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NAVIGATING THE M&A LANDSCAPE: FINANCIAL SPONSOR BACKING, INNOVATION, AND LEGAL DISPUTES

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EXECUTIVE SUMMARY

Mergers and acquisitions (M&As) are one of the major ways through which corporate assets change owners. This reallocation mechanism represents an important instrument to ensure the efficient use of assets and the associated post-merger integration process often implies drastic changes not only for employees, customers and suppliers, but also for competitors and the overall industry structure. The potential gains or losses can be material in size for the involved parties, and as such considerable research has been devoted to advance our understanding of transactions. Nevertheless, research gaps remain, for example with respect to the impact of major corporate events such as initial public offerings (IPOs) or security class action lawsuits (SCAs) on M&A transactions as well as regarding the implications of acquisitions for the competitive dynamics within a given industry. This dissertation consists of three distinct studies aiming to contribute to existing research gaps in the field of M&As.

The first study examines the role of financial sponsors—i.e., private equity (PE) and venture capital (VC) investors—in the context of the acquisition activity of their portfolio firms once these firms went public. In particular, it focuses on the question whether financial sponsors promote or moderate the acquisition activity of their portfolio company after going public, a research question previously unaddressed. My findings suggest that PE-backed newly public firms engage in almost three times as many acquisitions as VC-backed newly public firms and that they achieve superior long-run post-IPO stock returns when doing so. The second study investigates the impact of corporate innovation on M&As. Specifically, the study seeks to understand the competitive dynamics that are at play when large technology conglomerates acquire innovative assets and the ramifications these acquisitions have for rival firms within the same industry. It shows that innovative acquirers are able to outbid non-innovative acquirers for innovative target firms and that innovative acquirer rivals react to these transactions by increasing both their R&D spending and their likelihood to acquire a technology target firm in the years after the competitor's M&A announcement. The third study explores M&A transactions in the context of security class action lawsuits (SCAs). Particularly, it analyzes to what extent bidders are able to capitalize on acquiring target firms that are subject to ongoing litigation. The study provides evidence that SCAs significantly reduce takeover premiums, but acquirers who purchase SCA-affected targets nevertheless experience significantly more negative announcement returns than acquirers of non-SCA affected ones. In the long-run, however, acquirers of SCA-affected targets are able to recoup some of their losses, particularly if the SCA is later dismissed.

ZUSAMMENFASSUNG

Mergers und Akquisitionen (M&A Deals) gehören zu den wichtigsten Hebeln, mittels denen Wirtschaftsgüter (Assets) ihren Besitzer wechseln. Dieser Umverteilungsmechanismus stellt ein wichtiges Instrument dar, um die effiziente Nutzung von Assets zu gewährleisten, und der damit verbundene Post-Merger-Integrationsprozess bringt oft drastische Veränderungen nicht nur für Mitarbeiter, Kunden und Zulieferer, sondern auch für Wettbewerber und die gesamte Industriestruktur mit sich. Die potenziellen Zugewinne oder Verluste einer Akquisition können für die beteiligten Parteien von erheblichem Ausmaß sein, und folglich wurden viele Forschungsbeiträge dem besseren Verständnis dieser Transaktionen gewidmet. Trotz diverser Erkenntnisse verbleiben Forschungslücken in diesem Teilbereich der Literatur, beispielsweise in Bezug auf die Rolle von großen Unternehmensereignissen wie Börsengängen (IPOs) oder Wertpapier-Sammelklagen im Kontext von M&A-Transaktionen sowie im Hinblick auf die Auswirkungen von Fusionen und Übernahmen auf die Wettbewerbsdynamiken innerhalb der jeweiligen Industrie. Die vorliegende Dissertation besteht aus drei Studien, die dazu beitragen, bestehende Forschungslücken im Bereich der M&A-Literatur zu adressieren.

Die erste Studie untersucht die Rolle von Finanzinvestoren – d.h. von Private Equity- (PE) und Venture Capital- (VC) Investoren – im Kontext der Übernahmeaktivität ihrer Portfoliounternehmen, nachdem diese an die Börse gegangen sind. Sie befasst sich insbesondere mit der Frage, ob Finanzinvestoren in den Jahren unmittelbar nach dem Börsengang die Akquisitionstätigkeit ihrer Portfoliounternehmen fördern oder hemmen. Die Ergebnisse zeigen, dass von PE-Investoren gehaltene Firmen nach ihrem Börsengang nahezu drei Mal so viele Übernahmen tätigen wie von VC-Investoren gehaltene Firmen und dass sie es schaffen, dadurch über längere Zeiträume höhere Renditen zu erzielen. Die zweite Studie befasst sich mit den Auswirkungen von Innovationen auf M&A-Deals. Konkret werden die Wettbewerbsdynamiken beleuchtet, die auftreten, wenn große Technologiefirmen innovative Assets kaufen.

Besonderer Fokus liegt dabei auf den Konsequenzen für die Wettbewerber in der gleichen Industrie. Die Ergebnisse suggerieren, dass innovative Firmen in der Lage sind, weniger innovative Firmen im Wettbewerb um innovative Assets zu überbieten. Innovative Wettbewerber des Käufers reagieren dabei auf die Ankündigung der Übernahme, indem sie in den Folgejahren ihre eigenen Investitionen in Forschung und Entwicklung erhöhen und mit erhöhter Wahrscheinlichkeit selbst ein Technologieunternehmen aufkaufen. Die dritte Studie erforscht den Zusammenhang zwischen Wertpapier-Sammelklagen und M&A-Transaktionen mit einem Schwerpunkt auf der Fragestellung, ob Käufer in der Lage sind, aus dem systematischen Erwerb von Firmen, die von einer Sammelklage betroffen sind, Kapital zu schlagen. Die Ergebnisse zeigen, dass Käufer zwar geringere Prämien für von Sammelklagen betroffene Unternehmen zahlen, die Käufer dieser Unternehmen aber dennoch bei der Ankündigung der Übernahme stärkere Verluste in ihrem Aktienkurs hinnehmen müssen als Käufer von nicht von Sammelklagen betroffenen Unternehmen. Über einen längeren Zeitraum können Käufer allerdings einen Teil dieser Verluste wieder ausgleichen, insbesondere wenn die Sammelklage später abgewiesen wird.

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LIST OF ABBREVIATIONS

AMEX	*American Stock Exchange*
ATT	*Average Treatment Effect on the Treated*
BHARs	*Buy-and-Hold Abnormal Returns*
CAPEX	*Capital Expenditures*
CARs	*Cumulative Abnormal Returns*
CEO	*Chief Executive Officer*
CRSP	*Center for Research in Security Prices*
EDGAR	*Electronic Data Gathering, Analysis, and Retrieval*
HHI	*Herfindahl-Hirschman-Index*
IMR	*Inverse Mills Ratio*
IPO	*Initial Public Offering*
M&As	*Mergers & Acquisitions*
NASDAQ	*National Association of Securities Dealers Automated Quotations*
NYSE	*New York Stock Exchange*
OLS	*Ordinary Least Squares*
PE	*Private Equity*
PSM	*Propensity Score Matching*
R&D	*Research & Development*
REIT	*Real Estate Investment Trust*
SCA	*Security Class Action lawsuit*
SDC	*Securities Data Company*
SEC	*Securities and Exchange Commission*
SIC	*Standard Industrial Classification*
SPAC	*Special Purpose Acquisition Company*
UK	*United Kingdom*
US(A)	*United States (of America)*
USD	*US Dollar*
USPTO	*United States Patent and Trademark Office*
VC	*Venture Capital*
WIPO	*World Intellectual Property Organization*

1 GENERAL INTRODUCTION

Mergers and acquisitions (M&As) are among the most impactful corporate events for acquiring and target firms alike. For acquirers, they can represent a potential growth strategy to quickly increase size and market share while target firms typically enjoy significant premiums above their latest valuation. From a macroeconomic perspective, M&As serve as an important mechanism to ensure that corporate assets are utilized in an efficient manner, giving managers the ability to compete for these assets by offering a premium if they are convinced that they can extract more value out of them than their current owner (Krug et al., 2014), potentially driven by synergies to their existing business.

Over the decades, the story of M&As has been one of almost continuous growth. While mergers and acquisitions generally tend to occur in waves that are subject to a certain degree of volatility (Golbe & White, 1993), the long-term trajectory has trended steadily upwards. Between the years 2001 and 2021, M&As have experienced an average annual growth rate in deal value of 5.3%, materially surpassing the growth rate of the overall world economy (Boston Consulting Group, 2022; The World Bank, 2022). In the year 2021 alone, 40,578[1] acquisitions have been conducted, corresponding to one acquisition every 13 minutes on average. Given their popularity and rise in importance, M&As have also attracted increasing scholarly attention, which can be broadly classified into the four fields of finance and financial performance (Arikan & Stulz, 2016; Eaton et al., 2022; Erel et al., 2015; Golubov et al., 2012; Mulherin & Boone, 2000; Tuch & O'Sullivan, 2007), strategic management (Bena & Li, 2014; Celikyurt et al., 2010; Cuypers et al., 2017; Hovakimian & Hutton, 2010; Humphery-Jenner et al., 2017; Lukas et al., 2019; Reuer et al., 2012; Wu & Chung, 2019; Xing et al., 2017),

[1] Refers only to pure M&As, i.e., excluding self-tenders, recapitalizations, exchange offers, repurchases, privatizations, spinoffs, and similar types of transactions.

organizational behavior (Bauer & Matzler, 2014; Björkman et al., 2007; Cai & Sevilir, 2012; Gomes et al., 2017; Hackbarth & Miao, 2012; Morosini et al., 1998; Rao-Nicholson et al., 2016; Shahrur, 2005; Vasilaki et al., 2016), and the associated post-merger integration processes (Ahammad et al., 2017; Almor et al., 2009; Angwin, 2004; Angwin et al., 2016; Angwin & Meadows, 2015; Björkman et al., 2007).

Evaluating the financial stock performance following M&As is among those topics most heavily investigated in the literature and also the field that is closest to this dissertation. The evidence, however, reveals a somewhat mixed picture on the overall shareholder value creation potential of M&As (Alexandridis et al., 2017; Campa & Hernando, 2004; Meckl & Röhrle, 2017). The most apparent results are from studies that investigate the performance from a target firm perspective. Shareholders of targets benefit from acquisitions as stock prices experience a significant abnormal return when the acquisition is announced (Alexandridis et al., 2010; Masulis & Simsir, 2018; Yılmaz & Tanyeri, 2016). The runup is justified by the anticipation of a potential premium above the target firm's current market value paid by the acquirer. This premium, on average, ranges between 40% and 45% (Eckbo, 2009) and is most commonly explained through potential synergies between the two merging firms (Antoniou et al., 2008; Devos et al., 2009; Diaz et al., 2009). While the consensus is that *target* firms benefit from being acquired, the picture is less favorable for *acquiring* firms. Various studies report that acquirers experience material negative abnormal stock returns when announcing their acquisitions (Alexandridis et al., 2013; Datta et al., 1992; Fuller et al., 2002; Moeller et al., 2004; Travlos, 1987), particularly if the target is public, indicating that investors on average are not convinced about the potential benefits of these acquisitions at the respective price paid. The comprehensive literature review conducted by Agrawal and Jaffe (2000) suggests that acquirers are also not able to recoup those losses later on as long-run returns following acquisitions are on average either negative or not significantly different from zero. Given these results, it is somewhat surprising that acquiring firm's shareholders approve M&As at all. However, the literature identifies some scenarios in which the general notion of negative value creation from an acquirer perspective does not hold, thus helping to shed some light on acquirers' rationale when pursuing target firms. Acquiring firms are able to benefit from their acquisitions when their own governance is good (Alexandridis et al., 2017), when they are small (Moeller et al., 2004), when the deal is not anticipated by stock markets (Tunyi, 2021), when acquiring subsidiaries (Fuller et al., 2002), when advised by high quality investment banks (Bao & Edmans, 2011), or in non-conglomerate acquisitions (Datta et al., 1992). Overall, these results imply that while creating value through acquisitions is far from guaranteed, the success of these endeavors is largely determined by the specific circumstances surrounding each transaction.

This dissertation sets out to investigate three specific situations in which firms may decide to acquire and puts emphasis on the value creation potential (or lack thereof) realized through such transactions. Specifically, I examine three potential rationales that may convince acquirers of the merits of a particular transaction irrespective of the generally observed negative returns associated with them. I do not, however, limit my analyses to the acquirer side exclusively, and also touch upon the ramifications of acquisitions for other stakeholders such as the target firm, owners (both publicly listed and privately held), and rival firms in my studies. The specific situations and acquisition rationales which my studies set out to investigate are described below.

The first study examines acquisitions made by newly listed firms in the phase immediately following their IPO. This point in time typically resembles the earliest period in which one can investigate acquirer performance given that stock price reactions are not observable for private firms and thus make it difficult to evaluate acquisitions by private firms objectively, albeit a recent study by Golubov and Xiong (2020) attempts to address this challenge. Using a sample of 1,341 US Initial Public Offerings (IPOs) between 2001 and 2017 and 1,845 subsequent acquisitions conducted by these firms, I investigate whether acquisition behavior systematically varies between those newly listed firms backed by a financial sponsor—i.e., private equity (PE) and venture capital (VC) investors—and those that are not backed by a financial sponsor. This specific situation is particularly interesting given that for sponsor-backed firms the incentives to acquire are ambiguous. On the one hand, these firms may be induced to acquire because they have raised material amounts of cash through the IPO which their investors expect them to deploy and given the sudden availability of stock as a potential currency to pay acquisitions with (Celikyurt et al., 2010; Hovakimian & Hutton, 2010). On the other hand, sponsors typically initiate an IPO of their portfolio firm only towards the end of their holding period and may thus not be in favor of pursuing acquisitions shortly before their intended exit, either because an acquisition would introduce too much uncertainty into the stock price (Arikan & Capron, 2010) or simply because the sponsor wants to focus its attention on (potentially more material) value creation in other parts of its portfolio (DeAngelo & DeAngelo, 1987). Overall, my results document that conducting acquisitions is a major motivation for firms to go public, in line with findings from prior studies (Brau & Fawcett, 2006; Celikyurt et al., 2010; Hovakimian & Hutton, 2010; Hsieh et al., 2011). More interestingly, differentiating the types of financial sponsors reveals that the positive impact of the IPO on acquisition behavior is most pronounced for PE-backed newly public firms which, on average, engage in three times as many acquisitions as VC-backed firms and twice as many as non-backed ones. My findings further show that PE-backed newly public acquirers achieve significantly positive M&A announcement returns as well as positive post-IPO stock returns while the returns from VC-backed newly public firms remain insignificant, indicating that only PE-backed newly public firms are on average able to extract shareholder value from acquisitions.

The second study investigates corporate innovation as one particular motive to acquire. It focuses on the technology industry, in which innovation resembles one of the main competitive advantages for firms to maintain or potentially extend their competitive positions. While leading technology firms typically possess material inhouse innovation capabilities, most of them also rely heavily on acquiring innovation externally through M&As. Using a sample of 786 public-to-public transactions in the US technology sector, I examine how corporate innovation affects M&A performance measured through takeover premiums and announcement returns. I extend the view beyond the implications for the immediately affected target and acquirer firms and also investigate the consequences for rival firms within the same industry. My results suggest that firms are not only generally willing to pay higher premiums to acquire an innovative firm, but that this effect is more pronounced for acquirers that are themselves innovative. Despite paying higher premiums, innovative acquirers' announcement returns remain indistinguishable from those of non-innovative acquirers, indicating that innovative acquirers are able to outbid their non-innovative peers without having to fear an adverse stock price reaction. These results suggest that innovative acquirers may be able to benefit from acquiring innovative firms despite paying a premium as they extend their scale and market position without experiencing a negative stock price reaction when doing so. Rival firms are also affected by innovation-driven acquisitions within their industry. In response to the acquisition, all types of acquirer rivals increase their R&D spending but the effect is more pronounced for innovative rivals than for non-innovative ones. Finally, my results also indicate that innovative acquirer rivals are more likely to acquire a technology target firm in the aftermath of their competitor's M&A announcement than their non-innovative peers.

The third and final study investigates another motive to acquire that is interlinked with the second study. Kempf and Spalt (2022) find that innovation output attracts security class action lawsuits (SCAs) that can lead to substantial shareholder-value losses for the affected firms, suggesting that innovation output makes a firm an attractive litigation target. I take this finding as a starting point to investigate the relationship between SCAs and M&As more broadly. Using a sample of 3,277 completed US-to-US transactions with public targets conducted between 2000 and 2021, I examine how SCAs affect M&As with respect to takeover premiums paid, announcement returns, long-run post-M&A returns, and deal completion probabilities. I find that target firms subject to ongoing litigation obtain significantly lower takeover premiums and M&A announcement returns. Acquirers of these SCA-affected targets likewise experience more severe share price reductions than acquirers of non-SCA-affected targets. Interestingly, acquirers are able to recoup some of these losses over extended time periods of up to 12 months after the announcement if the SCA is ultimately dismissed, suggesting that acquirers may be able to benefit from buying targets subject to ongoing litigation if the lawsuit proves to be without legal merit.

Overall, my findings suggest that while the decision to acquire is not an unambiguous one, value may nevertheless be created in specific circumstances. Acquirers may benefit from acquisitions if they have extensive prior M&A experience as is typically the case for PE-backed newly public firms. They may also improve their market position through the acquisition of innovative firms if they themselves are sufficiently innovative. When doing so, they are able to pay premiums that other acquirers cannot offer without having to fear adverse stock price reactions. Finally, acquirers may benefit, at least in the long-term, from an acquisition strategy based on leveraging ongoing litigation at the target firm to pay lower premiums, albeit this benefit only materializes over longer time horizons and only if the legal dispute turns out to be without merit.

My dissertation contributes to three strands of the extant M&A literature. First, it contributes to the literature on the acquisition behavior of newly public firms (Anderson et al., 2017; Celikyurt et al., 2010; Hovakimian & Hutton, 2010; Hsieh et al., 2011) by showing that the backing of a financial sponsor has a pronounced impact on the acquisition strategy of firms in the years after going public. Moreover, the study differentiates between PE and VC sponsors, a distinction that prior studies neglect. Doing so, I find that PE-backed and VC-backed firms pursue different growth strategies after their respective IPOs, with PE-backed newly public firms engaging in more acquisitions while their VC-backed peers put more emphasis on organic growth options via R&D expenditures. Second, my dissertation contributes to the literature investigating the role of corporate innovation in the context of M&As (Desyllas & Hughes, 2010; Gantumur & Stephan, 2012; Kim et al., 2021; Valentini, 2012; Wu & Chung, 2019). I clarify the previously diverging results by documenting a positive effect of target innovativeness on takeover premiums and target cumulative abnormal returns (CARs). I show that this effect is more pronounced for innovative acquirers than for non-innovative ones and that innovative acquirers do not have to fear negative repercussions in the form of adverse stock price reactions when doing so. This finding helps to advance our understanding of the underlying dynamics that lead to the concentration of innovative capabilities in a few, large technology giants. I also extend the view to rival firms and investigate the role of innovation in the context of M&A rival reactions, a field that is largely unexplored to date. Lastly, I contribute to the literature investigating stock price reactions associated with security class action lawsuits (Basnet et al., 2021; Bradley et al., 2014; Fich & Shivdasani, 2007; Gande & Lewis, 2009). While it is well documented that these legal disputes can have severe repercussions for the affected firms, the way in which they interact with major corporate events such as M&As has not yet been closely investigated. My study helps to fill this gap by showing that SCAs have a negative impact on takeover premiums and target CARs. I also quantify this effect and find spill-overs to the acquirer firm in terms of lower announcement returns when buying a target subject to ongoing litigation compared to acquiring a target that is not subject to ongoing litigation. Deal completion probabilities are likewise affected as termination fees, which generally have a positive effect on the likelihood of deal completion, prove to be less effective when the target has an ongoing SCA pending.

This dissertation is structured in six chapters. This first chapter serves as the general introduction to the remainder of the dissertation. Chapters two, three and four contain the three studies introduced above, each structured with individual sections introducing the respective topic, contextualizing the relevant literature, outlining the research approach, describing my findings and concluding the individual studies. Each study also has an individual appendix section. Chapter five provides a general conclusion to my dissertation. Chapter six provides the references cited throughout this document.

2 THE INFLUENCE OF INITIAL SPONSOR BACKING ON POST-IPO ACQUISITION ACTIVITY

Abstract

We investigate whether financial sponsor backing, in the form of venture capital (VC) or private equity (PE), leads to different post-IPO acquisition strategies for newly public companies. We find that PE-backed newly public firms engage in almost three times as many acquisitions as VC-backed newly public firms and almost twice as many as non-backed firms, suggesting that PE sponsors use acquisitions as a primary strategy to drive growth in their portfolio companies. This result remains valid using various robustness checks to address potential endogeneity concerns. Additionally, PE-backed firms are more likely to pursue transformative acquisitions, as proxied by size, while VC-backed firms prioritize organic growth through higher R&D expenditures. Furthermore, we find significant positive long-run post-IPO stock returns for PE-backed newly public acquirers, but not for VC-backed ones.

Note: *This chapter has been published as*

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2.1 Introduction

Going public by listing shares on a stock exchange is a crucial event in a company's life cycle. The reasons firms choose to go public are manifold, ranging from obtaining a new (external) source of equity with a view to minimize the firm's cost of capital (Scott, 1976), broaden ownership (Chemmanur & Fulghieri, 1999), increasing analyst coverage (Bradley et al., 2003) to enabling insiders to cash out (e.g., Zingales, 1995). However, the most prominent reason appears to be the facilitation of takeover activity: In a survey of chief financial officers, Brau and Fawcett (2006) report that the desire to engage in future acquisition activity is often the main motivation for firms to go public as newly issued shares can be used as a currency with which to either purchase other firms or exchange when being the target in a share deal (Brau et al., 2003). Financial sponsors may have a particular preference to take their portfolio companies public to further grow them through acquisitions. Even though sponsors' primary concern following the initial public offering (IPO) may be the timely realization of a lucrative exit, they typically retain a significant amount of their shares for one to three years following the IPO, partly due to lock-up periods and signaling concerns (Barry et al., 1990; Dong et al., 2020; Leland & Pyle, 1977). We seek to address whether sponsors' guidance of their portfolio firms during this post-IPO period of transitional ownership influences their portfolio firms' acquisition activity as well as share price performance.

We aim to answer these questions by analyzing the impact of venture capital and private equity backing at the time of the IPO on the firm's subsequent acquisition activity and stock price development. Prior studies frequently forgo a detailed investigation of the effects of sponsor backing by treating it as an ancillary topic or control. In case sponsor backing is addressed, the focus is almost exclusively on the impact of VC backing on post-IPO acquisition activity (e.g., Anderson et al., 2017; Celikyurt et al., 2010; Hovakimian & Hutton, 2010), with

PE-backed firms only marginally considered, if at all, and with little to no regard for the differences between VC and PE backing (Anderson et al., 2017; Arikan & Capron, 2010; Celikyurt et al., 2010; Ragozzino et al., 2018). This is surprising, as VC and PE investors have different investment strategies at the core of their value proposition. While VC firms mainly invest in smaller, research-intensive firms with strong organic growth potential, PE investors focus on mature companies with stable cash flow generating abilities. Levis (2011) documents this difference, as PE firms generally back larger firms with higher sales compared to the ones VCs typically back. Additionally, he shows that PE-backed firms' stock returns outperform their VC-backed and non-backed peers following an IPO. Given these differences, it stands to reason that the type of financial sponsor backing, either through VC or PE investors, will lead to different post-IPO merger and acquisition strategies pursued by portfolio companies.

Despite acquisitions seemingly being a powerful driver in the decision to go public (Brau & Fawcett, 2006), the empirical evidence on this topic is still comparatively limited. Celikyurt et al. (2010) find that newly public firms conduct more acquisitions than more mature firms in the same industry, mainly by making use of their IPO proceeds and through better access to debt and equity markets. When it comes to financial sponsor backing, VC-backed firms are more likely to become acquisition targets while at the same time, the prospect of potentially being acquired also influences the propensity of VC-backed firms to become active acquirers themselves during the post-IPO period (Anderson et al., 2017). Yet, there is little empirical evidence on sponsor backing and post-IPO acquisition activity, particularly with regard to PE sponsors. We aim to fill this gap.

Analyzing a sample of 1,341 US IPOs between 2001 and 2017 and 1,845 subsequent acquisitions by these newly public firms, we find that financial sponsor backing itself as well as the type of financial sponsor backing at the time of the IPO has a meaningful impact on a firm's post-IPO M&A activity and share price development. Accounting for differences in firm characteristics, we find that PE-backed newly public firms surpass their VC-backed and non-backed peers in the number of post-IPO acquisitions they conduct and in the speed with which they proceed. This difference in acquisition activity is significantly stronger when the leading PE firm is the majority owner, suggesting that PE-ownership plays an influential role. For VC-backed firms, we find significantly higher post-IPO R&D spending. This suggests that sponsors promote growth in their newly public portfolio firms using different strategies: PE sponsors focus on inorganic growth through acquisitions, while VC sponsors focus on realizing organic growth options through R&D expenditures. Consistent with this pattern, our results further indicate that PE-backed newly public firms tend to conduct larger transactions than their peers. The results are robust to different regression model specifications, sample matching procedures, and also hold in a switching regression model with endogenous switching. Our analysis of the post-IPO stock returns reveals that PE-backed newly public acquirers achieve positive long-run stock returns during the first two years following the IPO, significantly outperforming VC-backed newly public acquirers. M&A announcement returns, however, do not differ significantly between PE-backed and VC-backed newly public acquirers.

Our study contributes to the existing literature in several ways. First, we document that PE-backed newly public firms play a significant role in driving the observed increase in newly public firms' post-IPO acquisition activity. Previous studies largely neglect to control for PE backing or solely focus on the acquisition activity of newly public VC-backed firms without separating the control group into PE-backed and non-backed newly public firms (e.g., Anderson et al., 2017; Celikyurt et al., 2010). Differentiating by sponsor type may help to reconcile the conflicting findings regarding the impact of VC backing on post-IPO acquisition activity, which ranges from positive (Anderson et al., 2017) to neutral (Celikyurt et al., 2010) to negative (Ragozzino et al., 2018). Second, we reveal distinct investment preferences in terms of organic and inorganic growth during the post-IPO period dependent on the sponsor at the time of the IPO being a VC or PE firm. PE-backed firms acquire more frequently following their IPO, whereas VC-backed firms invest more in R&D. Additionally, we observe differences in the types of acquisitions conducted following the IPO based on initial sponsor backing as PE funds steer their newly public portfolio firms to conduct more transformative acquisitions in terms of relative target size. Third, we extend prior research on the long-run post-IPO stock performance of newly public firms. Contrary to the prevailing notion that newly public firms underperform the market, we find positive long-term returns for PE-backed newly public acquirers. Our findings also contribute to the literature by substantiating the finding of positive shareholder wealth effects of M&A announcements (e.g., Alexandridis et al., 2017), especially for PE-backed newly public acquirers. Understanding the benefits and potential drawbacks of the growth strategies pursued by different financial sponsors has important implications for investors when deciding on portfolio allocation, particularly when looking at the difference in the long-run stock price development of newly public firms based on their pre-IPO ownership background.

The remainder of this chapter is structured as follows. Section 2.2 provides a brief overview of the two main types of financial sponsors and introduces the relevant literature and our main hypotheses. Section 2.3 presents the sample construction as well as descriptive sample statistics. Section 2.4 discusses the results of our empirical analysis on the impact of initial sponsor backing on post-IPO acquisition activity, growth alternatives, and acquisition characteristics, including several robustness tests. Section 2.5 focuses on the post-IPO stock performance conditioned on initial sponsor backing and acquisition activity. Section 2.6 concludes.

2.2 Background and research hypotheses

2.2.1 Financial sponsors

As temporary owners of corporations, financial sponsors buy equity stakes in firms with the intention of selling them for a profit after having successfully increased their value. More formally, Metrick and Yasuda (2011) define financial sponsors as meeting the following criteria:[2] (i) being a financial intermediary, meaning that it uses investors' capital to directly invest in portfolio companies; (ii) investing only in private companies, meaning that once the investments are made, the companies cannot be immediately traded on a public exchange;[3] (iii) taking an active role in monitoring and supporting the companies in its portfolio; and (iv) having the primary goal of maximizing its financial return by exiting investments through a sale or an IPO.

Within the group of financial sponsors, the extant literature commonly differentiates two types of sponsors: VC and PE investors (Buchner et al., 2019; Michala, 2019; Paglia & Harjoto, 2014). While both conform to the above criteria, they differ in the kinds of firms they invest in. VC sponsors typically invest in young, often research-intensive firms with strong growth potential but considerable uncertainty regarding their future cash flows. PE sponsors, in contrast, mostly focus on mature and comparatively large companies with proven business models and stable cash flows. Accordingly, they also differ in the structuring of their investments: While VC sponsors acquire minority equity stakes in early financing rounds, PE investors typically acquire controlling majority stakes which they finance with debt borrowed

[2] Metrick and Yasuda (2011) and others refer to 'private equity' as the overarching category comprising venture capital (VC) and buyout (BO) investors. While meaning the same, we refer to the overarching category as 'financial sponsors' and the subgroup of BO investors as private equity (PE) investors. We therefore use the term 'financial sponsors' as descriptive of the overall category in the definition provided above.

[3] This does not rule out that portfolio companies are traded on public exchanges during some part of the holding period, typically after the IPO but before a complete sponsor exit.

against their portfolio firms' future cash flows. The economics of PE and VC funds also differ.[4] VC funds rely on a small number of 'star investments' with high failure rates in the remaining portfolio (Manigart et al., 2002) while PE funds' investments have significantly lower failure rates and show more uniform returns across investments with leverage being an important driver of returns.

Most VC and PE sponsors (claim to) make changes in the ways their portfolio firms operate. Their tools, however, often differ. Firstly, PE sponsors have more sway in affecting change because they typically hold controlling stakes in their portfolio firms. This may lead to a more directive and in-depth involvement in portfolio firms' operations compared to the advisory-type guidance provided by VC sponsors (DeAngelo & DeAngelo, 1987).[5] Secondly, the unique challenges of the type of firms they back mean that PE and VC sponsors' main levers of value creation differ. For instance, for the mature and often low-growth companies that PE firms back, acquisition-induced growth is a key lever for value creation (see e.g., Greve, 2008). As a result, a large number of PE sponsors are burnishing their credentials in executing add-on acquisitions or managing strategies such as 'buy-and-build'. This isn't the case for VC sponsors, whose portfolio firms are mainly growing organically, implying that additional capital is often deployed to refine the product and scale operations to continue on an accelerated growth path.

In terms of channels for exiting investments, IPOs are important for PE and VC investors alike. However, within the VC world, IPOs are commonly considered the exit channel of choice for the best performing ventures (Black & Gilson, 1998; Gompers, 1995; Lerner,

[4] Both PE and VC investors raise closed-end funds with finite lifetimes of typically ten years. While the sponsors serve as general partners of their funds, the vast majority of capital contained in these funds is raised from so-called limited partners. For the first five years of their lifetimes, these funds are in their 'investment period', focusing on deploying capital before switching to 'harvesting mode' during which the focus gradually shifts towards exiting investments. During all stages, a considerable share of attention is devoted towards monitoring and steering of portfolio firms (Metrick & Yasuda, 2011).

[5] While individual VC investors typically do not hold controlling stakes, their stakes are nevertheless material. In our sample, VC sponsors cumulatively hold on average a 53.4% stake, with the average leading VC sponsor holding a 26.4% share of the IPO firm, allowing them to steer their portfolio companies' operational decisions.

1994; Masulis & Nahata, 2011). This dynamic cannot be observed for PE sponsors. In terms of exiting their investments following an IPO, both PE and VC sponsors hold on to their shares for a considerable time after the IPO: the majority of PE and VC sponsors do not sell any shares in the IPO and hold a substantial number of shares for up to three years after the IPO (Barry et al., 1990; Dong et al., 2020). The other main exit channels for financial sponsors are either trade or secondary sales – these, however, are not part of this study's explicit focus.[6]

2.2.2 Related literature and hypotheses development

The desire to acquire is a major motivation for firms to go public (Brau & Fawcett, 2006). Yet, research on the acquisition activity of newly public firms is comparatively limited with the dominating theme being the post-IPO uptake in acquisition activity (e.g., Anderson et al., 2017; Celikyurt et al., 2010; Hovakimian & Hutton, 2010). This rise in M&A activity is not only driven by IPO proceeds, but also by better access to credit markets and the ability to use newly issued shares as a currency in acquisitions (Celikyurt et al., 2010). There is some evidence that newly public firms time the market when making the decision to acquire as they are more likely to pay with stock when their valuations are high (Celikyurt et al., 2010; Hovakimian & Hutton, 2010), with stock liquidity being one potential driver of the acquisition decision (Signori & Vismara, 2017). Additionally, newly public firms alter the scope of their acquisitions, shifting from targeting subsidiaries towards the acquisition of entire firms (Hovakimian & Hutton, 2010).

[6] When it comes to exiting their investments, PE firms tend to do so through follow-on secondary equity offerings or third-party takeovers (Dong et al., 2020). There is no evidence that PE firms are better able to time the market than non-backed firms when it comes to IPOs or that they use IPOs to offload underperforming portfolio companies (Michala, 2019). When it comes to VC-backed firms, Gill and Walz (2016) find that VC-backed firms are more likely to delist following takeover than non-VC-backed firms, giving the VC firm an exit opportunity. IPOs are therefore not necessarily the primary exit strategy of VC firms either, but rather an intermediary step prior to VC firms' ultimate exit. This exit mode seems to be particularly relevant for corporate venture capital firms (Useche & Pommet, 2021).

Even though the rise in acquisition activity of newly public firms is empirically documented, the drivers have not yet been fully identified. Given that financial sponsors are more prevalent today, having backed more than 50% of US IPOs over the past two decades (Ritter, 2022), while simultaneously moving towards greater operational orientation and growth-focused strategies (Lerner et al., 2011), they may also be one driver behind post-IPO M&A activity more generally. PE and VC firms may induce corporate myopia but could also be directing a company's growth strategy.[7] It is therefore crucial for entrepreneurs and investors to obtain a better understanding of the role financial sponsor backing plays in determining the acquisition activity of newly public firms. Yet, the literature so far is relatively silent on the importance of financial sponsors as a driver in either promoting or diminishing the acquisition activity of newly public firms. Moreover, sponsor backing is always interpreted as VC backing with PE-backed firms only marginally considered, if at all (Anderson et al., 2017; Arikan & Capron, 2010; Brau & Fawcett, 2006; Celikyurt et al., 2010; Ragozzino et al., 2018; Wiggenhorn et al., 2007).

The results of the prior literature diverge when it comes to the influence of financial sponsor backing on the M&A activity of newly public firms, mainly focusing on the effects of VC backing. VC backing could increase post-IPO acquisition activity (Anderson et al., 2017), play no significant role (Celikyurt et al., 2010; Hovakimian & Hutton, 2010) or even diminish it (Ragozzino et al., 2018). Although these differences in the empirical results for VC-backed newly public firms are potentially driven by varying sample and control specifications, their

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[7] The issue of myopia may be especially relevant where the dominating shareholders represent "impatient" capital with limited investment horizons, which is an inherent part of PE and VC firms' investment philosophy and particularly true in the period of post-IPO transitionary ownership where the primary objective is a (profitable) exit. This may lead to companies underinvesting relative to a value maximizing strategy (Brossard et al., 2013; Bushee, 1998; Wahal & McConnell, 2000). However, PE and VC firms may specifically pursue growth opportunities as markets tend to reward growth stories. This later point seems to be prevalent, as previous studies were not able show that financial sponsors are a source of corporate myopia; the contrary actually appears to be the case (Lerner et al., 2011; Lichtenberg & Siegel, 1990).

exact sources remain unclear as there is considerable ambiguity surrounding the definition of VC backing.[8] While an exact definition may not be particularly relevant for studies whose focus does not demand going beyond controlling for VC backing, it is important for understanding the implications of VC backing, and sponsor backing more generally, on firms' post-IPO acquisition activity.

Given the distinct business models and strategies of PE and VC firms, it stands to reason that their impact on a newly public company's acquisition activity will also differ. Prior studies documented the importance of acquisitions for firms with limited organic growth opportunities, while firms with ample organic growth opportunities are less likely to pursue inorganic growth (see e.g., Greve, 2008). Given PE firms' business model and their backing of more mature companies, they are likely to rely on inorganic growth through (strategic) acquisitions. This, combined with markets' tendency to reward growth stories, may lead PE sponsors to steer their newly public portfolio firms to engage in acquisitions at a higher frequency. In contrast, VC-backed firms may have more internal growth opportunities and therefore no critical need for acquisitions to achieve growth. We therefore hypothesize:

H1: *PE backing of newly public firms will lead to higher acquisition activity by these firms compared to VC-backed or non-backed newly public firms.*

Given our assumption that VC-backed newly public firms are likely to have more organic growth options than PE-backed or non-backed newly public firms, they may be more likely to use their IPO proceeds to realize these options. Capital markets reward organic growth investments, for example signaled through increases in R&D spending, provided the respective firm is believed to have viable organic growth options (Chan et al., 1990; Zantout & Tsetsekos,

[8] The studies by Anderson et al. (2017), Celikyurt et al. (2010), Hovakimian and Hutton (2010) as well as Ragozzino et al. (2018) remain silent on whether they employ a threshold for VC ownership that has to be met before a company is considered VC-backed and may also implicitly include PE-backed IPOs in the control group of non-backed offerings.

1994). Additionally, Celikyurt et al. (2010) show that VC backing is positively associated with R&D and CAPEX spending in the years following an IPO, suggesting a higher reliance on organic growth options for VC-backed firms. We therefore hypothesize:

H2: *VC backing of newly public firms will lead to an emphasis on organic growth options by these firms compared to PE-backed or non-backed newly public firms.*

When it comes to acquisitions, newly public firms also appear to pivot towards acquiring larger targets (Hovakimian & Hutton, 2010). Particularly PE-backed firms may engage in different types of acquisitions than their VC-backed or non-backed peers. On the one hand, this may be due to the different investment strategies of PE and VC sponsors, but, on the other hand, may also be driven by a PE firm's past experience. The primary advantages are access to the PE firm's M&A process expertise and support regarding target selection, valuation, due diligence, purchase price negotiations, and post-merger integration. In addition, our data suggests that PE-backed IPO firms engage in more acquisitions prior to going public (average of 0.8 acquisitions during the three years prior to the IPO) than their VC-backed (0.5 acquisitions) or non-backed peers (0.4 acquisitions) and may therefore leverage the expertise from these prior deals. This broader set of experience in M&A may not only manifest itself in the quantity of transactions but may also lead to more transformative transactions. Therefore, PE-backed firms may be more willing to pursue growth through transformative deals, such as larger M&As or cross-industry and cross-border deals, where the newly public company may serve as platform for (strategic) add-on acquisitions.[9] In contrast, VC-backed and non-backed newly public firms are likely to avoid such transformative deals. We therefore hypothesize:

[9] There is anecdotal evidence that firms may actively be looking for PE investments if they wish to engage in a buy-and-build strategy. For example, the German construction company WWB Tiefbau stated in a press release: "*Our "buy-and-build" strategy requires a lot of capital and manpower/expertise. We, therefore, want to embark on this journey with a strong partner in these dimensions. (...) We are happy and proud to explore this new territory with our partner Auctus Capital Partners (...).*" (translated from German) WWB Tiefbaugesellschaft (2021).

H3: *PE backing of newly public firms will lead to these firms engaging in more transformative acquisitions compared to VC-backed or non-backed newly public firms.*

Besides affecting the post-IPO acquisition activity of newly public firms, the different strategic approaches to realize a portfolio firm's growth options by PE and VC sponsors are also likely to shape their portfolio firm's share price performance. In this context, one needs to differentiate between the long-run post-IPO stock performance and the short-term wealth effects surrounding post-IPO M&A announcements of the newly public firm based on initial sponsor backing. With respect to the long-run stock market performance following IPOs, Brau et al. (2012) find significant underperformance in subsequent years for firms that engage in an acquisition within the first year after their IPO, while companies that refrain from acquiring show slightly positive returns. Looking at the influence of financial sponsor backing on post-IPO stock market performance, Levis (2011) reports that PE-backed firms perform better than non-backed firms. For VC-backed firms, the picture is less clear and any long-run outperformance appears to be contingent on the methodology employed. Brau et al. (2012) find evidence that VC backing at the time of a firm's IPO has a positive impact on the long-run stock performance, but only when benchmarking the returns against the market adjusted model. This confirms the results of Brav and Gompers (1997), who show that VC-backed IPO firms outperform non-VC-backed ones when using equal weighted returns as a benchmark, but not when using value weighted returns.

Given our previous assumption that PE or VC backing will guide their newly public portfolio companies towards different growth strategies, combining the two strands of the literature on post-IPO acquisition activity and on initial sponsor backing may result in a more nuanced picture with respect to long-run post IPO stock performance. Given that PEs may steer their newly public portfolio firms to pursue growth through M&As, particularly those firms that successfully engage in acquisitions should benefit. VC-backed newly public firms, on the other hand, are more likely to rely on internal growth and hence engaging in post-IPO acquisitions may not be perceived as a value-enhancing activity by investors. This should lead to stark post-IPO stock return differentials between acquiring PE-backed and VC-backed newly public firms and we therefore hypothesize:

H4a: *PE-backed newly public acquirers show higher long-run stock returns than VC-backed newly public acquirers.*

With respect to the short-term value creation of acquisitions by newly public firms, several studies find at least some evidence of positive short-term wealth effects (e.g., Anderson et al., 2017; Arikan & Capron, 2010; Wiggenhorn et al., 2007), a finding that stands in contrast to the traditionally negative announcement returns observed for public acquirers (e.g., Moeller et al., 2004; Mulherin & Boone, 2000). We anticipate that PE-backed newly public firms will obtain higher returns than VC-backed ones. This is based on the assumption that PE-backed firms can benefit from their financial sponsor's expertise in running an efficient M&A process and successful post-merger integration, resulting in more beneficial capital market valuations. There is also limited evidence that VC backing has a negative impact on the acquisition performance of newly public firms (Wiggenhorn et al., 2007), which may be due to shareholders expecting VC-backed newly public firms to focus on organic rather than inorganic growth. We therefore hypothesize:

H4b: *PE-backed acquirers experience higher short-term stock returns surrounding post-IPO M&A announcements than VC-backed acquirers.*

2.3 Data

2.3.1 Sample construction

We create our sample by combining IPO firms that went public on US stock exchanges between 2001 and 2017 and their associated M&A transactions within a 3-year period after the date of going public. For IPO-related data, we use Refinitiv's Securities Data Company Platinum (SDC) as a basis. We filter for IPO firms that went public on the NASDAQ, NYSE and NYSE American between January 2001 and December 2017 and exclude both depositary issues and closed-end funds. This approach yields 2,207 observations. In line with standard research practice (e.g., Liu & Ritter, 2011; Loughran & Ritter, 2004), we limit the sample to IPO companies using a firm commitment regime and to offerings of common shares, which reduces the sample size to 1,953. Next, we exclude simultaneous offerings (i.e., parallel offerings on multiple exchanges) for which the US is not the target market as well as IPO firms from the financial sector (e.g., banks, insurance companies, asset managers, REITS, SPACs, etc.) which leaves us with 1,763 remaining observations.[10] We further exclude 85 companies that were insufficiently covered, e.g., newly public firms for which no prospectus could be found in the US Securities and Exchange Commission's (SEC) Electronic Data Gathering, Analysis, and Retrieval (EDGAR) database and 205 firms that did not survive the first three years after their IPO. Lastly, we set an ownership threshold of 25% that the financial sponsors need to meet in aggregate in order to classify an IPO as financial sponsor backed. IPOs with no sponsor stake are classified as non-backed while IPOs with cumulative sponsor stakes above 0% and below our threshold of 25% are dropped from the sample (132 observations), leaving us with a final sample of 1,341 IPOs. As SDC only provides limited data on the identity and the size of stakes held by financial sponsors at the time of the IPO, we hand-collect the corresponding ownership data for all financial sponsor-backed IPOs using the prospectuses available in the SEC's EDGAR database. Specifically, we collect the identity and pre- and post-IPO shareholdings of all reported institutional shareholders. For those financial sponsor-backed IPOs that exceed our threshold, we use the flag provided by SDC to differentiate between PE- and VC-backed IPOs.

[10] Some studies also exclude IPOs with an offer price lower than USD 5. In our sample, 30 IPOs fall below that threshold. When excluding these, our results remain unchanged.

Following this procedure, 917 IPO firms are categorized as sponsor-backed (386 PE-backed and 531 VC-backed) while the remaining 424 IPO firms are categorized as non-backed.

For M&A transaction-related data, we again use SDC as a starting point to collect the acquisitions associated with the IPO companies in our sample. This time, we filter for M&A transactions completed between 2001 and 2020 so that we cover the three-year post-IPO period for all firms in our sample that went public between 2001 and 2017 and their associated transactions.[11] We include all transactions above a materiality threshold of USD 10 million.[12] Employing these filters results in an initial M&A sample size of 8,917 transactions. We exclude M&A transactions that could not be mapped unambiguously to one IPO firm in our sample, which leaves us with 7,348 remaining observations. We then map these acquisitions to the IPO firms in our sample and compare the date of the acquisition to the date of going public. Out of the 7,348 transactions, 1,845 deals took place within the first three years after the associated IPO, while another 3,793 deals were conducted more than three years following the IPO and are hence not relevant for our analysis. An additional 1,710 transactions were undertaken prior to the IPO, 723 of which fall within three years before the IPO. The 1,845 deals conducted within the first three years following the IPO will serve as our main research sample, while the transactions conducted pre-IPO will be of interest as a control variable for prior M&A experience in our regression models. Further, we use Center for Research in Security Prices (CRSP) for retrieving daily stock price data for all sample firms. Finally, we supplement the variables provided by SDC with financial data for the acquirer (e.g., revenue, EBIT, total

[11] We additionally collect data on M&A transactions conducted by our sample IPO firms in the years 1998-2000 to construct a variable measuring the three-year pre-IPO M&A experience for all firms in our sample.
[12] We complement the SDC data by manually researching all acquisitions with unreported deal values in the database and hand-collect 293 additional deal values, 154 of which are below USD 10m and thus dropped from our sample. Otherwise, in line with prior literature (e.g., Celikyurt et al., 2010) we also keep all transactions with no reported deal value. Results reported in sections 2.4 and 2.5 are qualitatively unchanged when restricting the sample to acquisitions with reported deal values only.

assets, etc.) from the Compustat database (see the Appendix for more details on all relevant variables).

2.3.2 Descriptive statistics

Our sample comprises a total of 1,341 IPO firms and 1,845 associated M&A transactions within three years after the IPO. Table 2-1 provides a breakdown of these IPO companies and the respective M&A transactions according to their IPO year and their backing classification (either PE-backed, VC-backed, or non-backed) using the 25% threshold. Across all years, 386 IPO firms (29%) are PE-backed, 531 (40%) are VC-backed and 424 (31%) are non-backed. For the corresponding M&A transactions within the first three years following the IPO, 881 deals (48%) are PE-backed, 441 (24%) are VC-backed and 523 (28%) are non-backed. PE-backed firms conduct the most M&As within the first three years after going public with an average of 2.3 transactions, while VC-backed companies are the least active in the M&A market with an average of only 0.8 deals, making PE-backed IPO firms almost three times as acquisitive as their VC-backed counterparts. Non-backed firms range between the two sponsor groups with an average of 1.2 deals per company. The data also reveals that PE-backed IPO firms are generally the most likely to acquire during the first three years of being public, with 61% of PE-backed firms engaging in at least one acquisition, compared to 39% for VC-backed firms and 44% for non-backed firms.

Table 2-2 provides additional details on the differences in ownership structure between PE-backed and VC-backed newly public firms and thereby highlights the differences in investment styles between the two types of financial sponsors. While VC investors usually invest smaller stakes in multiple funding rounds, PE investors tend to buy entire companies and have a lower propensity to co-invest with other PE investors. Consequently, PE sponsors tend to hold significantly larger stakes in their IPO firms than VC sponsors both cumulatively

Table 2-1: Sample IPOs and associated M&A transactions by year and sponsor backing

This table provides an overview of the 1,341 sample IPOs that listed on a US stock exchanges between 1 January 2001 and 31 December 2017 by year. The IPOs are classified as either PE-backed, VC-backed, or non-backed. In order for an IPO firm to be considered either PE-backed or VC-backed, the pre-IPO cumulative ownership held by the respective sponsor group must exceed 25% of total share capital. The number of acquisitions an IPO firm of a given year undertook during its first three post-IPO years (# acquis. in 3 yrs. post IPO) is also shown along with the average number of acquistions per IPO firm (av. # acquis. per IPO firm) and the percentage of IPO firms of a given year cohort that undertook at least one M&A deal (% IPO firms with >0 acquis).

	PE-backed IPO firms				VC-backed IPO firms				Non-backed IPO firms				All			
IPO year	#IPOs	# acquis. in 3 yrs. post IPO	av. # acquis. per IPO firm	% IPO firms with >0 acquis.	#IPOs	# acquis. in 3 yrs. post IPO	av. # acquis. per IPO firm	% IPO firms with >0 acquis.	#IPOs	# acquis. in 3 yrs. post IPO	av. # acquis. per IPO firm	% IPO firms with >0 acquis.	#IPOs	# acquis. in 3 yrs. post IPO	av. # acquis. per IPO firm	% IPO firms with >0 acquis.
2001	13	30	2.3	62%	14	21	1.5	50%	27	63	2.3	52%	54	114	2.1	54%
2002	12	18	1.5	58%	11	10	0.9	36%	21	16	0.8	33%	44	44	1.0	41%
2003	11	20	1.8	64%	14	20	1.4	50%	14	49	3.5	64%	39	89	2.3	59%
2004	30	84	2.8	77%	49	32	0.7	43%	37	55	1.5	59%	116	171	1.5	57%
2005	42	119	2.8	76%	21	16	0.8	43%	45	56	1.2	47%	108	191	1.8	57%
2006	37	63	1.7	49%	32	19	0.6	38%	35	40	1.1	49%	104	122	1.2	45%
2007	28	33	1.2	57%	47	29	0.6	36%	35	67	1.9	37%	110	129	1.2	42%
2008	3	1	0.3	33%	2	4	2.0	50%	11	10	0.9	45%	16	15	0.9	44%
2009	13	12	0.9	15%	8	8	1.0	38%	11	6	0.5	36%	32	26	0.8	28%
2010	20	42	2.1	60%	34	41	1.2	41%	20	10	0.5	25%	74	93	1.3	42%
2011	17	36	2.1	59%	32	39	1.2	53%	14	14	1.0	36%	63	89	1.4	51%
2012	27	78	2.9	67%	29	34	1.2	59%	13	11	0.8	54%	69	123	1.8	61%
2013	37	72	1.9	68%	52	53	1.0	40%	25	43	1.7	60%	114	168	1.5	54%
2014	46	112	2.4	59%	76	27	0.4	24%	27	25	0.9	44%	149	164	1.1	38%
2015	22	56	2.5	64%	50	33	0.7	34%	22	8	0.4	32%	94	97	1.0	40%
2016	11	58	5.3	64%	29	37	1.3	31%	28	13	0.5	25%	68	108	1.6	34%
2017	17	47	2.8	59%	31	18	0.6	35%	39	37	0.9	38%	87	102	1.2	41%
Total	**386**	**881**	**2.3**	**61%**	**531**	**441**	**0.8**	**39%**	**424**	**523**	**1.2**	**44%**	**1,341**	**1,845**	**1.4**	**47%**

(77.9% average cumulative share for PE firms compared to 53.4% for VC firms) as well as related to the leading sponsor's share (65.7% average leading sponsor share for PE-backed firms compared to 26.4% for VC-backed ones). Correspondingly, VC-owned IPO firms are backed by more sponsors than PE-owned IPO firms with the average VC-owned IPO company being backed by 3.4 sponsors compared to 1.7 sponsors for PE-owned IPO companies. These differences between PE-backed and VC-backed firms are significant at the 1% level of significance for both average and median. The higher level of shareholder dispersion in VC-backed IPO firms is also evident in the Herfindahl-Hirschman-Index (HHI) of stakes held pre-IPO, with PE-backed firms having an average sponsor HHI of 0.8, while VC-backed firms only have a sponsor HHI of 0.4. The difference between PE and VC backing is again significant at the 1% level of significance.

Table 2-2: Ownership characteristics by sponsor backing

This table shows the descriptive statistics relating to pre-IPO sponsor ownership, divided by PE-backed and VC-backed IPO firms. The average and median cumulative share held by all sponsors and the average and median cumulative share held by the leading sponsor are shown, along with the average and median number of different sponsors. Sponsor HHI represents the Herfindahl-Hirschman Index of stakes held by all sponsors. Differences between PE-backed and VC-backed firms are tested for significance using the parametric two-sample *t*-test and the nonparametric Wilcoxon rank-sum test. *, **, and *** indicate significance at the 10%, 5%, and 1% level of significance, respectively.

	PE-backed IPO firms	VC-backed IPO firms	PE-backed – VC-backed
Average cumulative share held by sponsors (in	77.9	53.4	24.5***
Median cumulative share held by sponsors (in %)	83.7	52.2	31.5***
Average share held by leading sponsor (in %)	65.7	26.4	39.2***
Median share held by leading sponsor (in %)	67.9	22.7	45.2***
Average number of different sponsors	1.7	3.4	−1.7***
Median number of different sponsors	1.0	3.0	−2.0***
Average sponsor HHI	0.8	0.4	0.4***
Median sponsor HHI	1.0	0.4	0.6***

Table 2-3 compares the different backing groups of newly public firms in our sample with respect to firm characteristics (Panel A) and IPO characteristics (Panel B). Differences between the ownership groups are significant across most characteristics, highlighting that the average IPO firm's characteristics differ depending on whether it is backed by PE investors, VC investors or not backed. With respect to firm characteristics, newly public firms backed by

Table 2-3: Sample IPO firm characteristics

This table shows the sample IPO firms' characteristics at the time of the IPO, divided by backing group and firm characteristics (Panel A) and IPO characteristics (Panel B). The variables are defined in Table 2-13 in the Appendix. The sample average is presented with the median below in parentheses. Differences between backing groups are tested for significance using the parametric two-sample *t*-test (averages) and the nonparametric Wilcoxon rank-sum test (medians). *, **, and *** indicate significance at the 10%, 5%, and 1% level of significance, respectively.

	PE-backed IPO firms (1)	VC-backed IPO firms (2)	Non-backed IPO firms (3)	(1) − (3)	(2) − (3)	(1) − (2)
Panel A: Firm Characteristics						
Firm age at IPO	35.21	9.47	20.97	14.24***	−11.50***	25.74***
	(25.50)	(8.00)	(12.00)	(13.50)***	(−4.00)***	(17.50)***
Firm revenue	1,475.21	108.64	1,132.36	342.85	−1,023.72**	1,366.57***
	(537.06)	(45.56)	(91.78)	(445.28)***	(−46.22)***	(491.50)***
Return on Assets	0.00	−0.20	−0.12	0.12***	−0.08***	0.20***
	(0.02)	(−0.18)	(0.02)	(0.00)	(−0.20)***	(−0.16)***
Book leverage	0.39	0.07	0.20	0.19***	−0.13***	0.32***
	(0.39)	(0.01)	(0.11)	(0.28)***	(−0.10)***	(0.38)***
Market-to-book ratio	2.34	3.90	3.19	−0.85**	0.71**	−1.56***
	(1.78)	(3.20)	(2.07)	(−0.29)***	(1.13)***	(−1.42)***
Financial slack	0.12	0.70	0.34	−0.22***	0.36***	−0.58***
	(0.06)	(0.74)	(0.23)	(−0.17)***	(0.51)***	(−0.68)***
Growth investment level	0.12	0.22	0.18	−0.06***	0.04***	−0.10***
	(0.08)	(0.19)	(0.11)	(−0.03)***	(0.08)***	(−0.11)***
Panel B: IPO characteristics						
Primary proceeds	231.77	90.88	329.15	−97.38	−238.27**	140.89***
	(142.80)	(71.41)	(65.17)	(77.63)***	(6.24)	(71.39)***
M&A is IPO motive (%)	0.20	0.47	0.34	−0.14***	0.13***	−0.27***
	–	–	–	–	–	–
Underwriter reputation	11.59	8.61	6.53	5.06***	2.08***	2.98***
	(12.02)	(9.72)	(4.20)	(7.82)***	(5.52)***	(2.30)***
Offer price revision	−5.52	−6.58	−4.51	−1.01	−2.07	1.06
	(−4.55)	(0.00)	(0.00)	(−4.55)	(0.00)	(−4.55)
Underpricing	12.11	18.60	11.47	0.64	7.13***	−6.49***
	(5.87)	(11.23)	(4.36)	(1.51)	(6.87)***	(−5.36)***
First 30-days post-IPO return	2.72	3.24	5.50	−2.78	−2.26	−0.52
	(2.94)	(0.60)	(−0.06)	(3.00)***	(0.66)	(−2.34)**
Dual class share structure (%)	0.11	0.05	0.20	−0.09***	−0.15***	0.06***
	–	–	–	–	–	–
Industry acquisition intensity	1.03	1.07	1.04	−0.01	0.03***	−0.04***
	(1.00)	(1.06)	(1.00)	(0.00)**	(0.06)***	(−0.06)***

PE investors tend to be the oldest and have the highest revenues, return on assets and book leverage, while they have the lowest market-to-book ratios, financial slack and growth investment level. VC-backed firms are on the opposite end of the distribution. They tend to be the youngest and have the lowest revenues, return on assets and book leverage while they rank highest with respect to market-to-book ratios, financial slack and growth investment level. All differences in firm characteristics between PE-backed and VC-backed companies are again highly significant for both average and median, highlighting the importance of differentiating between PE- and VC-backed IPO firms when discussing the role of financial sponsors in newly public firms. Across all firm characteristics, non-backed firms tend to rank between PE- and VC-backed firms. With respect to IPO characteristics, PE-backed firms are the least likely to mention M&As as an IPO motive in their prospectus, which is surprising given that PE-backed firms conduct the most post-IPO M&As in our sample.[13] They also employ more prestigious underwriters than both VC-backed and non-backed firms. VC-backed firms raise the lowest primary proceeds across all ownership groups and are most likely to mention M&A in their IPO prospectus, despite their low post-IPO M&A frequency. Finally, VC-backed firms experience significantly higher underpricing than their PE-backed and non-backed peers.

2.4 Empirical results

2.4.1 Sponsor backing and acquisition frequency

To investigate how financial sponsor backing impacts newly public firms' post-IPO acquisition frequency, we first conduct univariate tests on the differences in acquisition behavior between PE-backed, VC-backed and non-backed IPO firms. Table 2-4 shows the results of the difference tests. Panel A summarizes the acquisition frequency before and after the IPO across ownership groups. Our data reveals that PE-backed firms undertake most acquisitions, both before and after the IPO, with on average 0.80 and 2.28 acquisitions, respectively, while VC-backed firms conduct, on average, 0.47 acquisitions in the three years prior to the IPO and 0.83 acquisitions in the three years following the IPO. The differences between PE-backed firms vis-à-vis VC-backed and non-backed firms are statistically significant at the 1% level for both the pre- and the post-IPO period, supporting hypothesis **H1**. While VC-backed and non-backed

[13] We concede that this is a self-reported variable by the IPO firm. However, in our view it is nonetheless an appropriate control variable to better understand the firm's (original) drivers for going public. Moreover, investors may also rely on the IPO prospectus when making investment decisions.

Table 2-4: Acquisition frequency and characteristics by sponsor backing

This table reports the sample IPO firms' acquisition frequency (Panel A) and acquisition characteristics (Panel B) divided by backing group. *# post-IPO acquisitions (3 years)* and *# pre-IPO acquisitions (3 years)* are the number of acquisitions conducted during the three years prior to and after the IPO, respectively, *Deal value ($mm)* is the deal value of acquisitions in million US dollars, *% of shares acquired* is the stake acquired through the transaction (i.e., irrespective of stakes held prior to the acquisition), *% paid in stock* is the share of the deal value that was paid in stock. *Deal value over acquirer sales* is the deal value in million US dollar divided by the acquirer's sales in million US dollar at the time of the IPO, *% cross-border* is the share of acquisitions that involve an acquirer and a target from different countries and *% cross-industry* is the share of acquisitions where acquirer and target come from different Fama-French 49 industry portfolios. The sample average is presented with the median below in parentheses. Differences between backing groups are tested for significance using the parametric two-sample *t*-test (averages) and the nonparametric Wilcoxon rank-sum test (medians). *, **, and *** indicate significance at the 10%, 5%, and 1% level of significance, respectively.

	PE-backed IPO firms (1)	VC-backed IPO firms (2)	Non-backed IPO firms (3)	(1) − (3)	(2) − (3)	(1) − (2)
Panel A: Acquisition frequency						
# post-IPO acquisitions (3 years)	2.28	0.83	1.23	1.05***	−0.40***	1.45***
	(1.00)	(0.00)	(0.00)	(1.00)***	(0.00)	(1.00)***
# pre-IPO acquisitions (3 years)	0.80	0.47	0.38	0.42***	0.09	0.33***
	(0.00)	(0.00)	(0.00)	(0.00)***	(0.00)	(0.00)***
# post-IPO / # pre-IPO acquisitions	1.48	0.36	0.85	0.63***	−0.49***	1.12***
	(1.00)	(0.00)	(0.00)	(1.00)***	(0.00)**	(1.00)**
Panel B: Acquisition characteristics						
Deal value ($mm)	436.07	105.58	257.16	178.91	−151.58**	330.49*
	(77.78)	(36.42)	(49.04)	(28.74)**	(−12.62)**	(41.36)***
% of shares acquired	99.36	99.33	97.94	1.42**	1.39**	0.03
	(100.00)	(100.00)	(100.00)	(0.00)	(0.00)	(0.00)
% paid in stock	8.5	30.9	20.8	−12.30***	10.10**	−22.40***
	(0.0)	(10.7)	(0.0)	(0.00)***	(10.70)**	(−10.70)***
Deal value over acquirer sales	0.55	7.95	9.69	−9.14	−1.74	−7.40*
	(0.14)	(0.37)	(0.22)	(−0.08)	(0.15)**	(−0.23)***
% cross-border	26.1	23.1	26.6	−0.50	−3.50	3.00
	(0.0)	(0.0)	(0.0)	(0.00)	(0.00)	(0.00)
% cross-industry	40.2	41.3	45.1	−4.90	−3.80	−1.10
	(33.3)	(33.3)	(33.3)	(0.00)	(0.00)	(0.00)

firms *pre-IPO* acquisition activity appears similar, we find some evidence that VC-backed firms conduct fewer acquisitions than even their non-backed peers *post-IPO*. We also compare the degree to which the IPO accelerates acquisition frequency across ownership groups. Consistent with Celikyurt et al. (2010), we find that the acquisition frequency increases materially after going public. However, the acceleration deviates among ownership groups: it is most pronounced for PE-backed firms, who, on average, conduct 1.48 more acquisitions in the three years following their IPO than in the three years prior to the IPO, while these differences stand at 0.36 and 0.85 for VC- and non-backed newly public firms, respectively.

The differences in M&A acceleration are significant between all groups. It is worth highlighting that the acceleration in acquisition behavior is markedly lower in case of VC-backed IPO firms than for their PE- or non-backed peers, indicating that acquisitions may, after all, not be the primary motivation for VCs to take a portfolio company public.

Table 2-4 Panel B additionally provides tests for selected deal characteristics. It becomes evident that the three ownership groups not only differ in their acquisition frequency but also in the nature of the acquisitions they engage in. PE-backed firms are significantly less likely to pay with stock than their VC-backed and non-backed peers while VC-backed firms conduct significantly smaller acquisitions than PE-backed and non-backed firms. Both PE-backed and VC-backed newly public firms have a tendency to acquire higher stakes in their target than their non-backed peers, albeit the difference is economically small. Finally, we find no significant difference in the likelihood to conduct cross-border or cross-industry acquisitions between PE-backed, VC-backed, and non-backed IPO firms.

To test whether these findings also hold in a multivariate setting, we conduct several regressions on the number of acquisitions conducted post-IPO. The regression takes the form:

$$Acquisition\ frequency_i = \alpha + \beta_1 PEBacked_i + \beta_2 VCBacked_i + \sum_j \gamma_j X_{i,j} + \sum_k \delta_k Y_{i,k} + \sum_l \tau_l Z_{i,l} + \varepsilon_i \quad (1)$$

where *Acquisition frequency* is the dependent variable and defined as IPO firm *i*'s total number of post-IPO acquisitions during the first (model (1)), the first two (model (2)), and the first three (model (3)) years following the IPO.[14] The independent variables are divided into four groups: (i) sponsor backing, (ii) company characteristics, (iii) IPO characteristics, (iv) and M&A characteristics. The sponsor backing binary variables are our variables of interest and consist of *PEBacked* and *VCBacked*, both defined as one if the IPO firm is, at the time of the

[14] Due to the nature of our dependent variable (being a count of events), we also conduct a Poisson regression as a robustness check. The results are presented in Table 2-14 in the Appendix and confirm the ones presented in this section. Additionally, to analyze potential non-linear relationships between sponsor backing and the number of post-IPO acquisitions, we re-estimate our models using ordered logit regressions. The results are reported in Table 2-15 in the Appendix and remain robust.

IPO, either 25% or more PE or VC owned, respectively, and zero otherwise.[15] $X_{i,j}$ $Y_{i,k}$ and $Z_{i,l}$ are vectors of variables related to company, IPO, and M&A characteristics, and ε_i is the error term. The vector of company characteristics includes variables such as firm *i*'s revenue, return on assets, or book leverage, the vector of IPO characteristics contains, amongst others, variables relating to the primary proceeds raised in the IPO and the underwriter's reputation, while the vector of M&A characteristics consists of variables relating to firm *i*'s pre-IPO acquisition activity and a firm's industry M&A intensity. The Appendix provides detailed variable definitions.

The regression results in Table 2-5 show that PE-backed IPO firms conduct significantly more acquisitions post-IPO than their non-backed peers for all time horizons, providing further support for hypothesis **H1**. The further we extend the time horizon from model (1) to (3), the more significant and economically large the effect of PE backing becomes. In results reported in Table 2-16 in the Appendix, we also find that PE backing significantly reduces the time a newly public firm takes to conduct its first acquisition following the IPO. With respect to the role of VC backing, the coefficient of *VCBacked* is negative but statistically insignificant, indicating that the significant difference found in Table 2-4 may at least be partially explained through other variables.

The significant and positive effect observed for PE-backed firms may be a consequence of the PE firms' active involvement in their portfolio firms, supporting the portfolio firm's acquisitions with their resources and network even after it went public. VC backing, in contrast, has no significant impact. The influence of VC backing on post-IPO acquisitions has only been marginally addressed in the literature, mostly as a control variable in analyses primarily focusing on other research questions. Our findings with respect to VC backing are consistent

[15] We also test whether the results differ depending on the actual percentage ownership of the leading PE or VC investor in regression models (4) through (6). Moreover, we also vary the ownership threshold for financial sponsors. While we find that the statistical strength of the relations slightly decreases when lowering the threshold, they remain significant.

Table 2-5: Regressions on post-IPO acquisition frequency

This table reports the cross-sectional regression coefficients using the IPO firm *i*'s number of post-IPO acquisitions as dependent variable. The variables of interest in models (1) to (3) are *PEBacked* and *VCBacked*, both defined as one if the IPO firm is either PE-backed or VC-backed, respectively, at the time of the IPO, whereby the sponsor's backing must exceed an ownership threshold of 25% in the IPO firm, and zero otherwise. The variables of interest in models (4) to (6) are *Leading PE equity stake* and *Leading VC equity stake*, both defined as the equity stake of the respective leading sponsor in percent at the time of the IPO. The other variables are divided into company characteristics, IPO characteristics, and M&A characteristics and are defined in Table 2-13 in the Appendix. The standard errors are corrected for heteroskedasticity and clustered by leading financial sponsor with associated *t*-values given in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

	# post-IPO acq. – full sample					
	(1) IPO + 1 yr	(2) IPO + 2 yrs	(3) IPO + 3 yrs	(4) IPO + 1 yr	(5) IPO + 2 yrs	(6) IPO + 3 yrs
Sponsor backing						
PEBacked	0.199**	0.381***	0.564***			
	(2.366)	(3.013)	(3.273)			
VCBacked	−0.084	−0.106	−0.153			
	(−1.293)	(−1.003)	(−0.989)			
Leading PE equity stake				0.004***	0.006***	0.008***
				(3.040)	(3.409)	(3.082)
Leading VC equity stake				−0.003**	−0.006**	−0.009*
				(−2.314)	(−2.334)	(−1.870)
Company characteristics						
Firm revenue	0.044*	0.114***	0.184***	0.045*	0.118***	0.189***
	(1.700)	(3.203)	(4.350)	(1.722)	(3.250)	(4.412)
Return on Assets	−0.038	−0.152	−0.176	−0.034	−0.144	−0.167
	(−0.981)	(−1.287)	(−1.143)	(−0.881)	(−1.290)	(−1.143)
Book leverage	−0.054	−0.151	−0.271	−0.055	−0.143	−0.239
	(−0.488)	(−0.785)	(−0.964)	(−0.486)	(−0.717)	(−0.834)
Market-to-book ratio	−0.006	0.015	0.037	−0.006	0.015	0.037
	(−0.483)	(0.801)	(1.505)	(−0.484)	(0.799)	(1.487)
Financial slack	−0.270	−0.428**	−0.613**	−0.210	−0.329	−0.533*
	(−1.637)	(−2.101)	(−2.100)	(−1.327)	(−1.640)	(−1.894)
Growth investment level	−0.341*	−0.887***	−1.072***	−0.322*	−0.871***	−1.077***
	(−1.888)	(−4.291)	(−3.477)	(−1.815)	(−4.196)	(−3.504)
Firm age at IPO	−0.036	−0.013	0.003	−0.040	−0.019	−0.002
	(−1.025)	(−0.188)	(0.032)	(−1.104)	(−0.277)	(−0.024)
IPO characteristics						
Primary proceeds	0.173***	0.305**	0.392**	0.170***	0.301**	0.389**
	(2.866)	(2.539)	(2.549)	(2.880)	(2.525)	(2.518)
M&A is IPO motive	0.308***	0.355***	0.512***	0.314***	0.362***	0.517***
	(4.595)	(3.938)	(3.957)	(4.650)	(4.021)	(3.982)
Underwriter reputation	−0.015**	−0.028***	−0.039***	−0.016***	−0.029***	−0.039***
	(−2.521)	(−2.667)	(−2.623)	(−2.923)	(−2.870)	(−2.720)
Underpricing	0.001	0.003	0.004*	0.002	0.003	0.004*
	(0.977)	(1.271)	(1.736)	(1.105)	(1.425)	(1.911)
Offer price revision	0.001	0.003	0.001	0.001	0.003	0.001
	(0.920)	(1.001)	(0.330)	(0.920)	(0.969)	(0.266)
First 30-days post-IPO return	0.002**	0.003*	0.004*	0.002**	0.003*	0.004*
	(2.170)	(1.946)	(1.905)	(2.221)	(1.861)	(1.874)
Dual class share structure	−0.102	−0.083	−0.005	−0.073	−0.053	0.020
	(−0.798)	(−0.399)	(−0.020)	(−0.621)	(−0.276)	(0.078)
M&A characteristics						
Pre-IPO acquirer	0.483***	0.826***	1.220***	0.489***	0.838***	1.235***
	(5.885)	(6.659)	(6.925)	(5.891)	(6.756)	(7.022)
Industry acquisition intensity	0.084	0.388	0.519	0.079	0.385	0.518
	(0.608)	(1.495)	(1.648)	(0.563)	(1.433)	(1.595)
Constant	−0.653**	−1.341*	−1.854*	−0.670**	−1.374*	−1.907*
	(−1.996)	(−1.871)	(−1.696)	(−2.019)	(−1.907)	(−1.731)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,071	1,071	1,071	1,071	1,071	1,071
R-squared	0.178	0.209	0.225	0.184	0.214	0.227

with Hovakimian and Hutton (2010), but stand in contrast to Anderson et al. (2017), who find weak evidence for VC backing being associated with a higher likelihood of becoming an acquirer during the first three years after going public, albeit they also find VC backing to be insignificant for the one- and two-year time horizons. The difference may be a consequence of different types of analyses.[16] Celikyurt et al. (2010) also include a VC dummy in their analysis on post-IPO acquisition volume and find evidence for a positive relationship between VC backing and stock-financed acquisitions as well as a negative relationship between VC backing and cash-financed acquisitions. In unreported results, and in line with Celikyurt et al. (2010), we find that the coefficient associated with *VCBacking* is positive and statistically significant when restricting the sample to stock-financed acquisitions. However, we do not find a statistically significant negative coefficient associated with *VCBacking* when restricting the sample to cash-financed acquisitions.

To gain additional insights into sponsors' role in driving post-IPO acquisition behavior, we rerun the same regression using the percentage stake of the lead investor (either PE or VC) as the variables of interest instead of dummy variables. If there is indeed a causal relationship between financial sponsor backing and post-IPO acquisition behavior, we would expect that this relationship becomes more accentuated with the size of the leading sponsor's stake, as sponsors with a higher stake in the firm have more power to enforce their interests. The results are shown in regression models (4) through (6) in Table 2-5 and are similar to models (1) to (3) in that higher ownership share of PE investors positively affects post-IPO acquisition frequency, providing further support for **H1**. Higher lead VC investor ownership, in contrast, leads to a significant reduction in acquisition activity, showing that higher VC sponsorship may even lower firms' acquisition activity. However, this result does not hold when using the Poisson regression or ordered logit regression set-up reported in Table 2-14 and Table 2-15 in

[16] While Anderson et al. (2017) use a logit regression approach to predict the likelihood of becoming an acquirer, we use an OLS regression explaining acquisition frequency. It may be the case that VC backing increases the likelihood of becoming an acquirer but at the same time has no statistically significant effect on acquisition frequency, especially if VC-backed IPO firms are more likely to conduct only a few acquisitions after going public.

the Appendix, respectively. We therefore conclude that higher leading VC equity stakes is not a robust indicator for lower post-IPO acquisition activity.

The control variables provide some additional insights into the drivers of post-IPO acquisition activity. Newly public firms benefit from the proceeds they raise through the IPO to conduct acquisitions, with higher proceeds being associated with increased acquisition activity. Revenues likewise affect post-IPO acquisitions positively. Unsurprisingly, firms acquire significantly more when they disclose M&A as one of their motives for going public in their IPO prospectus. Prior M&A experience also matters, as newly public firms that have acquired prior to going public also engage in more acquisitions following the IPO. Growth options outside of M&A negatively affect acquisitions post-IPO as indicated by the negative and significant coefficient for the variable related to the growth investment level. The coefficients of the other control variables remain largely insignificant.

2.4.2 The impact of initial sponsor backing on organic growth alternatives

To test hypothesis **H2** that VCs guide their portfolio firms towards organic growth, we investigate whether VC-backed firms rely more heavily on organic growth options to substitute for their lower acquisition volume vis-à-vis PE-backed and non-backed IPO firms. We use both Capex and R&D spending as proxies for organic growth investments and conduct several regressions on these two dependent variables using the same set of variables as in equation (1).

The results are presented in Table 2-6. In models (1) to (3) where Capex is the dependent variable, the coefficient for *VCBacked* is statistically significant and negative for the first year following the IPO but insignificant for the two- and three-year time periods, respectively, failing to support hypothesis **H2**. In models (4) to (6) with R&D expenditures as the dependent variable, however, we find evidence in support of hypothesis **H2** as VC backing is positively associated with higher R&D expenditures as the coefficient is significant at the

Table 2-6: Impact of initial sponsor backing on Capex and R&D expenditures

This table reports the cross-sectional regression coefficients using the natural logarithm of IPO firm *i*'s total Capex (models (1) through (3)) or R&D expenditures (models (4) through (6)), respectively. For each dependent variable, the first specification refers to the first year after the IPO, the second specification to the first two years after the IPO, and the third specification to the first three years after the IPO, respectively. The variables of interest are *PEBacked* and *VCBacked*, both defined as one if the IPO firm is either PE-backed or VC-backed, respectively, at the time of the IPO, whereby the sponsor's backing must exceed an ownership threshold of 25% in the IPO firm, and zero otherwise. The other variables are divided into company characteristics, IPO characteristics, and M&A characteristics and are defined in Table 2-13 in the Appendix. The standard errors are corrected for heteroskedasticity and clustered by leading financial sponsor with associated *t*-values given in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

	Total CAPEX			Total R&D		
	(1) IPO + 1 yr	(2) IPO + 2 yrs	(3) IPO + 3 yrs	(4) IPO + 1 yr	(5) IPO + 2 yrs	(6) IPO + 3 yrs
Sponsor backing						
PEBacked	−0.021	0.011	−0.005	−0.048	−0.033	−0.052
	(−0.288)	(0.142)	(−0.063)	(−0.672)	(−0.384)	(−0.538)
VCBacked	−0.161**	−0.039	0.011	0.337***	0.455***	0.549***
	(−1.993)	(−0.510)	(0.130)	(4.405)	(4.968)	(5.497)
Company characteristics						
Firm revenue	0.188***	0.213***	0.229***	0.001	−0.012	−0.012
	(6.380)	(7.053)	(7.465)	(0.028)	(−0.254)	(−0.234)
Return on Assets	0.168***	0.269***	0.341***	−0.255***	−0.237**	−0.232**
	(2.773)	(3.442)	(3.727)	(−2.959)	(−2.411)	(−2.232)
Book leverage	0.289**	0.240*	0.258*	−0.389*	−0.514**	−0.566**
	(2.112)	(1.693)	(1.709)	(−1.902)	(−2.150)	(−2.211)
Market-to-book ratio	−0.018	0.002	0.011	0.071***	0.095***	0.112***
	(−1.304)	(0.169)	(0.763)	(3.172)	(3.840)	(4.314)
Financial slack	−0.607***	−0.808***	−0.924***	1.950***	2.327***	2.474***
	(−4.025)	(−5.034)	(−5.811)	(10.383)	(10.525)	(10.316)
Growth investment level	1.996***	2.068***	2.239***	0.478	0.100	−0.101
	(5.020)	(5.842)	(8.498)	(1.440)	(0.358)	(−0.370)
Firm age at IPO	−0.127***	−0.129***	−0.128***	0.118**	0.125**	0.142**
	(−4.387)	(−3.541)	(−3.388)	(2.295)	(2.093)	(2.251)
IPO characteristics						
Primary proceeds	0.679***	0.714***	0.737***	0.317***	0.351***	0.358***
	(18.210)	(14.672)	(13.795)	(6.260)	(6.043)	(5.540)
M&A is IPO motive	−0.075	−0.038	−0.033	0.076	0.097	0.113
	(−1.046)	(−0.527)	(−0.532)	(0.946)	(1.083)	(1.228)
Underwriter reputation	0.011*	0.015***	0.016***	0.029***	0.033***	0.035***
	(1.898)	(2.721)	(2.798)	(5.210)	(4.952)	(4.584)
Underpricing	0.005***	0.005***	0.006***	0.001	0.000	0.000
	(3.860)	(3.246)	(3.685)	(0.321)	(0.134)	(0.140)
Offer price revision	−0.002*	−0.001	−0.002	−0.006**	−0.007**	−0.008**
	(−1.912)	(−1.195)	(−1.182)	(−2.113)	(−2.262)	(−2.312)
First 30-days post-IPO return	0.002**	0.002**	0.002**	0.002	0.002	0.002
	(2.202)	(2.145)	(2.019)	(1.457)	(1.252)	(1.450)
Dual class share structure	0.027	0.026	−0.006	0.210**	0.257**	0.289**
	(0.291)	(0.251)	(−0.053)	(2.368)	(2.522)	(2.545)
M&A characteristics						
Pre-IPO acquirer	0.061	0.054	0.074	0.302***	0.392***	0.429***
	(0.879)	(0.587)	(0.639)	(2.683)	(2.822)	(2.792)
Industry acquisition intensity	0.166	0.151	0.173	0.239	0.213	0.169
	(0.812)	(0.685)	(0.814)	(0.975)	(0.756)	(0.532)
Constant	−0.723	−0.518	−0.694	−2.077***	−2.082***	−2.274***
	(−1.467)	(−0.905)	(−1.114)	(−5.170)	(−4.273)	(−4.270)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,071	1,071	1,071	1,071	1,071	1,071
R-squared	0.694	0.701	0.703	0.576	0.589	0.589

1% level for all time horizons. In a similar analysis, Celikyurt et al. (2010) document a significantly positive relationship between VC backing and the sum of R&D and Capex spending for all time horizons between zero and four years after the IPO. To make this finding comparable, we rerun our regression with the sum of R&D and capex expenditures as the dependent variable. In unreported results, we find that the coefficient for *VCBacked* remains significant and positive, showing that our results are in line with Celikyurt et al. (2010), albeit our results being more nuanced as the main effect is due to R&D spending and not from capital expenditures. As expected, we find no comparable effect of higher organic growth investments in PE-backed IPO firms. It is worth noting, however, that the coefficient for *PEBacked* is also not significantly negative, indicating that PE-backed newly public firms do not seem to conduct significantly fewer organic growth investments compared to non-backed newly public firms despite their focus on acquisition-based growth strategies. This suggests that the previous results are not a consequence of PE sponsors using M&A as a substitute for Capex or R&D expenditures.

Our control variables again provide further insights into the drivers of organic growth investments. Unsurprisingly, firm revenue and IPO proceeds are positively associated with capital expenditures while firms with more financial slack tend to rely less on capex and more on R&D. Underwriter reputation exhibits a positive relationship with both capex and R&D while underpricing only shows a positive relation to capex, both may be explained by prior studies finding a positive link between the two variables and firm quality (Zheng & Stangeland, 2007). Interestingly, having conducted M&As prior to the IPO has a positive effect on post-IPO R&D expenditures. Finally, there appears to be a significantly negative relationship between offer price revision and post-IPO R&D expenditures. As offer price revision is often perceived as a proxy for valuation uncertainty (see e.g., Loughran & McDonald, 2013), this negative effect may be a consequence of R&D projects being inherently more difficult to evaluate. The coefficients of the remaining control variables lack significance.

2.4.3 Acquisition characteristics based on initial sponsor backing

Hypothesis **H3** proposes that PE sponsors may steer their newly public portfolio firms towards conducting more transformative acquisitions given their M&A experience and capabilities. We identify three proxies for the degree to which an acquisition may be transformative for the acquirer. First, cross-border acquisitions, which are typically more complex and may involve a different culture, language and/or governance system. Second, cross-industry acquisitions, which are by nature transformative by diversifying the product offering, but likely more difficult to integrate into the acquirers' existing operations. Third, acquisitions that involve a large target relative to the size of the acquirer, as these target firms are frequently more complex and therefore also more difficult to integrate into the acquirer's existing operations.

We investigate the likelihood of conducting transformative acquisitions following these three proxies using the subsample of the 629 IPO firms that conduct at least one acquisition in the first three years of going public and employ logit regressions with three different specifications for the dependent variable. In model (1), the dependent variable is equal to one if at least one of the deals the firm conducts is a cross-border deal following its IPO, zero otherwise, in model (2) the dependent variable is equal to one if the IPO firm engaged in at least one post-IPO cross-industry acquisition, defined as a transaction where acquirer and target come from different Fama-French 49 industry portfolios, zero otherwise, and in model (3) the dependent variable is equal to one if at least one acquisition following the IPO is large in relative size, whereby this is defined as a ratio of deal value to acquirer revenue at the time of the IPO being greater than 50%, zero otherwise.

The results of this analysis are shown in Table 2-7. The coefficient of *PEBacked* is positive but statistically insignificant in models (1) and (2), indicating that PE-backed IPO firms are not significantly more likely to conduct cross-border or cross-industry acquisitions than their peers. Similarly, we find no significant relationship between VC backing and cross-

Table 2-7: Impact of initial sponsor backing on the probability of engaging in transformative deals
This table reports results of several logit regressions for the IPO firm sample, where the dependent variable is defined as one if the IPO firm engaged in at least one cross-border acquisition during its first three post-IPO years (model 1), engaged in at least one cross-industry acquisition during its first three post-IPO years (model 2), or engaged in at least one relatively large acquisition (defined as an acquisition for which the deal value exceeds 50% of the acquirer's revenue at the time of the IPO) during its first three post-IPO years (model 3), and zero otherwise. The variables of interest are *PEBacked* and *VCBacked*, both defined as one if the IPO firm is either PE-backed or VC-backed, respectively, at the time of the IPO, whereby the sponsor's backing must exceed an ownership threshold of 25% in the IPO firm, and zero otherwise. The other variables are divided into company characteristics, IPO characteristics, and M&A characteristics and are defined in Table 2-13 in the Appendix. The associated *t*-values are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

	(1) Cross-border	(2) Cross-industry	(3) Relative size
Sponsor backing			
PEBacked	0.074	0.119	1.031**
	(0.260)	(0.420)	(2.280)
VCBacked	−0.535	−0.113	−0.164
	(−1.520)	(−0.330)	(−0.340)
Company characteristics			
Firm revenue	0.041	0.305***	−1.607***
	(0.390)	(2.780)	(−7.250)
Return on Assets	0.539	0.074	−0.608
	(0.670)	(0.090)	(−0.500)
Book leverage	0.081	−0.693	1.130
	(0.170)	(−1.400)	(1.410)
Market-to-book ratio	0.129**	0.016	−0.094
	(2.260)	(0.280)	(−1.370)
Financial slack	0.696	−0.132	−0.431
	(1.090)	(−0.210)	(−0.510)
Growth investment level	−0.616	−0.919	−1.756
	(−0.700)	(−1.070)	(−1.150)
Age at IPO	0.230*	0.027	−0.313
	(1.760)	(0.210)	(−1.640)
IPO characteristics			
Primary IPO proceeds	0.124	−0.059	1.183***
	(0.800)	(−0.370)	(4.290)
M&A is IPO motive	−0.105	0.636***	0.368
	(−0.460)	(2.780)	(1.190)
Underwriter reputation	0.023	−0.024	−0.047
	(0.940)	(−1.020)	(−1.350)
Underpricing	0.007	0.004	0.007
	(1.330)	(0.700)	(1.090)
Offer price revision	−0.017***	−0.001	−0.010
	(−2.690)	(−0.090)	(−1.090)
First 30-days post-IPO return	0.002	0.002	0.001
	(0.300)	(0.420)	(0.170)
Dual class share structure	0.000	−0.002	−0.053
	(0.000)	(−0.010)	(−0.130)
M&A characteristics			
Pre-IPO acquirer	0.070	0.092	−0.045
	(0.340)	(0.440)	(−0.160)
Industry acquisition intensity	0.143	−0.643	1.439
	(0.260)	(−1.060)	(1.550)
Constant	−3.370**	−0.850	3.421*
	(−2.190)	(−0.620)	(1.690)
Year fixed effects	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
Observations	539	539	458
Pseudo R-squared	0.078	0.107	0.371

border or cross-industry acquisitions, albeit here the coefficients are negative. With respect to model (3), we find that PE-backed IPO firms are significantly more likely to acquire relatively large targets. We therefore obtain some evidence in favor of hypothesis **H3**. However, as this support is only related to one of our three proxies for transformative acquisitions, we conclude that hypothesis **H3** can only be partially supported.

2.4.4 Robustness tests

We acknowledge that our results so far may be affected by issues surrounding our sample selection. IPO firms backed by PE or VC sponsors may be inherently different from each other and from newly public firms without financial sponsor involvement due to the distinct sponsor characteristics and investment strategies outlined in section 2.2.1. While we control for a variety of differentiating factors including firm size, age, leverage and more and use different regression specifications, we conduct two additional robustness tests using propensity score matching (PSM) as well as switching regression models with endogenous switching.[17]

2.4.4.1 Propensity score matching

We estimate propensity scores via a logit regression to predict the probability of being a VC-backed firm.[18] We then use these scores to match treated observations (VC-backed IPO firms) to our control group (PE-backed IPO firms) using 1:1 matching with and without replacement. The first method without replacement yields 122 observations (61 matched pairs) while the second one yields 426 observations (213 pairs). We estimate Average Treatment Effects on the Treated (ATTs) for our variables of interest to validate our results from sections 2.4.1 through 2.4.3.

The results in Table 2-8 related to the number of post-IPO acquisitions and the log-transformed cumulative R&D indicate that our results remain robust. The ATT for post-IPO

[17] Besides PSM, we also use entropy balancing to obtain matched samples (see e.g., Hainmueller, 2012; Madsen & McMullin, 2020). While the results remain largely similar, there are some minor differences in the results regarding the proxy for relative size, based on which we continue to interpret our results on transformative acquisition cautiously.

[18] The analysis in Table 2-8 focuses on the differences between PE-backed and VC-backed IPO firms, disregarding non-backed firms. However, we conduct similar propensity score matching analyses for the pair of PE-backed vs. non-backed firms as well as for the pair of VC-backed vs. non-backed firms, respectively. The results are shown in the Appendix in Table 2-17 and Table 2-18.

Table 2-8: PSM analysis for acquisition frequency and organic growth (VC- vs. PE-backed firms)
The table reports the outcome of the propensity score matching (PSM) analysis with emphasis on the effect of sponsor backing on the IPO firm's post-IPO acquisition activity and organic growth investments. The treatment variable is assigned the value of 1 if the IPO firm is backed by a VC fund exceeding the sponsor ownership threshold of 25%, and 0 otherwise. Panel A presents the logit model estimating the likelihood of an IPO firm being VC-backed. Panel B presents the outcome of the two matching algorithms (i) without replacement and a caliper of 25% of the standard deviation of the propensity score of the logit estimation and (ii) with replacement and a caliper of 0.025. We report the number of treated and control observations in addition to the estimated average treatment effects on the treated (ATTs) with Abadie and Imbens (2006) standard errors. In Panel C, we report the mean of each variable in the treated group and the control group, in addition to the bootstrapped *t*-value from the *t*-test of the null hypothesis that the difference is statistically equal to 0, both before and after matching. The Abadie and Imbens (2006) standard errors are reported in parentheses. All variables are defined in Table 2-13 in the Appendix. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Logit model

Firm revenue	Return on Assets	Book leverage	Market-to-book ratio	Financial slack	Growth inv. level	Firm age at IPO	Underwriter reputation	Underpricing	First 30d post-IPO return	Pre-IPO acquirer	N
−0.082 (0.147)	0.170 (0.891)	−3.073*** (0.880)	−0.032 (0.062)	7.979*** (0.855)	0.169 (1.332)	−0.534*** (0.205)	−0.042 (0.032)	0.004 (0.003)	−0.000 (0.010)	0.503 (0.317)	791

Panel B: Matching results

	Matching without replacement	Matching with replacement
Caliper	0.25 standard deviations	0.025
Matched observations per treated deal	1:1	1:1
Number of treated observations	61	213
Number of control observations	61	213
# Acquisitions ATT	−0.574*	−1.850**
Abadie and Imbens (2006) standard errors	(0.306)	(0.917)
Log cumulative R&D ATT	0.828**	2.211*
Abadie and Imbens (2006) standard errors	(0.413)	(1.333)
Log cumulative Capex ATT	0.089	−0.800*
Abadie and Imbens (2006) standard errors	(0.305)	(0.443)

Panel C: Covariates' balancing

Sample	Before matching			After matching without replacement			After matching with replacement		
Variable	Treatment	Control	*t*-value	Treatment	Control	*t*-value	Treatment	Control	*t*-value
Firm revenue	3.60	6.41	22.32	5.02	4.73	1.08	5.22	5.96	6.51
Return on Assets	−0.17	0.01	12.54	−0.05	−0.06	0.19	−0.00	0.01	1.02
Book leverage	0.06	0.39	21.81	0.11	0.11	0.12	0.14	0.26	7.19
Market-to-book	4.03	2.29	10.64	3.83	3.29	1.07	2.99	2.52	2.57
Financial slack	0.67	0.11	41.28	0.36	0.37	0.02	0.14	0.16	1.07
Growth inv. level	0.21	0.12	11.24	0.17	0.19	0.99	0.14	0.14	0.44
Firm age at IPO	2.12	3.15	18.44	2.27	2.18	0.62	3.20	2.72	5.28
Underwriter rep.	9.01	11.62	7.28	10.57	9.06	1.59	5.97	10.80	10.19
Underpricing	19.71	12.17	3.39	21.49	21.80	0.03	21.73	14.60	2.22
First 30d return	2.89	2.62	0.23	1.97	−0.55	0.78	0.38	1.67	1.01
Pre-IPO acquirer	0.25	0.34	2.70	0.33	0.38	0.56	0.13	0.38	6.27

acquisitions is negative for both methods and significant at the 10% and 5% level, respectively, confirming that VC-backed IPO firms conduct significantly fewer acquisitions than their PE-backed peers. Similarly, the ATT of the R&D variable is positive and significant, confirming that VC-backed IPO firms emphasize R&D spending more than their PE-backed counterparts.

Interestingly, the ATT of the capex variable is negative and weakly significant at the 10% level using the matching method with replacement, suggesting that PE-backed IPO firms may emphasize growth via capital expenditures more than VC-backed IPO firms. Table 2-8 Panel C provides information on the covariate balancing and shows that prior to matching, most covariates are significantly different at the 1% level between the treatment and control group. While the matching approach without replacement eliminates the covariate imbalances, the matching procedure with replacement is less successful. Although the latter approach still significantly reduces the differences between the two groups, they nevertheless remain significant for several variables, highlighting the tradeoff between the two matching methods. While the matching method without replacement is more rigorous in eliminating covariate differences, it also eliminates a larger share of the sample. The matching method with replacement is less successful in eliminating covariate imbalances but allows us to keep a larger and thus more comparable subset of our sample.

We conduct a similar PSM robustness check on our findings related to acquisition characteristics, the results are shown in Table 2-9.[19] We estimate a new logit regression to predict the likelihood of being VC-backed based on the subsample of firms which we use for our analysis in section 2.4.3 (i.e., IPO firms that have conducted at least one acquisition during their first three years after going public). The results show that the ATT for the relative size variable is negative and significant at the 5% level for both matching algorithms. This suggests that VC-backed newly public firms are significantly less likely to undertake large acquisitions compared to PE-backed newly public firms. By inversion, this also implies that PE-backed newly public firms tend to conduct larger acquisitions in terms of relative size, supporting our main finding with respect to acquisition characteristics. The ATTs for cross-border and trans-

[19] Similar to before, the analysis focuses on the differences between PE-backed and VC-backed IPO firms. The corresponding analyses for the pair of PE-backed vs. non-backed firms as well as for the pair of VC-backed and non-backed firms are shown in the Appendix in Table 2-19 and Table 2-20, respectively.

Table 2-9: PSM analysis for undertaking transformative deals (VC- vs. PE-backed firms)
The table reports the outcome of the propensity score matching (PSM) analysis with emphasis on the effect of sponsor backing on the IPO firm's post-IPO probability to engage in transformative transactions. The treatment variable is assigned the value of 1 if the IPO firm is backed by a VC fund exceeding the sponsor ownership threshold of 25%, and 0 otherwise. Panel A presents the logit model used to estimate the likelihood of an IPO firm being VC-backed. Panel B presents the outcome of the two matching algorithms (i) without replacement and a caliper of 25% of the standard deviation of the propensity score of the logit estimation and (ii) with replacement and a caliper of 0.025. We report the number of treated and control observations on the matched sample, in addition to the estimated average treatment effects on the treated (ATTs) with Abadie and Imbens (2006) standard errors. In Panel C, we report the mean of each variable in the treated group and the control group, in addition to the bootstrapped *t*-value from the *t*-test of the null hypothesis that the difference is statistically equal to 0, both before and after matching. The Abadie and Imbens (2006) standard errors are reported in parentheses. All variables are defined in Table 2-13 in the Appendix. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Logit model

Firm revenue	Return on Assets	Book leverage	Market-to-book ratio	Financial slack	Growth inv. level	Firm age at IPO	Underwriter reputation	Underpricing	First 30d post-IPO return	Pre-IPO acquirer	N
−0.282 (0.230)	−1.364 (1.268)	−4.146*** (1.390)	0.043 (0.096)	6.632*** (1.112)	1.260 (1.772)	−0.454 (0.284)	0.040 (0.041)	0.008* (0.004)	0.014 (0.014)	0.833** (0.417)	410

Panel B: Matching results

	Matching without replacement	Matching with replacement
Caliper	0.25 standard deviations	0.025
Matched observations per treated deal	1:1	1:1
Number of treated observations	38	63
Number of control observations	38	63
Cross-border acquisitions ATT	−0.132	0.111
Abadie and Imbens (2006) standard errors	(0.110)	(0.133)
Cross-industry acquisitions ATT	−0.026	0.063
Abadie and Imbens (2006) standard errors	(0.114)	(0.140)
Relative size ATT	−0.267**	−0.310**
Abadie and Imbens (2006) standard errors	(0.122)	(0.127)

Panel C: Covariates' balancing

Sample	Before matching			After matching without replacement			After matching with replacement		
Variable	Treatment	Control	*t*-value	Treatment	Control	*t*-value	Treatment	Control	*t*-value
Firm revenue	4.45	6.55	15.02	5.04	4.78	1.23	5.24	5.19	0.28
Return on Assets	−0.10	0.01	6.91	−0.02	−0.04	0.54	−0.02	−0.01	0.44
Book leverage	0.04	0.40	15.03	0.09	0.07	0.76	0.11	0.12	0.56
Market-to-book	4.72	2.14	10.87	3.43	3.34	0.22	3.09	2.86	0.80
Financial slack	0.61	0.12	27.49	0.38	0.37	0.05	0.29	0.29	0.05
Growth inv. level	0.18	0.11	5.92	0.18	0.18	0.24	0.14	0.16	0.70
Firm age at IPO	2.14	3.11	11.59	2.18	2.18	0.03	2.42	2.32	0.71
Underwriter rep.	10.26	11.38	2.35	10.07	9.02	0.86	9.79	10.22	0.43
Underpricing	27.69	10.89	4.71	20.57	29.53	0.58	21.64	21.04	0.06
First 30d return	3.62	3.75	0.08	6.03	0.42	1.32	6.50	4.08	0.72
Pre-IPO acquirer	0.38	0.41	0.61	0.37	0.42	0.46	0.41	0.43	0.18

formative acquisitions remain insignificant, similar to what our previous results already indicated.

2.4.4.2 Switching regression

The PSM approach helps to control for observable differences between PE-backed and VC-backed newly public firms. However, potential endogeneity issues may still arise due to unobservable factors that are jointly correlated with our dependent variables and the presence of VC or PE backing. To address this concern, we use a switching regression model with endogenous switching (Fang, 2005; Golubov et al., 2012; Heckman, 1979). To identify an appropriate instrumental variable, we draw from existing literature that employs market share-based instruments in the context of financial sponsor backing (Berger et al., 2005; Brander et al., 2015; Hammer et al., 2022; Hellmann et al., 2008). We construct the instrumental variable *Local VC share*, which approximates the likelihood of VC investors supporting a firm within a given industry. The basic idea is that VC investors exhibit varying levels of interest in different industries, influenced by factors such as growth prospects, life cycle stage, and competitive landscape, and that these factors are exogenous to the portfolio firm and the financial sponsor. Specifically, we define *Local VC share* as the ratio of VC-backed IPOs to total financial sponsor-backed IPOs (including both VC and PE-backed) in a given combination of year and TRBC economic sector, as identified by SDC based on a total of 3,109 sponsor-backed IPOs recorded in SDC between 2001 and 2017.

We use the *Local VC share* variable as an instrument in the first stage of our model to predict whether an IPO is more likely to be VC-backed than PE-backed. We find that the coefficient for *Local VC share* is positive and highly significant, indicating that the variable has an impact on the likelihood of a given firm being VC-backed (Table 2-10 Panel A). Next, we compute the second-stage equation using the Inverse Mills Ratio (IMR) constructed from the first-stage selection equation to correct for selection bias. The IMR is included as an additional control variable in the second-stage models to correct for any potential endogeneity bias in the regression model specifications in Table 2-10 Panel A columns (2) through (5). The

Table 2-10: Endogeneity and switching regressions for post-IPO acquisitions (PE- vs. VC-backed)

This table reports the results of the switching regression models with endogenous switching. Panel A presents the results of the two-stage model. The first stage in column (1) is the selection model using a probit regression with *VCBacked*, defined as one if the IPO firm is backed by a VC investor following our previously outlined definition, and zero otherwise, as the dependent variable. The second stage regression model using the number of post-IPO acquisitions in the first three years after the IPO as dependent variable are shown in columns (2) and (3) for VC-backed and PE-backed IPO firms, respectively. Columns (4) and (5) show similar second stage regressions with total R&D expenses as the dependent variable. *Local VC share* serves as the instrumental variable and is defined as the market share of VC-backed IPOs out of all sponsor-backed IPOs in a given combination of industry and year, where the industry is defined as the TRBC economic sector. The Inverse Mills Ratio adjusts for the non-zero mean of the error terms. The standard errors are corrected for heteroskedasticity with associated *t*-values (*z*-values for the probit regression) given in parentheses. Panel B reports the results of the switching regression model estimates for the What-if analyses of VC-backed and PE-backed IPO firms for the number of post-IPO acquisitions as well as for total R&D within the first three years after going public. All variables are defined in Table 2-13 in the Appendix. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Model

	First stage	Second stage: # acquisitions IPO + 3 yrs		Second stage: Total R&D IPO + 3 yrs	
	(1) Selection	(2) VC-backed	(3) PE-backed	(4) VC-backed	(5) PE-backed
Local VC share	2.309***				
	(7.025)				
Inverse Mills Ratio		−0.604**	−0.549**	−1.481***	−0.837***
		(−2.229)	(−2.143)	(−3.418)	(−4.025)
Company characteristics					
Firm revenue	−0.086	0.032	0.430***	0.006	−0.070
	(−1.012)	(0.816)	(2.879)	(0.082)	(−0.648)
Return on Assets	0.460	0.164	−0.260	−0.852*	−1.532*
	(0.817)	(0.502)	(−0.258)	(−1.881)	(−1.727)
Book leverage	−1.186**	−0.355	0.062	−1.036	0.770
	(−2.462)	(−0.618)	(0.124)	(−1.171)	(1.482)
Market-to-book ratio	−0.067*	0.087**	−0.015	0.083**	0.132**
	(−1.878)	(2.457)	(−0.220)	(2.447)	(2.503)
Financial slack	3.473***	−1.112**	−1.039	1.336**	2.106**
	(7.704)	(−2.213)	(−0.789)	(2.007)	(2.058)
Growth investment level	1.390	−0.412	−1.118	1.054	−2.971***
	(1.598)	(−0.694)	(−0.866)	(1.295)	(−3.699)
Firm age at IPO	−0.365***	−0.081	0.161	0.195	0.527***
	(−2.983)	(−0.778)	(0.699)	(1.288)	(4.024)
IPO characteristics					
Primary proceeds	−0.243	0.515	0.692**	0.948***	0.541***
	(−1.638)	(1.520)	(2.410)	(4.594)	(3.882)
M&A is IPO motive	−0.073	0.314**	0.933**	0.195	0.287
	(−0.403)	(2.041)	(2.355)	(1.414)	(1.099)
Underwriter reputation	−0.027	−0.001	−0.058*	0.015	0.047**
	(−1.624)	(−0.059)	(−1.865)	(1.035)	(2.422)
Underpricing	0.013***	0.002	−0.006	−0.001	−0.018***
	(3.152)	(0.467)	(−0.576)	(−0.334)	(−3.091)
Offer price revision	0.007	−0.001	−0.002	−0.008**	−0.016**
	(1.291)	(−0.299)	(−0.163)	(−2.105)	(−2.188)
First 30-days post-IPO return	−0.003	−0.001	0.023*	0.005	−0.002
	(−0.515)	(−0.458)	(1.887)	(1.235)	(−0.259)
Dual class share structure	0.111	0.289	−0.384	0.320	0.228
	(0.391)	(0.668)	(−0.661)	(0.993)	(0.683)
M&A characteristics					
Pre-IPO acquirer	0.326*	0.778***	1.519***	0.667***	0.142
	(1.814)	(3.979)	(3.808)	(3.857)	(0.625)
Industry acquisition intensity	−0.561	−0.268	0.562	0.017	0.652
	(−1.253)	(−0.313)	(1.147)	(0.021)	(1.505)
Constant	0.768	−0.729	−3.659**	−2.286*	−2.345**
	(0.825)	(−0.379)	(−2.471)	(−1.656)	(−2.416)
Observations	764	424	340	424	340
(Pseudo) R-squared	0.730	0.279	0.183	0.389	0.271

Panel B: What-if Analysis

	VC-backed	PE-backed
# post-IPO acquisitions 3 yrs		
Actual # post-IPO acquisitions 3 yrs	0.90	2.04
Hypothetical # post-IPO acquisitions 3 yrs	1.04	0.29

Deterioration / Improvement	**−0.14***	**1.75*****
LN Cum. R&D 3 yrs		
Actual LN Cum. R&D 3 yrs	3.93	1.25
Hypothetical LN Cum. R&D 3 yrs	3.33	0.05
Deterioration / Improvement	**0.61*****	**1.19*****

coefficient of the IMR is negative and significant in all second-stage specifications, indicating that self-selection is likely to have adversely affected our previous results.

The adoption of the switching regression approach enables us to estimate the counterfactual number of acquisitions and total R&D expenditures[20] for VC-backed newly public firms if they were PE-backed, and vice versa for PE-backed firms if they were VC-backed. The results of these calculations are presented in Table 2-10 Panel B. Our prior findings are supported, particularly for PE-backed newly public firms. We find that the actual number of acquisitions is significantly higher than what would be expected if these firms were VC-backed, with a difference of 1.75 acquisitions. Regarding R&D expenditures, the picture is more nuanced. The actual R&D spending during the three years following the IPO is significantly higher for VC-backed firms compared to the counterfactual scenario if they were PE-backed. However, the results also indicate that if newly public PE-backed firms were VC-backed, their R&D spending would be even lower. This suggests that the level of R&D spending may depend on the characteristics of the companies chosen by VC and PE sponsors. Nonetheless, our findings still hold regarding the substantially higher R&D spending by VC-backed newly public firms compared to PE-backed ones.

Overall, the switching regression analyses provide further support for our previous findings regarding the differences in post-IPO M&A activity and R&D spending. PE-backed newly public firms engage in significantly more M&A transactions during the first three years following the IPO, while VC-backed newly public firms allocate more resources to R&D

[20] For reasons of brevity, the analysis of the CAPEX variable in our switching regression framework is not shown given that the PSM results in the previous section already suggest that the results regarding to CAPEX are weaker than for R&D and the switching regression approach largely confirms this outcome.

activities. This further confirms that financial sponsors pursue different growth strategies, with PE-backed newly public firms emphasizing external growth through acquisitions, while VC-backed newly public firms prioritize growth through R&D spending.[21]

2.5 Initial sponsor backing and post-IPO stock price performance

In this section we turn to the post-IPO stock price performance of newly public firms. First, we test hypothesis **H4a** and examine the long-run post IPO stock returns conditioned on initial sponsor backing, to test whether VC backing or PE backing and the choice to acquire lead to different results. Second, we test hypothesis **H4b** by looking at newly public acquirers to analyze whether initial sponsor backing leads to different market reactions to M&A announcements.

2.5.1 Long-run post-IPO returns

Long-run stock returns are calculated using traditional buy-and-hold abnormal returns in line with standard practice (e.g., Brau et al., 2012; Lyon et al., 1999):

$$BHAR_i = \prod_{t=\tau_1}^{\tau_2}(1 + R_{it}) - \prod_{t=\tau_1}^{\tau_2}(1 + R_{pt}) \tag{2}$$

where $BHAR_i$ is firm i's buy-and-hold abnormal return, $\tau_1, \tau_2 \in [0, \ldots, 36]$ are the holding periods in months, excluding the first trading day for all holding periods, and R_{pt} is an equally weighted matched portfolio of up to five style-matched competitor firms.[22] For the matched

[21] For the sake of completeness, we also use the switching regression framework with instrumental variables defined following a similar logic to compare PE-backed and non-backed firms (Table 2-21) and VC-backed and non-backed firms (Table 2-22). The regressions for PE-backed and non-backed newly public firms show that the coefficient of the IMR is insignificant, indicating that there was likely no bias in our previous regression analyses. The comparison between VC-backed and non-backed newly public firms in Table 2-22 reveals that the previous regression coefficients may have been biased with regard to R&D spending (IMR coefficient significant at the 1% level), but not with respect to post-IPO acquisition activity.

[22] Barber and Lyon (1997) as well as Kothari and Warner (1997) document the superiority of using matched-firm approaches vis-à-vis using a reference portfolio approach (e.g., based on a market index). In unreported results and as a further test, we calculate BHARs benchmarked against the Russell 3000 index. The results tend to show higher BHARs (both positive and negative) and higher levels of significance, suggesting that our benchmarking approach leads to more conservative results.

portfolio we use the text-based industry matching approach by Hoberg and Phillips (2010, 2016) and select up to five competitors with the highest similarity scores.[23,24]

Table 2-11 presents the results of our examination of BHARs for holding periods of 12, 24 and 36 months by initial sponsor backing. Echoing the results of Levis (2011), we find positive BHARs for all PE-backed newly public firms for the 12-month holding period, followed by insignificant returns, with the average BHAR being positive, while the median BHAR is negative (Table 2-11 Panel A). In contrast, for VC-backed newly public firms, we observe mostly negative returns, particularly for the 24 and 36-months holding periods. The difference between PE-backed and VC-backed newly public firms is significant for all holding periods, with PE-backed newly public firms outperforming their VC-backed peers (Table 2-11 Panel A).

Dividing the sample into PE-backed and VC-backed newly public acquirers and non-acquirers (Table 2-11 Panels B and C) reveals the underlying drivers of the results. We find that particularly PE-backed newly public acquirers drive the positive results for PE-backed firms with significant positive BHARs for the 12- and 24-months holding periods. VC-backed newly public acquirers, on the other hand, earn insignificant returns, with median BHARs for all holding periods being negative. The difference tests document that PE-backed acquiring firms outperform VC-backed ones for the 12-months holding period and to a certain degree for the 24-months holding period, supporting hypothesis **H4a**. The results for non-acquiring firms

[23] Our initial sample of 917 financial sponsor-backed IPO firms is reduced to 732 observations due to IPO firms with no match in the Hoberg and Phillips database or insufficient data on the proposed match(es). The 732 IPO firms in this analysis have on average 3.4 matched firms.

[24] Bessembinder and Zhang (2013) and Bessembinder et al. (2019) highlight potential issues when using BHARs to assess corporate events. In essence, the observed returns may be driven by a bad benchmark problem. While we acknowledge that this may also affect our analyses, we are confident that our rival matching approach should arrive at robust results from an investor perspective. The advantage of our approach is that we use the closest rivals based on text-based Network Industry Classifications developed by Hoberg and Phillips (2010, 2016). This means that the rivals likely have the same underlying risk factors and are similarly exposed to industry wide systemic shocks and should therefore show similar return patterns. This should alleviate the bad benchmarking problem to a certain extent.

Table 2-11: Post-IPO buy-and-hold abnormal returns

This table reports the buy-and-hold abnormal returns (BHARs) of newly public firms during the first twelve ($BHAR_{[0;12]}$), 24 ($BHAR_{[0;24]}$), and 36 months ($BHAR_{[0;36]}$) following their IPO, divided by backing group. Panel A shows the BHARs for all newly public firms, Panel B for firms that undertake at least one acquisition within the first three years following their IPO, Panel C for firms that do not engage in any acquisitions throughout the first three years of being public, and Panel D shows the difference between acquirers (Panel B) and non-acquirers (Panel C), all subdivided by backing group. The market return is estimated using an equally weighted portfolio of up to five style-matched competitor firms. For the matched portfolio we utilize the text-based industry matching approach by Hoberg and Phillips (2010, 2016) and use up to five competitor firms with the highest similarity scores. Average BHARs are tested for statistical significance using the parametric *t*-test and median BHARs are tested using the nonparametric Wilcoxon test. Differences between samples are tested for significance using the parametric two-sample *t*-test and the nonparametric Wilcoxon rank-sum test. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

	Average BHAR	Median BHAR	Average BHAR	Median BHAR	Δ Average BHAR	Δ Median BHAR
Panel A: Buy-and hold abnormal returns by backing group						
	PE-backed firms (n=285)		VC-backed firms (n=447)		Difference PE-backed and VC-backed firms	
$BHAR_{[0;12]}$	9.33%***	5.74%**	−0.82%	−6.32%	10.15%**	12.06%**
$BHAR_{[0;24]}$	5.46%	−0.28%	−9.51%*	−17.00%***	14.97%**	16.72%***
$BHAR_{[0;36]}$	1.03%	−5.91%	1.43%	−23.15%**	−0.40%	17.24%***
Panel B: Buy-and hold abnormal returns for acquirers by backing group						
	PE-backed firms (n=184)		VC-backed firms (n=173)		Difference PE-backed and VC-backed firms	
$BHAR_{[0;12]}$	13.26%***	6.98%***	−1.89%	−10.73%	15.15%**	17.71%***
$BHAR_{[0;24]}$	14.13%***	6.54%**	1.40%	−18.72%	12.73%	25.26%***
$BHAR_{[0;36]}$	5.67%	−6.04%	7.75%	−16.79%	−2.08%	10.75%
Panel C: Buy-and hold abnormal returns for non-acquirers by backing group						
	PE-backed firms (n=101)		VC-backed firms (n=274)		Difference PE-backed and VC-backed firms	
$BHAR_{[0;12]}$	2.19%	−3.34%	−0.15%	−4.43%	2.34%	1.09%
$BHAR_{[0;24]}$	−10.33%	−6.49%	−16.40%**	−15.64%***	6.07%	9.15%
$BHAR_{[0;36]}$	−7.43%	−5.91%	−2.57%	−29.67%***	−4.86%	23.76%***
Panel D: Buy-and hold abnormal returns: difference between acquirers and non-acquirers by backing group						
	Δ Average	Δ Median	Δ Average	Δ Median		
	PE-backed firms		VC-backed firms			
$BHAR_{[0;12]}$	11.07%**	10.32%	−1.74%	−6.30%		
$BHAR_{[0;24]}$	24.46%***	13.03%**	17.80%*	−3.08%		
$BHAR_{[0;36]}$	13.10%	−0.13%	10.32%	12.88%*		

are more ambiguous. PE-backed newly public non-acquirers display generally negative returns, which are insignificant, and VC-backed newly public non-acquirers also show negative returns, which are partially significant. The differences between the two backing groups generally lack significance.

Overall, our analysis of the long-term post-IPO returns confirms hypothesis **H4a** as PE-backed newly public acquirers not only outperform VC-backed newly public acquirers, but also their non-acquiring peers, particularly during the first two post-IPO years. This positive post-IPO stock performance, especially by PE-backed newly public acquirers, stands in contrast to the majority of the prior literature, which generally observes a long-run underperformance (e.g., Brav et al., 2000; Ritter, 1991; Ritter & Welch, 2002).[25]

2.5.2 M&A announcement returns

Abnormal returns (ARs) surrounding post-IPO acquisition announcement are calculated using a market-adjusted event study model, summing ARs over the respective event window to obtain cumulative ARs (CARs):

$$CAR_{i,[\tau_1,\tau_2]} = \sum_{t=\tau_1}^{\tau_2} (R_{it} - R_{mt}) \quad (3)$$

where $CAR_{i,[\tau_1,\tau_2]}$ is firm *i*'s CAR during the event window $[\tau_1; \tau_2]$ with $\tau_1, \tau_2 \in [-2, \dots, +2]$, R_{it} is firm *i*'s stock return and R_{mt} is the benchmark return, for which we use the Russell 3000 Index. Average CARs are calculated by adding all CARs over a specific event window and dividing them by the total number of observations. After controlling for confounding events (e.g., multiple acquisitions at the same time, earnings announcements, etc.), we are left with a sample of 1,662 observations.[26]

The results of the event study are presented in Table 2-12. Both PE-backed and VC-backed newly public acquirers achieve positive returns, but only the returns to PE-backed newly public acquirers are significant, particularly during the [−1;+1] event window. However, while the returns to PE-backed firms are significant, the difference to the returns observed for VC-backed newly public acquirers is insignificant. Given the lack of significance, we reject

[25] We also examine long-term stock returns in a regression setting. Our dependent variables are the newly public firm *i*'s 12, 24, or 36 months BHAR. The results of the regression are presented in Table 2-23 in the Appendix. The regression results resonate with our findings in Table 2-11 and show that particularly newly public PE-backed acquirers perform well for the 12-months and 24-months holding periods, as indicated by the positive and significant coefficient of the interaction term *PEBacked × Firm is post-IPO acquirer*.

[26] We calculate ARs using the market-adjusted model, as some companies engage in acquisitions shortly after their IPO, leaving us with estimation periods that are too short for a market model event study. However, in unreported results we also use a market model event study of the form $AR_{it} = R_{it} - (\alpha_i + \beta_i R_{mt})$ with an estimation window from t = −126 to t = −3, with R_{it} and R_{mt} again being firm *i*'s stock return and the market return as approximated by the Russell 3000 Index and α_i and β_i are the slope coefficient and the sensitivity of stock *i* to the market index. The results are very similar to the ones presented in this section.

Table 2-12: Post-IPO acquirer returns surrounding M&A announcements

This table reports the stock market reaction of newly public acquirers between 2001 and 2017 to M&A announcements during the first three years following their IPO, divided by backing group. The cumulative abnormal returns (CARs) are estimated for bidding firms over multiple event windows. Daily abnormal returns are obtained using the market-adjusted event study model with the Russel 3000 as the market portfolio. Average CARs are tested for significance using the parametric *t*-test and median CARs are tested using the nonparametric Wilcoxon test. Differences between sample groups are tested for significance using the parametric two-sample *t*-test and the nonparametric Wilcoxon rank-sum test. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Event window	Average CAR	Median CAR	Average CAR	Median CAR	Δ Average CAR	Δ Median CAR
	PE-backed firms (n=776)		VC-backed firms (n=419)		Difference PE-backed and VC-backed firms	
[−2;+2]	0.74%***	0.50%***	0.75%	0.11%	−0.01%	0.39%
[−1;+1]	0.60%***	0.23%**	0.75%*	0.45%	−0.15%	−0.22%
[0;0]	0.26%**	0.05%*	0.26%	−0.03%	0.00%	0.07%
[−2;0]	0.23%	0.03%	0.22%	0.01%	0.01%	0.02%
[0;+2]	0.78%***	0.46%***	0.79%*	0.54%	−0.01%	−0.08%

hypothesis **H4b**, which assumes that announcement returns for PE-backed newly public acquirers would surpass those of VC-backed ones. The results are nonetheless interesting, as newly public acquirers do not destroy shareholder wealth when engaging in acquisitions, irrespective of their initial sponsor backing. This result stands in contrast to prior M&A research that documents negative returns to acquiring firms (e.g., Moeller et al., 2004; Mulherin & Boone, 2000) but is aligned with the related literature that observes positive wealth effects for newly public acquiring firms (Arikan & Capron, 2010; Wiggenhorn et al., 2007), and more recent studies on M&As, such as Alexandridis et al. (2017), which document positive shareholder wealth effects for acquirers more generally.[27]

2.6 Conclusion

In this study, we examine the differential impact of PE and VC backing at the time of the IPO on the subsequent acquisition activity of newly public firms. Our analysis is based on a sample of 1,341 IPOs conducted in the US between 2001 and 2017, with 1,845 subsequent post-IPO acquisitions by these newly public firms. Our results show that PE-backed newly public firms

[27] We also examine short-term announcement returns in a regression setting. Our dependent variables are acquirer *i*'s [−1;+1] and [−2;+2] event window CAR. The results are presented in Table 2-24 in the Appendix and echo our findings of the univariate analysis as the coefficient for the variable *PEBacked* lacks significance.

engage in nearly three times as many post-IPO acquisitions as VC-backed newly public firms and almost twice as many compared to non-backed firms. Furthermore, PE-backed firms initiate acquisitions earlier than VC-backed or non-backed ones.

Our results also indicate that VC-backed and PE-backed firms pursue different growth strategies for their portfolio companies. PE sponsors steer their newly public portfolio firms to pursue more acquisitions, including more transformative ones based on relative target size. In contrast, VC sponsors guide their newly public portfolio firms towards significantly higher post-IPO R&D spending, emphasizing organic growth options. These findings persist across various regression specifications, a matched sample approach to address inherent differences in the companies selected by PE and VC firms, and a switching regression model with endogenous switching.

We furthermore observe differences in post-IPO share price performance based on initial financial sponsor backing. Specifically, PE-backed newly public acquirers experience positive long-run post-IPO stock returns, particularly within the first two post-IPO years, and achieve significantly higher gains than VC-backed newly public acquirers. Moreover, our analysis shows that newly public firms, irrespective of initial sponsor backing, do not destroy shareholder wealth when engaging in post-IPO acquisitions, with significant returns observed for PE-backed newly public acquirers. However, the returns for VC-backed newly public acquirers are insignificant, as is the difference in returns between the two backing groups.

This study contributes to the literature on acquisition behavior of newly public firms by documenting the impact of financial sponsor backing on post-IPO acquisition activity of these firms, specifically differentiating between PE and VC sponsors, a distinction that prior studies neglected. Our findings highlight the importance of recognizing the distinct types of financial sponsors and their influence on growth strategies employed by portfolio companies.

Additionally, we identify a significantly higher long-run post-IPO stock price performance for PE-backed newly public acquirers compared to VC-backed ones.

These findings have implications for investors seeking to understand IPO firms' growth strategies and their implications on long- and short-term share price performance based on their pre-IPO ownership background. Furthermore, our study adds to the understanding of the role of financial sponsors as owners of newly public firms. Investors could use these insights to make more informed investment decisions.

2.7 Appendix

Table 2-13: Variable definitions and data sources

This table defines the regression variables and describes them in more detail, including an identification of their data source. The variables are divided into sponsor backing variables, as well as company characteristics, IPO characteristics, M&A characteristic variables, main dependent variables, and the instrumental variables.

Variable	Definition	Data source
Sponsor backing		
PEBacked	Binary variable defined as one if the IPO firm is backed by (a) PE sponsor(s) with a (cumulative) pre-IPO ownership stake that exceeds 25%, zero otherwise.	Securities Data Company Platinum (SDC), SEC EDGAR
VCBacked	Binary variable defined as one if the IPO firm is backed by (a) VC sponsor(s) with a (cumulative) pre-IPO ownership stake that exceeds 25%, zero otherwise.	SDC, SEC EDGAR
Leading PE equity stake	Equity stake in percent of the leading PE sponsor (i.e., the one with the highest equity stake) at the time of the IPO.	SDC, SEC EDGAR
Leading VC equity stake	Equity stake in percent of the leading VC sponsor (i.e., the one with the highest equity stake) at the time of the IPO.	SDC, SEC EDGAR
Company characteristics		
Firm revenue	Natural logarithm of the firm's revenues in million US dollars in the IPO year.	Compustat
Return on Assets	Firm's net income in million US dollars divided by the firm's total assets in million US dollars in the IPO year.	Compustat
Book leverage	Firm's interest-bearing debt in million US dollars divided by the firm's total assets in million US dollars in the IPO year.	Compustat
Market-to-book ratio	Firm's market value of equity in million US dollars in the IPO year divided by the firm's book value of equity in million US dollars in the IPO year.	Compustat
Financial slack	Firm's cash and marketable securities in million US dollars divided by total assets in million US dollars in the IPO year.	Compustat
Growth investment level	Sum of firm's R&D and Capex expenses in million US dollars divided by total assets in million US dollars in the IPO year.	Compustat
Firm age at IPO	Natural logarithm of the firm's calendar year of offering minus the firm's calendar year of founding.	SDC, Website of Jay Ritter (https://site.warrington.ufl.edu/ritter/files/founding-dates.pdf)
IPO characteristics		
Primary proceeds	Natural logarithm of capital raised during the IPO from sale of primary shares in million US dollars.	SDC
M&A is IPO motive	Binary variable defined as one if the IPO firm discloses M&A as a motive for going public, zero otherwise.	SDC
Underwriter reputation	Sum of proceeds from US IPOs in which the leading book runner served as underwriter in IPO year divided by sum of proceeds from all US IPOs in IPO year.	SDC
Underpricing	Percentage change from the IPO offer price to the first day closing price.	SDC
Offer price revision	Percentage change from the midpoint of the original file price range to the actual offer price of the IPO.	SDC, SEC EDGAR
First 30-days post-IPO return	Cumulative returns of the issuer between days 1 and 30 after the IPO (i.e., excluding first day returns).	SDC

Dual Class share structure	Binary variable defined as one if the IPO firm has employed a dual class share structure, zero otherwise.	SDC
M&A characteristics		
Firm is pre-IPO acquirer	Binary variable defined as one if IPO firm conducted a transaction within three years prior to the IPO, zero otherwise.	SDC
Industry acquisition intensity	Number of acquisitions within the Fama-French 49 industry portfolio divided by total firms in the Fama-French 49 industry portfolio in the year prior to the IPO.	SDC, Website of Kenneth French (https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html)
Pre-IPO acquisitions	Number of acquisitions conducted by IPO firm within three years prior to the IPO.	SDC
Time to acquisition	Days between IPO and the acquisition announcement date.	SDC
Stock runup return (prv 30d)	Total stock return of acquirer in the last 30 days before acquisition (−32;−3) excluding the event study event window.	Center for Research in Security Prices (CRSP)
% of shares acquired	Percentage of shares acquired in the transaction.	SDC
Acquisition is cross-border	Binary variable defined as one if acquirer and target are located in different countries, zero otherwise.	SDC
Acquisition is cross-industry	Binary variable defined as one if acquirer and target are located in different Fama-French 49 industry portfolios, zero otherwise.	SDC, Website of Kenneth French (https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html)
Target is public	Binary variable defined as one if target is publicly listed at the time of the acquisition, zero otherwise.	SDC
Firm is post-IPO acquirer	Binary variable defined as one if IPO firm conducted one or more acquisitions after going public, zero otherwise.	SDC
Main dependent variables		
Acquisition frequency	IPO firm's total number of post-IPO acquisitions for up to three years following the IPO.	SDC
Total R&D	Natural logarithm of a firm's total R&D spending in million US dollars for up to three years following the IPO.	Compustat
Total CAPEX	Natural logarithm of a firm's total CAPEX expenditures in million US dollars for up to three years following the IPO.	Compustat
Cross-border	Binary variable equal to one if the IPO firm has conducted at least 1 cross-border acquisitions during the three years following the IPO, zero otherwise.	SDC
Cross-industry	Binary variable equal to one if the IPO firm has conducted at least 1 cross-industry acquisitions, where acquirer and target come from different Fama-French 49 industry portfolios, during the three years following the IPO, zero otherwise.	SDC, Website of Kenneth French (https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html)
Relative size	Binary variable equal to one if the IPO firm has conducted at least one acquisition during the three years following the IPO where the ratio of deal value to acquirer revenue at the time of the IPO being greater than 50%.	SDC, Compustat
Days to first post-IPO acquisition	Natural logarithm of the IPO firm' s number of days until its first post-IPO acquisition.	SDC
BHAR	IPO firm buy-and-hold abnormal stock return over the respective holding period excluding the IPO date	CRSP, Website of Hoberg and Phillips

	benchmarked against the expected return of an equally weighted matched portfolio of up to five style-matched competitor firms with the highest similarity scores identified using the text-based industry matching procedure introduced by Hoberg and Phillips (2010, 2016).	(https://hobergphillips.tuck.dartmouth.edu/)
CAR	Market adjusted acquirer cumulative abnormal stock return over the respective event window benchmarked against the Russel 3000 Index.	CRSP
Instrumental variables		
Local VC share	Number of VC-backed IPOs in a given combination of year and TRBC economic sector to the sum of IPOs of VC-backed firms and the respective control group (PE-backed / non-backed) in the same combination of year and TRBC economic sector.	SDC
Local PE share	Number of PE-backed IPOs in a given combination of year and TRBC economic sector to the sum of IPOs of VC-backed firms and the respective control group (PE-backed / non-backed) in the same combination of year and TRBC economic sector.	SDC

Table 2-14: Poisson regressions on post-IPO acquisition frequency

This table reports the cross-sectional Poisson regression coefficients using the IPO firm *i*'s number of post-IPO acquisitions as dependent variable. The variables of interest in models (1) to (3) are *PEBacked* and *VCBacked*, both defined as one if the IPO firm is either PE-backed or VC-backed, respectively, at the time of the IPO, whereby the sponsor's backing must exceed an ownership threshold of 25% in the IPO firm, and zero otherwise. The variables of interest in models (4) to (6) are *Leading PE equity stake* and *Leading VC equity stake*, both defined as the equity stake of the respective leading sponsor in percent at the time of the IPO. The other variables are divided into company characteristics, IPO characteristics, and M&A characteristics and are defined in Table 2-13. The associated *t*-values are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

	# post-IPO acq. – full sample					
	(1) IPO + 1 yr	(2) IPO + 2 yrs	(3) IPO + 3 yrs	(4) IPO + 1 yr	(5) IPO + 2 yrs	(6) IPO + 3 yrs
Sponsor backing						
PEBacked	0.295*	0.294**	0.296**			
	(1.805)	(2.023)	(2.124)			
VCBacked	−0.109	−0.048	−0.038			
	(−0.601)	(−0.328)	(−0.271)			
Leading PE equity stake				0.006***	0.005***	0.004***
				(2.828)	(2.791)	(2.578)
Leading VC equity stake				−0.007	−0.007*	−0.005
				(−1.485)	(−1.771)	(−1.331)
Company characteristics						
Firm revenue	0.199***	0.241***	0.254***	0.202***	0.243***	0.257***
	(2.868)	(4.155)	(4.555)	(2.913)	(4.290)	(4.740)
Return on Assets	0.253	0.091	0.200	0.294	0.112	0.215
	(0.758)	(0.424)	(0.891)	(0.816)	(0.495)	(0.936)
Book leverage	−0.199	−0.223	−0.254	−0.197	−0.210	−0.236
	(−0.789)	(−1.125)	(−1.366)	(−0.778)	(−1.065)	(−1.266)
Market-to-book ratio	0.006	0.033	0.043**	0.003	0.031	0.041**
	(0.196)	(1.597)	(2.436)	(0.093)	(1.503)	(2.329)
Financial slack	−1.274***	−0.941***	−0.876***	−1.099***	−0.793***	−0.775***
	(−3.393)	(−3.598)	(−3.726)	(−2.917)	(−3.017)	(−3.235)
Growth investment level	−0.999**	−1.273***	−1.033***	−0.932**	−1.255***	−1.036***
	(−2.236)	(−3.588)	(−3.054)	(−2.045)	(−3.467)	(−3.022)
Firm age at IPO	−0.086	−0.051	−0.038	−0.097	−0.064	−0.048
	(−1.245)	(−0.801)	(−0.616)	(−1.386)	(−1.042)	(−0.810)
IPO characteristics						
Primary proceeds	0.201**	0.143*	0.111	0.200**	0.143*	0.110
	(2.289)	(1.939)	(1.562)	(2.254)	(1.949)	(1.550)
M&A is IPO motive	0.777***	0.521***	0.512***	0.781***	0.523***	0.514***
	(5.256)	(4.457)	(4.746)	(5.275)	(4.474)	(4.765)
Underwriter reputation	−0.023	−0.023*	−0.021*	−0.024*	−0.023*	−0.021*
	(−1.622)	(−1.710)	(−1.711)	(−1.696)	(−1.688)	(−1.646)
Underpricing	0.003	0.003	0.003	0.004	0.003	0.003
	(0.919)	(1.065)	(1.298)	(1.123)	(1.302)	(1.521)
Offer price revision	0.007*	0.006**	0.003	0.006*	0.006*	0.003
	(1.943)	(1.979)	(1.128)	(1.907)	(1.905)	(1.048)
First 30-days post-IPO return	0.004	0.003	0.002	0.004	0.003	0.002
	(1.495)	(1.461)	(1.173)	(1.525)	(1.480)	(1.204)
Dual class share structure	−0.165	−0.084	−0.044	−0.134	−0.074	−0.040
	(−0.937)	(−0.619)	(−0.354)	(−0.777)	(−0.550)	(−0.323)
M&A characteristics						
Pre-IPO acquirer	0.742***	0.639***	0.633***	0.749***	0.651***	0.644***
	(6.167)	(6.250)	(6.633)	(6.285)	(6.437)	(6.798)
Industry acquisition intensity	0.040	0.292	0.274	0.048	0.307	0.289
	(0.114)	(1.042)	(1.173)	(0.134)	(1.073)	(1.220)
Constant	−3.022***	−2.351***	−1.899***	−3.079***	−2.368***	−1.916***
	(−3.295)	(−3.187)	(−2.678)	(−3.382)	(−3.215)	(−2.696)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,071	1,071	1,071	1,071	1,071	1,071
Pseudo R-squared	0.217	0.228	0.245	0.222	0.232	0.247

Table 2-15: Ordered logit regression on post-IPO acquisition frequency

This table reports the cross-sectional ordered logit regression coefficients using a categorical dependent variable that is zero if the IPO firm *i*'s number of post-IPO acquisitions is zero, one if the IPO firm *i*'s number of post-IPO acquisitions is one and two if the IPO firm *i*'s number of post-IPO acquisition is greater than one. The variables of interest in models (1) to (3) are *PEBacked* and *VCBacked*, both defined as one if the IPO firm is either PE-backed or VC-backed, respectively, at the time of the IPO, whereby the sponsor's backing must exceed an ownership threshold of 25% in the IPO firm, and zero otherwise. The variables of interest in models (4) to (6) are *Leading PE equity stake* and *Leading VC equity stake*, both defined as the equity stake of the respective leading sponsor in percent at the time of the IPO. The other variables are divided into company characteristics, IPO characteristics, and M&A characteristics and are defined in Table 2-13. The associated *t*-values are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

	post-IPO acq. – full sample					
	(1) IPO + 1 yr	(2) IPO + 2 yrs	(3) IPO + 3 yrs	(4) IPO + 1 yr	(5) IPO + 2 yrs	(6) IPO + 3 yrs
Sponsor backing						
PEBacked	0.325	0.373*	0.412**			
	(1.440)	(1.870)	(2.150)			
VCBacked	−0.085	0.126	0.073			
	(−0.340)	(0.580)	(0.340)			
Leading PE equity stake				0.007**	0.006**	0.006***
				(2.530)	(2.340)	(2.600)
Leading VC equity stake				−0.002	−0.002	−0.004
				(−0.370)	(−0.420)	(−0.660)
Company characteristics						
Firm revenue	0.204**	0.241***	0.260***	0.205**	0.247***	0.269***
	(2.350)	(3.130)	(3.370)	(2.330)	(3.230)	(3.490)
Return on Assets	0.213	0.164	0.226	0.253	0.165	0.227
	(0.640)	(0.600)	(0.760)	(0.680)	(0.600)	(0.750)
Book leverage	−0.081	−0.206	−0.170	−0.087	−0.209	−0.162
	(−0.240)	(−0.710)	(−0.620)	(−0.260)	(−0.710)	(−0.590)
Market-to-book ratio	0.019	0.046	0.046	0.019	0.047	0.048
	(0.560)	(1.370)	(1.490)	(0.560)	(1.420)	(1.540)
Financial slack	−1.704***	−0.936**	−0.460	−1.579***	−0.727*	−0.261
	(−3.550)	(−2.240)	(−1.100)	(−3.400)	(−1.750)	(−0.630)
Growth investment level	−1.657***	−2.063***	−2.135***	−1.563***	−2.003***	−2.070***
	(−2.930)	(−4.030)	(−3.950)	(−2.720)	(−3.930)	(−3.850)
Firm age at IPO	−0.115	−0.027	−0.002	−0.122	−0.040	−0.015
	(−1.170)	(−0.280)	(−0.030)	(−1.220)	(−0.410)	(−0.160)
IPO characteristics						
Primary proceeds	0.173	0.142	0.154	0.171	0.137	0.149
	(1.430)	(1.280)	(1.390)	(1.390)	(1.240)	(1.350)
M&A is IPO motive	0.849***	0.598***	0.714***	0.871***	0.616***	0.731***
	(4.540)	(3.860)	(4.760)	(4.640)	(3.980)	(4.890)
Underwriter reputation	−0.028	−0.016	−0.014	−0.031*	−0.015	−0.014
	(−1.600)	(−0.980)	(−0.880)	(−1.790)	(−0.940)	(−0.870)
Underpricing	0.001	0.000	0.001	0.001	0.000	0.001
	(0.250)	(−0.020)	(0.280)	(0.340)	(0.120)	(0.410)
Offer price revision	0.010**	0.011***	0.007*	0.010**	0.011**	0.007*
	(2.200)	(2.620)	(1.710)	(2.210)	(2.550)	(1.650)
First 30-days post-IPO return	0.006*	0.002	0.003	0.006*	0.002	0.003
	(1.770)	(0.750)	(0.970)	(1.820)	(0.690)	(0.920)
Dual class share structure	−0.143	0.045	0.213	−0.078	0.065	0.236
	(−0.590)	(0.210)	(1.050)	(−0.320)	(0.300)	(1.160)
M&A characteristics						
Pre-IPO acquirer	1.021***	0.985***	1.009***	1.043***	1.013***	1.036***
	(6.170)	(6.330)	(6.460)	(6.300)	(6.500)	(6.630)
Industry acquisition intensity	0.001	−0.022	−0.331	0.000	−0.007	−0.317
	(0.000)	(−0.050)	(−0.860)	(0.000)	(−0.020)	(−0.820)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,071	1,071	1,071	1,071	1,071	1,071
Pseudo R-squared	0.163	0.162	0.175	0.166	0.164	0.176

Table 2-16: Regressions on post-IPO acquisition timing

This table reports the cross-sectional regression coefficients using the logarithm of the IPO firm *i*'s number of days until its first post-IPO acquisition as dependent variable. The variables of interest are *PEBacked* and *VCBacked*, both defined as one if the IPO firm is either PE-backed or VC-backed, respectively, at the time of the IPO, whereby the sponsor's backing must exceed an ownership threshold of 25% in the IPO firm, and zero otherwise. The other variables are divided into company characteristics, IPO characteristics, and M&A characteristics and are defined in Table 2-13. The standard errors are corrected for heteroskedasticity and clustered by leading financial sponsor with associated *t*-values given in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

	Days to first post-IPO acquisition
Sponsor backing	
PEBacked	−0.285***
	(−3.183)
VCBacked	0.087
	(0.675)
Company characteristics	
Firm revenue	−0.109**
	(−2.140)
Return on Assets	0.009
	(0.031)
Book leverage	−0.017
	(−0.093)
Market-to-book ratio	0.015
	(0.721)
Financial slack	0.293
	(1.348)
Growth investment level	0.828***
	(2.824)
Firm age at IPO	0.050
	(0.987)
IPO characteristics	
Primary proceeds	−0.068
	(−1.323)
M&A is IPO motive	−0.342***
	(−4.066)
Underwriter reputation	0.029***
	(3.310)
Underpricing	−0.002
	(−1.066)
Offer price revision	−0.008***
	(−3.459)
First 30-days post-IPO return	−0.008***
	(−3.712)
Dual class share structure	0.035
	(0.284)
M&A characteristics	
Pre-IPO acquirer	−0.527***
	(−6.356)
Industry acquisition intensity	−0.331*
	(−1.693)
Constant	6.965***
	(17.154)
Year fixed effects	Yes
Industry fixed effects	Yes
Observations	736
R-squared	0.198

Table 2-17: PSM analysis for acquisition frequency and organic growth (PE- vs. non-backed firms)
The table reports the outcome of the propensity score matching (PSM) analysis with emphasis on the effect of sponsor backing on the IPO firm's post-IPO acquisition activity and organic growth investments. The treatment variable is assigned the value of 1 if the IPO firm is backed by a PE fund exceeding the sponsor ownership threshold of 25%, and 0 otherwise. Panel A presents the logit model used to estimate the likelihood of an IPO firm being PE-backed. Panel B presents the outcome of the two matching algorithms (i) without replacement and a caliper of 25% of the standard deviation of the propensity score of the logit estimation and (ii) with replacement and a caliper of 0.025. We report the number of treated and control observations on the matched sample, in addition to the estimated average treatment effects on the treated (ATTs) with Abadie and Imbens (2006) standard errors. In Panel C, we report the mean of each variable in the treated group and the control group, in addition to the bootstrapped *t*-value from the *t*-test of the null hypothesis that the difference is statistically equal to 0, both before and after matching. The Abadie and Imbens (2006) standard errors are reported in parentheses. All variables are defined in Table 2-13. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Logit model

Firm revenue	Return on Assets	Book leverage	Market-to-book ratio	Financial slack	Growth inv. level	Firm age at IPO	Underwriter reputation	Underpricing	First 30d post-IPO return	Pre-IPO acquirer	N
0.277*** (0.093)	−0.151 (0.278)	1.057** (0.472)	0.115* (0.069)	−2.867*** (0.669)	−1.767*** (0.672)	−0.036 (0.112)	0.109*** (0.022)	0.004 (0.005)	−0.004 (0.006)	0.211 (0.227)	639

Panel B: Matching results

	Matching without replacement	Matching with replacement
Caliper	0.25 standard deviations	0.025
Matched observations per treated deal	1:1	1:1
Number of treated observations	151	346
Number of control observations	151	346
# Acquisitions ATT	0.311	0.549
Abadie and Imbens (2006) standard errors	(0.349)	(0.504)
Log cumulative R&D ATT	0.029	0.301
Abadie and Imbens (2006) standard errors	(0.234)	(0.316)
Log cumulative Capex ATT	−0.033	−0.182
Abadie and Imbens (2006) standard errors	(0.229)	(0.338)

Panel C: Covariates' balancing

Sample	Before matching			After matching without replacement			After matching with replacement		
Variable	Treatment	Control	*t*-value	Treatment	Control	*t*-value	Treatment	Control	*t*-value
Firm revenue	6.39	4.49	11.63	5.67	5.77	0.50	6.39	6.50	0.93
Return on Assets	0.01	−0.10	3.44	−0.02	−0.04	0.40	0.00	0.03	3.24
Book leverage	0.39	0.20	9.17	0.24	0.27	1.20	0.38	0.32	3.18
Market-to-book	2.32	2.85	3.40	2.42	2.53	0.56	2.27	2.03	2.04
Financial slack	0.12	0.31	11.08	0.18	0.18	0.16	0.12	0.12	0.48
Growth inv. level	0.12	0.17	4.34	0.16	0.15	0.41	0.12	0.11	0.98
Firm age at IPO	3.13	2.57	6.69	2.78	2.83	0.45	3.13	2.92	2.49
Underwriter rep.	11.58	6.60	10.99	9.73	9.94	0.31	11.56	12.30	1.82
Underpricing	10.45	12.00	0.90	10.59	11.26	0.28	10.41	8.59	1.34
First 30d return	3.21	4.97	1.04	2.84	2.30	0.33	3.19	3.29	0.11
Pre-IPO acquirer	0.34	0.20	4.00	0.26	0.28	0.39	0.35	0.43	2.35

Table 2-18: PSM analysis for acquisition frequency and organic growth (VC- vs. non-backed firms)

The table reports the outcome of the propensity score matching (PSM) analysis with emphasis on the effect of sponsor backing on the IPO firm's post-IPO acquisition activity and organic growth investments. The treatment variable is assigned the value of 1 if the IPO firm is backed by a VC fund exceeding the sponsor ownership threshold of 25%, and 0 otherwise. Panel A presents the logit model used to estimate the likelihood of an IPO firm being VC-backed. Panel B presents the outcome of the two matching algorithms (i) without replacement and a caliper of 25% of the standard deviation of the propensity score of the logit estimation and (ii) with replacement and a caliper of 0.025. We report the number of treated and control observations on the matched sample, in addition to the estimated average treatment effects on the treated (ATTs) with Abadie and Imbens (2006) standard errors. In Panel C, we report the mean of each variable in the treated group and the control group, in addition to the bootstrapped *t*-value from the *t*-test of the null hypothesis that the difference is statistically equal to 0, both before and after matching. The Abadie and Imbens (2006) standard errors are reported in parentheses. All variables are defined in Table 2-13. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Logit model

Firm revenue	Return on Assets	Book leverage	Market-to-book ratio	Financial slack	Growth inv. level	Firm age at IPO	Underwriter reputation	Underpricing	First 30d post-IPO return	Pre-IPO acquirer	N
0.204*** (0.076)	0.021 (0.327)	−2.322*** (0.784)	0.010 (0.055)	5.312*** (0.550)	1.069 (0.708)	−0.447*** (0.148)	0.077*** (0.024)	0.011** (0.005)	−0.014*** (0.005)	0.897*** (0.278)	711

Panel B: Matching results

	Matching without replacement	Matching with replacement
Caliper	0.25 standard deviations	0.025
Matched observations per treated deal	1:1	1:1
Number of treated observations	126	419
Number of control observations	126	419
# Acquisitions ATT	−0.190	0.463
Abadie and Imbens (2006) standard errors	(0.210)	(0.325)
Log cumulative R&D ATT	0.971***	0.741*
Abadie and Imbens (2006) standard errors	(0.264)	(0.428)
Log cumulative Capex ATT	−0.031	0.549
Abadie and Imbens (2006) standard errors	(0.243)	(0.425)

Panel C: Covariates' balancing

Sample	Before matching			After matching without replacement			After matching with replacement		
Variable	Treatment	Control	*t*-value	Treatment	Control	*t*-value	Treatment	Control	*t*-value
Firm revenue	3.59	4.49	5.20	3.79	3.82	0.11	3.59	3.20	2.64
Return on Assets	−0.17	−0.10	2.20	−0.15	−0.16	0.04	−0.17	−0.12	2.33
Book leverage	0.06	0.20	10.80	0.10	0.10	0.19	0.06	0.05	1.34
Market-to-book	4.03	2.85	6.50	3.49	3.35	0.50	4.03	3.91	0.73
Financial slack	0.68	0.31	18.95	0.49	0.52	0.71	0.68	0.73	3.21
Growth inv. level	0.21	0.17	3.10	0.19	0.21	0.88	0.21	0.17	4.33
Firm age at IPO	2.12	2.57	7.31	2.27	2.26	0.07	2.12	1.99	3.05
Underwriter rep.	9.00	6.60	5.34	6.57	7.18	0.78	9.00	5.99	8.11
Underpricing	19.76	12.00	3.83	15.39	14.98	0.13	19.76	25.42	2.59
First 30d return	2.95	4.97	1.12	7.23	5.67	0.51	2.95	6.06	1.96
Pre-IPO acquirer	0.26	0.20	1.65	0.22	0.23	0.15	0.26	0.19	2.33

Table 2-19: PSM analysis for undertaking transformative deals (PE- vs. non-backed firms)

The table reports the outcome of the propensity score matching (PSM) analysis with emphasis on the effect of sponsor backing on the IPO firm's post-IPO probability to engage in transformative transactions. The treatment variable is assigned the value of 1 if the IPO firm is backed by a PE fund exceeding the sponsor ownership threshold of 25%, and 0 otherwise. Panel A presents the logit model used to estimate the likelihood of an IPO firm being PE-backed. Panel B presents the outcome of the two matching algorithms (i) without replacement and a caliper of 25% of the standard deviation of the propensity score of the logit estimation and (ii) with replacement and a caliper of 0.025. We report the number of treated and control observations on the matched sample, in addition to the estimated average treatment effects on the treated (ATTs) with Abadie and Imbens (2006) standard errors. In Panel C, we report the mean of each variable in the treated group and the control group, in addition to the bootstrapped *t*-value from the *t*-test of the null hypothesis that the difference is statistically equal to 0, both before and after matching. The Abadie and Imbens (2006) standard errors are reported in parentheses. All variables are defined in Table 2-13. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Logit model

Firm revenue	Return on Assets	Book leverage	Market-to-book ratio	Financial slack	Growth inv. level	Firm age at IPO	Underwriter reputation	Underpricing	First 30d post-IPO return	Pre-IPO acquirer	N
0.089 (0.095)	−2.215** (1.061)	1.417*** (0.513)	−0.041 (0.083)	−1.679** (0.789)	−1.092 (0.881)	0.181 (0.127)	0.063*** (0.024)	0.004 (0.005)	0.004 (0.007)	0.060 (0.240)	388

Panel B: Matching results

	Matching without replacement	Matching with replacement
Caliper	0.25 standard deviations	0.025
Matched observations per treated deal	1:1	1:1
Number of treated observations	116	228
Number of control observations	116	228
Cross-border acquisitions ATT	−0.026	0.066
Abadie and Imbens (2006) standard errors	(0.064)	(0.085)
Cross-industry acquisitions ATT	−0.017	−0.026
Abadie and Imbens (2006) standard errors	(0.064)	(0.086)
Relative size ATT	0.051	0.063
Abadie and Imbens (2006) standard errors	(0.067)	(0.086)

Panel C: Covariates' balancing

Sample	Before matching			After matching without replacement			After matching with replacement		
Variable	Treatment	Control	*t*-value	Treatment	Control	*t*-value	Treatment	Control	*t*-value
Firm revenue	6.55	5.69	4.77	5.93	6.06	0.60	6.54	6.84	1.86
Return on Assets	0.01	0.03	1.18	0.02	0.01	0.70	0.01	0.01	0.07
Book leverage	0.40	0.23	5.59	0.23	0.28	1.71	0.38	0.36	0.77
Market-to-book	2.14	2.54	2.20	2.35	2.30	0.21	2.05	2.00	0.33
Financial slack	0.12	0.23	5.50	0.18	0.17	0.61	0.12	0.12	0.16
Growth inv. level	0.11	0.13	1.54	0.14	0.13	0.47	0.11	0.11	0.33
Firm age at IPO	3.11	2.93	1.68	2.93	3.04	0.81	3.11	3.05	0.60
Underwriter rep.	11.38	8.54	4.90	9.85	9.89	0.06	11.36	11.36	0.01
Underpricing	10.89	11.58	0.20	9.22	9.38	0.08	10.88	9.00	0.66
First 30d return	3.75	3.91	0.09	4.58	3.67	0.51	3.74	4.63	0.73
Pre-IPO acquirer	0.41	0.32	1.81	0.34	0.35	0.14	0.42	0.42	0.00

Table 2-20: PSM analysis for undertaking transformative deals (VC- vs. non-backed firms)

The table reports the outcome of the propensity score matching (PSM) analysis with emphasis on the effect of sponsor backing on the IPO firm's post-IPO probability to engage in transformative transactions. The treatment variable is assigned the value of 1 if the IPO firm is backed by a VC fund exceeding the sponsor ownership threshold of 25%, and 0 otherwise. Panel A presents the logit model used to estimate the likelihood of an IPO firm being VC-backed. Panel B presents the outcome of the two matching algorithms (i) without replacement and a caliper of 25% of the standard deviation of the propensity score of the logit estimation and (ii) with replacement and a caliper of 0.025. We report the number of treated and control observations on the matched sample, in addition to the estimated average treatment effects on the treated (ATTs) with Abadie and Imbens (2006) standard errors. In Panel C, we report the mean of each variable in the treated group and the control group, in addition to the bootstrapped *t*-value from the *t*-test of the null hypothesis that the difference is statistically equal to 0, both before and after matching. The Abadie and Imbens (2006) standard errors are reported in parentheses. All variables are defined in Table 2-13. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Logit model

Firm revenue	Return on Assets	Book leverage	Market-to-book ratio	Financial slack	Growth inv. level	Firm age at IPO	Underwriter reputation	Underpricing	First 30d post-IPO return	Pre-IPO acquirer	N
−0.029 (0.143)	−1.856* (1.062)	−3.865*** (1.455)	0.130 (0.097)	5.214*** (0.855)	1.187 (1.320)	−0.843*** (0.257)	0.094*** (0.033)	0.002 (0.009)	−0.010 (0.007)	1.022*** (0.388)	338

Panel B: Matching results

	Matching without replacement	Matching with replacement
Caliper	0.25 standard deviations	0.025
Matched observations per treated deal	1:1	1:1
Number of treated observations	48	171
Number of control observations	48	171
Cross-border acquisitions ATT	−0.125	−0.064
Abadie and Imbens (2006) standard errors	(0.099)	(0.180)
Cross-industry acquisitions ATT	0.000	0.234
Abadie and Imbens (2006) standard errors	(0.100)	(0.176)
Relative size ATT	−0.116	−0.202
Abadie and Imbens (2006) standard errors	(0.107)	(0.228)

Panel C: Covariates' balancing

Sample	Before matching			After matching without replacement			After matching with replacement		
Variable	Treatment	Control	*t*-value	Treatment	Control	*t*-value	Treatment	Control	*t*-value
Firm revenue	4.45	5.69	6.43	4.59	4.65	0.15	4.44	2.90	6.02
Return on Assets	−0.10	0.03	6.02	−0.04	−0.02	0.60	−0.10	−0.12	0.68
Book leverage	0.04	0.23	9.91	0.09	0.08	0.42	0.04	0.05	0.77
Market-to-book	4.72	2.54	7.78	3.25	3.60	0.86	4.79	4.47	1.02
Financial slack	0.61	0.23	16.51	0.39	0.43	0.89	0.62	0.62	0.15
Growth inv. level	0.18	0.13	3.17	0.15	0.13	0.94	0.18	0.18	0.72
Firm age at IPO	2.14	2.93	8.99	2.26	2.21	0.29	2.13	1.59	5.44
Underwriter rep.	10.27	8.54	2.65	8.09	7.98	0.07	10.29	6.15	6.20
Underpricing	27.69	11.58	5.63	19.46	21.83	0.44	28.16	63.97	8.05
First 30d return	3.62	3.91	0.12	7.48	8.39	0.15	4.02	4.42	0.20
Pre-IPO acquirer	0.38	0.32	1.16	0.31	0.27	0.44	0.38	0.19	3.90

Table 2-21: Endogeneity and switching regressions for post-IPO acquisitions (PE- vs. non-backed)
This table reports the results of the two stage switching regression models with endogenous switching. The first stage in column (1) is the selection model using a probit regression with *PEBacked*, defined as one if the IPO firm is backed by a PE investor following our previously outlined definition, and zero otherwise, as the dependent variable. The second stage regression model using the number of post-IPO acquisitions in the first three years after the IPO as dependent variable are shown in columns (2) and (3) for PE-backed and non-backed IPO firms, respectively. Columns (4) and (5) show similar second stage regressions with total R&D expenses as the dependent variable. *Local PE share* serves as the instrumental variable and is defined as the market share of PE-backed IPOs out of all PE-backed and non-backed IPOs in a given combination of industry and year, where the industry is defined as the TRBC economic sector. The Inverse Mills Ratio adjusts for the non-zero mean of the error terms. All variables are defined in Table 2-13. The standard errors are corrected for heteroskedasticity with associated *t*-values (*z*-values for the probit regression) given in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

	First stage	Second stage: # acquisitions IPO + 3 yrs		Second stage: Total R&D IPO + 3 yrs	
	(1) Selection	(2) PE-backed	(3) Non-backed	(4) PE-backed	(5) Non-backed
Local PE share	2.625***				
	(7.004)				
Inverse Mills Ratio		1.558	0.340	−0.284	0.010
		(1.538)	(1.193)	(−0.581)	(0.038)
Company characteristics					
Firm revenue	0.139**	0.547***	0.207*	−0.145	0.080
	(2.406)	(3.300)	(1.891)	(−1.299)	(1.133)
Return on Assets	−0.141	0.039	−0.106	−1.077	−0.177
	(−0.819)	(0.037)	(−0.842)	(−1.123)	(−0.850)
Book leverage	0.622**	−0.057	−0.173	−0.138	−0.596
	(2.346)	(−0.120)	(−0.289)	(−0.255)	(−1.006)
Market-to-book ratio	0.076*	0.000	0.102	0.111*	0.177***
	(1.842)	(0.000)	(1.169)	(1.713)	(2.965)
Financial slack	−1.593***	−1.563	−1.371***	4.503***	3.550***
	(−3.865)	(−1.092)	(−2.647)	(4.264)	(6.813)
Growth investment level	−0.978**	−1.882	−0.984**	−2.114**	−0.051
	(−2.439)	(−1.206)	(−1.988)	(−2.374)	(−0.119)
Firm age at IPO	−0.050	−0.182	0.004	0.202*	0.054
	(−0.703)	(−0.790)	(0.029)	(1.809)	(0.568)
IPO characteristics					
Primary proceeds	−0.015	0.545*	0.235	0.349**	0.266**
	(−0.190)	(1.954)	(1.462)	(2.566)	(2.036)
M&A is IPO motive	−0.030	1.124**	0.601**	0.275	−0.050
	(−0.208)	(2.322)	(2.035)	(1.011)	(−0.252)
Underwriter reputation	0.066***	−0.027	−0.024	0.026	0.043*
	(5.134)	(−0.594)	(−0.591)	(1.118)	(1.743)
Underpricing	0.001	−0.000	0.004	−0.010*	0.007*
	(0.334)	(−0.014)	(1.148)	(−1.823)	(1.809)
Offer price revision	−0.005	−0.002	0.006	−0.016*	−0.017***
	(−1.468)	(−0.181)	(0.675)	(−1.922)	(−3.306)
First 30-days post-IPO return	−0.001	0.009	0.001	−0.007	0.001
	(−0.222)	(0.679)	(0.382)	(−0.814)	(0.497)
Dual class share structure	−0.809***	−0.826	0.109	0.343	0.252
	(−4.944)	(−1.018)	(0.279)	(0.857)	(0.773)
M&A characteristics					
Pre-IPO acquirer	0.143	1.774***	0.859**	0.397*	0.134
	(1.033)	(4.170)	(2.320)	(1.793)	(0.498)
Industry acquisition intensity	0.304	0.707	0.699	0.425	−0.011
	(1.076)	(1.363)	(1.451)	(1.013)	(−0.018)
Constant	−2.361***	−4.936**	−1.848**	−1.518	−2.117**
	(−4.501)	(−2.001)	(−2.085)	(−1.276)	(−2.191)
Observations	642	350	292	350	292
(Pseudo) R-squared	0.341	0.168	0.158	0.221	0.373

Table 2-22: Endogeneity and switching regressions for post-IPO acquisitions (VC- vs. non-backed)
This table reports the results of the two stage switching regression models with endogenous switching. The first stage in column (1) is the selection model using a probit regression with *VCBacked*, defined as one if the IPO firm is backed by a VC investor following our previously outlined definition, and zero otherwise, as the dependent variable. The second stage regression model using the number of post-IPO acquisitions in the first three years after the IPO as dependent variable are shown in columns (2) and (3) for VC-backed and non-backed IPO firms, respectively. Columns (4) and (5) show similar second stage regressions with total R&D expenses as the dependent variable. *Local VC share* serves as the instrumental variable and is defined as the market share of VC-backed IPOs out of all VC-backed and non-backed IPOs in a given combination of industry and year, where the industry is defined as the TRBC economic sector. The Inverse Mills Ratio adjusts for the non-zero mean of the error terms. All variables are defined in Table 2-13. The standard errors are corrected for heteroskedasticity with associated *t*-values (*z*-values for the probit regression) given in parentheses *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

	First stage	Second stage: # acquisitions IPO + 3 yrs		Second stage: Total R&D IPO + 3 yrs	
	(1) Selection	(2) VC-backed	(3) Non-backed	(4) VC-backed	(5) Non-backed
Local VC share	1.811***				
	(7.156)				
Inverse Mills Ratio		−0.090	−0.276	−1.614***	−1.520***
		(−0.191)	(−0.483)	(−3.689)	(−5.253)
Company characteristics					
Firm revenue	0.150***	0.007	0.133**	−0.080	−0.072
	(3.432)	(0.124)	(2.065)	(−1.068)	(−1.084)
Return on Assets	0.021	0.197	−0.093	−0.764*	−0.217
	(0.117)	(0.599)	(−0.735)	(−1.652)	(−1.337)
Book leverage	−1.020**	−0.111	−0.037	−1.240	0.695
	(−2.380)	(−0.136)	(−0.058)	(−1.351)	(1.176)
Market-to-book ratio	0.014	0.067*	0.087	0.062*	0.164***
	(0.447)	(1.802)	(0.980)	(1.797)	(2.984)
Financial slack	2.281***	−1.116	−1.551	0.888	0.342
	(7.165)	(−1.549)	(−1.178)	(1.229)	(0.433)
Growth investment level	0.398	−0.850	−0.909*	1.109	−0.685*
	(0.937)	(−1.290)	(−1.743)	(1.349)	(−1.682)
Firm age at IPO	−0.325***	−0.232	0.092	0.257*	0.458***
	(−4.041)	(−1.509)	(0.716)	(1.669)	(4.072)
IPO characteristics					
Primary proceeds	0.054	0.286	0.255	0.770***	0.258**
	(0.594)	(0.714)	(1.636)	(4.031)	(2.173)
M&A is IPO motive	0.102	0.317*	0.563*	0.151	−0.186
	(0.805)	(1.798)	(1.715)	(1.066)	(−1.015)
Underwriter reputation	0.050***	−0.001	−0.049	−0.021	−0.015
	(3.785)	(−0.027)	(−0.879)	(−1.251)	(−0.576)
Underpricing	0.005	0.005	0.003	−0.001	0.002
	(1.426)	(1.263)	(0.677)	(−0.258)	(0.470)
Offer price revision	−0.007**	−0.000	0.008	−0.001	−0.010**
	(−2.144)	(−0.019)	(1.053)	(−0.238)	(−2.098)
First 30-days post-IPO return	−0.009***	0.002	0.004	0.010***	0.012***
	(−3.157)	(0.692)	(0.908)	(2.701)	(3.291)
Dual class share structure	−0.923***	0.237	0.500	0.755**	1.349***
	(−4.331)	(0.466)	(1.133)	(2.285)	(3.893)
M&A characteristics					
Pre-IPO acquirer	0.600***	1.015***	0.711	0.441**	−0.675**
	(3.912)	(3.649)	(1.306)	(2.361)	(−2.312)
Industry acquisition intensity	−0.340	−0.400	0.615	0.019	0.026
	(−0.799)	(−0.451)	(1.296)	(0.023)	(0.050)
Constant	−2.224***	0.815	−0.682	−0.267	1.098
	(−3.614)	(0.350)	(−0.493)	(−0.177)	(1.149)
Observations	722	430	292	430	292
(Pseudo) R-squared	0.432	0.262	0.157	0.387	0.444

Table 2-23: Regression on post-IPO bidder BHARs

This table reports the cross-sectional regression coefficients using the IPO firm *i*'s 12 (model (1)), 24 (model (2)), and 36 (model (3)) months buy-and-hold return (BHAR) as dependent variables. The primary variable of interest is *PEBacked*, defined as one if the IPO firm is PE-backed at the time of the IPO, whereby the sponsor's backing must exceed an ownership threshold of 25% in the IPO firm, and zero otherwise. Further variables of interest are *Firm is post-IPO acquirer* and the interaction term *PEBacked×Firm is post-IPO acquirer*. The other variables are divided into company characteristics, IPO characteristics, and M&A characteristics and are defined in Table 2-13. Models (1) to (3) include all IPO firms on US stock exchanges from January 1, 2001, through December 31, 2017, for which BHARs for the post-IPO holding period of 12, 24 and 36 months are calculated as in Table 2-11. The standard errors are corrected for heteroskedasticity and clustered by leading financial sponsor with associated *t*-values given in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

	BHARs		
	(1) [0;12]	(2) [0;24]	(3) [0;36]
Sponsor backing			
PEBacked	0.002	−0.184	−0.272
	(0.015)	(−1.146)	(−1.227)
Firm is post-IPO acquirer	−0.041	0.059	0.063
	(−0.563)	(0.492)	(0.521)
PEBacked×Firm is post-IPO acquirer	0.260***	0.328*	0.278
	(2.834)	(1.941)	(1.337)
Company characteristics			
Firm revenue	0.017	0.071	0.109**
	(0.553)	(1.436)	(2.360)
Growth investment level	−0.256	−0.122	0.177
	(−1.040)	(−0.307)	(0.344)
Market-to-book ratio	0.090***	0.077***	0.117***
	(4.855)	(2.953)	(3.986)
Return on Assets	0.436***	0.452	0.309
	(2.769)	(1.585)	(0.903)
Book leverage	−0.282**	−0.241	−0.608**
	(−2.192)	(−1.201)	(−2.059)
Financial slack	−0.128	−0.082	−0.244
	(−0.882)	(−0.267)	(−0.830)
Firm age at IPO	−0.022	0.037	0.039
	(−0.615)	(0.622)	(0.510)
IPO characteristics			
Primary proceeds	−0.030	−0.088	−0.156*
	(−0.633)	(−1.431)	(−1.884)
Underwriter reputation	0.014**	0.015	0.029**
	(2.465)	(1.530)	(2.551)
M&A is IPO motive	−0.072	−0.085	−0.229
	(−1.424)	(−0.796)	(−1.631)
Underpricing	−0.002	0.001	−0.002
	(−1.413)	(0.510)	(−0.760)
Offer price revision	−0.005***	−0.006***	−0.006*
	(−3.173)	(−2.657)	(−1.862)
First 30-days post-IPO return	0.003**	0.003	0.001
	(2.017)	(1.008)	(0.323)
Dual Class share structure	0.037	0.416***	0.584***
	(0.502)	(2.851)	(3.086)
M&A characteristics			
Firm is pre-IPO acquirer	−0.043	−0.069	−0.022
	(−0.819)	(−0.753)	(−0.203)
Industry acquisition intensity	0.354	0.048	0.310
	(1.426)	(0.161)	(0.885)
Constant	−0.494	−0.157	−0.093
	(−1.232)	(−0.271)	(−0.118)
Year fixed effects	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
Observations	623	623	623
R-squared	0.222	0.141	0.150

Table 2-24: Regression on post-IPO bidder CARs

This table reports the cross-sectional regression coefficients using the IPO firm *i*'s cumulative abnormal announcement returns (CARs) during the [−2;+2] and [−1;+1] day event window in models (1) and (2). The variable of interest is *PEBacked*, defined as one if the IPO firm is PE-backed at the time of the IPO, whereby the sponsor's backing must exceed an ownership threshold of 25% in the IPO firm, and zero otherwise. The other variables are divided into company characteristics, IPO characteristics, and M&A characteristics and are defined in Table 2-13. Models (1) and (2) include all acquisitions announced by PE- and VC-backed IPO firms during the first three years of their listings for which CARs are calculated as in Table 2-11. The standard errors are corrected for heteroskedasticity and clustered by leading financial sponsor with associated *t*-values given in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

	Bidder CARs	
	(1) [−2,+2]	(2) [−1,+1]
Sponsor backing		
PEBacked	0.008	0.008
	(0.875)	(1.069)
Company characteristics		
Firm revenue	−0.003	−0.003
	(−0.585)	(−0.764)
Growth investment level	−0.011	−0.012
	(−0.437)	(−0.629)
Market-to-book ratio	−0.000	0.001
	(−0.189)	(0.619)
IPO characteristics		
Primary proceeds	−0.000	−0.001
	(−0.055)	(−0.279)
Underwriter reputation	−0.002**	−0.002***
	(−2.336)	(−2.787)
M&A is IPO motive	−0.014**	−0.012**
	(−1.990)	(−2.174)
M&A characteristics		
Time to acquisition	0.000	0.000
	(0.431)	(0.064)
Stock runup return (prv 30d)	0.016	0.002
	(0.628)	(0.121)
% of shares acquired	0.000**	0.000**
	(2.531)	(2.129)
Acquisition is cross-border	0.009	0.008
	(1.339)	(1.561)
Acquisition is cross-industry	−0.009	−0.003
	(−1.573)	(−0.799)
Target is public	0.021	−0.001
	(1.293)	(−0.050)
Pre-IPO acquisitions	0.002**	0.002**
	(2.164)	(2.365)
Industry acquisition intensity	−0.035	−0.022
	(−1.185)	(−1.325)
Constant	0.057	0.042
	(1.184)	(1.164)
Year fixed effects	Yes	Yes
Industry fixed effects	Yes	Yes
Observations	1,108	1,108
R-squared	0.054	0.060

3 ACQUIRING FOR INNOVATION: EVIDENCE FROM THE U.S. TECHNOLOGY INDUSTRY

Abstract

We investigate the effect of corporate innovation on mergers and acquisitions (M&A). Using a sample of 786 public-to-public transactions in the U.S. technology sector, we show that acquirers are willing to pay higher premiums for more innovative target firms. This effect is amplified by the acquirer's own level of innovativeness as more innovative acquirers are willing to pay higher premiums for innovative targets than non-innovative acquirers. We further document significant strategic reactions of rival firms. In the aftermath of the M&A, all acquirer rivals increase their R&D spending but the effect is more pronounced for innovative rivals than for non-innovative ones. Innovative acquirer rivals are also more likely to acquire a technology firm in the aftermath of their competitor's M&A announcement than their non-innovative peers. The similarity between acquirers and their rivals shrinks in the post-acquisition period, which may be caused by rival firms extending the breadth of their technological search in response to the acquisition.

Note: *This chapter has been published as*

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3.1 Introduction

The success of leading technology firms is commonly attributed to their innovative capabilities, operating within an industry that relies heavily on innovation to foster growth. However, once at the top it is difficult to stay there, as evidenced by various former technology conglomerates that either let their lead slip away (e.g., Yahoo, Nokia, MySpace) or had to go out of business completely (e.g., Compaq, Blockbuster, Kodak) because they failed to keep up with product innovations in their respective fields. As Glazer and Weiss (1993) note, knowledge in the technology industry depreciates rapidly, forcing successful companies to constantly innovate in order to stay competitive. While leading technology firms typically possess material inhouse innovation capabilities, most of them also rely heavily on acquiring innovation externally through corporate mergers & acquisitions (M&A) to defend their market leadership positions. Lukas et al. (2019) argue that serial acquisitions are more likely in sectors with high levels of uncertainty and Hackbarth and Miao (2012) show that mergers happen more often in industries with a high exposure to industry-wide shocks, both of which may particularly be the case for the innovation-reliant technology industry, further highlighting the importance of M&As for technology firms. Karim and Mitchell (2000) show that firms participating in acquisitions change their product lines substantially more than non-participants, indicating that M&A activity is a key mechanism in which firms tend to innovate and update their business models. Salesforce founder and CEO Marc Bernioff commented on the role of inorganic innovation in the context of Salesforce's acquisition of Tableau in 2019:

> *"I am a huge believer in innovation, it's one of our core values. […] I strongly believe in not just organic innovation, […] but I also strongly believe that companies, in order to be competitive and successful today, have also to believe in inorganic innovation. We can't build the technology fast enough to be able to deliver to our customers' demands."*

This study examines the relationship between corporate innovation and M&A activity in the U.S. technology industry. Specifically, we concentrate on the ability of technology firms to maintain or even extend their position in the market through the means of innovation-driven M&A and use premiums paid as well as stock market reactions to measure how investors evaluate these transactions. While multiple studies investigate corporate innovation in the context of M&As, most of them focus on the impact on post-acquisition innovation performance and are less concerned with premiums and stock market reactions (Desyllas & Hughes, 2010; Gantumur & Stephan, 2012; Valentini, 2012). Wu and Chung (2019) and Kim et al. (2021) are among the few who investigate the role of innovation in determining takeover premiums and abnormal announcement stock returns. However, their results are diverging, as Kim et al. (2021) report a negative relationship between target firm innovativeness and takeover premiums while Wu and Chung (2019) find a positive relationship, leaving room for further clarification. We also extend the focus and investigate corporate innovation in the context of M&As and its strategic effects on rival firms and the competitive landscape. Various studies investigate the impact of competition more generally on innovation (Aghion et al., 2005; Bloom et al., 2013; McGahan & Silverman, 2006; Spulber, 2013), but few in the context of M&A. Valentini (2016) explores this topic focusing on the effect that M&A has on the breadth of technological search of rival firms. However, he does not investigate the level of innovativeness of the rival firm itself in this context. This study is, to the best of our knowledge, the first study that investigates the role that rival innovativeness plays in determining the behavior of said rivals in response to their competitor's M&A announcement.

Using a sample of 786 mergers and acquisitions of public target firms from the U.S. technology industry conducted between 2000 and 2019, we show that acquirers are paying higher premiums for innovative targets and that innovative target firms achieve higher abnormal stock returns than non-innovative target firms, suggesting that innovation represents a source of synergies and value creation in the context of M&A. All else being equal, our baseline regression results indicate that a one-standard-deviation increase in one of our three innovation measures increases takeover premiums by between 1.8 and 3.3 percentage points, corresponding to an average premium increase between USD 31 and USD 58 million. Our results further show that innovative acquirers are able to pay higher premiums for innovative target firms than non-innovative acquirers and that these innovative acquirers do not experience negative announcement stock returns when doing so. This suggests that innovative firms are able to outbid non-innovative firms in technology-motivated M&A processes without experiencing adversarial effects, thus describing a self-reinforcing dynamic as innovative acquirers may become more and more innovative by acquiring innovative target firms. We further use a sample of 1,968 target rivals as well as 1,890 acquirer rivals to document that the M&A announcement has not only significant implications for acquirer and target, but also for rival firms. Their reactions, however, differ based on their own level of innovation. We show that innovative acquirer rivals increase their R&D spending more heavily than their non-innovative peers following the M&A announcement. Our results further suggest that innovative acquirer rivals are also more likely to acquire a target firm from a technology-intensive industry. This highlights that the self-reinforcing dynamic described above induces acquirer rivals to search for innovation-driven M&A opportunities themselves in order not to fall behind. Target rivals experience significantly positive abnormal stock returns in response to the announcement, a finding that is in line with the acquisition probability hypothesis, albeit their reaction does not differ based on their own level of innovativeness.

This study contributes to the extant literature in two ways. First, we contribute to the literature on the relationship between innovation and M&A. We document a positive link between the innovativeness of the target firm and takeover premiums/target stock returns. This finding may help to clarify the diverging results on the role of innovation on M&A from related studies (Kim et al., 2021; Wu & Chung, 2019). In this context, we also extend the literature by showing that premiums and target stock returns are amplified by the innovativeness of the acquirer firm and that innovative acquirers do not experience negative announcement stock returns when paying these higher premiums. This finding helps to further our understanding of the underlying competitive dynamics that lead to the concentration of innovative capabilities in a few, large technology giants as they are able to outbid non-innovative competitors when acquiring innovative target firms. Second, we contribute to the literature on the strategic effects of corporate innovation on competition in general and rival firms in particular. While multiple scholars investigate the impact of innovation in the context of competition more generally (Aghion et al., 2005; Bloom et al., 2013; McGahan & Silverman, 2006; Spulber, 2013), these studies typically investigate it in relation to product market competition and not in the context of M&A. Valentini (2016) is the first to investigate this question, focusing on the change in technological scope of innovation efforts following a competitor's M&A announcement. He does not, however, investigate the role that the innovativeness of rival firms play in determining the innovation behavior after the competitor's M&A announcement. We extend this strand of the literature by investigating how the strategic post-M&A response of rival firms differs based on their innovativeness. We document that innovative acquirer rivals react differently to their competitor's M&A announcement than their non-innovative peers. Innovative acquirer rivals increase their R&D spending more heavily than their non-innovative peers, suggesting that the pressure exerted on rivals from innovation-driven M&A depends on rival firms' innovativeness. Innovative acquirer rivals are also more likely to acquire a target firm from a technology-intensive industries in the years after their competitor's announcement than non-innovative rivals. We also find that for both innovative and non-innovative acquirer rival firms, the similarity to the acquirer decreases in the years following the announcement. Finally, we find no evidence that *target* rival firms' generally positive stock price reactions to the competitor M&A announcement differ based on their own level of innovativeness.

The remainder of this chapter is structured as follows. Section 3.2 provides an overview over the relevant literature and develops our main hypotheses. Section 3.3 presents the sample construction as well as descriptive sample statistics. Section 3.4 outlines the empirical approach and discusses our results. Section 3.5 concludes.

3.2 Literature review and research hypotheses

Studying the relationship between corporate innovation and finance is not new, various studies analyze the degree to which innovation affects corporate finance more generally (see, e.g., He and Tian (2018) for a review of the literature) as well as corporate M&A and shareholder wealth specifically. Desyllas and Hughes (2010) show that acquirers benefit from acquiring innovative targets as acquirers' R&D-intensity increases in the long-term following high technology acquisitions. Similarly, Gantumur and Stephan (2012) find that acquirers' innovation output increases after the transaction and is positively linked to the level of prior inhouse R&D success. Farida et al. (2022) show that acquisitions increase the firm's innovation output and efficiency. The results of Valentini (2012) are more nuanced, indicating that M&A has a positive effect on innovation output but a negative effect on innovation quality. Capron et al. (1998) document that in horizontal mergers, the involved firms redeploy more resources between their businesses following the acquisition if acquirer and target firm have different relative strengths in these resources. Wu and Chung (2019) find a positive relationship between target firm innovativeness and takeover premiums whereas Kim et al. (2021) observe a negative relationship, implying that results on the relationship between innovativeness and takeover premiums are diverging and not yet conclusively answered. Hsu et al. (2021) take on a macroeconomic country perspective and show that innovative firms from low innovation countries are more likely to acquire abroad and that they achieve higher abnormal stock returns when doing so.

The common theme across these studies is that innovation is seen as a competitive advantage (McGrath et al., 1996; Urbancova, 2013; Weerawardena & Mavondo, 2011). Innovative firms achieve superior stock returns (Hirshleifer et al., 2013) and are more likely to become acquirers than targets (Bena & Li, 2014). Fulghieri and Sevilir (2009) find that firms from industries with highly competitive product markets may be able to gain a comparative advantage through technology acquisitions. Obtaining a competitive advantage may be especially relevant in the context of high technology industries. In these environments, knowledge depreciates rapidly and thus, becoming and staying innovative may be a more important driver of competition for these firms (Glazer & Weiss, 1993). Kleer and Wagner (2013) report that only acquisitions with a technological background are positively associated with an increase in post-acquisition innovation output while the same does not hold for non-technological acquisitions, providing support for examining the role of corporate innovation in the context of the technology industry.

Becoming innovative is not an easy task. Firms need to invest considerable amounts of financial resources into R&D, and research projects often take years until they materialize in the form of a patent, if ever. Even after successfully registering a patent, firms still need to further invest to properly exploit it, e.g., by deploying it to multiple markets and scaling it to its full potential. As Kim et al. (2021) point out, a firm holding one or more patents may have the potential for growth but may lack the resources to capitalize on it. In this case, an acquirer can provide those resources and in doing so create additional value by unlocking the full potential of the patent portfolio. In the M&A market, this synergistic gain may materialize in the form of higher takeover premiums paid for innovative target firms as well as higher announcement stock returns to both acquirers' and targets' stocks involved in the acquisition of an innovative firm, leading to the following two hypotheses:

H1a: *Innovative target firms achieve higher abnormal announcement stock returns and takeover premiums than their non-innovative peers.*

H1b: *Acquirers of innovative target firms achieve higher abnormal announcement stock returns than acquirers of non-innovative firms.*

The ability to fully exploit patents obtained through acquisitions may also depend on the acquirer's own innovation capabilities. Cohen and Levinthal (1990) establish their theory on absorptive capacity, which refers to a firm's ability to “value, assimilate, and utilize new external knowledge.” They provide evidence that a firm's ability to benefit from new external knowledge is largely a function of the firm's level of prior related knowledge: the higher a firm's own innovation capacity, the better it is positioned to assimilate and utilize external knowledge. Thus, the synergistic gain created through the acquisition of a patent portfolio may be higher for transactions involving an acquiring firm that possesses material own inhouse innovation capabilities, enabling it to better exploit and use patents. Again, this value creation may materialize in the form of higher takeover premiums or higher announcement stock returns to the acquirer or target firm, leading to the following hypotheses:

H2a: *Innovative target firms achieve higher announcement stock returns and takeover premiums when the acquirer firm itself is innovative (that is, the effect from H1a is more pronounced for innovative acquirers than for non-innovative ones).*

H2b: *Innovative acquirer firms buying innovative target firms achieve higher announcement stock returns than non-innovative acquirer firms.*

However, acquisitions do not only affect the involved firms themselves but also the rivals of those firms. As the competitive landscape shifts, competitors are directly affected by acquisitions within their industry. Multiple studies investigate the stock price impact of M&A

on rival firms and mostly report positive announcement stock returns (Clougherty & Duso, 2009; Fee & Thomas, 2004; Shahrur, 2005). Rivals benefit from the positive signaling effect of the acquisition with regard to attractiveness and future takeover activity within the industry (Eckbo, 1983) as well as from decreased competition and increased collusion potential (Shahrur, 2005). Song and Walkling (2000) study the effect of acquisition announcements on *target* rivals, and provide evidence for their acquisition probability hypothesis stating that rivals of acquisition targets earn positive abnormal stock returns because of the increased probability that they themselves will become targets. As innovativeness increases the likelihood to become a takeover target (Wu & Chung, 2019), it stands to reason that target rival effects should be different for innovative rivals compared to non-innovative ones. Innovative rivals may react more positively to acquisition announcements given their higher likelihood to become a target, leading to the following hypothesis:

H3a: *Innovative target rivals show more positive stock price reactions to acquisition announcements than their non-innovative peers.*

The potential effects of M&A announcements on *acquirer* rival firms are likewise severe. This is particularly true for innovation-related acquisitions where the success of these endeavors largely depends on the innovation strategy of competitors as well as the general competitive landscape. Aghion et al. (2005) find an inverted-U relationship between innovation and product market competition, i.e., firms that lag behind are discouraged from innovation given the gap to their competitors while 'neck-and-neck' firms are encouraged to invest into innovation. Spulber (2013) finds that competition is beneficial for innovation as it helps inventors to realize the fair market value of their innovations by reducing the rents extracted by competitors. More generally, Bloom et al. (2013) investigate the spillover effects of R&D investments to rival firms and find that both positive effects from technology spillovers and negative 'business stealing effects' from product market rivals may occur, but that the positive technology spillover effects generally dominate. In a similar vein, McGahan and Silverman (2006) find that patented innovation of a given firm has significant effects on the market value of its competitors. Despite these well-documented effects between competition and innovation, the role of M&A in the context of innovation and its strategic implications on competition have received limited scholarly attention to date. Valentini (2016) is the only study known to the authors that explores the impact of M&A on rival firms' innovation strategies. He shows that merging firms reduce their commitment to innovation in the period following the deal as they are occupied with short-term M&A implementation and financial considerations. He further finds that rivals of the merging firms may exploit this moment of inertia to broaden their research efforts and increase the breadth of their technological search, leading to more impactful innovations. This effect may be more severe for rivals that have experience with the innovation process themselves, given that prior innovation experience is an important determinant of future innovation success (Triguero & Córcoles, 2013). Firms familiar with the R&D process may find it easier to broaden and increase their existing research efforts given that they already have the required resources and processes in place and can leverage their existing team of researchers to explore other innovation pathways. On the other hand, firms with limited to no prior innovation experience would have to build up or at least scale up all these capabilities ad hoc in response to the acquisition announcement in order to benefit from the temporary time window of competitor's inertia. This leads us to our final hypothesis:

H3b: *Innovative acquirer rivals will accelerate their innovation efforts more distinctly in the aftermath of the acquisition announcement than non-innovative acquirer rival firms.*

Our study contributes to the literature in two major ways. First, drawing on absorptive capacity theory, we analyze the effect of *acquirer* innovativeness on M&A takeover premiums and announcement stock returns. This research question has previously not been addressed by studies that typically focus on the impact of *target* innovativeness on M&A activity (Phillips

& Zhdanov, 2013; Sevilir & Tian, 2012; Wu & Chung, 2019). Our finding of a self-reinforcing process (i.e., innovative acquirers are able to pay higher premiums for innovative targets than non-innovative acquirers) helps to shed light on the competitive dynamics in the technology industry that lead to the dominance of few, large technology giants. In this context, it also contributes to the findings from Kim et al. (2021) who investigate the role of acquirer innovation but only include it using an innovation dummy if a firm has at least one patent and thus neither explore a continuous linear relationship of innovation quantity nor the impact of innovation quality (i.e., citations). Second, we extend the literature on the strategic effects of corporate innovation on competition in general and rival firms in particular. While multiple scholars investigate the impact of innovation in the context of competition more generally (Aghion et al., 2005; Bloom et al., 2013; McGahan & Silverman, 2006; Spulber, 2013), these studies typically investigate it in relation to product market competition and not in the context of M&A. Valentini (2016) is the first to investigate this question, focusing on the change in technological scope of innovation efforts following a competitor's M&A announcement. He does not, however, examine the role that the innovativeness of rival firms plays in determining the innovation behavior after the competitor's M&A announcement. We contribute to the literature by investigating this gap. We show that innovative acquirer rivals react profoundly different to the M&A announcement than non-innovative acquirer rivals. Innovative acquirer rivals do not only increase their R&D spending more heavily than their innovative peers, but they are also more likely to acquire a target firm from a technology-intensive industry in the years after their competitor's announcement. We also find that the similarity between the acquirer and its rival firms decreases in the years following the announcement, highlighting that the broader technological search in response to the acquisition documented by Valentini (2016) leads to tangible product market differences.

3.3 Data and methodology

3.3.1 Sample creation and data sources

We create a sample of completed mergers and acquisitions in the U.S. between January 1, 2000 and December 31, 2019 based on Refinitiv's Securities Data Company Platinum (SDC) database. We limit the sample to transactions involving publicly listed firms so that cumulative abnormal stock returns may be calculated. In line with the research question and consistent with various studies (Colombo & Rabbiosi, 2014; Desyllas & Hughes, 2010; Han et al., 2018; Jo et al., 2016; Kleer & Wagner, 2013; Schildt et al., 2012), we limit our sample to technology acquisitions. In line with Desyllas and Hughes (2009), we define technology firms as firms from technology-intensive industries following the OECD two-digit SIC code classification[28] and eliminate all transactions for which the target firm is not from a technology-intensive industry. Finally, we exclude acquisitions with confounding events (e.g., acquisitions announced on 9/11 or those announced jointly with other material corporate events) or insufficient data quality from the sample. Applying these limitations results in a final sample of 786 transactions, Table 3-1 provides an overview over the sample reconciliation.

Table 3-1: Sample reconciliation

Total US-to-US acquisitions between 2000 and 2019 (from SDC)	5,690
Remove acquisitions involving private firms (target or acquirer)	(1,901)
Remove acquisitions with targets from non-technology-intensive industries	(2,965)
Remove acquisitions with confounding events or missing data	(38)
Final sample	**786**

We supplement our sample with patent and citation data obtained from The United States Patent and Trademark Office (USPTO).[29] We collect data on 6.3 million patents granted between January 1970 and December 2020 as well as their associated citations and match them

[28] According to the OECD two-digit SIC code classification, SIC codes 28, 35, 36, 37, 38, 48, 73, and 87 are defined as technology-intensive.
[29] https://bulkdata.uspto.gov/data/patent/assignment/economics/2020/

to both acquirers and targets from the main sample. We use the patent classification scheme from the World Intellectual Property Organization (WIPO) obtained from PatentsView[30] to identify a technology classification for each patent.[31] Finally, we use Refinitiv's Datastream to retrieve daily stock price data for all acquirers and targets in the sample.

To identify the rivals of target and acquirer firms in our sample, we utilize the text-based competitor matching provided by Hoberg and Phillips (2010). For each acquirer and target in our sample, we rank the rival firms by their similarity scores and calculate cumulative abnormal stock returns for up to three rivals with the highest scores for the acquirer and target, respectively. This approach results in a rival sample size of 1,968 target rivals and 1,890 acquirer rivals as some target and acquirer firms from our sample have no or less than three matches in the database provided by Hoberg and Phillips (2010).[32]

3.3.2 Focal variables construction

We follow the approach of Wu and Chung (2019) in order to construct three measures for the innovativeness of a given firm. The first measure, *INNO_PT*, estimates the innovative activity based on patent grants and is thus an indicator for the quantity of innovation output, while the second measure, *INNO_CITE*, estimates innovative activity based on patent citations, representing an indicator for the quality of innovation output. The third measure, *INNO_R&D*, is based on the respective firm's R&D spending and is thus an indicator of innovation *input*. To estimate our first measure, *INNO_PT*, we calculate firm *i*'s patent market share for each technology class *k* for a period of ten years:

[30] https://patentsview.org/download/data-download-tables
[31] Scholars such as Wu and Chung (2019) follow the patent technology classification from Hall et al. (2001). However, their classification is based on the United States Patent Classification (USPC) system which was discontinued in late 2012 and hence cannot be applied to samples that include patents granted after 2012. The WIPO classification we use provides 35 different technology classes, largely similar to the 37 sub-categories provided by Hall et al. (2001).
[32] We decide to keep rival firms of targets and acquirers with a non-zero number of matches less than three in our sample. Overall, only 28 out of 786 targets as well as 57 out 786 acquirers in our sample fall in this category.

$$Y_{i,k,t}^{p} = \frac{\sum_{t-10}^{t} P_{i,k,t}}{\sum_{j=1}^{N} \sum_{t-10}^{t} P_{j,k,t}} \tag{4}$$

where *t* corresponds to the year of the acquisition, $P_{i,k,t}$ corresponds to the number of patents granted to firm *i* in technology class *k* in year *t* and *N* denotes the number of firms in technology class *k*. We then measure firm *i*'s competitive advantage in innovation as its patent market share in the technology class in which it has the largest share:

$$INNO\_PT_{i,t} = Max\left(Y_{i,k,t}^{p}\right). \tag{5}$$

As Wu and Chung (2019) point out, measuring innovation output based on the largest technology class market share instead of a mean value across technology classes is beneficial given that some firms have a small number of patents in technology classes unrelated to its core business, thus distorting the mean.

To estimate the corresponding measure based on patent forward citations, *INNO_CITE*, we first have to correct for the citation lag. Since patent citations accumulate over time, older patents tend to have higher citation counts than their less mature counterparts. We follow the fixed-effects approach of Hall et al. (2001) to correct for this truncation bias, that is, all citation counts are re-scaled by the mean citation count of patents in the same technology class. We then use these re-scaled citation counts to calculate firm *i*'s citation count market share for each technology class *k* for a period of ten years:

$$Y_{i,k,t}^{c} = \frac{\sum_{t-10}^{t} C_{i,k,t}}{\sum_{j=1}^{N} \sum_{t-10}^{t} C_{j,k,t}} \tag{6}$$

where $C_{i,k,t}$ corresponds to the number of re-scaled forward citations for firm *i*'s patents in technology class *k* in year *t* and *N* denotes the number of firms in technology class *k*. We then measure firm *i*'s competitive advantage in innovation as its citation count market share in the technology class in which it has the largest share[33]:

$$INNO\_CITE_{i,t} = Max(Y^{c}_{i,k,t}). \quad (7)$$

Finally, to estimate innovation input, we construct our third measure, INNO_R&D, as the firm's market share of R&D spending relative to all firms in the same 2-digit SIC code for a period of ten years as follows:

$$INNO\_R\&D_{i,t} = \frac{\sum_{t-10}^{t} R\&D_{i,t}}{\sum_{j=1}^{N}\sum_{t-10}^{t} R\&D_{j,t}} \quad (8)$$

where $R\&D_{i,t}$ is the amount of R&D spending of firm *i* in year *t* and *j* is the universe of firms in the same 2-digit SIC code.

We construct these three innovation measures for acquirers, targets and rival firms in the sample and differentiate between them using the suffixes *TAR*, *ACQ* and *RIV*, respectively.

3.3.3 Dependent variables construction

For our baseline regressions, we construct three dependent variables: the takeover premium paid in the transaction as well as the cumulative abnormal stock returns (CARs) for the target and the acquirer firm, respectively.

To calculate the takeover premium, we follow the approach of Betton et al. (2008b) who calculate initial offer premiums against the target's share price 42 days prior to the initial offer date adjusted for splits and dividends:

$$PREMIUM = \frac{p_{ini}}{p_{-42}} - 1. \quad (9)$$

where p_{ini} represents the initial offer price and p_{-42} represents the target share price 42 trading days prior to the announcement. The base price is chosen 42 days prior to the announcement

[33] Following this approach allows for the possibility that a firm's INNO_PT technology class is different from its INNO_CITE technology class, particularly in the case in which the firm has a high number of infrequently cited patents in one technology class and a small number of frequently cited patents in another technology class.

since this is the last date unaffected by price runups associated with the market anticipating the transaction (Schwert, 1996).

The abnormal stock returns are calculated against the expected returns from the Fama French three factor model (Fama & French, 1993) estimated for an estimation window of 255 days (one trading year) and given by

$$R_{i,t} - r_{f,t} = \alpha_i + \beta_{i,M}\left(R_{M,t} - r_{f,t}\right) + \beta_{i,S}SMB_t + \beta_{i,H}HML_t + \varepsilon_{i,t} \tag{10}$$

where $R_{i,t}$ is firm *i*'s return on day *t*, $r_{f,t}$ is the risk-free return on day *t*, $R_{M,t}$ denotes the market's return on day *t*, SMB_t represents the difference in returns between small and big firms and HML_t denotes the difference in returns between firms with a high and low book-to-market equity ratio. Data for the daily returns of the three factors was collected from Kenneth French's Data Library website.[34] The abnormal returns $AR_{i,t}$ are then estimated as the difference between firm *i*'s actual return and its expected return from the Fama French three factor model:

$$AR_{i,t} = R_{i,t} - \left(r_{f,t} + \beta_{i,M}\left(R_{M,t} - r_{f,t}\right) + \beta_{i,S}SMB_t + \beta_{i,H}HML_t\right). \tag{11}$$

Finally, cumulative ARs (CARs) are calculated by summing the ARs of firm *i* over the respective event window $[\tau_1; \tau_2]$:

$$CAR_{i,[\tau_1;\tau_2]} = \sum_{t=\tau_1}^{\tau_2} AR_{i,t}. \tag{12}$$

3.3.4 Descriptive statistics

Table 3-2 shows descriptive statistics of both focal and control variables from our sample, detailed definitions of all control variables are provided in Table 3-13 in the Appendix. The mean premium paid is 42.8% while the median is 36.7% attributable to some transactions with very high premiums up to a maximum of 210%. In line with Wu and Chung (2019), we find that acquirers produce, on average, more innovative output than their targets: the mean

[34] https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

INNO_PT (*INNO_CITE*) is 0.334 (0.363) for acquirers while the mean for targets is only 0.034 (0.047), making the average acquirer 9.8x (7.7x) more innovative than the average target. This pattern is consistent with a general trend towards consolidation observed across industries (Grullon et al., 2019).

Table 3-2: Descriptive sample statistics

This table provides descriptive statistics for focal variables as well as control variables. N denotes sample size for each variable, S.D. denotes standard deviation, Med denotes the median. All variable definitions are provided in Table 3-13 the Appendix.

	N	Mean	S.D.	Min	25^{th}	Med	75^{th}	Max
Focal variables								
Premium_-42	786	0.428	0.362	-0.488	0.216	0.367	0.572	2.099
Acquirer $CAR_{[-2;2]}$	759	-0.013	0.081	-0.424	-0.048	-0.010	0.024	0.330
Target $CAR_{[-2;2]}$	745	0.285	0.288	-0.328	0.112	0.232	0.394	2.799
INNO_PT_TAR (%)	786	0.034	0.137	0.000	0.000	0.002	0.019	2.468
INNO_PT_ACQ (%)	786	0.334	1.262	0.000	0.000	0.009	0.142	11.586
INNO_CITE_TAR (%)	786	0.047	0.165	0.000	0.000	0.001	0.025	2.398
INNO_CITE_ACQ (%)	786	0.363	1.222	0.000	0.000	0.011	0.207	12.693
INNO_R&D_TAR (%)	786	0.001	0.005	0.000	0.000	0.000	0.001	0.062
INNO_R&D_ACQ (%)	786	0.050	0.472	0.000	0.000	0.002	0.017	10.918
Control variables								
Firm size $bn (Target)	782	1.731	5.194	0.005	0.099	0.327	1.123	53.018
Book-to-market (Target)	777	0.473	0.501	-3.164	0.209	0.394	0.628	4.207
R&D ratio (Target)	768	0.290	0.865	0.000	0.007	0.105	0.218	8.344
Capex ratio (Target)	785	0.035	0.046	0.000	0.010	0.022	0.045	0.632
Tangible Asset ratio (Target)	785	0.780	0.235	0.000	0.637	0.861	0.983	1.000
Tobin's Q (Target)	776	0.687	0.605	-2.082	0.286	0.609	1.002	3.916
Firm size $bn (Acquirer)	763	28.733	57.532	0.003	1.029	4.159	25.028	547.445
Book-to-market (Acquirer)	757	0.389	0.427	-0.384	0.187	0.312	0.488	7.548
R&D ratio (Acquirer)	782	0.125	0.271	0.000	0.012	0.080	0.156	3.760
Stake acquired	786	98.050	10.332	0.000	100.000	100.000	100.000	100.000
Diversifying	786	0.615	0.487	0.000	0.000	1.000	1.000	1.000
All stock	786	0.192	0.394	0.000	0.000	0.000	0.000	1.000
Toehold	786	0.004	0.062	0.000	0.000	0.000	0.000	1.000
Contested	786	0.050	0.217	0.000	0.000	0.000	0.000	1.000
Hostile	786	0.005	0.071	0.000	0.000	0.000	0.000	1.000
Tender Offer	786	0.258	0.438	0.000	0.000	0.000	1.000	1.000
Merger intensity	786	0.433	0.092	0.216	0.372	0.433	0.499	0.673
All cash	786	0.533	0.499	0.000	0.000	1.000	1.000	1.000

Table 3-3 additionally provides an overview over the distribution of patents across the M&A sample. Acquirers and targets are roughly equally likely to have at least one patent – 58.1% of all targets and 66.4% of all acquirer firms were granted at least one patent in the ten years preceding the acquisition. However, among those firms with at least one patent, the larger innovativeness of acquirers vis-à-vis target firms materializes in the mean number of patents granted – the average target with at least one patent was granted 88.5 patents in total compared to 1,291.8 patents granted to the average acquirer with at least one patent, again indicating that acquirers are materially more innovative than their targets.[35]

Table 3-3: Sample patent statistics
This table provides descriptive statistics for patent data across target and acquirer firms based on the last ten calendar years prior to the acquisition. Avg. # of patents are related to those firms that hold patents only.

		Target firms with patents			Acquirer firms with patents		
	N	Abs.	%	Avg. # of patents	Abs.	%	Avg. # of patents
2000	20	5	25.0%	24.2	13	65.0%	927.5
2001	35	13	37.1%	156.2	21	60.0%	1,546.8
2002	29	13	44.8%	22.0	19	65.5%	433.8
2003	42	20	47.6%	17.6	24	57.1%	562.7
2004	48	22	45.8%	37.2	35	72.9%	134.8
2005	70	45	64.3%	48.9	49	70.0%	1,898.7
2006	59	35	59.3%	39.3	37	62.7%	4,335.8
2007	70	37	52.9%	40.7	48	68.6%	334.5
2008	46	29	63.0%	29.5	32	69.6%	437.1
2009	40	24	60.0%	37.7	27	67.5%	3,109.6
2010	48	30	62.5%	58.7	28	58.3%	627.6
2011	24	18	75.0%	163.8	16	66.7%	1,042.7
2012	26	19	73.1%	38.8	14	53.8%	4,095.0
2013	25	16	64.0%	60.0	14	56.0%	231.9
2014	32	16	50.0%	27.4	19	59.4%	237.7
2015	44	29	65.9%	520.5	37	84.1%	1,817.6
2016	48	33	68.8%	102.6	31	64.6%	864.0
2017	28	17	60.7%	78.2	22	78.6%	775.9
2018	30	21	70.0%	109.3	21	70.0%	323.2
2019	22	15	68.2%	70.5	15	68.2%	1,239.1
Total	**786**	**457**	**58.1%**	**88.5**	**522**	**66.4%**	**1,291.8**

To further illustrate the underlying patent data, Table 3-4 provides an overview over the technology classes for the full patent sample, i.e., also including patents not matched to the M&A sample. In total, the 6.3 million patents are distributed across 35 classes, albeit few technology classes dominate the distribution – the top three classes (computer technology;

[35] The large difference in the mean number of patents granted to acquirer and target firms is partially influenced by a few extremely innovative acquirers. The difference becomes less severe when comparing the median number of patents granted of 78.0 for acquirers vis-à-vis 14.0 for targets, albeit the difference remains material.

electrical machinery, apparatus, energy; digital communication) account for 24% of all patents. The average firm from the patent sample holds 17.7 patents, significantly below the average number of patents held by target and acquirer firms from the M&A sample (see Table 3-3) as it only includes large, publicly listed firms whereas the patent sample also covers patents held by small- and medium-sized companies.

Table 3-4: Technology classes overview

This table provides descriptive statistics for the 35 WIPO technology classes to which patents are assigned for the full patent sample (i.e., including patents not granted to a firm from the M&A sample).

WIPO technology class	# of firms with at least 1 patent	# of patents	Avg. # of patents per firm	Avg. patent age
Analysis of biological materials	6,972	29,854	4.3	19.7
Audio-visual technology	23,172	344,288	14.9	18.5
Basic communication processes	8,227	121,846	14.8	19.6
Basic materials chemistry	14,237	119,719	8.4	24.0
Biotechnology	13,233	109,258	8.3	19.3
Chemical engineering	26,331	130,740	5.0	22.8
Civil engineering	27,376	123,835	4.5	20.8
Computer technology	34,310	646,473	18.8	14.4
Control	17,627	97,518	5.5	18.2
Digital communication	22,008	431,372	19.6	12.6
Electrical machinery, apparatus, energy	38,853	443,029	11.4	18.6
Engines, pumps, turbines	15,160	169,836	11.2	20.7
Environmental technology	12,927	55,000	4.3	20.7
Food chemistry	7,032	39,086	5.6	21.1
Furniture, games	22,742	93,210	4.1	19.2
Handling	27,803	130,879	4.7	22.9
IT methods for management	12,938	74,091	5.7	13.7
Machine tools	23,787	120,416	5.1	23.3
Macromolecular chemistry, polymers	9,273	123,546	13.3	25.0
Materials, metallurgy	14,120	97,586	6.9	24.8
Measurement	37,937	310,102	8.2	20.0
Mechanical elements	25,106	160,208	6.4	21.9
Medical technology	36,722	314,751	8.6	16.6
Micro-structural and nano-technology	1,304	6,899	5.3	14.7
Optics	16,365	309,356	18.9	19.7
Organic fine chemistry	14,200	195,998	13.8	26.5
Other consumer goods	17,239	70,581	4.1	20.7
Other special machines	30,737	153,568	5.0	22.5
Pharmaceuticals	21,326	184,287	8.6	16.9
Semiconductors	11,501	363,321	31.6	15.6
Surface technology, coating	14,367	82,956	5.8	21.9
Telecommunications	16,611	219,695	13.2	18.1
Textile and paper machines	12,866	124,070	9.6	23.3
Thermal processes and apparatus	11,502	54,875	4.8	22.2
Transport	24,808	222,882	9.0	18.7
Sum	**353,767**	**6,275,131**	**17.7**	**18.6**

3.4 Empirical results

3.4.1 Corporate innovation and M&A shareholder wealth effects

To examine the role of corporate innovation on M&A shareholder wealth effects, we begin by splitting the sample into those acquisitions involving an innovative target firm and those involving a non-innovative target firm. We define innovative targets as those with at least one matched patent within the last ten years prior to the acquisition (i.e., *INNO_PT_TAR* > 0), non-innovative target firms are all those remaining with no matched patent within the last ten years before the acquisition (*INNO_PT_TAR* = 0).[36] Table 3-5 shows takeover premiums as well as target and acquirer cumulative abnormal stock returns (CARs) for the full sample as well as for the thus created subsamples of deals with innovative and non-innovative target firms.

Table 3-5: Cumulative abnormal stock returns (CARs) and premiums by target innovativeness
This table shows differences in CARs and takeover premiums depending on whether the deal involved an innovative target firm. Innovative targets are all those firms with at least one matched patent within the last 10 years prior to the deal. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively, for the two-sample t-test in means.

	Full sample			Deals with innovative target firms			Deals with non-innovative target firms			Difference		
Cumulative abnormal returns	N	Mean	Med	N	Mean	Med	N	Mean	Med	Mean	Med	t-value
Panel A: Target firm CARs												
[0;0]	746	20.2%	12.9%	437	22.5%	15.3%	308	16.9%	10.7%	5.6%	4.5%	2.96***
[-2;0]	746	21.0%	15.2%	437	23.5%	18.2%	308	17.5%	12.0%	6.0%	6.2%	3.08***
[0;2]	746	27.9%	22.3%	437	30.4%	24.3%	308	24.3%	18.8%	6.1%	5.5%	2.87***
[-2;2]	746	28.5%	23.2%	437	31.3%	26.0%	308	24.6%	19.4%	6.6%	6.6%	3.12***
[-1;1]	746	28.9%	23.1%	437	31.2%	25.2%	308	25.6%	20.7%	5.6%	4.5%	2.63***
Panel B: Acquirer firm CARs												
[0;0]	760	-0.9%	-0.3%	446	-0.8%	-0.2%	313	-1.1%	-0.4%	0.3%	0.2%	0.85
[-2;0]	760	-0.8%	-0.6%	446	-0.7%	-0.7%	313	-0.9%	-0.6%	0.3%	-0.1%	0.58
[0;2]	760	-1.4%	-0.7%	446	-1.5%	-0.7%	313	-1.2%	-0.8%	-0.3%	0.1%	0.47
[-2;2]	760	-1.3%	-1.0%	446	-1.4%	-1.2%	313	-1.1%	-0.8%	-0.3%	-0.4%	0.56
[-1;1]	760	-1.2%	-0.8%	446	-1.5%	-0.8%	313	-0.8%	-0.6%	-0.8%	-0.2%	1.26
Panel C: Takeover premiums												
[-30;0]	787	43.2%	36.6%	457	45.1%	40.2%	329	40.5%	32.1%	4.5%	8.1%	1.72*
[-42;0]	787	42.8%	36.7%	457	44.5%	38.1%	329	40.3%	34.6%	4.2%	3.5%	1.59
[-60;0]	783	45.7%	38.1%	457	49.2%	38.9%	325	40.8%	37.2%	8.4%	1.8%	1.73*
[-90;0]	772	50.4%	39.0%	451	54.4%	41.1%	320	44.6%	34.7%	9.8%	6.4%	1.39

[36] The threshold of one patent is consistent with the one used by Wu and Chung (2019). In unreported results, we also replicate the analysis for a higher threshold of five patents. The results remain qualitatively unchanged, albeit the statistical and economic significance naturally weakens as the difference between the two groups is softened.

For the full sample, the results indicate that target firms achieve positive abnormal stock returns between 20.2% and 28.9%, depending on the event window, while acquirer CARs are generally negative, varying between -0.8% and -1.4%. The result of negative acquirer announcement stock returns is in line with various scholars (Moeller et al., 2004; Mulherin & Boone, 2000), indicating that, on average, the value created through the transaction goes to the target firm. Takeover premiums for the full sample vary between 42.8% and 50.4% depending on the date from which the base price is drawn.

With respect to the subsamples of deals involving innovative and non-innovative target firms, the results further show that innovative targets achieve significantly higher takeover premiums and announcement stock returns than their non-innovative peers. The average innovative firm receives a takeover premium (CAR) that is at least 4.2 (5.6) percentage points higher than that of its non-innovative counterpart, depending on the time horizon. The difference is significant at the 1% level for all event windows for the target firms' CARs and significant at the 10% and 5% level for two out of the four takeover premium time windows, providing evidence in support of our hypothesis **H1a**. These results are in line with Wu and Chung (2019) but stand in contrast to Kim et al. (2021), who find a negative relationship between takeover premiums and the innovativeness of the target firm. The difference may at least partially be a consequence of differences in how the takeover premium is measured. Kim et al. (2021) measure the premium against the target firm's market capitalization immediately before the acquisition announcement. Schwert (1996) shows that stock markets start to anticipate acquisitions as early as 42 days prior to the announcement, suggesting that a share of the premium is already priced in before the deal is announced. Thus, we measure the premium relative to the stock price 42 days before the acquisition is announced. Finally, we find no evidence for a significant difference in acquirer CARs between acquirers of innovative and non-innovative firms. The average acquirer of innovative targets experiences negative abnormal announcement stock returns between -0.7% and -1.5% while the average acquirer of non-innovative targets experiences abnormal announcement stock returns between -0.8% and -1.2%. The difference between the two remains statistically insignificant, thus providing no support for our hypothesis **H1b**.

To investigate whether these findings also hold in a multivariate setting, we estimate the following regression equations:

$$DEPVAR = \alpha + \beta_1 INNO\_TAR_i + \sum_k \beta_k X_{i,k} + \epsilon_i \quad (13)$$

where the dependent variable *DEPVAR* is either the target firm's cumulative abnormal stock return, the acquirer firm's cumulative abnormal stock return or the natural logarithm of the takeover premium measured against the stock price of the target firm 42 trading days before the acquisition announcement.[37] Cumulative abnormal stock returns are calculated against the returns predicted by the Fama French three factor model over a five-day event window centered around the announcement date. The main variable of interest is $INNO\_TAR_i$, which represents one of the three innovation measures *INNO_PT*, *INNO_CITE* or *INNO_R&D* for target firm *i*, while $X_{i,k}$ is a vector of control variables, and ε_i is the error term. The vector of control variables includes variables such as deal value, acquired stake, merger intensity in the target's industry, and further company and deal characteristics. A complete list of all variables including their definitions can be found in Table 3-13 in the Appendix.

The results, shown in Table 3-6, confirm the univariate findings. The quantity-related innovation output measure *INNO_PT*, the quality-related innovation output measure *INNO_CITE* as well as the input-related innovation measure *INNO_R&D* are all positively

[37] In line with various scholars, we use the log-transformed takeover premium throughout regression analyses to account for the skewness in its distribution (see, e.g., Betton et al. (2008a)). As a robustness check, we rerun the main analyses using the non-log-transformed takeover premium as the dependent variable. The results remain robust.

associated with announcement stock returns of the target (specifications 1 – 3) as well as takeover premiums (specifications 7 – 9), providing further support for hypothesis **H1a**. The

Table 3-6: Impact of target innovativeness on announcement stock returns and premiums

This table reports the cross-sectional regression coefficients for the relationship between target firms' innovativeness and target CARs (specifications 1-3), acquirer CARs (specifications 4-6) and takeover premiums (specifications 7-9), respectively. CARs are calculated for a five-day window centered around the announcement date, premiums are measured against the stock price 42 trading days prior announcement. All variable definitions are provided in Table 3-13 in the Appendix. The standard errors are corrected for heteroskedasticity with the associated *t*-values given in parentheses. *,**,*** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	Target CAR$_{[-2;2]}$			Acquirer CAR$_{[-2;2]}$			LN Premium$_{[-42;0]}$		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Focal variables									
INNO_PT_TAR	0.094**			0.035			0.087**		
	(2.213)			(1.349)			(2.083)		
INNO_CITE_TAR		0.091**			0.021			0.074**	
		(2.174)			(0.845)			(1.970)	
INNO_R&D_TAR			5.551*			0.335			4.515***
			(1.688)			(0.769)			(2.789)
Control variables									
Firm size (Target)	-0.070***	-0.070***	-0.071***	-0.004	-0.004	-0.003	-0.032***	-0.032***	-0.033***
	(-5.482)	(-5.539)	(-5.638)	(-1.633)	(-1.532)	(-1.376)	(-4.371)	(-4.380)	(-4.562)
Book-to-market (Target)	-0.018	-0.018	-0.018	0.005	0.005	0.004	0.060*	0.060*	0.060*
	(-0.303)	(-0.303)	(-0.295)	(0.612)	(0.598)	(0.579)	(1.784)	(1.778)	(1.771)
R&D ratio (Target)	0.016	0.015	0.016	0.003	0.003	0.003	0.026	0.026	0.026
	(1.140)	(1.090)	(1.140)	(1.175)	(1.130)	(1.178)	(1.456)	(1.429)	(1.430)
Capex ratio (Target)	0.082	0.090	0.092	0.088	0.089	0.087	-0.219	-0.215	-0.203
	(0.348)	(0.386)	(0.401)	(0.694)	(0.696)	(0.682)	(-1.308)	(-1.283)	(-1.219)
Tangible Asset ratio (Target)	0.011	0.009	0.014	-0.004	-0.003	-0.002	0.065*	0.064*	0.067*
	(0.219)	(0.174)	(0.280)	(-0.274)	(-0.243)	(-0.126)	(1.740)	(1.714)	(1.799)
Tobin's Q (Target)	-0.079**	-0.079**	-0.075**	0.005	0.005	0.005	-0.023	-0.023	-0.019
	(-2.123)	(-2.112)	(-1.999)	(0.724)	(0.679)	(0.645)	(-0.922)	(-0.923)	(-0.751)
Firm size (Acquirer)	0.042***	0.042***	0.041***	0.004*	0.004*	0.004*	0.027***	0.027***	0.026***
	(4.452)	(4.463)	(4.495)	(1.724)	(1.749)	(1.716)	(4.449)	(4.461)	(4.379)
Book-to-market (Acquirer)	-0.011	-0.011	-0.014	0.002	0.002	0.002	0.003	0.003	0.001
	(-0.434)	(-0.434)	(-0.529)	(0.158)	(0.165)	(0.162)	(0.161)	(0.165)	(0.081)
R&D ratio (Acquirer)	-0.005	-0.005	-0.008	-0.021	-0.021	-0.021	-0.107**	-0.107**	-0.109**
	(-0.119)	(-0.125)	(-0.202)	(-1.634)	(-1.634)	(-1.618)	(-2.247)	(-2.248)	(-2.268)
Stake acquired	0.001**	0.001**	0.001**	-0.000	-0.000	-0.000	0.004***	0.004***	0.004***
	(2.466)	(2.480)	(2.404)	(-0.843)	(-0.829)	(-0.811)	(4.091)	(4.084)	(4.064)
Diversifying	0.008	0.009	0.007	-0.006	-0.006	-0.007	0.004	0.005	0.004
	(0.408)	(0.439)	(0.373)	(-1.007)	(-1.008)	(-1.059)	(0.253)	(0.274)	(0.215)
All stock	-0.041	-0.042	-0.040	-0.004	-0.004	-0.004	0.002	0.001	0.001
	(-1.303)	(-1.330)	(-1.271)	(-0.360)	(-0.367)	(-0.337)	(0.055)	(0.029)	(0.025)
Toehold	-0.131	-0.128	-0.123	-0.053**	-0.051**	-0.050**	-0.016	-0.013	-0.007
	(-1.350)	(-1.312)	(-1.282)	(-2.170)	(-2.165)	(-2.264)	(-0.208)	(-0.166)	(-0.091)
Contested	-0.107***	-0.108***	-0.105***	0.012	0.011	0.011	0.049	0.048	0.051
	(-3.520)	(-3.569)	(-3.527)	(0.958)	(0.917)	(0.927)	(1.085)	(1.062)	(1.120)
Hostile	-0.045	-0.042	-0.027	0.001	0.004	0.008	-0.079	-0.074	-0.061
	(-0.725)	(-0.677)	(-0.500)	(0.042)	(0.145)	(0.231)	(-0.757)	(-0.708)	(-0.501)
Tender Offer	0.049*	0.049*	0.047*	-0.000	-0.000	-0.001	0.057***	0.057***	0.055***
	(1.846)	(1.844)	(1.816)	(-0.026)	(-0.058)	(-0.108)	(2.716)	(2.710)	(2.690)
Merger intensity	0.414	0.419	0.343	-0.021	-0.022	-0.029	0.046	0.049	-0.016
	(1.122)	(1.136)	(0.897)	(-0.195)	(-0.198)	(-0.265)	(0.158)	(0.167)	(-0.054)
All cash	-0.002	-0.003	-0.001	0.023***	0.023***	0.023***	0.020	0.020	0.021
	(-0.057)	(-0.072)	(-0.028)	(2.988)	(2.944)	(2.926)	(0.883)	(0.862)	(0.935)
Constant	-0.034	-0.023	0.013	0.025	0.024	0.023	-0.244	-0.243	-0.209
	(-0.211)	(-0.142)	(0.083)	(0.453)	(0.431)	(0.414)	(-1.339)	(-1.332)	(-1.142)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Target industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	699	699	699	716	716	716	737	737	737
R-squared	0.275	0.276	0.279	0.124	0.122	0.121	0.225	0.225	0.229

results are not only statistically but also economically significant. A one-standard-deviation increase in our three innovation measures increases target CARs by between 1.3 and 2.6 percentage points as well as takeover premiums by between 1.8 and 3.3 percentage points. The latter corresponds to an average premium increase between USD 31 and USD 58 million in our sample, highlighting that acquirers are willing and able to pay materially higher premiums for innovative target firms.[38] The positive relationship between target innovativeness and premiums/CARs may be explained by innovative firms' ability to outperform non-innovative firms. Hirshleifer et al. (2013) show that innovative firms achieve superior excess returns compared to their non-innovative peers. The higher premiums paid for innovative firms may thus show how the acquirer reflects this outperformance in this offer price to the target firm. As was the case for the univariate tests, the coefficients of the innovation measures remain insignificant in the specifications predicting acquirer CARs (specifications 4 – 6), again not supporting **H1b**. While the findings regarding target CARs are consistent with Wu and Chung (2019), the findings regarding acquirer CARs are not: Wu and Chung (2019) find a positive relationship between target innovativeness and acquirer's announcement returns. The difference may arise due to systematic differences between the two samples as Wu and Chung (2019) do not limit their sample to the technology sector. It may be the case that investors in the technology industry react less enthusiastic to the acquisition of target firms with large patent portfolios than investors in other, less patent-heavy industries, thus explaining the difference.

With respect to control variables, our results are largely in line with those from other studies investigating announcement stock returns and takeover premiums. Consistent with Cai and Sevilir (2012) and Eckbo (2009), we find that larger target firms earn lower announcement

[38] Given that our baseline regression specifications estimating takeover premiums use a log-transformed variable, we estimate new regression specifications in unreported results using the non-transformed premium as the dependent variable. We use the coefficients of the innovation measures from these regressions to derive an estimate on the premium percentage point impact of a one-standard-deviation increase (rather than using the coefficients from the log-transformed regression specifications for a relative interpretation).

stock returns and takeover premiums than their smaller peers. The opposite is true with respect to the acquirer's size: the larger the acquiring firm, the higher the takeover premium paid to the target. This is in line with Moeller et al. (2004) who explain this finding through managers of larger firms being more prone to overconfidence and thus also to overpaying in a transaction. In line with Qiu et al. (2014) and Dimopoulos and Sacchetto (2014), our results confirm that tender offers are associated with higher premiums, potentially caused by the need to incentivize atomistic shareholders to tender their shares. Finally, consistent with Faccio et al. (2006), our data indicates that acquirer firms achieve superior abnormal stock returns when paying with cash, which may be a consequence of the acquirer not having to share the upside potential of future returns with the target firm in the case of an equity payment (La Bruslerie, 2013).

We acknowledge that given our empirical setup there may be endogeneity concerns regarding the results from our main baseline regressions. Innovative and non-innovative target firms may be inherently different from each other, leading to a spurious relationship between target innovativeness and our dependent variables (CARs and premiums). We address these concerns using propensity score matching, thereby largely eliminating the observable differences between these two groups. The results are shown in Table 3-7. We estimate propensity scores via a logit regression to predict the probability of the transaction involving an innovative target firm (Table 3-7 Panel A). We then use these scores to match treated observations (i.e., innovative target firms) to our control group (non-innovative target firms) using 1:1 nearest neighbor matching without replacement and a caliper of 25% of the standard deviation of the propensity scores. This matching approach yields a total of 460 observations (230 matched pairs). We estimate average treatment effects on the treated (ATTs) for our variables of interest: target CARs, premiums, and acquirer CARs. The ATTs indicate that our results remain robust. The coefficients of the ATTs for both target CARs and premiums are positive and significant at the 5% level, indicating that even for the propensity score matched

Table 3-7: PSM analysis for premiums and CARs (innovative vs. non-innovative targets)

This table presents the outcome of the propensity score matching (PSM) analysis with emphasis on the effect of target innovation on abnormal announcement returns and takeover premiums. The treatment variable is assigned the value of one if the target firm has at least one matched patent within the last ten years prior to the acquisition, and zero otherwise. Panel A presents the logit model used to estimate the likelihood of a target firm being innovative (variable names abbreviated). Panel B presents the outcome of the matching with a caliper of 25% of the standard deviation of the propensity score of the logit estimation. We report the number of treated and control observations on the matched sample, in addition to the estimated average treatment effects on the treated (ATTs) with Abadie and Imbens (2006) standard errors in parentheses. In Panel C, we report the mean of each variable in the treated group and the control group, in addition to the bootstrapped *t*-value from the *t*-test of the null hypothesis that the difference is statistically equal to zero, both before and after matching. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Logit model

Firm size (T)	B-t-M (T)	R&D ratio (T)	Capex ratio (T)	TA ratio (T)	Tobin's Q (T)	Firm size (A)	B-t-M (A)	R&D ratio (A)	Stake acq.	Diversi-fying	All stock	Contes-ted	Tender Offer	Merger intens.	All cash	N
0.025 (0.064)	0.204 (0.236)	0.163 (0.127)	-4.678** (2.090)	1.594 (0.390)	0.344 (0.215)	0.117** (0.055)	0.280 (0.204)	0.362 (0.437)	0.021** (0.009)	-0.191 (0.172)	0.070 (0.252)	-0.355 (0.405)	0.326 (0.202)	3.135*** (0.993)	0.078 (0.208)	724

Panel B: Matching results

	Matching specifications & output
Caliper	0.25 standard deviations without replacement
Matched observations per treated deal	1:1
Number of treated observations	230
Number of control observations	230
Target $CAR_{[-2;2]}$ ATT	0.060**
Abadie and Imbens (2006) standard errors	(0.024)
$LN\ Premium_{-42}$ ATT	0.331**
Abadie and Imbens (2006) standard errors	(0.020)
Acquirer $CAR_{[-2;2]}$ ATT	−0.018
Abadie and Imbens (2006) standard errors	(0.008)

Panel C: Covariates' balancing

Sample	Before matching			After matching		
Variable	Treatment	Control	*t*-value	Treatment	Control	*t*-value
Firm size (Target)	5.954	5.675	2.05**	5.788	5.769	0.11
B-t-M (Target)	0.434	0.499	-1.77*	0.496	0.473	0.56
R&D ratio (Target)	0.359	0.199	2.43**	0.224	0.242	-0.27
Capex ratio (Target)	0.032	0.040	-2.26**	0.034	0.040	-1.46
TA ratio (Target)	0.812	0.740	4.27***	0.750	0.787	-1.82*
Tobin's Q (T)	0.766	0.590	4.06***	0.618	0.647	-0.56
Firm size (Acquirer)	8.768	8.197	3.56***	8.303	8.431	-0.66
B-t-M (Acquirer)	0.383	0.404	-0.65	0.401	0.402	-0.04
R&D ratio (Acquirer)	0.128	0.099	1.73*	0.115	0.110	0.21
Stake acquired	98.998	96.941	2.71***	98.684	98.367	0.39
Diversifying	0.591	0.660	-1.88*	0.657	0.630	0.58
All stock	0.159	0.215	-1.91*	0.213	0.165	1.31
Contested	0.038	0.043	-0.33	0.052	0.035	0.91
Tender Offer	0.280	0.205	2.33**	0.204	0.230	-0.68
Merger intensity	0.445	0.417	4.15***	0.418	0.426	-1.01
All cash	0.580	0.479	2.70***	0.504	0.535	-0.65

subsample, innovative firms experience higher announcement returns and are paid higher premiums than their non-innovative counterparts. In line with the results from our baseline regressions, the coefficient of the ATT for acquirer CARs remains insignificant, confirming our previous result that acquirers do not experience negative announcement returns when paying higher premiums for innovative firms. Panel C additionally provides information on the balancing of covariates both before and after matching. Before matching, there are significant differences between treated and control group for most covariates. After matching, almost all differences remain insignificant, highlighting the success of the matching approach. Overall, the propensity score matching approach suggests that endogeneity with respect to observable firm and deal characteristics does not materially alter our results. We acknowledge that endogeneity may nevertheless be a concern in the context of unobservable characteristics (e.g., omitted variable or sample selection biases) that is difficult to control for without a natural instrumental variable.

Next, we turn towards investigating the impact of acquirer innovativeness when bidding for innovative target firms. As outlined in section 3.2, it may be the case that innovative acquirers are better suited to extract the full potential from the patent portfolio of an innovative target and that this materializes in higher takeover premiums or announcement stock returns. To investigate this question, we estimate the following regression equations:

$$DEPVAR = \alpha + \beta_1 INNO\_TAR_i + \beta_2 INNO\_ACQ_j + \beta_3 INNO\_TAR_i \times INNO\_ACQ_j + \sum_k \beta_k X_{i,k} + \epsilon_i \qquad (14)$$

where the dependent variable *DEPVAR* is defined as in equation (13). We add two additional variables: $INNO\_ACQ_j$ represents one of the three innovation measures for acquirer firm j and $INNO\_TAR_i \times INNO\_ACQ_j$ represents the interaction term between the innovation measures for the target and the acquirer, respectively. Results from the regressions outlined in equation (14) are reported in Table 3-8. We find that shareholder wealth effects of acquisitions with

Table 3-8: Impact of relationship between target & acquirer innovativeness on M&A

This table reports the cross-sectional regression coefficients for the relationship between M&A firms' innovativeness and target CARs (specifications 1-3), acquirer CARs (specifications 4-6) and takeover premiums (specifications 7-9), respectively. CARs are calculated for a five-day window centered around the announcement date, premiums are measured against the stock price 42 trading days prior announcement. All variable definitions are provided in Table 3-13 in the Appendix. The standard errors are corrected for heteroskedasticity with the associated *t*-values given in parentheses. *,**,*** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	Target $CAR_{[-2;2]}$			Acquirer $CAR_{[-2;2]}$			LN $Premium_{[-42;0]}$		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Focal variables									
INNO_PT_TAR	0.051			0.035			0.042		
	(1.245)			(1.231)			(1.024)		
INNO_PT_ACQ	-0.007			-0.000			-0.004		
	(-1.140)			(-0.473)			(-0.989)		
*INNO_PT_TAR*ACQ*	0.360**			0.001			0.365***		
	(2.075)			(0.025)			(3.597)		
INNO_CITE_TAR		0.034			0.022			0.011	
		(0.720)			(0.775)			(0.246)	
INNO_CITE_ACQ		-0.007			0.000			-0.007*	
		(-0.826)			(0.103)			(-1.782)	
*INNO_CITE_TAR*ACQ*		0.219**			-0.002			0.239***	
		(2.014)			(-0.061)			(3.144)	
INNO_R&D_TAR			1.585			0.924			3.291
			(0.683)			(1.279)			(1.431)
INNO_R&D_ACQ			-0.060***			0.001			0.022
			(-2.652)			(0.186)			(0.731)
*INNO_R&D_TAR*ACQ*			100.578*			-14.651			31.645
			(1.818)			(-1.301)			(0.831)
Control variables									
Firm size (Target)	-0.070***	-0.070***	-0.070***	-0.004	-0.004	-0.004	-0.032***	-0.031***	-0.032***
	(-5.578)	(-5.627)	(-5.627)	(-1.645)	(-1.537)	(-1.452)	(-4.398)	(-4.310)	(-4.471)
Book-to-market (Target)	-0.018	-0.018	-0.017	0.005	0.005	0.004	0.060*	0.060*	0.060*
	(-0.290)	(-0.297)	(-0.273)	(0.607)	(0.597)	(0.581)	(1.785)	(1.763)	(1.760)
R&D ratio (Target)	0.016	0.015	0.015	0.003	0.003	0.003	0.026	0.025	0.026
	(1.152)	(1.098)	(1.106)	(1.178)	(1.127)	(1.193)	(1.442)	(1.419)	(1.427)
Capex ratio (Target)	0.081	0.095	0.108	0.088	0.089	0.083	-0.208	-0.201	-0.193
	(0.349)	(0.417)	(0.471)	(0.690)	(0.693)	(0.652)	(-1.241)	(-1.199)	(-1.150)
Tangible Asset ratio (Target)	0.007	0.007	0.009	-0.004	-0.003	-0.001	0.061	0.062	0.066*
	(0.150)	(0.136)	(0.180)	(-0.276)	(-0.240)	(-0.087)	(1.626)	(1.643)	(1.768)
Tobin's Q (Target)	-0.078**	-0.079**	-0.073*	0.005	0.005	0.005	-0.021	-0.023	-0.018
	(-2.075)	(-2.087)	(-1.959)	(0.708)	(0.676)	(0.614)	(-0.837)	(-0.898)	(-0.710)
Firm size (Acquirer)	0.043***	0.043***	0.041***	0.004*	0.004*	0.004*	0.027***	0.027***	0.025***
	(4.786)	(4.919)	(4.340)	(1.728)	(1.690)	(1.799)	(4.154)	(4.241)	(4.135)
Book-to-market (Acquirer)	-0.011	-0.011	-0.014	0.002	0.002	0.002	0.003	0.004	0.001
	(-0.430)	(-0.416)	(-0.547)	(0.160)	(0.164)	(0.176)	(0.174)	(0.207)	(0.043)
R&D ratio (Acquirer)	-0.003	-0.004	-0.010	-0.021	-0.021	-0.021	-0.106**	-0.106**	-0.109**
	(-0.079)	(-0.096)	(-0.251)	(-1.625)	(-1.632)	(-1.598)	(-2.229)	(-2.232)	(-2.273)
Stake acquired	0.001**	0.001**	0.001**	-0.000	-0.000	-0.000	0.004***	0.004***	0.004***
	(2.315)	(2.324)	(2.378)	(-0.831)	(-0.825)	(-0.787)	(4.026)	(4.023)	(4.025)
Diversifying	0.010	0.010	0.007	-0.006	-0.006	-0.006	0.005	0.005	0.002
	(0.499)	(0.491)	(0.374)	(-0.979)	(-1.000)	(-1.006)	(0.299)	(0.312)	(0.115)
All stock	-0.042	-0.044	-0.040	-0.004	-0.004	-0.004	-0.000	-0.002	0.003
	(-1.315)	(-1.366)	(-1.260)	(-0.356)	(-0.367)	(-0.362)	(-0.009)	(-0.058)	(0.095)
Toehold	-0.121	-0.114	-0.124	-0.053**	-0.051**	-0.050**	-0.005	0.003	-0.009
	(-1.220)	(-1.119)	(-1.300)	(-2.153)	(-2.159)	(-2.220)	(-0.069)	(0.042)	(-0.106)
Contested	-0.110***	-0.112***	-0.102***	0.012	0.011	0.011	0.047	0.045	0.053
	(-3.569)	(-3.647)	(-3.365)	(0.944)	(0.918)	(0.865)	(1.044)	(0.979)	(1.163)
Hostile	-0.096	-0.086	-0.029	0.001	0.005	0.008	-0.131	-0.122	-0.059
	(-1.092)	(-1.002)	(-0.541)	(0.045)	(0.160)	(0.226)	(-1.552)	(-1.418)	(-0.489)
Tender Offer	0.047*	0.045*	0.046*	-0.000	-0.000	-0.000	0.056***	0.054**	0.054***
	(1.776)	(1.738)	(1.791)	(-0.052)	(-0.050)	(-0.067)	(2.687)	(2.560)	(2.644)
Merger intensity	0.409	0.424	0.400	-0.021	-0.022	-0.039	0.033	0.046	0.009
	(1.108)	(1.150)	(1.072)	(-0.194)	(-0.197)	(-0.346)	(0.113)	(0.159)	(0.029)
All cash	-0.001	-0.002	0.002	0.024***	0.023***	0.022***	0.020	0.020	0.023
	(-0.022)	(-0.049)	(0.053)	(2.991)	(2.930)	(2.832)	(0.897)	(0.894)	(1.018)
Constant	-0.017	-0.014	0.004	0.024	0.024	0.024	-0.222	-0.233	-0.214
	(-0.110)	(-0.087)	(0.022)	(0.433)	(0.430)	(0.428)	(-1.211)	(-1.271)	(-1.175)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Target industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	699	699	699	716	716	716	737	737	737
R-squared	0.279	0.280	0.283	0.124	0.122	0.122	0.230	0.231	0.230

innovative targets indeed differ depending on the acquirer firm's own level of innovation. The coefficient of the interaction term between target and acquirer innovativeness is positively significant in specifications (1) - (3), indicating that the effect of target firm innovativeness on target CARs is magnified by the acquirer firm's own innovative capabilities. Specifications (7) and (8) reveal a similar relationship with respect to takeover premiums, showing that innovative acquirers are willing to pay higher premiums for innovative targets than non-innovative acquirers. These results provide support for our hypothesis **H2a** and are consistent with predictions drawn from absorptive capacity theory (Cohen & Levinthal, 1990) that innovative acquirers are better positioned to utilize innovation and extract value out of target firms with patent portfolios. It is worth noting, however, that the effect on premiums does not seem to hold for the innovation input-related measure *INNO_R&D* (specification 9). This may be driven by firms that only achieve little innovation output despite high R&D spending, therefore not enabling them to better extract value out of a target firm's patent portfolio.

Acquirer CARs do not appear to be significantly influenced by the relationship between target and acquirer innovativeness: the coefficient of the interaction term between the innovation measures remains insignificant in specifications (4) - (6), thus not supporting our hypothesis **H2b**. These findings suggest that innovative firms are able to outbid their non-innovative peers when it comes to acquiring innovative targets without experiencing negative market reactions when doing so. We interpret this to be indicative of a positive market perception towards these innovation-motivated acquisitions and as a sign that the market believes in the ability of innovative acquirers to integrate innovative target firms in an efficient and value-enhancing way.

3.4.2 Corporate innovation and rival effects

We now turn to the rival sample to investigate how rival firms react to acquisitions made by their competitors. Table 3-9 shows selected reactions of rival firms in response to the M&A

Table 3-9: Rival innovativeness and reactions to competitor M&A announcements

This table shows target rival CARs as well as multiple acquirer rival reactions to competitor M&A announcements for the full sample as well as for the subsamples of innovative or non-innovative rivals, respectively. Time frames shown relate to trading days for CARs and to years for all other variables. Innovative rivals are all those firms with at least one matched patent within the last 10 years prior to the deal. *N* refers to the time frame with the highest number of observations as data availability for CARs, change in acquirer R&D and change in acquirer rival similarity differs by time frame. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively, for the one-sample t-test or the two-sample t-test in means for differences.

	Full sample			Innovative rival firms			Non-innovative rival firms			Difference		
Cumulative abnormal returns	Mean	Med	t-value	Mean	Med	t-value	Mean	Med	t-value	Mean	Med	t-value
Panel A: Target rival CARs	*(N = 1,968)*			*(N = 869)*			*(N = 1,099)*					
[0;0]	0.37%	0.09%	3.7***	0.33%	0.13%	2.5**	0.41%	0.07%	2.8***	-0.08%	0.06%	0.3
[-2;0]	0.50%	0.04%	3.6***	0.48%	0.04%	2.5**	0.50%	0.04%	2.6**	-0.02%	0.00%	0.0
[0;2]	0.77%	-0.04%	4.5***	0.61%	-0.02%	3.0***	0.89%	-0.06%	3.5***	-0.28%	0.04%	0.7
[-2;2]	0.85%	-0.01%	4.6***	0.78%	-0.01%	3.1***	0.91%	-0.01%	3.4***	-0.13%	-0.01%	0.2
[-1;1]	0.64%	0.12%	4.4***	0.75%	0.22%	3.6***	0.56%	0.05%	2.7***	0.19%	0.16%	0.8
Panel B: Δ in Acq Rival R&D	*(N = 1,341)*			*(N = 687)*			*(N = 654)*					
[0;1]	0.0%	2.5%	0.0	2.1%	3.1%	1.3	-2.3%	1.9%	-1.2	4.4%	1.2%	-1.7*
[0;2]	9.1%	8.5%	5.8***	12.0%	9.9%	5.7***	6.1%	6.4%	2.6***	5.9%	3.5%	-1.9*
[0;3]	15.7%	12.6%	8.7***	19.3%	16.7%	8.0***	12.0%	10.4%	4.4***	7.3%	6.2%	-2.0**
[0;4]	20.6%	20.0%	10.1***	24.9%	24.6%	9.3***	16.2%	15.0%	5.3***	8.7%	9.6%	-2.1**
[0;5]	24.4%	23.6%	10.8***	32.6%	31.1%	10.5***	16.3%	12.9%	5.1***	16.2%	18.2%	-3.6***
Panel C: Acq rival tech acq.	*(N = 2,327)*			*(N = 954)*			*(N = 1,373)*					
[0;1]	0.17	0.00	21.8***	0.24	0.00	17.3***	0.12	0.00	13.7***	0.12	0.00	-7.6***
[0;2]	0.27	0.00	29.2***	0.37	0.00	23.8***	0.20	0.00	18.2***	0.18	0.00	-9.7***
[0;3]	0.32	0.00	33.5***	0.44	0.00	27.3***	0.25	0.00	21.1***	0.19	0.00	-10.0***
[0;4]	0.36	0.00	36.1***	0.48	0.00	29.5***	0.28	0.00	23.0***	0.20	0.00	-10.1***
[0;5]	0.38	0.00	38.1***	0.51	1.00	31.8***	0.29	0.00	23.9***	0.22	1.00	-11.1***
Panel D: Δ in Similarity to	*(N = 2,186)*			*(N = 936)*			*(N = 1,250)*					
[0;1]	-0.03	-0.01	-22.5***	-0.027	-0.01	-16.4***	-0.029	-0.01	-16.0***	0.00	0.00	0.2
[0;2]	-0.04	-0.03	-30.0***	-0.041	-0.03	-22.2***	-0.045	-0.03	-21.3***	0.00	0.00	-0.2
[0;3]	-0.06	-0.04	-33.9***	-0.053	-0.04	-24.0***	-0.056	-0.04	-24.5***	0.00	0.00	0.2
[0;4]	-0.06	-0.05	-38.8***	-0.062	-0.06	-28.1***	-0.064	-0.05	-27.6***	0.00	0.00	0.9
[0;5]	-0.07	-0.06	-43.5***	-0.069	-0.07	-30.9***	-0.073	-0.06	-31.3***	0.00	0.00	0.6

announcement of their respective competitor for the full sample as well as for the subsamples of innovative and non-innovative rivals of both the target and the acquirer firm, respectively. Panel A shows cumulative abnormal returns of target rival firms in the aftermath of the competitor's acquisition. Analyzing the full sample, we find that target rival CARs are generally positive. The average target rival firm achieves positive abnormal stock returns between 0.37% and 0.85%, depending on the event horizon. These rival CARs are significantly different from zero at the 1% level, in line with the results of various scholars (Clougherty & Duso, 2009; Fee

& Thomas, 2004; Gaur et al., 2013; Shahrur, 2005; Song & Walkling, 2000). Song and Walkling (2000) propose the *acquisition probability hypothesis* to explain positive target rival announcement returns. The hypothesis posits that the occurrence of an acquirer that is willing to buy another firm paying a premium above the current trading price is a sign for a potential valuation differential in the industry that induces other firms in the industry (and their respective shareholders) to reevaluate their own probability of being acquired. Innovation may influence this effect. Wu and Chung (2019) show that innovative firms are more likely to be acquired and thus one may expect that innovative target rival firms also show more pronounced reactions in their abnormal announcement stock returns than their non-innovative peers (**H3a**). To investigate whether innovation has a differential impact on target rival announcement stock returns, we split the rival sample into innovative and non-innovative firms in Table 3-9, where following the previous definition innovative rivals are all those firms that have registered at least one patent in the last ten years prior to the acquisition (i.e., *INNO_PT_RIV* > 0) and non-innovative rivals are all those firms with zero registered patents within the last ten year (*INNO_PT_RIV* = 0).[39] The results indicate that there is no differential pattern in the announcement stock returns between innovative and non-innovative target rival firms. The CARs of innovative target rival firms are below those of their non-innovative peers for most event windows and the difference remains statistically insignificant, jointly not supporting our hypothesis **H3a** and the predictions drawn from the acquisition probability hypothesis.

Panels B to D in Table 3-9 further show selected acquirer rival characteristics in the aftermath of the competitor's acquisition announcement. Panel B shows the percent change in acquirer rival R&D spending between base year zero (the year of the competitor's acquisition) and years one to five. The results indicate that rival firms generally increase their R&D

[39] In unreported results, we run the same robustness check as before for Table 3-5 also for the rival analysis and change the threshold for the definition of an innovative rival to five patents instead of one. The results remain robust to this change.

spending in the years after the announcement and that the relative increase in R&D spending is most pronounced in the second year after the acquisition and then slows down thereafter. The results further suggest that innovative acquirer rivals increase their R&D spending more severely than non-innovative acquirer rivals. The differences, ranging between 4.4 and 16.2 percentage points, are weakly significant for the first two cumulative years and become more significant in subsequent years, providing support for our hypothesis **H3b** in a univariate context.

Panel C displays the likelihood of acquirer rival firms to engage in a technology acquisition in the aftermath of the competitor's M&A announcement. The variable shown is a dummy variable that is equal to one if the acquirer rival has acquired a technology firm (following the previously outlined definition) in the respective time period in years, and zero otherwise. Unsurprisingly, the results demonstrate that both innovative and non-innovative acquirer rival firms engage in technology acquisitions. More interestingly, innovative acquirer rivals are significantly more likely to engage in such an acquisition than non-innovative acquirer rival firms. In the first year after the competitor's M&A announcement, about 24% of innovative acquirer rivals conduct a tech-driven acquisition while only 12% of non-innovative acquirer rival firms do so, making the average innovative rival about two times as likely to acquire a technology target firm as the average non-innovative rival firm. The pattern is consistent over all time frames and the difference between non-innovative and innovative acquirer rivals remains highly significant for all periods, providing further support for our hypothesis **H3b**.

Finally, we also investigate the change in similarity scores between the acquirer and its rival firm following the acquisition, using the text-based similarity scores from Hoberg and Phillips (2010). The variable shown in Panel D is the absolute change in similarity scores between base year zero and years one to five, respectively. The results demonstrate that the similarity between acquirers and their rivals shrinks in the post-acquisition period for both innovative and non-innovative rival firms, which may be a consequence of rival firms extending their technological search after the acquisition to new and previously unexplored innovation pathways. This interpretation is in line with the results from Valentini (2016) who shows that acquisitions draw the focus of the merging firms to short-term M&A implementation and financial considerations, leading to a moment of inertia with respect to innovation efforts. He finds evidence for his hypothesis that rival firms may exploit this window of opportunity to explore new ideas and broaden their research, a finding that may also explain why acquirer rivals become less similar to the acquirer in the aftermath of the acquisition.

To test whether these findings also hold in a multivariate setting, we estimate the following regression equations:

$$DEPVAR_{[t_1;t_2]} = \alpha + \beta_1 INNO\_RIV_i + \sum_k \beta_k X_{i,k} + \epsilon_i \tag{15}$$

where the dependent variable *DEPVAR* is either the cumulative abnormal stock return of the target rival firm over a three- or five-day event window centered around the announcement date (Table 3-10) or the relative change in acquirer rival R&D over one, two or three years, respectively (Table 3-11). The remaining variables are defined as in equation (13).

Table 3-10 displays the results from the regressions estimating target rival CARs. In specifications (1) - (3), the dependent variable is the cumulative abnormal stock return of target rival firms over a three-day event window whereas in specifications (4) to (6) a five-day event window is used, both centered around the announcement date. The results show that the coefficients of the innovation measures *INNO_PT*, *INNO_CITE* and *INNO_R&D* remain insignificant in all specifications, indicating that stock prices of innovative target rival firms do not react differently to acquisition announcements within their industry than those of non-innovative target rival firms. This result is in line with the univariate findings and provides no

Table 3-10: Impact of rival innovativeness on target rival CARs

This table reports the cross-sectional regression coefficients using the target rival firm's cumulative abnormal stock return (CAR) centered around the announcement date as the dependent variable. Specifications (1) - (3) show target rival CARs for the [-2;2] event window whereas specifications (4) to (6) show target rival CARs for the [-1;1] event window, respectively. All variable definitions are provided in Table 3-13 in the Appendix. The standard errors are corrected for heteroskedasticity with the associated *t*-values given in parentheses. *,**,*** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	Target rival $CAR_{[-2;2]}$			Target rival $CAR_{[-1;1]}$		
	(1)	(2)	(3)	(4)	(5)	(6)
Focal variables						
INNO_PT_RIV	-0.005			-0.004		
	(-1.430)			(-1.487)		
INNO_CITE_RIV		-0.002			-0.001	
		(-0.833)			(-0.587)	
INNO_R&D_RIV			-0.001			-0.001
			(-0.393)			(-0.837)
Control variables						
Firm size (Target)	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(-0.626)	(-0.646)	(-0.604)	(-1.492)	(-1.510)	(-1.477)
Book-to-market (Target)	0.002	0.002	0.001	0.001	0.000	-0.000
	(0.207)	(0.202)	(0.092)	(0.079)	(0.074)	(-0.064)
R&D ratio (Target)	0.006^{*}	0.006^{*}	0.006^{*}	0.003	0.003	0.003
	(1.847)	(1.843)	(1.806)	(1.252)	(1.250)	(1.210)
Capex ratio (Target)	0.032	0.032	0.040	0.090^{*}	0.090^{*}	0.097^{**}
	(0.513)	(0.519)	(0.624)	(1.882)	(1.893)	(2.024)
Tangible Asset ratio (Target)	-0.004	-0.004	-0.006	-0.002	-0.002	-0.004
	(-0.429)	(-0.444)	(-0.633)	(-0.254)	(-0.271)	(-0.419)
Tobin's Q (Target)	-0.000	-0.000	-0.001	0.000	0.000	-0.001
	(-0.062)	(-0.062)	(-0.164)	(0.101)	(0.103)	(-0.120)
Firm size (Acquirer)	0.000	0.000	0.000	0.000	0.000	0.000
	(0.732)	(0.723)	(0.657)	(0.191)	(0.180)	(0.165)
Book-to-market (Acquirer)	0.003	0.003	0.003	0.002	0.002	0.003
	(0.628)	(0.637)	(0.741)	(0.605)	(0.614)	(0.723)
R&D ratio (Acquirer)	-0.010	-0.010	-0.012	-0.002	-0.002	-0.003
	(-0.745)	(-0.743)	(-0.837)	(-0.204)	(-0.204)	(-0.259)
Stake acquired	0.000	0.000	0.000	-0.000	-0.000	-0.000
	(0.237)	(0.234)	(0.123)	(-0.052)	(-0.057)	(-0.117)
Diversifying	-0.004	-0.004	-0.004	0.001	0.001	0.001
	(-0.863)	(-0.849)	(-0.981)	(0.256)	(0.277)	(0.206)
All stock	0.004	0.004	0.004	0.006	0.006	0.006
	(0.563)	(0.568)	(0.651)	(1.044)	(1.044)	(1.033)
Toehold	-0.041^{**}	-0.041^{**}	-0.041^{**}	-0.022^{*}	-0.022^{*}	-0.021^{*}
	(-2.295)	(-2.307)	(-2.239)	(-1.723)	(-1.729)	(-1.650)
Contested	0.002	0.002	0.003	-0.003	-0.003	-0.003
	(0.275)	(0.287)	(0.347)	(-0.440)	(-0.425)	(-0.483)
Hostile	-0.042	-0.042	-0.042	-0.006	-0.007	-0.006
	(-1.481)	(-1.495)	(-1.495)	(-0.274)	(-0.289)	(-0.272)
Tender Offer	0.016^{***}	0.016^{***}	0.016^{***}	0.008^{**}	0.008^{**}	0.009^{**}
	(3.088)	(3.101)	(3.125)	(2.138)	(2.156)	(2.233)
Merger intensity	-0.073	-0.073	-0.056	-0.007	-0.008	0.004
	(-0.935)	(-0.944)	(-0.715)	(-0.115)	(-0.124)	(0.066)
All cash	-0.000	0.000	0.001	0.003	0.003	0.003
	(-0.001)	(0.004)	(0.136)	(0.623)	(0.629)	(0.610)
Constant	0.040	0.040	0.001	-0.013	-0.013	-0.013
	(0.808)	(0.807)	(0.013)	(-0.324)	(-0.324)	(-0.317)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Target industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,820	1,820	1,799	1,820	1,820	1,799
R-squared	0.063	0.062	0.062	0.044	0.044	0.044

support for our hypothesis **H3a**.[40]

Our regression results estimating the relative change in acquirer rival R&D are shown in Table 3-11, using the relative change in acquirer rival R&D expenditures over the first year (specifications 1-3), the first two years (specifications 4-6), or the first three years (specifications 7-9), respectively, as dependent variables. The results confirm the univariate picture that innovative acquirer rivals increase their R&D more distinctly after the competitor's M&A announcement as the coefficients of our innovation measures are statistically significant in six out of nine specifications, providing additional support for our hypothesis **H3b** in a multivariate setting. It also appears intuitive that the effect is most pronounced in the year immediately following the M&A announcement and then becomes less severe as we extend the time horizon to longer periods where the impact of the M&A announcements on rival firms begins to vanish, a picture that the univariate results did not exhibit.

As an additional test of our hypothesis **H3b**, we also estimate a logit regression on the likelihood of acquirer rival firms to acquire a technology firm themselves. We use a dummy variable as the dependent variable that takes the value of one if the acquirer rival firm acquired a target firm from the technology industry over the respective time horizon, and zero otherwise. The results from these logit regressions, shown in Table 3-12, again confirm the univariate picture. The coefficients of our innovation measures are statistically significant in seven out of nine specifications, revealing that innovative acquirer rivals are more likely to acquire a technology target than their non-innovative peers in the years following the competitor's M&A announcement, thus providing further support for our hypothesis **H3b**. The results are least significant for our innovation measure based on R&D expenditures, which may be driven by

[40] We also investigate whether the acquisition affects the likelihood of target rivals to be acquired within the first three years after the acquisition announcement. In unreported results, we use the full universe of publicly listed U.S. firms to run a logit regression using a dummy variable as the dependent variable that is equal to one if the target rival was acquired within the first one, two or three years after the announcement, respectively, and zero otherwise. The results remain statistically insignificant, similar to the pattern visible in target CARs.

Table 3-11: Impact of rival innovativeness on change in acquirer rival R&D

This table reports the cross-sectional regression coefficients using the rival firm's percent change in R&D expenditures relative to its R&D expenditures in the year of the M&A announcement as the dependent variable. Specifications (1) - (3) show results for the specification using the relative change in R&D after one year while specifications (4) to (6) and (7) to (9) use the change in R&D after two and three years as dependent variables, respectively. All variable definitions are provided in Table 3-13 in the Appendix. The standard errors are corrected for heteroskedasticity with the associated *t*-values given in parentheses. *,**,*** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	Δ Acquirer rival R&D$_{[0;1]}$			Δ Acquirer rival R&D$_{[0;2]}$			Δ Acquirer rival R&D$_{[0;3]}$		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Focal variables									
INNO_PT_RIV	0.064***			0.059**			0.049*		
	(3.371)			(2.228)			(1.779)		
INNO_CITE_RIV		0.041***			0.032*			0.019	
		(2.771)			(1.792)			(0.982)	
INNO_R&D_RIV			0.459**			0.336			0.343
			(2.463)			(1.129)			(0.700)
Control variables									
Firm size (Target)	-0.000**	-0.000**	-0.000**	-0.000	-0.000	-0.000	-0.000*	-0.000*	-0.000*
	(-2.311)	(-2.329)	(-2.441)	(-1.404)	(-1.419)	(-1.467)	(-1.763)	(-1.782)	(-1.829)
Book-to-market (Target)	0.040	0.041	0.040	0.068	0.069	0.069	0.013	0.015	0.015
	(0.954)	(0.983)	(0.929)	(1.339)	(1.364)	(1.359)	(0.205)	(0.229)	(0.226)
R&D ratio (Target)	-0.000	-0.000	0.000	0.007	0.007	0.008	0.015	0.015	0.015
	(-0.031)	(-0.018)	(0.016)	(0.360)	(0.367)	(0.382)	(0.658)	(0.665)	(0.674)
Capex ratio (Target)	0.237	0.230	0.262	0.424	0.419	0.439	0.007	0.007	0.021
	(0.432)	(0.418)	(0.478)	(0.723)	(0.715)	(0.750)	(0.014)	(0.013)	(0.039)
Tangible Asset ratio (Target)	0.015	0.017	0.013	-0.056	-0.054	-0.057	-0.171*	-0.169*	-0.172*
	(0.253)	(0.286)	(0.221)	(-0.699)	(-0.676)	(-0.711)	(-1.900)	(-1.877)	(-1.906)
Tobin's Q (Target)	0.024	0.024	0.022	0.048	0.048	0.049	0.053	0.053	0.054
	(0.709)	(0.710)	(0.649)	(1.077)	(1.081)	(1.096)	(0.977)	(0.982)	(0.994)
Firm size (Acquirer)	-0.000**	-0.000**	-0.000**	-0.000	-0.000	-0.000	-0.000**	-0.000**	-0.000*
	(-2.499)	(-2.417)	(-2.242)	(-1.596)	(-1.491)	(-1.388)	(-2.070)	(-1.972)	(-1.946)
Book-to-market (Acquirer)	-0.057	-0.060	-0.056	-0.125**	-0.128**	-0.124**	-0.088	-0.090	-0.087
	(-1.233)	(-1.286)	(-1.189)	(-2.333)	(-2.375)	(-2.289)	(-1.330)	(-1.362)	(-1.304)
R&D ratio (Acquirer)	0.032	0.032	0.035	-0.035	-0.035	-0.032	0.041	0.041	0.044
	(0.618)	(0.624)	(0.670)	(-0.556)	(-0.549)	(-0.499)	(0.431)	(0.425)	(0.452)
Stake acquired	0.001	0.001	0.001	0.002	0.001	0.002	0.003	0.003	0.003
	(1.133)	(1.124)	(1.136)	(0.982)	(0.975)	(1.004)	(1.510)	(1.516)	(1.547)
Diversifying	0.047*	0.047*	0.046	0.044	0.043	0.043	0.022	0.022	0.021
	(1.682)	(1.658)	(1.626)	(1.272)	(1.263)	(1.259)	(0.554)	(0.560)	(0.535)
All stock	0.008	0.008	0.012	0.052	0.051	0.053	0.107*	0.105*	0.108*
	(0.186)	(0.182)	(0.263)	(0.932)	(0.914)	(0.940)	(1.706)	(1.676)	(1.722)
Toehold	-0.031	-0.030	-0.041	-0.233**	-0.236**	-0.248**	-0.003	-0.010	-0.012
	(-0.173)	(-0.165)	(-0.232)	(-2.181)	(-2.218)	(-2.407)	(-0.014)	(-0.042)	(-0.052)
Contested	0.027	0.028	0.031	0.055	0.056	0.057	0.045	0.046	0.048
	(0.406)	(0.424)	(0.462)	(0.631)	(0.643)	(0.661)	(0.490)	(0.498)	(0.525)
Hostile	0.279	0.278	0.284	0.115	0.111	0.114	0.314	0.310	0.317
	(1.473)	(1.463)	(1.491)	(0.655)	(0.636)	(0.650)	(1.627)	(1.603)	(1.637)
Tender Offer	-0.004	-0.006	-0.003	0.037	0.037	0.040	0.072	0.072	0.075
	(-0.134)	(-0.180)	(-0.090)	(0.934)	(0.913)	(0.999)	(1.533)	(1.537)	(1.598)
Merger intensity	-0.319	-0.302	-0.304	-0.514	-0.501	-0.511	0.189	0.192	0.195
	(-0.655)	(-0.619)	(-0.625)	(-0.855)	(-0.832)	(-0.853)	(0.263)	(0.267)	(0.271)
All cash	-0.015	-0.015	-0.015	-0.009	-0.009	-0.008	0.075	0.074	0.074
	(-0.425)	(-0.423)	(-0.431)	(-0.202)	(-0.204)	(-0.190)	(1.599)	(1.589)	(1.595)
Constant	-0.317	-0.332	-0.324	-0.180	-0.187	-0.199	0.746	0.739	0.731
	(-1.381)	(-1.444)	(-1.408)	(-0.505)	(-0.524)	(-0.558)	(1.580)	(1.563)	(1.552)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Target industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,275	1,275	1,275	1,174	1,174	1,174	1,031	1,031	1,031
R-squared	0.054	0.053	0.053	0.058	0.057	0.057	0.065	0.064	0.065

those acquirer rivals that put larger emphasis on (organic) R&D growth but are less concerned with acquiring innovation through the means of M&A. We test the robustness of our findings on innovation-related rival reactions to changes in our rival identification strategy by extending

Table 3-12: Impact of rival innovativeness on likelihood to engage in M&A post-acquisition
This table reports the logit regression coefficients using a dummy variable as the dependent variable that is equal to one if the respective acquirer rival firm engages in at least one acquisition of a target firm from the technology industry, and zero otherwise. Specifications (1) - (3) show results for the first year after the competitor's acquisition while specifications (4) to (6) and (7) to (9) show results for the first two and three years, respectively. All variable definitions are provided in Table 3-13 in the Appendix. The standard errors are corrected for heteroskedasticity with the associated *t*-values given in parentheses. *,**,*** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	Rival tech acquisition dummy$_{[0;1]}$			Rival tech acquisition dummy$_{[0;2]}$			Rival tech acquisition dummy$_{[0;3]}$		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Focal variables									
INNO_PT_RIV	0.776***			0.809***			0.831***		
	(6.012)			(5.407)			(5.112)		
INNO_CITE_RIV		0.514***			0.504***			0.528***	
		(4.603)			(4.183)			(4.066)	
INNO_R&D_RIV			2.001*			1.852			1.803
			(1.753)			(1.491)			(1.359)
Control variables									
Firm size (Target)	-0.000	-0.000	-0.000	0.000	0.000	0.000	-0.000	-0.000	-0.000
	(-0.166)	(-0.234)	(-0.326)	(0.537)	(0.477)	(0.337)	(-0.287)	(-0.338)	(-0.448)
Book-to-market (Target)	-0.059	-0.050	-0.049	0.028	0.036	0.037	-0.017	-0.008	-0.006
	(-0.368)	(-0.312)	(-0.304)	(0.209)	(0.268)	(0.272)	(-0.129)	(-0.065)	(-0.048)
R&D ratio (Target)	-0.105	-0.095	-0.091	-0.081	-0.074	-0.071	-0.043	-0.038	-0.036
	(-1.272)	(-1.213)	(-1.223)	(-1.184)	(-1.114)	(-1.128)	(-0.693)	(-0.623)	(-0.603)
Capex ratio (Target)	-1.622	-1.802	-1.622	-2.450*	-2.573*	-2.418*	-3.256**	-3.362**	-3.220**
	(-0.937)	(-1.018)	(-0.934)	(-1.727)	(-1.790)	(-1.721)	(-2.398)	(-2.453)	(-2.403)
Tangible Asset ratio (Target)	-0.461*	-0.419	-0.377	-0.483**	-0.448*	-0.415*	-0.456**	-0.426*	-0.392*
	(-1.735)	(-1.590)	(-1.429)	(-2.104)	(-1.959)	(-1.818)	(-2.058)	(-1.930)	(-1.782)
Tobin's Q (Target)	0.104	0.087	0.082	0.165	0.155	0.148	0.221*	0.213*	0.207*
	(0.682)	(0.568)	(0.530)	(1.350)	(1.261)	(1.194)	(1.909)	(1.833)	(1.760)
Firm size (Acquirer)	0.000	0.000	0.000**	0.000	0.000*	0.000**	0.000	0.000*	0.000**
	(1.147)	(1.492)	(2.112)	(1.531)	(1.868)	(2.494)	(1.445)	(1.736)	(2.373)
Book-to-market (Acquirer)	0.233*	0.218*	0.223*	0.188*	0.175	0.179	0.317***	0.305***	0.307***
	(1.956)	(1.821)	(1.861)	(1.707)	(1.579)	(1.615)	(2.761)	(2.667)	(2.670)
R&D ratio (Acquirer)	-0.593*	-0.573*	-0.470*	-0.379*	-0.379*	-0.322	-0.513**	-0.514**	-0.449**
	(-1.798)	(-1.810)	(-1.664)	(-1.648)	(-1.688)	(-1.545)	(-2.200)	(-2.244)	(-2.100)
Stake acquired	0.002	0.002	0.003	0.010*	0.010*	0.010*	0.010**	0.010**	0.011**
	(0.368)	(0.379)	(0.454)	(1.752)	(1.760)	(1.815)	(2.057)	(2.066)	(2.115)
Diversifying	-0.185	-0.200	-0.206*	-0.186*	-0.198*	-0.205**	-0.205**	-0.215**	-0.222**
	(-1.483)	(-1.606)	(-1.670)	(-1.774)	(-1.891)	(-1.968)	(-2.051)	(-2.160)	(-2.241)
All stock	-0.229	-0.247	-0.248	-0.209	-0.225	-0.228	-0.185	-0.199	-0.201
	(-1.177)	(-1.271)	(-1.276)	(-1.266)	(-1.362)	(-1.385)	(-1.189)	(-1.279)	(-1.300)
Toehold	-	-	-	-	-	-	-0.951	-0.951	-1.078
	-	-	-	-	-	-	(-0.886)	(-0.886)	(-1.012)
Contested	-0.069	-0.039	-0.027	-0.166	-0.143	-0.123	-0.167	-0.148	-0.127
	(-0.241)	(-0.139)	(-0.094)	(-0.651)	(-0.574)	(-0.490)	(-0.709)	(-0.640)	(-0.544)
Hostile	-0.342	-0.351	-0.340	-0.161	-0.167	-0.151	-0.135	-0.137	-0.119
	(-0.389)	(-0.402)	(-0.389)	(-0.218)	(-0.227)	(-0.206)	(-0.199)	(-0.202)	(-0.175)
Tender Offer	-0.132	-0.154	-0.125	-0.000	-0.018	-0.001	0.040	0.024	0.039
	(-0.877)	(-1.023)	(-0.837)	(-0.003)	(-0.144)	(-0.009)	(0.335)	(0.200)	(0.325)
Merger intensity	-3.136	-2.948	-3.308	0.132	0.225	-0.076	0.756	0.833	0.547
	(-1.403)	(-1.318)	(-1.472)	(0.074)	(0.125)	(-0.043)	(0.458)	(0.504)	(0.328)
All cash	0.066	0.066	0.094	0.042	0.043	0.062	-0.001	-0.000	0.020
	(0.441)	(0.442)	(0.633)	(0.329)	(0.336)	(0.484)	(-0.004)	(-0.001)	(0.161)
Constant	-0.639	-0.683	-0.571	-2.475**	-2.496**	-2.388**	-2.509**	-2.526**	-2.416**
	(-0.487)	(-0.523)	(-0.440)	(-2.259)	(-2.280)	(-2.190)	(-2.451)	(-2.474)	(-2.364)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Target industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,188	2,188	2,188	2,188	2,188	2,188	2,197	2,197	2,197
R-squared	0.048	0.043	0.033	0.047	0.041	0.032	0.051	0.046	0.037

the number of potential rival firms matches from three to five matches. The results are shown in Table 3-14 and Table 3-15 in the Appendix, respectively. While the effects we describe here remain statistically significant and robust in the scenario of five rivals, the economic magnitude of the effects slightly weakens. This result appears intuitive. As we extend the number of potential rival firm matches, we include rivals in our sample that are less similar to the M&A acquirer or target firms, respectively. We interpret this as evidence that the effects of innovation-driven M&A on rivals are most pronounced for these firms that are also the most similar to the target or acquirer, respectively.

3.5 Conclusion

We investigate the relationship between innovativeness and key M&A characteristics for acquirer, target and rival firms alike. Using a sample of 786 U.S. technology acquisitions conducted between 2000 and 2019 as well as a sample of 3,858 associated rival firms, our study sheds additional light on the role of innovation activities in determining shareholder wealth creation for the parties directly involved in the transaction and on the strategic effects that innovation-driven M&A has on the competitive landscape.

Our results indicate that acquirers are paying higher premiums for innovative targets and that innovative target firms achieve higher abnormal stock returns than non-innovative target firms. The acquirers of innovative firms, however, do not seem to benefit as their abnormal stock returns remain statistically indistinguishable from those of acquirers of non-innovative firms. These results are amplified by the acquiring firm's own level of innovativeness. Both the premium paid for innovative target firms as well target abnormal stock returns are higher when the acquirer firm itself is innovative, a result which is in line with the arguments laid out by the absorptive capacity theory from Cohen and Levinthal (1990). This also implies that innovative acquirers are able to outbid their non-innovative peers when it comes to acquiring innovative target firms and our results further indicate that stock markets do not react negatively when innovative acquirers are doing so, suggesting a self-reinforcing process in which innovative firms are able to outbid non-innovative firms in M&A processes, thus becoming even more innovative. We further document that innovation-driven M&A has strategic implication for the rival firms of the merging parties. Innovative acquirer rivals increase their R&D more strongly than non-innovative acquirer rivals in the years after the competitor's M&A announcement. Innovative acquirer rivals are also more likely to acquire a target firm from a technology-intensive industry in the aftermath of the M&A than their non-innovative peers, indicating that the M&A announcement induces innovative acquirer rivals to search for innovation-driven M&A opportunities themselves. We also show that the similarity between acquirers and their rivals decreases following the M&A announcement, which we interpret as a sign that rivals are open to increase the breadth of their technological search in response to their competitor's M&A announcement.

Our study extends the research on the relationship between corporate innovation and M&A in two major ways. First, we contribute to the literature on the relationship between innovation and M&A. Our finding of higher premiums and target abnormal stock returns associated with acquisitions of innovative targets is in line with Wu and Chung (2019) but contrasts those of Kim et al. (2021), thus contributing to further clarify the effect corporate innovation has on M&A. In this context, we also contribute to the literature on absorptive capacity theory by investigating the relationship between a firm's own level of innovation and shareholder wealth creation through acquisitions. The finding that innovative acquirers pay higher premiums for innovative targets than non-innovative acquirers indicates that the predictions from absorptive capacity theory also materialize in the context of acquisitions. Against this background, the result of indistinguishable acquirer CARs between innovative and non-innovative acquirers indicates that innovative acquirers are not punished by the market for outbidding non-innovative acquirers, suggesting a self-reinforcing process in which innovative acquirers are becoming more and more innovative as they are able to bid more for innovative target firms. This finding provides unique insights for our understanding of why technology markets gravitate towards monopolistic or oligopolistic structures. Second, we contribute to the literature on the strategic effects of corporate innovation on competition in general and rival firms in particular. We focus on the role that rival firms' innovativeness plays in determining rival reactions in response to the M&A announcement within their industry, a previously unexplored question. We extend this strand of the literature by showing that innovative acquirer rivals react differently to competitor M&A announcement by increasing both their R&D spending and their likelihood to acquire a technology target firm more heavily than non-innovative acquirer rivals. These results document that innovation-driven M&A deals have strategic implications for rival firms and that these implications differ based on the rival firms own level of innovativeness.

Future research may further extend our understanding of the intersection between innovation and M&A. It may be fruitful to analyze the conditions and circumstances under which innovative acquirers are able to outbid non-innovative acquirers in greater detail, e.g., how close or distinct do the technological capabilities of the acquirer and the target firm have to be in order to justify a higher premium? It may also be interesting to extend our analyses on the strategic effects of innovation-driven M&A to industries other than the technology industry to investigate whether similar patterns occur in industries less heavily tied to innovation. Finally, it may be a fruitful area of research to investigate the role of innovation in the context of M&A and its competitive implications using an empirical framework that better addresses potential endogeneity concerns, particularly with respect to a potential omitted variables bias.

3.6 Appendix

Table 3-13: Variable definitions and data sources

This table defines variables and describes them in more detail, including an identification of their data source. The variables are divided into focal variables (i.e., innovation-related measures) and control variables.

Variable	Definition	Data source
Focal variables		
INNO_PT	Following the definition of Wu and Chung (2019), innovation output is measured via a firm *i's* market share of patents in technology class *k* for a period of ten years using the following formula: $Y^{p}_{i,k,t} = \frac{\sum^{t}_{t-10} P_{i,k,t}}{\sum^{N}_{j=1}\sum^{t}_{t-10} P_{j,k,t}}$, where $P_{i,k,t}$ is the number of patents granted to firm *i* in technology class *k* during year *t* and *N* is the number of firms in technology class *k*. Firm *i's* comparative advantage in innovation over its peers, $INNO\_PT_{i,t}$, is then calculated as the market share of innovation output in the technology class in which the firm has the largest market share: $INNO\_PT_{i,t} = Max(Y^{p}_{i,k,t})$. Suffixes *TAR*, *ACQ* and *RIV* indicate whether the variable is related to the target, the acquirer or the rival firm, respectively.	United States Patent and Trademark Office (USPTO)
INNO_CITE	Firm *i's* market share of *citations* in technology class *k* for a period of ten years is calculated using the following formula: $Y^{c}_{i,k,t} = \frac{\sum^{t}_{t-10} C_{i,k,t}}{\sum^{N}_{j=1}\sum^{t}_{t-10} C_{j,k,t}}$, where $C_{i,k,t}$ is the number of citations for firm *i's* patents in technology class *k* granted in year *t* and *N* is the number of firms in technology class *k*. Firm *i's* comparative advantage in innovation over its peers, $INNO\_CITE_{i,t}$, is then calculated as the market share of citations in the technology class in which the firm has the largest number of citations: $INNO\_CITE_{i,t} = Max(Y^{c}_{i,k,t})$. Suffixes *TAR*, *ACQ* and *RIV* indicate whether the variable is related to the target, the acquirer or the rival firm, respectively.	United States Patent and Trademark Office (USPTO)
INNO_R&D	Firm *i's* market share of *R&D spending* within its 2-digit SIC code for a period of ten years is calculated using the following formula: $INNO\_R\&D_{i,t} = \frac{\sum^{t}_{t-10} R\&D_{i,t}}{\sum^{N}_{j=1}\sum^{t}_{t-10} R\&D_{j,t}}$, where $R\&D_{i,t}$ is the amount of R&D spending of firm *i* in year *t*. Suffixes *TAR*, *ACQ* and *RIV* indicate whether the variable is related to the target, the acquirer or the rival firm, respectively.	Worldscope
Control variables		
Firm size	Natural logarithm of the market value of common equity.	SDC
Book-to-market	Book value of common equity divided by market value of common equity.	SDC
R&D ratio	Research & Development expenses divided by total sales.	Worldscope
Capex ratio	Capital expenditure divided by total assets.	Worldscope
Tangible Asset ratio	Total assets minus intangible assets divided by total assets.	SDC
Tobin's Q	Natural logarithm of the sum of the firm's book value of liabilities and its market value of equity divided by total assets.	SDC

Stake acquired	Percentage of shares that were acquired in the transaction.	SDC
Diversifying	Binary variable defined as one if acquirer and target are located in different Fama-French 49 industry portfolios, zero otherwise.	SDC, Website of Kenneth French[41]
All stock	Binary variable defined as one if the acquisition is paid exclusively in stock, zero otherwise.	SDC
Toehold	Binary variable defined as one if the acquirer holds more than zero but less than five percent of the target firm's stock prior to the announcement, zero otherwise.	SDC
Contested	Binary variable defined as one if the acquisition is contested by at least one other buyer, zero otherwise.	SDC
Hostile	Binary variable defined as one if the deal is flagged as hostile, zero otherwise.	SDC
Tender Offer	Binary variable defined as one if the bid was made as a tender offer, zero otherwise.	SDC
Merger intensity	Number of acquisitions on U.S. targets in the technology industry in the three months prior to the acquisitions divided by total number of publicly listed technology companies.	SDC
All cash	Binary variable defined as one if the acquisition is paid exclusively in cash, zero otherwise.	SDC

[41] https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

Table 3-14: Robustness test of univariate rival innovativeness results using five rival firm matches

This table shows target rival CARs as well as multiple acquirer reactions to competitor M&A announcements for the full sample as well as for the subsamples of innovative or non-innovative rivals, respectively, using up to five matched rival firms instead of three. Time frames shown relate to trading days for CARs and to years for all other variables. Innovative rivals are all those firms with at least one matched patent within the last 10 years prior to the deal. *N* refers to the time frame with the highest number of observations as data availability for CARs, change in acquirer R&D and change in acquirer rival similarity differs by time frame. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively, for the one-sample t-test or the two-sample t-test in means.

	Full sample			Innovative rival firms			Non-innovative rival firms			Difference		
Cumulative abnormal returns	Mean	Med	t-value	Mean	Med	t-value	Mean	Med	t-value	Mean	Med	t-value
Panel A: Target rival CARs	*(N = 2,859)*			*(N = 1,689)*			*(N = 1,170)*					
[0;0]	0.34%	0.07%	4.4***	0.36%	0.08%	4.0***	0.31%	0.03%	2.3**	0.06%	0.05%	-0.4
[-2;0]	0.42%	0.00%	3.7***	0.38%	-0.02%	2.6***	0.48%	0.07%	2.6***	-0.10%	-0.08%	0.4
[0;2]	0.66%	0.05%	5.0***	0.68%	0.10%	4.2***	0.65%	-0.05%	2.8***	0.02%	0.15%	-0.1
[-2;2]	0.71%	0.00%	4.6***	0.67%	0.01%	3.5***	0.79%	0.00%	3.1***	-0.12%	0.02%	0.4
[-1;1]	0.50%	0.01%	4.0***	0.46%	0.04%	2.8***	0.56%	-0.01%	2.8***	-0.09%	0.05%	0.4
Panel B: Δ in Acq rival R&D	*(N = 2,299)*			*(N = 1,586)*			*(N = 713)*					
[0;1]	10.2%	6.4%	16.1***	10.0%	6.6%	14.1***	10.4%	5.2%	8.1***	-0.4%	1.4%	0.3
[0;2]	21.1%	14.1%	22.1***	21.7%	14.7%	19.4***	19.8%	12.9%	10.9***	1.9%	1.8%	-0.9
[0;3]	28.3%	21.5%	23.9***	30.0%	23.6%	21.5***	24.5%	15.0%	11.0***	5.4%	8.5%	-2.1**
[0;4]	33.4%	26.5%	23.8***	36.8%	31.7%	22.2***	26.1%	15.8%	10.1***	10.7%	15.9%	-3.6***
[0;5]	36.5%	29.8%	23.0***	41.8%	34.0%	21.8***	25.0%	17.4%	9.2***	16.8%	16.7%	-5.0***
Panel C: Acq rival tech acq.	*(N = 3,878)*			*(N = 1,944)*			*(N = 1,934)*					
[0;1]	0.17	0.00	27.8***	0.21	0.00	22.0***	0.12	0.00	17.7***	0.08	0.00	-10.3***
[0;2]	0.26	0.00	36.8***	0.33	0.00	30.0***	0.19	0.00	24.1***	0.13	0.00	-13.3***
[0;3]	0.31	0.00	41.8***	0.39	0.00	34.5***	0.23	0.00	26.3***	0.16	0.00	-14.4***
[0;4]	0.35	0.00	45.3***	0.43	0.00	37.8***	0.26	0.00	28.5***	0.17	0.00	-15.0***
[0;5]	0.37	0.00	47.8***	0.46	0.00	40.2***	0.28	0.00	30.1***	0.18	0.00	-15.4***
Panel D: Δ in Similarity to	*(N = 3,878)*			*(N = 1,944)*			*(N = 1,934)*					
[0;1]	-0.02	-0.01	-29.4***	-0.02	-0.01	-20.2***	-0.02	-0.01	-21.7***	0.00	0.00	-0.2
[0;2]	-0.04	-0.02	-38.7***	-0.04	-0.02	-27.6***	-0.04	-0.02	-28.1***	0.00	-0.01	0.3
[0;3]	-0.05	-0.03	-44.3***	-0.05	-0.04	-30.8***	-0.04	-0.03	-32.4***	-0.01	-0.01	1.3
[0;4]	-0.05	-0.04	-51.2***	-0.06	-0.05	-36.4***	-0.05	-0.04	-36.9***	-0.01	-0.02	2.4**
[0;5]	-0.06	-0.05	-57.0***	-0.06	-0.06	-40.5***	-0.05	-0.04	-41.1***	-0.01	-0.02	2.6***

Table 3-15: Robustness test of regressions on rival CARs using five rival firm matches

This table reports the cross-sectional regression coefficients using the target rival firm's cumulative abnormal stock return (CAR) centered around the announcement date as the dependent variable for up to five rival firm matches instead of three. Specifications (1) - (3) show target rival CARs for the [-2;2] event window whereas specifications (4) - (6) show target rival CARs for the [-1;1] event window, respectively. All variable definitions are provided in Table 3-13. The standard errors are corrected for heteroskedasticity with the associated *t*-values given in parentheses. *,**,*** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	Target rival $CAR_{[-2;2]}$			Target rival $CAR_{[-1;1]}$		
	(1)	(2)	(3)	(4)	(5)	(6)
Focal variables						
INNO_PT_RIV	-0.003			-0.003		
	(-1.255)			(-1.231)		
INNO_CITE_RIV		-0.002			-0.001	
		(-0.969)			(-0.656)	
INNO_R&D_RIV			0.002*			0.000
			(1.662)			(0.565)
Control variables						
Firm size (Target)	0.000	0.000	0.000	-0.000	-0.000	-0.000
	(0.246)	(0.235)	(0.265)	(-0.253)	(-0.268)	(-0.220)
Book-to-market (Target)	0.002	0.002	0.001	0.001	0.001	0.000
	(0.242)	(0.242)	(0.140)	(0.202)	(0.203)	(0.081)
R&D ratio (Target)	0.006**	0.006**	0.006**	0.004**	0.004**	0.004**
	(2.354)	(2.348)	(2.296)	(2.235)	(2.233)	(2.160)
Capex ratio (Target)	0.005	0.005	0.008	0.048	0.049	0.053
	(0.090)	(0.094)	(0.162)	(0.966)	(0.973)	(1.062)
Tangible Asset ratio (Target)	-0.003	-0.003	-0.004	-0.006	-0.006	-0.007
	(-0.405)	(-0.415)	(-0.559)	(-0.798)	(-0.813)	(-0.922)
Tobin's Q (Target)	-0.002	-0.002	-0.003	-0.002	-0.002	-0.002
	(-0.435)	(-0.434)	(-0.548)	(-0.425)	(-0.421)	(-0.594)
Firm size (Acquirer)	0.000	0.000	0.000	-0.000	-0.000	-0.000
	(1.223)	(1.208)	(1.146)	(-0.716)	(-0.724)	(-0.733)
Book-to-market (Acquirer)	0.000	0.000	0.001	0.000	0.000	0.000
	(0.074)	(0.077)	(0.129)	(0.033)	(0.038)	(0.096)
R&D ratio (Acquirer)	-0.010	-0.010	-0.011	-0.004	-0.004	-0.004
	(-0.883)	(-0.881)	(-0.963)	(-0.367)	(-0.368)	(-0.387)
Stake acquired	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(-0.162)	(-0.166)	(-0.288)	(-0.175)	(-0.182)	(-0.234)
Diversifying	-0.004	-0.004	-0.004	0.002	0.002	0.002
	(-1.200)	(-1.193)	(-1.304)	(0.578)	(0.592)	(0.557)
All stock	0.007	0.007	0.007	0.003	0.003	0.003
	(1.297)	(1.303)	(1.373)	(0.611)	(0.611)	(0.579)
Toehold	-0.040***	-0.040***	-0.041***	-0.017*	-0.017*	-0.017
	(-2.677)	(-2.685)	(-2.679)	(-1.663)	(-1.673)	(-1.616)
Contested	0.008	0.008	0.009	0.001	0.001	0.001
	(0.906)	(0.907)	(0.966)	(0.151)	(0.155)	(0.136)
Hostile	-0.050**	-0.050**	-0.050**	-0.021	-0.021	-0.021
	(-2.254)	(-2.260)	(-2.263)	(-1.119)	(-1.128)	(-1.104)
Tender Offer	0.015***	0.015***	0.016***	0.009***	0.009***	0.009***
	(3.699)	(3.701)	(3.712)	(2.707)	(2.714)	(2.754)
Merger intensity	-0.053	-0.053	-0.039	-0.001	-0.001	0.011
	(-0.875)	(-0.886)	(-0.638)	(-0.015)	(-0.026)	(0.209)
All cash	0.002	0.002	0.002	0.003	0.004	0.003
	(0.392)	(0.396)	(0.475)	(0.910)	(0.911)	(0.850)
Constant	0.064	0.064	0.062	-0.000	-0.000	-0.034
	(1.535)	(1.540)	(1.475)	(-0.010)	(-0.006)	(-1.015)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Target industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,696	2,696	2,668	2,698	2,698	2,670
R-squared	0.068	0.068	0.068	0.038	0.038	0.038

4 THE REAL COST OF LITIGATION: EVIDENCE FROM SECURITY CLASS ACTIONS AND M&As

Abstract

We investigate the influence of *ongoing* security class action lawsuits (SCAs) on takeover premiums, M&A announcement returns, and the likelihood of deal completion. Targets subject to an SCA receive between 7.6 and 10.2 percentage points lower takeover premiums, with this negative effect extending to target M&A announcement returns. Acquirers of firms subject to ongoing litigation likewise experience more pronounced share price reductions than acquirers of targets not subject to litigation. Categorizing SCAs by their ultimate outcome reveals that these negative effects are more pronounced if the SCA is ultimately settled rather than dismissed. Our results hold for a variety of robustness tests that address potential endogeneity concerns. We further show that the presence of an ongoing SCA weakens the positive impact of termination fees on the likelihood of deal completion. Our results highlight the significant and economically relevant impact of litigation on major corporate events.

Note: *This chapter is based on a working paper jointly written with Sascha Kolaric.*

4.1 Introduction

Being named a defendant in a security class action lawsuit (SCA) is a major corporate event that can have severe negative repercussions for the affected firm. The filing of an SCA does not only lead to negative press coverage about the defendant due to the revelation of (potential) corporate misconduct, but typically has multiple additional adverse consequences for the firm. In the short term, the SCA filing can lead to a significant drop in the company's share price, not only for the defendant firm (Fich & Shivdasani, 2007; Gande & Lewis, 2009), but also for its peers (Gande & Lewis, 2009). Moreover, SCAs also have longer term consequences and can lead to an increase in the firm's cost of equity (Chava et al., 2010) and debt (Arena, 2018), result in CEO pay reductions or turnover (Crutchley et al., 2015; Humphery-Jenner, 2012), and force the company to improve its corporate governance (Cheng et al., 2010) and investment policies (Arena & Julio, 2015; McTier & Wald, 2011). Given that SCAs affect corporations in a variety of ways, it stands to reason that they will also impact major corporate events such as initial public offerings and mergers and acquisitions. Higher litigation risk has been associated with higher IPO underpricing (Lowry & Shu, 2002) and an increase in firms' delisting probability (Brogaard et al., 2022). When it comes to the impact of SCAs on M&As, however, there is so far only limited evidence on the way in which SCAs interact with M&As.

In this study we investigate how SCAs affect M&As across multiple dimensions. Specifically, we want to test the impact of SCAs on takeover premiums, target and acquirer M&A announcement returns, acquirer post-M&A returns, and the likelihood of deal completion. To this end, we construct a sample of publicly traded US targets that are subject to an *ongoing* SCA at the time of the takeover announcement. Our results show that takeover premiums of these SCA-affected targets are significantly lower than for targets that are not subject to ongoing litigation. All else being equal, SCAs reduce premiums by 7.6 to 10.2 percentage points, corresponding to an average loss between USD 79 and USD 102 million.

However, the average SCA settlement amount, where data is available, is about three to four times smaller, at around USD 24.6 million. This suggests that in addition to the SCA's direct costs, the reduction in takeover premiums also reflects additional indirect costs to the target, potentially driven by an increase in the acquirer's bargaining power or reputational losses due to the SCA. Moreover, we find that shareholders of SCA-affected targets experience lower announcement returns than those of non-SCA affected targets. Concurrently, we observe that acquirers experience more pronounced share price reductions when they announce to purchase an SCA-affected target compared to a non-SCA-affected one. Interestingly, acquirers of SCA-affected targets appear to be able to recoup some of their share price losses during the 12-month period following the M&A announcement. Finally, when looking at the way that SCAs affect the likelihood of deal completion, we find that transactions with SCA-affected targets are significantly more likely to be withdrawn, even when the acquisition agreement stipulates acquirer or target termination fees.

While the outcome of an SCA is unknown at the time of its filing, Bradley et al. (2014) document that stock market reactions to SCA filings differ depending on whether the SCA is ultimately settled or dismissed. In cases where the SCA is eventually dismissed, the stock market reaction is less negative compared to cases where the SCA is eventually settled. They interpret this as a sign that stock market participants are cognizant about the merits of an SCA and react accordingly. Building on the results of Bradley et al. (2014), we split our sample of SCA-affected targets into those whose SCA is ultimately settled and those whose SCA is eventually dismissed. In a first step, we replicate the results of Bradley et al. (2014) for our sample and establish that there is a significant difference in the stock market reaction to the filing of an SCA, conditional on its outcome. SCAs that are eventually dismissed lead to a less pronounced reduction in share prices than those that are settled.

In a next step, we test the extent to which the outcome of an SCA affects our baseline results. With respect to takeover premiums, we find only small differences between SCAs that are ultimately settled and those that are dismissed. Target M&A announcement returns, however, are more clearly impacted. Here, target shareholders experience significantly lower returns if the target is subject to an ongoing SCA that is ultimately dismissed, while shareholders of targets whose SCA is eventually settled are generally less impacted. The opposite is observed for acquirer returns. Specifically, acquirers that purchase an SCA-affected target where the SCA finally results in a settlement earn significantly lower announcement returns, while purchasing an SCA-affected target where the SCA is ultimately dismissed has no significant impact on acquirer returns. The results for takeover premiums as well as target and acquirer M&A announcement returns imply that acquirers of targets subject to an ongoing SCA that is ultimately dismissed benefit. These acquirers pay lower takeover premiums while the impact on their share price appears limited. This result is further strengthened when looking at long-term buy-and-hold returns, where acquirers of SCA-affected targets with eventually dismissed SCAs achieve higher 12-months returns than other acquirers. Finally, we document a higher likelihood of deal withdrawal for deals where the SCA is ultimately settled, even if acquirer termination fees are negotiated in the acquisition agreement.

To address potential endogeneity concerns that may affect our baseline results, we conduct several robustness and sensitivity tests. First, we use a switching regression model with endogenous switching to address concerns that the acquirer's decision to purchase an SCA-affected target may be endogenous and that certain unobservable target characteristics make the target itself more susceptible to being subject to SCAs. In addition, the switching regression set-up allows us to build a counterfactual to answer the question of how much higher the target premium could have been if the target had not been subject to ongoing litigation. Using litigation intensity as an instrumental variable, we find that SCA-affected targets could have earned up to 6 percentage points higher premiums had they not been subject to an ongoing SCA. This result provides additional support for our baseline results. As a further robustness test, we conduct a matched sample analysis to address potential issues with our sample selection. Only a relatively small portion of all public targets in our sample are subject to an ongoing SCA at the time of the acquisition announcement, with these SCA-affected targets displaying some differences in their firm characteristics compared to non-SCA-affected targets. The matched sample approach eliminates these differences and validates our main results. Finally, focusing on SCA-affected targets implies that all our targets are publicly listed, while this may not necessarily be the case for the acquirer. This may leave us vulnerable to an omitted variable bias by not being able to include acquirer-specific variables. Therefore, as a final robustness test, we address this issue by rerunning our main regression analyses on takeover premiums and target abnormal returns using only our subset of public acquirers, which allows us to include a large number of acquirer-specific variables. The results of our baseline regressions remain largely unchanged.

Our study adds to the research on value drivers in M&As in multiple ways. First, we contribute to the literature exploring the factors that influence takeover premiums (Bargeron et al., 2008; Eaton et al., 2021; Eckbo, 2009; Gaspar et al., 2005; La Bruslerie, 2013; Mulherin & Simsir, 2015). Specifically, we provide empirical evidence of a negative impact of SCAs on takeover premiums and undertake a first attempt to quantify the costs associated with litigation by estimating the loss in takeover premiums. Crucially, our identification strategy deviates from prior studies that examine litigation based on the M&A itself (Krishnan et al., 2012), which occurs *after* the M&A announcement, and only focus on SCAs that are already ongoing *before* the announcement of the transaction. In this way, we can more clearly isolate the costs that SCAs impose on target shareholders in the form of foregone takeover premiums and stock price appreciation around the M&A announcement. Second, our study contributes to the existing literature on the factors influencing M&A announcement returns (Fuller et al., 2002; Golubov et al., 2015; Harford et al., 2012) by highlighting the impact of litigation risk on target and acquirer returns. We find that the presence of ongoing litigation significantly diminishes the positive wealth effects typically experienced by target shareholders. Moreover, acquirers that purchase a target which is subject to ongoing litigation assume additional risks, which are consequently reflected in lower returns surrounding the M&A announcement. By examining the interplay between litigation and M&A announcement returns, our study provides insights into the determinants of shareholder wealth effects in M&A transactions.

Our study also adds to the literature on the factors influencing deal completion. While we confirm prior results that the inclusion of termination fees increases the likelihood of deal completion (Bates & Lemmon, 2003; Krishnan et al., 2012; Neyland & Shekhar, 2018; Officer, 2003), we offer more nuanced insights into the interplay of termination fees and litigation. Specifically, we show that acquisitions in which the target is subject to ongoing litigation are less likely to be completed, even if termination fees are agreed in the acquisition agreement. Chen et al. (2022) show that the value of a termination fee largely depends on the volatility of the target firm's value to the bidder and Bhagwat et al. (2016) find that high market volatility decreases the likelihood of deal completion. Our findings therefore contribute to this strand of the literature by showing that the litigation risk created by SCAs as well as the related potential changes in target firm value for the bidder negatively affect the likelihood of deal completion. We also build on and expand the results of Bradley et al. (2014) by decomposing our SCA variable into ultimately dismissed and settled SCAs and extending this analysis to M&As. We thereby provide a nuanced picture on how investors' assessment of the ultimate outcome of an SCA may influence M&As. Investors appear, to some extent, cognizant of the merits of an SCA and react accordingly. This suggests that acquirers capable of accurately anticipating whether an SCA will be dismissed, could avoid many of the negative spillover effects associated with eventually settled SCAs.

Our study also relates to the literature on the real consequences of SCAs for companies. Prior research has shown that greater litigation risk plays a role in discouraging firms from engaging in innovation (Kempf & Spalt, 2022), increasing a firm's cost of equity (Chava et al., 2010) and debt (Arena, 2018), favoring corporate alliances as a growth strategy over M&As (Huang et al., 2023), heightening firm's stock price crash risk (Obaydin et al., 2021), and may even drive firms' delisting decisions (Brogaard et al., 2022). Our study extends this area of research by highlighting the negative economic consequences of securities litigation in the context of corporate acquisitions. Specifically, we show that these negative consequences not only affect the shareholders of the target company that is subject to an SCA through lower takeover premiums and lower announcement returns, but that the negative impact appears to spill over to the acquirer as well. These negative spillover effects manifest themselves through even more pronounced reductions in the acquiring firm's share price surrounding the M&A announcement. Therefore, litigation has a significant and economically relevant impact on M&As by imposing additional costs on firms beyond the original adverse stock market reaction to the SCA filing.

The remainder of this chapter is structured as follows. Section 4.2 describes our sample selection procedure and introduces our dataset. Section 4.3 explains our empirical strategy, while Section 4.4 reports our results. Section 4.5 divides our sample of SCA-affected targets by the SCAs' ultimate outcome to test whether differences exist between dismissed and settled SCAs. Section 4.6 includes multiple robustness tests and sensitivity analyses and Section 4.7 concludes.

4.2 Data

4.2.1 Sample selection procedure

To investigate the impact of ongoing litigation on M&As, we combine data on M&As with data on SCAs. For our sample of M&As, we retrieve all completed and withdrawn M&A transactions between 2000 and 2021 where the acquirer and target are located in the US from Refinitiv's Securities Data Company (SDC) database. As SCAs are typically brought against publicly traded firms, we require that SDC records the target as being a publicly listed entity.[42] In addition, this allows us to calculate takeover premiums as well as stock market reactions to the takeover announcement. We do not place any restrictions on the acquirer's public status. Next, we remove all transactions that are considered to be restructurings or where the acquirer purchased less than a 50% ownership in the target. Then, and in line with standard practice (Hackbarth & Morellec, 2008; Masulis & Simsir, 2018), we drop transactions where the target is from the financial sector (Standard Industry Classification (SIC) codes 6000 to 6999) or a utilities firm (SIC codes 4900 to 4999). Finally, we drop all deals where the target was acquired within 20 trading days after the SCA filing[43] and where the target firm was affected by two SCAs with subsequently different outcomes (settlement or dismissal, respectively) to avoid overlapping time frames or unclear event identification. This leaves us with a sample of 3,985 acquisition announcements of US listed public targets, whereof 3,277 transactions were completed and 708 were withdrawn. The sample of completed M&A deals will serve as the basis for our analyses, while we add the withdrawn transactions back to the sample of

[42] Generally, SCAs may be brought against companies by investors if they suffered a financial loss in a specific stock, bond, or investment fund. This also implies that a firm does not necessarily have to be stock-listed (e.g., a firm may be private but has issued a publicly traded bond). Of the 4,626 SCAs filed between the years 2000 and 2021 that are recorded in the Stanford Securities Class Action Clearinghouse Database, only 138 (2.98%) are considered to be filed against privately held firms, which are too few observations to warrant further analyses.

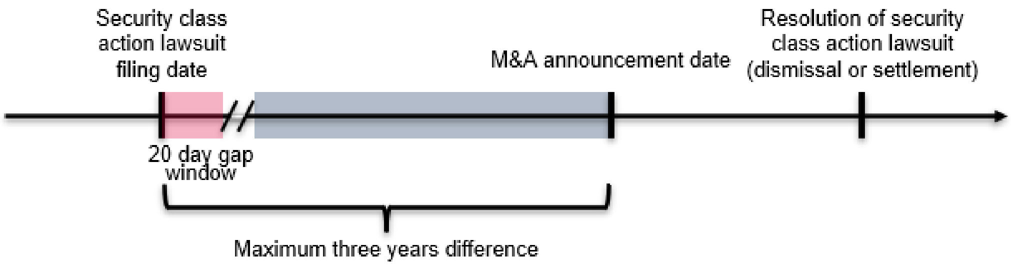
[43] We leave a 20-day gap window between the SCA filing date and the M&A announcement date to avoid overlapping event windows for our event study analyses.

completed deals to assess the impact of SCAs on the likelihood of deal completion in section 4.5.4.

We supplement our M&A sample with data on SCAs from the Stanford Securities Class Action Clearinghouse Database. We only use SCAs that are resolved and which resulted in either a settlement or the dismissal of the case. Next, we match the SCAs to the target firms from our M&A sample. In order for a target to be considered subject to an ongoing SCA, we require that the SCA was filed within three calendar years prior to the acquisition announcement and that the outcome of the SCA is not yet known when the deal is announced (i.e., the resolution of the SCA through a settlement or dismissal is not formally known at the time of the M&A announcement). This identification strategy differs from prior studies that focused on the M&A as the trigger for litigation (Krishnan et al., 2012) and allows us to isolate the impact of the ongoing SCA on takeover premiums, target and acquirer announcement returns, and the likelihood of deal completion. Figure 4-1 further illustrates the chronological order of events. Using this approach, we are able to match a total of 298 SCAs to our target sample (216 settled and 82 dismissed), of which 229 SCAs can be matched to completed M&A transactions (166 settled and 63 dismissed) and 69 SCAs to withdrawn transactions (50 settled and 19 dismissed).

Figure 4-1: Illustrative timeline of events

This figure shows an illustrative timeline for our selection of targets with ongoing security class action lawsuits at the time of the M&A announcement date. In order for a target to be considered subject to an ongoing SCA, we require that the SCA was filed within three calendar years prior to the acquisition announcement and that the outcome of the SCA was not yet known (i.e., the resolution of the SCA through a settlement or dismissal was not formally known at the time of the M&A announcement).



4.2.2 Descriptive statistics

Table 4-1 provides an overview over the distribution of completed M&A transactions by year and industry.[44] The number of transactions display a slight tendency to go down over the years. Looking at the number of SCA-affected targets, we observe that the majority of SCA-affected transactions result in a settlement (166; 72.5%), while approximately one quarter of the SCAs are dismissed (63; 27.5%). Most SCA-affected targets are from the high-tech industry (104) followed by firms operating in the healthcare (40) and retail (22) sectors.

Table 4-2 shows the descriptive statistics of our sample, divided into deal characteristics (Panel A) and target characteristics plus our variables of interest (Panel B), and further split into SCA-affected and non-SCA-affected transactions (all variables are defined in Table 4-10 in the Appendix).[45] The deal characteristics in Panel A show that about 10% of the deals in our sample involve a financial acquirer, while 57% of the acquirers are public firms. As we only selected majority acquisitions, we find that the average stake acquired is about 98% with a median of 100%. The univariate difference tests further show that SCA-affected targets are more likely to be acquired by a public firm and that bids for SCA-affected targets are more likely to be contested by other potential acquirers. These later points are relevant for our subsequent analyses as Rossi and Volpin (2004) document that contested bids are associated with higher takeover premiums while Bargeron et al. (2008) find that public acquirers tend to pay higher premiums than private acquirers.

Table 4-2 Panel B further highlights certain differences in the target characteristics for targets subject to an ongoing SCA and those that are not subject to one. The average SCA-affected target has significantly lower return on assets and leverage than targets not affected by an SCA. However, the average and median total assets and market-to-book ratios are signifi-

[44] Detailed sample statistics for our sample of withdrawn deals are provided in Table 4-13 and Table 4-14 in the Appendix.
[45] The pairwise correlation matrix for the variables presented in Table 4-2 is shown in Table 4-15 in the Appendix.

Table 4-1: Sample distribution

This table provides an overview of the sample of the 3,277 completed M&A transactions between 1 January 2000 and 31 December 2021. Panel A shows the distribution of transactions by year and further subdivides the sample into targets that are subject to an ongoing security class action lawsuit (SCA-affected) and those that are not subject to one (non-SCA-affected). For the SCA-affected targets, the sample is further split by the eventual resolution of the security class action, which is either a settlement or a dismissal of the lawsuit. Panel B shows the distribution of transactions by target industry. We use the Fama-French 10 industry definition to classify our firms to a given industry, except for utilities, which are excluded based on our sample selection procedure. The distribution by industry is likewise subdivided into SCA-affected and non-SCA-affected targets, whereby the sample of SCA-affected targets is further split by the eventual resolution of the security class action, which is either a settlement or dismissal of the lawsuit.

Panel A: Sample distribution by year

Year	N	Non-SCA-affected	SCA-affected		
			All	Settled	Dismissed
2000	314	293	21	16	5
2001	266	246	20	16	4
2002	174	149	25	24	1
2003	192	170	22	20	2
2004	152	133	19	18	1
2005	179	162	17	12	5
2006	207	195	12	11	1
2007	204	189	15	8	7
2008	125	120	5	3	2
2009	131	124	7	5	2
2010	159	153	6	4	2
2011	129	119	10	6	4
2012	129	126	3	0	3
2013	108	102	6	3	3
2014	102	100	2	0	2
2015	118	114	4	3	1
2016	126	118	8	4	4
2017	106	94	12	7	5
2018	113	105	8	2	6
2019	90	84	6	3	3
2020	60	60	0	0	0
2021	93	92	1	1	0
Total	**3,277**	**3,048**	**229**	**166**	**63**

Panel B: Sample distribution by target industry

Target industry	N	Non-SCA-affected	SCA-affected		
			All	Settled	Dismissed
Consumer Durables	59	54	5	3	2
Consumer Non-Durables	175	168	7	4	3
Manufacturing	319	311	8	4	4
High Tech	1107	1003	104	75	29
Retail	328	306	22	17	5
Telecommunications	142	129	13	8	5
Energy	187	185	2	2	0
Healthcare	492	452	40	29	11
Other	468	440	28	24	4
Total	**3,277**	**3,048**	**229**	**166**	**63**

cantly higher for SCA-affected targets than for non-affected ones. Particularly the difference in market-to-book ratios is relevant in the context of takeover premiums, as Eckbo (2009) finds that target firms with market-to-book ratios above their respective industry median obtain higher premiums that those with market-to-book ratios below their respective industry median.

Table 4-2: Descriptive statistics

This table provides an overview of the descriptive statistics of the sample of 3,277 completed M&A transactions between 1 January 2000 and 31 December 2021. Panel A shows the mean, median, and number of observations for selected deal characteristics and further subdivides the sample into targets that are subject to an ongoing security class action lawsuit (SCA-affected) and those that are not subject to one (non-SCA-affected). The last two columns show the differences in mean and median between the SCA-affected and non-SCA-affected targets. Panel B shows the mean, median, and number of observations for selected target characteristics and our main dependent variables for the subsequent regression analyses. The sample is again subdivided into deals with SCA-affected and non-SCA-affected targets and the last two columns again show the differences in mean and median between these two subsamples of targets. Detailed definitions of the variables are provided in Table 4-10 in the Appendix. Differences in mean and median for the two target groups are tested for significance using the parametric two-sample *t*-test and the nonparametric Wilcoxon rank-sum test. *, **, and *** indicate significance at the 10%, 5%, and 1% level of significance, respectively.

Panel A: Deal characteristics

	Full sample (1)			SCA-affected (2)			Non-SCA-affected (3)			(2) – (3)	
	Mean	Median	N	Mean	Median	N	Mean	Median	N	Mean	Median
Financial Acquirer	0.10	0.00	3,277	0.10	0.00	229	0.09	0.00	3,048	0.01	0.00
Public Acquirer	0.57	1.00	3,277	0.63	1.00	229	0.57	1.00	3,048	0.06*	0.00*
Hostile Deal	0.00	0.00	3,277	0.00	0.00	229	0.00	0.00	3,048	0.00	0.00
Contested Bid	0.05	0.00	3,277	0.08	0.00	229	0.05	0.00	3,048	0.03**	0.00**
Divestiture	0.06	0.00	3,277	0.03	0.00	229	0.06	0.00	3,048	−0.03*	0.00*
Diversifying Deal	0.55	1.00	3,277	0.53	1.00	229	0.55	1.00	3,048	−0.01	0.00
All Cash	0.53	1.00	3,277	0.51	1.00	229	0.53	1.00	3,048	−0.02	0.00
Stake Acquired	0.98	1.00	3,277	0.97	1.00	229	0.98	1.00	3,048	−0.00	0.00
Tender Offer	0.20	0.00	3,277	0.22	0.00	229	0.20	0.00	3,048	0.02	0.00

Panel B: Target characteristics and dependent variables

	Full sample (1)			SCA-affected (2)			Non-SCA-affected (3)			(2) – (3)	
	Mean	Median	N	Mean	Median	N	Mean	Median	N	Mean	Median
Target RoA	−0.11	0.01	3,009	−0.26	−0.06	215	−0.10	0.01	2,794	−0.16***	−0.07***
Target Assets (USD million)	1,639.5	247.9	3,011	2,383.1	302.1	215	1,582.4	244.1	2,796	800.8*	58.0**
Target Leverage	0.24	0.16	2,976	0.19	0.07	208	0.24	0.17	2,768	−0.06**	−0.10***
Target Market-to-Book	3.38	1.96	2,617	4.69	2.53	196	3.28	1.93	2,421	1.41***	0.60***
Initial Premium	0.44	0.34	2,749	0.44	0.33	182	0.44	0.34	2,567	−0.01	−0.02
Combined Premium	0.48	0.34	2,841	0.47	0.38	191	0.48	0.34	2,650	−0.01	0.04
Target CAR [−1;+1]	0.28	0.21	2,560	0.24	0.19	187	0.28	0.21	2,373	−0.03	−0.02*
Target CAR [−3;+3]	0.28	0.22	2,560	0.25	0.19	187	0.29	0.23	2,373	−0.03	−0.04*
Acquirer CAR [−1;+1]	−0.01	−0.01	1,747	−0.03	−0.01	135	−0.01	−0.01	1,612	−0.02*	0.00
Acquirer CAR [−3;+3]	−0.01	−0.01	1,747	−0.04	−0.01	135	−0.01	−0.01	1,612	−0.03**	−0.01**
Acquirer BHAR 3m	−0.01	−0.01	1,565	−0.03	0.00	119	−0.01	−0.01	1,446	−0.02	0.01
Acquirer BHAR 6m	−0.02	−0.02	1,513	0.02	−0.02	113	−0.02	−0.02	1,400	0.05	0.00
Acquirer BHAR 12m	−0.03	−0.03	1,463	0.05	0.01	109	−0.03	−0.03	1,354	0.09*	0.04

Finally, we also observe some minor differences in our variables of interest. While the differences in takeover premiums between targets subject to an ongoing SCA and those without ongoing litigation have the expected signs, the differences are generally small and lack significance in the univariate setting. When it comes to the announcement returns, however, we observe some differences between SCA-affected and non-SCA-affected targets. The abnormal returns for both the target and acquirer are lower when the target is SCA-affected, albeit the statistical significance of this difference is weak.

4.3 Empirical strategy

In order to examine the impact of SCAs on M&As, our empirical approach consists of three main steps. First, we explain how we derive our dependent variables for our regressions, which are the takeover premiums, the short-term target and acquirer abnormal announcement returns, and the long-term acquirer returns for up to one year following the acquisition. We show how we derive these variables in sections 4.3.1 and 4.3.2, respectively. In a second step, we use these dependent variables in different robust ordinary least squares (OLS) regression settings and test the impact of an ongoing SCA, along with a large number of control variables, on our dependent variables. In the third and final step, we utilize our sample of withdrawn transactions along with our completed deals to test how SCAs influence the likelihood of deal completion.

4.3.1 Estimation of takeover premiums

Following the approach of Officer (2003), we use two different types of takeover premiums: the initial premium and the combined premium. The initial premium is calculated as follows:

$$Initial\ Premium = \frac{Price_{initial}}{Price_{t=-42}} - 1 \tag{16}$$

where $Price_{initial}$ represents the initial offer price and $Price_{t=-42}$ is the target share price 42 trading days prior to the announcement adjusted for any stock splits and dividends. In line with prior research (Betton et al., 2008b; Eckbo, 2009; Mulherin & Simsir, 2015), we use the stock price 42 trading days prior to the acquisition announcement in the denominator as this is generally considered to be the last date unaffected by any potential stock price runups associated with the market anticipating the transaction (Schwert, 1996).[46] In addition, and motivated by the recent study of Eaton et al. (2021) that suggests that the runup in targets' share prices associated with M&A announcements starts earlier than prior research indicated, we also use targets' share prices 105 trading days before the M&A announcement ($Price_{t=-105}$) as the basis for the calculation of takeover premiums.

Furthermore, we also estimate the combined premium in a similar manner to Officer (2003). For this, we first need to calculate the component-based premium as the aggregate amount of all payments offered to target shareholders (i.e., cash, equity, debt, etc.) divided by the target firm's market capitalization 42 (or 105) trading days prior to the announcement date minus one. We then set the combined premium equal to the component-based premium if that premium can be calculated and lies between −50% and 500% to avoid extreme outliers.[47] In case the component-based premium does not fall within this range, the combined premium is set to the initial premium as long as this number is between -50% and 500%. In the event that neither condition is met, the combined premium is left blank.

4.3.2 Stock market reactions

4.3.2.1 Short-term stock market reactions

To investigate the short-term stock market reaction around the SCA filing date and the M&A announcement date, we use an event study based on the Fama and French (1993, 1996) three-

[46] While we leave a 20-day gap between the SCA filing date and the M&A announcement date, there may be instances where the SCA filing occurs between 20 days to 42 days prior to the M&A announcement date and may therefore affect our results. However, this is only the case for five SCAs and does not change our results.
[47] It is common practice to truncate premiums that are considered outliers (Dong et al., 2006; Moeller et al., 2004; Officer, 2007), albeit the precise cutoff values vary for each study. As a sensitivity analysis, we also used cut-offs of 450% and 400% and the results remain qualitatively the same.

factor model.[48] We calculate the three-factor model using a 230-day estimation window from $t=-250$ to $t=-21$ days prior to the event date ($t=0$), taking the form:[49]

$$R_{it} - r_{ft} = \alpha_i + \beta_{MKT,i}(R_{Mt} - r_{ft}) + \beta_{SMB,i}SMB_t + \beta_{HML,i}HML_t + \varepsilon_{i,t} \tag{17}$$

where R_{it} is firm i's stock return on day t during the estimation period, r_{ft} is the one-month Treasury bill rate on day t, R_{mt} is the market return of the CRSP value-weighted index on day t, SMB_t is the size factor and represents the average return of three small-cap portfolios versus three large-cap portfolios on day t, and HML_t is the value factor and represents the difference in the average return of two value and two growth portfolios on day t. Data for the daily returns of the three factors was collected from Kenneth French's Data Library website.[50] The regression coefficients associated with the market return and the size and value factors are $\beta_{MKT,i}$, $\beta_{SMB,i}$, and $\beta_{HML,i}$, respectively.

The cumulative abnormal returns for different event windows are calculated by:

$$CAR_{i,[\tau_1;\tau_2]} = \sum_{t=\tau_1}^{\tau_2} \left[R_{i,t} - \left(r_{f,t} + \beta_{i,MKT}(R_{M,t} - r_{f,t}) + \beta_{i,SMB}SMB_t + \beta_{i,HML}HML_t\right)\right] \tag{18}$$

where $CAR_{i,[\tau_1;\tau_2]}$ is the CAR during the event window measured in days [τ_1; τ_2] with $\tau_1, \tau_2 \in [-10,\ldots,+10]$. Average CARs (ACARs) are calculated by summing all $CAR_{i,[\tau_1;\tau_2]}$ for a specific event window and dividing by the number of observations. We test for statistical significance using the standard t-test and the nonparametric Wilcoxon rank-sum test.

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[48] To address concerns that the regression coefficients for the estimation of the abnormal returns surrounding the M&A announcements could be impacted by the SCA filing, we also run a market-adjusted event study model. The results are largely the same, both in terms of significance and magnitude.

[49] As a robustness exercise, we also vary the length of the event windows to capture any potential pre-M&A announcement price runups. To this end, we use the [−104;+10] and [−42;+10] event window, in each case keeping a 230-day estimation window starting one day prior to the first day of the event window. The results show no meaningful price runups.

[50] The data is readily available for download through Kenneth French's website under https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

4.3.2.2 Long-term stock price performance

We measure the long-run stock returns for acquirers following the M&A announcement using buy-and-hold abnormal returns (BHARs). We calculate BHARs in line with standard practice (Brau et al., 2012; Lyon et al., 1999):

$$BHAR_i = \prod_{t=\tau_1}^{\tau_2}(1 + R_{it}) - \prod_{t=\tau_1}^{\tau_2}(1 + R_{pt}) \tag{19}$$

where $BHAR_i$ is firm *i*'s BHAR, $\tau_1, \tau_2 \in [0, \ldots, 12]$ are the holding periods in months, excluding the first trading date after the M&A announcement, and R_{pt} is an equally weighted matched portfolio. For the calculation of the matched portfolio, we use up to five style-matched competitor firms leveraging the text-based industry matching procedure introduced by Hoberg and Phillips (2010, 2016) and select up to five competitors with the highest similarity scores.[51,52] We calculate BHARs for holding periods of 3 months, 6 months, and 12 months.

4.3.3 Multivariate setting

Our baseline OLS regression model to measure the impact of SCAs on M&As takes the following form:

$$VAR_i = \alpha + \beta_1 SCA_i + \sum_j \gamma_j Y_{i,j} + \sum_k \delta_k Z_{i,k} + YearFE + IndustryFE + \varepsilon_i \tag{20}$$

where the variable VAR_i is defined as one of our main dependent variables and can be either the initial or combined takeover premium measures, the target or acquirer CAR for a specific

[51] Prior studies document that using a matched-firm approach compared to using a reference portfolio approach (e.g., based on a market index) leads to superior results (Barber & Lyon, 1997; Kothari & Warner, 1997). In unreported results and as a further test, we calculate BHARs benchmarked against a CRSP value-weighted portfolio of all US firms listed on NYSE, AMEX or NASDAQ. The results tend to show more pronounced BHARs (both positive and negative) and comparable levels of significance, suggesting that our benchmarking approach results in a more conservative measurement of BHARs.

[52] Bessembinder and Zhang (2013) and Bessembinder et al. (2019) point out that there are potential issues when using BHARs to evaluate the impact of corporate events on firms' long-term stock performance. Essentially, they argue that the observed BHARs could be driven by a bad benchmark problem. We cannot rule out that this issue may also affect our analysis, but we are confident that the matching procedure we selected arrives at robust results. The main benefit of our approach is that we employ the text-based Network Industry Classifications developed by Hoberg and Phillips (2010, 2016) for our matched firm selection. This means that the matched portfolio firms are likely to have the same underlying risk factors and are similarly exposed to industry-wide systemic shocks. This should, at least to a certain degree, ameliorate the bad benchmarking problem.

event window, or the acquirer BHARs for a specific holding period. Our main independent variable of interest is SCA_i, which is a binary variable defined as one if the target is subject to an ongoing SCA at the time of the acquisition announcement, and zero otherwise. Prior research by Bradley et al. (2014) documents that the stock market reactions to SCA filings differ depending on the outcome and that capital market participants therefore appear to be able to distinguish between meritorious SCAs that will eventually be settled and those that will be dismissed. To explore whether there is a differential effect depending on the ultimate outcome of the SCA in our setting, we decompose the SCA variable in section 4.5 into the two binary variables $Settled_i$ and $Dismissed_i$, which take the value of one if the SCA is eventually settled or dismissed, respectively, and zero otherwise.

The vectors $Y_{i,j}$ and $Z_{i,k}$ consist of control variables related to deal characteristics and target characteristics. These control variables are the most commonly used ones in the M&A literature (Golubov et al., 2015; Harford et al., 2012). The deal characteristics variables include controls for financial acquirers, publicly listed acquirers, hostile takeovers, contested bids, divestitures and diversifying deals, transactions paid in cash, the stake acquired, and whether or not a tender offer was made. The target control variables include the target's return on assets, its leverage, its total assets, and its market-to-book ratio, all as of the end of the fiscal year prior to the M&A announcement.[53] All variables are defined in detail in Table 4-10 in the Appendix. Finally, *YearFE* and *IndustryFE* are year fixed and industry fixed effects, respectively, and ε_i is the error term. For the regressions where the acquirer CARs and BHARs are the dependent variable, as well as for our robustness checks in Section 4.6.2, we extend our baseline regression model by adding a vector of acquirer-specific independent variables. These include

[53] We also measure the impact of the relative importance of the target to the acquirer by using relative size, defined as acquirer's revenue divided by the target's revenue, as an additional control variable. Our results still hold when including this variable jointly with other variables measuring either target or acquirer size. However, as we already include proxies for target and acquirer size as controls, we drop the relative acquirer size variable from our regressions due to multicollinearity concerns.

acquirer's return on assets, leverage, size, free cash flow, Tobin's Q, as well as the acquirer's stock market returns, the standard deviation of the acquirer's market adjusted buy-and-hold returns during the runup to the M&A announcement, and a binary variable controlling for any ongoing SCAs at the acquirer level. All continuous variables are winsorized at the 1st and 99th percentile to mitigate the effects of potential outliers. The acquirer-specific variables are again described in detail in Table 4-10 in the Appendix.

In order to estimate the effect of SCAs on the likelihood of deal completion, we use several logistic regression models. For this analysis, we add our 708 withdrawn deals to the sample of completed deals, bringing our sample for this analysis to 3,985 observations. The baseline logit regression model takes the form:

$$\begin{aligned} Completion_i = {} & \alpha + \beta_1 SCA_i + \beta_2 Term\ Fees_i + \beta_3 SCA_i \times Term\ Fees_i \\ & + \sum_j \gamma_j Y_{i,j} + \sum_k \delta_k Z_{i,k} + YearFE + IndustryFE + \varepsilon_i \end{aligned} \tag{21}$$

where *Completion*$_i$ is a binary variable taking the value of one if the M&A transaction was completed and a value of zero if the deal was withdrawn. For the estimation of the likelihood of deal completion, it is important to include variables designating whether acquirer or target termination fees have been included in the acquisition agreement. Prior research has repeatedly demonstrated that termination fees are a central variable in explaining the likelihood of deal completion and that the inclusion of termination fees in the acquisition agreement leads to a higher likelihood of deal completion (Jeon & Ligon, 2011; Krishnan et al., 2012; Neyland & Shekhar, 2018; Officer, 2003). To account for this, we introduce the variable *Term Fees*$_i$ into our regression, whereby *Term Fees*$_i$ can take two different forms. It can either be *Acquirer Term Fees*$_i$, a binary variable that takes the value of one if acquirer termination fees are negotiated in the acquisition agreement, and zero otherwise, or *Target Term Fees*$_i$, a binary variable that takes the value of one if target termination fees are included in the acquisition agreement, and zero otherwise. *SCA*$_i$ is again an indicator variable for the target being subject to ongoing litigation, which we again decompose into its two manifestations $Settled_i$ or $Dismissed_i$. The interaction term $SCA_i \times Term\ Fees_i$, as well as the different forms for each of the two variables, are included to test to what degree SCAs in conjunction with termination fees determine the likelihood of deal completion. $Y_{i,j}$ and $Z_{i,k}$ are again the same vectors of control variables related to deal characteristics and target characteristics as discussed before. Moreover, for certain regression specifications, the vector of acquirer-specific independent variables discussed above is added to ensure the results remain robust. All variable definitions can again be found in Table 4-10 in the Appendix.

4.4 The effect of security class actions on M&As

4.4.1 The impact of security class actions on takeover premiums

We start by testing the impact of SCAs on takeover premiums. We use our baseline regression model, using either the initial premium or the combined premium as the dependent variable.[54] The results of the regressions are reported in Table 4-3.

The results show that SCAs have a significant negative impact on takeover premiums, irrespective of which method we use for the premium estimations. The impact varies depending on the selected premium estimation and, all else being equal, lies between 7.6 and 10.2 percentage points. In economic terms, this implies an average forgone premium between USD 79 and USD 102 million for the target company due to the ongoing litigation. The average reduction in takeover premiums is slightly higher when using the target's share price 105 trading days prior to the M&A announcement date as the base value instead of the share price 42 trading days prior to the announcement. The results suggest that acquirers incorporate ongoing litigation into their takeover premium calculations and are offering significantly lower

[54] In unreported results, we also rerun the same regression specifications using the final premium, defined similar to the initial premium but calculated using the final offer price instead, as the dependent variable. The results remain qualitatively unchanged and are not reported for reasons of brevity given the very high correlation between the initial and final premium (correlation coefficient of 0.97).

Table 4-3: Security class actions and takeover premiums

This table reports the regression results using the initial takeover premium (columns (1) and (2)) and the combined takeover premium (columns (3) and (4)) as compared to the target firm's stock price 42 trading days and 105 trading days before the acquisition announcement as dependent variables. The variable of interest is *SCA*, defined as one if the target firm is affected by a security class action lawsuit (SCA) that has not yet resolved at the time of M&A announcement, and zero otherwise. The other variables are divided into deal controls and target controls. All variables are defined in Table 4-10 in the Appendix. The standard errors are corrected for heteroskedasticity with associated *t*-values given in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

	(1) Initial Premium ($t=-42$)	(2) Initial Premium ($t=-105$)	(3) Combined Premium ($t=-42$)	(4) Combined Premium ($t=-105$)
Security class action variable				
SCA	−0.081**	−0.102**	−0.076**	−0.094**
	(−2.504)	(−2.561)	(−2.311)	(−2.191)
Deal controls				
Financial Acquirer	−0.052**	−0.026	−0.032	−0.001
	(−2.151)	(−0.822)	(−0.856)	(−0.021)
Public Acquirer	0.032	0.089***	−0.026	0.031
	(1.441)	(3.465)	(−0.903)	(1.066)
Hostile Deal	−0.226**	−0.224	0.008	0.027
	(−2.286)	(−0.796)	(0.065)	(0.095)
Contested Bid	0.047	−0.008	0.100**	0.031
	(1.164)	(−0.166)	(2.100)	(0.553)
Divestiture	−0.065	−0.014	−0.103**	−0.077
	(−1.449)	(−0.194)	(−2.333)	(−1.324)
Diversifying Deal	−0.035	−0.065**	−0.037	−0.059**
	(−1.626)	(−2.503)	(−1.515)	(−2.058)
All Cash	0.051**	0.021	−0.111***	−0.137***
	(2.225)	(0.739)	(−4.111)	(−4.155)
Stake Acquired	0.004***	0.003	0.016***	0.017***
	(2.637)	(1.421)	(13.418)	(13.947)
Tender Offer	0.049**	0.022	0.092***	0.066**
	(2.073)	(0.773)	(3.548)	(2.086)
Target controls				
Target RoA	−0.191***	0.005	−0.255***	0.394***
	(−3.107)	(0.068)	(−4.407)	(4.619)
Target Assets	−0.017**	−0.024***	−0.012	−0.023**
	(−2.195)	(−2.671)	(−1.512)	(−2.461)
Target Leverage	0.009	0.005	0.390***	0.394***
	(0.170)	(0.068)	(5.748)	(4.619)
Target Market-to-Book	−0.005**	−0.008**	−0.013***	−0.013***
	(−1.970)	(−2.247)	(−4.027)	(−3.236)
Constant	0.354	0.780***	−0.906***	−0.680***
	(1.535)	(2.668)	(−5.091)	(−3.372)
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Observations	2,263	2,236	2,333	2,302
R-squared	0.117	0.116	0.149	0.146

premiums. The foregone premium amounts are economically relevant for the target, indicating that SCAs have real costs that extend beyond the immediate negative stock market valuation effects and continue to affect the firm in case of major corporate events, such as M&As. Comparing the loss in takeover premium with the final settlement amount for a subsample of settled SCAs, we find that the average settlement amount is around USD 24.6 million, which is about three to four times smaller than the average takeover premium loss for the entire sample. Therefore, other factors, such as the increased bargaining power of the acquirer due to potential risks associated with the ongoing SCA or reputational losses at the target due to the SCA, may also play a role. Regarding reputational losses, our result echoes that of Karpoff et al. (2008), who find that the average reputational loss in dollar terms far exceeds the penalties imposed on firms by the SEC as a result of enforcement actions related to misrepresentation of the company's financial situation.

4.4.2 M&A announcement effects

From Table 4-2 Panel B, it can already be observed that SCA-affected targets experience lower announcement returns than those targets that are not subject to an ongoing SCA. The difference in mean and median announcement returns for the [−1;+1] and [−3;+3] event windows vary between 3 and 4 percentage points but are only weakly significant at best. Similarly, it can also be observed that mean and median acquirer announcement returns are negative for the [−1;+1] as well [−3;+3] event windows. However, acquirers of SCA-affected targets earn significantly lower announcement returns than acquirers of targets that are not affected by an SCA. The average and median difference generally ranges between 1 and 3 percentage points, which is mostly significant.

Next, we go beyond these univariate results and test how SCAs influence M&A announcement returns in a multivariate setting. To this end, we again use our baseline regression with either the target or acquirer [−1;+1] or [−3;+3] event window CARs as the dependent variable. The results are presented in Table 4-4.[55] Looking at the impact of SCAs on target announcement returns in the multivariate set-up in columns (1) and (2) of Table 4-4, it can be seen that the coefficient of the SCA variable is significant and negative, irrespective of which event window CAR is used as the dependent variable. This negative stock market reaction mirrors the negative effect observed for SCAs on takeover premiums in Table 4-3 and

[55] The results are qualitatively similar if we use the target or acquirer CARs of any other symmetrical event window between the [−1;+1] and [−10;+10] one as the dependent variable.

Table 4-4: Security class actions and short-term M&A announcement returns

This table reports the regression results using the target cumulative abnormal returns (CARs) (columns (1) and (2)) and the acquirer CARs (columns (3) and (4)) for the [−1;+1] and [−3;+3] event window surrounding the M&A announcement date as dependent variables. The target and acquirer CARs are calculated using a three-factor model based on Fama and French (1993, 1996) with a 230-day estimation window from $t=-250$ to $t=-21$ days prior to the event date ($t=0$). The variable of interest is *SCA*, defined as one if the target firm is affected by a security class action lawsuit (SCA) that has not yet resolved at the time of M&A announcement, and zero otherwise. The other variables are divided into deal controls and target controls, and, in case the acquirer CARs are used as the depended variable, acquirer controls. All variables are defined in Table 4-10 in the Appendix. The standard errors are corrected for heteroskedasticity with associated *t*-values given in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

	(1) Target $CAR_{[-1;+1]}$	(2) Target $CAR_{[-3;+3]}$	(3) Acquirer $CAR_{[-1;+1]}$	(4) Acquirer $CAR_{[-3;+3]}$
Security class action variable				
SCA	−0.051***	−0.052**	−0.008	−0.024**
	(−2.588)	(−2.570)	(−0.832)	(−2.072)
Constant	0.326***	0.312***	0.048	0.070
	(3.025)	(2.929)	(0.990)	(1.102)
Deal controls	Yes	Yes	Yes	Yes
Target controls	Yes	Yes	Yes	Yes
Acquirer controls	No	No	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Observations	2,196	2,196	1,288	1,288
R-squared	0.145	0.146	0.128	0.113

is in line with expectations, as lower takeover premiums should result in lower M&A announcement returns. The regression coefficients suggest that, all else being equal, the reduction in target CARs around the M&A announcement date slightly exceeds 5.0 percentage points. This result, in conjunction with the previous result on takeover premiums, suggests that the discount acquirers apply to takeover premiums for targets that are subject to an ongoing SCA is substantial and then consequently also reflected in lower M&A announcement returns.

To see how acquirer returns are affected by the purchase of an SCA-affected target, we examine the impact of the SCA variable on acquirer returns. Table 4-4 columns (3) and (4) show the regression results using the acquirer announcement CARs as the dependent variable. Overall, the impact of SCAs on acquirers appears to be lower than for targets. While the coefficient for *SCA* is negative, it is only significant for the [−3;+3] event window CAR. Nevertheless, this finding suggests that the acquisition of an SCA-affected target leads to an adverse stock price reaction for acquirers, which may be due to a potential litigation risk transfer from the target to the acquirer. If this were the case, we would expect to observe a more pronounced negative reaction for SCAs that are eventually settled than for those that are ultimately dismissed. We will explore the effect of differences between SCAs that are resolved through a settlement or dismissal in more detail in the next section.

4.5 The ultimate resolution of security class actions and M&As

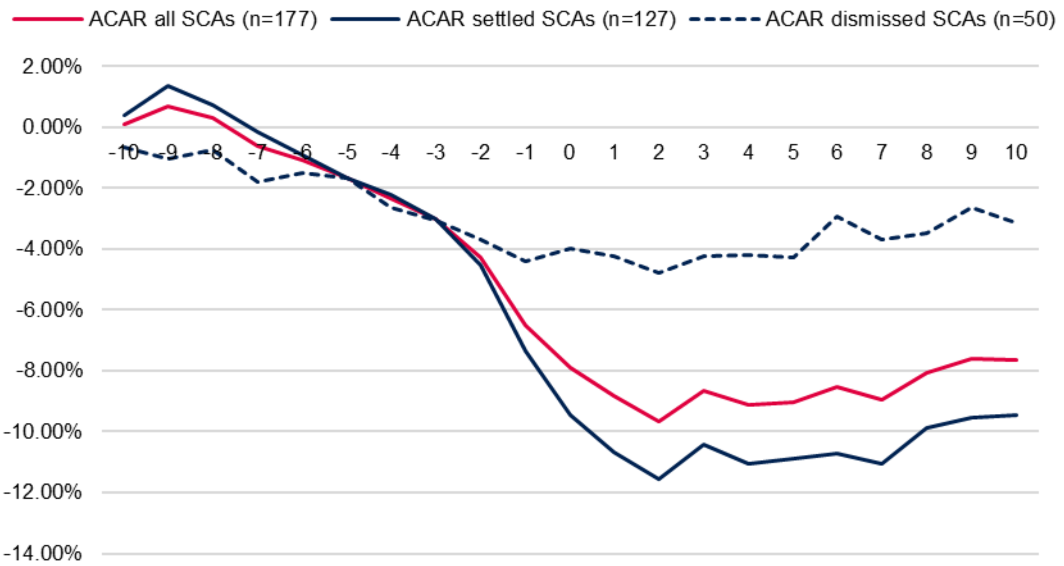
4.5.1 Target stock price reactions to security class action filings

We start our analysis regarding the impact of the ultimate outcome of SCAs on M&As by examining the stock price reactions to SCA filings for our sample of target firms. While the stock market reaction to the filing of SCAs is not the main focus of this study, we still begin our analysis with this for two main reasons. First, we want to understand whether the stock market reaction to SCA fillings within our sample of eventual acquisition targets is significantly negative and thereby in line with the prior literature (Fich & Shivdasani, 2007; Gande & Lewis, 2009; Humphery-Jenner, 2012). Second, we also want to test whether the results of Bradley et al. (2014) hold in our setting. That is, we want to test whether stock market reactions already differ at the time of the SCA filing depending on whether the SCA is ultimately resolved through a settlement or dismissal.

We calculate ACARs for the [−10;+10] event window surrounding the SCA filing date for our sample of eventual acquisition targets. Figure 4-2 shows the return patterns and it can be seen that there is a significant negative market reaction around the SCA filing date, with the ACAR reaching −7.66% during the [−10;+10] event window. In economic terms, this is equivalent to an average abnormal loss of approximately USD 149 million. This pronounced negative market reaction is in line with prior research, not only in terms of significance but also largely in terms of magnitude (Fich & Shivdasani, 2007; Gande & Lewis, 2009; Humphery-Jenner, 2012). Dividing our sample of SCAs by their ultimate outcome reveals that stock market reactions differ depending on whether the SCA is eventually settled or dismissed. While both outcomes lead to negative share price reactions with ACARs between -3.12% and -9.44%

Figure 4-2: Stock price reaction around the security class action filing date

This figure shows the development of the average cumulative abnormal return (ACAR) around security class action lawsuit (SCA) filing date for the companies that are later target firms in our sample of completed M&A transactions. ACARs around the SCA filing date are calculated with a three-factor event study model based on Fama and French (1993, 1996) with a 230-day estimation window from $t=-250$ to $t=-21$ days prior to the event date ($t=0$). The sample of all SCAs is further divided into SCAs that ultimately resulted in a settlement and SCAs that were eventually dismissed.



for the [−10;+10] event window, they are only significant for SCAs that are eventually settled and not for those that are dismissed at a later stage. Moreover, the negative reaction is much less pronounced for those SCA filings where the SCA is ultimately dismissed compared to those that are eventually settled (the precise results are shown in Table 4-16 in the Appendix). This confirms the results of Bradley et al. (2014) and provides evidence that investors appear to differentiate already at the time of the SCA filing how the SCA will finally be resolved.[56]

The results in this section show that SCAs that are ultimately dismissed do not have a significant impact on share prices around the filing date, while SCAs resulting in a settlement lead to significant share price reductions. This differential stock market reaction at the time of SCA filing may also be reflected in later takeover premiums and target and acquirer M&A announcement returns. Moreover, long-term post M&A announcement returns may also differ

[56] While the results presented in this section only document the stock market reactions to SCA filings for targets where the M&A is eventually completed, the results remain unchanged when we add the withdrawn M&A deals to our sample. In this case, the negative ACAR for the [−10;+10] event window is −7.74%. The differential return patterns between SCAs that are eventually settled and those that are ultimately dismissed are also still apparent.

depending on the ultimate outcome of the SCA, as may the likelihood of deal completion. We will explore these assumptions in the following sections.

4.5.2 Takeover premiums and M&A announcement returns

Table 4-5 Panel A reports the regression results using our different takeover premium measures as dependent variables. We find that both dismissed and settled SCAs are associated with lower takeover premiums, but only SCAs that are eventually settled show a consistent and significant premium reduction. This result is intuitive, as acquirers are likely to apply a larger discount to the takeover premium when a settlement is expected. Although the SCA is still ongoing at the time of the M&A announcement, the acquirer is likely aware of the merits of the SCA based on its due diligence efforts. That we also observe some instances with weakly significant reductions in takeover premiums even for eventually dismissed SCAs may be due to our setting. Given that the SCA is still ongoing at the time of the acquisition announcement, there may still be residual uncertainty regarding the ultimate resolution of the SCA. Acquirers are likely to demand compensation for this uncertainty, resulting in lower premiums.

Table 4-5 Panel B examines how the eventual resolution of an SCA at the target level affects target and acquirer CARs. The regression results for the target CARs in columns (1) and (2) show that the ultimate outcome of an SCA, either through settlement or a dismissal, is associated with lower CARs, as indicated by the negative and significant coefficients for the variables *Settled* and *Dismissed*. This is in line with our general finding and is likely reflective of the lower takeover premiums SCA-affected targets receive. Notably, SCAs that are eventually dismissed lead to more pronounced reductions in target announcement returns than SCAs that are settled. Columns (3) and (4) show the impact of SCAs on acquirer M&A announcement returns, depending on the SCA's resolution. The results reveal that the negative effect of an ongoing SCA at the target is entirely driven by SCAs that are eventually settled, as

Table 4-5: Takeover premiums and M&A announcement returns depending on the ultimate outcome of SCAs

This table reports the regression results using takeover premiums and target and acquirer cumulative abnormal returns (CARs) as the dependent variable. Panel A reports the results when using the initial takeover premium (columns (1) and (2)) and the combined takeover premium (columns (3) and (4)) as compared to the target firm's stock price 42 trading days and 105 trading days before the acquisition announcement as dependent variables. Panel B reports the regression results using the target cumulative abnormal returns (CARs) (columns (1) and (2)) and the acquirer CARs (columns (3) and (4)) for the [−1;+1] and [−3;+3] event window surrounding the M&A announcement date as dependent variables. The target and acquirer CARs are calculated using a three-factor model based on Fama and French (1993, 1996) with a 230-day estimation window from $t=-250$ to $t=-21$ days prior to the event date ($t=0$). The variables for interest relate to the ultimate outcome of the security class action lawsuit (SCA) and are the two binary variables *Dismissed* and *Settled*, which take the value of one if the SCA is eventually dismissed or settled, respectively, and zero otherwise. The other variables are divided into deal controls and target controls, and, in case the acquirer CARs are used as the depended variable, acquirer controls. All variables are defined in Table 4-10 in the Appendix. The standard errors are corrected for heteroskedasticity with associated *t*-values given in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Takeover premiums

	(1) Initial Premium ($t=-42$)	(2) Initial Premium ($t=-105$)	(3) Combined Premium ($t=-42$)	(4) Combined Premium ($t=-105$)
Security class action variables				
Dismissed	−0.080*	−0.086	−0.085*	−0.079
	(−1.826)	(−1.500)	(−1.656)	(−1.041)
Settled	−0.081**	−0.109**	−0.072*	−0.100**
	(−2.023)	(−2.184)	(−1.828)	(−1.992)
Constant	0.353	0.779***	−0.906***	−0.681***
	(1.534)	(2.665)	(−5.086)	(−3.378)
Deal controls	Yes	Yes	Yes	Yes
Target controls	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Observations	2,263	2,236	2,333	2,302
R-squared	0.117	0.116	0.149	0.146

Panel B: Target and acquirer M&A announcement returns

	(1) Target $CAR_{[-1;+1]}$	(2) Target $CAR_{[-3;+3]}$	(3) Acquirer $CAR_{[-1;+1]}$	(4) Acquirer $CAR_{[-3;+3]}$
Security class action variables				
Dismissed	−0.065**	−0.064**	0.015	0.005
	(−2.118)	(−2.002)	(0.878)	(0.284)
Settled	−0.045*	−0.047*	−0.016	−0.034**
	(−1.919)	(−1.946)	(−1.582)	(−2.476)
Constant	0.326***	0.313***	0.046	0.068
	(3.025)	(2.931)	(0.961)	(1.076)
Deal controls	Yes	Yes	Yes	Yes
Target controls	Yes	Yes	Yes	Yes
Acquirer controls	No	No	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Observations	2,196	2,196	1,288	1,288
R-squared	0.145	0.146	0.130	0.115

indicated by the significant and negative coefficient for *Settled*. This result appears sensible since for SCAs that are ultimately settled, any risks associated with the ongoing litigation at the target level will be transferred to the acquirer. This should result in more negative stock market valuations for acquirers, even though takeover premiums are significantly lower for SCA-affected targets where the SCA is ultimately settled. In contrast, if the SCA is eventually dismissed, this does not appear to have a detrimental impact on the acquirer's announcement returns, as the coefficient for *Dismissed* lacks significance.[57]

4.5.3 Acquirer post-M&A buy-and-hold returns

To understand acquirers' post-M&A stock price performance, we estimate the stock returns for holding periods of up to 12 months following the M&A announcement. The univariate results in Table 4-2 Panel B show no differences in BHARs between acquirers of SCA-affected and non-affected targets for the first three and six months following the acquisition, while there is weak evidence that acquirers of SCA-affected firms achieve higher BHARs over the 12-month holding period. We again use our baseline regression as a starting point, including acquirer controls, to see whether a similar pattern is observed in the multivariate setting. The regression results are shown in Table 4-6. The coefficients of *SCA* largely lack significance, except for the 12-months holding period where the coefficient becomes weakly significant. Decomposing the SCA variable into its respective outcomes reveals that these significant positive returns are entirely driven by SCAs that are eventually dismissed. Following the M&A announcement, it may become gradually more apparent that the SCA will be dismissed and that there is no further risk for acquirer from the litigation at the target level. This is then reflected in positive BHARs.

4.5.4 Security class actions and the likelihood of deal completion

In this section, we now focus on the impact of an ongoing SCA at the target firm on the likelihood of deal completion. To this end, we add the 708 withdrawn deals back to the sample of 3,277 completed transactions. Given the well-established finding on the importance of termi-

[57] We also investigate whether the length of the time period between the SCA filing date and the acquisition announcement date has an impact on acquirer M&A announcement returns. To this end, we run an OLS regression for the subsample of SCA-affected targets with a public acquirer and define the variable *Time-to-Acquisition* as one divided by the natural logarithm of the trading days between SCA filing date and M&A announcement date (i.e., the higher the value of this variable, the faster the SCA-affected target was bought following the SCA filing date). The results are reported in Table 4-11 in the Appendix. While the coefficient for *Time-to-Acquisition* itself remains insignificant, it becomes positive and significant when interacting it with *Dismissed*. This suggests that acquirers that purchase a target affected by an ultimately dismissed SCA at an earlier stage may be able to capture more value by benefitting from the decline of the target's share price in the wake of the SCA filing.

Table 4-6: Security class actions and acquirer long-run returns

This table reports the regression results using the acquirer firm's buy-and-hold abnormal returns (BHARs) over a time frame of three months ($BHAR_{[0;3]}$), six months ($BHAR_{[0;6]}$), and twelve months ($BHAR_{[0;12]}$) as dependent variables. The market return is estimated using an equally weighted portfolio of up to five style-matched competitor firms. For the matched portfolio, we utilize the text-based industry matching approach by Hoberg and Phillips (2010, 2016) and use up to five competitor firms with the highest similarity scores. The variable of interest is *SCA*, defined as one if the target firm is affected by a security class action lawsuit (SCA) that has not yet resolved at the time of M&A announcement, and zero otherwise. The SCA variable is also split into the two binary variables *Dismissed* and *Settled*, which take the value of one if the SCA is eventually dismissed or settled, respectively, and zero otherwise. The other variables are divided into deal controls, target controls, and acquirer controls. All variables are defined in Appendix A. The standard errors are corrected for heteroskedasticity with associated *t*-values given in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

	(1) $BHAR_{[0;3]}$	(2) $BHAR_{[0;3]}$	(3) $BHAR_{[0;6]}$	(4) $BHAR_{[0;6]}$	(5) $BHAR_{[0;12]}$	(6) $BHAR_{[0;12]}$
Security class action variables						
SCA	−0.027		0.018		0.098*	
	(−1.041)		(0.552)		(1.898)	
Dismissed		−0.007		0.100**		0.136**
		(−0.182)		(2.035)		(2.295)
Settled		−0.033		−0.009		0.085
		(−1.068)		(−0.240)		(1.313)
Constant	−0.110	−0.111	−0.064	−0.073	−0.072	−0.076
	(−0.783)	(−0.797)	(−0.312)	(−0.357)	(−0.271)	(−0.285)
Deal controls	Yes	Yes	Yes	Yes	Yes	Yes
Target controls	Yes	Yes	Yes	Yes	Yes	Yes
Acquirer controls	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,032	1,032	1,006	1,006	979	979
R-squared	0.062	0.063	0.052	0.054	0.074	0.074

nation fees on deal completion (Bates & Lemmon, 2003; Jeon & Ligon, 2011; Officer, 2003), we are particularly interested in the way in which SCAs interact with termination fees. The results of the previous subsections indicate that there is a difference how an ongoing SCA at the target level affects acquirers contingent on the ultimate outcome of the SCA. Consequently, it is reasonable to assume that this will also be reflected in the likelihood of deal completion. This may especially be the case if following the M&A announcement it becomes increasingly obvious that the SCA will eventually result in a settlement. To examine how SCAs affect the likelihood of deal completion, we run our baseline logit regression introduced in Equation (21) and its variations. The results of the regressions are presented in Table 4-7.

In line with prior research and expectations, we find that the inclusion of either acquirer or target termination fees increases the likelihood of deal completion. The coefficient of the SCA variable, however, remains insignificant, indicating that acquiring an SCA-affected target

Table 4-7: Security class actions and the likelihood of deal completion

This table reports the logit regression results on the effect of security class action lawsuits (SCAs) on the likelihood of deal completion. The dependent variable is *Completion*, a binary variable equal to one if the deal was completed and zero if the deal was withdrawn. The variables of interest are *SCA*, defined as one if the target firm is affected by an SCA that has not yet resolved at the time of M&A announcement, and zero otherwise, and *Acquirer Term Fees* and *Target Term Fees*, defined as one if the acquisition agreement contained acquirer or target termination fees, respectively, and zero otherwise. The SCA variable is also split into the two binary variables *Dismissed* and *Settled*, which take the value of one if the SCA is eventually dismissed or settled, respectively, and zero otherwise. The other variables are divided into deal controls and target controls. All variables are defined in Table 4-10 in the Appendix. The standard errors are corrected for heteroskedasticity with associated *z*-values given in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

	Completion					
	(1)	(2)	(3)	(4)	(5)	(6)
Termination fee related variables						
Acquirer Term Fees	0.982***	1.104***	1.104***			
	(6.688)	(6.965)	(6.962)			
Target Term Fees				2.446***	2.507***	2.508***
				(17.302)	(17.097)	(17.083)
Acquirer Term Fees×SCA		−1.148***				
		(−2.700)				
Acquirer Term Fees×Dismissed			−1.101			
			(−1.538)			
Acquirer Term Fees×Settled			−1.168**			
			(−2.311)			
Target Term Fees×SCA					−0.693*	
					(−1.770)	
Target Term Fees×Dismissed						−0.497
						(−0.713)
Target Term Fees×Settled						−0.776*
						(−1.695)
Security class action variables						
SCA	−0.177	0.053		−0.129	0.189	
	(−0.954)	(0.266)		(−0.584)	(0.678)	
Dismissed			0.036			0.126
			(0.103)			(0.264)
Settled			0.060			0.216
			(0.258)			(0.659)
Constant	2.456**	2.392**	2.397**	4.599***	4.584***	4.597***
	(2.559)	(2.492)	(2.494)	(4.064)	(4.079)	(4.094)
Deal controls	Yes	Yes	Yes	Yes	Yes	Yes
Target controls	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,060	3,060	3,060	3,060	3,060	3,060
Pseudo R-squared	0.210	0.212	0.212	0.326	0.327	0.327

does not materially affect the likelihood of deal completion. Examining the interplay between SCAs and termination fees, we observe that the interaction between these two variables is negative and significant, particularly when the SCA variable is interacted with acquirer termination fees. This suggests that if the target is SCA-affected, acquirers are more likely to withdraw from the transaction even if acquirer termination fees are negotiated in the acquisition agreement. Decomposing the SCA variable into the eventual outcome of the SCA offers a more nuanced picture. We find that the negative coefficient observed for the interaction of the SCA variable with the acquirer termination fees is entirely driven by those SCAs that are ultimately settled. This aligns well with our previous findings. If it becomes increasingly apparent that the SCA will be resolved through a settlement, the costs that are potentially associated with the ongoing litigation at the target firm may lead the acquirer to reevaluate the transaction. If these costs (e.g., potential settlement amount, reputation risk) are deemed too high, the acquirer may choose to withdraw from the deal. This result also highlights that concerns regarding the ongoing litigation at the target are likely an important consideration for acquirers, so much so that acquirers may choose to withdraw from a deal despite acquirer termination fees being agreed in the acquisition agreement. In contrast, we find that the effect of target termination fees on the completion probability of the deal is less pronounced, with only weakly significant coefficients for the interaction terms *Target Term Fees* × *SCA* and *Target Term Fees* × *Settled*.

4.6 Robustness tests

4.6.1 Endogeneity and switching regression

Given our empirical set-up, we acknowledge that there may be concerns regarding endogeneity, particularly with respect to a potential selection bias affecting the way in which acquirers may select SCA-affected takeover targets. To address this, we apply an endogenous switching regression framework (Barbopoulos et al., 2020; Fang, 2005; Golubov et al., 2012; Heckman, 1979) to account for the potentially endogenous choice of an acquirer to buy an SCA-affected target. Moreover, the switching regression framework allows us to undertake a What-if type analysis to answer the question of how much higher the target takeover premium could have been, were the target not subject to an SCA.

We start by estimating a first-stage selection equation predicting whether a deal involves a target firm that is SCA-affected or not. For this model, we require an exogenous instrumental variable that should influence whether the target in the deal is SCA-affected or not but does not have an impact on our outcome variables (i.e., takeover premiums and target CARs). We use *Litigation Intensity* as our instrumental variable, which is defined as the number of SCAs filed in the 3-digit SIC code of the target firm during the six months prior to the M&A announcement. Previous research demonstrated that the litigation intensity within a given industry has a significant effect on a firm's probability to be subject to an SCA (Arena & Julio, 2015; Gande & Lewis, 2009). At the same time, the industry-wide litigation intensity should satisfy the exclusion restriction as there is no clear economic rationale why *Litigation Intensity* should significantly impact an individual transaction's takeover premium or target M&A announcement date CAR, as the effect of an SCA on these measures is captured by the SCA variable. We find that the average litigation intensity across all industries remains relatively constant over time with slightly elevated levels between 2017 and 2019 and a distinct peak in 2001 due to the 'In RE IPO Securities Litigation' class action that ultimately combined a large number of SCAs where investment banks and companies were sued over alleged fraud in the pricing of IPOs during the late 1990s and early 2000s. However, this relative consistency masks some large variation within industries, where computer and data processing services providers (SIC code 737), drug makers (SIC code 283), and communication equipment and electronic components and accessories manufacturers (SIC codes 366 and 367) are among the most affected industries.[58]

We include *Litigation Intensity* in our first-stage probit regression predicting the likelihood of a deal involving an SCA-affected target firm. We find that the coefficient of *Litigation Intensity* is positive and highly significant, indicating that the number of previously filed SCA lawsuits in the target firm's 3-digit SIC code helps to predict the likelihood of a transaction involving an SCA-affected target firm (Table 4-8 Panel A column (1)). Next, we proceed to estimate the second-stage equation which leverages the Inverse Mills Ratio (IMR)

[58] Figure 4-3 in the Appendix shows the average litigation intensity across all industries during our sample period, while Table 4-17 in the Appendix shows litigation intensity over time on a semi-annual basis, first in the average across all industries and then for the ten 3-digit SIC codes with the highest litigation intensity values during the sample period. The ten 3-digit SIC codes with the highest litigation intensity show large overlap with the FPS variable of Kim and Skinner (2012) that is based on the work of Francis et al. (1994), which indicates industries with high susceptibility to SCAs.

Table 4-8: Endogeneity and switching regressions for takeover premiums and target M&A

This table reports the results of the switching regression models with endogenous switching. Panel A presents the results of the two-stage models. The first stage in column (1) is the selection model using a probit regression with *SCA*, defined as one if the target firm is affected by a security class action lawsuit (SCA) that has not yet resolved at the time of M&A announcement, and zero otherwise, as the dependent variable. The second stage regression models using the initial takeover premium, measured compared to the target firm's stock price 42 trading days before the acquisition announcement, as dependent variable are shown in columns (2) and (3) for deals involving SCA-affected and non-SCA-affected target firms, respectively. Columns (4) and (5) present the second stage regression models using the target [−3;+3] event window cumulative abnormal returns (CARs) surrounding the M&A announcement date as the dependent variables, again divided into SCA-affected and non-SCA-affected targets. The target CARs are calculated using a three-factor model based on Fama and French (1993, 1996) with a 230-day estimation window from $t=-250$ to $t=-21$ days prior to the event date ($t=0$). *Litigation Intensity* serves as the instrumental variable and is defined as the number of SCAs filed in the 3-digit SIC industry of the target firm within six months prior to the acquisition announcement. The Inverse Mills Ratio adjusts for the non-zero mean of the error terms. All variables are defined in Table 4-10 in the Appendix. The standard errors are corrected for heteroskedasticity with associated *t*-values (*z*-values for the probit regression) given in parentheses. Panel B reports the results for the switching regression model estimates for the What-if analyses of SCA-affected and non-SCA-affected targets for the initial premium and the target [−3;+3] event window CARs surrounding the M&A announcement date and the respective differences. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Model

	First stage	Second stage: Initial Premium		Second stage: Target CARs [-3;+3]	
	(1) Selection	(2) SCA-affected	(3) Non-SCA-affected	(4) SCA-affected	(5) Non-SCA-affected
Litigation Intensity	0.008***				
	(2.745)				
Inverse Mills Ratio		−0.748***	−0.492**	−0.503***	−0.290**
		(−2.713)	(−2.015)	(−3.481)	(−1.962)
Financial Acquirer	0.093	−0.010	−0.124***	−0.063	−0.024
	(0.631)	(−0.094)	(−3.903)	(−0.747)	(−0.917)
Public Acquirer	0.149	0.007	−0.030	0.008	−0.002
	(1.546)	(0.072)	(−0.769)	(0.134)	(−0.081)
Contested Bid	0.235	0.002	−0.060	−0.119**	−0.156***
	(1.525)	(0.014)	(−0.957)	(−2.234)	(−4.264)
Divestiture	−0.176	−0.196	0.024	−0.026	−0.049
	(−0.782)	(−1.478)	(0.394)	(−0.418)	(−1.459)
Diversifying Deal	0.106	−0.114	−0.071**	−0.062	−0.044**
	(1.253)	(−1.382)	(−2.169)	(−1.143)	(−2.190)
All Cash	0.001	0.097	0.011	0.154***	0.082***
	(0.015)	(1.189)	(0.470)	(3.538)	(5.433)
Stake Acquired	−0.008*	0.007*	0.007***	0.004**	0.004***
	(−1.844)	(1.661)	(3.129)	(2.024)	(2.853)
Tender Offer	0.089	−0.046	0.053*	0.089	0.074***
	(0.889)	(−0.568)	(1.722)	(1.466)	(3.448)
Target RoA	−0.686***	0.377	0.109	0.264	−0.019
	(−5.590)	(1.532)	(0.673)	(1.618)	(−0.191)
Target Assets	0.153***	−0.129***	−0.097***	−0.096***	−0.054***
	(6.118)	(−2.659)	(−3.044)	(−4.047)	(−2.782)
Target Leverage	−0.948***	0.741**	0.428**	0.511***	0.289**
	(−3.778)	(2.445)	(2.097)	(2.832)	(2.234)
Target Market-to-Book	0.012	−0.000	−0.010**	−0.024***	−0.008***
	(1.320)	(−0.031)	(−2.449)	(−3.086)	(−3.293)
Constant	−2.782***	2.713**	1.957***	1.964***	1.121**
	(−5.675)	(2.606)	(2.589)	(3.229)	(2.478)
Observations	2,473	154	2,102	156	2,034
(Pseudo) R-squared	0.060	0.164	0.061	0.304	0.106

Panel B: What-if Analysis

	SCA-affected	Non-SCA-affected
Initial Premiums		
Actual Initial Premium	38.8%	42.8%
Hypothetical Initial Premium	45.0%	39.5%
Deterioration / Improvement	**−6.2%****	**3.3%*****
Target CARs [−3;+3]		
Actual Target CAR [−3;+3]	24.9%	28.1%
Hypothetical Target CAR [−3;+3]	33.1%	22.3%
Deterioration / Improvement	**−8.2%*****	**5.9%*****

constructed from the first-stage selection equation to correct for selection bias (Li & Prabhala, 2007). The IMR is included as an additional control variable in the second-stage models to correct for a potential endogeneity bias in the regression model specifications in Table 4-8 Panel A columns (2) through (5). The coefficient of the IMR is negative and significant in all second-stage specifications, indicating that self-selection may have adversely affected our previous results.

In a similar vein to prior studies (Fang, 2005; Golubov et al., 2012), we estimate the second-stage equation separately for SCA-affected targets and for non-SCA-affected targets. This approach enables us to employ a switching regression framework to compute hypothetical takeover premiums (Table 4-8 Panel A columns (2) and (3)) and target M&A announcement CARs (Table 4-8 Panel A columns (4) and (5)) for SCA-affected deals as if they had not been SCA-affected (and vice versa, for non-SCA-affected targets as if they had been subject to an ongoing SCA). Table 4-8 Panel B shows the results of this What-if type analysis and confirms our prior findings. The average actual initial premium received by SCA-affected firms is 38.8% whereas the hypothetical premium the target could have achieved had it not been subject to an ongoing SCA is 45.0%. This implies a statistically significant improvement of 6.2 percentage points in takeover premiums if the target had not been subject to an SCA. Using the same approach for non-SCA-affected target firms reveals that these firms' premiums would have deteriorated by 3.3 percentage points if they had been SCA-affected. Running the same What-if analysis for the target CARs, we similarly find that target CARs could have been approximately 8.2 percentage points higher if the target were not subject to an ongoing SCA. At the same time, non-SCA affected targets would have experienced 5.9 percentage point lower returns if they had been subject to an SCA.[59] The results of this analysis underscore the real

[59] We also estimate the switching regression framework with endogenous switching using the combined premium (instead of initial premiums) as well as for target CARs for the [−1;+1] event window (instead of the [−3;+3] event window) as the dependent variables for the second-stage models. The results remain qualitatively unchanged and are omitted here for reasons of brevity.

economic costs that SCAs have for target shareholders in the form of foregone takeover premiums and lower shareholder wealth effects.[60]

4.6.2 Additional checks

We conduct two additional robustness checks. First, we use a propensity score matching (PSM) to address potential differences between the company characteristics of SCA-affected and non-SCA-affected targets. Second, we introduce a large set of acquirer control variables to our main regression models for takeover premiums and target M&A announcement returns. This restricts our sample to transactions with public acquirers but allows us to ameliorate potential concerns regarding an omitted variable bias that may be present in the absence of acquirer controls.

The univariate results of the difference tests in Table 4-2 suggest that SCA-affected targets may be different from non-SCA-affected targets across several dimensions. To address this potential sample selection bias, we check our results using PSM. Similar to the approach of Alexandridis et al. (2017), we estimate propensity scores via a logit regression to predict the probability of the transaction involving an SCA-affected target. We then use these scores to match treated observations (i.e., SCA-affected deals) to our control group (i.e., non-SCA-affected deals) using 1:1 nearest neighbor matching with replacement, which yields a total of 424 observations (212 matched pairs).[61]

Next, we use this propensity score matched subsample and re-estimate our main regression specifications from Table 4-3 (takeover premiums) and Table 4-4 (target and

[60] We use the same switching regression framework using the acquirer [−3;+3] event window CARs as the dependent variable. The results are presented in Table 4-12 in the Appendix and likewise confirm our prior results regarding acquirer M&A announcement CARs being significantly lower in the case of the purchase of an SCA-affected target. Acquirers of SCA-affected targets would have achieved 4.2 percentage points higher abnormal returns if the target were not subject to an SCA. Correspondingly, acquirers of non-SCA-affected targets would have experienced 1.9 percentage points lower returns if the target were subject to an ongoing litigation. These results suggest that acquiring firm shareholders also bear some of the costs of an SCA at the target through more negative wealth effects surrounding the M&A announcement.

[61] The results of our matching procedure reported in Table 4-18 in the Appendix show that any differences in the covariates are eliminated through the matching procedure as the differences among all covariates are insignificant after matching.

acquirer announcement CARs). The results for these replication analyses are presented in Table 4-9. Our findings related to takeover premiums and target CARs generally remain robust for the PSM subsample. SCA-affected target firms receive lower takeover premiums and experience lower M&A announcement date CARs than non-SCA-affected targets. Our results also hold when decomposing the SCA variable into its components of eventually dismissed and settled SCAs, with the coefficients largely keeping the same levels of significance as before. The results for the PSM subsample using the acquirer M&A announcement date CARs as the dependent variable likewise confirm our prior results (Table 4-9 Panel C).[62] Acquirers of SCA-affected target firms continue to achieve significantly lower abnormal returns compared to acquirers of non-SCA-affected firms. This is again entirely driven by acquisition of SCA-affected targets where the SCA is ultimately settled. Therefore, our results remain robust even after controlling for potential differences in the target characteristics of SCA-affected firms and non-SCA affected ones.

Our final robustness check addresses potential concerns regarding an omitted variable bias given that our analyses on takeover premiums and target CARs so far did not include any acquirer-specific variables. Including acquirer controls limits our sample to only public acquirers with readily available data and reduces our sample size from 3,277 to 1,873 observations. We rerun our regressions from Table 4-3 (takeover premiums) and Table 4-4 (target M&A announcement CARs) and include a large set of acquirer controls in the regression specifications. The results of these additional analyses are shown in Table 4-19 in the Appendix. Our findings in relation to takeover premiums remain robust, both for the coefficient of our SCA variable as well as for the decomposition of the SCA variable into its components of eventually dismissed and settled deals. The regression results for target M&A

[62] Given the relatively small sample size due to the inclusion of acquirer controls, we omit year-fixed effects in Table 4-9 Panel C to avoid overfitting the regression model.

Table 4-9: The effect of security class actions on M&As using matched samples

This table reports the regression results using the propensity score matched samples and repeating the regression analyses from Table 4-3 and Table 4-4. Panel A reports the results using the initial takeover premium (columns (1) and (2)) and the combined takeover premium (columns (3) and (4)) compared to the target firm's stock price 42 trading days before the acquisition announcement as dependent variables. Panels B and C report the regression results using the target cumulative abnormal returns (CARs) (Panel B) and the acquirer CAR (Panel C) for the [−1;+1] and [−3;+3] event windows surrounding the M&A announcement date as the dependent variables. The target and acquirer CARs are calculated using a three-factor model based on Fama and French (1993, 1996) with a 230-day estimation window from $t=-250$ to $t=-21$ days prior to the event date ($t=0$). The variable of interest is *SCA*, defined as one if the target firm is affected by a security class action lawsuit (SCA) that has not yet resolved at the time of M&A announcement, and zero otherwise. The SCA variable is also split into the two binary variables *Dismissed* and *Settled*, which take the value of one if the SCA is eventually dismissed or settled, respectively, and zero otherwise. The other variables are divided into deal controls and target controls, and, in case the acquirer CARs are used as the depended variable, acquirer controls. All variables are defined in Table 4-10 in the Appendix. The standard errors are corrected for heteroskedasticity with associated *t*-values given in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Takeover Premiums

	(1) Initial Premium ($t=-42$)	(2) Initial Premium ($t=-42$)	(3) Combined Premium ($t=-42$)	(4) Combined Premium ($t=-42$)
SCA	−0.130**		−0.126**	
	(−2.195)		(−2.009)	
Dismissed		−0.133**		−0.121*
		(−2.142)		(−1.703)
Settled		−0.129*		−0.129*
		(−1.900)		(−1.795)
Constant	−0.183	−0.182	−1.347***	−1.348***
	(−0.372)	(−0.368)	(−3.119)	(−3.107)
Deal controls	Yes	Yes	Yes	Yes
Target controls	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Observations	311	311	324	324
R-squared	0.263	0.263	0.268	0.268

Panel B: Target CARs

	(1) $CAR_{[-1;+1]}$	(2) $CAR_{[-1;+1]}$	(3) $CAR_{[-3;+3]}$	(4) $CAR_{[-3;+3]}$
SCA	−0.079**		−0.077**	
	(−2.524)		(−2.441)	
Dismissed		−0.082**		−0.091**
		(−2.051)		(−2.258)
Settled		−0.078**		−0.071**
		(−2.206)		(−2.015)
Constant	0.244	0.244	0.291	0.292
	(0.863)	(0.862)	(1.238)	(1.237)
Deal controls	Yes	Yes	Yes	Yes
Target controls	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Observations	316	316	316	316
R-squared	0.296	0.296	0.305	0.306

Panel C: Acquirer CARs

	(1) $CAR_{[-1;+1]}$	(2) $CAR_{[-1;+1]}$	(3) $CAR_{[-3;+3]}$	(4) $CAR_{[-3;+3]}$
SCA	−0.031**		−0.037**	
	(−2.282)		(−2.471)	
Dismissed		−0.014		−0.023
		(−0.736)		(−1.153)
Settled		−0.038**		−0.043**
		(−2.565)		(−2.490)
Constant	0.080	0.077	0.133	0.131
	(0.667)	(0.638)	(0.960)	(0.894)
Deal controls	Yes	Yes	Yes	Yes
Target controls	Yes	Yes	Yes	Yes
Acquirer controls	Yes	Yes	Yes	Yes
Year fixed effects	No	No	No	No
Industry fixed effects	Yes	Yes	Yes	Yes
Observations	187	187	187	187
R-squared	0.345	0.350	0.436	0.438

announcement CARs likewise hold when adding acquirer controls to the regression models, but the level of significance for the SCA variable is generally lower, reaching only the 10% level of significance. The results are somewhat less robust when decomposing the SCA variable into ultimately dismissed and settled lawsuits. While the coefficients for *Dismissed* remain negative and significant, they are now only significant at the 10% level. The coefficients for *Settled* were only weakly significant in our main analyses and now fail to reach common thresholds of statistical significance. This is likely driven by the smaller sample size of SCA-affected targets when including acquirer controls. Finally, we also rerun our logit regressions from Table 4-7 for the likelihood of deal completion including acquirer controls. The results presented in Table 4-20 in the Appendix likewise confirm our previous results even though the levels of significance are reduced in some instances.

4.7 Conclusion

SCAs can have severe consequences for companies that go beyond the initial stock price drop at the time of the SCA filing. While prior studies documented that SCAs, among other things, increase a firm's cost of equity (Chava et al., 2010), lead to CEO pay reductions or turnover (Crutchley et al., 2015; Humphery-Jenner, 2012), and force changes to a firm's investment policies (Arena & Julio, 2015; McTier & Wald, 2011), there is so far little evidence how SCAs may impact major corporate events, such as M&As. This study contributes to the existing literature by examining the impact of SCAs on different dimensions of M&A transactions. Specifically, we investigate the effects of SCAs on takeover premiums, target and acquirer M&A announcement returns, acquirer post-M&A BHARs, and the likelihood of deal completion.

Our results with respect to takeover premiums suggest that targets that are subject to an ongoing SCA at the time of the M&A announcement receive significantly lower premiums, with our baseline results indicating that the reduction due to the SCA is between 7.6 and 10.2

percentage points. These negative effects are predominantly driven by SCAs that are eventually settled. Looking at the stock returns around the M&A announcement date, we continue to see the negative impact of the SCAs observed for takeover premiums. Targets that are subject to an ongoing SCA achieve significantly lower announcement returns compared to targets that are not subject to ongoing litigation. Moreover, the negative impact of the SCA also carries over to the acquirer, as acquirers of SCA-affected targets obtain significantly lower M&A announcement date returns than other acquirers that purchase targets that are not subject to an ongoing SCA. For acquirers the negative announcement returns are entirely driven by SCAs which are eventually settled. Interestingly, acquirers that purchase SCA-affected targets appear to be able to record significantly positive 12-months BHARs, but only if the ultimate outcome of the target firm's SCA is a dismissal. One possible explanation could be that the resolution of the SCA through a dismissal shows that the allegations against the target were not meritorious, while there are also no settlement costs incurred by the acquirer. Additionally, we find that transactions with SCA-affected targets impact the likelihood of deal completion. While an SCA at the target level in itself has no impact on the likelihood of deal completion, when interacted with termination fees, we find that transactions with SCA-affected targets lead to a lower deal completion probability, despite termination fees being included in the acquisition agreement. That acquirers are willing to withdraw from a transaction despite the costs they incurred due to the termination fees demonstrates that ongoing litigation at the target level is an important consideration for acquirers. Our results remain valid even when undertaking a variety of robustness checks, including controlling for endogeneity, sample composition, and potential omitted variables.

The results of our study add to the literature on factors influencing acquisition premiums (Eaton et al., 2021; Mulherin & Simsir, 2015), M&A announcement returns (Golubov et al., 2015; Harford et al., 2012), and the likelihood of deal completion (Neyland &

Shekhar, 2018; Officer, 2003) by showing that ongoing litigation at the target has an economically relevant impact on M&As for both targets and acquirers and is therefore an important consideration for M&A deals. Moreover, we add to the literature on the real consequences of SCAs (Arena & Julio, 2015; Chava et al., 2010) by showing that they can significantly impact major corporate events, such as M&As, and thereby continue to impose costs on the firm affected by the SCA beyond the original negative stock market reaction to the SCA filing. We also find that the ultimate outcome of an SCA either through a settlement or a dismissal appears to be anticipated by investors. While the ultimate outcome of the SCA has little impact on takeover premiums, acquirers appear to be able to obtain slight benefits when the SCA is eventually dismissed, particularly in the long run. Therefore, acquirers may derive additional benefits from a rigorous legal evaluation of the likely outcome of the target firm's SCA.

4.8 Appendix

Table 4-10: Variable definitions and data sources

This table defines the variables and describes them in more detail, including an identification of their data source. The variables are divided into security class action variables, dependent variables, deal control variables, target control variables, acquirer control variables, and further variables.

Variable	Definition	Data source
Security class action variables		
SCA	Binary variable defined as one if the target firm is subject to an ongoing security class action lawsuit (SCA) within the three years prior to the acquisition that has not been resolved at the time of acquisition announcement, and zero otherwise.	Stanford Security Class Action Clearinghouse
Dismissed	Binary variable defined as one if the target firm is subject to an ongoing SCA within the three years prior to the acquisition that has not been resolved at the time of acquisition announcement that is ultimately dismissed, and zero otherwise.	Stanford Security Class Action Clearinghouse
Settled	Binary variable defined as one if the target firm is subject to an ongoing SCA within the three years prior to the acquisition that has not been resolved at the time of acquisition announcement that is ultimately settled, and zero otherwise.	Stanford Security Class Action Clearinghouse
Dependent variables		
Initial Premium	Initial offer price divided by the target share price 42 (105) trading days prior to the announcement, adjusted for stock splits and dividends, minus one.	SDC, CRSP
Combined Premium	Equal to the component premium, which is defined as the aggregate amount of all payments offered to target shareholders (i.e., cash, equity, debt, etc.) divided by the target firm's market capitalization 42 (105) trading days prior to the announcement date minus one, provided that the component premium is available and lies between −50% and 500%. If the component premium is not available, this variable is equal to the initial premium as long as this premium lies between −50% and 500%. If neither condition is met, the combined premium is left blank.	SDC, CRSP
Target CARs	Target firm cumulative abnormal stock return over the respective event window benchmarked against the expected return using the Fama and French (1993, 1996) three-factor portfolio with a 230-day estimation window from $t=-250$ to $t=-21$ days prior to the event date.	CRSP, Website of Kenneth French (https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html)
Acquirer CARs	Acquirer firm cumulative abnormal stock return over the respective event window benchmarked against the expected return using the Fama and French (1993, 1996) three-factor portfolio with a 230-day estimation window from $t=-250$ to $t=-21$ days prior to the event date.	CRSP, Website of Kenneth French
Acquirer BHARs	Acquirer firm buy-and-hold abnormal stock return over the respective holding period excluding the first trading date after the M&A announcement benchmarked against the expected return of an equally weighted matched portfolio of up to five style-matched competitor firms with the highest similarity scores identified using the text-based industry matching procedure introduced by Hoberg and Phillips (2010, 2016).	CRSP, Website of Hoberg and Phillips (https://hobergphillips.tuck.dartmouth.edu/)
Completion	Binary variable defined as one if the deal is flagged in SDC as completed and zero if the deal is flagged as withdrawn.	SDC
Deal control variables		
Financial Acquirer	Binary variable defined as one if the acquirer is identified as a financial sponsor by SDC, and zero otherwise.	SDC
Public Acquirer	Binary variable defined as one if the acquirer is a publicly listed firm, and zero otherwise.	SDC

Hostile Deal	Binary variable defined as one if the deal is flagged as hostile, and zero otherwise.	SDC
Contested Bid	Binary variable defined as one if the acquisition is contested by at least one other buyer, and zero otherwise.	SDC
Divestiture	Binary variable defined as one if the deal is flagged as a corporate divestiture, and zero otherwise.	SDC
Diversifying Deal	Binary variable defined as one if acquirer and target are located in different Fama-French 49 industry portfolios, and zero otherwise.	SDC, Website of Kenneth French
All Cash	Binary variable defined as one if the acquisition is paid exclusively in cash, and zero otherwise.	SDC
Stake Acquired	Percentage of shares that were acquired in the acquisition.	SDC
Tender Offer	Binary variable defined as one if the bid was made as a tender offer, and zero otherwise.	SDC
Target control variables		
Target RoA	Target firm's net income divided by its total assets in the fiscal year prior to the acquisition.	Datastream
Target Assets	Natural logarithm of the target firm's total assets in million US dollars in the fiscal year prior to the acquisition.	Datastream
Target Leverage	Target firm's total long-term debt divided by its total assets in the fiscal year prior to the acquisition.	Datastream
Target Market-to-Book	Target firm's market value of equity divided by its book value of equity in the fiscal year prior to the acquisition.	Datastream
Acquirer control variables		
Acquirer RoA	Acquirer firm's net income divided by its total assets in the fiscal year prior to the acquisition.	Datastream
Acquirer Leverage	Acquirer firm's total long-term debt divided by its total assets in the fiscal year prior to the acquisition.	Datastream
Acquirer Firm Size	Natural logarithm of the acquirer firm's market capitalization in million US dollars the day before the acquisition announcement.	Datastream
Acquirer FCF	Acquirer firm's free cash flow in the last twelve months before the acquisition announcement divided by its total assets.	SDC
Acquirer Q	Acquirer firm's Tobin Q, defined as the market value of equity plus its total liabilities divided by its total assets the day before the acquisition announcement.	SDC
Acquirer Runup	Market-adjusted buy-and-hold return of the acquirer firm's stock over a 230-day time period from $t=-250$ to $t=-21$ days prior to the event date.	CRSP
Acquirer Sigma	Standard deviation of the market-adjusted buy-and-hold return of the acquirer firm's stock over a 230-day time period from $t=-250$ to $t=-21$ days prior to the event date.	CRSP
Acquirer SCA	Binary variable defined as one if the acquirer firm is subject to an ongoing security class action lawsuit (SCA) within the three years prior to the acquisition that has not been resolved at the time of acquisition announcement, and zero otherwise.	Stanford Security Class Action Clearinghouse
Further variables		
Acquirer Term Fees	Binary variable defined as one if acquirer termination fees were agreed in the acquisition agreement, and zero otherwise.	SDC
Target Term Fees	Binary variable defined as one if target termination fees were agreed in the acquisition agreement, and zero otherwise.	SDC
Time-to-Acquisition	One divided by the natural logarithm of the numeric difference in trading days between the SCA filing date and the acquisition announcement date.	SDC, Stanford Security Class Action Clearinghouse
Litigation Intensity	Number of SCAs filed in the target firm's 3-digit SIC code within the six months prior to the M&A announcement.	Stanford Security Class Action Clearinghouse

Table 4-11: Security class actions and time-to-acquisition

This table reports the regression results for the acquirer M&A announcement returns depending on the timing of the acquisition following the security class action lawsuit (SCA) filing. The dependent variable is the acquirer cumulative abnormal return (CAR) for the [−1;+1] and [−3;+3] event windows surrounding the takeover announcement of an SCA-affected target as the dependent variables. The acquirer CARs are calculated using a three-factor model based on Fama and French (1993, 1996) with a 230-day estimation window from $t=-250$ to $t=-21$ days prior to the event date ($t=0$). The variables of interest are *Time-to-Acquisition*, defined as one divided by the natural logarithm of the trading days between SCA filing date and M&A announcement date (i.e., the higher the value of this variable, the faster the SCA-affected target was bought following the announcement) and *Dismissed*, which takes the value of one if the SCA is eventually dismissed, and zero otherwise. The other variables are divided into deal controls, target controls, and acquirer controls. All variables are defined in Table 4-10. The standard errors are corrected for heteroskedasticity with associated *t*-values given in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

	(1) $CAR_{[-1;+1]}$	(2) $CAR_{[-1;+1]}$	(3) $CAR_{[-3;+3]}$	(4) $CAR_{[-3;+3]}$
Variables of interest				
Dismissed	0.014	−0.205*	0.033	−0.242
	(0.737)	(−1.731)	(1.269)	(−1.665)
Time-to-Acquisition	0.007	−0.424	−0.590	−1.131
	(0.024)	(−0.969)	(−1.176)	(−1.648)
Dismissed×Time-to-Acquisition		1.161*		1.453*
		(1.901)		(1.869)
Constant	0.037	0.108	0.350*	0.439**
	(0.263)	(0.690)	(1.930)	(2.209)
Deal controls	Yes	Yes	Yes	Yes
Target controls	Yes	Yes	Yes	Yes
Acquirer controls	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Observations	101	101	101	101
R-squared	0.370	0.398	0.451	0.474

Table 4-12: Endogeneity and switching regressions for acquirer M&A announcement returns

This table reports the results of the switching regression models with endogenous switching. Panel A presents the results of the two-stage model. The first stage in column (1) is the selection model using a probit regression with *SCA*, defined as one if the target firm is affected by a security class action lawsuit (SCA) that has not yet resolved at the time of M&A announcement, and zero otherwise, as the dependent variable. The second stage regression model using the acquirer [−3;+3] event window cumulative abnormal returns (CARs) surrounding the M&A announcement date as dependent variable are shown in columns (2) and (3) for deals involving SCA-affected and non-SCA-affected target firms, respectively. The acquirer CARs are calculated using a three-factor model based on Fama and French (1993, 1996) with a 230-day estimation window from $t=-250$ to $t=-21$ days prior to the event date ($t=0$). *Litigation Intensity* serves as the instrumental variable and is defined as the number of SCA lawsuits filed in the 3-digit SIC industry of the target firm within six months prior to the acquisition announcement. The Inverse Mills Ratio adjusts for the non-zero mean of the error terms. All variables are defined in Table 4-10. The standard errors are corrected for heteroskedasticity with associated *t*-values (*z*-values for the probit regression) given in parentheses. Panel B reports the results for the switching regression model estimates for the What-if analyses of SCA-affected and non-SCA affected targets for acquirer [−3;+3] event window CARs surrounding the M&A announcement date and the respective differences. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Model

	First stage	Second stage: Acquirer CARs [−3;+3]	
	(1) Selection	(2) SCA-affected	(3) Non-SCA-affected
Litigation Intensity	0.009**		
	(2.004)		
Inverse Mills Ratio		0.284**	0.071*
		(2.053)	(1.709)
Contested Bid	0.081	0.002	−0.015
	(0.356)	(0.055)	(−1.059)
Divestiture	−0.062	0.039	−0.003
	(−0.182)	(0.200)	(−0.144)
Diversifying Deal	−0.027	−0.010	−0.010*
	(−0.234)	(−0.437)	(−1.686)
All Cash	0.095	0.064**	0.027***
	(0.689)	(2.110)	(3.733)
Stake Acquired	−0.004	−0.001	−0.000
	(−0.372)	(−0.708)	(−0.548)
Tender Offer	0.109	0.055**	0.009
	(0.776)	(2.069)	(1.239)
Target RoA	−0.495**	−0.144	−0.057**
	(−2.409)	(−1.337)	(−2.413)
Target Assets	0.143***	0.021	0.006
	(3.207)	(1.032)	(1.175)
Target Leverage	−0.795**	−0.100	−0.052
	(−2.103)	(−0.741)	(−1.597)
Target Market-to-Book	0.012	−0.001	−0.001
	(0.972)	(−0.248)	(−1.176)
Acquirer RoA	−0.727	−0.240**	−0.018
	(−1.343)	(−2.129)	(−0.370)
Acquirer Leverage	−1.011**	−0.219*	−0.037
	(−2.569)	(−1.795)	(−0.890)
Acquirer Firm Size	0.038	0.005	0.001
	(0.912)	(0.503)	(0.341)
Acquirer Free Cash Flow	0.446	0.087	0.004
	(0.752)	(0.662)	(0.098)
Acquirer Q	−0.075*	−0.020*	−0.005
	(−1.878)	(−1.810)	(−1.267)
Acquirer Runup	0.134	−0.017	−0.014
	(1.311)	(−0.688)	(−1.476)
Acquirer Sigma	2.533	−1.205	−0.486
	(0.555)	(−0.812)	(−1.156)
Constant	−3.057***	−0.705	−0.178
	(−2.888)	(−1.388)	(−1.208)
Observations	1,273	96	1,177
(Pseudo) R-squared	0.070	0.376	0.075

Panel B: What-if Analysis

	SCA-affected	Non-SCA-affected
Acquirer CARs [−3;+3]		
Actual Acquirer CAR [−3;+3]	−3.5%	−1.5%
Hypothetical Acquirer CAR [−3;+3]	0.7%	−3.5%
Deterioration / Improvement	**−4.2%*****	**1.9%*****

Table 4-13: Sample distribution – Withdrawn deals sample

This table provides an overview of the sample of the 708 withdrawn M&A transactions between 1 January 2000 and 31 December 2021. Panel A shows distribution of transactions by year and further subdivides the sample into targets that are subject to an ongoing security class action lawsuit (SCA-affected) and those that are not subject to one (non-SCA affected). For the SCA-affected targets, the sample is further split by the eventual resolution of the security class action, which is either a settlement or a dismissal of the lawsuit. Panel B shows the distribution of transactions by target industry. We use the Fama-French 10 industry definition to classify our firms to a given industry, except for utilities, which are excluded based on our sample selection procedure. The distribution by industry is likewise subdivided into SCA-affected and non-SCA-affected targets, whereby the sample of SCA-affected targets is further split by the eventual resolution of the security class action, which is either a settlement or dismissal of the lawsuit.

Panel A: Sample distribution by year

Year	N	Non-SCA-affected	SCA-affected		
			All	Settled	Dismissed
2000	85	79	6	4	2
2001	52	51	1	0	1
2002	46	34	12	10	2
2003	37	29	8	8	0
2004	32	30	2	1	1
2005	43	42	1	1	0
2006	50	44	6	6	0
2007	50	47	3	2	1
2008	56	47	9	6	3
2009	32	31	1	0	1
2010	32	31	1	0	1
2011	25	24	1	1	0
2012	25	23	2	1	1
2013	21	19	2	1	1
2014	20	19	1	0	1
2015	24	22	2	2	0
2016	14	11	3	2	1
2017	17	12	5	3	2
2018	14	12	2	1	1
2019	8	7	1	1	0
2020	17	17	0	0	0
2021	8	8	0	0	0
Total	**708**	**639**	**69**	**50**	**19**

Panel B: Sample distribution by target industry

Target industry	N	Non-SCA-affected	SCA-affected		
			All	Settled	Dismissed
Consumer Durables	15	13	2	1	1
Consumer Non-Durables	43	40	3	1	2
Manufacturing	62	60	2	2	0
High Tech	204	176	28	23	5
Retail	119	108	11	6	5
Telecommunications	31	29	2	1	1
Energy	34	31	3	2	1
Healthcare	78	68	10	7	3
Other	122	114	8	7	1
Total	**708**	**639**	**69**	**50**	**19**

Table 4-14: Descriptive statistics – Withdrawn deals sample

This table provides an overview of the descriptive statistics of the sample of 708 withdrawn M&A transactions between 1 January 2000 and 31 December 2021. Panel A shows the mean, median, and number of observations for selected deal characteristics and further subdivides the sample into targets that are subject to an ongoing security class action lawsuit (SCA-affected) and those that are not subject to one (non-SCA-affected). The last two columns show the differences in mean and median between the SCA-affected and non-SCA-affected targets. Panel B shows the mean, median, and number of observations for selected target characteristics and our main dependent variables for the subsequent regression analyses. The sample is again subdivided into deals with SCA-affected and non-SCA-affected targets and the last two columns again show the differences in mean and median between these two subsamples of targets. Detailed definitions of the variables are provided in Table 4-10. Differences in mean and median for the two target groups are tested for significance using the parametric two-sample *t*-test and the nonparametric Wilcoxon rank-sum test. *, **, and *** indicate significance at the 10%, 5%, and 1% level of significance, respectively.

Panel A: Deal characteristics

	Withdrawn sample (1)			SCA-affected (2)			Non-SCA-affected (3)			(2) – (3)	
	Mean	Median	N	Mean	Median	N	Mean	Median	N	Mean	Median
Financial Acquirer	0.11	0.00	708	0.19	0.00	69	0.10	0.00	639	0.09**	0.00**
Public Acquirer	0.44	0.00	708	0.38	0.00	69	0.45	0.00	639	−0.07	0.00
Hostile Deal	0.05	0.00	708	0.09	0.00	69	0.05	0.00	639	0.04	0.00
Contested Bid	0.31	0.00	708	0.45	0.00	69	0.29	0.00	639	0.16***	0.00***
Divestiture	0.03	0.00	708	0.00	0.00	69	0.03	0.00	639	−0.03	0.00
Diversifying Deal	0.67	1.00	708	0.65	1.00	69	0.67	1.00	639	−0.02	0.00
All Cash	0.57	1.00	708	0.57	1.00	69	0.57	1.00	639	−0.01	0.00
Stake Acquired	0.96	1.00	708	0.96	1.00	69	0.96	1.00	639	0.00	0.00
Tender Offer	0.09	0.00	708	0.09	0.00	69	0.09	0.00	639	0.00	0.00

Panel B: Target characteristics and dependent variables

	Withdrawn sample (1)			SCA-affected (2)			Non-SCA-affected (3)			(2) – (3)	
	Mean	Median	N	Mean	Median	N	Mean	Median	N	Mean	Median
Target RoA	−0.09	0.01	668	−0.09	−0.04	63	−0.09	0.01	605	0.00	−0.05
Target Assets (USD million)	2,191.8	262.3	669	3,504.3	391.8	63	2,055.4	235.9	606	1,448.9	155.9***
Target Leverage	0.24	0.19	667	0.16	0.11	62	0.25	0.20	605	−0.09**	−0.09**
Target Market-to-Book	3.14	1.86	584	3.89	2.36	63	3.05	1.80	521	0.84	0.56**
Initial Premium	0.37	0.26	599	0.33	0.30	60	0.38	0.25	539	−0.04	0.04
Combined Premium	0.41	0.26	627	0.40	0.24	61	0.41	0.26	566	−0.01	−0.02
Target CAR [−1;+1]	0.19	0.15	588	0.14	0.09	58	0.20	0.15	530	−0.06	−0.07**
Target CAR [−3;+3]	0.20	0.15	588	0.14	0.07	58	0.21	0.16	530	−0.07	−0.08***
Acquirer CAR [−1;+1]	−0.02	−0.01	267	−0.08	−0.05	23	−0.02	−0.01	244	−0.06***	−0.04***
Acquirer CAR [−3;+3]	−0.03	−0.02	267	−0.10	−0.07	23	−0.03	−0.02	244	−0.07***	−0.05**
Acquirer BHAR 3m	−0.04	−0.03	231	−0.07	−0.10	21	−0.04	−0.03	210	−0.03	−0.07
Acquirer BHAR 6m	−0.08	−0.07	227	−0.13	−0.05	20	−0.07	−0.07	207	−0.06	0.02
Acquirer BHAR 12m	−0.09	−0.10	218	−0.08	−0.10	19	−0.09	−0.10	199	0.01	0.00

Table 4-15: Correlation matrix

This table reports the pairwise correlations of the variables for our sample of 3,277 completed M&A transactions between 1 January 2000 and 31 December 2021. All variables are defined in Table 4-10.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
(1) Initial Premium	1.00																					
(2) Combined Premium	0.70	1.00																				
(3) Target CAR [−1;+1]	0.52	0.37	1.00																			
(4) Target CAR [−3;+3]	0.54	0.38	0.97	1.00																		
(5) Acquirer CAR [−1;+1]	0.00	0.05	0.11	0.11	1.00																	
(6) Acquirer CAR [−3;+3]	−0.01	0.04	0.11	0.15	0.84	1.00																
(7) Acquirer BHAR 3m	−0.04	−0.02	0.00	0.01	0.12	0.19	1.00															
(8) Acquirer BHAR 6m	−0.08	−0.07	−0.01	0.00	0.10	0.18	0.66	1.00														
(9) Acquirer BHAR 12m	−0.01	−0.05	−0.03	−0.02	0.05	0.08	0.43	0.60	1.00													
(10) SCA	−0.04	−0.04	−0.03	−0.03	−0.04	−0.04	−0.03	0.02	0.04	1.00												
(11) Financial Acquirer	−0.04	−0.04	0.02	0.02	0.03	0.04	0.02	0.00	0.00	−0.02	1.00											
(12) Hostile Deal	−0.02	0.02	−0.03	−0.03	−0.02	−0.03	0.09	0.00	0.02	−0.02	0.00	1.00										
(13) Contested Bid	−0.01	0.03	−0.09	−0.08	−0.02	−0.04	0.04	0.01	0.04	−0.02	−0.02	0.12	1.00									
(14) Divestiture	−0.04	−0.03	−0.06	−0.07	−0.02	−0.01	0.03	0.00	0.04	0.00	−0.01	−0.01	−0.01	1.00								
(15) Diversifying Deal	−0.02	−0.03	−0.01	−0.01	0.00	−0.02	0.00	0.01	0.02	−0.01	0.10	−0.02	−0.02	0.01	1.00							
(16) All Cash	0.06	−0.09	0.20	0.20	0.24	0.20	0.01	0.04	0.04	0.00	0.08	0.01	−0.02	−0.05	0.13	1.00						
(17) Stake Acquired	0.07	0.13	0.06	0.07	−0.02	−0.01	−0.06	−0.07	−0.07	−0.02	0.01	0.01	0.02	−0.03	0.01	0.00	1.00					
(18) Tender Offer	0.10	0.08	0.18	0.18	0.09	0.07	−0.02	0.02	0.00	0.04	−0.01	0.11	0.11	−0.07	0.01	0.30	0.00	1.00				
(19) Target RoA	−0.12	−0.08	−0.23	−0.23	−0.04	−0.05	0.01	−0.02	−0.01	−0.09	0.04	0.02	0.04	0.04	0.06	0.00	−0.01	−0.07	1.00			
(20) Target Assets	−0.16	−0.02	−0.20	−0.19	−0.10	−0.06	0.01	0.00	−0.01	0.01	0.07	0.05	0.07	0.05	−0.05	−0.22	−0.01	−0.13	0.39	1.00		
(21) Target Leverage	−0.07	0.18	−0.09	−0.09	−0.02	0.00	0.02	−0.01	−0.04	−0.06	0.06	0.02	0.01	0.06	−0.05	−0.29	−0.05	−0.14	0.13	0.44	1.00	
(22) Target Market-to-Book	−0.04	−0.03	−0.03	−0.04	−0.05	−0.07	−0.01	0.01	0.02	0.03	0.02	−0.01	−0.02	0.06	−0.04	−0.08	−0.06	0.00	−0.13	−0.01	0.17	1.00

Table 4-16: Filing date event study results

This table reports the event study results surrounding the security class action lawsuit (SCA) filing date for the companies that are later target firms in our sample of completed M&A transactions. Panel A shows the event study results for all companies, while Panel B and C divide the sample into SCAs that are ultimately settled and dismissed, respectively. Average cumulative abnormal returns (CARs) and median CARs around the SCA filing date are calculated using a three-factor event study model based on Fama and French (1993, 1996) with a 230-day estimation window from $t=-250$ to $t=-21$ days prior to the event date ($t=0$). Average and median CARs are tested for statistical significance using the standard *t*-test and the nonparametric Wilcoxon rank-sum test (Wilcoxon test), respectively. Differences between SCAs that ultimately resulted in a settlement and SCAs that were eventually dismissed are tested for significance using the parametric two-sample *t*-test and the nonparametric Mann-Whitney-U-test are used. *, **, *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Event Window	ACAR (%)	Median CAR (%)	*t*-test (*t*-value)	Wilcoxon test (Z-score)
Panel A: All security class action filings (n=177)				
[−10;+10]	−7.66	−4.38	−3.773***	−3.405***
[−5,+5]	−7.94	−3.99	−4.878***	−4.633***
[−3;+3]	−6.33	−3.66	−4.815***	−4.561***
[−2;+2]	−6.63	−3.28	−5.476***	−5.081***
[−1;+1]	−4.55	−1.89	−4.912***	−4.596***
Panel B: Security class action filings resulting in a settlement (n=127)				
[−10;+10]	−9.44	−7.27	−3.681***	−3.479***
[−5,+5]	−9.96	−6.32	−4.829***	−4.550***
[−3;+3]	−8.20	−4.92	−4.970***	−4.625***
[−2;+2]	−8.56	−4.62	−5.671***	−5.342***
[−1;+1]	−6.14	−3.01	−5.269***	−4.986***
Panel C: Security class action filings resulting in a dismissal (n=50)				
[−10;+10]	−3.12	−1.58	−1.052	−0.767
[−5,+5]	−2.79	−1.80	−1.236	−1.318
[−3;+3]	−1.59	−2.63	−0.842	−1.028
[−2;+2]	−1.73	−0.87	−0.986	−0.758
[−1;+1]	−0.53	−0.26	−0.416	−0.150
Panel D: Differences between eventually settled and dismissed security class actions				
Event Window	ΔACAR (%)	ΔMedian CAR (%)	Two-sample *t*-test (*t*-value)	Mann-Whitney-U-Test (Z-score)
[−10;+10]	−6.32	−5.69	−1.405	−1.497
[−5,+5]	−7.17	−4.51	−2.002**	−1.810*
[−3;+3]	−6.60	−2.30	−2.289**	−2.302**
[−2;+2]	−6.83	−3.75	−2.580**	−2.875***
[−1;+1]	−5.61	−2.76	−2.777***	−3.051***

Table 4-17: Litigation intensity over time and by 3-digit SIC code industry

This table shows the distribution of the *Litigation Intensity* instrumental variable over time on a semi-annual basis, first the average across all 3-digit SIC industries and then split for the ten 3-digit SIC codes with the highest litigation intensity values during the sample period. *Litigation Intensity* is defined as the number of SCAs filed in the 3-digit SIC industry of the target firm within the last half-year prior to the acquisition announcement (see also Table 4-10).

Half-year	**Full Sample**	SIC 737	SIC 283	SIC 602	SIC 367	SIC 384	SIC 873	SIC 366	SIC 621	SIC 738	SIC 481
1999-H2	**0.27**	10	1	2	3	0	1	0	0	2	2
2000-H1	**0.39**	27	4	2	3	2	1	4	2	2	3
2000-H2	**0.37**	27	6	1	2	1	1	5	1	5	11
2001-H1	**0.57**	51	4	1	7	0	1	11	1	4	9
2001-H2	**1.17**	133	6	1	23	5	5	27	1	17	20
2002-H1	**0.41**	7	5	3	4	3	3	9	15	3	4
2002-H2	**0.45**	13	8	13	3	3	0	5	15	2	5
2003-H1	**0.41**	11	9	13	8	3	0	3	6	1	3
2003-H2	**0.32**	10	10	5	5	3	1	0	8	1	2
2004-H1	**0.39**	16	10	6	2	2	0	2	4	0	1
2004-H2	**0.41**	17	11	4	8	4	3	3	1	1	4
2005-H1	**0.38**	15	11	5	6	5	3	5	4	0	0
2005-H2	**0.25**	7	7	3	2	3	2	0	0	3	0
2006-H1	**0.23**	5	5	0	5	1	0	2	0	2	2
2006-H2	**0.19**	7	6	0	6	2	0	3	0	1	0
2007-H1	**0.23**	4	9	3	4	1	0	4	0	0	1
2007-H2	**0.39**	4	7	5	5	2	3	5	1	4	3
2008-H1	**0.37**	2	5	25	2	4	1	1	12	3	2
2008-H2	**0.36**	6	6	13	9	6	2	3	8	0	0
2009-H1	**0.24**	3	3	15	0	1	0	1	11	2	2
2009-H2	**0.27**	2	10	7	1	4	0	1	1	1	1
2010-H1	**0.25**	2	8	8	2	5	1	3	3	1	0
2010-H2	**0.35**	9	11	10	0	4	0	1	2	0	0
2011-H1	**0.34**	12	3	7	4	1	3	4	1	0	3
2011-H2	**0.34**	8	9	4	4	5	0	2	2	3	1
2012-H1	**0.34**	9	10	5	2	5	2	3	1	1	0
2012-H2	**0.23**	3	8	3	1	3	1	3	1	2	0
2013-H1	**0.27**	4	9	3	8	4	1	1	0	0	3
2013-H2	**0.32**	8	10	0	2	9	2	5	0	2	2
2014-H1	**0.28**	7	13	1	4	1	2	1	1	5	1
2014-H2	**0.34**	6	17	4	1	4	5	1	3	3	0
2015-H1	**0.36**	12	7	0	6	4	4	3	1	2	0
2015-H2	**0.41**	10	11	2	5	4	9	3	1	4	2
2016-H1	**0.43**	10	15	7	3	9	4	2	3	1	2
2016-H2	**0.56**	12	26	5	4	3	6	1	1	2	1
2017-H1	**0.79**	19	28	8	4	12	13	1	3	10	5
2017-H2	**0.65**	18	20	11	8	4	13	4	0	6	1
2018-H1	**0.70**	18	17	3	8	6	10	5	0	4	2
2018-H2	**0.70**	27	21	5	7	5	6	1	1	4	3
2019-H1	**0.69**	20	21	8	8	7	9	3	1	4	6
2019-H2	**0.75**	27	31	6	3	11	8	4	2	4	2
2020-H1	**0.59**	20	21	11	4	6	6	2	2	1	2
2020-H2	**0.51**	21	22	6	4	7	11	1	0	1	0
2021-H1	**0.38**	20	14	1	2	2	10	2	0	1	1
Full Sample	**0.41**	**15.09**	**11.00**	**5.44**	**4.49**	**3.91**	**3.40**	**3.33**	**2.67**	**2.56**	**2.49**

Table 4-18: Propensity score matching model and results

The table reports the outcome of the propensity score matching (PSM) analysis. The treatment variable is assigned the value of one if the target firm is subject to an ongoing security class action lawsuit (SCA), and zero otherwise. Panel A presents the logit model used to estimate the likelihood of a target firm being SCA-affected. Panel B presents the matching algorithm whereby a nearest-neighbor matching procedure with replacement is used. We report the number of treated and control observations on the matched sample. In Panel C the mean of each variable in the treated group and the control group is reported, in addition to the bootstrapped *p*-value from the *t*-test of the null hypothesis that the difference is statistically equal to zero, both before and after matching. All variables are defined in Table 4-10.

Panel A: Logit model

Financial Acquirer	*Contested Bid*	*Divestiture*	*All Cash*	*Target RoA*	*Target Assets*	*Target Leverage*	N
0.187 (0.271)	0.226 (0.318)	−0.531 (0.528)	−0.137 (0.174)	−0.764*** (0.263)	0.270*** (0.052)	−1.392*** (0.441)	2,607

Panel B: Matching results

	Matching specifications
Matching procedure	Nearest neighbor
Matched observations per treated deal	1:1
Number of treated observations	212
Number of control observations	212

Panel C: Covariates' balancing

Sample	Before matching			After matching		
Variable	Treatment	Control	*p*-value	Treatment	Control	*p*-value
Financial Acquirer	0.106	0.092	0.50	0.106	0.087	0.51
Contested Bid	0.072	0.050	0.17	0.072	0.072	1.00
Divestiture	0.034	0.055	0.20	0.034	0.024	0.56
All Cash	0.534	0.544	0.77	0.534	0.563	0.56
Target RoA	−0.256	−0.094	0.00	−0.256	−0.210	0.55
Target Assets	12.858	12.511	0.01	12.858	12.905	0.79
Target Leverage	0.187	0.245	0.02	0.187	0.165	0.31

Table 4-19: Regressions on takeover premiums and target M&A announcement returns including

This table reports the regression results for the sensitivity analyses including acquirer controls for the takeover premiums and the target M&A announcement returns. Panel A reports the results using the initial takeover premium (columns (1) and (2)) and the combined takeover premium (columns (3) and (4)) compared to the target firm's stock price 42 trading days before the acquisition announcement as dependent variables. Panel B reports the regression results using the target cumulative abnormal returns (CARs) for the [−1;+1] and [−3;+3] event windows surrounding the M&A announcement date as the dependent variables. The target CARs are calculated using a three-factor model based on Fama and French (1993, 1996) with a 230-day estimation window from $t=-250$ to $t=-21$ days prior to the event date ($t=0$). The variable of interest is *SCA*, defined as one if the target firm is affected by a security class action lawsuit (SCA) that has not yet resolved at the time of M&A announcement, and zero otherwise. The SCA variable is also split into the two binary variables *Dismissed* and *Settled*, which take the value of one if the SCA is eventually dismissed or settled, respectively, and zero otherwise. The other variables are divided into deal controls, target controls, and acquirer controls. All variables are defined in Table 4-10. The standard errors are corrected for heteroskedasticity with associated *t*-values given in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Takeover premiums

	(1) Initial Premium ($t=-42$)	(2) Initial Premium ($t=-42$)	(3) Combined Premium ($t=-42$)	(4) Combined Premium ($t=-42$)
Security class action variables				
SCA	−0.110***		−0.092**	
	(−2.795)		(−2.102)	
Dismissed		−0.125**		−0.090
		(−2.399)		(−1.309)
Settled		−0.105**		−0.093*
		(−2.194)		(−1.802)
Constant	0.010	0.011	−1.171***	−1.171***
	(0.026)	(0.028)	(−3.667)	(−3.667)
Deal controls	Yes	Yes	Yes	Yes
Target controls	Yes	Yes	Yes	Yes
Acquirer controls	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Observations	1,232	1,232	1,259	1,259
R-squared	0.145	0.145	0.154	0.154

Panel B: Target CARs

	(1) $CAR_{[-1;+1]}$	(2) $CAR_{[-1;+1]}$	(3) $CAR_{[-3;+3]}$	(4) $CAR_{[-3;+3]}$
Security class action variables				
SCA	−0.042*		−0.046*	
	(−1.742)		(−1.884)	
Dismissed		−0.056*		−0.060*
		(−1.810)		(−1.951)
Settled		−0.037		−0.041
		(−1.256)		(−1.374)
Constant	0.424**	0.425**	0.310*	0.311*
	(2.351)	(2.353)	(1.671)	(1.674)
Deal controls	Yes	Yes	Yes	Yes
Target controls	Yes	Yes	Yes	Yes
Acquirer controls	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Observations	1,186	1,186	1,186	1,186
R-squared	0.190	0.190	0.183	0.183

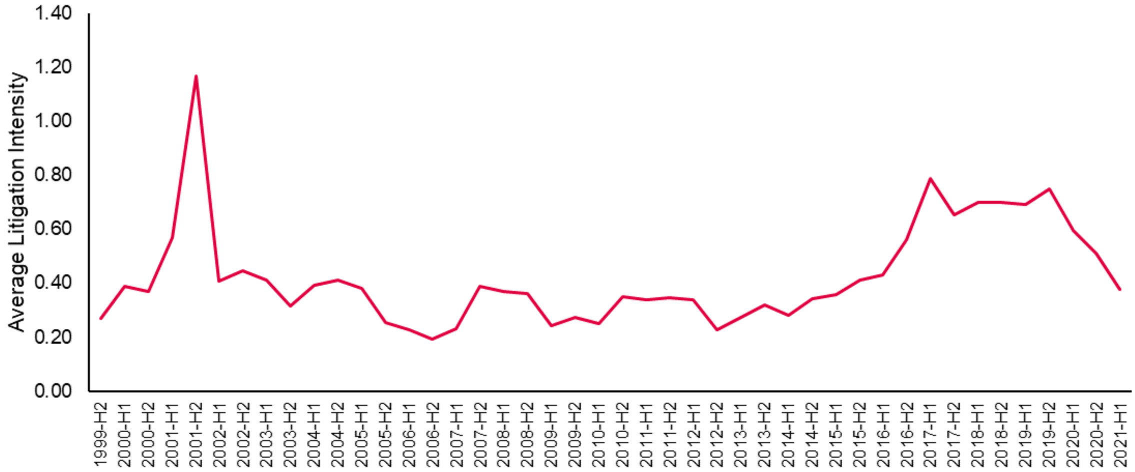
Table 4-20: Security class actions and the likelihood of deal completion including acquirer controls

This table reports the logit regression results on the effect of security class action lawsuits (SCAs) on the likelihood of deal completion. The dependent variable is *Completion*, a binary variable equal to one if the deal was completed and zero if the deal was withdrawn. The variables of interest are *SCA*, defined as one if the target firm is affected by an SCA that has not yet resolved at the time of M&A announcement, and zero otherwise, and *Acquirer Term Fees* and *Target Term Fees*, defined as one if the acquisition agreement contained acquirer or target termination fees, respectively, and zero otherwise. The SCA variable is also split into the two binary variables *Dismissed* and *Settled*, which take the value of one if the SCA is eventually dismissed or settled, respectively, and zero otherwise. The other variables are divided into deal controls, target controls, and acquirer controls. All variables are defined in Table 4-10. The standard errors are corrected for heteroskedasticity with associated *z*-values given in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

	Completion					
	(1)	(2)	(3)	(4)	(5)	(6)
Termination fee related variables						
Acquirer Term Fees	1.191***	1.359***	1.360***			
	(4.729)	(4.809)	(4.808)			
Target Term Fees				2.579***	2.695***	2.696***
				(11.667)	(11.879)	(11.837)
Acquirer Term Fees×SCA		−1.398**				
		(−2.165)				
Acquirer Term Fees×Dismissed			−1.247			
			(−1.190)			
Acquirer Term Fees×Settled			−1.459*			
			(−1.923)			
Target Term Fees×SCA					−1.474**	
					(−2.097)	
Target Term Fees×Dismissed						0.688
						(0.741)
Target Term Fees×Settled						−2.334**
						(−2.387)
Security class action variables						
SCA	−0.181	0.179		−0.301	0.695	
	(−0.595)	(0.487)		(−0.810)	(1.134)	
Dismissed			0.188			−0.522
			(0.294)			(−0.851)
Settled			0.176			1.276
			(0.398)			(1.414)
Constant	13.508***	14.592***	14.605***	14.016***	15.618***	14.955***
	(7.250)	(7.777)	(7.789)	(6.914)	(7.508)	(7.199)
Deal controls	Yes	Yes	Yes	Yes	Yes	Yes
Target controls	Yes	Yes	Yes	Yes	Yes	Yes
Acquirer controls	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,496	1,496	1,496	1,496	1,496	1,496
Pseudo R-squared	0.267	0.270	0.270	0.370	0.374	0.377

Figure 4-3: Litigation intensity over time

This figure shows the average of the *Litigation Intensity* variable across all 3-digit SIC-codes on a semi-annual basis from 1999-H2 to 2021-H1. *Litigation Intensity* is defined as the number of SCAs filed in the 3-digit SIC industry of the target firm within the last half-year prior to the acquisition announcement (see also Table 4-10).



5 GENERAL CONCLUSION

This dissertation explores three distinct situations that may promote acquisitive behavior by firms, namely financial sponsor backing in the post-IPO phase, corporate innovation, and ongoing legal disputes in the form of security class action lawsuits.

In Chapter 2, I investigate the influence of initial investor backing on post-IPO acquisition behavior. My results suggest that going public promotes the pursuit of acquisitions for all types of firms, irrespective of their prior financial sponsor affiliation. The positive influence of IPOs on M&As is most evident for PE-backed newly public firms which engage in three times as many acquisitions as their VC-backed and twice as many acquisitions as their non-backed peers. PE-backed newly public acquirers also achieve significantly positive M&A announcement returns as well as long-run post-IPO stock returns while those of VC-backed newly public firms remain indistinguishable from zero, suggesting that PE-backed newly public firms are able to create shareholder value through M&As.

In Chapter 3, I examine the ramifications of corporate innovations on M&As. I document that acquiring firms are willing to pay higher premiums for innovative targets than for non-innovative ones. Further, I show that this increased willingness to pay is elevated if the acquiring firm itself is innovative, indicating that the value of acquiring innovation depends on a firm's own innovative capabilities. Innovative acquirers do not experience more negative M&A announcement returns than non-innovative ones when acquiring innovative target firms. This suggests that innovative acquirers can outbid their non-innovative peers without negative repercussions, thus describing a self-reinforcing dynamic as innovative acquirers may become more and more innovative by acquiring other innovative firms without a backlash from their shareholders. Finally, I also extend my analysis to rival firms and find that particularly innovative acquirer rivals react to their competitor's M&A announcement by increasing their R&D expenditures and by being more likely to acquire a technology firm themselves.

In Chapter 4, I explore the consequences of ongoing litigation in the form of SCAs at the target firm for M&As. The results show that target firms with a pending SCA obtain lower takeover premiums and M&A announcement returns. Likewise, the acquirers of these SCA-affected target firms are also worse off as their announcement returns are more negative than those of their peers who acquire non-SCA-affected targets. In the long-run, however, acquirers of SCA-affected targets are able to recoup some of their losses if the SCA is later dismissed and thus does not lead to a costly settlement, suggesting that acquirers may benefit if they can accurately predict the legal outcome of the SCA.

My findings shed additional light on the underlying motivation that leads firms to engage in acquisitions. While shareholder value creation through the means of M&As is far from guaranteed, the three studies presented in this dissertation show that acquirers may benefit if they pursue certain strategies and acquisition rationales. These results may not only be informative to academia but also to corporate stakeholders and investors alike who may wish to gauge the merits of individual acquisitions.

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DECLARATION OF HONOR

I declare upon my word of honor that the dissertation submitted herewith is my own work. All sources and aids used have been listed. All references or quotations in any form and their use have been clearly identified. The dissertation has not been submitted for examination purposes to any institution before.

Ich erkläre hiermit ehrenwörtlich, dass ich die vorliegende Arbeit selbständig angefertigt habe. Sämtliche aus fremden Quellen direkt und indirekt übernommene Gedanken sind als solche kenntlich gemacht. Die Dissertation wurde bisher keiner anderen Prüfungsbehörde vorgelegt und noch nicht veröffentlicht.

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