ROA*) is lower than Masulis *et al.* (2009). In general, the summary statistics indicate that the acquirers' characteristics depend on the sample period and the specific firms included in the sample.

When we focus on the deal characteristics, 48.9% of all the deals are financed entirely by cash, whereas only 14.3% are for acquiring public targets. These values are close to the values of Masulis *et al.* (2009). We also find that 42.5% of the M&As are diversifying deals, whereas Masulis *et al.* (2009) find that 31.2% are diversifying deals. This indicates that while some of the deal characteristics are different in our sample firms, other characteristics have remained consistent to previous studies.

Panel B shows the yearly distribution for the six industry categories in which our sample is divided. We find a consistent increase in firm complexity from 1996 to 2010, after which the level of complexity has stabilized. We also find that most of the acquisitions have taken place in the manufacturing industry, followed by the service sector.

[Insert Table 1 here]

4.2 Main regression results

Table 2 presents the regression results on the relationship between acquirer complexity and announcement period abnormal returns. We use firm and year-fixed effects since our primary independent variable is a firm-level measure of complexity. We use five-day cumulative abnormal returns around the announcement dates as the dependent variables. The results in Panel A indicate that in all the cases, firm complexity has an economically and statistically significant positive effect on the announcement period CAR. Economically speaking, the coefficient of *Firm Complexity* shows that a one standard deviation increase in firm complexity is associated with a 16.8%[4] increase in five-day CAR around the announcement date. Interestingly, we find that diversifying acquisitions (*Diversifying Dummy*) is significantly and negatively associated with CAR. This is contrary to Masulis *et al.* (2007) and Masulis *et al.* (2009) who find an insignificant effect of diversifying acquisitions. In Panel B, we divide the sample based on the median value (lagged) of *Firm Complexity* to identify the effect of high and low complexity on CAR. Consistent with Panel A, we find a positive and significant effect only in the case of highly complex firms. Thus, the results indicate that M&A announcements by more complex firms are likely to generate positive reactions from the market.

[Insert Table 2 here]

4.3. Acquiring firms' operational risk

In this section, we investigate the effects of the acquirer's operational risk on the relationship between firm complexity and announcement period CAR since acquirers with high operational risk may create different perceptions among investors regarding M&As. Literature suggests that a major source of risk for firms is involvement in international operations. For example, while Agmon and Lessard (1977) and Fatemi (1984) argue that international operations reduce systematic risk and elicit positive market reactions (Doukas & Travlos, 1988), Kwok and Reeb (2000) indicate that international operations positively impact such risk. Reeb *et al.* (1998)

[4] The mean value of the *CAR (-2,2)* is 0.009, and its standard deviation is equal to 0.084. The coefficient for *Firm Complexity* is equal to 0.018. Therefore, a one standard deviation increase in *Firm Complexity* is associated with a 16.80% increase in *CAR (-2,2)* [(0.018*0.084)/0.009) = 0.1680, i.e., 16.80%).

suggest that systematic risk arises from factors such as exchange rate risk, political risk, and agency problems, to mention a few. In the context of complex firms, if investors perceive that the systematic risk is likely to exacerbate an acquirer's difficulty in integrating the target firm or generate additional operational difficulties, the market may react negatively to merger announcements. Further, in firms with high operational risk, a perception of high integration costs, the lack of synergy with the target firm, and the associated decreased financial benefits from M&As may also negatively influence the market's reaction to merger announcements. On the other hand, if the market perceives that an acquisition involves acquiring a target that strengthens the acquirer's strategic positions, such an acquisition announcement may generate a positive market reaction. Rabier (2017) argues that acquisitions motivated by strategic synergies create more wealth than acquisitions motivated by financial synergies, as the later types of acquisitions are more difficult to implement and evaluate, making them more uncertain. Therefore, acquisitions aimed at fulfilling strategic objectives might signal to the market that the management of a more complex firm is committed to addressing systematic risks, leading to a high announcement period CAR.

In addition to systematic risk, it is crucial to consider the impact of idiosyncratic risk in complex firms. Previous studies indicate that operation risk arising from firm-level uncertainty may prevent merged firms from achieving synergy (Rhodes-Kropf & Robinson, 2008; Hoberg & Phillips, 2018) and may cause negative merger performance. However, Nguyen *et al.* (2019) find that firms with idiosyncratic risk experience significant stock price increases if the deals are financed by cash. We argue that in the case of complex firms with high idiosyncratic risk, it may be more challenging for the market to evaluate the potential synergy gain and value creation by a merger. Further, since the ratio of idiosyncratic risk to systematic risk has substantially increased in the US (Morck *et al.*, 2000), the market may be more concerned with the negative consequence of the high idiosyncratic risk of the complex acquirers and, thus, react positively to merger announcements by low-risk complex acquirers. In columns (1) and (2) of Table 3, we consider the level of foreign income/sales as a proxy for systematic risk in the spirit of Huang (2013). The results indicate that investors react positively to merger announcements by complex firms with more systematic risk. In columns (3) and (4), when we consider stock return volatility (Hoberg & Prabhala, 2009) as a proxy for idiosyncratic risk, we find that investors prefer complex acquirers with low idiosyncratic risk. Thus, the results indicate that the market reaction to merger announcements by complex firms depends on the type of risk these acquirers are subject to.

[Insert Table 3 here]

4.4. Board Characteristics

Acquirers' corporate boards play an important role in M&As. The board members may serve by enhancing oversight and governance, helping formulate strategic decision-making and better risk management. While the literature has focused on various aspects of board characteristics, we focus on board size and independence in the context of acquisitions by complex firms, as these two dimensions are most extensively studied. The findings of the studies focusing on broad size indicate contradictory effects of the number of board members. One strand of literature, for example, Lipton and Lorsch (1992) and Jensen (1993) argue that board size beyond a certain point may adversely affect the board's effectiveness. Jensen (1993) indicates that when the number of board members is greater than seven or eight, there are coordination and communication problems among the board members, which makes it easier for the CEOs to control the firm. Similarly, Lipton and Lorsch (1992) argue that a board with more than ten directors may have little time to express ideas and opinions. However, another strand of literature favors larger boards as they bring diverse expertise and resources to firms (Dalton *et al.*, 1999). In firms with larger boards, there may be a higher likelihood that the board will carefully examine the deals and ensure that shareholders' interests are served. Further, since large boards may include more experienced members, it is likely to signal a better governance structure to handle merger deals. Coles *et al.* (2008) argue that large boards are more beneficial for complex firms, such as large firms, firms with higher leverage, and firms that operate across industries. We posit that since larger boards provide better monitoring (Boone *et al.*, 2007) and improve financial reporting quality (Hsu & Yang, 2022), the market is likely to react positively to merger announcements by complex firms with larger boards. Columns (1) and (2) of Table 4 show that more complex firms with larger boards experience positive announcement period CAR[5].

We then focus on the composition of board members. Studies indicate that outsider directors are likely to improve corporate governance mechanisms as they are compensated with stock and stock options and may face adverse reputational effects in the labor market if they do not address shareholders' interests (Fama, 1980; Coles & Hoi, 2003). Coles *et al.* (2008) argue that the benefits of board compositions depend on the nature of knowledge required by firms. Firms in which firm-specific knowledge is more important should benefit in the presence of more insiders, whereas firms that require diverse perspectives should benefit when there are more outsiders on the boards. We posit that since a higher proportion of outside directors in complex firms may provide unbiased oversight and act in the best interests of the shareholders, they are perceived as an assurance by investors that the mergers are initiated with proper consideration of strategic fit. Therefore, investors may feel more confident that the deals are focused on the long-term benefits of the firm, leading to a positive announcement period CAR. We test this conjecture in columns (3) and (4). The results indicate that complex firms with a high percentage of outside directors gain significantly from merger announcements[6]. Thus, the results in this section confirm Coles *et al.* (2008) that complex firms benefit more from larger and more independent boards.

[5] The mean value of the *CAR (-2,2)* is 0.009, and its standard deviation is equal to 0.084. The coefficient for *Firm Complexity* is equal to 0.031 in the case of *Large Board Size*. Therefore, a one standard deviation increase in *Firm Complexity* is associated with a 28.93% increase in *CAR (-2,2)* [(0.031*0.084)/0.009) = 0.2893, i.e., 28.93%).

[6] The mean value of the *CAR (-2,2)* is 0.009, and its standard deviation is equal to 0.084. The coefficient for *Firm Complexity* is equal to 0.033 in the case of *Independent Board*. Therefore, a one standard deviation increase in *Firm Complexity* is associated with a 30.80% increase in *CAR (-2,2)* [(0.033*0.084)/0.009) = 0.3080, i.e., 30.80%).

[Insert Table 4 here]

4.5. Organizational capital

Organizational capital is a multifaceted firm-specific intangible asset that arises from human capital (Prescott & Visscher, 1980) and is based on a firm's internal knowledge and capability (Atkeson & Kehoe, 2005). Li *et al.* (2018b) find that acquirers with higher organizational capital achieve significantly high announcement period CAR. They argue that acquirers with high organizational capital are likely to improve their cost structure and innovative productivity, as organization capital is closely related to a firm's operating, investment, and innovative capabilities. We argue that complex firms may have high organizational capital if they can leverage their diverse resources and capabilities in an effective way to create value. Since complex firms may have multiple segments/departments, they are likely to possess distinct knowledge and expertise attributes. Complex firms with strong corporate cultures may foster successful collaboration with the acquired firm, risk-taking, and improvements, thereby supporting a productive environment and innovations (Francis *et al.*, 2021). We test this conjecture and report the results in Table 5[7].

In columns (1) and (2), we divide the sample based on the organizational capital following Lev and Radhakrishnan (2005) and Eisfeldt and Papanikolaou (2013). The results indicate that complexity has a significant positive effect on cumulative abnormal returns only in complex firms with high organizational capital. In columns (3) and (4), we consider the median industry-adjusted ratio of organizational capital to total assets as a proxy, following Li *et al.* (2018b). The results are still consistent with those in the first two columns[8]. The results in this section indicate that the positive effect of organizational capital on CAR persists even when firm complexity is taken into consideration.

[Insert Table 5 here]

4.6. R&D intensity

Several studies have documented that investors consider R&D expenditures as long-term investments since they are expected to produce future benefits. Therefore, investors take these benefits into account when pricing the stocks. In general, the existing studies offer two different views associated with the innovative performance of acquisitions. The first view, as suggested by Barney (1991), indicates that acquisitions are a strategic weapon that expands acquirers' existing assets. The second view, as suggested by Vermeulen and Barkema (2001), indicates that acquisitions help firms to reduce inertia and rigidity. For high R&D focus complex acquirers,

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[7] Appendix B provides a detailed derivation of organizational capital.

[8] The mean value of the *CAR (-2,2)* is 0.009, and its standard deviation is equal to 0.084. The coefficient for *Firm Complexity* is equal to 0.025 in the case of *High Organizational Capital*. Therefore, a one standard deviation increase in *Firm Complexity* is associated with a 23.33% increase in *CAR (-2,2)* [(0.025*0.084)/0.009) = 0.2333, i.e., 23.33%). Similarly, for *High IndAdj. Organizational Capital*, the coefficient for *Firm Complexity* is equal to 0.024, indicating a 22.40% increase in *CAR (-2,2)*

investors may perceive the acquisitions as an opportunity to combine the R&D capabilities of merging firms, thereby creating better synergy, which leads to greater innovation and wealth creation. Therefore, it can be argued that acquisitions by innovative complex firms may have a higher potential to leverage access to new technologies, human capital, and intellectual properties. Further, since acquisitions may be motivated by risk diversion (Thijssen, 2008), acquisitions by high R&D focus complex firms may be viewed as attempts to achieve economies of scale and scope, thereby reducing the risks associated with uncertainties of R&D projects, leading to positive market reactions to acquisition announcements. We test this conjecture using two proxies of R&D following Chambers *et al.* (2002) – a) the pro forma R&D asset at the end of the year *t* (*Net R&D Asset*) and b) R&D amortization for year *t* (*Net R&D Amortization*), calculated as follows:

$$Net\ R\&D\ Asset_t = RDEXP_t + 0.8(RDEXP_{t-1}) + 0.6(RDEXP_{t-2}) + 0.4(RDEXP_{t-3}) + 0.2(RDEXP_{t-4}) \qquad (2)$$

$$Net\ R\&D\ Amortization_t = 0.2(RDEXP_{t-1} + RDEXP_{t-2} + RDEXP_{t-3} + RDEXP_{t-4} + RDEXP_{t-5}) \qquad (3)$$

Where *RDEXP* is the R&D expenditure for year *t.*

Table 6 reports the results related to R&D intensity. In columns (1) and (2), we consider *Net R&D Asset,* and in columns (3) and (4), we consider *Net R&D Amortization*[9]. In both cases, the results indicate a positive effect of R&D intensity in complex firms. In sum, the results in the section point out the market's positive expectations in response to acquisitions carried out by R&D-intensive complex firms.

[Insert Table 6 here]

4.7. Target size and location

Literature on corporate takeover suggests that firms are more likely to be acquired due to disciplinary actions when they use resources inefficiently (Manne, 1965). Offenberg (2009) extends the dimension of disciplinary mechanisms by identifying that larger firms are subject to disciplinary takeover more than smaller firms. We argue that larger firms may offer significant opportunities for economies of scale, cost savings, and operational efficiencies. Further, complex acquirers may have extensive operational knowledge and experience across various industries, which can be valuable in efficiently utilizing the under-appreciated assets of large targets and integrating such targets more effectively through higher synergies. Following Moeller *et al.* (2004), we test this conjecture in Panel A of Table 7 and find consistent results to our argument.

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[9] The mean value of the *CAR (-2,2)* is 0.009, and its standard deviation equals 0.084. The coefficient for *Firm Complexity* equals 0.026 in the case of *High Net R&D assets*. Therefore, a one standard deviation increase in *Firm Complexity* is associated with a 24.27% increase in *CAR (-2,2)* [(0.026*0.084)/0.009) = 0.2427, i.e., 24.27%). Similarly, for *High Net R&D Amortization*, the coefficient for *Firm Complexity* is equal to 0.020, indicating a 18.67% increase in *CAR (-2,2)*.

The results indicate that, on average, larger targets are likely to increase the acquirers' CAR by 14.93%[10].

We extend our examination of the effect of target characteristics on acquirers' CAR by considering whether the target firms are located inside or outside the US. This is important, as Chakrabarti and Mitchell (2013) find that geographical proximity plays a critical role in influencing acquisition strategies. Their findings indicate that acquirers tend to favor geographically proximate targets due to lower coordination and integration costs. However, other studies provide contradictory evidence of the effect of cross-border acquisitions. For example, Doukas and Travlos (1988) indicate that there is no value gain for acquirers in cross-border acquisitions carried out by firms with prior operations in the host countries. They also find significant gains for acquirers without prior exposure to foreign host countries. Francis *et al.* (2008) also show positive CARs for acquirers with cross-border acquisitions. We posit that since complex acquirers may have well-established operational and organizational structures to identify and mitigate risks associated with cross-border acquisitions and a higher ability to deal with cultural diversity, they may receive positive marker reactions for acquiring international targets. Further, the challenges originating from cultural differences, regulatory restrictions, and communication and coordination problems may be less difficult to manage. We test this conjecture in Panel B of Table 7 and find a positive market reaction to cross-border acquisitions by complex firms. In economic terms, more complex firms with cross-border acquisitions are likely to experience a 28%[11] gain in CAR during the announcement period. In sum, the results in this section provide convincing evidence of the relevance of firm complexity in evaluating market reactions to cross-border acquisitions.

[Insert Table 7 here]

4.8. The effect of diversification

In this section, we examine the level of abnormal returns experienced by complex acquirers conditional on the level of diversification. While a number of studies have examined the effect of geographic and industrial diversification on acquirers' abnormal returns, the results are contradictory. For example, Caves (1996) indicates that acquirers with high intangible assets may create shareholder value through international acquisitions as they are more likely to create higher synergy and efficiency. In contrast, Roll (1986) and Denis *et al.* (2002) indicate that international acquisitions may increase the competition for corporate control, hubris, and agency problems, resulting in less synergistic gain and lower CAR. Moeller and Schlingemann (2005) also find that

[10] The mean value of the *CAR (-2,2)* is 0.009, and its standard deviation equals 0.084. The coefficient for *Firm Complexity* equals 0.016 in the case of *High Net R&D assets*. Therefore, a one standard deviation increase in *Firm Complexity* is associated with a 14.93% increase in *CAR (-2,2)* [(0.016*0.084)/0.009) = 0.1493, i.e., 14.93%%).

[11] The mean value of the *CAR (-2,2)* is 0.009, and its standard deviation equals 0.084. The coefficient for *Firm Complexity* equals 0.030 in the case of *High Net R&D assets*. Therefore, a one standard deviation increase in *Firm Complexity* is associated with a 28% increase in *CAR (-2,2)* [(0.030*0.084)/0.009) = 0.28, i.e., 28%).

international acquirers experience significantly lower returns than domestic acquirers due to differences in institutional environment. While several other studies have extensively examined the effects of diversification and corresponding value consequences, surprisingly, there is a lack of evidence on whether acquisition announcements by complex acquirers that are geographically diversified realize positive or negative announcement period CAR.

In columns (1) and (2) of Table 8, we present results based on the high and low number of foreign segments, while in columns (3) and (4), we consider the role of industrial diversification in terms of the number of business segments, to complement the results related to geographic diversification. The results indicate that complex acquirers with less geographic diversification presence are more likely to experience positive announcement period CAR than more geographically diversified acquirers. This pattern suggests that less diversified acquirers, when making acquisition announcements, may signal a strategic move to expand their capabilities in a specific geographic area never operated before and the intent to strengthen their competitive position. Further, since diversified firms may be discounted (Denis *et al.*, 2002), our results indicate that less diversified complex acquirers are perceived to be more efficient, which may translate into high post-acquisition synergy gains, leading to positive market reactions.

[Insert Table 8 here]

4.9. Sources of funds for M&As

Several studies have examined the role of payment methods in M&As under various conditions and identified the different consequences of such payment methods. While studies identify negative market reactions to stock-based payments rather than cash (Travlos, 1987; Amihud *et al.*, 1990), only a few studies have focused on the role of internal vs. external financing in assessing market reaction. For example, Fischer (2017) finds that cash-based acquisitions occur when acquirers have substantial cash reserves and are more confident about the valuation of the targets, while stock-based acquisitions are preferred when the acquirers want to share risk or have over-valued stocks. In the context of complex firms, we argue that internally financed firms may receive either positive or negative market reactions. If investors are confident about the acquirer's financial strength and the prudence of the management in evaluating the targets, they are likely to react positively. However, if investors perceive that the complex acquirers are likely to face high coordination costs and administrative and other internal inefficiencies, using internal funds for M&As may signal potential misallocation of resources. Similarly, if external funds are used[12], a positive market reaction may be expected if the market perceives that the acquirer is leveraging debt for growth. Following Fischer (2017), we test these conjectures in Table 9. Columns (1) and (2) indicate a positive market reaction when mergers are financed by non-borrowed funds. To

[12] In our sample, only twenty-seven acquisitions are flagged as "Financing via Common Stock," which indicates a vast majority of acquisitions are financial by borrowed funds or cash or a combination of both.

further investigate the effect of the source of finance, in columns (2) and (4), we consider internal and external funds and find a more economically significant positive market reaction when internal funds are used. Thus, the results indicate a positive market perception of merger announcements by complex firms when they use internally generated funds for acquisitions. This may also suggest investors' confidence in the capability of the acquirer's management.

[Insert Table 9 here]

4.10. Managerial ability

A number of studies have explored the impact of managerial ability in the context of M&As. For example, Chen and Lin (2018) find that high-ability managers are associated with profitable M&As and generate positive announcement period CAR. More recently, Feng and Doukas (2021) report that acquirers with strong managerial ability realize higher announcement-period abnormal returns. They argue that high-ability managers perform better in situations involving high uncertainty. Similarly, Doukas and Zhang (2020) show that acquirers with high-ability managers engage in a high level of earning smoothing and realize better announcement period abnormal returns. Cui and Leung (2020) find that acquirers with high managerial ability experience high M&A synergy and thus enjoy better long-term performance. In fact, high-ability managers are likely to have more expertise in the effective integration of targets as they may have a higher level of skill in identifying the strategic fit of the targets.

According to Hambrick and Mason (1984), organizational strategy and performance depend on managerial characteristics. They argue that following the *upper echelon theory*, different managers have different experiences, which induce them to make different choices. Bamber *et al.* (2010) find that these differences in choices, i.e., manager-specific fixed effects, are reflected in managerial decisions in their firms' voluntary financial disclosure choices. Extending the findings of Bamber *et al.* (2010), Baik *et al.* (2018) find that high-ability managers improve the information environment of their firms since they have a better understanding of their firms (Demerjian *et al.*, 2012), which leads to a better knowledge-sharing with investors (Baik *et al.*, 2011). The findings of these studies indicate that when high-ability managers run more complex firms, these managers are likely to be more specific in disclosing the complexity-related attributes of their firms. They may also conduct more due diligence in selecting targets, reducing the risk of acquiring underperforming assets. Thus, since the market may be more confident in the high-ability managers' superior communication and strategic skills, merger announcements by complex firms run by high-ability managers may receive favorable market reactions. We test this conjecture using the managerial ability data as developed by Demerjian *et al.* (2012)[13]. The results are presented in Table (10). The results indicate that the average market capitalization of the complex

[13] The data is downloaded from: https://peterdemerjian.weebly.com/managerialability.html

firm run by high-ability managers increases by 25.2%[14] during the five-day window surrounding the announcement date. Thus, our results reinforce the importance of managerial ability in a firm's strategic decisions and performance.

[Insert Table 10 here]

4.11. Takeover premium

According to Officer (2007) and Amel-Zadeh and Zhang (2015), a takeover premium is the excess of the offer price over the target stock, where the offer price reflects the potential benefit of the acquisition. Scholars have identified several underlying reasons for offering a premium in acquisitions. Some studies show that under certain situations, takeover premiums are higher. For example, Bates and Lemmon (2003) indicate that takeover premiums are higher in the presence of target termination agreements; Chatterjee *et al.* (2012) find that divergence of opinion among investors induces higher takeover premiums. On the contrary, Bargeron (2012) shows that the presence of a Shareholder Tender Agreement (STA) induces a lower takeover premium. While these studies provide a comprehensive list of the determinants of takeover premiums, to the best of our knowledge, they overlook the influence of acquirers' complexity in determining takeover premiums. We argue that firm complexity may influence takeover premiums either positively or negatively. Complex acquirers with efficient operations and broader access to resources may reduce the perceived risks of acquisitions related to synergies and, therefore, may offer a higher premium. This may also be possible when complex acquirers have access to sophisticated processes and teams that allow these acquirers to assess target firms more accurately. However, if the complexity of acquirers leads to difficulty in accessing the synergies that can be derived from the acquisition, complex acquirers may be willing to offer lower or negative premiums. We examine the effect of acquirers' complexity on the takeover premium by using two measures of offer price-based takeover premiums following Suk and Wang (2021)[15]:

$$OfferP1W = \frac{\text{Offer price – Target Closing Stock 1 weeks before announcement day}}{\text{Target Closing Stock 1 weeks before announcement day}} \quad (4)$$

$$OfferP1D = \frac{\text{Offer price – Target Closing Stock 1 day before announcement day}}{\text{Target Closing Stock 1 day before announcement day}} \quad (5)$$

Table 11 presents the regression results on the relationship between acquirers' complexity and takeover premium. The results show that the complexity of the acquiring firm is positive and significant for both one week before (*OfferP1W)* and one day before (*OfferP1D)*. The gradual

[14] The mean value of the *CAR (-2,2)* is 0.009. The coefficient for *Firm Complexity* is equal to 0.027, and its standard deviation is equal to 0.084. A one standard deviation increase in *Firm Complexity* is associated with a 25.2% increase in *CAR (-2,2)* [(0.027*0.084)/0.009) = 0.252, i.e., 25.2%).

[15] Here, we create a dummy variable based on the median value of the offer premium due to availability of data.

statistical and economical increase in the coefficient of *Firm Complexity* may indicate that complex acquirers are willing to offer a higher premium as they approach the announcement dates.

[Insert Table 11 here]

4.12. Endogeneity

In our analysis of the effect of firm complexity on the announcement period returns, while we control for various firm-level characteristics, along with firm and year-fixed effects, the possibility of potential endogeneity may not be ruled out. This is because it is possible that some unobserved factors may have affected both firm complexity and announcement period CAR. Since it may not be quite straightforward to determine how the unobserved factors may influence firm complexity and CAR, we use the instrumental variable approach in a 2SLS (two-stage least square) method to mitigate endogeneity concerns.

As the measure of firm complexity developed by Loughran and McDonald (2023) is relatively new, to the best of our knowledge, the existing literature offers limited choice of instruments. The measure of firm complexity developed by Loughran and McDonald (2023) is on specific keywords from the 10-K statements. We, therefore, develop an instrument based on the findings of multiple studies related to firm location and the quality of financial statements. Urcan (2007) finds that the quality of corporate disclosure is affected by the geographical locations of firms. Specifically, firms located in rural areas create higher-quality financial statements. Further, Pirinsky and Wang (2006) suggest that a firm's headquarters location is exogenously determined. Since the headquarters ZIP codes are unrelated to corporate policies (Jiraporn *et al.*, 2014), it can be argued that M&A decisions are also unlikely to be influenced by headquarters ZIP codes. Therefore, based on Chatjuthamard and Jiraporn (2023), we develop our instrument by calculating the average firm complexity (excluding the focal firm) within a specific three-digit ZIP code. Since the sign of the coefficient of the *ZIP-based firm complexity* may depend on the extent of concentration of same-industry firms, we argue that the coefficient of *ZIP-based firm complexity* may be positive or negative. In column (1) of Table 12, we regress *Firm Complexity* on the ZIP code-specific firm complexity and other firm and deal characteristics, as in our baseline regressions. We find that the coefficient of *ZIP-based firm complexity* is negative, suggesting the dominance of firms belonging to different industries within a specific three-digit ZIP code. In column (2), we regress the announcement period CAR on the fitted value derived from the first stage, along with other control variables. The coefficient of *Fitted* indicates a statistically significant positive effect on CAR. Thus, the results may alleviate the concern that our findings are subject to endogeneity.

[Insert Table 12 here]

5. Conclusion

While the research on firm complexity has received scholarly attention over the last two decades, its popularity has gained significant momentum in the last few years. Nevertheless, scholars have overlooked the possible role of acquiring firms' complexity in influencing the market reaction to M&A announcements. Our study fills this gap in the literature and reveals that acquirers' complexity has a positive impact on the market's reaction to acquisition announcements. The results reveal a positive effect of complexity on the announcement period abnormal returns, which is counter-intuitive to the traditional notion that complexity may be detrimental to firm performance and governance. The findings suggest that complexity could be viewed as a strategic advantage in certain contexts, challenging existing assumptions about its impact. Our results indicate that the market may perceive the acquiring firm's complexity as an asset rather than a liability, suggesting that more complex firms may possess characteristics that the market believes to be favorable for acquisitions.

Our analyses provide evidence that M&A announcements by more complex firms receive favorable market reactions when acquirers face high systematic risk but low idiosyncratic risk, have larger and more independent boards, and possess high organizational capital. Further, the results indicate a positive announcement period cumulative abnormal return for R&D-intensive and less diversified acquirers as well as large and cross-border targets. The results reveal that more complex firms tend to pay a higher takeover premium, suggesting that they have higher confidence to improve firm performance and shareholder value from their acquisition decisions. In sum, our study not only provides evidence of the importance of considering firm complexity in empirical corporate finance but also opens up an important dimension of corporate characteristics that may influence the outcomes of other major corporate decisions.

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Variables	Definitions	Source
Firm complexity	The measure of firm complexity as developed by Loughran and McDonald (2023)	
Tobin's Q	The Market value of assets scaled by the book value of assets: AT – CEQ + CSHO × PRCC)/AT	Compustat
ROA	Net income (OIBDP) scaled by the book value of total assets (AT)	Compustat
Leverage	The sum of long-term and short-term debt (DLTT + DLC) scaled by the market value of total assets (AT - CEQ + CSHO ×PRCC)	Compustat
Size	The log of the book value of total assets (AT)	Compustat
All Cash Dummy	A dummy variable that takes a value of 1 if a deal is purely cash-financed and 0 otherwise	SDC Platinum
Stock Deal Dummy	A dummy variable that takes a value of 1 if a deal is partially stock financed and 0 otherwise	SDC Platinum
Subsidiary Target	A dummy variable that takes a value of 1 if the target is a subsidiary and 0 otherwise	SDC Platinum
Relative Deal Size	The deal value (from SDC), scaled by the market of the acquirer's total assets	Compustat
Diversifying Dummy	A dummy variable that takes a value of 1 if the acquirer and the target do not share a Fama-French industry and 0 otherwise	SDC Platinum
Hostile Dummy	A dummy variable that takes a value of 1 if the deal is a hostile deal and 0 otherwise	SDC Platinum
Public Target	A dummy variable that takes a value of 1 if the target firm is a public firm and 0 otherwise	SDC Platinum
Tender Offer	A dummy variable that takes a value of 1 if a tender offer is launched for the target and 0 otherwise	SDC Platinum
Private Target	A dummy variable that takes a value of 1 if the target firm is a private firm and 0 otherwise	SDC Platinum
Divestiture	A dummy variable that takes a value of 1 if the deal is a divestiture and 0 otherwise	SDC Platinum
Foreign Income	Pretax Income - Foreign (PIFO)	Compustat
Return Volatility	The standard deviation of daily stock returns using stock prices over the past 60 months.	CRSP
Board Size	The number of directors on the board.	ISS Director
Board Independence	The percentage of outside directors on the board	ISS Director
Geographic segments	The number of geographic segments	Compustat
Business Segment	The number of business segments	Compustat

Table 1: Summary statistics

Panel A presents the summary statistics of the variables used in examining the effect of firm complexity on five-day cumulative abnormal return (CAR) around the event date (-2,+2), where the merger and acquisition announcement date is the event day (0). The sample period covers between 1996 and 2021, and the sample consists of 10,469 firm-year observations. The sample excludes utility firms (SIC codes 4900-4999) or financial firms (SIC codes 6000-6999) and all the missing observations. *Firm Complexity* is the measure of firm complexity as determined by Loughran and McDonald (2020); *Tobin's Q* is the market value of assets over the book value of assets; *ROA* is the net income over the book value of total assets; *Leverage* is the total debt scaled by the market value of total assets; *Size* is the natural log of the book value of total assets; *Relative Deal Size* is the deal value scaled by the acquirer's market value of total assets; *Diversifying Dummy* is dummy variable that takes a value of 1 if an acquirer and target do not share a Fama–French industry (48), and 0 otherwise; *Hostile Dummy* is dummy variable that takes a value of 1 for hostile deals, and 0 otherwise; *Public Target* is dummy variable that takes a value of 1 if the target firm is a public targets, and 0 otherwise; *Subsidiary Target* is dummy variable that takes a value of 1 for subsidiary targets, and 0 otherwise; *All Cash Dummy* is dummy variable that takes a value of 1 if a deal is entirely cash-financed deals, 0 otherwise; *Private Target* is dummy variable that takes a value of 1 if the target firm is a private targets, and 0 otherwise; Finally, *Stock Deal Dummy* is dummy variable that takes a value of 1 for deals that are at least partially stock financed, and 0 otherwise. Appendix A provides a detailed definition of all the variables used in the study. Panel B reports on the yearly industry-wide distribution of acquisitions.

Panel A: Descriptive statistics of full sample

	N	Mean	Std Dev	Lower Quartile	Median	Upper Quartile
CAR	10469	0.009	0.084	-0.027	0.005	0.042
Firm complexity	10469	0.429	0.168	0.306	0.402	0.525
Tobin's Q	10469	2.278	1.649	1.329	1.777	2.577
ROA	10469	0.032	0.113	0.013	0.049	0.084
Leverage	10469	0.146	0.146	0.019	0.111	0.221
Size	10469	7158.34	23021.13	310.73	1070.21	4000.00
Relative Deal Size	10469	0.293	6.323	0.015	0.051	0.147
Diversifying Dummy	10469	0.425	0.494	0	0	1.000
Hostile Dummy	10469	0.008	0.088	0	0	0
Public Target	10469	0.143	0.350	0	0	0
Subsidiary Target	10469	0.338	0.473	0	0	1.000
All Cash Dummy	10469	0.489	0.500	0	0	1.000
Private Target	10469	0.506	0.500	0	1.000	1.000
Stock Deal Dummy	10469	0.501	0.500	0	1.000	1.000

Panel B: Yearly distribution of acquisitions, industry-wise (Fama-Frech 48 Industry)

Year	Total	Average Firm Complexity	Agriculture (01–09)	Mine and Construction (10–17)	Manufacturing (20–39)	Transportation And Communications (40–43)	Wholesale and retail Trade (50–59)	Services (70–99)
1996	354	0.331	4	10	202	23	43	72
1997	803	0.335	1	50	375	60	92	225
1998	831	0.353	0	41	378	41	95	276
1999	741	0.393	0	31	375	35	71	229

2000	605	0.397	0	26	341	34	38	166
2001	495	0.425	1	34	253	37	31	139
2002	520	0.434	1	25	254	19	53	168
2003	499	0.410	0	32	252	17	42	156
2004	617	0.441	1	33	311	21	46	205
2005	612	0.429	5	32	282	27	51	215
2006	588	0.423	1	33	299	27	52	176
2007	593	0.416	1	38	294	32	48	180
2008	452	0.425	3	33	203	24	38	151
2009	358	0.442	2	24	194	17	14	107
2010	415	0.491	1	32	225	18	31	108
2011	442	0.461	0	30	241	25	35	111
2012	458	0.475	2	30	240	30	41	115
2013	402	0.462	4	20	216	38	28	96
2014	495	0.460	4	28	250	33	43	137
2015	332	0.475	0	15	172	29	30	86
2016	215	0.490	0	24	119	16	9	47
2017	184	0.480	0	8	100	13	20	43
2018	237	0.505	0	16	131	12	13	65
2019	185	0.465	0	10	105	10	9	51
2020	167	0.463	0	10	86	9	8	54
2021	221	0.460	0	17	103	7	17	77

Table 2: Baseline regressions

The table reports the regression results for the relationship between firm complexity and the five-day (-2,+2) cumulative abnormal returns (CAR) around the merger and acquisition announcement date (0). Column (1) of Panel A shows the regressions results with firm clustering and column (2) shows the results with Fama-French industry (48) clustering. Panel B shows the regression results based on high and low firm complexity (the sample is divided based on the median value of *Firm Complexity*. *Firm Complexity* is the measure of firm complexity as determined by Loughran and McDonald (2020); *Tobin's Q* is the market value of assets over the book value of assets; *ROA* is the net income over the book value of total assets; *Leverage* is the total debt scaled by the market value of total assets; *Size* is the natural log of the book value of total assets; *Relative Deal Size* is the deal value scaled by the acquirer's market value of total assets; *Diversifying Dummy* is dummy variable that takes a value of 1 if an acquirer and target do not share a Fama–French industry (48), and 0 otherwise; *Hostile Dummy* is dummy variable that takes a value of 1 for hostile deals, and 0 otherwise; *Public Target* is dummy variable that takes a value of 1 if the target firm is a public targets, and 0 otherwise; *Subsidiary Target* is dummy variable that takes a value of 1 for subsidiary targets, and 0 otherwise; *All Cash Dummy* is dummy variable that takes a value of 1 if a deal is entirely cash-financed deals, 0 otherwise; *Private Target* is dummy variable that takes a value of 1 if the target firm is a private targets, and 0 otherwise; Finally, *Stock Deal Dummy* is dummy variable that takes a value of 1 for deals that are at least partially stock financed, and 0 otherwise. Appendix A provides a detailed definition of all the variables used in the study. In parentheses are the t-statistics based on standard errors adjusted for heteroskedasticity (White, 1980) and firm clustering (Peterson, 2008). The symbols ***, **, and * indicate the statistical significance based on two-sided tests at the 1%, 5%, and 10% levels, respectively.

Panel A:

	Dependent Variable:	
	CAR (-2,2)	*CAR (-2,2)*
	(1)	(2)
Firm complexity	**0.018****	**0.018****
	(2.037)	**(2.442)**
Tobin's Q	0.004**	0.004**
	(2.561)	(2.349)
ROA	0.013	0.014
	(0.883)	(1.441)
Leverage	0.016	0.016
	(0.854)	(1.038)
Size	-0.003	-0.003*
	(-1.155)	(-1.724)
Relative Deal Size	$0.071*10^{-3}$	$0.071*10^{-3}$
	(0.677)	(0.723)
Diversifying Dummy	-0.006***	-0.005**
	(-2.777)	(-2.580)
Hostile Dummy	-0.008	-0.008
	(-0.981)	(-0.930)
Public Target	-0.013	-0.013
	(-0.541)	(-0.715)
Subsidiary Target	0.012	0.012**
	(1.452)	(2.203)
All Cash Dummy	0.027**	0.027**
	(2.137)	(2.076)
*Public Target *Stock Deal Dummy*	-0.011	-0.011
	(-0.497)	(-0.584)
*Public Target * All Cash Dummy*	-0.002	-0.002

	(-0.071)	(-0.142)
*Private Target * Stock Deal Dummy*	0.008	0.008
	(0.963)	(1.258)
*Private Target * All Cash Dummy*	-0.022**	-0.022**
	(-2.223)	(-2.209)
*Subsidiary Target *All Cash Dummy*	-0.025*	-0.025**
	(-1.911)	(-2.049)
No. of Observations	10,469	10,385
Adj R-squared	0.1044	0.1041
Firm FE	Yes	Yes
Year FE	Yes	Yes

Panel B:

	Dependent Variable: *CAR (-2,2)*	
	High Complex Firms	*Low Complex Firms*
	(1)	(2)
Firm complexity	**0.022***	**0.002**
	(1.859)	**(0.090)**
Tobin's Q	0.001	0.006**
	(0.780)	(2.236)
ROA	0.009	0.002
	(0.389)	(0.092)
Leverage	-0.028	0.048*
	(-0.848)	(1.723)
Size	-0.002	-0.001
	(-0.503)	(-0.225)
Relative Deal Size	0.002	$0.122*10^{-3}$
	(0.483)	(0.273)
Diversifying Dummy	-0.010***	0.001
	(-3.947)	(0.414)
Hostile Dummy	$-0.447*10^{-3}$	-0.003
	(-0.039)	(-0.220)
Public Target	-0.058	0.001
	(-1.336)	(0.050)
Subsidiary Target	0.005	0.020*
	(0.453)	(1.814)
All Cash Dummy	0.025	-0.003
	(1.206)	(-0.135)
*Public Target *Stock Deal Dummy*	0.028	-0.019
	(0.652)	(-0.765)
*Public Target * All Cash Dummy*	0.041	0.023
	(0.884)	(0.724)
*Private Target * Stock Deal Dummy*	0.005	0.011
	(0.438)	(1.071)
*Private Target * All Cash Dummy*	-0.022	0.011
	(-1.337)	(0.568)
*Subsidiary Target *All Cash Dummy*	-0.020	0.002
	(-0.962)	(0.110)

No. of Observations	4,889	4,896
Adj R-squared	0.1084	0.0825
Firm FE	Yes	Yes
Year FE	Yes	Yes

Table 3: Acquirers' operational risk

The table reports the regression results for the relationship between firm complexity and five-day (-2,+2) cumulative abnormal return (CAR) during the window around the event date, where the merger and acquisition announcement date is the event day (0), conditional on the high and low operational risk. We divide the high and low categories based on the lagged median values of operational risk. In columns (1) and (2), we define operational risk in terms of the amount of foreign income; and in columns (3) and (4), we define operational risk in terms of stock return volatility. We divide the high and low categories based on the median values during the previous period. *Firm Complexity* is the measure of firm complexity as determined by Loughran and McDonald (2020); *Tobin's Q* is the market value of assets over the book value of assets; *ROA* is the net income over the book value of total assets; *Leverage* is the total debt scaled by the market value of total assets; *Size* is the natural log of the book value of total assets; *Relative Deal Size* is the deal value scaled by the acquirer's market value of total assets; *Diversifying Dummy* is dummy variable that takes a value of 1 if an acquirer and target do not share a Fama–French industry (48), and 0 otherwise; *Hostile Dummy* is dummy variable that takes a value of 1 for hostile deals, and 0 otherwise; *Public Target* is dummy variable that takes a value of 1 if the target firm is a public targets, and 0 otherwise; *Subsidiary Target* is dummy variable that takes a value of 1 for subsidiary targets, and 0 otherwise; *All Cash Dummy* is dummy variable that takes a value of 1 if a deal is entirely cash-financed deals, 0 otherwise; *Private Target* is dummy variable that takes a value of 1 if the target firm is a private targets, and 0 otherwise; Finally, *Stock Deal Dummy* is dummy variable that takes a value of 1 for deals that are at least partially stock financed, and 0 otherwise. Appendix A provides a detailed definition of all the variables used in the study. In parentheses are the t-statistics based on standard errors adjusted for heteroskedasticity (White, 1980) and firm clustering (Petersen, 2008). The symbols ***, **, and * indicate the statistical significance based on two-sided tests at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable: *CAR (-2,2)*			
	High Foreign Income	*Low Foreign Income*	*High Return Volatility*	*Low Return Volatility*
	(1)	(2)	(3)	(4)
Firm complexity	**0.034*** **	**0.003**	**0.022**	**0.015***
	(3.168)	**(0.125)**	**(1.127)**	**(1.733)**
Tobin's Q	-0.001	0.005*	0.006**	0.001
	(-0.705)	(1.792)	(2.543)	(0.827)
ROA	0.030	0.023	-0.003	0.022
	(1.025)	(0.768)	(-0.148)	(0.879)
Leverage	$-0.067*10^{-3}$	-0.027	0.018	-0.005
	(-0.006)	(-0.651)	(0.552)	(-0.251)
Size	-0.005	0.002	-0.006	-0.001
	(-1.166)	(0.275)	(-1.041)	(-0.317)
Relative Deal Size	$-0.310*10^{-3}$	0.028**	$-0.052*10^{-3}$	$-0.011*10^{-3}$
	(-0.443)	(2.324)	(-0.990)	(-0.036)
Diversifying Dummy	-0.007**	-0.008*	-0.008*	-0.004**
	(-2.407)	(-1.904)	(-1.807)	(-2.030)
Hostile Dummy	-0.022**	0.007	-0.005	-0.003
	(-2.084)	(0.418)	(-0.188)	(-0.347)
Public Target	-0.075***	-0.120**	0.014	-0.002
	(-5.371)	(-2.142)	(0.257)	(-0.141)
Subsidiary Target	-0.008	0.001	0.035**	-0.002
	(-0.615)	(0.035)	(2.133)	(-0.213)
All Cash Dummy	0.016	0.005	0.044	0.011
	(0.650)	(0.170)	(1.266)	(0.804)
*Public Target *Stock Deal Dummy*	0.034***	0.074	-0.023	-0.029**
	(3.999)	(1.446)	(-0.440)	(-2.154)

*Public Target * All Cash Dummy*	0.052**	0.089	-0.028	-0.009
	(2.040)	(1.396)	(-0.456)	(-0.440)
*Private Target * Stock Deal Dummy*	-0.011	-0.013	0.023	-0.004
	(-0.937)	(-0.529)	(1.428)	(-0.404)
*Private Target * All Cash Dummy*	-0.021	-0.015	-0.019	-0.018*
	(-1.109)	(-0.932)	(-0.604)	(-1.771)
*Subsidiary Target *All Cash Dummy*	-0.011	-0.003	-0.048	-0.007
	(-0.479)	(-0.110)	(-1.339)	(-0.501)
No. of Observations	2,392	2183	4,134	4,491
Adj R-squared	0.0843	0.0767	0.0511	0.1376
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Table 4: The effect of board characteristics

The table reports the regression results for the relationship between firm complexity and five-day (-2,+2) cumulative abnormal return (CAR) during the window around the event date, where the merger and acquisition announcement date is the event day (0), conditional on the high and low board size and board independence. We divide the high and low categories based on the lagged median values of board size and independence. *Firm Complexity* is the measure of firm complexity as determined by Loughran and McDonald (2020); *Tobin's Q* is the market value of assets over the book value of assets; *ROA* is the net income over the book value of total assets; *Leverage* is the total debt scaled by the market value of total assets; *Size* is the natural log of the book value of total assets; *Relative Deal Size* is the deal value scaled by the acquirer's market value of total assets; *Diversifying Dummy* is dummy variable that takes a value of 1 if an acquirer and target do not share a Fama–French industry (48), and 0 otherwise; *Hostile Dummy* is dummy variable that takes a value of 1 for hostile deals, and 0 otherwise; *Public Target* is dummy variable that takes a value of 1 if the target firm is a public targets, and 0 otherwise; *Subsidiary Target* is dummy variable that takes a value of 1 for subsidiary targets, and 0 otherwise; *All Cash Dummy* is dummy variable that takes a value of 1 if a deal is entirely cash-financed deals, 0 otherwise; *Private Target* is dummy variable that takes a value of 1 if the target firm is a private targets, and 0 otherwise; Finally, *Stock Deal Dummy* is dummy variable that takes a value of 1 for deals that are at least partially stock financed, and 0 otherwise. Appendix A provides a detailed definition of all the variables used in the study. In parentheses are the t-statistics based on standard errors adjusted for heteroskedasticity (White, 1980) and firm clustering (Petersen, 2008). The symbols ***, **, and * indicate the statistical significance based on two-sided tests at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable: *CAR (-2,2)*			
	Large Board Size	*Small Board Size*	*Independent Board*	*Non-Independent Board*
	(1)	(2)	(3)	(4)
Firm complexity	**0.031*** **	**-0.005**	**0.033*** **	**0.013**
	(2.883)	**(-0.248)**	**(2.815)**	**(0.813)**
Tobin's Q	-0.002	0.005**	0.002	0.002
	(-1.248)	(1.968)	(0.963)	(0.972)
ROA	0.036	0.018	0.013	0.020
	(1.212)	(0.580)	(0.450)	(0.537)
Leverage	-0.019	0.009	-0.037	-0.008
	(-0.740)	(0.246)	(-1.362)	(-0.253)
Size	$-0.349*10^{-3}$	-0.016**	-0.003	-0.007
	(-0.085)	(-2.071)	(-0.612)	(-1.279)
Relative Deal Size	$-0.117*10^{-3}$	0.019*	$-0.399*10^{-3}$	0.004
	(-0.139)	(1.726)	(-0.368)	(1.340)
Diversifying Dummy	-0.006**	-0.007	-0.005*	-0.010**
	(-2.267)	(-1.356)	(-1.768)	(-2.370)
Hostile Dummy	-0.008	0.006	-0.007	-0.001
	(-0.742)	(0.393)	(-0.644)	(-0.121)
Public Target	0.006	-0.022	-0.060***	-0.025
	(0.408)	(-0.702)	(-4.561)	(-0.955)
Subsidiary Target	0.009	0.023	0.017*	0.002
	(0.766)	(0.850)	(1.680)	(0.072)
All Cash Dummy	0.021	0.043	0.048**	-0.015
	(1.277)	(1.070)	(2.333)	(-0.597)
*Public Target *Stock Deal Dummy*	-0.018*	0.002	0.050***	$-0.426*10^{-3}$
	(-1.667)	(0.104)	(4.119)	(-0.038)
*Public Target * All Cash Dummy*	-0.022	-0.007	0.026	0.033

	(-1.143)	(-0.146)	(1.156)	(1.204)
*Private Target * Stock Deal Dummy*	0.010	0.011	0.017*	-0.005
	(0.859)	(0.413)	(1.765)	(-0.216)
*Private Target * All Cash Dummy*	-0.015	-0.036	-0.029*	-0.003
	(-1.265)	(-1.094)	(-1.763)	(-0.242)
*Subsidiary Target *All Cash Dummy*	-0.021	-0.038	-0.040**	0.009
	(-1.231)	(-0.930)	(-1.981)	(0.373)
No. of Observations	2,817	1,417	2,360	1,885
Adj R-squared	0.0910	0.1072	0.1208	0.1173
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Table 5: Organizational capital

The table reports the regression results for the relationship between firm complexity and five-day (-2,+2) cumulative abnormal return (CAR) during the window around the event date, where the merger and acquisition announcement date is the event day (0), conditional on the organizational capital and industry-adjusted organizational capital, measured by using capitalized selling, general, and administrative (SG&A) expenses. We divide the high and low categories based on the lagged median values of organizational capital and industry-adjusted organizational capital. *Firm Complexity* is the measure of firm complexity as determined by Loughran and McDonald (2020); *Tobin's Q* is the market value of assets over the book value of assets; *ROA* is the net income over the book value of total assets; *Leverage* is the total debt scaled by the market value of total assets; *Size* is the natural log of the book value of total assets; *Relative Deal Size* is the deal value scaled by the acquirer's market value of total assets; *Diversifying Dummy* is dummy variable that takes a value of 1 if an acquirer and target do not share a Fama–French industry (48), and 0 otherwise; *Hostile Dummy* is dummy variable that takes a value of 1 for hostile deals, and 0 otherwise; *Public Target* is dummy variable that takes a value of 1 if the target firm is a public targets, and 0 otherwise; *Subsidiary Target* is dummy variable that takes a value of 1 for subsidiary targets, and 0 otherwise; *All Cash Dummy* is dummy variable that takes a value of 1 if a deal is entirely cash-financed deals, 0 otherwise; *Private Target* is dummy variable that takes a value of 1 if the target firm is a private targets, and 0 otherwise; Finally, *Stock Deal Dummy* is dummy variable that takes a value of 1 for deals that are at least partially stock financed, and 0 otherwise. Appendix A provides a detailed definition of all the variables used in the study. In parentheses are the t-statistics based on standard errors adjusted for heteroskedasticity (White, 1980) and firm clustering (Petersen, 2008). The symbols ***, **, and * indicate the statistical significance based on two-sided tests at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable: *CAR (-2,2)*			
	High Organizational Capital	*Low Organizational Capital*	*High IndAdj. Organizational Capital*	*Low IndAdj. Organizational Capital*
	(1)	(2)	(3)	(4)
Firm complexity	**0.025****	**0.026**	**0.024***	**0.014**
	(2.061)	**(1.619)**	**(1.766)**	**(1.035)**
Tobin's Q	0.005	0.005***	0.004*	0.003
	(1.381)	(2.740)	(1.859)	(1.220)
ROA	-0.002	0.010	0.021	-0.011
	(-0.075)	(0.366)	(0.764)	(-0.385)
Leverage	0.022	-0.012	0.022	-0.016
	(0.657)	(-0.468)	(0.688)	(-0.614)
Size	-0.004	-0.008**	-0.003	-0.012***
	(-0.814)	(-2.054)	(-0.730)	(-2.764)
Relative Deal Size	$-0.150*10^{-3}$	$0.034*10^{-3}$	0.001	-0.000**
	(-1.256)	(0.103)	(0.762)	(-2.309)
Diversifying Dummy	-0.001	-0.006*	-0.004	-0.003
	(-0.355)	(-1.888)	(-1.193)	(-0.915)
Hostile Dummy	0.010	-0.010	-0.002	0.009
	(0.834)	(-1.056)	(-0.128)	(0.849)
Public Target	-0.061	0.004	-0.043	0.002
	(-1.396)	(0.206)	(-1.240)	(0.081)
Subsidiary Target	0.002	0.020	$0.294*10^{-3}$	0.018
	(0.221)	(1.609)	(0.035)	(1.197)
All Cash Dummy	0.011	0.037*	0.012	0.058
	(0.558)	(1.687)	(0.846)	(1.646)
*Public Target *Stock Deal Dummy*	0.028	-0.010	0.010	-0.013
	(0.647)	(-0.698)	(0.286)	(-1.097)

*Public Target * All Cash Dummy*	0.047	-0.018	0.035	-0.043
	(1.004)	(-0.666)	(0.947)	(-1.096)
*Private Target * Stock Deal Dummy*	-0.003	0.021	$-0.335*10^{-3}$	0.018
	(-0.294)	(1.572)	(-0.039)	(1.175)
*Private Target * All Cash Dummy*	-0.015	-0.025	-0.018	-0.046
	(-1.014)	(-1.365)	(-1.478)	(-1.470)
*Subsidiary Target *All Cash Dummy*	-0.010	-0.036	-0.012	-0.055
	(-0.489)	(-1.584)	(-0.768)	(-1.565)
No. of Observations	3,701	3,753	3,636	3,773
Adj R-squared	0.1021	0.1097	0.0945	0.1210
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Table 6: Research and development intensity

The table reports the regression results for the relationship between firm complexity and five-day (-2,+2) cumulative abnormal return (CAR) during the window around the event date, where the merger and acquisition announcement date is the event day (0), conditional on the high and low net amount of R&D assets and R&D amortization. We divide the high and low categories based on the lagged median values of R&D assets and R&D amortization. *Firm Complexity* is the measure of firm complexity as determined by Loughran and McDonald (2020); *Tobin's Q* is the market value of assets over the book value of assets; *ROA* is the net income over the book value of total assets; *Leverage* is the total debt scaled by the market value of total assets; *Size* is the natural log of the book value of total assets; *Relative Deal Size* is the deal value scaled by the acquirer's market value of total assets; *Diversifying Dummy* is dummy variable that takes a value of 1 if an acquirer and target do not share a Fama–French industry (48), and 0 otherwise; *Hostile Dummy* is dummy variable that takes a value of 1 for hostile deals, and 0 otherwise; *Public Target* is dummy variable that takes a value of 1 if the target firm is a public targets, and 0 otherwise; *Subsidiary Target* is dummy variable that takes a value of 1 for subsidiary targets, and 0 otherwise; *All Cash Dummy* is dummy variable that takes a value of 1 if a deal is entirely cash-financed deals, 0 otherwise; *Private Target* is dummy variable that takes a value of 1 if the target firm is a private targets, and 0 otherwise; Finally, *Stock Deal Dummy* is dummy variable that takes a value of 1 for deals that are at least partially stock financed, and 0 otherwise. Appendix A provides a detailed definition of all the variables used in the study. In parentheses are the t-statistics based on standard errors adjusted for heteroskedasticity (White, 1980) and firm clustering (Petersen, 2008). The symbols ***, **, and * indicate the statistical significance based on two-sided tests at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable: *CAR (-2,2)*			
	High Net R&D asset	*Low Net R&D asset*	*High Net R&D Amortization*	*Low Net R&D Amortization*
	(1)	(2)	(3)	(4)
Firm complexity	**0.026****	**0.014**	**0.020***	**0.016**
	(2.413)	**(0.806)**	**(1.908)**	**(0.903)**
Tobin's Q	0.002	0.009	0.002	0.009
	(1.479)	(1.510)	(1.250)	(1.581)
ROA	0.020	-0.039	0.014	-0.017
	(1.209)	(-0.811)	(0.810)	(-0.373)
Leverage	0.032	-0.017	0.022	-0.010
	(1.045)	(-0.599)	(0.728)	(-0.348)
Size	-0.007*	-0.003	-0.006*	-0.006
	(-1.911)	(-0.720)	(-1.735)	(-1.451)
Relative Deal Size	$-0.191*10^{-3}$	$0.027*10^{-3}$	$-0.295*10^{-3}$	$0.010*10^{-3}$
	(-0.230)	(0.352)	(-0.355)	(0.128)
Diversifying Dummy	-0.007**	-0.001	-0.006**	$0.031*10^{-3}$
	(-2.395)	(-0.372)	(-2.255)	(0.008)
Hostile Dummy	0.010	-0.020**	0.010	-0.020**
	(0.784)	(-1.983)	(0.809)	(-2.069)
Public Target	-0.043	-0.001	-0.042	-0.004
	(-0.910)	(-0.068)	(-0.881)	(-0.186)
Subsidiary Target	0.003	0.014	0.004	0.013
	(0.241)	(1.132)	(0.328)	(1.075)
All Cash Dummy	0.028	0.022	0.034*	0.018
	(1.355)	(1.034)	(1.665)	(0.827)
*Public Target *Stock Deal Dummy*	0.013	-0.014	0.016	-0.014
	(0.282)	(-0.803)	(0.353)	(-0.769)
*Public Target * All Cash Dummy*	0.016	0.002	0.011	0.009

	(0.317)	(0.076)	(0.211)	(0.308)
*Private Target * Stock Deal Dummy*	0.001	0.013	0.004	0.010
	(0.077)	(1.102)	(0.330)	(0.824)
*Private Target * All Cash Dummy*	-0.025	-0.022	-0.029*	-0.018
	(-1.511)	(-1.229)	(-1.850)	(-1.014)
*Subsidiary Target *All Cash Dummy*	-0.019	-0.028	-0.025	-0.024
	(-0.943)	(-1.231)	(-1.231)	(-1.058)
No. of Observations	3,952	3,695	3,928	3,674
Adj R-squared	0.1154	0.0763	0.1087	0.0852
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Table 7: The effect of target size

The table reports the regression results for the relationship between firm complexity and five-day (-2,+2) cumulative abnormal return (CAR) around the merger and acquisition announcement date (0), conditional on target size, defined as the market value of target four weeks before the announcement date. We divide the high and low categories based on the lagged median values of target size (Panel A). In Panel B, we divide the sample based on the target's locations – domestic and international. *Firm Complexity* is the measure of firm complexity as determined by Loughran and McDonald (2020); *Tobin's Q* is the market value of assets over the book value of assets; *ROA* is the net income over the book value of total assets; *Leverage* is the total debt scaled by the market value of total assets; *Size* is the natural log of the book value of total assets; *Relative Deal Size* is the deal value scaled by the acquirer's market value of total assets; *Diversifying Dummy* is dummy variable that takes a value of 1 if an acquirer and target do not share a Fama–French industry (48), and 0 otherwise; *Hostile Dummy* is dummy variable that takes a value of 1 for hostile deals, and 0 otherwise; *Public Target* is dummy variable that takes a value of 1 if the target firm is a public targets, and 0 otherwise; *Subsidiary Target* is dummy variable that takes a value of 1 for subsidiary targets, and 0 otherwise; *All Cash Dummy* is dummy variable that takes a value of 1 if a deal is entirely cash-financed deals, 0 otherwise; *Private Target* is dummy variable that takes a value of 1 if the target firm is a private targets, and 0 otherwise; Finally, *Stock Deal Dummy* is dummy variable that takes a value of 1 for deals that are at least partially stock financed, and 0 otherwise. Appendix A provides a detailed definition of all the variables used in the study. In parentheses are the t-statistics based on standard errors adjusted for heteroskedasticity (White, 1980) and firm clustering (Petersen, 2008). The symbols ***, **, and * indicate the statistical significance based on two-sided tests at the 1%, 5%, and 10% levels, respectively.

Panel A: Target Size

	Dependent Variable: *CAR (-2,2)*	
	Large Target	*Small Target*
	(1)	(2)
Firm complexity	0.016*	0.012
	(1.761)	(0.647)
Tobin's Q	0.001	0.005
	(1.149)	(1.530)
ROA	-0.003	0.019
	(-0.175)	(0.890)
Leverage	-0.020	0.012
	(-0.833)	(0.452)
Size	-0.003	-0.008
	(-1.029)	(-1.602)
Relative Deal Size	$-0.358*10^{-3}$**	0.002*
	(-2.148)	(1.653)
Diversifying Dummy	-0.006***	-0.006
	(-2.604)	(-1.512)
Hostile Dummy	-0.003	-0.019
	(-0.308)	(-0.714)
Public Target	-0.019	-0.018
	(-0.664)	(-0.441)
Subsidiary Target	0.005	0.027*
	(0.578)	(1.793)
All Cash Dummy	0.013	0.061**
	(0.980)	(2.001)
*Public Target *Stock Deal Dummy*	-0.010	0.001

	(-0.361)	(0.024)
*Public Target * All Cash Dummy*	0.011	-0.018
	(0.333)	(-0.361)
*Private Target * Stock Deal Dummy*	$-0.428*10^{-3}$	0.019
	(-0.052)	(1.287)
*Private Target * All Cash Dummy*	-0.011	-0.049*
	(-0.994)	(-1.889)
*Subsidiary Target *All Cash Dummy*	-0.012	-0.063**
	(-0.824)	(-2.035)
No. of Observations	5,447	4,721
Adj R-squared	0.1195	0.0614
Firm FE	Yes	Yes
Year FE	Yes	Yes
SE clustering level	Firm	Firm

Panel B: Target location

	Dependent Variable: *CAR (-2,2)*	
	Domestic Target	*International Target*
	(1)	(2)
Firm complexity	0.016	0.030*
	(1.636)	(1.755)
Controls	*Yes*	*Yes*
No. of Observations	8,384	1,370
Adj R-squared	0.1062	0.1030
Firm FE	Yes	Yes
Year FE	Yes	Yes

Table 8: The effect of geographic and business diversification

The table reports the regression results for the relationship between firm complexity and five-day (-2,+2) cumulative abnormal return (CAR) during the window around the event date, where the merger and acquisition announcement date is the event day (0), conditional on the high and low number of geographic and business segments. We divide the high and low categories based on the lagged median number of geographic and business segmentation. *Firm Complexity* is the measure of firm complexity as determined by Loughran and McDonald (2020); *Tobin's Q* is the market value of assets over the book value of assets; *ROA* is the net income over the book value of total assets; *Leverage* is the total debt scaled by the market value of total assets; *Size* is the natural log of the book value of total assets; *Relative Deal Size* is the deal value scaled by the acquirer's market value of total assets; *Diversifying Dummy* is dummy variable that takes a value of 1 if an acquirer and target do not share a Fama–French industry (48), and 0 otherwise; *Hostile Dummy* is dummy variable that takes a value of 1 for hostile deals, and 0 otherwise; *Public Target* is dummy variable that takes a value of 1 if the target firm is a public targets, and 0 otherwise; *Subsidiary Target* is dummy variable that takes a value of 1 for subsidiary targets, and 0 otherwise; *All Cash Dummy* is dummy variable that takes a value of 1 if a deal is entirely cash-financed deals, 0 otherwise; *Private Target* is dummy variable that takes a value of 1 if the target firm is a private targets, and 0 otherwise; Finally, *Stock Deal Dummy* is dummy variable that takes a value of 1 for deals that are at least partially stock financed, and 0 otherwise. Appendix A provides a detailed definition of all the variables used in the study. In parentheses are the t-statistics based on standard errors adjusted for heteroskedasticity (White, 1980) and firm clustering (Petersen, 2008). The symbols ***, **, and * indicate the statistical significance based on two-sided tests at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable: *CAR (-2,2)*			
	High No. of Geographic Segment (Non-Focused)	*Low No. of Geographic Segment (Focused)*	*High No. of Business Segment*	*Low No. of Business Segment*
	(1)	(2)	(3)	(4)
Firm complexity	**0.007**	**0.039****	**0.004**	**0.048****
	(0.677)	**(2.085)**	**(0.411)**	**(2.521)**
Tobin's Q	0.001	0.004	0.001	0.005
	(0.621)	(1.279)	(0.429)	(1.553)
ROA	-0.013	0.020	-0.013	0.020
	(-0.547)	(0.543)	(-0.512)	(0.617)
Leverage	-0.049**	0.036	-0.052**	0.041
	(-2.131)	(0.918)	(-2.201)	(1.199)
Size	-0.007*	-0.011**	-0.004	-0.009*
	(-1.806)	(-2.102)	(-1.139)	(-1.848)
Relative Deal Size	0.001	$-0.018*10^{-3}$	0.002	$-0.132*10^{-3}$
	(0.873)	(-0.228)	(0.549)	(-0.179)
Diversifying Dummy	-0.005**	$-0.168*10^{-3}$	-0.004	-0.003
	(-2.009)	(-0.037)	(-1.406)	(-0.727)
Hostile Dummy	-0.007	0.017	-0.004	0.014
	(-0.927)	(0.746)	(-0.461)	(0.618)
Public Target	-0.025	-0.021	-0.014	-0.013
	(-1.494)	(-0.511)	(-0.855)	(-0.359)
Subsidiary Target	0.004	0.025*	0.009	0.020
	(0.326)	(1.745)	(0.917)	(1.394)
All Cash Dummy	0.014	0.059	0.016	0.057*
	(0.868)	(1.531)	(1.004)	(1.670)
*Public Target *Stock Deal Dummy*	$-0.341*10^{-3}$	0.019	-0.011	0.010
	(-0.025)	(0.495)	(-0.793)	(0.298)

*Public Target * All Cash Dummy*	0.012	-0.014	$0.101*10^{-3}$	-0.015
	(0.572)	(-0.250)	(0.005)	(-0.317)
*Private Target * Stock Deal Dummy*	0.002	0.021	0.004	0.019
	(0.166)	(1.463)	(0.395)	(1.333)
*Private Target * All Cash Dummy*	-0.017	-0.043	-0.017	-0.042
	(-1.264)	(-1.191)	(-1.233)	(-1.357)
*Subsidiary Target *All Cash Dummy*	-0.011	-0.063	-0.015	-0.058*
	(-0.668)	(-1.586)	(-0.925)	(-1.651)
No. of Observations	3,800	3,024	3,725	3,300
Adj R-squared	0.1230	0.0667	0.1165	0.0745
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Table 9: Sources of funds

The table reports the regression results for the relationship between firm complexity and five-day (-2,+2) cumulative abnormal return (CAR) around the merger and acquisition announcement date (0), conditional on the source of funds for M&As. In columns (1) and (2), we divide the acquiring firms based on whether they borrowed funds for M&As, and in columns (3) and (4), we divide the acquiring firms based on whether they use internal corporate funds. *FIRM Complexity* is the measure of firm complexity as determined by Loughran and McDonald (2020); *Tobin's Q* is the market value of assets over the book value of assets; *ROA* is the net income over the book value of total assets; *Leverage* is the total debt scaled by the market value of total assets; *Size* is the natural log of the book value of total assets; *Relative Deal Size* is the deal value scaled by the acquirer's market value of total assets; *Diversifying Dummy* is dummy variable that takes a value of 1 if an acquirer and target do not share a Fama–French industry (48), and 0 otherwise; *Hostile Dummy* is dummy variable that takes a value of 1 for hostile deals, and 0 otherwise; *Public Target* is dummy variable that takes a value of 1 if the target firm is a public targets, and 0 otherwise; *Subsidiary Target* is dummy variable that takes a value of 1 for subsidiary targets, and 0 otherwise; *All Cash Dummy* is dummy variable that takes a value of 1 if a deal is entirely cash-financed deals, 0 otherwise; *Private Target* is dummy variable that takes a value of 1 if the target firm is a private targets, and 0 otherwise; Finally, *Stock Deal Dummy* is dummy variable that takes a value of 1 for deals that are at least partially stock financed, and 0 otherwise. Appendix A provides a detailed definition of all the variables used in the study. In parentheses are the t-statistics based on standard errors adjusted for heteroskedasticity (White, 1980) and firm clustering (Petersen, 2008). The symbols ***, **, and * indicate the statistical significance based on two-sided tests at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable: *CAR (-2,2)*			
	Sources of Fund - Borrowed	*Sources of Fund - Non - Borrowed*	*Financing via Internal Corporate Funds*	*Financing via External Corporate Funds*
	(1)	(2)	(3)	(4)
Firm complexity	**-0.014**	**0.017***	**0.068****	**0.020****
	(-0.394)	**(1.927)**	**(2.211)**	**(2.146)**
Tobin's Q	0.002	0.003**	0.002	0.004**
	(0.232)	(2.210)	(0.535)	(2.410)
ROA	0.005	0.014	0.069	0.012
	(0.071)	(0.857)	(1.068)	(0.743)
Leverage	-0.054	0.009	-0.018	0.014
	(-1.076)	(0.431)	(-0.357)	(0.689)
Size	0.011	-0.003	-0.018**	-0.002
	(0.936)	(-1.188)	(-1.980)	(-0.535)
Relative Deal Size	0.016	0.000	0.021	0.000
	(1.511)	(1.028)	(0.861)	(0.567)
Diversifying Dummy	0.003	-0.005**	-0.013	-0.005**
	(0.264)	(-2.353)	(-1.606)	(-2.050)
Hostile Dummy	-0.059	-0.011	0.018	-0.009
	(-1.266)	(-1.153)	(0.605)	(-0.942)
Public Target	-0.040	-0.005	-0.028	-0.014
	(-0.853)	(-0.162)	(-0.290)	(-0.592)
Subsidiary Target	0.030	0.012	0.090*	0.009
	(1.045)	(1.337)	(1.794)	(1.127)
All Cash Dummy	0.074*	0.026*	0.073	0.021
	(1.792)	(1.788)	(1.064)	(1.347)

*Public Target *Stock Deal Dummy*	0.048	-0.019	0.078	-0.013
	(1.078)	(-0.614)	(0.925)	(-0.547)
*Public Target * All Cash Dummy*	-0.013	-0.009	0.027	0.004
	(-0.241)	(-0.254)	(0.250)	(0.140)
*Private Target * Stock Deal Dummy*	0.044*	0.009	0.080	0.006
	(1.690)	(0.984)	(1.609)	(0.776)
*Private Target * All Cash Dummy*	-0.040	-0.019*	0.018	-0.017
	(-1.117)	(-1.694)	(0.360)	(-1.340)
*Subsidiary Target *All Cash Dummy*	-0.074*	-0.023	-0.063	-0.019
	(-1.689)	(-1.533)	(-0.906)	(-1.221)
No. of Observations	471	9,445	785	9,119
Adj R-squared	0.1265	0.0884	0.0767	0.1013
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Table 10: Managerial ability

The table reports the regression results for the relationship between firm complexity and the five-day (-2,+2) cumulative abnormal return (CAR) around the merger and acquisition announcement date (0), conditional on the high and low managerial ability. The data for managerial ability and firm efficiency is obtained from Demerjian *et al.*(2012). We divide the high and low categories based on the median values during the previous year. *Firm Complexity* is the measure of firm complexity as determined by Loughran and McDonald (2020); *Tobin's Q* is the market value of assets over the book value of assets; *ROA* is the net income over the book value of total assets; *Leverage* is the total debt scaled by the market value of total assets; *Size* is the natural log of the book value of total assets; *Relative Deal Size* is the deal value scaled by the acquirer's market value of total assets; *Diversifying Dummy* is dummy variable that takes a value of 1 if an acquirer and target do not share a Fama–French industry (48), and 0 otherwise; *Hostile Dummy* is dummy variable that takes a value of 1 for hostile deals, and 0 otherwise; *Public Target* is dummy variable that takes a value of 1 if the target firm is a public targets, and 0 otherwise; *Subsidiary Target* is dummy variable that takes a value of 1 for subsidiary targets, and 0 otherwise; *All Cash Dummy* is dummy variable that takes a value of 1 if a deal is entirely cash-financed deals, 0 otherwise; *Private Target* is dummy variable that takes a value of 1 if the target firm is a private targets, and 0 otherwise; Finally, *Stock Deal Dummy* is dummy variable that takes a value of 1 for deals that are at least partially stock financed, and 0 otherwise. Appendix A provides a detailed definition of all the variables used in the study. In parentheses are the t-statistics based on standard errors adjusted for heteroskedasticity (White, 1980) and firm clustering (Petersen, 2008). The symbols ***, **, and * indicate the statistical significance based on two-sided tests at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable: *CAR (-2,2)*	
	High Ability	*Low Ability*
	(1)	(2)
Firm complexity	**0.027****	**0.000**
	(1.999)	**(0.026)**
Tobin's Q	0.003*	0.010***
	(1.922)	(2.660)
ROA	$0.144*10^{-3}$	-0.006
	(0.007)	(-0.178)
Leverage	-0.005	0.016
	(-0.144)	(0.594)
Size	-0.004	-0.002
	(-0.963)	(-0.353)
Relative Deal Size	0.001	$0.097*10^{-3}$
	(0.721)	(0.295)
Diversifying Dummy	-0.008**	-0.005*
	(-2.539)	(-1.905)
Hostile Dummy	0.008	-0.023*
	(0.641)	(-1.901)
Public Target	-0.029	0.026
	(-0.919)	(1.206)
Subsidiary Target	0.014	0.006
	(1.337)	(0.454)
All Cash Dummy	0.021	0.025
	(1.100)	(1.248)
*Public Target *Stock Deal Dummy*	-0.000	-0.045**
	(-0.015)	(-2.401)
*Public Target * All Cash Dummy*	0.016	-0.042
	(0.456)	(-1.571)
*Private Target * Stock Deal Dummy*	0.003	0.006
	(0.329)	(0.411)
*Private Target * All Cash Dummy*	-0.014	-0.028*
	(-0.822)	(-1.961)

*Subsidiary Target *All Cash Dummy*	-0.022	-0.024
	(-1.110)	(-1.160)
No. of Observations	4,778	4,716
Adj R-squared	0.0834	0.1114
Firm FE	Yes	Yes
Year FE	Yes	Yes

Table 11: Takeover premium

The table reports the regression results for the relationship between firm complexity and takeover premium. The dependent variables, *OfferP1W and OfferP1D* are the difference between the acquirer's offer price minus the target firm's closing stock price one week and one day prior to the acquisition announcement date, over the target firm's closing stock price one week and one day prior to the acquisition announcement date. *Firm Complexity* is the measure of firm complexity as determined by Loughran and McDonald (2020); *Tobin's Q* is the market value of assets over the book value of assets; *ROA* is the net income over the book value of total assets; *Leverage* is the total debt scaled by the market value of total assets; *Size* is the natural log of the book value of total assets; *Relative Deal Size* is the deal value scaled by the acquirer's market value of total assets; *Diversifying Dummy* is dummy variable that takes a value of 1 if an acquirer and target do not share a Fama–French industry (48), and 0 otherwise; *Hostile Dummy* is dummy variable that takes a value of 1 for hostile deals, and 0 otherwise; *Public Target* is dummy variable that takes a value of 1 if the target firm is a public targets, and 0 otherwise; *Subsidiary Target* is dummy variable that takes a value of 1 for subsidiary targets, and 0 otherwise; *All Cash Dummy* is dummy variable that takes a value of 1 if a deal is entirely cash-financed deals, 0 otherwise; *Private Target* is dummy variable that takes a value of 1 if the target firm is a private targets, and 0 otherwise; Finally, *Stock Deal Dummy* is dummy variable that takes a value of 1 for deals that are at least partially stock financed, and 0 otherwise. Appendix A provides a detailed definition of all the variables used in the study. In parentheses are the t-statistics based on standard errors adjusted for heteroskedasticity (White, 1980) and firm clustering (Petersen, 2008). The symbols ***, **, and * indicate the statistical significance based on two-sided tests at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable:	
	OfferP1W	*OfferP1D*
	(2)	(3)
Firm complexity	**0.043****	**0.047****
	(2.040)	**(2.242)**
Tobin's Q	$-0.057*10^{-3}$	0.001
	(-0.030)	(0.322)
ROA	0.025	0.017
	(0.956)	(0.627)
Leverage	0.044	0.045
	(1.377)	(1.402)
Size	0.014**	0.015**
	(2.233)	(2.456)
Relative Deal Size	0.001	0.001
	(0.728)	(0.746)
Diversifying Dummy	-0.006	-0.005
	(-1.243)	(-0.886)
Hostile Dummy	0.010	0.010
	(0.327)	(0.316)
Public Target	0.640***	0.708***
	(5.889)	(6.920)
Subsidiary Target	0.004	0.004
	(0.447)	(0.383)
All Cash Dummy	-0.018	-0.021
	(-0.941)	(-1.122)

*Public Target *Stock Deal Dummy*	-0.132	-0.199*
	(-1.202)	(-1.918)
*Public Target * All Cash Dummy*	-0.175	-0.237**
	(-1.561)	(-2.233)
*Private Target * Stock Deal Dummy*	0.021**	0.022**
	(2.180)	(2.333)
*Private Target * All Cash Dummy*	0.021	0.025
	(1.181)	(1.466)
*Subsidiary Target *All Cash Dummy*	0.012	0.015
	(0.607)	(0.796)
No. of Observations	10,469	10,469
Adj R-squared	0.4572	0.4602
Firm FE	Yes	Yes
Year FE	Yes	Yes

Table 12: Endogeneity

The table reports the instrumental variable (IV) regression of announcement period CAR on firm complexity. The dependent variable is the five-day (-2,+2) cumulative abnormal return (CAR) around the event date (0). In column (1), the instrumental variable, *ZIP-based firm complexity,* is the acquiring firms' headquarters three-digit Zip-code-based firm complexity (excluding the focus firm). In column (2), *Fitted* is the fitted value of *Firm Complexity* computed from the first stage. *Firm Complexity* is the measure of firm complexity as determined by Loughran and McDonald (2020); *Tobin's Q* is the market value of assets over the book value of assets; *ROA* is the net income over the book value of total assets; *Leverage* is the total debt scaled by the market value of total assets; *Size* is the natural log of the book value of total assets; *Relative Deal Size* is the deal value scaled by the acquirer's market value of total assets; *Diversifying Dummy* is dummy variable that takes a value of 1 if an acquirer and target do not share a Fama–French industry (48), and 0 otherwise; *Hostile Dummy* is dummy variable that takes a value of 1 for hostile deals, and 0 otherwise; *Public Target* is dummy variable that takes a value of 1 if the target firm is a public targets, and 0 otherwise; *Subsidiary Target* is dummy variable that takes a value of 1 for subsidiary targets, and 0 otherwise; *All Cash Dummy* is dummy variable that takes a value of 1 if a deal is entirely cash-financed deals, 0 otherwise; *Private Target* is dummy variable that takes a value of 1 if the target firm is a private targets, and 0 otherwise; Finally, *Stock Deal Dummy* is dummy variable that takes a value of 1 for deals that are at least partially stock financed, and 0 otherwise. Appendix A provides a detailed definition of all the variables used in the study. In parentheses are the t-statistics based on standard errors adjusted for heteroskedasticity (White, 1980) and firm clustering (Petersen, 2008). The symbols ***, **, and * indicate the statistical significance based on two-sided tests at the 1%, 5%, and 10% levels, respectively.

	IV regressions	
	Dependent Variable:	
	Firm Complexity (First Stage)	*CAR (-2,+2) (Second Stage)*
	(1)	(2)
ZIP-based firm complexity	**-3.253***** **(-6.992)**	
Fitted		**0.046*** **(1.809)**
Tobin's Q	$-0.432*10^{-3}$ (-0.136)	0.004*** (2.599)
ROA	0.014 (0.658)	0.013 (0.864)
Leverage	0.023 (1.018)	0.015 (0.800)
Size	-0.001 (-0.125)	-0.003 (-1.147)
Relative Deal Size	$-0.012*10^{-3}$ (-0.092)	$0.072*10^{-3}$ (0.689)
Diversifying Dummy	0.003 (0.971)	-0.006*** (-2.829)
Hostile Dummy	-0.005 (-0.364)	-0.008 (-0.967)
Public Target	-0.036 (-1.228)	-0.012 (-0.481)
Subsidiary Target	0.001 (0.075)	0.012 (1.463)
All Cash Dummy	0.037*	0.026**

	(1.773)	(2.047)
*Public Target *Stock Deal Dummy*	0.024	-0.012
	(0.852)	(-0.540)
*Public Target * All Cash Dummy*	-0.009	-0.002
	(-0.259)	(-0.073)
*Private Target * Stock Deal Dummy*	-0.001	0.008
	(-0.104)	(0.985)
*Private Target * All Cash Dummy*	-0.040**	-0.020**
	(-2.182)	(-2.074)
*Subsidiary Target *All Cash Dummy*	-0.036*	-0.024*
	(-1.687)	(-1.827)
No. of Observations	10469	10469
Adj R-squared	0.6483	0.1043
Firm FE	Yes	Yes
Year FE	Yes	Yes