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Essays on Acquisitions of Private Companies

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Declaration

I certify that the thesis I have presented for examination for the Ph.D. degree of the London Business School is solely my own work.

London, April 2013 *Lora Dimitrova*

Abstract

This thesis is an empirical investigation into various aspects of acquisitions of private companies, their determinants, performance and governance.

In Chapter 2 of my thesis I study acquisitions of entrepreneurial ventures by corporate venture capital (CVC) investors as a way to access external innovation. I find that the likelihood of such an acquisition decreases with the uncertainty associated with the venture's innovation and increases with the number of CVCs co-invested in the venture. Moreover, CVCs with lower level of internal innovation are more likely to acquire portfolio ventures. However, the acquisition signals poor prospects for future innovation, which explains the negative market reaction to the announcements of such deals.

In Chapter 3 of my thesis I examine the performance of acquisitions by Special Purpose Acquisition Companies (SPACs) and show that a significant portion of the cross-sectional variation in performance can be explained by the strong implicit incentives embedded in the SPAC contract. For instance, the short-term performance of SPAC acquirers is worse for acquisitions that are announced closer to the 2-year deadline (SPACs are given two years to complete a deal), for acquisitions where a portion of the IPO underwriting fees are being deferred and paid conditionally on a successful merger completion, and for acquisitions that have a market value very close to the required 80% threshold.

In the last chapter of my dissertation I analyze the effect of target insiders' ownership on the performance of acquisitions involving private targets. My findings suggest that there is a concave relationship between the market reaction upon the announcement of an acquisition of a private target and target insiders' ownership. This result is primarily driven by the monitoring that target insiders provide, when they are elected as directors on the board or when they become blockholders in the merged firm.

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For any errors or inadequacies that may remain in this work, of course, the responsibility is entirely my own.

To my family

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Chapter 1

Introduction

This thesis is organized in three chapters that study different aspects of acquisitions of private companies. The first chapter examines the determinants and performance of acquisitions of entrepreneurial ventures by CVC acquirers. The second chapter studies acquisitions of predominantly private companies by SPAC bidders and the effect of the specific SPAC contract structure on shareholder value. The third chapter examines the influence of target insiders' ownership on value creation in mergers involving private targets. A brief overview of each chapter is provided in what follows.

In Chapter 2 of my thesis, "Strategic Acquisitions by Corporate Venture Capital Investors", I study acquisitions of external innovation by CVC investors. Unlike traditional venture capitalists, corporate venture capital investors are likely to eventually acquire portfolio ventures. I find that the likelihood of such an acquisition decreases with the uncertainty associated with the venture's innovation and increases with the number of CVCs co-invested. Moreover, CVCs with lower level of internal innovation are more likely to acquire portfolio ventures. However, the acquisition signals poor prospects for future innovation, which explains the negative market reaction to the announcements of such deals. I also show that CVCs appear to be learning through active management of their portfolios and acquire ventures backed by other CVCs when their own portfolio performs poorly.

In Chapter 3 of my thesis, "The Perverse Incentives of SPACs", I examine the performance of acquisitions by SPACs and show that a significant portion of the cross-sectional

variation in performance can be explained by the strong implicit incentives embedded in the SPAC contract. For instance, the short-term performance of SPAC acquirers is worse for acquisitions that are announced closer to the 2-year deadline (SPACs are given two years to complete a deal), for acquisitions where a portion of the IPO underwriting fees are being deferred and paid conditionally on a successful merger completion, and for acquisitions that have a market value very close to the required 80% threshold (at least 80% of the SPAC's net assets must be spend on the target business). This evidence suggests that some of the incentives in the contract may lead to value-destroying outcomes. While the continued involvement of SPAC sponsors as shareholders and CEOs in the new companies improves long-term performance, extremely high levels of sponsor ownership are found to be detrimental for performance. Surprisingly, the presence of institutional investors is also negatively related to performance, possibly because of the temporary cessation of lending to hedge funds during the financial crisis of 2008.

In Chapter 4 of my dissertation, "Monitoring Effects in Acquisitions of Private Companies", I analyze the ownership structure of private targets and the effect of target insiders' ownership on the performance of acquisitions involving private targets. My findings suggest that there is a concave relationship between the market reaction upon the announcement of an acquisition of a private target and target insiders' ownership. This result is primarily driven by the monitoring that target insiders provide, when they are elected as directors on the board or when they become blockholders in the merged firm. The market reacts more positively to an acquisition of a private target with low levels of insiders' ownership, relative to an acquisition of a target with high levels of insiders' ownership. The concave relationship between the market reaction and target insiders' ownership suggests that monitoring by insiders whose incentives are aligned with those of minority shareholders is beneficial for the new company, while monitoring by entrenched insiders is detrimental.

Chapter 2

Strategic Acquisitions by Corporate Venture Capital Investors

2.1 Introduction

Over the past decade, large established companies have undertaken substantial corporate venture capital (CVC) investments in innovative start-ups. In 2011 alone, CVCs invested $2.3 billion into 551 deals, representing 15% of all venture capital deals during that year. These investments are typically minority equity stakes held either directly or through wholly-owned subsidiaries. Such CVCs (e.g., "Intel Capital") bring a unique and specialized perspective to venture investing and are increasingly active in supporting the growth of emerging technologies.[1]

CVC investing is often viewed as an effective way for established companies to benefit from R&D conducted more efficiently by external units (Fulghieri and Sevilir 2009a). And indeed, firms investing in CVC enjoy a significant increase in their innovation rates and higher firm value (Dushnitsky and Lenox 2005b; 2006). CVCs also appear to provide portfolio ventures with valuable inputs improving operating and stock performance, at least when the CVCs play a complementary rather than competing role (Ivanov and Xie 2010). Yet, the extent to which CVC investments benefit the parent company, and the mechanisms through which CVCs add value remain ill-understood. For instance, while "identifying acquisition opportunities" has been a prominent motive for corporate venture investing, CVC acquisitions have been overlooked (Alter and Buchsbaum 2000).

Unlike traditional VCs, who mainly seek financial gains from selling portfolio firms, CVC investors have the additional goal of obtaining strategic benefits that arise from synergies with their existing activities (Hellmann 2002). For this reason, CVCs generally have strong incentives to acquire their portfolio companies, even if this does not maximize the CVC's financial returns from these investments (Masulis and Nahata 2011). Previous research shows that CVC takeovers of own portfolio companies are typically met with a negative stock price reaction, although this is not true for their acquisitions of other entrepreneurial firms (Benson and Ziedonis 2010). This raises the question of why corporate investors are willing to acquire portfolio companies. In this paper, I address this question by studying the determinants of acquisitions of CVC-backed entrepreneurial firms by 54 large U.S. corporate venture capitalists from 1987 to 2010. I also study whether these determinants explain the cross-sectional variation in acquisition performance.

I hypothesize that the timing of a CVC's decision to acquire a portfolio firm results from the trade-off between two opposing forces. On the one hand, the CVC is better off waiting for the venture's uncertainty to resolve before exercising its option to acquire it. Therefore, the likelihood of an acquisition should decrease with the venture's residual

[1] Corporate venture capital, is significantly different from traditional venture capitalists in organizational structure, objectives, investment behavior, and the range of services provided to portfolio companies (Gompers and Lerner 2000a).

uncertainty. On the other hand, by waiting, the CVC runs the risk of being scooped for the venture, in particular by other CVCs co-invested in it. Therefore, the likelihood of an acquisition should increase with the number of competing CVC investors (Grenadier 2002; Morellec and Zhdanov 2005).

I find that CVCs are less likely to acquire portfolio ventures with higher residual uncertainty. I measure the uncertainty associated with the venture's innovation using three alternative measures: number of patents, number of citations, and number of backward citations (references made to prior patents). Because patents and citations may also measure venture performance, I create my third measure of venture uncertainty, backward citations. I find that my results are statistically significant only when I use this last measure. In particular, an increase in the venture uncertainty by one standard deviation reduces the likelihood of a portfolio acquisition by 14%. Moreover, I find that as the number of other CVC investors co-invested in the venture increases, a CVC acquisition is more likely to occur, and to occur earlier.[2] For instance, going from two to four CVC investors increases the likelihood of an acquisition by 29%. In contrast, increasing the number of traditional VCs invested in the venture reduces the probability of a portfolio acquisition.[3] This is consistent with VCs favoring the most profitable exit, which may be an IPO or a trade sale to an outside buyer.

If CVCs manage actively their portfolios, I expect their decision to acquire portfolio venture to depend on the uncertainty associated with all *other ventures* included in the CVC's investment portfolio.[4] I test two alternative hypotheses. On the one hand, if CVCs transfer knowledge between portfolio ventures, and potentially reduce residual venture uncertainty, the probability of an acquisition should decrease with portfolio uncertainty (George et al. 2001). On the other hand, if allocating scarce resources to the most promising portfolio venture implies that start-ups effectively compete with one another for limited CVC capital, the probability of an acquisition should increase with portfolio uncertainty (Inderst, Mueller and Münnich 2007). I find support for the latter. In other words, CVC investors are more likely to acquire an innovative venture when the degree of innovation of its portfolio ventures is more uncertain (Fulghieri and Sevilir 2009b).[5]

I conjecture that the timing of the CVC's decision to acquire also depends on the

[2]I use the number of CVCs invested in a given start-up company to measure the degree of potential competition.

[3]Typically corporate investors co-invest with traditional VCs. I find that portfolio ventures acquired by CVC investors are, on average, backed up by 3.7 traditional VC investors and 1.7 CVC investors. I use the number of traditional VCs co-invested in the venture to measure the degree of uncertainty associated with their presence.

[4]I use three alternative measures of portfolio uncertainty: portfolio patents, portfolio citations, and portfolio backward citations.

[5]Moreover, I also find that CVCs are more likely to acquire portfolio ventures when their holding portfolio is less diversified. I measure portfolio diversification by counting the number of all *other ventures* included in the investment portfolio of a given CVC investor.

level of the CVC's own innovation, measured by its patent stock. Some CVCs may be more efficient in producing innovations in-house, while others may choose to outsource R&D and acquire external innovations (Sevilir and Tian 2012). Therefore, controlling for R&D expenditures, the likelihood of an acquisition should decrease with the level of CVC's internal innovation. I find that an increase in the number of CVC patents by one standard deviation reduces the likelihood of a portfolio acquisition by over 39%.[6] This is consistent with corporate investors with a poor innovation record being more dependent on external innovation and therefore more likely to acquire one of their portfolio ventures.

Next, I study the market reaction to acquisitions by CVC investors. Like Benson and Ziedonis (2010), I find that CVC investors experience an average significant negative abnormal return of -0.60%, when they acquire portfolio companies, but not when they acquire non-portfolio CVC-backed ventures.[7,8] Moreover, CVC acquirers with high levels of internal innovation experience more positive stock price reactions. Increasing the number of CVC patents by one standard deviation leads to an increase in the acquirers' cumulative abnormal returns (CARs) by over 6.8%. Consistent with my previous results that CVCs with less efficient internal innovation are more likely to acquire portfolio ventures, I find that the market reacts more negatively to the announcement of such deals. The decision of a CVC to acquire a portfolio venture reflects the CVC acquirer's high dependence on external innovation.

It is also common for CVC investors to acquire non-portfolio ventures backed by other CVCs. For such acquisitions, the results are slightly different.[9] I find that while the degree of venture uncertainty does not affect the decision of CVC investors to acquire a non-portfolio venture, portfolio uncertainty does. I find that the estimated effects are over twice as large as those for acquisitions of portfolio ventures. For instance, increasing portfolio uncertainty from its 25^{th} percentile to the 50^{th} percentile increases the probability that a CVC investor buys a non-portfolio venture by more than 29.3%, against 14.7% for a portfolio venture. In other words, CVCs appear to be learning through active management of their portfolios and acquire ventures backed by their competitors when their own portfolio performs poorly.

Similar to acquisitions of portfolio ventures, I find that the likelihood of a non-portfolio acquisition increases with the number of CVCs involved. To preempt the potential com-

[6] My results are even stronger when I scale the number of patents owned by the CVC investor by its R&D expenses.

[7] On a dollar-value basis, these estimates suggest that the average portfolio acquisition is associated with a loss of $45.9 million in CVC's shareholder value.

[8] Although, when I take into account the significant positive market reaction to the initial CVC investments made in portfolio ventures, I show that acquisitions of portfolio ventures are actually not worse than acquisitions of non-portfolio ventures.

[9] Non-invested CVC acquirers, unlike CVCs that have backed the venture, face higher degree of information asymmetry.

petition from invested CVCs, outside corporate bidders are more likely to acquire the venture earlier. However, the presence of VCs co-invested in the venture does not appear to affect CVC acquisitions of non-portfolio ventures. I also find that unlike for portfolio ventures, the likelihood of acquisitions of non-portfolio ventures is independent of the level of innovation of the CVC acquirer. Moreover, the level of CVC's innovation does not affect the performance of non-portfolio acquisitions; possibly because acquirers of non-portfolio ventures have not previously invested in the venture, and thus, have not shown intentions of acquiring its innovation. Further, the target insiders, unaware of the CVC's own innovation and its willingness to pay for external innovation, earn lower premiums. Hence, my findings can explain some of the difference in performance between acquisitions of portfolio versus non-portfolio ventures.

A potential issue is that CVCs' investment choices are endogenous. As a further check, I perform Heckman two-stage estimation. The results are robust and remain largely unchanged after taking into account the selectivity correction. I also examine my data in a duration framework to address the issue of timing of the acquisition. I use a Cox proportional hazard model, which in contrast to the logit approach, does not assume the probability of an acquisition to be constant over time. I confirm that my findings do not suffer from survivorship bias.

This paper relates to three strands of literature. First, CVCs have received only limited attention in the finance literature, which unlike the management studies, either ignores them or bundles them together with traditional VCs.[10] To my knowledge, the only paper that studies CVC acquisitions is Benson and Ziedonis (2010). The authors find that, unlike acquisitions of other companies, CVCs experience significant negative abnormal returns when they acquire portfolio ventures.[11] My paper contributes to our understanding of CVC by examining the determinants of such acquisitions. Moreover, I show that some of these determinants can explain part of the difference in performance between acquisitions of portfolio versus non-portfolio ventures. Second, the role of M&A for innovation has recently received attention.[12] Established firms may prefer acquiring smaller innovative firms to conducting R&D in-house. My study sheds light on M&A as a way to access external innovation, by showing that CVCs with poor internal innovation, are more likely to acquire external knowledge. Last, relatively recent and limited research has shown that individual investments are not evaluated in isolation, as predicted by standard models.[13] By documenting the effect of the overall venture portfolio innovativeness and diversification on the CVC investment decisions about individual portfolio and non-portfolio companies,

[10]CVC has been mainly examined by management scholars (See Chesbrough 2002; Dushnitsky and Lenox 2005b).

[11]The authors cannot explain the negative CARs by overconfidence, poor governance, or by competition-driven overbidding by the CVC acquirer.

[12]For instance, see Sevilir and Tian (2012), and Phillips and Zhdanov (2012).

[13]See Kanniainen and Keuschnigg (2004), Inderst, Muller and Münnich (2007), and Sorensen (2008).

this paper also relates to the limited literature on interactions among investments and CVC firms' investment strategies.

The paper proceeds as follows. Section 2.2 discusses the literature and derives hypotheses about the decision of the corporate investor to acquire a CVC-backed venture. Section 2.3 describes the data set and summarizes the characteristics of the sample. Section 2.4 presents the empirical results. Section 2.5 concludes.

2.2 Literature and Hypothesis Development

This section starts with a discussion of the concept of open innovation and the use of CVC investments as a way to access external innovation. Next, it develops the hypotheses about the determinants of the corporate investor's decision to acquire a portfolio venture. The second half of the section discusses the decision of CVC investors to acquire a non-portfolio venture.

2.2.1 Open Innovation Paradigm

Firms increasingly use CVC as a "window onto new technologies" that gives them access to highly innovative start-ups, and knowledge that resides outside their boundaries. Fulghieri and Sevilir (2009a) show that with a high level of competition CVC emerges as an optimal investment strategy, especially in innovation-intensive sectors. As the intensity of the race to innovate increases, firms move from internal to external organization of innovation, and increase the success rate of their R&D projects by providing a greater proportion of the financing needs of the R&D project in the form of CVC investments.

The advantage of external innovation comes from the potential to mitigate the moral hazard problem, on the part of the inventor (entrepreneur), arising from the separation of ownership and management. According to the principal-agent conflict, managers are more risk averse than shareholders and avoid innovative projects that will increase the riskiness of the firm. Managers may be reluctant to take variance-increasing R&D projects, which shareholders would like to undertake, and as a result the internal innovation, and long-term investments of the firm can suffer. When innovation is not developed internally, as is the case of CVC investments, the property rights of any future innovation remain in the hands of the innovative start-up companies, and therefore they have stronger incentives to exert effort (Grossman and Hart 1986; Hart and Moore 1990). Moreover, the inability of CVC investors and start-up companies to write ex ante contracts specifying the conditions

at which the innovation is delivered and implemented, leads to incomplete contracts. This implies that any preexisting sharing rule is renegotiated away, and the division of the surplus is determined entirely by interim bargaining. Thus, the innovative venture's payoff is independent from any equity stake that the CVC investor may have in the venture's equity. Acquisitions, on the other hand, result in weaker incentives for the innovative ventures, since the CVC acquirer obtains all property rights of any future innovation. Hence, acquisitions may be costly for the CVC firm because they may lead to a lower probability of obtaining innovation. Unless corporate investors are certain about the nature and value of the venture's innovation they will be cautious taking control over the innovative start-up company.

While CVC investments may alleviate the moral hazard problem, they may increase the problem of asymmetric information between the inventor and the CVC investor. An inventor frequently has better information about the likelihood of success and the nature of the contemplated innovation project than the corporate investor. The asymmetric information problem could lead to Akerlof's (1970) "market for lemons". When the level of intellectual property rights is a highly observable signal, as it is in the U.S., the "lemons" problem could be potentially mitigated, but certainly not eliminated. Moreover, start-up firms are reluctant to reduce the information asymmetry, by revealing their innovative ideas to CVC investors, because of fear of expropriation or imitation of their ideas. In other words, because there could be a substantial cost of revealing information to their competitors, start-up companies have an incentive to reduce the quality of the information they provide about the potential of the venture. CVC investments allow investors to minimize commitment and downside risk, while retaining their ability to gain via subsequent investments from the upside potential of good ideas.[14]

According to Siegel et al. (1988), CVC investors rate "exposure to new technologies and markets" and "potential to acquire companies" among their top five reasons for investing in start-ups. Similarly, Alter and Buchsbaum (2000) report that "identifying acquisition opportunities" is a prominent motive for corporate venture investing. CVC investments that precede acquisitions of full control limit downside risk for corporate investors by providing them with valuable information about their ventures' markets and technologies (Dushnitsky 2006). This information provides investors with an advantaged position relative to non-investors, and allows both investors and ventures to make more informed and better decisions about the acquisition (Roberts and Weitzman 1981). However, since the patent stock of a company is publicly available information, one may argue

[14]First, in the presence of potentially unfavorable outcomes, the investor can minimize its losses by abandoning the investment, by selling or writing off its equity stake (Li and Mahoney 2011). Second, the investor can defer action and allow uncertainty to resolve over time (Dixit and Pindyck 1994). Third, given that CVC investments provide privileged access to valuable real options, investors may decide to exercise their option by taking on subsequent investment opportunities. For example, by taking a full control of the venture.

that in addition to CVC investors any potential bidder has the option to acquire the venture. Therefore, in order to differentiate between CVC acquisitions of portfolio ventures and CVC acquisitions of non-portfolio ventures, in my analysis, I implicitly assume that the asymmetric information between the innovative ventures and CVC investors is lower relative to the incomplete information between the ventures and outside CVC companies that have never invested in them.[15]

Ventures have high dissolution rates and often work with new technologies in unproven markets, creating uncertainty about viability of the technology and the venture.[16] McDonald and Siegel (1986) and Pindyck (1988) use a contingent claims framework to value the option to postpone irreversible investment in the presence of uncertainty. They show that uncertainty lowers irreversible investment in two ways. First, the value of waiting causes firms to defer investing in a given project until uncertainty is resolved. Second, uncertainty lowers investment by reducing the optimal size of risky projects. However, a maintained assumption in the above models is that firms hold exclusive property rights to their options, and that their own-firm investment returns are independent of rivals' investment returns.

Recent takeover models address these concerns by introducing strategic interactions. On the one hand, some argue that competition erodes real option values and reduces investment delays (Grenadier 2002; Lambrecht and Perraudin 2003; Morellec and Zhdanov 2005). On the other hand, other studies show that the prediction that competition drives option premia to zero is not generally true (Novy-Marx 2007). Therefore, while the effect of product market competition on investment is an empirical issue, it is important to study the decision of CVC investors to acquire, while taking into account the strategic acquisition decisions of other corporate investors. Morellec and Zhdanov (2005), show that the timing and the terms of the acquisition are determined jointly in the presence of competition and imperfect information. Because the future value of the innovative venture is uncertain, there is opportunity cost of acquiring it today, "the option to wait". However, when there is competition and fear of preemption, the option to wait becomes less valuable and this speeds up the acquisition process. This may be especially true for CVC investors that are in a weaker competitive position and rely largely on external innovation. Finally, the choice to acquire may also depend on the uncertainty associated with the corporate venture portfolio, which includes all other start-up companies backed by the CVC investor. I develop the testable hypotheses in more detail below.

[15] In other words, while both acquirers (invested CVC acquirers and non-invested CVC acquirers) hold options, the option of the former has a lower volatility. Therefore the "option to wait" is less valuable for invested CVC acquirers than for non-invested CVC acquirers.

[16] If the start-up fails, its assets cannot be easily redeployed, making the investment largely irreversible (Li and Mahoney 2011).

Venture Uncertainty

New ventures are typically engaged in developing novel technologies that are often characterized by significant uncertainty related to the technological arena the venture is pursuing. They exhibit significant volatility in terms of their survival and future economic returns (Li and Mahoney 2011). Technological uncertainty is an important aspect of uncertainty that innovations are faced with. Furthermore, the level of venture uncertainty could influence the acquisition decision of the CVC investor. As time passes, the technology is being improved, more information becomes available about its commercial viability, and as a result, the uncertainty associated with the venture diminishes. Therefore, I expect that as the technological uncertainty associated with the venture declines, the CVC investor becomes more likely to acquire the start-up.

I estimate the degree of venture uncertainty that CVC investors face, by measuring the uncertainty associated with the start-ups' innovation. An extensive literature on the economics of technological change demonstrates that patenting activity reflects the quality and extent of firm innovation (Hall, Jaffe, and Trajtenberg 2001). I use widely accepted patent-based measures of firm innovative activity that have been shown not only to capture firms' technological contribution but also to be economically meaningful (Hall, Jaffe, and Trajtenberg 2005). The first measure of innovative output that I use is a simple count of the number of patents granted. However, patent counts do not reflect the importance, or novelty of a patent. Therefore, my second metric of innovation involves measuring the value of a patent by counting the number of citations a patent has received following its approval. It should be mentioned that the number of patents and number of citations variables may suffer from truncation bias. The truncation bias stems from the lag in patent approval (of about two years) and the general lag in citations. Thus, towards the end of the sample, patents and citations under report the actual patenting activity since many patents, although applied for, might not have been granted, or cited.

While I use the stock of patents, and stock of citations as proxies of venture uncertainty, it can be argued that these measures also capture venture performance. Start-up companies may use patents to reduce the asymmetric information between their firms and investors, and improve their chances of securing investment. However, although patents may measure uncertainty, if they are correlated with hard-to-measure start-up firm capabilities and characteristics, they may also signal firm quality. I create an additional measure of venture uncertainty, the number of backward citations (references made to prior patents). In particular, I count the number of citations that a granted patent made to previous patents. I conjecture that granted patents that cite fewer previous patents are more self-reliant, and therefore, associated with more uncertainty, relative to granted patents that cite many previous patents, and are generally considered to be more basic.

Competitive Uncertainty

Shared real options may be less attractive than financial options (which are typically exclusive) because counter investments by the competition can erode or even preempt profits (Kester 1984). When options are shared between investors, each firm may have different reasons to hold the option and will usually assign different values to the underlying assets. Anyone of the holding investors will be encouraged to exercise their option earlier than one otherwise would, to preempt the actions of the competitor and extract higher returns (Trigeorgis 1996; Grenadier 2002). The actions of competitive investors may not only increase the price of exercising the option but also reduce its value (Folta and Miller 2002). As more competing investors are sharing the option, the uncertainty associated with capturing value from it increases.

Typically corporate venture capitalists tend to co-invest with other corporations and with traditional VCs (Dushnitsky 2006). Moreover, traditional VC investors invest in start-up companies following their sole financial objective to maximize return on capital. In contrast, most often CVC investors are motivated to invest based on their strategic objectives to learn about a novel technology and develop a new, related business (Dushnitsky and Lenox 2006; Hellman, Lindsey and Puri 2008). As a consequence, CVC investors who wish to acquire a portfolio venture, a venture in which they have been previously investing, face two forms of competitive uncertainty. First, other investors may prefer venture exit via an IPO, or selling the venture to a different acquirer.[17] Second, a corporate investor may face competition from other CVC investors, who also want to acquire the venture. In both cases a CVC investor delaying the acquisition of the portfolio venture creates the risk of preemptive actions by other investors and potential loss of investment opportunity.

These two forms of uncertainty have opposing effects on the probability of a portfolio acquisition. The level of potential competition and the fear of preemption coming from other co-invested CVCs, may encourage the CVC acquirer to take over the venture earlier. VC investors might be more inclined to vote against an acquisition by a CVC insider if they can receive higher financial returns when the the venture is sold via IPO, or to an outside company that does not hold a toehold (pre-bid ownership of target shares).[18] Venture capitalists may prefer the portfolio company to go public because this event typically yields the highest returns for investors (Gompers and Lerner 2000a; Gompers and Lerner 2004). Further, Betton and Eckbo (2000) show that greater bidder toeholds reduce the

[17]For example, the strategic objectives of CVCs are likely to be in conflict with both those of the traditional VCs and the start-up founders, and this may have an impact on the start-up's development, direction, valuation, and exit strategy (Hellmann 2002).

[18]This is assuming that CVC investors with a toehold are unable to renege on their offers, and are not intentionally overbidding in hopes of provoking higher counteroffers (Singh 1998).

probability of competition and are associated with lower bid premiums.[19]

I use the number of VC and CVC investors in a given start-up company to measure the degree of VC and CVC competitive uncertainty associated with the venture. I expect to find a negative relation between the number of VCs that have invested in the start-up, and the probability that one of the CVC investors acquires the venture. In contrast, as the number of competing CVC investors increases, the threat of preemption also increases. Higher uncertainty that a competing corporate investor may acquire the venture first, is expected to have a positive effect on the speed of acquisition. Moreover, the presence of multiple invested CVC investors may also signal higher interest in the start-up firm. Therefore, I expect the more CVCs have invested in the venture, the more likely that the venture is acquired.

CVC Innovativeness

The effect of potential competition, coming from co-invested CVC investors, on the probability of acquisition may differ depending on the level of competitiveness of the CVC acquirer. Although acquiring innovation may be an important motive for undertaking investments in innovative ventures, and subsequently acquiring them, some CVC investors may rely more on external innovation than others (Sevilir and Tian 2012). For instance, CVCs that are more efficient in producing internal innovation may be less likely to react to the threat of competitors. Because they are less dependent on external innovation, their value of the "option to wait" is higher, despite the risk of being overtaken by the competitors. In other words, the costs of acquiring the venture earlier may be lower for corporate investors that are in need to access new innovation, relative to CVCs that are in a strong competitive position. I measure the degree of CVC competitiveness using the stock of patents owned by a given investor.[20] I conjecture that the likelihood that corporate investors acquire a portfolio venture is higher when their own internal innovation is relatively poor.

[19] Other studies explore conflicts of interest in mergers and acquisitions that arise among institutional shareholders, when some institutional investors hold shares in both bidders and targets, and find that they significantly affect managerial merger decisions (Harford, Jenter and Li 2011; Bodnaruk, Massa and Simonov 2009; Matvos and Ostrovsky 2008). Masulis and Nahata (2011) extend this line of research by exploring the conflicts of interest that exist among equity investors in privately held VC- and CVC-backed companies, and show their effects on acquisition profitability and target purchase prices.

[20] My results are robust when I scale the number of patents owned by the CVC investor by its R&D expenses.

CVC Portfolio Uncertainty

Corporate investors typically invest in more than one start-up at any given time, and engage in active portfolio management to maximize the return from their investments. While a smaller portfolio gives stronger incentives for CVCs to provide support to companies, a larger portfolio allows reallocation of human capital across start-ups, which is valuable when the probability of a start-up failing is high, and when start-ups are technologically more related (Kanniainen and Keuschnigg 2004; Fulghieri and Sevilir 2009b). Hence, given the importance of portfolio interactions, it is reasonable to take into account the holding portfolio of CVC investors when examining their decision to acquire.

To measure the size of the CVC's venture portfolio I simply count the number of *all other ventures* that the CVC has invested in for a given year. Therefore, for a given venture i included in the venture portfolio of acquirer k, the portfolio size, $Portfolio\ Size_{itk}$, is the number of all other ventures included in the portfolio of CVC acquirer k in year t, apart from venture i.

$$Portfolio\ Size_{itk} = \sum_{i=1}^{n} Venture_{itk} \text{-} Venture_{itk} \tag{2.1}$$

Because I also study acquisitions by CVC acquirers of non-portfolio ventures, ventures in which they have not been previously investing, the CVC's portfolio size at the time of a non-portfolio acquisition will be the sum of all ventures included in the CVC's portfolio. In other words, for a non-portfolio venture j, acquired by CVC acquirer k but not included in its venture portfolio, the portfolio size, $Portfolio\ Size_{jtk}$, is the number of all ventures that CVC acquirer k is invested in for a given year t.

$$Portfolio\ Size_{jtk} = \sum_{i=1}^{n} Venture_{itk} \tag{2.2}$$

To measure the degree of innovation on a venture portfolio level, rather than on an individual start-up level, I create three additional variables. The first measure is the sum of all granted patents to the *other ventures* included in the venture portfolio of a given CVC investor. Specifically, let $Patents_{itk}$ be the cumulative number of patents that venture i, from the portfolio of CVC acquirer k holds in year t. The number of patents of the *other ventures* included in the CVC portfolio, $Portfolio\ Patents_{itk}$, is then, $Patents_{-itk}$, the sum of patents of all ventures included in the venture portfolio of CVC acquirer k, excluding the patents of venture i, that is,

$$Portfolio\ Patents_{itk} = \sum_{i=1}^{n} Patents_{itk} \text{-} Patents_{itk} \tag{2.3}$$

For a non-portfolio venture j acquired by CVC acquirer k but not included in its venture portfolio, the number of portfolio patents, $Portfolio\ Patents_{jtk}$, equals the sum of cumulative patents granted to all ventures included in the venture portfolio of CVC acquirer k for a given year t. In other words, the number of portfolio patents, $Portfolio\ Patents_{jtk}$ for a non-portfolio venture j, acquired by CVC investor k, is given by,

$$Portfolio\ Patents_{jtk} = \sum_{i=1}^{n} Patents_{itk} \tag{2.4}$$

In a similar manner I create my second variable of portfolio uncertainty, *Portfolio* $Cites_{itk}$, a variable that measures the sum of all citations to granted patents to the *other ventures* included in the venture portfolio of a given CVC investor. Hence,

$$Portfolio\ Cites_{itk} = \sum_{i=1}^{n} Cites_{itk} \text{-} Cites_{itk} \tag{2.5}$$

For a venture j that is not included in the venture portfolio of CVC investor k, the equation becomes,

$$Portfolio\ Cites_{jtk} = \sum_{i=1}^{n} Cites_{itk} \tag{2.6}$$

My third measure of portfolio uncertainty is the backward citations made by granted patents, *Portfolio Backward* $Cites_{itk}$, a variable that measures the sum of all backward citations that granted patents to the *other ventures* included in the venture portfolio of a given CVC investor have made.

$$Portfolio\ Backward\ Cites_{itk} = \sum_{i=1}^{n} Backward\ Cites_{itk} \text{-} Backward\ Cites_{itk} \tag{2.7}$$

And for a non-portfolio venture j, respectively,

$$Portfolio\ Backward\ Cites_{jtk} = \sum_{i=1}^{n} Backward\ Cites_{itk} \tag{2.8}$$

As discussed earlier, although CVC investments give corporations access to highly innovative start-ups, these ventures are typically associated with a significant degree of technological uncertainty. Counting the number of ventures included in the corporate portfolio may not fully capture the gains realized from these investments and it is important to consider them as a bundle of capabilities (George et al. 2001). Higher innovativeness of the *other ventures* (included in the CVC's portfolio) may be associated with a better CVC expertise of selecting, or endorsing the start-up companies. If CVC investors are learning from their investments and transfer knowledge between portfolio ventures, they may potentially reduce the residual uncertainty associated with a given venture. Therefore, the probability of an acquisition should decrease with portfolio uncertainty. On the other hand, allocating scarce resources to the most promising portfolio venture implies that start-ups effectively compete with one another for limited CVC capital (Inderst, Mueller and Münnich 2007). The CVC investor may be more willing to acquire when the degree of innovation of its portfolio ventures is more uncertain. Therefore, the probability of an acquisition should increase with portfolio uncertainty. Which effect dominates (transfer of knowledge vs. allocation of scarce resources) in the decision of CVC investors to acquire is an empirical issue that I test in my analysis.

2.2.2 Strategic Acquisitions of Non-Portfolio Ventures

In this section I examine the determinants of the decision of CVC investors to acquire CVC-backed start-up companies in which they have not been previously investing. My goal is to understand why a CVC company would decide to acquire a less known, non-portfolio start-up firm, given that it has invested in other start-ups, included in its venture portfolio. By acquiring a non-portfolio start-up, the CVC acquirer is no longer able to take advantage of the reduced information asymmetry associated with ventures that are included in its holding portfolio. Moreover, the CVC acquirer is also risking facing a tougher competition from other CVC investors that have invested in the venture, and are therefore likely to have more preferential positions.

Given their limited resources, corporate investors typically invest in a limited number of heterogeneous ventures. Using a framework that explicitly considers the heterogeneity

and availability of projects, Sorensen (2008) finds evidence that strongly rejects the hypothesis that individual VC investments are evaluated in isolation. VCs not only learn from past investments (exploitation) but also consider the option value of future learning (exploration) when making investment decisions. I expand on these findings and study whether the uncertainty of the CVC's venture portfolio could potentially affect their choice to acquire a non-portfolio venture. The question that I am interested in is whether CVC investors learn from their investments in start-up companies and whether their acquisitions of non-portfolio ventures are a reaction to this learning. If indeed CVC investors engage in active portfolio management, I expect to find a negative relation between the innovation of the CVC's venture portfolio and the propensity of a non-portfolio venture acquisition.

Because CVC acquirers of non-portfolio ventures face higher asymmetric information, their option to acquire a venture in which they have not been previously investing has a higher volatility, and thus, is more valuable. Therefore, similarly to acquisitions of portfolio ventures, I expect to find that the likelihood of a non-portfolio venture acquisition increases with the decline in venture uncertainty. However, the effect should be mitigated by the fact that CVC acquirers of non-portfolio targets face higher information asymmetry. The effect of competitive uncertainty on the CVC decision to acquire a non-portfolio venture is also different since the CVC acquirer is now an outside competitor. Following their financial incentives, VC investors that have invested in the venture, would welcome increased competition for the target by outside bidders. They may act as intermediaries between the ventures and potential outside acquirers, by reducing the information asymmetry between both. Hence, I expect to find a positive relation between the probability that a CVC company acquires a non-portfolio venture, and the number of VCs that have invested in that venture.

When I examine the effect of competitive uncertainty, coming from other CVC investors that have invested in the venture, on the decision of an outside CVC acquirer to purchase a non-portfolio venture, I expect to find a stronger effect, relative to my findings on acquisitions of portfolio ventures. The fact that CVC investors who have been previously investing in the venture have superior information and in some cases possibly preferential contracts, suggests that an outside bidder will face a stronger competition when buying a non-portfolio CVC-backed venture. The outside CVC acquirer may try to preempt the actions of inside CVC investors, who may also want to acquire the venture, and purchase the venture earlier. Therefore, I expect to find a positive relation between the number of CVC investors that have invested in the venture and the speed to acquisition by an outside CVC acquirer.

2.2.3 Performance of Acquisitions by CVC Investors

Next, I seek to explain the cross-sectional variation in the CVC acquirers' acquisition performance by focusing on factors that explain their decision to acquire. Following Benson and Ziedonis (2010), I include venture uncertainty and competition as explanatory variables in my model. Under uncertainty, the option to wait is usually more valuable. However, in the presence of competition and fear of preemption, CVC investors may be encouraged to acquire the venture earlier. Given the high opportunity cost of an early acquisition, high venture uncertainty may signal premature acquisition. Therefore, I expect the market reaction to the acquisition announcement to be negatively related to the level of venture uncertainty. CVC firms may offer higher premiums to potential targets in order to deter competing bids and acquire the target. Because CVC acquirers may end up overpaying, I also expect to find a negative relation between acquirers' abnormal returns and competition coming from other CVC investors (Moeller et al. 2004).

If indeed CVC investors are investing in innovative start-ups mainly to access external innovation, the decision of a CVC investor to acquire a portfolio venture may reveal information to the market not only about the innovativeness of the target, but also about the CVC's own current and future innovation. The competitive race for innovation may especially affect CVC investors who rely extensively on external innovation, investors who are in a weaker competitive position and have lower level of internal innovation. I test this hypothesis by measuring the internal innovation of the acquirer with the patent stock of the CVC investor, and conjecture a positive relation between the level of the acquirer's internal innovation and acquisition performance.[21] In other words, I expect that the market reacts more negatively to the announcement of acquisitions by CVC acquirers with poor internal innovation, relative to the announcement of acquisitions by CVC acquirers that are less dependent on external innovation.

Lastly, I examine the cross-sectional variation in the acquisition returns of acquirers of non-portfolio ventures. Similarly to acquisitions of portfolio ventures, I expect venture uncertainty and competition to have negative effect on the announcement returns of CVC acquirers. However, the expected effect of CVC's internal innovation on the acquirer's returns is unclear. The CVC acquirer has not previously invested in the non-portfolio venture, and therefore, has not signaled to the market its interest of acquiring external innovation. Moreover, the target insiders are also unaware about CVC's willingness to pay for external knowledge, and may not be able to extract higher premiums. For these reasons, when I examine acquisitions of non-portfolio ventures, I do not expect to find a significant relation between the level of the acquirer's internal innovation and acquisition

[21] The results are robust when I scale the number of CVC's patents by its R&D expenses.

performance.

2.3 Data

The data set is constructed from several data sources combining information on CVC and VC investments, patent data, financial information and other firm characteristics. In this section I describe the steps in constructing the sample, and provide summary statistics.

2.3.1 CVC and M&A Data

To construct my sample of CVC acquirers, I first use the population of firms engaging in corporate venture activity from Thomson Financial's VentureXpert database. I examine all publicly traded U.S. companies that have provided venture capital directly to start-ups, from 1987 through 2010. Using Thomson Financial's SDC Mergers and Acquisitions database I identify all CVC investors that have subsequently acquired at least one entrepreneurial firm from their venture portfolios. The resulting sample includes 54 CVC acquirers of 117 targets of portfolio ventures acquired by them.[22] Approximately 89% of these targets are private companies. I next obtain all start-up companies that were part of the venture portfolios of those 54 CVC investors but were never acquired by them. This results in 2,662 ventures that were not acquired, from a total of 2,779 start-ups, in which corporate investors have invested over the years. I also select all acquisitions, made by the 54 CVC investors, of start-up companies that were not included in their venture portfolios but were CVC-backed by other investors. My sample includes 186 acquisitions of targets of non-portfolio ventures, 80.7% of which are private companies. These findings suggest that CVC investors are also likely to acquire competitors' CVC-backed start-ups, without previously having investing in them.

Table 2.1 presents all 54 CVC acquirers in my sample, the number of ventures included in their investment portfolios, as well as the number and fractions of acquisitions of portfolio and acquisitions of non-portfolio start-ups that they have made. The distributions suggest that on average CVC investors acquire only 4.2% of all portfolio companies in which they have been previously investing. At the same time they also acquire non-portfolio CVC-backed start-ups. These acquisitions represent 6.7% of all companies in

[22] I have 3 financial acquirers (SIC codes between 6000 and 6999) in my sample, however their inclusion in my analyses does not change the results.

which the corporate investors have invested.[23] Further, the results presented in Table 2.1 also show that there is a significant variation across different CVC acquirers, in both the size of their venture portfolios and the fraction of portfolio and non-portfolio ventures that they eventually acquire.

Table 2.2 summarizes the distributions of my sub-samples by year. The table presents the number of ventures included in the CVC portfolio each year. It also lists the share of portfolio ventures that were acquired by their CVC investors every year, as well as the share of non-portfolio ventures purchased by CVC acquirers. Two things should be highlighted from the summary statistics. First, the level of corporate venture activity has risen over the period, reflecting the more general growth of the corporate venture capital industry over these years. Second, the share of acquisitions of portfolio and non-portfolio ventures, purchased by CVC acquirers, also appears to be increasing over time. Moreover, the summary statistics show that some periods, such as the late-1990s, and late mid-2000s, are associated with a significant increase in the number of both portfolio and non-portfolio acquisitions. In good times, money flows easily into start-ups. When times turn bad, corporate investors disappear. Therefore, to control for the time clustering of acquisition events across firms, I include year-fixed effects in my regression analyses.

Table 2.3 contains the industry composition of CVCs' venture portfolios, and the composition of their portfolio and non-portfolio target firms. The dominant importance of firms in the "business services", "electronic, electrical equipment and components, except computer equipment", and "surgical and medical instruments and apparatus" industries is apparent. The concentration of acquired targets by CVC companies in these industries closely mirrors the overall corporate investment pattern of the examined CVC investors. What is more interesting is that the pattern of acquired portfolio targets almost perfectly matches the pattern of acquired non-portfolio targets. This suggests that CVCs may be learning from their investments in portfolio ventures and acquire non-portfolio companies.

2.3.2 Patent Data

The patent data are obtained from the National Bureau of Economic Research (NBER) patent database, which includes detailed information on more than three million patent documents submitted to the U.S. Patent and Trademark Office (USPTO) from 1976 to 2006. Since the NBER database ends in 2006, I consult the USPTO database search engine and update my dataset to 2010. Most start-ups included in my sample are private companies that lack an identification number. Therefore, I use their firm name to obtain

[23] The difference between the number of portfolio acquisitions and the number of non-portfolio acquisitions is not statistically significant.

the patent data. The goal is to collect information on the firms' innovative activity covering the period from their founding year until 2010, or the year of the company's acquisition or liquidation. Further, I obtain information on the ventures' exits, to account for the fact that over the long time span of my sample, some of the start-ups may have been acquired (by acquirers other than the 54 acquirers of my sample), or filed for bankruptcy. I use the SDC Mergers and Acquisitions database and CapitalIQ to search for acquisitions and bankruptcies. I perform extensive checks to verify the nature of private firms' exits using the Public Access to Court Electronic Records (PACER) database, Factiva, and web searches. Finally, I also collect the patent data of all the CVC acquirers included in my sample.

In Panel A of Table 2.4, I compare the patenting activity of portfolio ventures that were acquired by their CVC investors, with portfolio ventures that were not acquired, conditionally on the CVCs previously investing in the ventures. I do not find any significant differences across the two groups in terms of the number of patents and the number of citations variables.[24] As discussed previously, patents and citations may not only measure venture uncertainty but also venture performance. Therefore, as a third measure of venture uncertainty I use the number of backward citations made by granted patents. Based on this measure, my results show that on average, acquired portfolio ventures are associated with lower degree of uncertainty relative to ventures that were not acquired. In Panel B of Table 2.4, I compare acquisitions of portfolio ventures with acquisitions of non-portfolio ventures. In the former, the CVC acquires the start-up company after previously investing in it, while in the latter, the CVC investor purchases the start-up without having made a prior investment. My results show that there are no significant differences across any of the patenting measures.[25]

The analysis of private start-up companies is usually restricted due to data limitations. While patents are useful in capturing the level of uncertainty and innovative activity as-

[24] It is possible that some of the ventures that are not acquired are being taken public by venture capitalists. If ventures that are taken public hold more patents and citations, and are associated with less uncertainty, my comparison between the uncertainty of ventures that are acquired by CVC investors and ventures that are not acquired may be biased. In other words, the fact that my sample of not acquired ventures has more public companies than the sample of acquired ventures, can potentially explain why I do not find a significant difference in venture uncertainty between the two groups. Therefore, in unreported results I exclude all publicly traded ventures. I confirm that my results do not suffer from a bias and remain qualitatively unchanged. Finally, my results also do not change if I use the number of applied patents instead of the number of granted patents.

[25] As inside investors, CVC acquirers that have previously invested in the venture could be taking advantage of the lower information asymmetry they face and acquire innovative ventures just prior to a patent grant. I investigate whether this is the case by examining the number of post-acquisition patents granted to the acquirer. In particular, I only count the number of acquirer's patents that involve at least one of the target's inventors and are granted in the first three years following the acquisition. My unreported results show that although CVC acquirers of portfolio ventures obtain more patents (protecting inventions created by target inventors) following the acquisition, relative to CVC acquirers of non-portfolio ventures, the difference in patents between the two types of acquirers is not statistically significant.

sociated with new ventures, no financial information is available on such companies in the standard financial databases. The only additional variables I am able to obtain on private ventures is their founding year and the four-digit standard industrial classification (SIC) code, both collected from the VentureXpert database. These control variables are particularly important, because I expect the number of patents and citations to increase with firm age. In Panel A of Table 2.4, I report the age of the start-up ventures and find that portfolio targets tend to be significantly younger relative to ventures that were not acquired. Further, I find that portfolio targets were backed by fewer corporate venture capitalists as well as traditional VC investors.[26] The smaller number of investors in portfolio targets, may be caused by the fact that these ventures are being acquired early in their stage. I find similar results in Panel B of Table 2.4, when I compare acquisitions of portfolio ventures to acquisitions of non-portfolio ventures. Portfolio targets are younger and have the support of fewer VC investors. However, although portfolio targets have fewer VC investors, they are endorsed by significantly more CVC companies. The results reported in this table show that the timing of the acquisition matters and that controlling for venture age is required.

Finally, I analyze the degree of innovation at the venture portfolio level, rather than the individual start-up level. In Panel A of Table 2.5, I compare the portfolio patenting activity of CVC acquirers versus CVCs that did not acquire portfolio ventures in a given year. I find that CVC acquirers tend to have smaller holding portfolios relative to corporate investors that do not acquire. The differences in means and medians between all variables that measure the level of CVC's portfolio uncertainty are statistically significant at the 1 percent level. These findings suggest that corporate investors take into account their portfolio interactions, when they make acquisition decisions. The more innovative are the *other ventures* included in the venture portfolio, the less likely the CVC investor is to acquire a portfolio target. In Panel B of Table 2.5, I compare how innovative the portfolio of CVC acquirers of portfolio ventures is, relative to the portfolio of CVC acquirers of non-portfolio ventures. I find that the former tend to hold larger portfolios of start-up companies, and their portfolios also appear to be more innovative. However, these results are based only on univariate statistics, and further analysis is required before I can draw any conclusions about the effect of portfolio uncertainty on the decision of CVC investors to acquire.

2.3.3 Financial Characteristics and Innovation of the Acquirer

All financial information on the acquirers in my sample comes from the COMPUSTAT

[26] I use VentureXpert database to collect information on the number of VC and CVC investors that have invested in the start-up company.

database. The CRSP database is used to obtain the stock returns of the publicly traded CVC acquirers. In Panel A of Table 2.6, I examine whether CVC acquirers differ from corporate investors who do not acquire their portfolio ventures by comparing their financial characteristics and innovation. I find substantial differences between the two groups of corporate investors. CVC acquirers tend to be significantly smaller in size, and to have lower net income to assets, and cash to assets. Moreover, they also appear to have higher R&D expenditures, and higher Tobin's Q. Surprisingly, although they invest heavily in R&D, their output of R&D expenditures, measured by the number of patents owned by the CVC acquirer, is significantly lower. This hints that CVC investors may be acquiring portfolio ventures because they are less efficient in producing internal innovation, and rely more on external innovation. All differences in means are statistically significant at least at the 5 percent threshold. Interestingly, when in Panel B of Table 2.6, I compare the financial characteristics of CVC acquirers of portfolio ventures with those of CVC acquirers of non-portfolio ventures, I find no significant differences between the two types of acquirers. They do not appear to differ across any of the financial characteristics that I study.[27]

2.3.4 Empirical Design

To identify the factors that affect the decision of CVC investors to acquire a portfolio, or a non-portfolio venture I start by estimating a baseline logit specification. In the case of acquisitions of portfolio ventures, equation (2.9), the dependent variable measures the probability of acquisition conditional on a CVC investment. When I examine acquisitions of non-portfolio ventures, equation (2.10), the dependent variable measures the unconditional probability of acquisition.

$$Pr(Acquisition|CVC\ investment) = F(Venture\ uncertainty,\ Competitive\ uncertainty,\ CVC\ innovativeness,\ CVC's\ portfolio\ uncertainty,\ Controls) \tag{2.9}$$

$$Pr(Acquisition|No\ CVC\ investment) = F(Venture\ uncertainty,\ Competitive\ uncertainty,\ CVC\ innovativeness,\ CVC's\ portfolio\ uncertainty,\ Controls) \tag{2.10}$$

[27] In unreported analysis I also compare CVC acquirers of non-portfolio ventures with corporate investors who do not acquire their portfolio ventures. I find that CVC acquirers of non-portfolio ventures tend to be smaller, to have higher R&D expenditures, higher Tobin's Q, and lower patent stock.

The logit model estimates the overall likelihood of an acquisition by a CVC acquirer, but it does not use information on the timing of the acquisition. Duration analysis uses valuable information about the timing of events that logit analysis is not able to capture. Duration analysis is appropriate when: (1) events occur at different times, (2) the probability of events may be changing over time, and (3) observations are censored. In my empirical analysis, I employ a duration model to investigate the length of time from the first CVC investment in the venture to the complete acquisition of the venture by a CVC acquirer (i.e., the timing of the acquisition), as well as the factors that influence the acquisition decision. A standard procedure for dealing with duration data is to employ a hazard model (Kalbfleisch and Prentice 1980; Kiefer 1988). I choose a Cox proportional hazard model, which is a parsimonious semiparametric model, and a common choice for modeling duration. The duration model explicitly takes into account the fact that different ventures may be acquired at different points of time, and that some start-ups may be removed from the sample of potential targets, either because they are acquired by other companies, or because they were liquidated. In other words, the hazard model allows for approximation of the probability of acquisition conditional on survival of the venture. The hazard function of the Cox proportional hazard model has the form

$$h(t) = h_0(t) exp\{\beta' X(t)\} \tag{2.11}$$

The Cox proportional hazard model does not impose any structure on the baseline hazard $h_0(t)$ and provides a way of estimating β without requiring estimates of $h_0(t)$. Suppose the complete durations are ordered $t_1 < t_2 < ... < t_n$. The risk set with respect to any moment of time is the set of firms that have not yet exited just prior to that time. Based on the hazard function, the conditional probability that observation i exits at time t_i, given that any of the observations in the risk set R_i could have been concluded at duration t_i, is given by

$$\frac{exp\{\beta' X_i(t)\}}{\sum_{j \in R_i} exp\{\beta' X_j(t)\}} \tag{2.12}$$

This conditional probability is independent of the baseline hazard function.[28]

[28]The corresponding log partial likelihood is

$$lnL = \sum_{i=1}^{n} \left[exp\{\beta' X_i\} - \sum_{j \in R_i} exp\{\beta' X_j\} \right]$$

Given that most of the independent variables included in my analysis are time-varying, the original Cox proportional hazard model needs to be modified to allow for time-varying covariates. The model that I estimate takes the form of

$$h(t,\ X(t)) = h_0(t,0)exp\{\beta' X(t)\} \tag{2.13}$$

where *h(t, X(t))* is the hazard rate at time t for a firm with covariates *X(t)*, and the Cox regression estimates the coefficient vector β. For ease of interpretation, in my results I also report the hazard ratios. The hazard ratio shows how much the hazard (i.e., the instantaneous risk) of the event increases for a unit change in the independent variables. In the case of a dummy variable, this is equal to the ratio of the (instantaneous) probabilities of the two possible states. A coefficient greater than one implies a higher hazard rate and thus a lower expected duration.

In order to explain the cross-sectional variation in acquisition performance, I estimate an ordinary least squares (OLS) regression model presented by equation (2.14). The dependent variable is the three-day event window cumulative abnormal returns measured around the acquisition announcement date. To estimate abnormal returns, I use standard event study methodology (see Brown and Warner 1985) and compute market model abnormal returns using the CRSP value-weighted index returns.

$$\begin{aligned} \textit{Acquisition Performance} = F(&\textit{Venture uncertainty, Competitive uncertainty,} \\ &\textit{CVC innovativeness, CVC's portfolio uncertainty, Controls)} \end{aligned} \tag{2.14}$$

2.4 Multivariate Results

I present my results in five subsections. I start in Section 2.4.1 by analyzing the factors that determine the decision of a CVC investor to acquire a portfolio venture. In Section 2.4.2, I examine whether the factors that explain CVC investor's decision to acquire a portfolio venture, also explain its decision to acquire a non-portfolio venture. In Section 2.4.3, I use an alternative method, proportional hazard model, to address the main

Technically, this is for the simplest case where exactly one firm exits at each distinct time and there are no censored observations. The partial log likelihood can handle censoring easily. Censored observations enter the risk set at each observation (in the denominator) but do not enter in the numerator of the partial likelihood.

questions of the paper. In Section 2.4.4, as a robustness check of my results, I perform Heckman two-stage selection bias model of the decision of a CVC investor to acquire a portfolio, or a non-portfolio venture. In Section 2.4.5, I report the CVC acquirers' stock returns at the acquisition announcement and at the announcement of the initial CVC investments, and compare the returns of acquisitions of portfolio ventures with the returns of acquisitions of non-portfolio ventures. In Section 2.4.6, I examine the extent to which the stock returns at the acquisition announcement are related to factors that explain the decision of CVC investors to acquire.

2.4.1 Decision to Acquire a Portfolio Venture

I start my analysis by exploring the determinants of the decision of corporate investors to acquire one of their own portfolio ventures. My sample includes CVC investments and subsequent acquisitions made during the sample period 1987 to 2010. Table 2.7 reports the results of a cross-sectional logit regression, where the sample includes only the ventures in which the CVC investor has previously invested. The dependent variable is a dummy variable that equals one if the CVC investor acquires a portfolio venture, and zero otherwise. The regressors in this analysis are: (1) the total number of patents the venture was granted; (2) the total number of citations to granted patents to the venture; (3) the total number of backward citations that granted patents to the venture have made; (4) the total number of patents granted to the *other ventures* included in the CVC's investment portfolio; (5) the total number of citations to granted patents to the *other ventures* included in the CVC's investment portfolio; (6) the total number of backward citations that granted patents to the *other ventures* included in the CVC's investment portfolio have made; (7) the number of *all other ventures* that the CVC is invested in for a given year; (8) the total number of patents granted to the CVC investor; (9) the total number of VC investors that have invested in the venture; (10) the total number of CVC investors that have invested in the venture; (11) the log of venture age; (12) a dummy variable that equals one if the venture is a public company; (13) a dummy variable that equals one if the venture and the CVC acquirer are from the same 2-digit SIC code industry; (14) the log of acquirer's total assets; (15) the ratio of acquirer's R&D expenditures to assets; (16) the ratio of acquirer's cash to assets; (17) the acquirer's Tobin's Q.

Because patents, citations and backward citations are highly correlated variables, given that they all measure the level of venture uncertainty, I include only one at a time when I estimate various specifications. For consistency, I also do that with my three variables ((4), (5) and (6)) that measure uncertainty at the venture portfolio level. I include a dummy variable (12) to control for the fact that information asymmetry between the venture and

the CVC acquirer will be lower when the start-up company is publicly traded. Similarly, CVC acquirers may be more likely to acquire ventures that are closely related to them.[29] To control for that, I also include dummy variable (13). Finally, I control for year and industry variation by including year- and acquirer's industry-fixed effects.[30] The reported standard errors are robust, having been adjusted for clustering by CVC acquirer firm.

The coefficient estimate of backward citations is statistically significant and indicates that CVC investors are more likely to acquire a portfolio venture when part of the uncertainty associated with the venture is resolved. In particular, an increase in the number of backward citations by one standard deviation increases the likelihood of a portfolio acquisition by 14%. On the other hand, the coefficient estimates of patents and citations are not statistically significant. It appears that these variables do not have predictive power in the decision of the CVC investor to acquire a portfolio venture. It is possible that *backward citations* is a better measure of venture uncertainty, while *patents* and *citations* are more likely to measure venture quality. Therefore, in unreported analysis I include both *backward citations* and *patents* (*backward citations* and *citations*) in the same regression model. I find that my results do not change. While *backward citations* remains statistically significant, *patents* and *citations* are not statistically significant.[31]

I also find that the total number of patents, citations and backward citations of the *other ventures* included in the CVC's investment portfolio all have negative and significant effect on the probability of an acquisition. Hence, the CVC's decision to acquire is a complex process that takes more than simply evaluating the potential target in isolation. The more innovative are the other ventures included in the corporate portfolio, the less likely the CVC investor is to acquire. The effect is significant, an increase from the 25^{th} percentile of portfolio patents (portfolio backward citations) to the 50^{th} percentile, an increase of 315 portfolio patents (2,834 portfolio backward citations), leads to a decline of 15.9% (14.7%) in the probability of an acquisition. The effect is even stronger in columns (3) and (4), where I measures the degree of uncertainty associated with the CVC's venture portfolio, with the number of citations received by all granted patents to the *other ventures*. The negative and statistically significant coefficient estimate on portfolio size further confirms my findings that the scarce resources of CVC investors affect their choice

[29] The relatedness between the corporate investor and the start-up company should allow the two firms to exchange knowledge more easily. Relatedness between the start-up firm and its investor has been previously found to affect the choice of acquisitions over alliances, and alliances over joint ventures (Villalonga and McGahan 2005). Further, being in the same industry as the target improves the returns to acquirers (Higgins and Rodriguez 2006).

[30] My results remain qualitatively unchanged if I remove the year- and acquirer's industry-fixed effects.

[31] I also estimate two alternative specifications. In the first, I transform the *patent* (*citation*) variable into a dummy variable that equals one if the venture holds any patents (citations), and zero otherwise. In the second, I transform the *patent* (*citation*) variable into ordered dummy variables of five categories. Based on the first transformation, I find that CVCs are more likely to acquire ventures with patents (citations). Based on the second transformation, I find positive and significant, non-monotonic relation between patents (citations) and the probability of a portfolio acquisition by a CVC acquirer.

to acquire. The fewer the outside options, and the less valuable the outside options of the investor, the more likely is the CVC investor to acquire. In particular, an increase of one standard deviation in the portfolio size is associated with more than 32% decline in the likelihood of a portfolio venture acquisition.

Competitive uncertainty, measured by the number of VC and CVC investors in the start-up company, also matters. Both coefficients are statistically significant at the 1 percent level, and consistent with the predictions of my hypotheses. I find that the higher the number of VCs invested in the venture, the less likely is the CVC investor to purchase the venture. On the other hand, the more CVCs have invested in the venture, the more likely is the CVC investor to acquire. These findings are consistent with the conflicting interests of VC and CVC investors who have co-invested in the venture. Unlike CVCs who have additional goals of obtaining strategic benefits arising from synergies with their existing activities, traditional venture capitalists' mainly seek financial gains from selling the portfolio firms. Therefore, VCs may prevent the CVC from acquiring the venture if they could obtain higher profit by selling it to outside investors via an IPO, or to a competing bidder in an acquisition. For instance, doubling the number of VCs invested in the venture from two to four, while keeping all other variables at their means, leads to at least 18% (depending on the specification) decrease in the probability of an acquisition. On the other hand, increasing the number of CVC investors from two to four, increases the likelihood of an acquisition by 29% on average. A start-up company endorsed by higher number of CVC investors signals higher interest in the venture, and thus, increases the likelihood of an acquisition.[32]

My results are consistent with the predictions of Morellec and Zhdanov (2005) that the decision of CVC investors to acquire a portfolio venture represents a trade-off between venture uncertainty and competitive uncertainty. In my analysis I find that the effect of potential competition is very important. This result is further confirmed by the negative and statistically significant coefficient estimate of the CVC's innovation variable. I show that CVC investors are more likely to acquire one of their portfolio ventures when their own internal innovation, measured by the number of patents owned by the CVC investor, is relatively poor. For instance, an increase in the number of CVC's patents by one standard deviation from their mean, while keeping all other variables at their averages, reduces the likelihood of an acquisition by more than 39%.[33] CVC companies that are less innovative may be in a weaker competitive position. Hence, their dependence on external innovation,

[32]In Section 2.4.3 of the paper I use an alternative method, a duration model, and show that higher potential competition for the venture may encourage CVC investors to preempt the actions of other CVC investors and acquire the venture earlier.

[33]In an alternative specification I scale the number of patents owned by the CVC investor by its R&D expenses. Consistent with the previous findings, my unreported results show that CVCs that are less efficient in producing internal innovation are more likely to take full control of a venture in which they have been previously investing.

and the fear of missing out on an opportunity may encourage an earlier acquisition. The results are consistent across specifications independently of whether I measure venture uncertainty using patents, citations, or backward citations.

Table 2.7 also indicates that CVC acquirers are more likely to acquire start-up portfolio companies that operate in the same industry. This is consistent with these deals being associated with lower information asymmetry, higher synergies, or CVCs trying to acquire their close competitors. The coefficient estimate of *Same Industry* is highly significant in all specifications. Finally, my results suggest a positive relation between the Tobin's Q of the CVC investor and its decision to acquire a portfolio venture. Highly valued CVC investors are more likely to take full control of a portfolio venture.

2.4.2 Decision to Acquire a Non-Portfolio Venture

In this section I explore the decision of corporate investors to acquire the competitor's venture (venture in which they have not been previously investing compared to other CVC investors), although they hold a portfolio of ventures in which they have been investing. For this purpose my sample in this section includes not only all ventures in which the CVC company has previously invested, but also all CVC-backed ventures that were not included in the CVC's venture portfolio but were eventually acquired by the corporate investor. Table 2.8 reports the results of a cross-sectional logit regression, where the dependent variable is a dummy variable that equals one if the CVC investor acquires a non-portfolio venture, and zero otherwise. In this analysis I use the same regressors as in Table 2.7.

I find that across all specifications, the coefficient estimates of the number of patents, citations, and backward citations are statistically insignificant. CVC acquirers of non-portfolio ventures are likely to face higher degree of information asymmetry relative to CVC investors who have invested in the venture, especially since most of these ventures are young, private companies. Therefore, in contrast to my findings on acquisitions of portfolio ventures, the decision of CVC investors to acquire a non-portfolio venture does not depend on the venture's uncertainty. On the other hand, I find that the decision of CVC investors to acquire a non-portfolio venture is significantly determined by the innovativeness and the size of their holding portfolio. I find that increasing the number of portfolio patents (portfolio backward citations) from their 25^{th} percentile to the 50^{th} percentile, an increase of 305 patents (2,658 backward citations) decreases the probability that CVC investor buys a non-portfolio venture by 40% (29.3%). The estimated effect of the uncertainty of the venture portfolio is quite large, and it is more than double the effect that portfolio uncertainty has on acquisitions of portfolio ventures. My results suggest that

CVCs are not passive investors, they appear to be learning from their investments and acquire the competitor's venture when their own portfolio is not performing well. Finally, I do not find a significant relation between the level of innovativeness of the corporate acquirer and the CVC's decision to acquire a venture backed by the competitor. The results from Table 2.8 suggest that CVCs' decision to acquire a non-portfolio start-up company is not driven by their need to access more efficient external innovation.

I next analyze the competitive uncertainty that CVC acquirers face when they purchase a CVC-backed start-up company, without previously having invested in it. My results are different from the results on acquisitions of portfolio ventures. The coefficient estimate of the number of VC investors is now positive but statistically insignificant. To some extent this result is consistent with my previous hypothesis that VCs' financial interests may encourage them to increase competition for the target by inviting outside corporate investors to participate in the bidding process. However, bidding for a start-up company that has been backed-up by the investments of other corporate investors may be a difficult task to complete. If the venture is valuable, previously invested CVC investors may not be willing to share their competitive advantage.[34] I find that outside CVC investors are more likely to acquire non-portfolio ventures that are backed by more CVC investors. In particular, I find large and highly statistically significant, positive coefficient estimate of the number of CVC investors. For example, across all specifications, increasing the number of CVCs invested in the venture from two to four increases the probability of an outside bidder acquiring the venture by more than 42%. In the following section of the paper I use an alternative model, and test whether outside CVC investors are likely to preempt the competition from invested CVCs and reduce the time to acquisition by acquiring the non-portfolio venture earlier.

In Table 2.8, I also report that, similarly to acquisitions of portfolio ventures, CVC acquirers tend to have higher Tobin's Q and are more likely to acquire start-up companies that operate in the same industry. In other words, they are highly valued companies who are likely to acquire their close competitors' portfolio ventures. Interestingly, in contrast to acquisitions of portfolio ventures, I find that acquisitions of non-portfolio ventures involve targets that are more likely to be publicly traded. The chance of a non-portfolio acquisition is higher if the target venture is a public company. A plausible explanation for this result is that public firms are associated with lower degree of information asymmetry, and therefore, are easier to evaluate by outside bidders. In the next section, I proceed by estimating a proportional hazard model to study the timing of the acquisition, and the fact that my dataset is censored.

[34] In fact, the presence of more CVC companies that have invested in the venture may be a signal of a high potential start-up company.

2.4.3 Proportional Hazard Model

To allay concerns, that the acquisition of a portfolio or a non-portfolio venture involves the timing of these events, this section presents an alternative method that addresses the main questions of the paper by examining my data in a duration framework. I use a Cox proportional hazard model, a parsimonious semi-parametric model, and a common choice for modeling duration. The dependent variable in my duration regressions is time-to-acquisition, while the independent variables are the same as in my previous analyses. Table 2.9 reports the results of acquisitions of portfolio ventures, where the dependent variable measures the time between the first CVC investment in the company and the time the company is acquired by a CVC acquirer that has previously invested in the venture. The main difference that appears in the duration model is that the coefficient estimates on the portfolio backward citations variable and on the acquirer's Tobin's Q are no longer statistically significant. Most of the other results are very similar to my results reported in Table 2.7. Lower innovativeness of the CVC's venture portfolio leads to a quicker acquisition. For both statistically significant measures of portfolio uncertainty, the hazard ratio equals one, indicating that increasing portfolio innovation by a unit increases the likelihood of a portfolio venture acquisition proportionally. The innovativeness of the CVC's venture, measured by the number of backward citations has negative and significant effect on the time to acquisition. Lower uncertainty associated with the venture speeds up the acquisition. However, similarly to my logit regression results, the number of patents and number of citations variables are not statistically significant. My results also show that the internal innovation of the CVC acquirer matters. CVC investors are more likely to acquire a portfolio venture sooner, when their internal R&D output is lower. Consistent with my previous results, I also find strong negative (positive) relation between the number of VCs (CVCs) invested in the venture and the probability of an acquisition conditional on survival of the venture.

The dependent variable in Table 2.10 measures the time-to-acquisition of the start-up company by a CVC acquirer that has not invested in the venture. Neither the magnitude nor the statistical significance of the key results presented in Table 2.8 changes significantly. I find that the time to a non-portfolio acquisition does not depend on the innovativeness of the venture, but it is significantly affected by the innovativeness of the CVC's venture portfolio. CVC investors are more likely to speed up the acquisition of a non-portfolio venture, when their own holding portfolio is associated with more uncertainty. CVC companies are also more likely to acquire earlier when faced with higher competition coming from inside CVC investors. The coefficient estimate on number of CVCs remains statistically significant at the 1 percent threshold. The results in both Table 2.9 and Table 2.10, also show that CVC acquirers operating in the same industry as the start-up firm are

more likely to purchase the venture sooner. The duration analysis in this section confirms that the main findings of the paper continue to hold after allowing for the probability of acquisition to vary over time.

2.4.4 Heckman Two-Stage Estimator

A potential challenge of this research is that CVCs' investment choices are endogenous. I address the issue by estimating Heckman two-stage model (Heckman, 1979). The proposed estimation technique corrects for the self selection problem by proceeding in two steps. The first step involves estimating a probit regression determining the decision of CVC investment. The second step is estimating a logit regression on the subsequent decision of corporate venture capitalists to acquire, including the inverse Mills ratio estimated from the first step as an additional regressor.

The procedure requires the availability of valid instruments, variables which contribute to determining the propensity to make CVC investments but are not related to the decision to make an acquisition. To satisfy the required exclusion restriction I use the number of spin-offs in a given year, a variable that enters in the first stage selection regression but not in the second stage regression. Existing firms are an important source of new entrepreneurs, and spin-offs from existing firms are seen as a major deal flow for "entrepreneurial spawning". (Bhidé 1994; Gompers, Lerner, and Scharfstein 2005; Klepper and Sleeper 2005). I explore whether the choice of corporate venture capitalists to invest is explained by a supply shock to their investment opportunity set, where I assume that the number of new spin-offs will directly affect their choice to invest but will not affect their future choice to acquire. I define spin-off as a "clean" transaction in which the existing parent company goes from 100 percent ownership to 0 percent ownership.[35] Moreover, given that CVC investment rounds do not take place every year and firms can only invest in a start-up company when an investment round takes place, I estimate my first stage probit regression only for the investment round years included in my sample.

The dependent variable in the first stage probit model is one if the start-up firm has received CVC financing, and zero otherwise. The independent variables included in the first stage regression are the same as the variables used in my main regressions in Table 2.7 and Table 2.8. To meet the exclusion restrictions, I include the number of new spin-offs in each year an investment round takes place in the probit model. Next, I use the estimates of the coefficients in the probit equation to form the expected value of the residuals, conditional on CVC investment. This is the inverse Mills ratio. In the second stage regression, reported in Table 2.12, I re-estimate the regressions from Table 2.7 and

[35]I obtain the number of spin-offs from Thomson Financial's SDC Mergers and Acquisitions database.

Table 2.8, but now additionally include the inverse Mills ratio obtained from the first step regression. The probit results reported in Table 2.11 confirm that the number of spin-offs is a good predictor of the probability of CVC investment. The coefficient estimate of number of spin-offs is positive and statistically significant in all first stage specifications.[36] The coefficient estimate of the inverse Mills ratio, included in my second stage regression, on the other hand, is statistically insignificant in all specifications, which provides evidence that my sample does not suffer from a selection bias. Moreover, even after taking the selectivity correction into account, the results remain qualitatively similar to my main findings reported in Table 2.7 and Table 2.8. This suggests that selection on observables is not driving my results.

2.4.5 Stock Returns to CVC Acquirers

In this section I examine the acquisition performance of all successfully completed acquisitions of CVC-backed ventures made by the 54 CVC acquirers in my sample. I compare the performance of acquisitions of portfolio versus acquisitions of non-portfolio start-ups. In particular, I measure the market reaction to CVC acquisitions by calculating the cumulative abnormal returns over a three-day event window around the acquisition announcement date.

The univariate results are reported in Panel A of Table 2.13. Upon the acquisition announcement, CVC acquirers of portfolio ventures experience an average significant negative announcement return of -0.60%, over a three-day event window.[37] On the other hand, when I examine the acquisitions of non-portfolio ventures, I find that the market reaction to these deals is positive and insignificantly different from zero. In the last column of Table 2.13 I report the differences in means and medians between acquisitions of portfolio ventures and acquisitions of non-portfolio ventures. While the differences in means are not statistically significant, the differences in medians appear to be significant at the one percent level. Although weak, these results are generally consistent with the findings of Benson and Ziedonis (2010) that the average CAR of CVC acquirers of portfolio ventures is -0.97%, compared to an average CAR of 0.67% when the same acquirers

[36] To test the relevance of my exclusion variable, the number of new spin-offs, I also perform a placebo test. I investigate whether the decision of CVC investors to invest today can be explained by future supply shocks to their investment opportunity set (using one year lead spin-offs variable). As expected, I find no evidence that the future number of spin-offs predicts the probability of CVC investment today. I do find, however, that the number of last year's spin-offs (measured by one year lag spin-offs variable) predicts the probability of CVC investment today, which is reasonable given the high persistence of the number of spin-offs variable.

[37] On a dollar-value basis, these estimates suggest that the average portfolio acquisition is associated with a loss of $45.9 million in CVC's shareholder value. The effect is substantial given that, on average, the size of the target is less than 4% of the acquirer's market capitalization.

purchase ventures in which they have not been previously investing.[38,39]

In Panel B of Table 2.13, I examine the stock performance of CVC investors when they make the initial minority investments in innovative ventures included in their portfolio. I find that initially corporate investors gain 1.20% average significant cumulative abnormal return over a three-day event window. This result suggests that, in contrast to acquisitions of full control, the market reacts positively to the preceding CVC investments made by CVC acquirers. While minority CVC investments are perceived as valuable growth opportunities, acquisitions of full control result in weaker incentives for the innovative ventures, and lower probability of future innovation for the acquirer. Furthermore, in Panel C of Table 2.13 where I represent acquisitions of portfolio ventures as two-stage deals (initial minority investment and subsequent acquisition of full control), and examine the combined CARs to CVC investors (CARs at the time of the initial investments plus CARs at the time of the subsequent acquisition), I find that on average the total market reaction to acquisitions of portfolio ventures is not significantly different from zero. Moreover, when I take into account the significant positive market reaction to the initial CVC investments made in portfolio ventures, I find that acquisitions of portfolio ventures are actually not worse than acquisitions of non-portfolio ventures.

2.4.6 Cross-Sectional Determinants of Stock Returns

In this section, I seek to explain the cross-sectional variation in performance of CVC acquirers by focusing on factors related to the decision of CVC investors to acquire. Table 2.14 presents my results. The dependent variable is the three-day event window CAR of the CVC acquirer, measured around the announcement of the acquisition of full control. The independent variables are the same as in Table 2.7. Models (1), (2), and (3) report the results of a cross-sectional regression on the performance of CVC acquirers of portfolio companies; models (4), (5), and (6) show the results of the performance of CVC acquirers when they purchase non-portfolio companies. In my regressions I control for acquirer's size, relative size, medium of exchange, and public status of the target, since these variables have been found to have an effect on acquisition announcement returns (see Moeller et al. 2004; Moeller et al. 2007; Travlos 1987; Officer 2007).[40] I also control for year- and

[38] While, as in Benson and Ziedonis (2010), I study acquisitions by CVC investors, there are two main reasons why my results are slightly different from theirs: sample and construction method. I start constructing my sample by requiring that every CVC acquirer in my sample has made at least one acquisition of a portfolio venture between 1987 and 2010. In contrast, Benson and Ziedonis select the top 100 CVC investors, and choose the subset that acquired at least one entrepreneurial firm between 1987 and 2003, irrespective of whether the startup was a portfolio company.

[39] In contrast, Higgins and Rodriguez (2006) find that the use of "pre-acquisition information-gathering mechanism" such as alliances, for example, improves the returns to acquirers in the event of a subsequent acquisition.

[40] Relative size is the value of the target as a fraction of the market capitalization of the acquirer. On

industry-fixed effects to make sure that the results are not driven by time or acquirer's industry specific characteristics.[41] Standard errors are clustered by CVC acquirer firm.

Interestingly, while venture uncertainty and competition do not appear to have a predictive power in the performance of portfolio venture acquisitions, the variable that measures CVC's own innovation has a substantial positive effect on acquisition performance.[42] The coefficient estimate of the *CVC Number of Patents* is statistically significant in all specifications at the 1 percent threshold.[43] Increasing the number of CVC patents by one standard deviation leads to an increase in the acquirers' CARs by over 6.8%. My results suggest that the announcement of a portfolio venture acquisition reveals negative information about the acquirer's own innovation. In other words, lower internal innovation of the CVC acquirers and large dependence on external knowledge, can potentially explain the average negative abnormal return of the acquirers at the acquisition announcement. Moreover, the acquisition of full control and the resulting transfer of property rights in the hands of the CVC acquirer can signal lower probability of obtaining future innovation. In contrast, when I examine the effect of the CVC's innovativeness on performance in the case of non-portfolio acquisitions, I do not find a significant relation. It appears that the market perceives these acquisitions differently; possibly because CVC acquirers have not invested in the ventures previously, and thus have not revealed that they may be interested in the start-ups' innovation. Moreover, the target insiders are unable to extract higher premiums because they know less about the CVC's own innovation and willingness to pay for external knowledge.

My findings in Table 2.14 also show that the coefficient estimates on venture age, acquirer's size and relative size are all negative and statistically significant. Some of these results are consistent with the available empirical evidence, such as the negative correlation between acquirer announcement returns and both acquirer size (Moeller, Schlingemann, and Stulz 2004) and the relative size of the merger transaction (Travlos 1987). However, the fact that these variables only matter in the case of acquisitions of portfolio ventures is puzzling. When I study the cross-sectional performance of acquisitions of portfolio companies, I also find that CVC acquirers with higher Tobin's Q tend to have better acquisition performance. The higher abnormal returns of these deals potentially reflects higher quality ventures that are being endorsed by highly valued CVC investors. Finally, my results on acquisitions of non-portfolio ventures show negative and statistically significant coefficient

average, the relative size of portfolio targets is 3.8%, while the relative size of non-portfolio targets is 4%.

[41] My results remain qualitatively unchanged if I remove the year-fixed effects.

[42] The insignificant coefficient estimates of venture uncertainty and competition are consistent with the findings of Benson and Ziedonis (2010). In contrast, Sevilir and Tian (2012) find that venture innovation has a positive effect on CARs of acquirers. However, they do not control for acquirer's level of innovation in their analysis, and measure the level of venture uncertainty by creating a dummy variable rather than using a continuous variable.

[43] The statistical significance of my results is even stronger if I scale the number of patents owned by the CVC investor by its R&D expenses.

estimates of portfolio patents and portfolio citations. In other words, the market reacts more negatively to deals, where the CVC acquires a non-portfolio venture, although the degree of innovation of its own portfolio of ventures is less uncertain.

2.5 Conclusion

While corporate venture capital is attracting growing attention from academic researchers, it remains unclear to what extent corporate venture investments benefit their parent companies, either financially or strategically. In this paper, I examine acquisitions by corporate venture capital investors as a way to access external innovation. In particular, I investigate what determines the decision of large CVC investors to acquire a venture in which they have been previously investing. I also study the propensity of CVC investors to acquire a non-portfolio venture, a company that was not included in the CVC's venture portfolio, but has received investments from other corporate venture capitalists.

Consistent with Benson and Ziedonis (2010), I find that CVC investors experience significant negative returns when they acquire portfolio ventures, but not when they acquire non-portfolio ventures backed by competing CVCs. However, when I take into account the significant positive market reaction to the initial CVC investments in portfolio ventures, I show that acquisitions of portfolio ventures are actually not worse than acquisitions of non-portfolio ventures. Yet, the determinants of the decision of CVC investors to acquire one versus the other appear to be different. I find that CVC investors are more likely to acquire portfolio ventures when the start-up's innovation is associated with low degree of uncertainty. However, when faced with higher competition coming from co-invested corporate investors, CVC acquirers are likely to preempt the actions of their competitors and acquire the venture earlier. Moreover, corporate investors that are largely dependent on external innovation, are more likely to acquire innovative portfolio ventures. I also show that higher number of co-invested VCs leads to a lower chance of a portfolio acquisition. This is consistent with the conflicts of interest between traditional VCs and CVC investors.

Similar to acquisitions of portfolio ventures, I find that the probability of a non-portfolio acquisition is also higher when more competing CVCs have invested in the venture. However, the presence of traditional VCs co-invested in the venture does not affect the probability of a non-portfolio acquisition. My results also suggest that CVCs are actively managing their portfolios and tend to acquire non-portfolio ventures when their own portfolio performs poorly. Lastly, unlike for portfolio ventures, the probability of acquisitions of non-portfolio ventures is independent of the level of the CVC's innovation. This finding potentially explains some of the difference in acquisition performance

between the two types of deals. Indeed, while CVC's innovation does not affect the performance of non-portfolio acquisitions, I find that acquisitions of portfolio ventures made by CVC acquirers with fewer patents have worse acquisition performance.

One implication of my analysis is that corporate venture capitalists appear to invest in innovative ventures as a way to access external innovation. However, the announcement of the acquisition of a portfolio venture sends a negative signal to market participants about the level of the CVC's internal innovation and the likelihood of obtaining future innovation.

This study suggests several avenues for future research. First, I hope to supplement my analysis with information on the innovation of CVC acquirers post acquisition. How does the acquisition of a start-up company affect the innovativeness of the CVC acquirers of portfolio ventures versus CVC acquirers of non-portfolio ventures? Second, what happens with the innovation of portfolio ventures that are not being acquired by the CVC investor?

Table 2.1: The 54 CVC Acquirers, their Portfolio Ventures and Acquisitions

		Acquisitions of portfolio targets		Acquisitions of non-portfolio targets	
Acquirer	**Number of portfolio ventures**	**Number of targets**	**Fraction of targets (%)**	**Number of targets**	**Fraction of targets (%)**
3Com Corp	24	1	4.2	2	8.3
Abbott Laboratories	16	2	12.5	3	18.8
ADC Telecommunications Inc	13	2	15.4	2	15.4
Advanced Fibre Communications Inc	2	1	50.0	0	0.0
Affymetrix Inc	6	1	16.7	0	0.0
Amazon.com Inc	19	3	15.8	3	15.8
Amgen Inc	24	1	4.2	3	12.5
Autodesk Inc	10	1	10.0	2	20.0
Becton, Dickinson and Co	12	1	8.3	4	33.3
Boston Scientific Corp	31	3	9.7	4	12.9
Broad.com Corp	6	2	33.3	12	200.0
Cisco Systems Inc	205	22	10.7	19	9.3
Comcast Corp	78	1	1.3	2	2.6
Compaq Computer Corp	2	1	50.0	2	100.0
Cypress Semiconductor Corp	7	1	14.3	1	14.3
Dun & Bradstreet Corp	6	2	33.3	0	0.0
eBay Inc	6	1	16.7	4	66.7
Eli Lilly and Co	20	1	5.0	2	10.0
Equifax Inc	4	1	25.0	2	50.0
General Electric Co	367	1	0.3	0	0.0
Harris Corp	12	2	16.7	1	8.3
I2 Technologies Inc	5	1	20.0	1	20.0
International Business Machines Corp	35	5	14.3	20	57.1
Inktomi Corp	10	1	10.0	1	10.0
Intel Corp	864	7	0.8	6	0.7
Intelligent System Corp	22	1	4.5	0	0.0
Johnson & Johnson	154	6	3.9	4	2.6

(*Continue*)

Table 2.1 – *Continued*

Acquirer	Number of portfolio ventures	Acquisitions of portfolio targets		Acquisitions of non-portfolio targets	
		Number of targets	Fraction of targets (%)	Number of targets	Fraction of targets (%)
Juniper Networks Inc	16	2	12.5	2	12.5
Liberty Media Corp Starz Group	16	1	6.3	0	0.0
Lucent Technologies Inc	29	2	6.9	5	17.2
MedImmune Inc	25	1	4.0	1	4.0
Medtronic Inc	41	3	7.3	2	4.9
Merck & Co Inc	17	1	5.9	1	5.9
Microsoft Corp	84	6	7.1	20	23.8
Monsanto Co	7	1	14.3	0	0.0
Motorola Solutions Inc	160	6	3.8	8	5.0
NCR Corp	2	1	50.0	1	50.0
Novell Inc	52	1	1.9	8	15.4
Peoplesoft Inc	6	1	16.7	1	16.7
Platinum Technology International Inc	3	1	33.3	0	0.0
QUALCOMM Inc	58	1	1.7	2	3.4
Quantum Corp	2	1	50.0	1	50.0
Repligen Corp	1	1	100.0	0	0.0
Safeguard Scientifics Inc	80	1	1.3	0	0.0
Sepracor Inc	2	1	50.0	0	0.0
Sun Microsystems Inc	64	2	3.1	6	9.4
Symantec Corp	11	1	9.1	8	72.7
Tandem Computers Inc	8	1	12.5	1	12.5
Texas Instruments Inc	50	1	2.0	5	10.0
Washington Post Co	12	1	8.3	0	0.0
Verisign Inc	21	1	4.8	5	23.8
Visa Inc	27	1	3.7	0	0.0
Walt Disney Co	8	2	25.0	1	12.5
Yahoo Inc	17	3	17.6	8	47.1
Total	**2779**	**117**	**4.2**	**186**	**6.7**

Table 2.2: Distribution by Year

		Acquisitions of portfolio targets		Acquisitions of non-portfolio targets	
Year	**Number of portfolio ventures**	**Number of targets**	**Fraction of targets (%)**	**Number of targets**	**Fraction of targets (%)**
1987	343	1	0.29	1	0.29
1988	363	0	0.00	1	0.28
1989	411	1	0.24	2	0.49
1990	439	0	0.00	0	0.00
1991	483	1	0.21	1	0.21
1992	536	0	0.00	1	0.19
1993	606	1	0.17	2	0.33
1994	687	0	0.00	1	0.15
1995	868	0	0.00	4	0.46
1996	1,109	4	0.36	4	0.36
1997	1,329	5	0.38	2	0.15
1998	1,605	4	0.25	6	0.37
1999	1,934	12	0.62	16	0.83
2000	2,119	13	0.61	15	0.71
2001	2,135	6	0.28	9	0.42
2002	2,086	8	0.38	10	0.48
2003	2,060	3	0.15	8	0.39
2004	2,029	7	0.34	12	0.59
2005	1,993	9	0.45	15	0.75
2006	1,936	9	0.46	24	1.24
2007	1,834	9	0.49	13	0.71
2008	1,719	10	0.58	16	0.93
2009	1,603	6	0.37	7	0.44
2010	1,504	8	0.53	16	1.06

Table 2.3: Distribution by Industry

Target Industry	Portfolio Ventures	Portfolio Targets	Non-Portfolio Targets
Agricultural Production Crops (SIC 01)	1	1	0
Crude Petroleum & Natural Gas (SIC 13)	1	0	0
Building Construction General Contractors & Operative Builders (SIC 15)	2	0	0
Food & Kindred Products (SIC 20)	1	0	0
Textile Mill Products (SIC 22)	1	0	0
Paper & Allied Products (SIC 26)	1	0	0
Printing, Publishing & Allied Industries (SIC 27)	6	1	0
Chemicals & Allied Products (SIC 28)	177	8	7
Rubber & Miscellaneous Plastics Products (SIC 30)	1	0	0
Leather & Leather Products (SIC 31)	1	0	0
Stone, Clay, Glass & Concrete Products (SIC 32)	3	0	0
Primary Metal Industries (SIC 33)	11	0	0
Fabricated Metal Products, Except Machinery & Transportation Equipment (SIC 34)	1	0	0
Industrial & Commercial Machinery & Computer Equipment (SIC 35)	70	4	6
Electronic, Electrical Equipment & Components, Except Computer Equipment (SIC 36)	345	20	32
Transportation Equipment (SIC 37)	3	0	0
Surgical & Medical Instruments & Apparatus (SIC 38)	167	14	14
Miscellaneous Manufacturing Industries (SIC 39)	2	0	0
Local & Suburban Transit & Interurban Highway Passenger Transportation (SIC 41)	1	0	0
Motor Freight Transportation & Warehousing (SIC 42)	1	0	0
Transportation Services (SIC 47)	2	0	0
Communications (SIC 48)	153	1	2
Electric, Gas & Sanitary Services (SIC 49)	2	0	0
Wholesale Trade - Durable Goods (SIC 50)	19	1	1
Wholesale Trade-non-durable Goods (SIC 51)	1	0	0
Building Materials, Hardware, Garden Supply & Mobile Home Dealers (SIC 52)	1	0	0
Food Stores (SIC 54)	2	0	0
Apparel & Accessory Stores (SIC 56)	2	0	0
Home Furniture, Furnishings & Equipment Stores (SIC 57)	2	0	0
Eating And Drinking Places (SIC 58)	3	0	0

(Continue)

Table 2.3 – *Continued*

Target Industry	**Portfolio Ventures**	**Portfolio Targets**	**Non-Portfolio Targets**
Miscellaneous Retail (SIC 59)	32	2	4
Depository Institutions (SIC 60)	3	0	0
Non-depository Credit Institutions (SIC 61)	4	0	0
Security & Commodity Brokers, Dealers, Exchanges & Services (SIC 62)	13	0	0
Insurance Carriers (SIC 63)	6	0	0
Insurance Agents, Brokers & Service (SIC 64)	1	0	0
Real Estate (SIC 65)	1	0	0
Holding & Other Investment Offices (SIC 67)	15	0	0
Business Services (SIC 73)	1300	63	115
Motion Pictures (SIC 78)	10	1	0
Amusement & Recreation Services (SIC 79)	9	0	0
Health Services (SIC 80)	19	0	1
Educational Services (SIC 82)	12	0	0
Social Services (SIC 83)	3	0	0
Engineering, Accounting, Research, Management & Related Services (SIC 87)	70	1	4
Miscellaneous Services (SIC 89)	2	0	0
Administration Of Environmental Quality & Housing Programs (SIC 95)	1	0	0

Table 2.4: Characteristics of Start-up Companies

The sample of 54 CVC acquirers is derived from VentureXpert, and includes public companies that have provided venture capital directly to start-ups, from 1987 through 2010, and that have subsequently acquired at least one entrepreneurial firm from their venture portfolio. Portfolio targets are identified as start-up companies, which were included in the CVC's venture portfolio and were later acquired by the CVC investor. Non-portfolio targets are CVC-backed ventures, which were not part of the CVC's investment portfolio but were acquired by it. Panel A of the table compares the characteristics of portfolio targets (columns (1), (2), and (3)) to the characteristics of not acquired portfolio ventures (columns (4), (5), and (6)), in the year of the acquisition. Panel B compares the characteristics of portfolio targets (columns (1), (2), and (3)) to the characteristics of non-portfolio targets (columns (4), (5), and (6)), in the year of the acquisition. The t-tests of differences in means, and nonparametric Wilcoxon signed rank tests for differences in medians are reported in the last two columns. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Portfolio Targets			**Not Acquired Portfolio Ventures**			**Difference**	
	Mean	**Median**	**Observations**	**Mean**	**Median**	**Observations**		
Panel A	(1)	(2)	(3)	(4)	(5)	(6)	(1) - (4)	(2) - (5)
Number of patents	3.39	0	116	4.86	0	13,489	-1.47	0.00
Number of citations	150.14	0	116	162.76	0	13,489	-12.63	0.00
Number of backward citations	63.72	0	116	43.08	0	13,489	20.64*	0.00
Venture age	6.58	5	103	8.10	7	12,491	-1.52**	-2.00***
Number of VC investors	3.69	4	116	5.44	5	13,489	-1.75***	-1.00***
Number of CVC investors	1.66	1	116	2.26	2	13,489	-0.60***	-1.00***

(Continue)

Table 2.4 – *Continued*

	Portfolio Targets			**Non-Portfolio Targets**			**Difference**	
	Mean	**Median**	**Observations**	**Mean**	**Median**	**Observations**		
Panel B	(1)	(2)	(3)	(4)	(5)	(6)	(1) - (4)	(2) - (5)
Number of patents	3.39	0	116	5.54	1	186	-2.15	-1.00
Number of citations	150.14	0	116	190.11	1	186	-39.97	-1.00
Number of backward citations	63.72	0	116	49.94	3.5	186	13.78	-3.50
Venture age	6.58	5	103	7.57	7	180	-0.99	-2.00***
Number of VC investors	3.69	4	116	5.31	5	186	-1.62***	-1.00***
Number of CVC investors	1.66	1	116	1.45	1	186	0.21*	0.00*

Table 2.5: Characteristics of Holding Portfolios of CVC Companies

The sample of 54 CVC acquirers is derived from VentureXpert, and includes public companies that have provided venture capital directly to start-ups, from 1987 through 2010, and that have subsequently acquired at least one entrepreneurial firm from their venture portfolio. Portfolio targets are identified as start-up companies, which were included in the CVC's venture portfolio and were later acquired by the CVC investor. Non-portfolio targets are CVC-backed ventures, which were not part of the CVC's investment portfolio but were acquired by it. Panel A of the table compares characteristics of the corporate venture portfolio of CVC acquirers (columns (1), (2), and (3)), to the characteristics of the corporate venture portfolio of non-acquirers (columns (4), (5), and (6)), in the year of the acquisition. Panel B compares characteristics of the corporate venture portfolio of CVC acquirers of portfolio targets (columns (1), (2), and (3)), to the characteristics of the corporate venture portfolio of CVC acquirers of non-portfolio targets (columns (4), (5), and (6)), in the year of the acquisition. The t-tests of differences in means, and nonparametric Wilcoxon signed rank tests for differences in medians are reported in the last two columns. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Acquirers of Portfolio Ventures			**Non-Acquirers of Portfolio Ventures**			**Difference**	
	Mean	**Median**	**Observations**	**Mean**	**Median**	**Observations**		
Panel A	(1)	(2)	(3)	(4)	(5)	(6)	(1) - (4)	(2) - (5)
Portfolio size	109.54	27.5	116	288.43	148	13,489	-178.89***	-120.50***
Portfolio patents	243.65	98	116	882.98	413	13,489	-639.33***	-315***
Portfolio citations	8,408.07	3,624	116	27,517.2	17,779	13,489	-19,109.13***	-14,155***
Portfolio backward citations	2,404.22	565.5	116	6,962.79	3,781	13,489	-4,558.57***	-3,215.5***

(Continue)

Table 2.5 – *Continued*

	Acquirers of Portfolio Targets			**Acquirers of Non-Portfolio Targets**			**Difference**	
	Mean	**Median**	**Observations**	**Mean**	**Median**	**Observations**		
Panel B	(1)	(2)	(3)	(4)	(5)	(6)	(1) - (4)	(2) - (5)
Portfolio size	109.54	27.5	116	70.75	25	186	38.80**	2.50
Portfolio patents	243.65	98	116	162.49	58.5	186	81.16**	39.5
Portfolio citations	8,408.06	3,624	116	5,831	1,152	186	2577.06*	2,472
Portfolio backward citations	2,404.22	565.5	116	1,695.94	485.5	186	708.28*	80

Table 2.6: Characteristics of CVC Companies

The sample of 54 CVC acquirers is derived from VentureXpert, and includes public companies that have provided venture capital directly to start-ups, from 1987 through 2010, and that have subsequently acquired at least one entrepreneurial firm from their venture portfolio. Portfolio targets are identified as start-up companies, which were included in the CVC's venture portfolio and were later acquired by the CVC investor. Non-portfolio targets are CVC-backed ventures, which were not part of the CVC's investment portfolio but were acquired by it. Panel A of the table compares characteristics of the CVC acquirers of portfolio ventures in the year of the acquisition (columns (1), (2), and (3)), to their average characteristics in years when they do not acquire portfolio ventures (columns (4), (5), and (6)). Panel B compares characteristics of CVC acquirers of portfolio targets (columns (1), (2), and (3)) to the characteristics of CVC acquirers of non-portfolio targets (columns (4), (5), and (6)) in the year of the acquisition. All dollar figures are in millions of dollars. Financial data on the acquirers comes from COMPUSTAT database. The t-tests of differences in means, and nonparametric Wilcoxon signed rank tests for differences in medians are reported in the last two columns. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Acquirers of Portfolio Targets			**Non-Acquirers of Portfolio Ventures**			**Difference**	
	Mean	**Median**	**Observations**	**Mean**	**Median**	**Observations**		
Panel A	(1)	(2)	(3)	(4)	(5)	(6)	(1) - (4)	(2) - (5)
Total assets ($MMs)	33,016	19,231	116	114,541	47,143	13,443	-81,525***	-27,912***
R&D to assets (%)	0.09	0.09	116	0.08	0.09	13,443	0.01***	0.00*
Net income to assets (%)	0.03	0.08	116	0.07	0.09	13,443	-0.04**	-0.01
Cash to assets (%)	0.09	0.12	116	0.12	0.15	13,443	-0.03**	-0.03*
Tobin's Q	4.25	3.04	115	2.98	2.45	13,405	1.26***	0.59***
CVC Number of Patents	4,664.62	1,259	116	16,038	8,044	13,489	-11,373.38***	-6,785***

(Continue)

Table 2.6 – *Continued*

	Acquirers of Portfolio Targets			**Acquirers of Non-Portfolio Targets**			**Difference**	
	Mean	**Median**	**Observations**	**Mean**	**Median**	**Observations**		
Panel B	(1)	(2)	(3)	(4)	(5)	(6)	(1) - (4)	(2) - (5)
Total assets ($MMs)	33,016.35	19,230.90	116	32,031.58	15,592.44	186	984.77	3,638.46
R&D to assets (%)	0.09	0.09	116	0.10	0.09	186	-0.01	0.00
Net income to assets (%)	0.03	0.08	116	0.08	0.10	186	-0.05	-0.02
Cash to assets (%)	0.09	0.12	116	0.12	0.14	186	-0.03	-0.02
Tobin's Q	4.25	3.04	115	3.98	3.05	186	0.27	-0.01
CVC Patents	4,664.62	1,259	116	5,628.98	2,409	186	-964.36	-1,150*

Table 2.7: Decision to Acquire a Portfolio Venture

This table reports results of a cross-sectional logit regression, where the sample includes only ventures in which the CVC investor has invested. The dependent variable is a dummy variable that equals one if the CVC investor acquires a portfolio venture, and zero otherwise. Independent variables include the total number of patents the venture was granted; the total number of citations to granted patents to the venture; the total number of backward citations that granted patents to the venture have made; the total number of patents granted to the *other ventures* included in the CVC's investment portfolio; the total number of citations to granted patents to the *other ventures* included in the CVC's investment portfolio multiplied by 100; the total number of backward citations that granted patents to the *other ventures* included in the CVC's investment portfolio have made multiplied by 100; CVC's investor portfolio size; the total number of patents granted to the CVC investor multiplied by 100; the total number of VC investors that have invested in the venture; the total number of CVC investors that have invested in the venture; the log of venture age; a dummy variable that equals one if the venture is a public company; a dummy variable that equals one if the venture and the CVC acquirer are from the same 2-digit SIC code industry; the log of acquirer's total assets; the ratio of acquirer's R&D expenditures to assets; the ratio of acquirer's cash to assets; and the acquirer's Tobin's Q, winsorized at the 99th percentile. All regressions include year- and industry-fixed effects. The reported standard errors are clustered by CVC acquirer firm. T-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable: Acquisition of Portfolio Venture					
Independent variables	(1)	(2)	(3)	(4)	(5)	(6)
Number of Patents	-0.002	-0.002				
	(-0.30)	(-0.33)				
Number of Citations			0.008	0.008		
			(1.10)	(1.06)		
Number of Back. Citations					0.001***	0.001***
					(3.36)	(3.10)
Portfolio Patents	-0.001***	-0.001***				
	(-5.55)	(-2.89)				
Portfolio Citations			-0.003***	-0.002***		
			(-6.50)	(-2.40)		
Portfolio Back. Citations					-0.010***	-0.006***
					(-3.87)	(-2.64)
Portfolio Size		-0.002***		-0.001**		-0.002***
		(-3.17)		(-2.10)		(-3.44)
CVC Number of Patents	-0.002**	-0.002**	-0.002**	-0.002**	-0.003***	-0.003***
	(-2.25)	(-2.29)	(-2.10)	(-2.20)	-(2.81)	(-2.84)
Number of VCs	-0.097***	-0.102***	-0.102***	-0.106***	-0.103***	-0.109***
	(-2.75)	(-2.95)	(-2.93)	(-3.04)	(-2.96)	(-3.17)
Number of CVCs	0.135***	0.132***	0.132***	0.132***	0.134***	0.130***
	(3.04)	(3.00)	(3.02)	(3.01)	(3.10)	(3.02)
Log of Venture Age	-0.126	-0.126	-0.139	-0.142	-0.163	-0.162
	(-1.11)	(-1.11)	(-1.28)	(-1.30)	(-1.45)	(-1.42)
Public Venture	0.319	0.305	0.280	0.274	0.278	0.262
	(0.82)	(0.78)	(0.73)	(0.72)	(0.74)	(0.70)
Same Industry	0.726***	0.645***	0.723***	0.665***	0.765***	0.663***
	(3.42)	(3.11)	(3.53)	(3.24)	(3.67)	(3.24)
Log of Total Assets	0.010	0.034	0.017	0.030	0.014	0.038
	(0.11)	(0.39)	(0.19)	(0.35)	(0.15)	(0.43)
R&D to Total Assets	0.155	0.328	0.213	0.263	0.057	0.287
	(0.09)	(0.20)	(0.13)	(0.16)	(0.03)	(0.17)

(Continue)

Table 2.7 – *Continued*

	Dependent Variable: Acquisition of Portfolio Venture					
Independent variables	(1)	(2)	(3)	(4)	(5)	(6)
Cash to Total Assets	-0.794*	-0.660	-0.696	-0.639	-0.808*	-0.662
	(-1.77)	(-1.29)	(-1.48)	(-1.25)	(-1.81)	(-1.29)
Tobin's Q	0.160**	0.144**	0.151**	0.142**	0.154**	0.141**
	(2.26)	(2.13)	(2.24)	(2.13)	(2.19)	(2.09)
Constant	-5.020***	-4.767***	-5.045***	-4.760***	-4.993***	-4.721***
	(-3.61)	(-3.50)	(-3.67)	(-3.47)	(-3.58)	(-3.46)
N	22,939	22,939	22,939	22,939	22,939	22,939
Adj R^2	0.096	0.101	0.098	0.100	0.098	0.103
Industry-Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year-Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

Table 2.8: Decision to Acquire a Non-Portfolio Venture

This table reports results of a cross-sectional logit regression, where the sample includes all ventures in which the CVC investor has previously invested, plus all ventures that were not included in the CVC's venture portfolio but were eventually acquired by the corporate investor. The dependent variable is a dummy variable that equals one if the CVC investor acquires a non-portfolio venture, and zero otherwise. Independent variables include the total number of patents the venture was granted; the total number of citations to granted patents to the venture; the total number of backward citations that granted patents to the venture have made; the total number of patents granted to the *other ventures* included in the CVC's investment portfolio; the total number of citations to granted patents to the *other ventures* included in the CVC's investment portfolio multiplied by 100; the total number of backward citations that granted patents to the *other ventures* included in the CVC's investment portfolio have made multiplied by 100; CVC's investor portfolio size; the total number of patents granted to the CVC investor multiplied by 100; the total number of VC investors that have invested in the venture; the total number of CVC investors that have invested in the venture; the log of venture age; a dummy variable that equals one if the venture is a public company; a dummy variable that equals one if the venture and the CVC acquirer are from the same 2-digit SIC code industry; the log of acquirer's total assets; the ratio of acquirer's R&D expenditures to assets; the ratio of acquirer's cash to assets; and the acquirer's Tobin's Q, winsorized at the 99th percentile. All regressions include year- and industry-fixed effects. The reported standard errors are clustered by CVC acquirer firm. T-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable: Acquisition of Non-Portfolio Venture					
Independent variables	(1)	(2)	(3)	(4)	(5)	(6)
Number of Patents	-0.004	-0.004				
	(-0.78)	(-0.79)				
Number of Citations			0.003	0.002		
			(0.28)	(0.20)		
Number of Back. Citations					0.000	0.000
					(0.37)	(0.03)
Portfolio Patents	-0.002***	-0.002**				
	(-2.92)	(-2.18)				
Portfolio Citations			-0.006***	-0.005**		
			(-3.45)	(-2.16)		
Portfolio Back. Citations					-0.019***	-0.014**
					(-3.08)	(-2.19)
Portfolio Size		-0.002**		-0.002		-0.002**
		(-2.17)		(-1.49)		(-2.17)
CVC Number of Patents	0.000	-0.001	-0.000	-0.000	-0.001	-0.001
	(0.09)	(-0.00)	(-0.18)	(-0.27)	(-0.57)	(-0.59)
Number of VCs	0.008	0.004	0.002	-0.002	0.003	-0.001
	(0.37)	(0.17)	(0.03)	(-0.11)	(0.16)	(-0.03)
Number of CVCs	0.189***	0.189***	0.198***	0.200***	0.199***	0.197***
	(5.16)	(5.18)	(5.56)	(5.57)	(5.65)	(5.63)
Log of Venture Age	0.205*	0.200	0.186	0.183	0.187	0.184
	(1.69)	(1.64)	(1.57)	(1.53)	(1.54)	(1.50)
Public Venture	0.457*	0.432*	0.415*	0.401*	0.419*	0.392
	(1.93)	(1.87)	(1.77)	(1.74)	(1.73)	(1.65)
Same Industry	1.045***	0.949***	1.073***	1.003***	1.139***	1.005***
	(5.51)	(4.90)	(5.76)	(5.17)	(6.16)	(5.24)
Log of Total Assets	0.025	0.048	0.022	0.036	0.027	0.054
	(0.33)	(0.63)	(0.29)	(0.48)	(0.36)	(0.71)
R&D to Total Assets	1.576	1.732	1.571	1.632	1.537	1.742
	(0.83)	(0.89)	(0.82)	(0.83)	(0.81)	(0.90)

(Continue)

Table 2.8 – *Continued*

	Dependent Variable: Acquisition of Portfolio Venture					
Independent variables	(1)	(2)	(3)	(4)	(5)	(6)
Cash to Total Assets	0.446	0.824	0.625	0.825	0.351	0.797
	(0.67)	(1.05)	(0.90)	(1.08)	(0.57)	(1.06)
Tobin's Q	0.165***	0.144***	0.152***	0.140***	0.160***	0.138***
	(3.59)	(3.33)	(3.50)	(3.35)	(3.44)	(3.27)
Constant	-6.409***	-6.140***	-6.341***	-6.059***	-6.422***	-6.100***
	(-5.13)	(-4.92)	(-5.34)	(-5.11)	(-5.20)	(-4.95)
N	25,065	25,065	25,065	25,065	25,065	25,065
Adj R^2	0.161	0.166	0.159	0.161	0.156	0.163
Industry-Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year-Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

Table 2.9: Cox Proportional Hazard Model

This table reports results of a Cox proportional hazard regression, where the sample includes only ventures in which the CVC investor has invested. The dependent variable is time-to-acquisition of a portfolio venture, which measures the time from the birth of a company to the date the company is acquired by a CVC acquirer that has previously invested in the venture. Independent variables include the total number of patents the venture was granted; the total number of citations to granted patents to the venture; the total number of backward citations that granted patents to the venture have made; the total number of patents granted to the *other ventures* included in the CVC's investment portfolio; the total number of citations to granted patents to the *other ventures* included in the CVC's investment portfolio multiplied by 100; the total number of backward citations that granted patents to the *other ventures* included in the CVC's investment portfolio have made multiplied by 100; CVC's investor portfolio size; the total number of patents granted to the CVC investor multiplied by 100; the total number of VC investors that have invested in the venture; the total number of CVC investors that have invested in the venture; the log of venture age; a dummy variable that equals one if the venture is a public company; a dummy variable that equals one if the venture and the CVC acquirer are from the same 2-digit SIC code industry; the log of acquirer's total assets; the ratio of acquirer's R&D expenditures to assets; the ratio of acquirer's cash to assets; and the acquirer's Tobin's Q, winsorized at the 99th percentile. All regressions include year- and industry-fixed effects. The reported standard errors are clustered by CVC acquirer firm. T-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable: Time-to-Acquisition of Portfolio Venture					
	Coeff.	**Hazard Ratio**	**Coeff.**	**Hazard Ratio**	**Coeff.**	**Hazard Ratio**
Independent variables	(1)	(2)	(3)	(4)	(5)	(6)
Number of Patents	-0.003	0.997				
	(-0.44)					
Number of Citations			0.006	1.000		
			(0.75)			
Number of Back. Citations					0.001***	1.001***
					(3.24)	
Portfolio Patents	-0.001**	1.000**				
	(-2.24)					
Portfolio Citations			-0.002*	1.000*		
			(-1.81)			
Portfolio Back. Citations					-0.004	1.000
					(-1.57)	
Portfolio Size	-0.002***	0.998***	-0.001**	0.999**	-0.002***	0.998***
	(-2.79)		(-2.07)		(-2.99)	
CVC Number of Patents	-0.002*	1.000*	-0.002*	1.000*	-0.002**	1.000**
	(-1.89)		(-1.85)		(-2.38)	
Number of VCs	-0.102***	0.903***	-0.105***	0.900***	-0.109***	0.897***
	(-2.96)		(-3.06)		(-3.18)	
Number of CVCs	0.138***	1.148***	0.138***	1.148***	0.136***	1.145***
	(3.29)		(3.31)		(3.30)	
Log of Venture Age	-0.118	0.889	-0.133	0.876	-0.157	0.855
	(-1.12)		(-1.32)		(-1.50)	
Public Venture	0.289	1.335	0.259	1.296	0.245	1.277
	(0.76)		(0.70)		(0.67)	
Same Industry	0.724***	2.063***	0.744***	2.104***	0.745***	2.106***
	(3.81)		(3.89)		(3.95)	

(Continue)

Table 2.9 – *Continued*

	Dependent Variable: Time-to-Acquisition of Portfolio Venture					
	Coeff.	**Hazard Ratio**	**Coeff.**	**Hazard Ratio**	**Coeff.**	**Hazard Ratio**
Independent variables	(1)	(2)	(3)	(4)	(5)	(6)
Log of Total Assets	0.037	1.038	0.033	1.033	0.034	1.035
	(0.44)		(0.39)		(0.40)	
R&D to Total Assets	0.964	2.622	0.914	2.493	0.828	2.289
	(0.58)		(0.55)		(0.50)	
Cash to Total Assets	-0.463	0.629	-0.484	0.616	-0.505	0.603
	(-0.83)		(-0.89)		(-0.92)	
Tobin's Q	0.084	1.088	0.083	1.086	0.084	1.087
	(1.36)		(1.36)		(1.35)	
N	24,346		24,346		24,346	
Model p-value	0.000		0.000		0.000	
Industry-Fixed Effects	Yes		Yes		Yes	
Year-Fixed Effects	Yes		Yes		Yes	

Table 2.10: Cox Proportional Hazard Model

This table reports results of a Cox proportional hazard regression, where the sample includes all ventures in which the CVC investor has previously invested, plus all ventures that were not included in the CVC's venture portfolio but were eventually acquired by the corporate investor. The dependent variable is time-to-acquisition of a non-portfolio venture, which measures the time from the birth of a company to the date the company is acquired by a CVC acquirer that has not been previously investing in the venture. Independent variables include the total number of patents the venture was granted; the total number of citations to granted patents to the venture; the total number of backward citations that granted patents to the venture have made; the total number of patents granted to the *other ventures* included in the CVC's investment portfolio; the total number of citations to granted patents to the *other ventures* included in the CVC's investment portfolio multiplied by 100; the total number of backward citations that granted patents to the *other ventures* included in the CVC's investment portfolio have made multiplied by 100; CVC's investor portfolio size; the total number of patents granted to the CVC investor multiplied by 100; the total number of VC investors that have invested in the venture; the total number of CVC investors that have invested in the venture; the log of venture age; a dummy variable that equals one if the venture is a public company; a dummy variable that equals one if the venture and the CVC acquirer are from the same 2-digit SIC code industry; the log of acquirer's total assets; the ratio of acquirer's R&D expenditures to assets; the ratio of acquirer's cash to assets; and the acquirer's Tobin's Q, winsorized at the 99th percentile. All regressions include year- and industry-fixed effects. The reported standard errors are clustered by CVC acquirer firm. T-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Dep. Variable: Time-to-Acquisition of Non-Portfolio Venture					
	Coeff.	**Hazard Ratio**	**Coeff.**	**Hazard Ratio**	**Coeff.**	**Hazard Ratio**
Independent variables	(1)	(2)	(3)	(4)	(5)	(6)
Number of Patents	-0.004	0.996				
	(-0.99)					
Number of Citations			-0.001	1.000		
			(-0.11)			
Number of Back. Citations					0.000	1.000
					(0.10)	
Portfolio Patents	-0.002***	0.998***				
	(-2.35)					
Portfolio Citations			-0.004**	1.000**		
			(-2.16)			
Portfolio Back. Citations					-0.013**	1.000**
					(-2.13)	
Portfolio Size	-0.002***	0.998***	-0.002	0.998	-0.002***	0.998***
	(-2.52)		(-1.67)		(-2.47)	
CVC Number of Patents	-0.000	1.000	-0.001	1.000	-0.001	1.000
	(-0.17)		(-0.39)		(-0.77)	
Number of VCs	0.006	1.006	-0.001	0.999	0.001	1.001
	(0.27)		(-0.05)		(0.05)	
Number of CVCs	0.178***	1.195***	0.191***	1.211***	0.189***	1.207***
	(5.11)		(5.64)		(5.72)	
Log of Venture Age	0.238*	1.269*	0.223*	1.250*	0.218*	1.243*
	(1.90)		(1.79)		(1.70)	
Public Venture	0.421*	1.524*	0.395*	1.484*	0.372	1.450
	(1.84)		(1.72)		(1.58)	
Same Industry	0.930***	2.533***	0.985***	2.678***	0.992***	2.696***
	(5.47)		(5.76)		(5.89)	

(Continue)

Table 2.10 – *Continued*

	Dep. Variable: Time-to-Acquisition of Non-Portfolio Venture					
	Coeff.	**Hazard Ratio**	**Coeff.**	**Hazard Ratio**	**Coeff.**	**Hazard Ratio**
Independent variables	(1)	(2)	(3)	(4)	(5)	(6)
Log of Total Assets	0.117*	1.124*	0.100	1.106	0.118*	1.126*
	(1.88)		(1.54)		(1.82)	
R&D to Total Assets	2.616	13.677	2.485	12.006	2.594	13.386
	(1.61)		(1.54)		(1.56)	
Cash to Total Assets	1.975*	7.209*	1.928*	6.873*	1.871*	6.492*
	(1.87)		(1.83)		(1.80)	
Tobin's Q	0.068	1.071	0.062	1.064	0.065	1.067
	(1.65)		(1.46)		(1.60)	
N	25,506		25,506		25,506	
Model p-value	0.000		0.000		0.000	
Industry-Fixed Effects	Yes		Yes		Yes	
Year-Fixed Effects	Yes		Yes		Yes	

Table 2.11: Heckman Selection Model – First Stage

This table presents the first stage estimates (using Heckman's (1979) two step procedure) of the determinants of CVC acquisition. The dependent variable is a dummy variable that equals one if the start-up company receives CVC financing, and zero otherwise. Independent variables include the total number of spin-offs in an given year; the total number of patents the venture was granted; the total number of citations to granted patents to the venture; the total number of backward citations that granted patents to the venture have made; the total number of patents granted to the *other ventures* included in the CVC's investment portfolio; the total number of citations to granted patents to the *other ventures* included in the CVC's investment portfolio multiplied by 100; the total number of backward citations that granted patents to the *other ventures* included in the CVC's investment portfolio have made multiplied by 100; CVC's investor portfolio size; the total number of patents granted to the CVC investor multiplied by 100; the total number of VC investors that have invested in the venture; the total number of CVC investors that have invested in the venture; the log of venture age; a dummy variable that equals one if the venture is a public company; a dummy variable that equals one if the venture and the CVC acquirer are from the same 2-digit SIC code industry; the log of acquirer's total assets; the ratio of acquirer's R&D expenditures to assets; the ratio of acquirer's cash to assets; and the acquirer's Tobin's Q, winsorized at the 99th percentile. All regressions include year- and industry-fixed effects. The reported standard errors are clustered by CVC acquirer firm. T-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable:		
Independent variables	(1)	(2)	(3)
Number of Spin-offs	0.099***	0.112***	0.100***
	(2.47)	(2.82)	(2.55)
Number of Patents	-0.001		
	(-0.23)		
Number of Citations		0.003	
		(0.41)	
Number of Back. Citations			-0.000
			(-0.95)
Portfolio Patents	0.001***		
	(2.63)		
Portfolio Citations		0.002***	
		(2.80)	
Portfolio Back. Citations			0.010***
			(2.83)
Portfolio Size	0.001***	0.001**	0.001***
	(2.37)	(2.03)	(2.77)
CVC Number of Patents	0.001	0.001	0.001
	(0.52)	(0.85)	(1.20)
Number of VCs	0.025	0.026	0.026
	(1.49)	(1.57)	(1.55)
Number of CVCs	-0.063**	-0.065**	-0.063**
	(-1.98)	(-2.07)	(-2.02)
Log of Venture Age	0.016	0.011	0.017
	(0.30)	(0.21)	(0.31)
Public Venture	-0.472***	-0.479***	-0.468***
	(-2.84)	(-2.94)	(-2.79)
Same Industry	-0.434***	-0.435***	-0.440***
	(-4.14)	(-4.17)	(-4.20)

(Continue)

Table 2.11 – *Continued*

	Dependent Variable:		
Independent variables	(1)	(2)	(3)
Log of Total Assets	-0.038	-0.034	-0.043
	(-0.90)	(-0.81)	(-1.01)
R&D to Total Assets	-1.711	-1.928	-1.857
	(-1.31)	(-1.48)	(-1.43)
Cash to Total Assets	-0.294	-0.308	-0.294
	(-1.10)	(-1.16)	(-1.10)
Tobin's Q	0.013	0.015	0.016
	(0.59)	(0.67)	(0.71)
Constant	0.451	0.251	0.472
	(0.50)	(0.29)	(0.54)
N	8,370	8,370	8,370
Adj R^2	0.221	0.219	0.219
Industry-Fixed Effects	Yes	Yes	Yes
Year-Fixed Effects	Yes	Yes	Yes

Table 2.12: Heckman Selection Model – Second Stage

This table presents the second stage estimates (using Heckman's (1979) two step procedure) of the determinants of CVC acquisition. The dependent variable in the first three specifications, (1), (2), and (3) is a dummy variable that equals one if the CVC investor acquires a portfolio venture, and zero otherwise. The sample in these specifications includes only ventures in which the CVC investor has invested. The dependent variable in specifications, (4), (5), and (6) is a dummy variable that equals one if the CVC investor acquires a non-portfolio venture, and zero otherwise. The sample in the last three specifications includes all ventures in which the CVC investor has previously invested, plus all venture that were not included in the CVC's venture portfolio but were eventually acquired by the corporate investor. Independent variables include the total number of patents the venture was granted; the total number of citations to granted patents to the venture; the total number of backward citations that granted patents to the venture have made; the total number of patents granted to the *other ventures* included in the CVC's investment portfolio; the total number of citations to granted patents to the *other ventures* included in the CVC's investment portfolio multiplied by 100; the total number of backward citations that granted patents to the *other ventures* included in the CVC's investment portfolio have made multiplied by 100; CVC's investor portfolio size; the total number of patents granted to the CVC investor multiplied by 100; the total number of VC investors that have invested in the venture; the total number of CVC investors that have invested in the venture; the log of venture age; a dummy variable that equals one if the venture is a public company; a dummy variable that equals one if the venture and the CVC acquirer are from the same 2-digit SIC code industry; the log of acquirer's total assets; the ratio of acquirer's R&D expenditures to assets; the ratio of acquirer's cash to assets; and the acquirer's Tobin's Q, winsorized at the 99th percentile; and the inverse Mills ratio obtained from the first step regression. All regressions include year- and industry-fixed effects. The reported standard errors are clustered by CVC acquirer firm. T-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable:					
	Acquisition of Portfolio Venture			**Acquisition of Non-Portfolio Venture**		
Independent variables	(1)	(2)	(3)	(4)	(5)	(6)
Number of Patents	-0.002			-0.003		
	(-0.23)			(-0.66)		
Number of Citations		0.009			0.004	
		(1.13)			(0.49)	
Number of Back. Citations			0.001***			-0.000
			(2.89)			(-0.04)
Portfolio Patents	-0.001***			-0.001*		
	(-3.28)			(-1.88)		
Portfolio Citations		-0.002***			-0.004*	
		(-2.56)			(-1.86)	
Portfolio Back. Citations			-0.005**			-0.012**
			(-2.14)			(-1.98)
Portfolio Size	-0.001***	-0.001**	-0.001***	-0.002**	-0.001	-0.002**
	(-3.15)	(-1.97)	(-3.49)	(-2.14)	(-1.37)	(-2.17)
CVC Number of Patents	-0.001*	-0.002*	-0.002***	0.001	-0.000	-0.001
	(-1.89)	(-1.82)	(-2.43)	(0.04)	(-0.25)	(-0.50)
Number of VCs	-0.093***	-0.097***	-0.099***	0.012	0.009	0.008
	(-2.64)	(-2.75)	(-2.85)	(0.49)	(0.36)	(0.36)
Number of CVCs	0.106***	0.109***	0.109***	0.152***	0.157***	0.161***
	(2.36)	(2.33)	(2.54)	(3.88)	(3.99)	(4.29)
Log of Venture Age	-0.135	-0.150	-0.170	0.203	0.185	0.192
	(-1.18)	(-1.36)	(-1.48)	(1.66)	(1.53)	(1.57)

(Continue)

Table 2.12 – *Continued*

	Dependent Variables:					
	Acquisition of Portfolio Venture			**Acquisition of Non-Portfolio Venture**		
Independent variables	(1)	(2)	(3)	(4)	(5)	(6)
Public Venture	0.122	0.117	0.104	0.238	0.190	0.224
	(0.28)	(0.27)	(0.26)	(0.78)	(0.66)	(0.77)
Same Industry	0.501***	0.539***	0.534***	0.665***	0.692***	0.725***
	(2.43)	(2.41)	(2.55)	(3.29)	(3.31)	(3.54)
Log of Total Assets	-0.057	-0.061	-0.048	-0.030	-0.033	-0.013
	(-0.50)	(-0.54)	(-0.42)	(-0.41)	(-0.46)	(-0.17)
R&D to Total Assets	0.490	0.428	0.424	1.206	1.055	1.235
	(0.29)	(0.25)	(0.25)	(0.55)	(0.48)	(0.57)
Cash to Total Assets	-0.599	-0.572	-0.601	0.752	0.745	0.733
	(-1.18)	(-1.13)	(-1.19)	(0.98)	(1.00)	(1.00)
Tobin's Q	0.111	0.109	0.108	0.127***	0.123***	0.123***
	(1.53)	(1.52)	(1.50)	(2.69)	(2.69)	(2.69)
Inverse Mills Ratio	0.602	0.492	0.526	1.088	1.218	1.012
	(0.66)	(0.49)	(0.58)	(1.19)	(1.40)	(1.19)
Constant	-4.087***	-4.052***	-4.032***	-5.718***	-5.727***	-5.745***
	(-2.69)	(-2.67)	(-2.64)	(-4.79)	(-5.12)	(-4.70)
N	21,744	21,744	21,744	23,952	23,952	23,952
Adj R^2	0.104	0.103	0.106	0.167	0.163	0.165
Industry-Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year-Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

Table 2.13: Acquirer Abnormal Returns by Acquisition Type

This table reports CARs to 54 CVC investors from acquiring CVC-backed start-ups. CARs are measured over a three-day event window around the acquisition announcement date. Acquisitions of portfolio ventures (non-portfolio ventures) are defined as acquisitions in which the acquirer had (had not) provided venture funds to the target at an earlier stage of development. Panel A reports CARs measured around the announcement of acquisitions of full control. Panel B restricts the sample to acquisitions of portfolio ventures only, and reports CARs measured around the announcement of initial CVC investments. Panel C restricts the sample to acquisitions of portfolio ventures only, and reports the combined CARs measured around the announcement of initial CVC investments and at the announcement of subsequent acquisitions of full control. Column 3 tests for significant differences in the mean and median (reported in brackets) abnormal returns to portfolio ventures (column 1) and non-portfolio ventures (column 2) using t-tests for differences in means, and nonparametric Wilcoxon signed rank tests for differences in medians. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Acquisitions of portfolio ventures	**Acquisitions of non-portfolio ventures**	**Difference**
Announcement Returns	(1)	(2)	(1) - (2)
Panel A: At the acquisition of full control			
CAR (-1,1)	-0.006*	0.000	-0.007
	[-0.004]*	[-0.001]	[-0.003]*
Number of Observations	114	186	
Panel B: At the acquisition of initial CVC stake			
CAR (-1,1)	0.012**		
	[0.003]*		
Number of Observations	114		
Panel C: Combined returns at initial CVC stake and subsequent acquisition			
CAR (-1,1)	0.006	0.000	0.006
	[-0.001]	[-0.001]	[0.000]
Number of Observations	114	186	

Table 2.14: Cross-Sectional Regression of CVC Acquisition Performance

This table presents results of a cross-sectional ordinary least squares regression of the performance of CVC acquisitions. The dependent variable is the market-adjusted CARs earned by CVC acquirers over a three-day event window around the acquisition announcement date. The sample in specifications (1), (2), and (3) includes only ventures in which the CVC investor has invested. The sample in specifications, (4), (5), and (6) includes all ventures in which the CVC investor has previously invested, plus all venture that were not included in the CVC's venture portfolio but were eventually acquired by the corporate investor. Independent variables include the total number of patents the venture was granted; the total number of citations to granted patents to the venture; the total number of backward citations that granted patents to the venture have made; the total number of patents granted to the *other ventures* included in the CVC's investment portfolio; the total number of citations to granted patents to the *other ventures* included in the CVC's investment portfolio multiplied by 100; the total number of backward citations that granted patents to the *other ventures* included in the CVC's investment portfolio have made multiplied by 100; the CVC's investor portfolio size; the total number of patents granted to the CVC investor multiplied by 100; the total number of VC investors that have invested in the venture; the total number of CVC investors that have invested in the venture; the log of venture age; a dummy variable that equals one if the venture is a public company; a dummy variable that equals one if the venture and the CVC acquirer are from the same 2-digit SIC code industry; the log of acquirer's total assets; the ratio of acquirer's R&D expenditures to assets; the ratio of acquirer's cash to assets; and the acquirer's Tobin's Q, winsorized at the 99th percentile; a dummy variable that equals one if the acquisition is paid 100 percent by cash; and the value of the target as a fraction of the market capitalization of the acquirer. All regressions include year- and industry-fixed effects. The reported standard errors are clustered by CVC acquirer firm. T-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable: Three-Day CAR					
	Acquisition of Portfolio Venture			**Acquisition of Non-Portfolio Venture**		
Independent variables	(1)	(2)	(3)	(4)	(5)	(6)
Number of Patents	-0.000			0.000		
	(-0.72)			(0.35)		
Number of Citations		0.002			0.001	
		(1.54)			(0.76)	
Number of Back. Citations			0.000			-0.000
			(0.71)			(-0.14)
Portfolio Patents	-0.000			-0.001***		
	(-0.29)			(-2.39)		
Portfolio Citations		-0.000			-0.001*	
		(-0.15)			(-1.92)	
Portfolio Back. Citations			0.000			-0.001
			(0.87)			(-0.72)
Portfolio Size	0.000	0.000	0.000	-0.000	-0.000	-0.001**
	(0.47)	(0.50)	(0.47)	(-1.36)	(-0.87)	(-2.12)
CVC Number of Patents	0.001***	0.001***	0.001***	0.001	0.001	0.001
	(2.38)	(2.82)	(2.49)	(0.45)	(0.39)	(0.24)
Number of VCs	0.002	0.002	0.001	-0.000	-0.000	-0.000
	(0.47)	(0.62)	(0.34)	(-0.19)	(-0.28)	(-0.39)
Number of CVCs	-0.006	-0.008	-0.003	-0.002	-0.001	-0.002
	(-0.82)	(-1.47)	(-0.42)	(-0.29)	(-0.19)	(-0.20)
Log of Venture Age	-0.022***	-0.025***	-0.019***	-0.002	-0.003	-0.001
	(-2.46)	(-3.09)	(-2.48)	(-0.29)	(-0.35)	(-0.17)

(Continue)

Table 2.14 – *Continued*

	Dependent Variable: Three-Day CAR					
	Acquisition of Portfolio Venture			**Acquisition of Non-Portfolio Venture**		
Independent variables	(1)	(2)	(3)	(4)	(5)	(6)
Public Venture	0.029	0.029	0.019	-0.013	-0.015	-0.013
	(1.30)	(1.52)	(0.83)	(-1.16)	(-1.29)	(-1.22)
Same Industry	0.012	0.009	0.009	-0.002	0.000	-0.001
	(0.78)	(0.59)	(0.57)	(-0.12)	(0.03)	(-0.09)
Log of Total Assets	-0.032***	-0.032***	-0.032***	-0.002	-0.002	-0.002
	(-2.38)	(-2.43)	(-2.51)	(-0.23)	(-0.35)	(-0.27)
R&D to Total Assets	-0.015	0.020	0.048	-0.071	-0.058	-0.051
	(-0.08)	(0.13)	(0.27)	(-0.82)	(-0.68)	(-0.58)
Cash to Total Assets	0.016	0.017	0.016	0.096	0.109	0.103
	(1.03)	(1.20)	(1.14)	(1.16)	(1.33)	(1.24)
Tobin's Q	0.007***	0.007***	0.008***	0.002	0.002	0.002
	(2.45)	(3.12)	(2.81)	(0.59)	(0.48)	(0.44)
Cash Deals	0.003	0.000	0.002	0.025**	0.025**	0.025**
	(0.17)	(0.01)	(0.11)	(2.27)	(2.26)	(2.04)
Relative Size	-0.113*	-0.101*	-0.114**	0.006	0.012	0.014
	(-1.79)	(-1.69)	(-2.17)	(0.10)	(0.16)	(0.22)
Constant	0.289**	0.268***	0.294***	-0.055	0.041	-0.045
	(2.26)	(2.43)	(2.41)	(-0.70)	(0.49)	(-0.55)
N	65	65	65	115	115	115
Adj R^2	0.611	0.632	0.622	0.399	0.382	0.369
Industry-Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year-Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

Chapter 3

The Perverse Incentives of SPACs

> *"Because all of our directors and officers either directly or indirectly own shares of our securities that will not participate in liquidation distributions, they may have a conflict of interest in determining whether a particular target business is appropriate for a business combination."*
>
> Prospectus of Acquicor Technology Inc.
> March 15, 2006

The above is only one of the long list of risks mentioned in the "Risks relating to the company and the offering" section of the prospectus of a typical Special Purpose Acquisition Company. While it is still unclear what incentives regular investors have to invest in these types of companies, it is certainly clear that SPAC founders have perverse incentives to take advantage of these investors. A special or specified purpose acquisition company, a mix between an initial public offering (IPO) and a reverse merger, is a relatively new investment vehicle designed to raise capital through public equity markets. SPACs are shell or blank-check companies that have no operations but go public with the intention of merging with or acquiring a company with the proceeds of the SPAC's initial public offering of shares.

Recently there has been a significant surge in SPAC IPOs, in contrast to the otherwise declining U.S. IPO market. Despite all the risks involved in investing in a company with no assets or business plan, and all specific risks associated with the SPAC structure, the interest in this type of transactions has been growing. For instance, in 2008 SPACs in the U.S. account for one third of the IPO market in terms of both the number of offerings and the total capital raised (Berger, 2008). Yet, regardless of their increasing importance, IPOs of SPACs and their follow-up acquisitions have been examined only in few studies. This stands in contrast to the large body of existing literature on factors that influence the value created or destroyed when a company goes public in a "traditional" IPO.

Acquisitions by SPAC bidders are being executed in numerous industries and potential targets typically see them as an alternative to a reliance on private equity or a "traditional" IPO. Some targets choose to be acquired by a SPAC because they need the financial resources but do not want to give up control to the private equity firm. For example, the management of a small company can use a reverse merger with a SPAC to give their company a cash infusion and publicly traded shares of stock, without losing control of the firm. In other cases, target owners agree to the SPAC acquisition because they wish to go public but otherwise cannot (IPOs could be relatively expensive (Loughran and Ritter, 2002)), or because they just want to "cash out".

The Special Purpose Acquisition Company is a modern form of the "blank check"

company which becomes regulated by the Penny Stock Reform Act of 1990, the Securities Exchange Act of 1934 Rule 3a51-1, and the Security Exchange Act of 1933 Rule 419, after being used as a part of many fraudulent investment schemes in the 1980s.[1] Creative lawyers developed the SPAC as a way to work around the new regulations without defeating the regulations' purpose of investor protection (Heyman, 2007). The SPAC uses an exception in the penny stock definition to avoid being subject to Rule 419, and yet because it follows most requirements of Rule 419, the Security and Exchange Commission (SEC) does not find it necessary to regulate it more heavily.[2]

SPACs have been around since the 1990s but have traditionally been confined to pursuing "below the radar screen" transactions, mainly because favourable market conditions during the 90s made it easy for small companies to raise money in traditional IPOs (see Savitz, 2005). However, in 2003 activity began to pick up and while the IPO market has been slow during the mid- and late-2000s, SPACs have grown significantly in size in recent years, and are now chasing bigger and bigger targets. Further, the constraints posed on private equity firms, big acquirers during that period, by difficulties in the high yield and leveraged loan market have accelerated SPACs' growth.

The increased popularity of SPACs in recent years suggests that there has been a significant interest from the different parties involved in such transactions: underwriters, SPAC founders, target companies, and investors.[3] However, as in the case with every innovation, SPAC transactions add value to the marketplace only if the total potential benefits associated with them overweight the costs. In this paper, I study acquisitions by SPAC acquirers that took place in the U.S. market over the period 2004-2010 to examine how the structure of the SPAC contract affects shareholder value. I find some evidence that SPAC transactions are one of those financial innovations that Van Horne (1985) describes as "ideas that have a substance, but the promoters have eaten not only the icing of the cake but also the cake itself". The SPAC structure and built in incentives create an enormous drive for the founders to do any kind of acquisition. The results show that their determination to close a deal, independent of whether it is a profit-generating or a value destroying acquisition, is reflected in the short- and long-run post-acquisition performance of SPACs.

I start by describing the SPAC structure in detail and examining the stock price reaction to SPAC acquisitions at the time of the acquisition announcement. Similar to previous findings on acquisitions by SPACs and acquisitions of private companies in general, I find that there is a significant positive market reaction upon the acquisition announcement.

[1] The SEC Rule 419 was intended to put strict controls on the proceeds of the blank check offering, and to increase investors' protection by bringing more transparency to the transaction.

[2] In order to be exempt from Rule 419, the SPAC's offering is designed in a way which leaves the company with greater than $5 million in net tangible assets subsequent to the IPO.

[3] See Heyman (2007) for a brief explanation of the interests of each party involved in a SPAC transaction.

Nevertheless, this positive stock performance is short lived-I find that over the long-run SPAC acquirers significantly underperform the market. The average one year buy-and-hold return following the acquisition completion is -42.9%, compared to an average market return of -2.1%.[4] However, I find that there is a large cross-sectional variation in the returns and that these returns are related to specific characteristics of the deal, as well as some governance characteristics in place at the time of the acquisition. In particular, the deadline to purchase a target within 2 years of the SPAC IPO puts SPAC sponsors under enormous time pressure.[5] This appears to affect performance as I find that there is a significant concave relationship between the time it takes for a SPAC acquirer to find a potential target and its short-term performance. My results suggest that the optimal time for the acquirer to announce an acquisition is approximately 7 months after the SPAC IPO. In addition, I find that the short-term performance of SPAC acquirers is worse if a portion of the underwriting fees of the IPO underwriters is deferred and paid only upon the merger completion. The market reaction is also significantly negative for acquisitions that have a market value very close to the required 80% threshold (at least 80% of the SPAC's net assets must be spend on the target business). These findings underline the importance of the incentives built in the SPAC contract, and how these incentives may in fact encourage the SPAC founders to make rather than to pass on a bad acquisition.

I find a significant cross-sectional variation in the long-term returns as well. For instance, the continued involvement of the SPAC sponsors as shareholders and members on board has an impact on the long-term performance of SPAC acquisitions. Increasing sponsor ownership is positively related to stock returns at low levels of ownership but negatively related at high levels of ownership. Extremely high levels of sponsor ownership seem to be detrimental for performance. This is consistent with the perverse incentives of SPAC sponsors to obtain a maximum compensation in the deal, by not diluting their ownership.[6] My results are also consistent with the findings of Jenkinson and Sousa (2009) that sponsors may be wrongly incentivised to make substantial purchases of the SPAC shares solely to ensure that they receive a favourable stockholder vote on the proposed acquisition. An alternative explanation could be that by "cashing out" their shares, target owners are sending a strong negative signal to the market, about the quality of their company. In contrast, I find that performance is higher when one of the SPAC founders is appointed as a CEO or a chairman in the merged company. More specifically, on average there is 71 percentage points increase in the 1-year post-acquisition returns if the CEO is one of the SPAC sponsors.

[4] I find similar results when I examine the performance for the whole period from the merger announcement until a year after the acquisition was completed.

[5] I use the terms "founder", "sponsor", and "manager" of the SPAC interchangeably in this paper.

[6] SPAC managers do not receive cash compensation. They typically are awarded 20% interest in the SPAC after a successful completion of a deal. However, their ownership will be diluted in all cases except for acquisitions paid 100% by cash.

I also find some evidence that SPACs perform worse with increasing target insiders ownership. This result is not surprising, given the enormous incentives of SPAC sponsors to complete an acquisition and the fact that they have to spend at least 80% of the invested money on the deal, a fact of which the target managers are well aware, may lead to sponsors overpaying for the acquisition and leaving target insiders with larger ownership in the new company. Finally, I find that the ownership of the institutional blockholders has also a negative effect on the long-term performance. While this result is puzzling and needs a further investigation, it suggests that the investment behaviour of institutional blockholders in SPAC acquisitions (who are typically represented by hedge funds) is mainly motivated by speculative reasons rather than activism and monitoring of the company's management. A plausible explanation could be that hedge funds were forced to liquidate their existing positions, due to the loss of debt capital during the financial crisis of 2008, and this led to a downward pressure on SPAC prices (Mitchell and Pulvino, 2011). In summary, the analysis shows that the average investor in SPAC acquisitions incurs large losses in the long run. However, some investors lose less than others.

The evidence from the accounting performance of SPAC acquirers, using measures such as operating margins and return on sales, further confirms that SPAC acquisitions significantly underperform various benchmarks. When I examine the level of long-term debt, I find that SPACs have more debt relative to their peers, however they also hold more cash on balance, and as a result SPAC acquisitions appear to be as levered as their counterparts. In other words, the poor operating performance of SPACs does not appear to be caused by higher leverage and financial distress costs. Lastly, I find some evidence that the market held high expectations for these deals because they are sold and trade, at least initially, at higher valuations relative to other comparable firms.

The literature on SPACs is quite limited compared to the importance of these deals. The few papers that have studied them have mainly described their specific structure characteristics and legal implications. Heyman (2007) illustrates some of the important features of SPACs, and Sjostrom (2008) points out the legal differences between SPACs and other blank check companies. Berger (2008) underlines the increasing popularity of SPACs, and highlights the various motives that lead private targets to pursue an acquisition by a SPAC. Jog and Sun (2007) primarily focus on the conflicts of interest inherent in the SPAC structure, while Jenkinson and Sousa (2009) show the role that SPAC managers play in the approval of value-destroying acquisitions. Lewellen (2009) compares SPACs to private equity funds and studies their return patterns. Finally, Tran (2009), whose paper is probably the closest to this study, compares the short-term performance of acquisitions by SPAC bidders to other acquisitions. He examines all deal announcements (completed and withdrawn) and finds positive abnormal performance observed around the acquisition announcement. Moreover, he finds that the announcement returns are negatively related

to the time it takes for a SPAC acquirer to announce an acquisition, but the negative effect is partially mitigated under the monitoring by independent long-term institutional blockholders.

Given that one third of the SPAC deals in Tran's sample are later withdrawn and are never completed, I extend on his study by first, comparing the announcement returns of completed versus uncompleted deals, and second by examining in deeper detail the post-acquisition performance of all completed deals. The main contributions of this paper are that I study not only the short-term market reaction, but also the long-term stock and operating performance of SPAC acquisitions. Furthermore, I introduce additional factors related to the conflicts of interest between various parties (including sponsors, target insiders, and SPAC IPO underwriters) involved in the deal, ownership structure, and corporate governance of the merged firms, and show that they have significant explanatory power for the cross-sectional variation in the performance of SPAC acquisitions.

The reminder of the paper is organized as follows. Section 3.1 discusses the SPAC transactions in more detail. Section 3.2 describes the characteristics of the sample. Section 3.3 analyses the short- and long-term performance, as well as the operating performance of the companies. Section 3.4 presents the cross-sectional variation in performance. Section 3.5 concludes.

3.1 Description of SPAC Transactions

3.1.1 The Acquirer

A SPAC is a blank check company that is formed to raise funds in a public stock offering for the sole purpose of purchasing an operating business. SPACs are typically formed by a small group of experienced managers, the sponsors, who rely mainly on their reputation to raise capital by creating a publicly traded shell company and offering shares in the shell company to investors via an IPO. The IPO is structured as a sale of units consisting of both common stock and "in the money" warrants, which cannot be exercised until the SPAC completes an acquisition. Typically, the common shares and warrants are decoupled from the units, and are traded separately after the IPO has been completed.

Upon the completion of the IPO, a minimum of 85% of the net proceeds of the offering are placed in an escrow or trust account, invested in low-risk U.S. government securities, until the SPAC's management makes an acquisition. These funds are released upon the earlier of the completion of a business combination or the liquidation of the SPAC. The management is typically allowed to use the remainder of the proceeds that are not held in

the trust as well as a predetermined fraction of the interest earned on the trust account to cover administrative expenses, fees and working capital. The costs of due diligence on prospective targets, as well as the costs of negotiation, structuring, and gaining shareholder approval for the merger, are also paid from this money.

SPAC managers are not granted a salary or other cash compensation.[7] They typically receive a 20% interest in the SPAC, which is usually purchased in a private placement executed prior to the IPO. They may also purchase heavily discounted warrants at the time of the IPO. If a deal is made, the 20% share of the founders becomes very valuable. On the other hand, if the SPAC liquidates without having completed an acquisition, the shares and warrants owned by the sponsors end up worthless as they do not share in the liquidation proceeds if a deal is not made. This in effect, creates an extremely strong economic incentive for the founders of the SPAC to complete an acquisition prior to the SPAC's expiration date.

3.1.2 The Acquisition

The founders normally have only eighteen months from the date of the IPO to make an acquisition, plus a six month grace period if a deal is announced but not completed by the end of the first eighteen months. If the SPAC does not acquire a target firm within the maximum period of 2 years, the company is required to liquidate and the escrowed IPO proceeds are distributed pro-rata to holders of IPO shares (Savitz, 2005).

Given the time pressure and the strong incentives of the sponsors of the SPAC to close an acquisition within the fixed time frame, the process of finding a suitable target starts immediately after the IPO and in many cases involves the consideration of a large number of potential target candidates.[8] While in most cases SPAC sponsors do not have a target company in mind at the time of the IPO, based on their particular expertise, they do typically provide a specific industry or geographic region of interest for their future acquisition.

[7] As previously mentioned, SPAC managers are allowed to use a maximum of 15% of the IPO proceeds for working capital. Interestingly, when reading the IPO prospectuses I find that typically SPAC managers pay a standard amount of $180,000 to cover their administrative expenses over the two-year period. Furthermore, the money is usually being paid to a company that is affiliated to either one or more of the SPAC sponsors. I also find that a significant portion of the proceeds is used by the SPAC sponsors to pay for director and officer liability insurance premiums. When I study the relation between the size of the insurance premiums they buy and the stock market reaction to the acquisition announcement, I find that there is a significantly negative relation between the two. SPACs whose sponsors insure themselves with higher premiums against potential future lawsuits are perceived to make lower quality deals (Lin, Officer, and Zou, 2011).

[8] According to Tran (2009), the average SPAC signs confidentiality agreements and receives confidentiality information from 30 different potential targets, and after reviewing them typically submits preliminary and non-binding acquisition proposals to about 5 potential targets.

Another important characteristic of the SPAC is that it must spend at least 80% of its net assets on the business combination in order to avoid liquidation. While in some rare cases SPACs attempt to acquire multiple targets at the same time, the most common approach is the acquisition of a single target. Nevertheless, the fact that SPACs must spend 80% of the invested money on their deal, a fact of which the target's own management and owners are well aware, could lead to the SPAC sponsors to overpay for the target company.

Typically, SPACs also rely on the advice of investment bankers, private equity professionals, lawyers and business owners. For instance, in many cases the SPAC IPO underwriters also become the company's advisors during the acquisition negotiation process. Importantly, underwrites have incentives to engage in the merger process because a portion of their IPO underwriting fees is usually deferred and paid only upon the successful completion of a business combination by the SPAC. In other words, if a SPAC fails to make an acquisition, the underwriters only receive a fraction of their total fee. While this in effect leads to high initial trust values (lower immediate underwriting fees are subtracted at the time of the IPO), it also creates a strong incentive for the underwriters to push for any potential target and close a merger on time.

SPAC shareholders are allowed to vote on a proposed business combination, even though such approval may not be required under state law.[9] A proposed acquisition is approved by the shareholders if: 1) a majority of shareholders vote to approve the transaction and 2) a substantial percentage of shareholders (typically 60-80%) agree not to redeem their shares for the pro-rata trust value on the date of the shareholder vote. If the above two conditions are not satisfied the acquisition must be withdrawn. External shareholders who vote against a proposed acquisition are entitled to redeem their common stock in return for a pro-rata share of the value held in trust if the acquisition is ultimately approved. The shareholders who choose to redeem their shares are allowed to keep and/or exercise their warrants irrespective of their voting decision.

3.1.3 The Target

The SPAC may be an attractive way for private companies to obtain access to additional capital without having to do an IPO on their own.[10] The target companies acquired by a SPAC avoid the lengthy process of doing a traditional IPO, as they are not required to supply the detailed financial statements and other disclosures that typically accompany initial public offerings (see Sjostrom, 2008). In addition, they also save on the extremely

[9] Most acquirers' shareholders are only allowed to vote on stock-for-stock acquisitions if the expected equity dilution factor from the business combination exceeds 20% (Hsieh and Wang, 2008).

[10] Although uncommon, it is possible that a SPAC acquirer buys a publicly traded company.

high costs associated with the traditional IPO underwriting process (Loughran and Ritter, 2002).[11]

Given their large cash reserves, SPACs may also be appealing to target companies whose owners prefer to cash out. By allowing the company to be purchased by a SPAC, they gain liquidity without having to sell their shares in the public market.[12] Similarly, SPACs may also be used by private equity firms as an exit vehicle of their portfolio companies.

Target companies may value not only the access to additional capital but also the benefit they receive from the expertise of the SPAC's management team. SPAC sponsors typically have demonstrated a track record of success and a proprietary edge in the areas of private equity, mergers and acquisitions, and/or operating experience.[13]

3.2 Sample Selection and Sample Characteristics

I gather data on SPAC acquisitions from a variety of sources. To identify the sample, I employ a list of SPACs that filed for an IPO and match it with a list of all completed acquisitions by a SPAC acquirer. The main data on the firms are obtained from SDC Platinum and Thompson One Banker (IPO data and M&A data), CRSP and Bloomberg (stock price data), and Compustat (accounting data). I obtain further data from S-1 (prospectuses), DEFM14A (proxy statements), and 10-K (annual reports) by searching the SEC filings in EDGAR.

Table 3.1 lists the completed acquisitions by SPACs included in my analysis, in chronological order of their respective S-1 dates. Table 3.2 shows the distribution of SPAC IPOs and M&A transactions. The first half of the table includes the distributions of IPO and M&A transactions of SPACs that successfully completed an acquisition within the fixed time frame. The second half shows the distribution of SPACs that were liquidated because they were unable to complete an acquisition. The first IPO transaction took place in 2003, the bulk of the deals that entered the sample occurred in 2005 and 2007, and

[11] I check whether some of the deals in my sample involve targets that have previously tried and failed to undergo an IPO. I find that there are only 4 deals in the whole sample where the target is a previously failed IPO, typically because of poor market conditions.

[12] For instance, exiting of the target's owners trough an IPO may be less plausible given that most IPOs feature share lockup agreements, which prevent insiders and other pre-IPO shareholders from selling any of their shares for a specified period immediately after the IPO (typically 180 days) (Field and Hanka, 2001).

[13] Services Acquisition Corp. is an example of a SPAC with high profile management that includes former executives from Blockbuster, AutoNation, and Boca Resorts. The SPAC that has received perhaps the most media attention of all is Acquicor Technology Inc., formed by former Apple executives Steve Wozniak, Gil Amelio, and Ellen Hancock.

only six SPACs that went public in 2008 and completed an acquisition within the next two years, are included in my sample. The distribution of completed acquisitions made by a SPAC acquirer over time shows that there are only two acquisitions in the first two years, 2004 and 2005, and that most of the deals are completed between 2007 and 2009. The difference in distributions between columns 2 and 3 of Table 3.2 gives some indication that there is a variation between SPACs in the time it takes them to complete an acquisition. Table 3.2 also shows that a significant portion of SPACs are being liquidated (approximately 39% of the SPACs in my sample announced an acquisition that was later withdrawn).

Table 3.3 contains the industry composition of the target firms. It appears that there is a significant industry variation in the target companies. The total sample of 73 targets being acquired by SPACs is spread over 31 industries. A total of 15 targets are in business services, 6 are in holding and other investment offices, 5 in engineering, accounting, research, management and related services, and 5 in communications. The remainder of the deals are distributed over 27 industries with a maximum of 3 targets coming from the same industry. It seems that SPACs are not limited to a particular industry and that they complete acquisitions with target companies from numerous industries.

Table 3.4 contains summary statistics. The average (median) deal value of an acquisition by a SPAC is \$275.7 (\$141.2) million. Based on the SPAC trading price at the time of the merger announcement, the average (median) market capitalization of acquirers is \$153.1 (\$73.4) million. The average (median) relative size, computed as the ratio of target value over market capitalization of the acquirer, is 1.907 (1.610). This implies that on average SPACs tend to purchase targets that are 1.9 times bigger. The financing required to pay for these larger deals is typically obtained by issuing additional equity or debt at the time of the acquisition.

The SPAC sponsors, on average, collectively own approximately 11% of the shares of the new merged company and they hold 34% of the board seats of the sample firms upon the merger completion. Although, sponsors are typically awarded 20% of the SPAC shares, their ownership may vary depending on the method of payment used in the acquisition, cash versus stock, and whether they bought additional shares in the stock market. In addition, the CEO (chairman) comes from the SPAC sponsors in 30% (52%) of the cases. This evidence suggests a substantial involvement by the SPAC sponsors at least in the initial operations of the newly merged companies. There are only two companies in the sample where the sponsors did not receive any shares and five companies where they did not obtain any board representation.[14] The shares received by the sponsors represent the

[14]The ownership structure (sponsors, target insiders, and institutional ownership) is collected from the definite merger proxy statements, and reflects the voting rights (in some cases shareholders may own shares that have cash flow rights but not voting rights) of different parties in the newly merged firm at the time

bulk of their compensation for their effort in finding a suitable target.

The target insiders own an average (median) 24.7% (21.6%) of the company after the acquisition. They supply about one third of the directors of the new company. A target insider is elected as a CEO of the new company in 66% of the cases, and as a chairman in 45% of the cases. There is a significant variation in the level of post-acquisition ownership of target insiders. This is consistent with the evidence that on one hand, SPACs may be used as an exit strategy of the target owners, while on the other hand they may be used by targets as a strategy to get an access to the U.S. public market, through a reverse merger.[15]

The primary holders of SPAC shares, the institutional investors (typically represented by hedge funds), have an average (median) ownership stake of about 29% (27%) in the new merged entity. At a first sight these levels seem to be below the average institutional ownership level of 51.6% for all publicly traded stocks as reported by Gompers and Metrick (2001). However, it is difficult to make any comparisons of the size of institutional ownership, given that my sample is in the bottom of the NYSE size deciles.[16]

While underwriters are generally attracted to SPACs because of the underwriting compensation in connection with the proposed offering, in 47% of the deals the SPAC IPO underwriters are also the company's acquisition advisors.[17] Furthermore, in approximately 66% of the SPAC IPO contracts a portion of the underwriter's compensation is deferred and paid only upon a successful merger completion. This evidence is suggestive of the strong incentives of underwriters to assist the SPAC during the acquisition process, in order to successfully complete a business combination and collect their deferred underwriting fees.[18] Interestingly, I find that the underwriter becomes the company's acquisition advisor 63% of the time if part of the underwriting fees are being deferred, while only 16% of the time if there are no deferred fees.

There is a significant variation in the time period between the SPAC IPO and the acquisition announcement. On average it takes about 13 months for a SPAC to find a suitable target. However, in some cases the acquisition is announced within 3 months of the IPO, while in other cases it takes almost the whole two-year period to find a target.

of the acquisition completion.

[15] An example of a high profile SPAC reverse merger deal is the agreement by Endeavor Acquisition Corp. to purchase American Apparel. American Apparel's CEO, Dov Charney, stated that this transaction is superior to private equity because a company is partnering with the marketplace, rather than a single person or company.

[16] The maximum market capitalization of SPACs in my sample is $1.026 billion.

[17] The SPAC underwriting fee in my sample varies between 5% and 10%, with an average fee of 7.40%, which is larger than the standard IPO fee of 7% (Chen and Ritter, 2000).

[18] The deferred underwriting fees and commissions are being placed in a trust account and are released only if a merger is completed. Underwriters do not share in the liquidation proceeds if a deal is not made and the SPAC has to be liquidated.

Given the requirement that the business acquired needs to have a fair market value equal to at least 80% of SPAC's net assets at the time of the acquisition, some sponsors may deliberately target the 80% threshold in order to complete an acquisition. I show that 24% of the deals in the sample have a value that is within 10% of the required 80% threshold, at the time of the acquisition completion.[19]

3.3 Measures of Success or Failure

In this section I examine the performance of SPAC acquisitions in my sample. I study both stock market performance and accounting performance. In each case, it is important to determine the appropriate benchmark. I first compare the stock price performance of the companies in the sample to a measure of the overall stock market, using the return on the Russell 2000 index. Second, I report results using industry- and size-matched firms. Further, I test the robustness of my results by comparing the performance of SPAC acquisitions to the performance of all companies that become public in the same year as the SPAC acquisition. I examine the performance of SPACs at the time of the acquisition announcement and also the long-run performance of the new merged company over the first year following the acquisition completion.

3.3.1 Stock Returns at the Acquisition Announcement

I measure the market reaction to SPAC-related acquisitions by calculating the cumulative abnormal returns (CARs) over three-day and two-day event windows around the acquisition announcement date. The univariate results are reported in Table 3.5. Upon the acquisition announcement, SPACs exhibit statistically significant average CARs of 1.5%, for the sample of completed acquisitions. I next examine only the sub-sample of uncompleted acquisitions and find that the market reaction to these deals is insignificantly different from zero. Moreover, the difference in CARs between completed and uncompleted deals is statistically significant, suggesting that the market perceives only the announcement of completed acquisitions as a value-creating event. Alternatively, it could also mean that the deals with poor announcement performance are later withdrawn. On average the

[19] I examine these deals in more detail by reading the information provided in the definite proxy statements on whether the potential targets satisfy the required "80% test". The findings can be summarized as follows: 1. the sponsors of these companies do not look for a fairness of opinion from an independent source when valuing the target; 2. the sponsors use the services of an independent source at the time of the acquisition announcement but do not update the information at the time of the merger completion; 3. the sponsors state that the deal value does not satisfy the "80% test" but ask shareholders to vote for the acquisition approval.

CARs are 2.2% higher for the successfully completed deals. The market reaction to all 118 acquisitions shows an average CAR of 1%. This result is consistent with the findings of Tran (2009) that SPAC acquirers make better acquisitions, than public acquirers with an average three-day CAR of 1.7% compared to the CAR of 0.33% of other public bidders.[20] The result is also consistent with the findings of the literature on acquisitions of private companies that bidder shareholders gain when buying a private firm or a subsidiary but lose when purchasing a public firm (see Chang, 1998, and Fuller, Netter, and Stegemoller, 2002).[21]

3.3.2 Post-Acquisition Stock Performance

Having shown that the announcements of acquisitions by SPAC acquirers are received positively by the market I next examine the long-run share price performance of SPAC acquisitions. In Panel A of Table 3.6, I report the buy-and-hold stock returns for several sub-periods after the effective date of the merger, as well as the buy-and-hold stock returns between the merger announcement and the merger effective date; and for the whole period from the merger announcement until a year after the acquisition was completed. I find no significant difference in the general market performance and the performance of the new merged company over the period between the merger announcement and the merger effective date. The average return on SPACs is 4.4%, compared to the Russell 2000 index return of 2.2% for the same period. After the merger completion, however, the average performance of the merged company starts to deteriorate dramatically. Mean and median returns for the new merged company are negative in all subsequent periods and always significantly less than the market returns. For the 70 firms in the sample, the 1 year post-merger return data shows total mean (median) returns of -42.9% (-56.3%), compared to the market returns of -2.1% (-6.6%). These figures provide strong evidence that investing in SPAC acquisitions has been harmful to shareholders' wealth, on average. Moreover, the performance for the whole period from the merger announcement until a year after the acquisition was completed is even worse, with an average buy-and-hold return of -44.1% compared to -1.4% return of the market.

The significant post merger underperformance of SPAC acquisitions is much worse compared to the findings of previous literature on the long-term performance of mergers. For example, Agrawal, Jaffe, and Mandelker (1992) examine 937 U.S. mergers from 1955 to 1987 and find that mergers are followed by significant abnormal returns of -1.5% over a

[20] Tran (2009) examines all acquisition announcements and uses the CRSP value-weighted return as a market benchmark.

[21] 88 % of the transactions in the sample involve acquisitions of a private target or a subsidiary, while the rest are acquisitions of public companies. There is no significant difference in the returns between these two groups of targets.

year, and -10.3% over a five-year period after the effective date.[22] In more recent evidence provided by Moeller, Schlingemann, and Stulz (2003), for 12,023 acquisitions from 1980 to 2001, the authors find three-year buy-and-hold returns of -16% for the whole sample. In addition, they find that acquirers of private targets are the worst long-term performers, with three-year buy-and-hold returns of -26.5%.

Panel B of Table 3.6 provides further evidence on the long-run stock price performance of the firms in my sample using an alternative benchmark constructed from a sample of matching firms. The sample consists of firms in the same industry (four-digit SIC code) closest in size to the SPAC merged company. As illustrated in the table, the firms in the sample also underperform the industry benchmark by a large margin: SPAC acquisitions one-year average returns are -42.9% versus 21.4% for the matched firms. Similarly, their performance for the whole period from the merger announcement until a year after the acquisition is completed is significantly worse than that of their matching counterparts.

Given that SPACs are viewed as a hybrid between an IPO and a merger transaction, I also compare the post-acquisition long term performance of SPACs to the post-IPO performance of companies that have completed an initial public offering in the same year as the SPAC acquisition. The results are reported in Panel C of Table 3.6. The 3 month post-acquisition returns show no significant difference between the long-term performance of the newly merged companies and the performance of the newly public companies. However, the performance in the following months suggests that the SPAC acquisitions are performing significantly worse than their IPO counterparts and a year after the acquisition they have an average buy-and-hold return of -43.2% compared to -19.4% of the newly public firms.

I reach the same conclusion when I compare my findings to the findings of other studies on post IPO performance. For example, Loughran and Ritter (1995) in their sample of 4,082 IPOs, conducted between 1970 and 1990 report one-year average raw returns of 1.6%, compared to 6.1% of their benchmark. The IPO-adjusted returns in my sample appear to be similar to those reported by Brown, Dittmar, and Servaes (2005), who show that roll-up IPOs also underperform the market, with an average total return of -7.45%, after two years, compared to market returns of 46.93%.[23]

Although the performance of the SPAC acquisitions is substantially worse than that of the alternative benchmarks, not all of the SPAC transactions in my sample perform poorly. In fact, some of them outperform their benchmarks by large margins. In Section 3.4, I examine whether the structure of the firm at the time of the acquisition announcement is

[22] Other studies of post-acquisition returns include Jensen and Ruback (1983), Loderer and Martin (1992), and Rau and Vermaelen (1998).

[23] I test the robustness of my results using a four factor market model as an alternative benchmark (Fama and French, 1993, and Carhart, 1997). The results are very similar to my previous findings.

related to the SPAC subsequent performance.

3.3.3 Post-Acquisition Operating Performance and Valuation

In this section I study the operating performance and valuation of the firms in my sample in the year following the acquisition. Panel A of Table 3.7 contains data on industry-adjusted, matched firm-adjusted, and IPO firm-adjusted profitability. I make industry adjustments by subtracting the median ratio of all firms that operate in the same four-digit SIC code, as defined by Compustat. I also perform matched firm-adjustments by subtracting the correspondent measures of firms in the same industry (four-digit SIC code) closest in size to the SPAC merged company. Lastly, the IPO firm-adjustment is done by subtracting the median ratio of all firms that performed an IPO at the same year as the SPAC acquisition.[24]

I report data on two profitability measures: operating profits divided by sales and net income divided by sales. The first measure, operating return on sales, shows that there is a significant difference in the accounting performance between SPACs and the various benchmarks used. The second measure, return on sales, provides further evidence that SPACs have significantly lower post-acquisition performance relative to other firms in their industry, matched peers, or newly public firms. The results are suggestive that SPAC acquisitions have not only poor stock price performance, but also poor operating performance.

My results are in contrast to the findings of previous literature that studies post-acquisition operating performance. For, example, Ghosh (2001), who uses firms matched on pre-acquisition performance and size as a benchmark, finds no evidence that operating performance improves following acquisitions. Healy, Palepu, and Ruback (1992), using industry-median firms as a benchmark, conclude that cash flow performance improves following acquisitions.

Again, it is also useful to compare the post-acquisition operating performance of SPACs to the post-IPO performance of companies that have completed an initial public offering. My findings are consistent with the previous studies that find a significant decline in operating performance following the year of the IPO (see Jain and Kini, 1994, and Mikkelson, Partch, and Shah, 1997).

When examining the operating performance of SPAC acquisitions is also important to take into consideration their capital structure. It could be that SPAC acquisitions are more levered, have higher financial distress costs, and as a result lower operating

[24] All variables reported in Tables 3.7 and 3.8, except the P/E ratios, are winsorized at the 5%.

performance. In Panel B of Table 3.7 I report the industry-, matched firm-, and IPO firm-adjusted ratio of long-term debt to assets, cash to assets, and net long-term debt to assets. The results suggest that firms in my sample do have higher level of leverage relative to the median firm in their industries and the median firm that became public in the same year. Nevertheless, SPAC acquisitions also appear to have significantly larger cash holdings compared to the median industry and IPO firm.[25] When I take into account the level of cash that each company holds I find that SPAC acquisitions are as levered as their counterparts. Only when compared to other IPO firms, SPAC acquisitions appear to have higher, and statistically significant average net long-term debt to assets ratio.

Given the above analyses showing that SPAC acquisitions have poor stock and accounting performance, it remains unclear why investors keep investing in these types of vehicles. It is possible that SPACs were expected to do much better, assuming the valuable expertise of their founders. I study whether this is the case by examining if the initial valuations of the SPAC acquisitions imply high anticipated profit growth relative to other firms in the industry. For this purpose I compute the Tobin's Q, E/P ratio and the P/E ratio.

Panel A of Table 3.8 reports statistics on the differences between the SPAC sample and the industry, matched firm, and IPO, firm valuation ratios, a year after the acquisition was completed. The Tobin's Q ratio of the SPACs is either not significantly different, or significantly lower, than that of the alternative benchmarks. However, their E/P ratio in the first year after the merger is significantly below all benchmarks. Given that 60 percent of the E/P ratios of the sample have negative values, I also report the P/E ratios only for the firms with positive earnings. The findings lead to the conclusion that the expectations for the earnings growth of SPAC acquisitions, were not higher than those based on various benchmarks. However, it might be useful to compare the anticipated profit growth of SPACs at the time of the merger completion rather than a year later. Therefore in Panel B of Table 3.8 I report the firm valuation ratios of SPAC acquisitions at the time of the merger. Although the results are weak, they give some indication that at least initially SPAC acquisitions were valued higher relative to some benchmarks and relative to their own valuations a year later.

In summary, the findings from this section imply that SPACs accounting performance in the year following the acquisition is worse than that of their industry peers. In addition, SPACs do not seem to be more levered, and at least initially investors had higher valuations of SPACs and were expecting them to perform better.

[25]For instance, in some IPO prospectuses the SPAC sponsors state that they would prefer not to use cash as a medium of exchange in order to keep significant amount of cash on hand that they can use to make subsequent acquisitions or finance other growth opportunities.

3.4 Cross-Sectional Determinants of Stock Returns

So far, I have shown that although the announcements of SPAC acquisitions are received positively by the market, SPACs, in aggregate, deliver poor stock returns in the year following the acquisition. In this section, I examine the deal- and firm-specific characteristics that help determine whether particular SPAC acquisitions are successful or not. For dependent variables, I first use the three-day event window CARs measured around the announcement date. I then study the long-run performance, measured by the one-year matched firm-, market-, and IPO firm-adjusted buy-and-hold stock returns of SPACs, following the effective date of the merger. I seek to explain the cross-sectional variation in performance by focusing on factors related to the conflicts of interest between various parties involved in the SPAC acquisition, corporate governance of the merged firms, as well as other deal characteristics.

The time from the IPO to the acquisition announcement may have an impact on acquisition announcement returns. SPACs have a maximum of 2 years from the time of their IPO to acquire another company or otherwise they have to liquidate and return the money to the investors. Knowing that they have to close an acquisition in order to collect their compensation, and being pressured under the 2-year time constraints, SPAC founders might be encouraged to make unsuitable acquisitions. The market reaction to the acquisition may vary depending on how much time it takes for a SPAC to find the right target. SPAC deals that are announced closer to the deadline of an acquisition completion might be perceived positively or negatively by the market. On one hand, SPACs that take longer time to announce an acquisition are potentially putting more effort and time in finding the best suitable target, and conducting thorough due diligence. This in effect could be reflected in a positive market reaction. On the other hand, deals announced by SPACs close to the acquisition deadline may be seen as a last minute opportunistic deals, and may receive a negative market reaction. For instance, Tran (2009) finds that SPAC acquisition announcement returns are negatively related to the time from IPO to acquisition announcement.[26]

The continued involvement of the SPAC IPO underwriters in the follow up acquisition process of the company may also affect the SPAC performance. Given that part of the underwriting fees is deferred and paid to the underwriters only upon the acquisition completion, the underwriters have an incentive to get involved in the merger process and influence the purchase decision of the SPAC managers. For example, by becoming acquisition advisors to the SPAC, underwriters may follow their own private interests and recommend any possible unsuitable target in order to close a deal and collect their deferred

[26]Tran (2009) does not allow for non-linearity in the relationship.

fees in addition to their merger advisory fees.[27] I therefore, investigate how the acquisition announcement performance varies when a portion of the underwriter's compensation is deferred and paid only upon the merger completion, and when the SPAC acquisition advisor is the same as its IPO underwriter. In addition, I also study how performance is affected when the IPO underwriter becomes the SPAC acquisition advisor, conditional on there being deferred underwriting fees.

One of the requirements about the target business, stated in the IPO prospectus of the SPACs, is that the initial target business that the SPAC acquires, must have a fair market value equal to at least 80% of the SPAC's net assets at the time of the acquisition. The rationale behind this rule is that the money is initially raised for the purpose of making an acquisition, and not to provide the SPAC with proceeds for general corporate purposes or to turn it into an investment fund.[28] However, this requirement may also give SPAC sponsors the wrong incentives to overpay for the target. In other words, the sponsors may use this 80% as an anchor in their decision when they evaluate potential targets, and not necessarily consider what is best for the interests of minority shareholders. They may find it more convenient to overpay for a smaller target, rather than bid for the acquisition of a large target and end up diluting their ownership. I test whether the market reacts differently to the announcement of acquisitions whose value is within 10% of the required 80% threshold (80% of the SPAC's net assets) at the time of the acquisition completion.

Sponsor ownership could potentially also affect performance. The effect of a high level of SPAC sponsor ownership on corporate performance could be positive or negative. The positive effect stems from the enhancement in firm value, as increased managerial ownership decreases agency costs of equity by reducing managers' consumption of perquisites (Jensen and Meckling, 1976). On the other hand, as Jenkinson and Sousa (2009) show, the enormous incentives of SPAC sponsors to complete any kind of deal may encourage the SPAC management teams and related parties to purchase large blocks of stock on the open market just prior to the shareholder vote on a proposed acquisition. The authors interpret this behaviour as evidence that SPAC sponsors are buying shares from likely "no" voters, and are approving acquisitions in order to receive their promised 20% equity compensation.[29] Given that the approved acquisitions are not necessarily the optimal choice,

[27] Lewellen (2009) reports that deferred underwriting compensation in SPAC IPOs have increased dramatically over time, from 0% in 2003 to an average of 3.8% of gross average proceeds in 2008.

[28] The sponsors can always use stock as a method of payment for the acquisition, and keep the cash proceeds raised in the SPAC IPO to finance future growth opportunities.

[29] I review Schedule 13D, Schedule 13G, as well as Form 13F, and find that in more than 50% of the deals in my sample the sponsors report that they buy additional shares prior to the Special Meeting of Stockholders, held to consider and vote upon the proposed merger. Furthermore, in 29 deals the sponsors enter into an agreement with Victory Park Capital Advisors, LLC pursuant to which funds managed by Victory Park, or other purchasers acceptable to Victory Park and the sponsors, will use their reasonable best efforts to purchase up to an agreed amount of SPAC shares from third parties prior to the Special Meeting of Stockholders.

increasing sponsor ownership may have negative effect on performance.[30] In addition, increasing sponsor ownership may also send a strong negative signal to the market about the quality of the target firm whose owners are using the acquisition as an exit strategy. Further, I also investigate whether the long-term post-acquisition SPAC performance is related to the level of board control exercised by the sponsor. I examine two aspects of board control: 1) whether one of the sponsors provides the CEO, and 2) whether one of the sponsors becomes the chairman of the board.

The involvement of the target insiders in the management of the newly merged company may also affect performance. Again, arguments can be developed to support both positive and negative effects. If the target insiders receive proper incentives to maximize the value of the new firm, their continued involvement could prove to be beneficial because they have substantial inside knowledge of the target and the industry. For instance, in many cases target insiders are also the founders of the target company and as pointed out by Schwert (1985) the founder is probably the most important asset of the firm at least in the early stages of the company's life. Conversely, higher target insider ownership in the merged company may be an indication that the SPAC sponsors overpaid for the acquisition. The target management and owners are well aware of the fact that sponsors must spend at least 80% of the SPAC money on the purchase, within the limited time of two years. Consequently, they may use their bargaining power and extract a higher premium for the target shareholders. In addition, I also examine whether the continued involvement of target insiders has an effect on the post-acquisition performance of the merged company, by introducing two new variables: 1) whether one of the target insiders provides the CEO, and 2) whether one of the target insiders becomes the chairman of the board.

The previous literature also underlines the role of institutional blockholders' monitoring as an important corporate governance mechanism. I investigate whether the level of institutional ownership in the merged firm is reflected in better performance of the SPAC acquisitions. As the majority of the targets in the sample are private companies, and acquisitions of private targets have been found to differ from acquisitions of public companies, I include an additional control variable PRIV (see Officer, 2007).[31] I also control for the SPAC size (LMKTCAP), relative size (RELSIZE), medium of exchange (CASH), and deal value (LDEALVALUE), since these variables have been found to have an effect on acquisition announcement returns (see Moeller et al., 2004, Moeller et al., 2007, and

[30] In fact, the SEC has recently proposed amendments to Rule 10b-18 under the Securities Exchange Act of 1934. The stated purpose of the change is to prevent use of the safe harbour (extend the time in which the safe harbour is unavailable in connection with an acquisition by a SPAC, until the completion of the SPAC's stockholder vote) where there is a strong incentive for a SPAC to make substantial purchases of its stock solely to ensure it receives a favourable stockholder vote on its acquisition.

[31] Given that 33% of the targets in the sample are foreign companies, I investigate whether the findings differ for this type of deals; however, I do not find that their performance is significantly different.

Travos, 1987, respectively).[32]

Table 3.9 contains the results of the regression analyses. The dependent variable in all specifications is the three-day event window CARs measured around the announcement date, using Russell 2000 index as a market proxy. Model (1) shows the effect of the time from IPO to the acquisition announcement variable, as well as the ownership variables, controlling only for deal and SPAC characteristics. In model (2), (3) and (4) I introduce three dummy variables that capture the effect of deferred IPO underwriter fees, SPAC underwriter being also the SPAC acquisition advisor, and an interaction dummy that captures the effect of a SPAC underwriter becoming an acquisition advisor, conditional on there being deferred underwriting fees, respectively. In the last two models I include a dummy variable that reflects whether the value of the target at the time of the acquisition was within 10% of the required 80% threshold of the SPAC's net asset value.

I find no evidence that the cumulative abnormal returns upon the acquisition announcement depend on the SPAC sponsors ownership. Similarly, I find no relationship between the stock performance of the SPAC and the ownership of target insiders, or institutional blockholders in the new merged company. I do find evidence, however, of a concave relationship between the time it takes for SPAC sponsors to find a potential target, and the SPAC performance. The estimated relationship reaches its maximum at around 200 days, based on the coefficients in model (6). In other words, the longer it takes for the SPAC to announce an acquisition, the higher are the stock returns, as the sponsors are potentially putting in more time to conduct thorough due diligence and purchase the most suitable target. However, acquisitions that are announced too quickly or too late are perceived by the market as less valuable. Given the strong incentive of the sponsors to buy a target, they can either purchase a target as soon as possible after the SPAC IPO, or make a last minute acquisition under the pressure of the approaching 2-year deadline date.

The coefficient estimate on the "deferred IPO underwriter fees" variable is negative and significantly different from zero. A possible interpretation of the less favourable reaction to these acquisitions is that the market realises that the deferred IPO underwriter fees may create the wrong incentives for the IPO underwriters. This indicates that the CARs are, on average, between 5.1 and 6.2 percentage points lower if part of the IPO underwriter compensation is deferred and paid upon the merger completion. When I add the "underwriter is an advisor" variable I find that its coefficient estimate is statistically insignificant. Similarly, when I add the interaction dummy that captures the effect of a SPAC underwriter becoming an acquisition advisor, conditional on there being deferred underwriting fees I also find a statistically insignificant coefficient estimate. In other words,

[32]LMKTCAP is the natural logarithm of the market capitalization of the SPAC computed at the price at the acquisition announcement, measured in millions of dollars. RELSIZE is the value of the target as a fraction of the market capitalization of the acquirer.

what appears to drive the results is whether part of the fees of the IPO underwriters are being deferred and paid conditional on a merger completion.

My findings suggest that the market recognizes the poor incentive of the SPAC underwriters, who have not collected the full amount of their underwriting fees, to get involved in the merger process and strictly follow their own private interests that may not necessarily be aligned with the interests of the SPAC shareholders, and push for any potential deal. Reading the "background of the merger" section in the definite merger proxy statements shows that in fact it is not uncommon that the underwriter/advisor is the one who finds the potential target and introduces it to the SPAC sponsors.

The market reaction is also significantly negative for acquisitions that have a market value very close to the required 80% threshold. These acquisitions have on average 4.4 percentage points lower CARs. It appears that although these deals are satisfying the 80% test, the market somehow perceives them as lower quality acquisitions. It is possible that SPAC sponsors, aware of the 80% requirement necessary for the acquisition approval, are given the wrong incentives to deviate from their optimal choice, overpay for a smaller target, complete an acquisition and collect their compensation.

In Table 3.10, I proceed to examine the long-run stock price performance of the newly merged firms following the acquisition. The dependent variable in the first four model specifications is the one-year industry- and size-adjusted buy-and-hold stock returns of SPACs, following the effective date of their acquisition. The adjustment is done by subtracting the one-year buy-and-hold returns of the industry- and size-matched firms. In the following specifications, to test the robustness of my results, I replace the dependent variable with the one-year market-adjusted buy-and-hold stock returns, in specification (5), and with the one-year IPO-adjusted buy-and-hold stock returns, in specification (6). The market adjustment is made by subtracting the one-year buy-and-hold return of Russell 2000 index. The IPO adjustment is done by subtracting the average one-year buy-and-hold return of all companies that became public in the same year as the SPAC acquisition. Because I am studying the long-term performance of SPACs I introduce an additional variable, the ratio of EBITDA to total assets (EBITDA_TA) to control for the operating profitability of each company. Further, I also control for the value of the target relative to the market capitalization of the acquirer (RELSIZE), and for the deal value (LDEALVALUE), since I conjecture that these choices could be affected by the sponsors' incentives, and therefore may have an indirect effect on SPACs post-acquisition performance.[33]

I find evidence that the continued involvement of the SPAC sponsors as shareholders and members on board has an impact on the long-term performance of SPAC acquisitions.

[33]For instance, I have previously shown that the 80% rule may wrongly incentivize sponsors when selecting the potential target, given that they may find it advantageous to overpay and acquire a smaller size target.

Based on the significant results, in almost all model specifications, there is a concave relationship between sponsor ownership and SPAC performance. It appears that increasing sponsor ownership has a positive impact on performance because sponsors have higher incentives to maximise firm value rather than expropriating shareholders wealth. The inflection point of the relationship is on average around 13.2% sponsor ownership, depending on the model used. Any further increase in sponsor ownership has a negative effect on performance. Sponsors may prefer to pass on potentially more valuable (but also more expensive) targets, in order not to dilute their ownership. Sponsors may be approving value-destroying acquisitions, in order to obtain their compensation, by buying additional shares in the open market. In addition, high sponsor ownership may be a proxy for acquisitions that were mainly paid by cash, and used by target insiders as an exit vehicle.[34] Therefore, the negative effect of high levels of sponsor ownership may also be interpreted as a signalling device about the bad quality of the target.

Further, sponsors board representation also seems to matter. The coefficient estimate on the CEO sponsor dummy is positive and statistically significant in the first four models. This indicates that the long-run returns are approximately 71 percentage points higher, based on model (2), after adjusting for industry movements, if one of the SPAC sponsors is appointed as a CEO of the merged company. These findings underline the importance of continuing sponsor involvement. While their expertise may matter a lot during the search for a suitable target and the execution of the acquisition, the results suggest that sponsors may also add value by leading the company's management, at least initially after the merger. My findings are also consistent with previous literature that underlies the importance of individuals' superior characteristics and track records for firm performance (see Bertrand and Schoar, 2003, and Kaplan et al., 2010). More importantly, since "CEO sponsor" and sponsor ownership are included in the model, the CEO sponsor variable is not simply a proxy for sponsor ownership. Further, whether the chairman is a sponsor also seem to affect the long term performance of the company. The results suggest that the long-run returns are between 37 and 60 percentage points higher, depending on the model, when the appointed chairman is one of the SPAC directors.

When I examine the effect of target insiders ownership on performance I do not find evidence of a strong relationship between the two variables. Only in the last model specification, where I use the IPO-adjusted buy-and-hold stock returns as the dependent variable, the coefficient estimates of the target insiders ownership variables seem to indicate that there is a non-linear relationship between target insiders ownership and SPAC performance. While the first-order coefficient estimate of target insiders ownership is negative, the second-order coefficient estimate is positive. The inflection point of the relationship is

[34] I have also controlled for deals that were paid 100% by cash (CASH), however the coefficient estimate of this variable appears to be statistically insignificant.

at 38% target insider ownership. The negative effect of increasing target insiders ownership on performance suggests that sponsors may have overpaid for the acquisition. Given their strong incentives to complete an acquisition, sponsors may agree on a deal that leaves target insiders with higher levels of ownership.

SPAC sponsors know that they have to make an acquisition in order to receive their compensation. Pressured under the time constraints they may be wrongly incentivized to engage in acquisition transactions that would benefit them but not necessarily benefit the minority shareholders. For example, Jog and Sun (2007) examine returns earned by shareholders and management of blank check IPOs from their issuance date to the post-acquisition date and show that while the shareholders earned -3% annualised abnormal returns, the sponsors earned approximately 1900 percent annualised return. In addition, target insiders ownership may be a proxy for target insiders who use the acquisition to cash out of firms expected to perform poorly. Therefore, target insiders left with a significant portion of the ownership may also be interpreted as a certification effect of the good quality of the target. I also find that the continued involvement of target insiders as chairmen in the newly merged companies has a positive effect on the long term performance of SPAC acquisitions. My results suggest that the inside knowledge of the target management is valuable for the company in the transition period following the acquisition completion.

Lastly, in my regression models I find that the ownership of the institutional blockholders has a negative effect on performance. These results are in contrast with the findings of Tran (2009). In particular, he examines the acquisition discount (the percent difference between acquisition multiples for the sample target and the average multiple for industry and size-matched comparable acquisitions of publicly traded targets) obtained by SPAC bidders at the time of the acquisition, and finds that the higher the level of independent long-term institutional blockholders the larger is the discount.[35] The author's interpretation is that institutional blockholders act as a monitoring device and potentially mitigate the perverse incentives of the sponsors to make unsuitable acquisitions. I, on the other hand, do not find that institutional ownership affects the cumulative abnormal returns around the merger announcement, but do find its effect on the long-term stock performance to be significant and negative.[36] The long-run buy-and-hold returns are on average between 6.4 and 15.2 percentage points lower, for every 10% increase in institutional ownership, depending on the specification used. In some regression models, reported in Table

[35]It is important to highlight the differences between my and Tran's identification technique. First, Tran (2009) is examining the effect of institutional ownership on the acquisition discount, while I am looking at the effect of institutional ownership on the post-acquisition, long-term stock performance of SPAC acquisitions. Second, he is studying only the effect of independent long-term institutional blockholdings, obtained one quarter before the merger announcement, while I am examining the effect of total institutional ownership, measured at the time of the acquisition completion.

[36]I have also allowed for non-linearity in the relationship; however, the results appear to indicate a linear relationship.

3.10, I divide the institutional ownership in two separate variables: the ownership of the original institutions, who bought shares at the time of the IPO, and the ownership of the new institutional holders, who bought at the merger completion. The coefficient estimates on both variables remain negative and statistically significant.

Typically institutional investors in SPAC acquisitions are represented by hedge funds. Unfortunately, the lack of disclosure limits the quantitative data available on hedge funds and constrains my empirical investigation. In an attempt to shed some light on the interests of institutional investors in SPAC transactions, I examine what their intentions are based on the information reported in Item 4 of Schedule 13D. For instance, Brav et al. (2008), argue that hedge funds are better positioned to act as informed monitors than other institutional investors, because they are subject to less regulation and their managers also suffer few conflicts of interest. In addition, according to their findings, hedge fund activists are not short-term in focus, as some critics have claimed, and based on their sample the holding period of hedge funds is closer to 20 months.

However, after reading Schedule 13D filed with the SEC, I do not find evidence that hedge funds interest is to force changes or seek control at the SPAC companies. In particular, the information in Item 4 of Schedule 13D, which requires the filer to declare its reasons for acquiring the shares, suggests that in majority of the cases institutional investors acquired shares for investment reasons only.[37] Moreover, I also examine whether the institutional investors in SPACs are short-term or long-term investors. It appears that initial institutional investors that owned on average 29% prior to the merger completion are left with 20% following the merger, and with 13%, one year following the effective date of the merger. These results suggest that the initial investors are mainly interested in short-term investment. In other words, the negative effect of institutional ownership on long-term performance, that I find, could potentially capture the downward pressure that the exit of hedge funds can have on the price.

In a way, my results are consistent with the findings of Mitchell and Pulvino (2011). They show that during the financial crisis of 2008, when debt financing was pulled from arbitrage hedge funds, and the substantial uncertainty in the market led to a significant increase in investor redemptions, hedge funds were forced to liquidate their existing positions. Furthermore, while for liquid securities, such as exchange-traded equities, rehypothecation lenders (banks or brokers who re-use collateral posted by clients, such as hedge funds, to back their own trades and borrowings) were able to liquidate the collateral to cover loans, in the case of relatively illiquid stocks such as SPACs rehypothecation lenders had no choice but to temporarily cease lending to hedge funds. The aggressive selling of SPACs by hedge funds that employ financial leverage could potentially explain the downward

[37] In fact, some hedge fund investors report that they have bought shares in the SPAC acquisition in order to benefit from event-, risk- or merger-arbitrage strategies.

pressure on the price, and the significant relative underperformance of SPACs.[38]

Overall, the findings reported in Tables 3.9 and 3.10 indicate that there are important cross-sectional differences in the short-run stock performance around the acquisition announcement, as well as in the long-run stock performance of the firms in my sample. If the SPAC sponsors take a long time to find a target or a portion of the IPO underwriting fees are being deferred and paid conditionally on a successful merger completion, the firms underperform following the acquisition announcement. The market reaction is also significantly negative for acquisitions that have a market value very close to the required 80% threshold.[39] Further, sponsor ownership and target insider ownership have non-linear effect on long-term performance. Too high ownership retention by the sponsors can be detrimental for the long-term performance of the merged company. The reverse relationship holds for target insiders ownership, suggesting that SPAC sponsors overpaid for the target and left target insiders with higher ownership in the newly merged firm. These results show that the perverse incentives of sponsors may wrongly incentivize them to buy unsuitable targets. Firms that appoint a sponsor as a CEO or a chairman, on the other hand, perform better, consistent with the valuable expertise and the importance of continuing to a certain extent, sponsor involvement. Finally, the presence of institutional investors also has a negative effect on long-term performance. Although my results suggest that institutional blockholders are there for speculative reasons rather than for intervention and monitoring, it is difficult to draw any conclusions about the trading strategies of hedge funds without knowing the full composition of their portfolios.

3.5 Concluding Remarks

Are Special Purpose Acquisition Companies a financial innovation that adds value, or do they require special regulations from the SEC given that the perverse incentives built in their structure lead mainly to value-destroying acquisitions? In this paper I try to shed some light on this question by studying 73 SPAC acquirers that have successfully completed an acquisition over the period 2004-2010. I study the stock price reaction to SPAC acquisitions at the time of the acquisition announcement, as well as their stock and accounting performance in the year following the successful acquisition completion.

[38] I have examined whether the negative relationship between institutional ownership and performance is stronger in the post-crisis period by creating an interactive dummy (multiplying the INSTOWN with a POST2008 dummy). Although, the coefficient estimate on the interactive dummy is negative, it is not significantly different from zero. Unfortunately, the small number of observations in my study prevents me from further analysing the effect by dividing the sample into two subsamples, pre- and post-crisis.

[39] When I add the "deferred IPO underwriter fees" and the "80% deal" dummy variables as independent variables in the regression models reported in Table 3.10, I find no evidence of a significant relationship.

While the announcements of acquisitions by SPAC acquirers in the sample are received positively by the market, on average these acquisitions underperform in the long-run. The results of the accounting performance of SPAC acquisitions also suggest that they significantly underperform their various benchmarks. Further, while SPAC acquisitions do not appear to be more levered, they do fall short of investors' expectations given that they are sold and initially trade at higher valuations relative to their peers.

There is a substantial cross-sectional variation in the short-term as well as in the long-term price performance of the companies in the sample. I document that the perverse incentives embedded in the SPAC contract may encourage some SPAC sponsors and underwriters to make bad acquisitions in order to collect their equity compensation, and deferred underwriting fees, respectively.

By examining the cross-sectional variation in the long-term returns, I find that the continued involvement of the SPAC sponsors as shareholders and members on board in the new company influences future performance. The results suggest that there is a concave relationship between sponsor ownership and stock returns. Further, I document that the continued involvement of SPAC sponsors as CEOs and chairmen of the merged company has a beneficial impact on the long-term performance.

The continued involvement of the target insiders as shareholders in the new company also seems to affect performance, as increasing ownership of target insiders leads to worse performance. It appears that target insiders, being aware of the strong incentives of sponsors to complete an acquisition, may be able to negotiate a better deal for themselves. Finally, the long-term performance of SPAC acquisitions is also negatively affected by the ownership of the institutional blockholders, which could potentially be due to the temporarily cease of lending to hedge funds during the financial crisis of 2008.

Although, acquisitions made by SPAC bidders perform poorly on average, the increased popularity of this type of transactions, and the significant amount of capital that SPACs raise suggest that there are parties who are interested investing in them. The analysis indicates that while there is a large cross-sectional variation in performance, the implicit incentives embedded in the SPAC contract are more likely to lead to value destroying acquisitions. Whether reregulation occurs and reduces this trend remains to be seen.

Table 3.1: Sample of Completed Acquisitions by a SPAC Acquirer

The sample acquisitions are listed in order of the S-1 filing date of the SPAC

SPAC	S-1 Date	Target	M&A Date
Millstream Acquisition Corp	25/08/2003	NationsHealth Holdings LLC	01/09/2004
CEA Acquisition Corp	12/02/2004	Etrials Worldwide Inc	09/02/2006
Chardan China Acquisition Corp	16/03/2004	State Harvest Holdings Ltd	08/11/2005
Great Wall Acquisition Corp	17/03/2004	ChinaCast Communication Holdings Ltd	18/01/2007
Tremisis Energy Acquisition Corp	12/05/2004	RAM Energy Inc	08/05/2006
Arpeggio Acquisition Corp	24/06/2004	Hill International Inc	28/06/2006
Rand Acquisition Corp	27/10/2004	Lower Lakes Towing Ltd	06/03/2006
China Unistone Acquisition Corp	18/11/2004	Beijing e-Channels Century	02/01/2006
Mercator Partners Acquisition Corp	11/04/2005	European Telecommunications & Technology Ltd	16/10/2006
Terra Nova Acquisition Corp	18/04/2005	ClearPoint Business Resources Inc	12/02/2007
KBL Healthcare Acquisition Corp II	21/04/2005	Summer Infant Inc	06/03/2007
Services Acquisition Corp	29/06/2005	Jamba Juice Co	29/11/2006
Courtside Acquisition Corp	30/06/2005	American Community Newspapers LLC	02/07/2007
Oakmont Acquisition Corp	12/07/2005	Brooke Credit Corp	18/07/2007
Israel Technology Acquisition Corp	12/07/2005	IXI Mobile Inc	06/06/2007
Fortress America Acquisition Corp	13/07/2005	VTC LLC	19/01/2007
Juniper Partners Acquisition Corp	13/07/2005	Firestone Communications Inc	19/01/2007
Echo Healthcare Acquisition Corp	15/07/2005	XLNT Veterinary Care Inc	07/01/2008
Healthcare Acquisition Corp	28/07/2005	PharmAthene Inc	07/08/2007
Chardan North China Acquisition Corp	02/08/2005	Beijing HollySys Co Ltd	20/09/2007
Stone Arcade Acquisition Corp	15/08/2005	Kraft Papers Business	02/01/2007
Ithaka Acquisition Corp	17/08/2005	Alsius Corp	25/06/2007
Ad.Venture Partners Inc	25/08/2005	180 Connect Inc	24/08/2007
Chardan South China Acquisition Corp	02/09/2005	Head Dragon Holdings Ltd	24/01/2008
Coconut Palm Acquisition Corp	08/09/2005	Equity Broadcasting Corp	02/04/2007
Viceroy Acquisition Corp	13/10/2005	Eastman SE Inc	01/11/2006
Federal Services Acquisition Corp	19/10/2005	Advanced Technology Systems Inc	16/01/2007

(Continue)

Table 3.1 – Continued

SPAC	S-1 Date	Target	M&A Date
Paramount Acquisition Corp	21/10/2005	Chem Rx Corp	26/10/2007
Platinum Energy Resources Inc	24/10/2005	Tandem Energy Corp	26/10/2007
Endeavor Acquisition Corp	15/12/2005	American Apparel Inc	12/12/2007
Star Maritime Acquisition Corp	15/12/2005	Star Bulk Carriers Corp	27/11/2007
Boulder Specialty Brands Inc	16/12/2005	GFA Holdings Inc	21/05/2007
Argyle Security Acquisition Corp	24/01/2006	ISI Detention Contracting Group Inc	31/07/2007
Global Logistics Acquisition Corp	15/02/2006	Clark Group Inc	13/02/2008
India Globalization Capital Inc	03/03/2006	Sricon Infrastructure Private Ltd	07/03/2008
Acquicor Technology Inc	15/03/2006	Jazz Semiconductor Inc	20/02/2007
Asia Automotive Acquisition Corp	11/04/2006	Hunan TX Enterprise Co Ltd	23/04/2008
Global Services Partners Acquisition Corp	18/04/2006	Southpeak Interactive LLC	14/05/2008
Community Bankers Acquisition Corp	05/06/2006	TransCommunity Financial Corp	31/05/2008
Marathon Acquisition Corp	24/08/2006	Global Ship Lease Inc	14/08/2008
Energy Services Acquisition Corp	30/08/2006	ST Pipeline Inc	15/08/2008
Freedom Acquisition Holdings Inc	21/12/2006	GLG Partners LP	02/11/2007
ChinaGrowth South Acquisition Corp	23/01/2007	Olympia Media Holdings Ltd	27/01/2009
ChinaGrowth North Acquisition Corp	23/01/2007	UIB Group Ltd	27/01/2009
Information Services Group Inc	31/01/2007	Technology Partners International Inc	16/11/2007
Hyde Park Acquisition Corp	05/03/2007	Essex Holdings LLC	31/10/2008
Symmetry Holdings Inc	07/03/2007	Novamerican Steel Inc	15/11/2007
China Opportunity Acquisition Corp	20/03/2007	Golden Green Enterprises Ltd	17/03/2009
Vectro Intersect Security Acquisition Corp	25/04/2007	Cyalume Technologies Inc	19/12/2008
Vantage Energy Services Inc	24/05/2007	Offshore Group Investments Ltd	12/06/2008
Aldabra 2 Acquisition Corp	19/06/2007	Boise Cascade LLC	22/02/2008
Alyst Acquisition Corp	29/06/2007	China Networks Media Ltd	30/06/2009
Alternative Asset Management Acquisition Corp	01/08/2007	Great American Group LLC	03/08/2009
InterAmerican Acquisition Group Inc	04/09/2007	Sing Kung Ltd	09/09/2009
Hicks Acquisition Co I Inc	28/09/2007	Resolute Natural Resources Co	25/09/2009
FMG Acquisition Corp	04/10/2007	United Insurance Holdings LLC	30/09/2008
TM Entertainment & Media Inc	17/10/2007	Hong Kong Mandefu Holdings Ltd	15/10/2009
Global BPO Services Corp	17/10/2007	Stream Holdings Corp	31/07/2008

(Continue)

Table 3.1 – Continued

SPAC	S-1 Date	Target	M&A Date
Triplecrown Acquisition Corp	22/10/2007	Cullen Agricultural Technologies Inc	22/10/2009
Secure America Acquisition Corp	23/10/2007	Ultimate Escapes Holdings LLC	29/10/2009
Enterprise Acquisition Corp	07/11/2007	ARMOUR Merger Sub Corp	06/11/2009
Prospect Acquisition Corp	14/11/2007	Kennedy-Wilson Inc	14/11/2009
China Holdings Acquisition Corp	16/11/2007	Gaoan Production Facility	22/01/2010
Ideation Acquisition Corp	19/11/2007	SearchMedia International Ltd	30/10/2009
Global Consumer Acquisition Corp	20/11/2007	Service1st Bank of Nevada Corp	29/10/2010
Camden Learning Corp	29/11/2007	Dlorah Inc	23/11/2009
Liberty Acquisition Holdings Corp	06/12/2007	Promotora de Informaciones	29/11/2010
Polaris Acquisition Corp	11/01/2008	Hughes Telematics Inc	31/03/2009
Asia Special Situation Acquisition Corp	16/01/2008	Amalphis Group Inc	30/01/2010
GHL Acquisition Corp	14/02/2008	Iridium Holdings LLC	29/09/2009
BPW Acquisition Corp	26/02/2008	The Talbots Inc	07/04/2010
CS China Acquisition Corp	11/08/2008	Asia Gaming & Resort Ltd	02/02/2010
Chardan 2008 China Acquisition Corp	11/08/2008	DAL Group LLC	15/01/2010

Table 3.2: Summary Statistics: Distribution of SPAC IPOs and M&A Transactions

Year	SPACs that completed an acquisition		SPACs that were liquidated	
	N of IPOs	N of Acquisitions	N of IPOs	N of Acquisitions
2003	1	-	-	-
2004	7	1	1	-
2005	24	1	5	-
2006	10	8	13	-
2007	25	25	25	-
2008	6	15	2	-
2009	-	16	-	-
2010	-	7	-	-
Total	73	73	46	-

Table 3.3: Summary Statistics: Industry Classification

Target Industry	**Frequency**
Agricultural Services (SIC 07)	1
Crude Petroleum & Natural Gas (SIC 13)	3
Water, Sewer, Pipeline & Communications & Power Line Construction (SIC 16)	2
Electrical Work (SIC 17)	1
Food & Kindred Products (SIC 20)	2
Apparel & Other Finished Products Made From Fabrics & Similar Materials (SIC 23)	1
Paper & Allied Products (SIC 26)	2
Printing, Publishing & Allied Industries (SIC 27)	3
Chemicals & Allied Products (SIC 28)	2
Stone, Clay, Glass, & Concrete Products (SIC 32)	1
Primary Metal Industries (SIC 33)	2
Electronic, Electrical Equipment & Components, Except Computer Equipment (SIC 36)	3
Surgical & Medical Instruments & Apparatus (SIC 38)	1
Games, Toys & Children's Vehicles (No Dolls & Bicycles) (SIC 39)	1
Deep Sea Foreign Transportation of Freight (SIC 44)	3
Communications (SIC 48)	5
Wholesale Trade - Durable Goods (SIC 50)	1
Apparel & Accessory Stores (SIC 56)	1
Miscellaneous Retail (SIC 59)	1
National Commercial Banks (SIC 60)	1
Personal Credit Institutions (SIC 61)	1
Security Brokers, Dealers & Flotation Companies (SIC 62)	1
Fire, Marine & Casualty Insurance (SIC 63)	2
Insurance Agents, Brokers, & Service (SIC 64)	1
Holding & Other Investment Offices (SIC 67)	6
Hotels & Motels (SIC 70)	1
Business Services (SIC 73)	15
Amusement & Recreation Services (SIC 79)	1
Health Services (SIC 80)	1
Educational Services (SIC 82)	2
Engineering, Accounting, Research, Management & Related Services (SIC 87)	5

Table 3.4: Summary Statistics: Deal Characteristics, Ownership, and Governance

Relative size is the value of the target as a fraction of the market capitalization of the acquirer. Market capitalization of SPAC is computed at the price at the acquisition announcement, measured in millions of dollars. Ownership of sponsors, target insiders and institutions is the fraction of the firm held by sponsors, target insiders, and institutional blockholders immediately after the acquisition, respectively. Deferred fees shows if part of the IPO underwriter fees are being deferred and paid only upon a successful merger completion. Time from IPO to acquisition announcement is measured in calendar days. 80% deal shows if the value of the deal is worth within 10% of the required 80% threshold (80% of the SPAC's net assets), at the time of the acquisition completion.

Variable	**Mean**	**Median**	**SD**	**Min.**	**Max.**	**N**
Panel A: Deal Characteristics						
Deal value	275.7	141.2	507.4	11.3	3403.4	72
Market capitalization of SPAC	153.1	73.4	183.1	7.2	1026.7	72
Relative size	1.907	1.610	1.192	0.264	5.073	71
Cash as a medium of exchange (%)	0.178	-	-	-	-	73
Stock as a medium of exchange (%)	0.205	-	-	-	-	73
Time from IPO to acquisition announcement	388.7	395.0	192.8	45.0	731.0	72
Deferred fees	0.658	-	-	-	-	73
Underwriter is a M&A advisor	0.466	-	-	-	-	73
Deferred fees & Underwriter is a M&A advisor	0.411	-	-	-	-	73
80% deal	0.239	-	-	-	-	71
Panel B: Ownership						
Ownership of sponsors (%)	0.108	0.080	0.095	0.000	0.502	71
Ownership of target insiders (%)	0.247	0.216	0.231	0.000	0.760	71
Ownership of institutions (%)	0.286	0.274	0.189	0.000	0.727	71
Panel C: Governance						
Directors from sponsors	0.342	0.286	0.231	0.000	1.000	71
CEO from sponsors	0.296	-	-	-	-	71
Chairman from sponsors	0.521	-	-	-	-	71
Directors from target insiders	0.323	0.286	0.226	0.000	0.875	71
CEO from target insiders	0.662	-	-	-	-	71
Chairman from target insiders	0.451	-	-	-	-	71
Board size	7.070	7.000	1.783	3.000	12.000	71

Table 3.5: Short-Term Stock Performance of SPACs around Acquisition Announcements

The table reports cumulative abnormal returns, measured over a three-day event window around the acquisition announcement date. The benchmark is the Russell 2000 index. The results of t-tests of differences in means, and nonparametric Wilcoxon signed rank tests of differences in medians are reported. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Announcement Return	**Mean**	**Median**	**SD**	**N**
Panel A: Completed Acquisitions				
All	0.016***	0.004	0.059	72
Cash	0.026	0.014	0.068	13
Stock	-0.005	-0.005	0.038	15
Mixed	0.021**	0.004	0.062	44
Panel B: Uncompleted Acquisitions				
All	0.001	-0.001	0.034	46
Cash	0.003	0.004	0.025	7
Stock	0.002	0.001	0.027	5
Mixed	0.001	-0.009	0.037	34
Panel C: All Acquisitions				
All	0.010**	0.001	0.048	118
Cash	0.015	0.009	0.048	20
Stock	-0.003	-0.002	0.034	20
Mixed	0.011**	-0.000	0.051	78
Panel D: Completed less Uncompleted				
All	0.022**	0.002		46

Table 3.6: Long-Term Stock Performance of SPACs using Alternative Benchmarks

In Panel A, the benchmark is the Russell 2000 index. In Panel B, the benchmark is the industry and size matched non-acquisitions, while in Panel C, all companies that became public in the year of the SPAC acquisition. Returns are computed assuming a buy and hold strategy. The first row shows the performance between the acquisition announcement and the acquisition completion. The last row shows the performance from the acquisition announcement until a year after the acquisition was completed. I also show the performance for the three, six, nine and twelve months time horizons following the acquisition completion. The t-tests of differences in means, and nonparametric Wilcoxon signed rank tests of differences in medians are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Time Horizon	**Mean Returns**		**Median Returns**		**N**
	SPACs	**Benchmark**	**SPACs**	**Benchmark**	
Panel A					
Announcement - Effective date	0.044	0.022 (0.58)	-0.002	0.047 (-0.86)	71
Effective date - 3 months post merger	-0.095	0.005*** (-2.39)	-0.145	0.034*** (-3.18)	71
Effective date - 6 months post merger	-0.198	0.003*** (-4.14)	-0.242	0.025*** (-4.68)	71
Effective date - 9 months post merger	-0.338	-0.016*** (-7.42)	-0.371	0.014*** (-5.86)	71
Effective date - 1 year post merger	-0.429	-0.021*** (-8.03)	-0.563	-0.066*** (-6.06)	70
Announcement - 1 year post merger	-0.441	-0.014*** (-7.87)	-0.600	-0.040*** (-5.87)	68
Panel B					
Announcement - Effective date	0.058	-0.009 (0.94)	0.006	-0.020 (-0.78)	67
Effective date - 3 months post merger	-0.091	-0.010 (-1.35)	-0.129	-0.019* (-1.93)	68
Effective date - 6 months post merger	-0.205	0.094*** (-2.96)	-0.260	-0.050*** (-3.38)	68
Effective date - 9 months post merger	-0.344	0.199*** (-2.70)	-0.385	-0.055*** (-4.74)	68
Effective date - 1 year post merger	-0.429	0.214*** (-2.91)	-0.563	-0.250*** (-4.80)	68
Announcement - 1 year post merger	-0.433	-0.058*** (-3.29)	-0.600	-0.203*** (-3.75)	66

(Continue)

Table 3.6 – *Continued*

Time Horizon	**Mean Returns**		**Median Returns**		**N**
	SPACs	**Benchmark**	**SPACs**	**Benchmark**	
Panel C					
Effective date - 3 months post merger	-0.093	-0.042 (-1.14)	-0.129	0.006 (-1.51)	70
Effective date - 6 months post merger	-0.197	-0.106* (-1.93)	-0.248	-0.161*** (-2.52)	70
Effective date - 9 months post merger	-0.340	-0.170*** (-4.18)	-0.375	-0.282*** (-3.68)	70
Effective date - 1 year post merger	-0.432	-0.194*** (-4.66)	-0.564	-0.199*** (-4.15)	69

Table 3.7: Industry-Adjusted, Matched Firm-Adjusted and IPO Firm-Adjusted Accounting Performance and Leverage

Panel A of this table reports industry-adjusted, matched firm-adjusted, and IPO firm-adjusted statistics on operating returns on sales, and return on sales. Operating return on sales is computed as operating income divided by total sales. Return on sales is computed as net income before extraordinary items divided by total sales. Panel B reports the industry-adjusted, matched firm-adjusted, and IPO firm-adjusted capital structure of SPAC acquisitions. Leverage is computed as the ratio of long-term debt to total assets. Cash is cash and equivalents, divided by total assets. Net leverage is computed as the ratio of long-term debt minus cash, divided by total assets. Industry is defined in the four-digit SIC code level. The t-tests of differences in means, and nonparametric Wilcoxon signed rank tests of differences in medians are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Industry-adjusted			**Matched firm-adjusted**			**IPO firm-adjusted**		
	Mean	**Median**	**N**	**Mean**	**Median**	**N**	**Mean**	**Median**	**N**
Panel A									
Operating return on sales (%)	-0.322***	-0.049***	66	-0.378***	-0.107***	66	-0.299***	-0.030***	66
	(-3.36)	(-2.62)		(-3.92)	(-3.54)		(-3.22)	(-2.39)	
Return on sales (%)	-0.291***	-0.049***	66	-0.335***	-0.078***	66	-0.302***	-0.064***	66
	(-3.56)	(-2.68)		(-3.50)	(-2.83)		(-3.49)	(-2.36)	
Panel B									
Long-term debt to assets (%)	0.094***	0.015	67	0.047	0.021	66	0.103***	0.020**	67
	(2.52)	(1.67)		(1.16)	(1.14)		(3.26)	(2.27)	
Cash to assets (%)	0.034***	0.003*	68	-0.040*	-0.019	68	0.041***	0.002*	68
	(2.49)	(1.76)		(-1.90)	(-1.55)		(2.47)	(1.89)	
Net long-term debt to assets (%)	0.047	0.047	67	0.073	0.096	66	0.072**	0.045	67
	(1.24)	(0.85)		(1.56)	(1.27)		(2.03)	(1.68)	

Table 3.8: Industry-Adjusted, Matched Firm-Adjusted and IPO Firm-Adjusted Valuation Measures

Panel A of the table reports Tobin's Q, E/P ratios, and P/E ratios for the SPAC acquisitions net of their respective industry median values, matched firms, and matched IPO firms measured one year after the merger was completed. Panel B reports the valuation ratios measured at the time of the merger completion. Tobin's Q is computed as [(book value of assets - book value of equity - deferred taxes + market value of equity)/book value of assets]. The E/P ratio is computed for all firms, while the P/E ratio is only computed for firms with positive earnings. Industry is defined in the four-digit SIC code level. The t-tests of differences in means and nonparametric Wilcoxon signed rank tests of differences in medians are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Industry-adjusted			**Matched firm-adjusted**			**IPO firm-adjusted**		
	Mean	**Median**	**N**	**Mean**	**Median**	**N**	**Mean**	**Median**	**N**
Panel A: Valuation ratios measured one year after the merger									
Tobin's Q	-0.083	-0.321*	65	-0.233*	-0.084	64	-0.136	-0.272**	65
	(-1.01)	(-1.75)		(-1.86)	(-1.09)		(-1.45)	(-2.13)	
E/P ratio	-32.954***	-2.307***	65	-30.610***	-1.556**	65	-32.119***	-1.105***	65
	(-2.89)	(-2.98)		(-2.64)	(-1.96)		(-2.84)	(-2.53)	
P/E ratio	-3.121	-0.415**	18	-2.055*	-0.382***	16	-0.342	-0.580	18
	(-1.26)	(-2.11)		(-1.71)	(-2.69)		(-0.94)	(-1.20)	

(Continue)

Table 3.8 – *Continued*

	Industry-adjusted			Matched firm-adjusted			IPO firm-adjusted		
	Mean	**Median**	**N**	**Mean**	**Median**	**N**	**Mean**	**Median**	**N**
Panel B: Valuation ratios measured at the time of the merger completion									
Tobin's Q	0.017 (0.15)	-0.168 (-1.25)	68	-0.158 (-1.08)	-0.195 (-1.55)	68	0.062 (0.51)	-0.175 (-1.09)	67
E/P ratio	-4.206*** (-2.43)	-0.642* (-1.91)	68	-2.578 (-1.12)	-0.754 (-0.95)	68	-4.445*** (-2.63)	0.004 (-1.16)	67
P/E ratio	2.453** (2.02)	0.498*** (3.36)	29	1.858 (1.03)	0.099 (0.24)	19	-4.448*** (-4.14)	-2.760*** (-3.18)	13

Table 3.9: Cross-Sectional Regression of Short-Term Stock Performance of SPACs

The dependent variable is the market-adjusted CARs earned by SPACs over a three-day event window around the acquisition announcement date. LTIMETOACQ is the natural logarithm of the number of days between the SPAC IPO and the acquisition announcement. LTIMETOACQ_SQ is LTIMETOACQ squared. SPONSOROWN, TARGETOWN and INSTOWN is the fraction of the firm held by sponsors, target insiders, and institutional blockholders immediately after the acquisition, respectively. CASH is a dummy variable that takes on a value of one if the medium of exchange is cash, and zero otherwise. PRIV is a dummy variable that takes on a value of one if the target is a private firm, and zero otherwise. DEF_FEES is a dummy variable that takes on a value of one if portion of the IPO's underwriter compensation is deferred and paid only upon a successful merger completion, and zero otherwise. UND_ADV is a dummy variable that takes on a value of one if a SPAC acquisition advisor is also the company's underwriter, and zero otherwise. DEF_FEES $*$ UND_ADV is the product of DEF_FEES and UND_ADV. 80% DEAL is a dummy variable that takes on a value of one if the deal value is worth within 10% of the required 80% threshold (80% of the SPAC's net assets), at the time of the acquisition completion, and zero otherwise. RELSIZE is the value of the target as a fraction of the market capitalization of the acquirer. LMKTCAP is the natural logarithm of the market capitalization of the SPAC computed at the price at the acquisition announcement, measured in millions of dollars. LDEALVALUE is the natural logarithm of the value of the transaction. Heteroskedasticity-adjusted (White) standard errors are used in calculation of t-statistics that are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Explanatory variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
LTIMETOACQ	0.454***	0.500***	0.523***	0.516***	0.440***	0.445***
	(2.61)	(3.22)	(3.29)	(3.21)	(2.81)	(2.72)
LTIMETOACQ_SQ	-0.042***	-0.047***	-0.049***	-0.048***	-0.041***	-0.042***
	(-2.65)	(-3.26)	(-3.33)	(-3.26)	(-2.88)	(-2.79)
SPONSOROWN	-0.133	-0.113	-0.111	-0.108	-0.112	-0.106
	(-1.35)	(-1.29)	(-1.26)	(-1.21)	(-1.29)	(-1.21)
TARGETOWN	0.019	0.022	0.023	0.024	0.014	0.017
	(0.46)	(0.62)	(0.64)	(0.68)	(0.41)	(0.47)
INSTOWN	0.028	0.028	0.023	0.025	0.024	0.023
	(0.66)	(0.73)	(0.58)	(0.63)	(0.63)	(0.60)
CASH	0.033	0.031	0.031	0.032*	0.034*	0.035*
	(1.56)	(1.67)	(1.66)	(1.68)	(1.85)	(1.86)
PRIV	0.026	0.028*	0.025	0.025	0.027*	0.025
	(1.51)	(1.82)	(1.60)	(1.57)	(1.84)	(1.64)
DEF_FEES		-0.062***	-0.058***	-0.053***	-0.061***	-0.051***
		(-4.04)	(-3.50)	(-2.75)	(-4.03)	(-2.73)
UND_ADV			-0.012	0.001		0.010
			(-0.73)	(0.05)		(0.36)
DEF_FEES $*$ UND_ADV				-0.018		-0.024
				(-0.52)		(-0.71)
80% DEAL					-0.044*	-0.044*
					(-1.76)	(-1.70)
RELSIZE	0.002	0.001	-0.001	-0.002	0.016	0.013
	(0.13)	(0.05)	(-0.08)	(-0.13)	(0.88)	(0.72)
LMKTCAP	0.011	0.030	0.027	0.025	0.073**	0.068*
	(0.35)	(1.07)	(0.93)	(0.84)	(1.98)	(1.76)
LDEALVALUE	0.002	-0.002	0.003	0.005	-0.046	-0.040
	(0.06)	(-0.07)	(0.11)	(0.18)	(-1.23)	(-1.02)
Constant	-1.256***	-1.408***	-1.464***	-1.449***	-1.227***	-1.240***
	(-2.61)	(-3.28)	(-3.34)	(-3.28)	(-2.83)	(-2.75)
N	69	69	69	69	69	69
Adj R^2	0.077	0.270	0.264	0.254	0.300	0.279

Table 3.10: Cross-Sectional Regression of Long-Term Stock Performance of SPACs

The dependent variable in columns 1 to 4 is the one-year matched firm-adjusted buy-and-hold returns of SPACs, following the acquisition completion date. The dependent variable in column 5 is the one-year market-adjusted buy-and-hold returns, while in column 6, the one-year IPO-adjusted buy-and-hold returns. SPONSOROWN (TARGETOWN) is the fraction of the firm held by sponsors (target insiders) immediately after the acquisition. SPONSOROWN_SQ (TARGETOWN_SQ) is SPONSOROWN (TARGETOWN) squared. SPONSORCEO (TARGETCEO) is a dummy variable that takes on a value of one if the CEO is one of the sponsors (target insiders), and zero otherwise. SPONSORCHAIR (TARGETCHAIR) is a dummy variable that takes on a value of one if the chairman is one of the sponsors (target insiders), and zero otherwise. OLD_INSTOWN is the fraction of the firm held by old institutional blockholders (institutional blockholders who also held shares prior to the acquisition) immediately after the acquisition. NEW_INSTOWN is the fraction of the firm held by new institutional blockholders (institutional blockholders who first buy shares at the time of the acquisition announcement) immediately after the acquisition. INSTOWN is the sum of OLD_INSTOWN and NEW_INSTOWN. RELSIZE is the value of the target as a fraction of the market capitalization of the acquirer. LDEALVALUE is the natural logarithm of the value of the transaction. EBITDA_AT is computed as the ratio of EBITDA to total assets, measured a year after the acquisition was completed. Heteroskedasticity-adjusted (White) standard errors are used in calculation of t-statistics that are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Explanatory variables	**(1) match adjusted**	**(2) match adjusted**	**(3) match adjusted**	**(4) match adjusted**	**(5) market adjusted**	**(6) IPO adjusted**
SPONSOROWN	6.145**	6.138**	5.439*	4.810*	3.023	5.248***
	(2.10)	(2.14)	(1.91)	(1.73)	(1.38)	(2.35)
SPONSOROWN_SQ	-20.687**	-22.659***	-21.410***	-18.620**	-12.944*	-19.219***
	(-2.27)	(-2.51)	(-2.41)	(-2.13)	(-1.88)	(-2.75)
TARGETOWN	-0.364	-0.746	-1.296	-0.646	-1.056	-1.520**
	(-0.37)	(-0.76)	(-1.28)	(-0.66)	(-1.41)	(-2.00)
TARGETOWN_SQ	0.278	0.698	1.254	0.664	1.174	2.005*
	(0.20)	(0.50)	(0.90)	(0.48)	(1.11)	(1.87)
SPONSORCEO	0.714*	0.709*	0.636*	0.700*	0.244	0.118
	(1.86)	(1.90)	(1.73)	(1.89)	(0.86)	(0.41)
TARGETCEO	0.426	0.457	0.385	0.451	0.195	0.145
	(1.17)	(1.27)	(1.08)	(1.25)	(0.71)	(0.52)
SPONSORCHAIR		0.521**	0.604***	0.513**	0.366**	0.119
		(2.17)	(2.52)	(2.30)	(2.00)	(0.64)
TARGETCHAIR		0.493**	0.563***	0.484**	0.399***	0.233
		(2.21)	(2.53)	(2.32)	(2.35)	(1.35)
OLD_INSTOWN			-1.183***			
			(-2.76)			
NEW_INSTOWN			-2.201***			
			(-4.04)			
INSTOWN	-1.504***	-1.517***		-1.421***	-0.642**	-0.654**
	(-3.70)	(-3.85)		(-3.66)	(-2.14)	(-2.14)
RELSIZE	0.098	0.130*	0.150**	0.105	0.117**	0.116**
	(1.32)	(1.76)	(2.04)	(1.45)	(2.09)	(2.02)
LDEALVALUE	-0.134*	-0.126*	-0.141*	-0.106	-0.113**	-0.137***
	(-1.77)	(-1.71)	(-1.94)	(-1.46)	(-2.02)	(-2.41)
EBITDA_AT	0.205	0.182	0.173		0.292***	0.298***
	(1.46)	(1.32)	(1.28)		(2.77)	(2.79)
Constant	-0.171	-0.714	-0.564	-0.736	-0.398	0.069
	(-0.31)	(-1.21)	(-0.97)	(-1.26)	(-0.88)	(0.15)
N	64	64	64	66	64	64
Adj R^2	0.228	0.274	0.304	0.250	0.174	0.184

Chapter 4

Monitoring Effects in Acquisitions of Private Companies

4.1 Introduction

There is evidence in the literature on mergers and acquisitions suggesting that while acquirers of publicly traded targets achieve zero or negative average announcement cumulative abnormal returns (CARs), acquirers of private targets gain on average positive CARs.[1] Despite their significance, private companies are rarely studied, mainly due to the limited data available on such firms.[2] As a result, although previous research looks at some possible explanations for the significant gains experienced by buyers in acquisitions of private targets, the fundamental factors that give rise to this phenomenon remain unclear.

The present paper aims to provide a new insight into acquirer announcement returns by investigating how the ownership structure of private targets influences those returns. The advantage of the Financial Analysis Made Easy (FAME) database, which I use in this research, is that it provides data on ownership and board of directors for public as well as for private UK companies. Hence, the use of this larger and more detailed data on private companies can shed additional light on our understanding of those firms.

Using a sample of UK acquisitions of public and private targets for the period between January 2000 and September 2009 I confirm the findings of previous literature: on average, acquirers of private targets gain significantly positive abnormal returns, in contrast to acquirers of listed companies who suffer losses. I then find that target insiders' ownership is an important determinant of acquirer's abnormal returns in acquisitions of private firms. The effect of insiders' ownership on acquirer's returns seems to be primarily driven by the monitoring that target insiders provide of the acquiring firm's management, either when they are elected as a member on board of directors, or when they become a blockholder in the new merged entity. Further, I also find that the relationship between acquirer's abnormal returns and target insiders' ownership is non-linear. The market perceives the effect of a potential monitoring provided by the target insiders as a value-creating event if insiders' ownership in the target is low, and as a value-destroying event if insiders' ownership in the target is high. This is consistent with a better alignment of the interests of insiders with those of minority shareholders at low levels of insiders' ownership and entrenchment of the insiders at high levels of ownership.

My paper is related to and contributes to the following research. A number of studies

[1] These findings have been documented for U.S. acquisitions (see e.g., Chang (1998), Fuller, Netter, and Stegemoller (2002), Moeller, Schlingemann, and Stulz (2004)), as well as for European (Faccio, McConnell, and Stolin (2006)) and UK mergers (Draper and Paudyal (2006)). The cumulative abnormal returns of acquirers at the merger announcement remain positive irrespective of whether the unlisted targets are categorized as stand-alone companies or subsidiaries of other firms (Fuller et al. (2002), Moeller et al. (2004)).

[2] Private firms represent a significant portion of all incorporated entities in the United Kingdom. More than two-thirds of corporate assets in the UK are owned by private firms, and more than 80% of all acquisitions involve takeovers of privately held companies (Brav (2009)).

have tried to explain the positive abnormal returns experienced by acquirers when they purchase a private firm. For instance, Fuller et al. (2002) suggest that the difference in market reaction to acquisitions of private and public targets is unlikely to be explained by differences between acquirers of private and acquirers of public firms. They find that the"listing effect" is still persistent when the same buyers acquire private and public firms.[3]

Other studies have investigated how important differences between private and public targets impact the returns to acquirers. Bitler, Moskowitz, and Vissing-Jorgensen (2005) develop a principle-agent model in an entrepreneurial setting, and test it using data on privately held firms. Applying instrumental variables to overcome the endogeneity problems, the authors conclude that effort increases with ownership while enhancing the firm's performance. Mantecon (2008) in his research concludes that the level of uncertainty and agency problems, associated with private targets, as well as the costly access to external capital markets to finance growth opportunities weakens their bargaining position. As a result, bidders are able to extract positive excess returns in the acquisition of private firms. On a similar note, uncertainty associated with target valuation is found by Cooney, Moeller, and Stegemoller (2009) to explain acquisition underpricing of private targets. They observe a positive relationship between the target's valuation revision (between their last SEC filing before their withdrawn IPO, and subsequent acquisition) and acquirer gains. This relationship is stronger for positive rather than negative valuation changes. The authors further find that, since private targets experience on average positive valuation changes, they are more underpriced and their acquirers have positive abnormal returns.

Several papers examine the relationship between the method of payment and acquirer returns. Chang (1998) shows that acquirers benefit only when they use stock as a medium of exchange. In this case, the financing of takeovers is similar to private placements of equity because target firms are owned by one or a small number of shareholders, who become blockholders of the acquirer and serve as an effective monitoring device. Officer, Poulsen, and Stegemoller (2009) find that the use of stock mitigates information asymmetry about the target and due to the gains of risk-sharing with the target's owners, acquirers experience positive announcement returns.

While, previous papers (Bitler at al., (2005), Mantecon (2008)) explore the relationship between the level of ownership by target's insiders and acquirer's returns, their analyses give mixed evidence. One possible explanation for their mixed results could be related to the representativeness of their datasets. Mantecon (2008) uses data on targets that were acquired shortly after they filed for an initial public offering (IPO) to circumvent the lack of information on private firms. Likewise, Cooney et al., (2009) use a sample

[3]See Faccio et al. (2006) for the "listing effect".

of acquisitions of private firms that withdraw an IPO. However, there are two things that should be considered. First, although these are newly public firms, their ownership structure is that of a public and not of a private firm. Second, the special characteristics of the data used in the above studies may lead to a small sample size bias and therefore a larger sample to test the robustness of their results is needed.

Another explanation of their insignificant results could be that in their tests the authors do not allow for non-linearity in the relationship between insiders' ownership and acquirer's returns. In his analysis, Mantecon (2008) tests the hypothesis that more concentrated ownership of the target leads to lower acquirer's returns, since increased managerial ownership decreases the agency costs of equity (Jensen and Meckling (1976)). In other words, insiders with high ownership should exert more effort during the negotiation of the acquisition, and extract a larger value for target shareholders at the expense of the bidder. However, increasing ownership may also lead to the managers' entrenchment and the use of value destroying policies without the fear of shareholder activism (see e.g., McConnell and Servaes (1990) and Morck, et al. (1988)). Which of the two effects dominates at a particular level of target insider ownership is an empirical issue that I examine in this paper by using ownership data on private targets collected from FAME database.

The rest of the paper is organized as follows. Section 4.2 develops the hypotheses that will serve as the basis for the empirical tests. Section 4.3 reviews the characteristics of the sample. Section 4.4 describes the methodology and reports the results. Section 4.5 concludes.

4.2 Theory and Hypotheses

A fundamental difference between private and public firms is their ownership structure, and hence the degree to which control is valued by their shareholders. Managerial ownership could be a major determinant of the target's management resistance to a takeover attempt. As Cotter and Zenner (1994) suggest, when faced with the decision to resist or support a tender offer, managers evaluate the trade-off between their gains, resulting from share ownership in the firm (as well as golden parachutes), and their losses of compensation, perquisites, and control. In the case of private firms, the private benefits of control are quite large relative to the financial returns. Maintaining control is probably one of the main reasons why these companies are private to begin with.[4] Hence, the managers' problem of a private company that is being acquired reduces to the choice of how to obtain additional liquidity (either for personal liquidity demands or by the need to raise external

[4]The decision to go public has been extensively examined. For empirical papers, see Lerner (1994), Pagano, Panetta, Zingales (1998), Helwege and Packer (2009).

financing for investment in the firm's growth opportunities, or both), by giving away as little control as possible.[5]

Managerial ownership can influence firm value in two offsetting ways. On one hand, increasing insider ownership is expected to enhance firm's value, as the cost of deviation from value maximisation due to agency problems declines. In particular, Jensen and Meckling (1976), argue that increased managerial ownership decreases the agency costs of equity by reducing managers' consumption of perquisites. On the other hand, increasing ownership may also lead to the managers' entrenchment and decrease in firm value (see e.g., Stulz (1988), McConnell and Servaes (1990), Morck, Schleifer, and Vishny (1988)).[6]

In acquisitions of private companies with low levels of insiders' ownership, target insiders will be left with a small stake in the merged firm. Since low levels of ownership in mature firms are associated with better alignment of incentives, acquisitions of targets with low levels of insiders' ownership will create a positive market reaction. In contrast, target insiders in acquisitions of private firms with high levels of insiders' ownership, are likely to end up with a high ownership in the merged firm. Since high ownership in mature firms is associated with higher entrenchment, acquisitions of targets with high levels of ownership will have a negative market reaction. Therefore, my hypothesis regarding the market reaction to the acquisitions of private firms is as follows.

Hypothesis 1: *There will be a positive (negative) relationship between acquirer's abnormal returns and target insiders' ownership for acquisitions of private targets with low (high) levels of insiders' ownership.*

Cash-financed acquisitions result in a complete loss of target insiders' control. Since target insiders will hold no shares in the merged firm, the market reaction to those acquisitions will be mitigated relative to the market reaction to all acquisitions. In fact, target insiders' ownership in the case of cash-financed acquisitions, should not have an explanatory power of the acquirer's abnormal returns, given that after the acquisition target insiders play no role in the new merged firm. Therefore, for acquisitions paid by cash, I expect to find no significant market reaction. Hence, my hypothesis regarding acquirer's abnormal returns for cash-financed acquisitions of private firms is as follows.

Hypothesis 2: *The relationship between acquirer's abnormal returns and target insiders' ownership conjectured in Hypothesis One will be reversed because of the complete exit of target insiders, in cash-financed acquisitions.*

The market reaction to acquisitions of private targets, where some of the target insiders

[5]Bolton and Von Thadden (1998) develop a model of corporate ownership structure in which costs and benefits of ownership concentration are analysed.

[6]From now on, I will refer to the positive influence of ownership on firm value as the "incentive alignment effect" and to the negative influence as the "entrenchment effect".

obtain a position on the board of directors in the new firm, should be more pronounced from the one conjectured in Hypothesis One. In particular, over the range of insider ownership, for which the incentive alignment effect dominates, the monitoring provided by the new directors would be beneficial. Over the range of insider ownership, for which the entrenchment effect dominates, however, the monitoring can have a detrimental influence, since the management of the new firm would be monitored by a director who cares more about his own interests rather than those of minority shareholders. Thus, my hypothesis regarding acquisitions of private firms where target insiders obtain a position in the board of directors of the merged firm is as follows.

Hypothesis 3: *The relationship between acquirer's abnormal returns and target insiders' ownership, conjectured in Hypothesis One, will be exacerbated because of the monitoring effect provided by target insiders who become directors in the new merged firm.*

Similarly, insiders of the target firm are likely to have a monitoring effect on the acquiring firm's management in the case that some of them become blockholders in the new firm. As discussed by Chang (1998), target managers are likely to evaluate the acquirer's future prospects carefully because a proportion of their wealth would be invested in the acquirer's shares after the merger. Therefore, the managers' acceptance of the acquirer's stock can be seen as a certification of the value of the offer and this is likely to increase the value of the acquirer's shares, which the managers will own after the merger. Further, similar to Hypothesis Three, over the range of insider ownership for which the incentive alignment effect dominates, the creation of the new blockholder will be received more positively by the market. Over the range of insider ownership for which the entrenchment effect dominates, on the other hand, the creation of the new blockholder will have a more negative market reaction. Thus, my hypothesis regarding acquisitions of private firms where a new blockholder is created is as follows.

Hypothesis 4: *The relationship between acquirer's abnormal returns and target insiders' ownership, conjectured in Hypothesis One, will be exacerbated because of the monitoring effect of the creation of a new blockholder.*

4.3 Data and Sample Selection

Since the aim of this paper is to explain the significant gains experienced by acquirers of private targets relative to those experienced by buyers of public targets, I collect data on all mergers involving UK publicly traded acquirers between January 2000 and September 2009 from the SDC/Platinum Mergers & Acquisitions database.[7] I exclude all transactions

[7]The availability of ownership data on FAME (which starts only in January 2003) restricts my sample.

where either the target or the acquirer is a financial firm. I also exclude utilities firms because they are heavily regulated.[8] I include only transactions where the value of the deal is available. This screening leaves me with a sample of 2,646 acquisitions involving UK private targets and 230 involving UK public targets. Next, I search in FAME database for each company that was included (either as a target or as an acquirer) in these two subsets. After I match all the cases where I have both, the acquirer and the target of each acquisition in FAME database, with the original sample of SDC acquisitions I am left with a sample of 1,358 acquisitions of private targets and 106 acquisitions of public targets. This sample is described in Table 4.1.

The data on the target's pre-merger ownership is collected from the Ownership section of FAME database. For each target, I collect the ownership available on the date preceding and closest to the acquisition announcement date.[9] Bureau van Dijk Electronic Publishing (BvDEP), the provider of FAME database keeps archived data in its Ownership Database since January 2003, nevertheless, the data available in the first two years is quite limited.[10]

I use the sample of 1,358 acquirers of private targets and 106 acquirers of public targets to perform the event-study methodology of the market reaction to the merger announcement. The closing prices on each public acquirer of these two subsets, as well as the closing price on the Financial Times Stock Exchange 100 share index (FTSE100) are collected from DataStream database.[11] I also use DataStream to obtain data on acquirers' market capitalization and book value of total assets.

Appendix B lists variables used in this study, while Table 4.2 provides relevant summary statistics. Mean (median) insider ownership in my sample is 15.7% (4.0%) for public targets and 70.8% (90.0%) for private targets. The mean (median) market capitalization for acquirers of public targets is £4,168 (£337) million, while the corresponding amount for acquirers of private targets is £598 (£77) million. The mean (median) Tobin's Q at the time of the acquisition is 2.1 (0.1) for acquirers of public targets and 28.7 (1.1) for acquirers of private targets.

Overall, I find a few significant differences between acquisitions of public and private firms. Insiders' ownership of public targets is significantly lower than that of private

[8] See Cotter and Zenner (1994).

[9] Normally, BvDEP inputs the ownership information collected in the annual report. Therefore, generally the available ownership is dated as of the end of a given year. However, since BvDEP is working with a very large panel of data providers, different sources of information could provide shareholders or subsidiaries of a same company but not necessarily at the same validity date and with a same level of details. I will either take the ownership recorded at the end of the year, or the ownership from another recorded date, whichever is closest but preceding the acquisition announcement.

[10] In many cases throughout the sample the data is not available. In other cases the database indicates that given shareholders have a share of the company, however since the actual percentage of ownership is unknown, the data is recorded as "n.a.".

[11] I also use a second benchmark, Financial Times Stock Exchange Total Non-Financial share index (FTATNOF).

targets. Acquirers of public firms tend to be significantly larger and have significantly lower Tobin's Q relative to acquirers of private targets. I also find that acquirers of public firms tend to buy bigger firms, relative to acquirers of private firms. Finally, the relative size of acquisitions of public targets (the value of the target as a fraction of the market capitalization of the acquirer) is significantly lager from the relative size of acquisitions of private targets, however, only in the case of medians, and not in the case of means.

Table 4.3 reports pairwise Pearson correlation coefficients among various control variables and their statistical significance. There is a significant negative correlation between target insiders' ownership and transaction value for both, acquisitions of public and acquisitions of private targets. Nevertheless, the correlation for the former is three times stronger than the correlation for the latter, which suggests that private targets have more concentrated ownership. In addition, the insignificant correlation between insiders' ownership and abnormal returns seems to imply a non-linear relationship.

4.4 Empirical Tests and Results

Section 4.4.1 describes the testing methodology and reports results on the difference in market reaction to acquisitions of private and public firms. Section 4.4.2 examines acquisitions of private firms and the influence of target insiders' ownership on abnormal returns. Section 4.4.3 studies market reaction to the creation of a new director or a blockholder in the acquired firm.

4.4.1 Methodology

I follow the event-study methodology (Brown and Warner (1985)) in order to calculate the cumulative abnormal returns experienced by acquirers around the announcement date of the merger. I define day "0", the day of the event, as the announcement date of the merger. I use 250 daily return observations for the period around the merger starting at day -244 and ending at day +5, relative to the event. The first 239 days in this period (-244 through -6) I define as my "estimation period", and the following 11 days (-5 through +5) as my "event period".

I use the market model to calculate the abnormal (excess) returns. The market model parameters are calculated over the estimation period. The abnormal return for each day in the event window is estimated using the following procedure:

$$A_{it} = R_{it} - \hat{\alpha}_i - \hat{\beta}_i R_{mt} \tag{4.1}$$

where α and β are values from the estimation period.[12] In Table 4.4, I report the cumulative abnormal returns (CARs) earned by my sample firms over a three-day event window around the announcement date.[13] The comparison of CARs earned by acquirers of public and acquirers of private firms reveals that on average CARs are 2.5% higher when a private firm is being acquired compared to an acquisition of a public firm. Acquirers of public targets have negative and significant abnormal returns for stock financed acquisitions, and insignificant returns for cash and mixed transactions. In contrast, acquirers of private targets realize positive abnormal returns for transactions paid by cash or a mixture of securities, while their abnormal returns are positive but not significant for stock financed acquisitions.

In Table 4.5, I provide further evidence of the difference in abnormal returns between acquisitions of public and private firms using various regression techniques. My findings for the full sample are consistent with prior research: on average, acquirers of private targets gain significantly positive abnormal returns, in contrast to acquirers of listed companies who suffer losses.

4.4.2 The Influence of Insider Ownership

To better understand the influence of target insiders' ownership on value gains by acquirers of private firms, I estimate the following regression:

$$CAR_i = \beta_0 + \beta_1 INSOWN_i + \beta_2 INSOWNSQ_i + \sum_j \beta_j Control\ variable_{ji} + \varepsilon_i \tag{4.2}$$

The dependent variable is the acquirer's CAR over a three-day event window around the announcement date. To allow for non-linearity in the relationship between value creation and target insiders' ownership, I use a quadratic specification. INSOWN is the insiders' ownership in the target firm, as reported on the date preceding and closest to the acquisition announcement.[14] INSOWNSQ is INSOWN squared.

[12] Brown and Warner (1985).

[13] I have also used cumulative abnormal returns over various other event windows in the univariate and multivariate tests. The results are qualitatively unchanged.

[14] I measure insider ownership as the percentage of shares controlled by the managers of the firm and by their family members. Further, I have also replicated all the results by excluding the family members ownership when measuring insider ownership. The results are qualitatively unchanged in these alternative specifications.

In all specifications, I control for the firm size (LMKT), relative size (RELSIZE), and medium of exchange (CASH, STOCK, MIXED) since these variables have been found to have an effect on acquisitions announcement returns (see Moeller et al., 2004, Moeller et al., 2007, and Travos, 1987, respectively). I also use the following additional control variables one at a time (all defined in the Appendix B): LDEALVALUE, SAMEINDUS, and TQ. These variables are suggested by the works of Maquieira et al. (1998), and Servaes (1991). I have also used year dummies and industry dummies as additional control variables to control for the variation in the merger activity across years and across industries (see Martynova and Renneboog, 2008, and Mitchel and Mulherin, 1996).

The market reaction upon acquisitions of private firms provides direct evidence about the influence of target insiders on the value of the new merged firm. In particular, since target insiders with low levels of ownership will be left with a small stake in the merged firm, the market will react more favourably to those acquisitions because it associates low levels of insiders' ownership with the positive incentive alignment effect. In contrast, the market will see acquisitions of targets with high levels of ownership less favourably since those insiders are likely to obtain a bigger stake in the merged company, and the market relates high levels of insiders' ownership with the negative entrenched effect. Hence, as that the incentive alignment effect dominates at low levels of insiders' ownership, while the entrenchment effect dominates at high levels of insiders' ownership, I expect β_1 to be positive and β_2 to be negative.

The results of the empirical tests of Eq. (4.2) are reported in Table 4.6. I find that the coefficient estimate for β_1 is positive, while the coefficient estimate for β_2 is negative. Both coefficient estimates are statistically significant at the 10% level. However, while coefficient β_1 is significant in all but one specification, coefficient β_2 is significant only in half of the specifications. These results imply a concave relationship between the market reaction upon an announcement of an acquisition of a private target, and target insiders' ownership. The estimated relationship reaches its maximum at around 63% insiders' ownership. My results suggest that, indeed, the market sees an acquisition of a target with low levels of insiders' ownership as good news, while acquisition of a target with high levels of insiders' ownership as bad news. In other words, low levels of ownership are associated with the incentive alignment effect, while high levels of ownership, with the entrenchment effect. These findings, although not very strong, are consistent with previous literature on public firms, which finds that increasing ownership may lead to management's entrenchment and the use of value-destroying policies without the fear of shareholder activism.[15]

[15]Stulz (1988), McConnell and Servaes (1990).

4.4.3 The Impact of Monitoring

In this section I study market reaction to acquisitions of private firms that create new director or a blockholder in the merged firm.

Cash-Financed Acquisitions

First, I examine if the market perceives cash-financed acquisitions differently from acquisitions where target insiders are left with some ownership in the new firm. I do so by estimating the following regression:

$$CAR_i = \beta_0 + \beta_1 INSOWN_i + \beta_2 INSOWNSQ_i + \beta_3 CASH_i + \beta_4 INSCASH_i + \beta_5 INSCASHSQ_i + \sum_j \beta_j Control\ variable_{ji} + \varepsilon_i \quad (4.3)$$

CASH is a dummy variable that takes on a value of one if the medium of exchange is cash, and zero otherwise. INSCASH and INSCASHSQ are constructed by multiplying CASH with INSOWN and INSOWNSQ, respectively. All control variables are as described for Eq. (4.2).

Since cash-financed acquisitions are associated with a complete exit of target insiders, insiders will be left with no stake in the merged firm. The market reaction to those acquisitions will be opposite to the one observed for all acquisitions. Consequently, I expect the sign of coefficient β_4 to be negative and the sign of coefficient β_5 to be positive, and the magnitude of those two coefficients to exactly offset the one of coefficients β_1 and β_2, respectively.

The results are reported in Column 1 of Table 4.7. Nonetheless, both coefficients have a negative sign and are not statistically significant. These results suggest that the relationship between acquirer returns and target insiders' ownership does not depend on the medium of exchange. It is also possible that these results are sample specific. For example, the summary statistics in Table 4.1 show that the number of cash acquisitions is less than the half of the number of acquisitions paid by a mixture of securities. This could potentially have an effect on my results, since on one hand it is difficult to classify the acquisitions paid by a mixture of securities (as being close to cash or stock), while on the other hand they should not be ignored since they represent the most significant proportion of all acquisitions.

New Director on the Board

Next, I move to study the market reaction to acquisitions of private firms where some of the target insiders obtain a position on the board of directors in the new merged firm. For this purpose I estimate the following regression:

$$CAR_i = \beta_0 + \beta_1 INSOWN_i + \beta_2 INSOWNSQ_i + \beta_3 DIR_i + \beta_4 INSDIR_i + \beta_5 INSDIRSQ_i + \sum_j \beta_j Control\ variable_{ji} + \varepsilon_i \quad (4.4)$$

DIR is a dummy variable that takes on a value of one if a target insider becomes a director in the merged firm, and zero otherwise. INSDIR and INSDIRSQ are constructed by multiplying DIR with INSOWN and INSOWNSQ, respectively.

By becoming a director in the merged firm, a target insider can monitor the acquirer's management. I expect this effect to be reflected in the relationship between target insiders' ownership and the acquiring firm's returns in the following manner. If insiders, whose incentives are aligned with those of minority shareholders, are elected as new directors, the market reaction will be positive. In contrast, if entrenched insiders become directors in the new firm the market will react negatively. Since my earlier findings imply incentive alignment of target insiders with low levels of ownership and entrenchment of target insiders with high levels of ownership, I expect the coefficient β_4 to be positive and the coefficient β_5 to be negative.

The results are reported in columns 2 through 5 of Table 4.7. In all four specifications the coefficient estimate for β_4 is positive and the coefficient estimate for β_5 is negative. Both coefficient estimates are statistically significant at either the 5% or the 10% level. Interestingly, after adding the interactive dummies, INSDIR and INSDIRSQ, to the regressions, the coefficient estimates for β_1 and β_2 become statistically insignificant. These results indicate that the impact of insiders' ownership reported in the earlier tests are, in fact, driven primarily by the monitoring effect that target insiders provide when they are elected as directors on the board of the merged firm.

New Blockholder

My findings above suggest that the monitoring effect provided by target insiders can explain the influence that insiders' ownership has on acquirer's returns. Hence, in order

to confirm these results, I proceed to examine the market reaction to acquisitions that result in the creation of a new blockholder in the acquirer firm. I do so by estimating the following regression:

$$CAR_i = \beta_0 + \beta_1 INSOWN_i + \beta_2 INSOWNSQ_i + \beta_3 BLOCK_i + \beta_4 INSBLOCK_i + \beta_5 INSBLOCKSQ_i + \sum_j \beta_j Control\ variable_{ji} + \varepsilon_i \quad (4.5)$$

BLOCK is a dummy variable that takes on a value of one if a target insider becomes a blockholder in the merged firm, and zero otherwise. INSBLOCK and INSBLOCKSQ are constructed by multiplying BLOCK with INSOWN and INSOWNSQ, respectively.

The monitoring provided by a target insider, whose proportion of wealth is invested in the acquirer's shares after the merger, could provide further support to the monitoring hypothesis. The creation of a new blockholder from the target with low levels of ownership will be received positively by the market, while a new blockholder from the target with high levels of ownership will have a negative market reaction. Hence, I expect the coefficient β_4 to be positive and the coefficient β_5 to be negative. Further, if the results in section 4.4.2 are in fact primarily driven by the monitoring effect, I expect coefficients β_1 and β_2 in Eq. (4.5) to be insignificant. If, on the other hand, target insiders' ownership has an effect on acquirer's returns, coefficients β_1 and β_2 will remain statistically significant.

The results, reported in columns 6 through 9 of Table 4.7, confirm the impact of the monitoring effect reported in the previous section. In particular, the coefficient estimate for β_4 is positive, while the coefficient estimate for β_5 is negative. Both coefficient estimates are statistically significant at the 5% level. In addition, the coefficient estimates for β_1 and β_2 are not statistically significant.

Overall, the results are consistent with my previous findings on the creation of a new director on board. They provide additional evidence that the relationship between insiders' ownership and acquirer's returns is primarily driven by the monitoring effect that target insiders have on the acquiring firm's management, by either becoming a director on board or a blockholder in the new merged firm. These results are also consistent with the findings of prior literature that advocates acquirers benefit when owners of closely held private targets become blockholders of the acquirer (Chang, 1998). Further, the market reaction is positive, when an insider, whose interests are aligned with those of minority shareholders, provides the monitoring and negative when an entrenched target insider provides the monitoring.

4.5 Conclusions

Private firms represent a significant proportion of all incorporated firms. The majority of acquisitions in the UK involve takeovers of privately held companies. Yet, private firms are rarely studied in the literature due to the limited data available on such firms. Using a sample of UK private firms, this paper examines the influence of target insiders' ownership on value creation in mergers involving private targets. My findings can be summarized as follows. First, I present evidence that target insiders' ownership affects acquirer's abnormal returns. I find a weak concave relationship between the market reaction upon the announcement of an acquisition of a private target and target insiders' ownership. This suggests better alignment of incentives at low levels of insiders' ownership, and insiders' entrenchment at high levels of ownership. Second, I find that the impact of insiders' ownership is in fact primarily driven by the monitoring effect that target insiders provide when they are nominated as directors on the board of the merged firm. This result is further confirmed when I use a second measure of the monitoring effect, target insider becoming a new blockholder in the merged firm. In summary, my findings imply that the market reacts to a potential monitoring provided by target insiders, in the following way: acquisitions of private targets with low levels of insiders' ownership are seen as a value-creating event, while acquisitions of targets with high levels of insiders' ownership, as a value-destroying event.

My study contributes to the understanding of private firms in several ways. It uses ownership data on private companies to explain the abnormal returns experienced by acquirers when they buy a private target. It shows that target insiders' ownership matters, although only through the monitoring effect that insiders have on the acquiring firm's management when they become a director or a blockholder in the new firm. However, since this is only an indirect evidence of the difference in acquirer's abnormal returns between acquisitions of private versus acquisitions of public firms, a possible extension of this paper could be to test if the same relationship exists in a matched sample of acquisitions of public targets.[16]

Another possible extension of this research could be to examine in detail the method of payment and in particular the composition of payment when a mixture of securities is used. Given the significant sample representation of deals paid by a mixture of securities, especially in acquisitions of private targets, can further our understanding of private firms.

[16]The small sample size of acquisitions of public targets for which insiders' ownership data is available restricted me from testing this hypothesis.

Table 4.1: Number of Acquisitions by Year, Medium of Exchange and Target Type

Year	Acquisitions of Private Targets						Acquisitions of Public Targets					
	Cash	Stock	Other	NA	Mix	All	Cash	Stock	Other	NA	Mix	All
2000	20	6	7	27	53	113	8	7	0	0	5	20
2001	10	6	2	12	68	98	6	4	0	0	2	12
2002	38	5	4	11	48	106	4	2	0	0	1	7
2003	20	1	0	11	39	71	0	2	0	0	1	3
2004	34	4	0	24	63	125	2	1	0	0	0	3
2005	46	7	0	20	77	150	6	5	0	0	5	16
2006	44	6	2	23	119	194	5	7	0	0	3	15
2007	65	2	1	45	160	273	8	4	0	0	4	16
2008	47	6	0	21	101	175	2	3	0	0	3	8
2009	15	2	1	6	29	53	1	5	0	0	0	6
Total	339	45	17	200	757	1358	42	40	0	0	24	106

Table 4.2: Summary Statistics

	Acquisitions of Public Targets			**Acquisitions of Private Targets**			**Difference**	
	Mean	**Median**	**St.Dev.**	**Mean**	**Median**	**St.Dev.**		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(1)-(4)**	**(2)-(5)**
INSOWN	0.157	0.040	0.203	0.708	0.900	0.356	-0.551***	-0.860***
MKT	4,168	337.4	11,685	598.6	77.1	2,916	3,570***	260.3***
DEALVALUE	135.1	31.1	199.3	12.2	4.0	35.6	123***	27.1***
RELSIZE	0.427	0.197	0.713	0.267	0.050	1.785	0.160	0.147***
TQ	2.066	0.138	5.859	28.65	1.081	137.3	-26.59***	-0.94***

Table 4.3: Correlation Matrix

Public Targets:	**CAR**	**INSOWN**	**MKT**	**DEALVALUE**	**RELSIZE**	**TQ**
CAR	1.000					
INSOWN	0.121	1.000				
MKT	0.047	-0.216	1.000			
DEALVALUE	0.065	-0.484*	0.213**	1.000		
RELSIZE	-0.051	0.059	-0.198*	0.081	1.000	
TQ	0.047	-0.221	0.997***	0.211**	-0.200**	1.000
Private Targets:						
CAR	1.000					
INSOWN	0.026	1.000				
MKT	-0.042	0.027	1.000			
DEALVALUE	0.021	-0.162***	0.242***	1.000		
RELSIZE	-0.017	0.025	-0.028	0.295***	1.000	
TQ	-0.038	0.048	0.197***	0.139***	-0.028	1.000

Table 4.4: Acquirer Abnormal Returns: Univariate Tests

The table reports cumulative abnormal returns, measured over a three-day event window around the announcement date. The market model parameters are calculated over 239 trading days ending on the 6th trading day before the acquisition announcement. The results of t-tests of differences in means and nonparametric Wilcoxon signed rank tests of differences in medians are reported. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Acquirer Cumulative Abnormal Returns			
	Mean	**Median**	**St.Dev.**	**N**
Public Targets:				
All	-0.011	-0.005	0.071	106
Cash	0.005	0.003	0.044	42
Stock	-0.035***	-0.024***	0.090	40
Mixed	0.000	-0.006	0.065	24
Private Targets:				
All	0.014***	0.004***	0.078	1,352
Cash	0.012***	0.001*	0.085	339
Stock	0.004	0.000	0.144	45
Mixed	0.017***	0.007***	0.075	754
Public less Private:				
All	-0.025***	-0.009***		
Cash	-0.007	0.002		
Stock	-0.039	-0.024		
Mixed	-0.017	-0.013		

Table 4.5: Acquirer Returns: Multivariate Tests

Sample includes 1,464 mergers of which, 1,358 of private targets, and 106 of public targets. The dependent variable is the cumulative abnormal return earned by the acquirer over a three-day event window around the announcement date. PRIV is a dummy variable that takes on a value of one if the target is a private firm, and zero otherwise. CASH is a dummy variable that takes on a value of one if the medium of exchange is cash, and zero otherwise. STOCK is a dummy variable that takes on a value of one if the medium of exchange is stock, and zero otherwise. MIXED is a dummy variable that takes on a value of one if the medium of exchange is a mixture of securities, and zero otherwise. LMKT is the natural logarithm of market capitalization (in millions of pounds), measured on the 20th trading day preceding the acquisition announcement. RELSIZE is the value of the target as a fraction of the market capitalization of the acquirer. Heteroskedasticity-adjusted (White) standard errors are used in calculation of t-statistics that are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Independent variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
PRIV	0.025***	0.025***	0.018**	0.023***	0.018**	0.018**	0.007	0.008	0.016**	0.016*
	(3.23)	(3.23)	(2.14)	(2.87)	(2.28)	(2.24)	(0.87)	(0.92)	(2.01)	(1.95)
CASH		0.000			0.003	0.003				
		(0.10)			(0.65)	(0.59)				
STOCK			-0.021**				-0.028***	-0.027***		
			(-2.24)				(-3.00)	(-2.81)		
MIXED				0.008*					0.006	0.006
				(1.87)					(1.37)	(1.35)
LMKT					-0.005***	-0.006***	-0.006***	-0.006***	-0.005***	-0.005***
					(-5.06)	(-5.28)	(-5.39)	(-5.60)	(-4.84)	(-5.08)
RELSIZE						-0.002		-0.002		-0.002
						(-1.56)		(-1.62)		(-1.64)
Intercept	-0.011	-0.011	-0.003	-0.013*	0.018*	0.020**	0.032***	0.033***	0.017*	0.019*
	(-1.50)	(-1.48)	(-0.41)	(-1.72)	(1.89)	(2.03)	(3.05)	(3.10)	(1.73)	(1.91)
N	1,458	1,458	1,458	1,458	1,456	1,447	1,456	1,447	1,456	1,447
Adj. R^2	0.007	0.007	0.011	0.010	0.024	0.026	0.030	0.031	0.025	0.027

Table 4.6: Acquisitions of Private Firms: Acquirer Returns and Target Insiders' Ownership

Sample includes 287 acquisitions of private firms with available data on insiders' ownership. The dependent variable is the cumulative abnormal return earned by the acquirer over a three-day event window around the announcement date. All variables are as described in the Appendix B. Insiders' ownership variables refer to the insiders' ownership in the target firm. The number of observations reported in columns 4 through 9 is 272, due to 15 missing observations of the TQ control variable. Heteroskedasticity-adjusted (White) standard errors are used in calculation of t-statistics that are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Independent variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
INSOWN	0.064*	0.064*	0.074**	0.076*	0.067*	0.076*	0.066*	0.076*	0.064
	(1.70)	(1.72)	(1.97)	(1.94)	(1.71)	(1.93)	(1.70)	(1.92)	(1.62)
INSOWNSQ	-0.051	-0.050	-0.059*	-0.061*	-0.052	-0.061*	-0.052	-0.061*	-0.049
	(-1.57)	(-1.56)	(-1.83)	(-1.79)	(-1.53)	(-1.78)	(-1.53)	(-1.78)	(-1.44)
CASH	-0.004	-0.003	-0.002	-0.002			-0.001	-0.002	
	(-0.61)	(-0.47)	(-0.34)	(-0.27)			(-0.09)	(-0.16)	
STOCK					0.058**		0.058**		0.060***
					(2.56)		(2.54)		(2.64)
MIXED						0.001		0.000	0.004
						(0.23)		(0.05)	(0.67)
LMKT	-0.003	-0.005	-0.005	-0.004	-0.004	-0.004	-0.004	-0.004	-0.003
	(-1.26)	(-1.52)	(-1.49)	(-1.19)	(-1.06)	(-1.20)	(-1.02)	(-1.18)	(-0.89)
RELSIZE	0.036**	0.020	0.022	0.025	0.026	0.025	0.026	0.025	0.027
	(2.17)	(0.84)	(0.92)	(1.00)	(1.03)	(1.00)	(1.04)	(1.00)	(1.07)
LDEALVALUE		0.003	0.003	0.002	0.003	0.002	0.003	0.002	0.003
		(0.91)	(0.82)	(0.71)	(1.01)	(0.68)	(0.98)	(0.69)	(0.83)
SAMEINDUS			-0.013**	-0.014**	-0.013**	-0.014**	-0.013**	-0.014**	-0.013**
			(-2.19)	(-2.22)	(-2.08)	(-2.22)	(-2.07)	(-2.21)	(-2.02)
TQ				0.000	0.000	0.000	0.000	0.000	0.000
				(-0.35)	(-0.40)	(-0.35)	(-0.41)	(-0.35)	(-0.47)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Intercept	0.017	0.024	0.025	0.036*	0.025	0.035	0.025	0.036	0.022
	(0.68)	(0.91)	(0.99)	(1.66)	(1.13)	(1.58)	(1.13)	(1.58)	(0.95)
N	287	287	287	272	272	272	272	272	272
Adj. R^2	0.089	0.092	0.108	0.114	0.137	0.114	0.137	0.114	0.138

Table 4.7: Acquisitions of Private Firms: Acquirer Returns, Medium of Exchange, and Monitoring by Target Insiders

Sample includes 287 acquisitions of private firms with available data on insiders' ownership. The dependent variable is the cumulative abnormal return over a three-day event window around the announcement date. All variables are as described in the Appendix B. All insiders' ownership variables refer to the insiders' ownership in the target firm. The number of observations reported in columns 1, 5 and 9 is 272, due to 15 missing observations of the TQ control variable. Heteroskedasticity-adjusted (White) standard errors are used in calculation of t-statistics that are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Independent variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
INSOWN	0.086*	0.046	0.045	0.055	0.057	0.050	0.050	0.060	0.064
	(1.84)	(1.19)	(1.18)	(1.43)	(1.41)	(1.32)	(1.32)	(1.58)	(1.59)
INSOWNSQ	-0.064	-0.036	-0.035	-0.043	-0.045	-0.040	-0.038	-0.048	-0.051
	(-1.61)	(-1.09)	(-1.06)	(-1.30)	(-1.28)	(-1.21)	(-1.16)	(-1.44)	(-1.48)
CASH	0.014	-0.005	-0.004	-0.003	-0.003	-0.004	-0.003	-0.002	-0.002
	(0.67)	(-0.73)	(-0.56)	(-0.42)	(-0.36)	(-0.62)	(-0.45)	(-0.32)	(-0.25)
INSCASH	-0.020								
	(-0.22)								
INSCASHSQ	-0.002								
	(-0.03)								
DIR		-0.069	-0.076*	-0.066	-0.065				
		(-1.53)	(-1.66)	(-1.44)	(-1.41)				
INSDIR		0.329*	0.355**	0.335*	0.332*				
		(1.92)	(2.05)	(1.94)	(1.89)				
INSDIRSQ		-0.255*	-0.276**	-0.264*	-0.260*				
		(-1.84)	(-1.98)	(-1.90)	(-1.82)				
BLOCK						-0.090*	-0.097**	-0.085*	-0.081
						(-1.88)	(-2.01)	(-1.75)	(-1.64)
INSBLOCK						0.503**	0.537**	0.491**	0.463**
						(2.28)	(2.41)	(2.21)	(2.04)
INSBLOCKSQ						-0.420**	-0.448**	-0.411**	-0.379**
						(-2.25)	(-2.39)	(-2.19)	(-1.98)

(Continue)

Table 4.7 – *Continued*

Independent variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
LMKT	-0.004	-0.002	-0.005	-0.005	-0.005	-0.002	-0.005*	-0.005	-0.004
	(-1.13)	(-1.17)	(-1.64)	(-1.61)	(-1.31)	(-1.22)	(-1.71)	(-1.65)	(-1.29)
RELSIZE	0.027	0.032*	0.012	0.013	0.016	0.034*	0.013	0.014	0.016
	(1.08)	(1.85)	(0.48)	(0.55)	(0.62)	(1.95)	(0.51)	(0.59)	(0.65)
LDEALVALUE	0.002		0.004	0.004	0.003		0.004	0.004	0.003
	(0.69)		(1.16)	(1.05)	(0.94)		(1.21)	(1.07)	(0.88)
SAMEINDUS	-0.014**			-0.013**	-0.014**			-0.012**	-0.013**
	(-2.24)			(-2.19)	(-2.22)			(-1.99)	(-2.10)
TQ	0.000				0.000				0.000
	(-0.37)				(-0.29)				(-0.32)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Intercept	0.030	0.019	0.028	0.029	0.041*	0.017	0.026	0.027	0.038*
	(1.30)	(0.76)	(1.07)	(1.14)	(1.88)	(0.67)	(1.00)	(1.04)	(1.73)
N	272	287	287	287	272	287	287	287	272
Adj. R^2	0.119	0.103	0.108	0.124	0.131	0.106	0.111	0.124	0.131

Appendix A

Strategic Acquisitions by Corporate Venture Capital Investors

Table A.1: Variable Description

Variable Name	Variable Description
Venture Uncertainty Measures:	
Patents	Number of granted patents.
Citations	Number of citations a patent receives from its grant year.
Backward Citations	Number of citations a granted patent have made to previous patents.
Portfolio Size	The number of all *other ventures* included in the venture portfolio of a given CVC investor, apart from the analyzed portfolio venture.
Portfolio Patents	The sum of all granted patents to the *other ventures* included in the venture portfolio of a given CVC investor. In the case of acquisitions of portfolio ventures, this variable will equal the sum of all granted patents to all portfolio ventures, excluding the number of granted patents to the analyzed portfolio venture. In the case of acquisitions of non-portfolio ventures, this variable will equal the sum of all granted patents to *all ventures* included in the venture portfolio, since the acquired venture is not part of the CVC investor's portfolio.
Portfolio Citations	The sum of all citations to granted patents received by the *other ventures* included in the venture portfolio of a given CVC investor. In the case of acquisitions of portfolio ventures, this variable will equal the sum of all citations received by all portfolio ventures, excluding the number of citations received by the analyzed portfolio venture. In the case of acquisitions of non-portfolio ventures, this variable will equal the sum of all citations received by *all ventures* included in the venture portfolio, since the acquired venture is not part of the CVC investor's portfolio.
Portfolio Backward Citations	The sum of all citations to previous patents made by all granted patents to the *other ventures* included in the venture portfolio of a given CVC investor. In the case of acquisitions of portfolio ventures, this variable will equal the sum of all backward citations made by all portfolio ventures, excluding the number of backward citations made by the analyzed portfolio venture. In the case of acquisitions of non-portfolio ventures, this variable will equal the sum of all backward citations made by *all ventures* included in the venture portfolio, since the acquired venture is not part of the CVC investor's portfolio.
Competitive Uncertainty Measures:	
Number of VCs	Number of all VC companies that have invested in the venture.
Number of CVCs	Number of all CVC companies that have invested in the venture.

(Continue)

Table A.1 – *Continued*

Variable Name	**Variable Description**
Control Variables:	
Venture Age	Firm age is calculated from the founding date. I collect the founding date of the venture from VentureXpert database.
Public Venture	A dummy variable that equals one if the venture is a public company.
Same Industry	A dummy variable that equals one if the venture and the CVC acquirer are from the same 2-digit SIC code industry.
Cash Deal	A dummy variable that equals one if the acquisition is paid 100 percent by cash.
Relative Size	The value of the target as a fraction of the market capitalization of the acquirer.
Number of Spin-offs	Spin-off is defined as a "clean" transaction in which the existing parent company goes from 100 percent ownership to 0 percent ownership.
Financial Characteristics and Innovation of the CVC Acquirer:	
Log Total Assets	The natural logarithm of the total book value of assets.
R&D / Assets	The ratio of R&D expenditure to book value of assets.
Net Income / Assets	The ratio of net income to book value of assets.
Cash / Assets	The ratio of cash holdings to book value of assets.
Tobin's Q	The ratio of book value of assets minus book value of equity minus deferred taxes plus market value of equity, to book value of assets.
CVC Number of Patents	Number of patents granted to the CVC company.

Appendix B

Monitoring Effects in Acquisitions of Private Companies

Table B.1: Variable Description

Variable Name	Variable Description
Measure of Value Creation:	
CAR	Cumulative abnormal return of the acquirer over a three-day event window around the announcement date.
Insider Ownership Variables:	
INSOWN	Insider ownership (on the date preceding and closest to the acquisition announcement) in either the acquiring or target firm.
INSOWNSQ	INSOWN squared.
CASH	Dummy variable that takes on a value of one if the medium of exchange is cash, and zero otherwise.
INSCASH	Produsct of CASH and INSOWN.
INSCASHSQ	Product of CASH and INSOWNSQ.
DIR	Dummy variable that takes on a value of one if a target insider becomes a director in the merged firm, and zero otherwise.
INSDIR	Produsct of DIR and INSOWN.
INSDIRSQ	Product of DIR and INSOWNSQ.
BLOCK	Dummy variable that takes on a value of one if a target insider becomes a blockholder in the merged firm, and zero otherwise.
INSBLOCK	Produsct of BLOCK and INSOWN.
INSBLOCKSQ	Product of BLOCK and INSOWNSQ.
Control Variables:	
MKT	The market capitalization (in million of pounds), measured on the 20th trading day preceding the acquisition announcement.
LMKT	The natural logarithm of the market capitalization of the acquirer.

(Continue)

Table B.1 – *Continued*

Variable Name	**Variable Description**
Control Variables:	
DEALVALUE	The value of the transaction (in million of pounds).
LDEALVALUE	The natural logarithm of the value of the transaction.
RELSIZE	The value of the target as a fraction of the market capitalization of the acquirer.
SAMEINDUS	Dummy variable that takes on a value of one if the target has the same 2-digit SIC code as the acquirer, and zero otherwise.
TQ	The Tobin's Q of the acquirer, computed as the market value of equity divided by the total value of assets.

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