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Corporate venture capital and the returns to acquiring portfolio companies ☆

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ABSTRACT

A prominent motive for corporate venture capital (CVC) is the identification of entrepreneurial-firm acquisition opportunities. Consistent with this view, we find that one of every five startups purchased by 61 top corporate investors from 1987 through 2003 is a venture portfolio company of its acquirer. Surprisingly, our analysis reveals that takeovers of portfolio companies destroy significant value for shareholders of acquisitive CVC investors, even though these same investors are "good acquirers" of other entrepreneurial firms. We explore numerous explanations for these puzzling findings, which seem rooted in managerial overconfidence or agency problems at the program level.

1. Introduction

From 1980 through 2003, established firms invested over $40 billion in entrepreneurial ventures (Venture Economics, 2005). Like independent venture capitalists, corporate investors often seek financial returns through exit events such as initial public offerings (IPOs) or sales of portfolio companies to third parties (Gompers and Lerner, 2000a). Corporations also invest for strategic reasons (Hellmann, 2002). In surveys, managers rate "identifying acquisition opportunities" and the "potential to acquire companies" as prominent motives for investing in start-ups (Siegel, Siegel, and MacMillan, 1988; Alter and Buchsbaum, 2000).

In principle, the provision of corporate venture capital (CVC) could help established firms assess the value of innovative young companies and gain efficiencies post-acquisition. Corporate investors commonly provide

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technical and commercial advice to portfolio companies and assume roles on boards of directors (Chesbrough, 2002; Maula and Murray, 2002). By reducing information asymmetries in markets to acquire entrepreneurial firms, the provision of venture capital could help corporations mitigate the "winner's curse" of overpayment in the event of subsequent acquisition (Thaler, 1988). Despite survey and case study evidence that CVC investments are used to inform entrepreneurial acquisition decisions, little is known about the extent to which CVC investors have preexisting venture ties with startups they acquire. More generally, prior studies have not examined whether CVC investors earn positive abnormal returns (net of investment and acquisition premiums) when acquiring startups from their portfolios of investment companies.

This paper contributes new evidence based on the returns to top U.S. corporate investors when acquiring entrepreneurial firms.[1] Integrating acquisitions data with information from press releases, news articles, and venture financing databases, we distinguish between acquisitions of entrepreneurial firms that are (and are not) CVC portfolio companies of their acquirers, which we refer to as "CVC" and "non-CVC" acquisitions, respectively. In total, we identify 530 entrepreneurial-firm takeovers by 61 CVC investors during 1987–2003. Of the entrepreneurial targets, 89 (17%) are portfolio companies.

The results of our event study are more surprising. For private takeovers of non-portfolio companies, we find a significant and positive acquirer return of 0.67% on average. This result closely approximates estimates of Moeller, Schlingemann, and Stulz (2004) for large acquirers of private targets and suggests that established firms in our sample are not necessarily "bad acquirers" of startups relative to the larger population of U.S. corporations. Indeed, private takeovers of non-portfolio companies created over $32 billion in shareholder value for these acquirers in 1999 and 2000, a period associated with "wealth destruction on a massive scale" in the market for corporate control (Moeller, Schlingemann, and Stulz, 2005).

In sharp contrast, CVC acquisitions tend to *destroy* value for shareholders of these same acquirers. For CVC (portfolio-company) acquisitions, acquirer returns are significant and negative at both mean and median values (-0.97% and -0.75%, respectively). We find no evidence that this negative market reaction reflects disappointment relative to higher payoffs anticipated from the initial investment. Moreover, the average return to CVC acquisitions remains more than 1.5% lower than the average return to non-CVC acquisitions in multivariate analyses that control for detailed characteristics of the acquirers, targets, and deals that could affect the market reaction. The results are not driven by "boom years" or outlier observations and remain stable across specifications that restrict the sample to matched pairs of CVC and non-CVC targets and that allow for unobserved heterogeneity among acquirers. On a dollar-value basis, our estimates suggest that acquiring-firm shareholders gain $8.5 million from the median non-CVC acquisition but *lose* $63 million from the median CVC takeover.

These findings naturally invite causal explanation: Why would acquisitions of portfolio companies destroy value for shareholders of the acquirers? As a first step toward investigating this issue, we explore three prominent explanations in the acquisitions literature: (1) overbidding due to "owner's curse"; (2) firm-level governance problems; and (3) managerial overconfidence. According to the "owner's curse" hypothesis, investors with a prior equity stake (toehold) may overbid in hopes of provoking higher counteroffers (Burkart, 1995; Singh, 1998). Assuming that bidders are unable to renege on their offers, toehold investors may end up overpaying for some of the targets they acquire. A second hypothesis is that firms with weak governance structures disproportionately make value-destroying takeovers of portfolio companies. In this view, value destruction is rooted in classic agency problems and misaligned incentives (Jensen, 1986). A third hypothesis is managerial "hubris" (Roll, 1986) or "overconfidence" (Malmendier and Tate, 2005, 2008). In this view, value-destroying CVC acquisitions stem from upward biases among managers when valuing portfolio companies.

Empirically, we find no evidence that the negative market reaction to CVC acquisitions is due to competition-driven overbidding (owner's curse), firm-level governance problems, or hubris among CEOs of these investors. Probing deeper, our analysis does reveal more favorable outcomes for investors that do (versus do not) house CVC programs in autonomous organizational units—both in the value captured from portfolio-company acquisitions and in the proclivity to "throw good money after bad" by reinvesting in startups that languish. Consistent with overconfidence-based theories, managers from dedicated CVC units may be less prone to bias when valuing portfolio companies due to greater exposure to investment opportunities ("deal flow") or superior training in finance. Alternatively, organizing CVC activities in standalone units could enable superior monitoring and compensation of investment activities, thus helping mitigate intra-organizational agency problems. Our conversations with managers point toward both explanations.

This paper contributes to several strands of literature. First, we add to an emerging body of research on corporate venture capital and the vehicles used to finance entrepreneurial firms. Empirical studies on the returns to CVC investing primarily focus on the returns to corporate investors when portfolio companies exit via IPOs or acquisitions by third parties (e.g., Gompers and Lerner, 2000a). We provide the first systematic evidence on how prior venture ties affect the returns to CVC investors as *acquirers* of entrepreneurial firms. Despite recent theoretical attention to the strategic nature of CVC investments (Hellmann, 2002), empirical research is largely limited to case studies and managerial surveys.[2] Within this

[1] Targets are classified as "entrepreneurial" or "startups" if they are less than 12 years old when acquired.

[2] In addition to generating returns on investment, CVC can stimulate internal research and development (R&D) productivity through improved management of internal projects (Thornhill and Amit, 2000) and information gained from portfolio companies (Hellmann, 2002;

literature, our study highlights the need for additional research on how and why program structure affects CVC financing decisions.

We also fill a gap in the large literature on factors that influence the value created or destroyed from takeover events. Growing evidence shows that acquisitions of private companies typically create value for acquiring-firm shareholders (e.g., Fuller, Netter, and Stegemoller, 2002; Moeller, Schlingemann, and Stulz, 2004). The influence of preexisting venture ties between acquirers and private targets has not been examined in this stream of research. A related body of work suggests that use of "pre-acquisition information-gathering mechanisms" such as alliances improves the returns to acquirers in the event of subsequent acquisition. Using a methodology similar to ours, Higgins and Rodriguez (2006) show that purchases by pharmaceutical acquirers of former alliance partners create *more* value for acquiring-firm shareholders than do purchases of targets made outright (in their case, without involving a prior alliance). Because of its relevance to our study, we discuss the Higgins and Rodriguez (2006) article in some detail below. The sharp contrast in our findings suggests new lines of inquiry for further study.

In Section 2 below, we briefly discuss the widespread experimentation in CVC investing during the past three decades and review relevant findings from prior studies. Section 3 describes the sample, data sources, and methodology and presents our main results. In Section 4, we investigate causal explanations for value destruction in CVC takeovers and attempt to distinguish among them. Finally, in Section 5, we summarize our main findings and discuss their implications for future research.

2. Background and related studies

In the late 1970s, regulatory changes in the United States ushered in an era of unprecedented investments in startups by both independent venture capitalists and established firms (Gompers and Lerner, 2000a). According to Venture Economics (2005), over 450 corporations ran venture capital programs in 2000 alone. The number of CVC investors fluctuates widely over time, however, with one wave of activity in the mid-1980s (until the 1987 stock market crash) and a more pronounced flurry of activity in the mid-to-late 1990s that subsided with the plummet in technology markets.

Established firms such as Xerox, Johnson and Johnson, and Motorola have long-standing CVC programs launched in the 1960s. Dushnitsky and Lenox (2005a) show, however, that the top 20 CVC investors by 1999—as measured by the dollar-value of investments since 1969—is dominated by information technology (IT) firms that initiated external venturing programs in the 1990s, including prominent investors such as Intel, Cisco Systems, and Microsoft. The overrepresentation of IT firms among top investors is attributed to several related factors, including uncertainty posed by emerging technologies during the 1990s, concerns about disruptions in core product markets, and corresponding attempts to supplement internal R&D activities with initiatives underway at entrepreneurial firms (Maula and Murray, 2002; Dushnitsky and Lenox, 2005b). The favorable climate for IPOs and the well-publicized success of startups such as eBay and Yahoo! fueled interest among corporate executives in entrepreneurial financing opportunities (Gompers and Lerner, 2004).

2.1. Related studies on corporate venture capital

The most systematic empirical research on corporate venture capital to date examines financial metrics common to independent and corporate venture capitalists—the returns to investments upon exit events such as IPOs or sales of portfolio companies to third parties. In general, these studies conclude that corporate investors place at least "as good of bets" as independent venture capitalists. Gompers and Lerner (2000a) provide the most comprehensive evidence by examining over 30,000 investments between 1983 and 1994 and tracing the status of recipient companies by the spring of 1998. The study finds that, for investments in related sectors, corporate investors are at least as successful as independent VCs, as measured by the probability of a portfolio company going public or being acquired for more than twice the value of the initial investment. Similar evidence is reported in sector-specific studies. Stuart, Hoang, and Hybels (1999) examine the IPOs of 301 venture-backed biotechnology firms during 1978–1991 and find that startups with prominent corporate investors launch IPOs more quickly and with higher valuations than startups lacking such ties. More recently, Maula and Murray (2002) examine 325 IT firms with IPOs in 1998 and 1999 and show that CVC-backed startups have higher market valuations than those financed by independent VCs alone.

By comparison, evidence on acquisitions of portfolio companies is largely confined to surveys of managerial motives (discussed earlier) and case studies of individual CVC programs. Dyer, Kale, and Singh (2004), for example, conduct interviews with managers at Cisco Systems and examine the company's history of acquisitions and alliances. According to the authors, Cisco managers use venture funds to "evaluate firms to determine if acquisitions will work," thus enabling them to make more informed acquisition decisions (Dyeryer, Kale, and Singh, 2004, p. 8).[3] The authors report that Cisco had prior

(*footnote continued*)
Dushnitsky and Lenox, 2005a, 2005b; Katila, Rosenberger, and Eisenhardt, 2008). As discussed by Chesbrough (2002), investors such as Intel also use corporate venturing to foster the development of firms introducing complementary products and services, thus stimulating sales of core products without necessitating acquisition. These broader benefits attributed to CVC programs fall beyond the scope of our study.

[3] Managers interviewed further estimate that it takes around 12–18 months to "build trust with partners and decide if the companies can work together" (Dyer, Kale, and Singh, 2004, p. 8). For example, Cisco worked with one of its portfolio companies, NETSYS Technologies, for 20 months before acquiring the firm in 1996 for its network infrastructure and software technologies. We find relationships of similar duration between corporate investors and acquired portfolio companies in our

venture ties with one of every four companies it acquired through 2003. Other corporate investors appear to pursue a similar approach. The director of Siemen's venture arm is reported to view "every investment as a potential acquisition" (Wieland, 2005, p. 1). According to another report, Motorola acquired three of the five startups sold from its venture portfolio in 2004 (Loizos, 2005). Contrasting approaches nonetheless exist within the IT sector, with Dell and Nokia focusing narrowly on financial returns and reporting little intent to acquire portfolio companies (Loizos, 2005; Wieland, 2005). While anecdotes exist, systematic evidence on the extent to which CVC investors have venture ties with startups they acquire remains lacking. More important, prior studies have not established whether takeovers of portfolio companies create (or destroy) value for shareholders of acquisitive CVC investors.

2.2. Related studies on acquisitions

In estimating acquirer returns to CVC and non-CVC acquisitions, our study also builds on a large body of work in corporate finance and strategy on the effects of restructuring events on shareholder value. Andrade, Mitchell, and Stafford (2001) review this extensive literature. Within the acquisitions literature, three strands of research are particularly relevant, including studies on (1) the returns to acquirers of private companies; (2) the impact of pre-acquisition alliances on acquirer returns; and (3) the use and effects of toehold investments in takeover contests.

In contrast to the negative or insignificant acquirer returns from purchases of firms that are publicly traded, a growing body of evidence shows that acquiring-firm shareholders tend to earn positive abnormal returns from takeovers of private companies (Andrade, Mitchell, and Stafford, 2001; Moeller, Schlingemann, and Stulz, 2004). Using a sample of 281 private firms acquired during 1981–1992, Chang (1998) reports a 2.6% abnormal return when stock is used to finance the deal. More recent studies report positive returns to acquirers of private targets regardless of financing method. Based on 3,135 takeovers made by frequent acquirers during 1990–2001, Fuller, Netter, and Stegemoller (2002) report significant positive acquirer returns in purchases of private firms (2.1% on average) but significant *negative* returns when the same acquirers purchase public companies (-1.0% on average). In a more comprehensive study of deals announced during 1980–2001, Moeller, Schlingemann, and Stulz (2004) show a significant 0.7% return to large U.S. acquirers of private firms, the subset that most closely parallels the empirical context of our study. These studies do not examine the effect of prior venture ties between acquirers and targets and rely on Securities Data Company (SDC) for information on ownership stakes in targets. As shown below, we find significant underreporting by SDC of prior venture ties between acquirers and entrepreneurial targets in our sample.

A separate line of research focuses more narrowly on acquisitions of former alliance partners, albeit primarily in the context of non-equity alliances between public companies. Building on earlier work by Chan, Kensinger, Keown, and Martin (1997), Higgins and Rodriguez (2006) examine 160 acquisitions in the pharmaceutical industry during 1994–2001, of which 45 (28%) involve former alliance partners. On average, pharmaceutical acquirers in their sample had four prior agreements, broadly defined as R&D, distribution, or marketing agreements, with partners they acquired during the period of study. Despite the fact that acquisitions between repeat alliance partners may be anticipated, at least partially, by the market, Higgins and Rodriguez find that the market responds *more* favorably when acquisitions of former alliance partners are announced than when targets are acquired outright—in their case, without a prior alliance. The authors argue that "pre-acquisition information gathering mechanisms" such as alliances reduce the likelihood that acquirers overpay in the event of subsequent acquisition and increase potential synergies from the deal. As suggested earlier, similar benefits should arise, at least in principle, through the provision of corporate venture capital.

A third set of acquisitions studies examines the use of minority equity investments in takeover contests, albeit solely in the context of public firms. As reviewed by Betton, Eckbo, and Thorburn (2009), toehold positions in public targets can deter competition, decrease managerial resistance, increase bidders' chances of winning takeover battles, and/or reduce premiums paid in the event of an acquisition. Nonetheless, others show that toehold investors may have incentives to bid aggressively, even overbid, given a positive probability of provoking a higher counteroffer (Burkart, 1995; Singh, 1998). Assuming that bidders cannot renege on their offers, toehold investors therefore may end up rationally overpaying for some of the firms they acquire, an effect referred to as owner's curse since overpayment arises because of the prior ownership stake. Empirical evidence of owner's curse remains inconclusive even among takeovers of public targets (e.g., Mikkelson and Ruback, 1985; Betton and Eckbo, 2000). The extent to which toeholds affect the returns to acquirers of entrepreneurial firms remains an open empirical question.[4]

(*footnote continued*)
sample, with a median lag of 16 months between the initial investment and the subsequent acquisition announcement.

[4] As discussed by Bulow, Huang, and Klemperer (1999), predictions from formal models on toeholds rest on assumptions regarding the disclosure and size of ownership stakes, the private or common value of the bidders, and constraints on the subsequent reneging of offers. Since takeovers of private firms face less stringent disclosure and reporting requirements, predictions from the toeholds literature may not generalize to private-target settings. For example, the Williams Act of 1970 requires disclosure to the Securities Exchange Commission (SEC) of ownership stakes greater than 5% in public firms through 13-D filings. In contrast, investors currently are not required to disclose minority equity stakes in firms that are private. Similarly, bidders for public targets must refrain from withdrawing tender offers during a 20-day period, whereas acquisitions for private firms typically are made through private auctions or bilateral negotiations (Graebner and Eisenhardt, 2004) that are not subject to this regulatory requirement.

3. Announcement returns for CVC and non-CVC acquisitions

3.1. Compiling the sample

To investigate the returns to CVC investors from acquiring portfolio and non-portfolio companies, we assembled data from a variety of public and private sources. The acquiring-firm sample was drawn from the top 100 publicly traded U.S. corporations with direct VC investments during 1980–2003, based on the total count of startups in their investment portfolios listed in Venture Economics (2005). Rank-ordering firms by the dollar value of investments produced a similar list. From these top 100 CVC investors, we chose the subset that acquired at least one entrepreneurial firm between 1987 and 2003, irrespective of whether the startup was a portfolio company. This filter eliminated financial investors (such as Comdisco Holding Company) that did not participate in entrepreneurial takeover markets. As listed in the Appendix, information about acquisitions made by CVC investors was obtained from multiple sources, including the SDC Merger and Acquisitions database, the CorpTech business directory, press releases, news articles, and two leading venture finance databases, VentureOne and Venture Economics.

To identify takeovers of "entrepreneurial firms," we selected the subset of targets that were 12 years old or younger in the year of acquisition, measured by the acquisition year minus the founding year of the firm. Hellmann and Puri (2000, 2002) similarly categorize startups as firms less than 11 years old based on years since founding. We experimented with more restrictive target criteria, including age cut-offs at 10 years and maximum sizes of 500 and 1,000 employees, and obtained similar results. To identify the existence (if any) of an acquirer's VC investment in an entrepreneurial-firm target, we hand-collected data from VentureOne, Venture Economics, news articles, and press releases. This process yielded 530 entrepreneurial-firm acquisitions by 61 corporate investors between 1987 and 2003. Of these entrepreneurial targets, 89 were portfolio companies of their acquirers (CVC acquisitions) while 441 were not (non-CVC acquisitions). In only six (7%) of the 89 CVC acquisitions was the acquirer's equity ownership stake listed in SDC's Mergers and Acquisitions database, the main source of data used in prior studies of acquisitions. For the remaining 83 cases, SDC failed to report the acquirer's prior VC ownership stake in the target.

Table 1 lists CVC and non-CVC acquisitions in the sample by year and for IT acquirers. As seen in Table 1, acquisition types are distributed similarly in time. In both cases, the largest share occurred in the merger wave of the late 1990s. Overall, 76% of the takeovers are by IT firms, which is not surprising given the overrepresentation of the IT sector among top CVC investors mentioned earlier.

3.2. The gains to acquiring-firm shareholders: univariate results

To estimate the cumulative abnormal returns (CAR) upon announcement of CVC and non-CVC acquisitions, we use a standard event study methodology. Acquisition dates were compiled from SDC and VentureOne and verified using articles in *The Wall Street Journal*. The results reported are based on a 2-day event window $(-1,0)$, a 250-day estimation period ending on day -11 $(-260,-11)$, and the Center for Research in Security Prices' CRSP value-weighted index. Following Brown and Warner (1985), p-values are corrected for serial correlation during the event window. We obtain similar estimates using a 3-day event window $(-1,+1)$, a 180-day estimation period $(-190,-11)$, and the CRSP equal-weighted index.[5] Of the 530 entrepreneurial acquisitions, we eliminated 41 observations (15 CVC and 26 non-CVC) due to simultaneous takeovers of the acquirer or major unrelated news announcements in the event window (e.g., regarding the filing or settlement of a lawsuit or unexpected earnings announcements).[6] Our estimation sample therefore includes 489 announcements of 74 CVC and 415 non-CVC acquisitions.

Columns 1 and 2 in Table 2 present the average abnormal returns to shareholders of these corporate investors for non-CVC and CVC acquisitions, respectively. Differences in acquirer returns are reported in column 3. Panel A reports results for the full sample of private and public targets. Panel B restricts the sample to private targets. Only three of the 74 CVC acquisitions (4%) involved public targets whereas 77 of the 415 startups purchased outright (19%) were publicly traded when acquired. As discussed earlier, prior studies show that target ownership status is a significant predictor of acquirer returns (e.g., Fuller, Netter, and Stegemoller, 2002). We therefore report results separately for private targets in Tables 2 and 3 and treat public and private targets separately in all regressions.

As shown in column 1 of Table 2, the estimated abnormal acquirer return is 0.37%, on average, for the full sample of non-CVC acquisitions and 0.67% for the subset involving private targets. The latter estimate approximates the 0.70% average return reported by Moeller, Schlingemann, and Stulz (2004) for large acquirers of private companies during 1980–2001 but is smaller in magnitude than the 2% reported by Fuller, Netter, and Stegemoller (2002) for frequent acquirers of private targets in the 1990s.

In sharp contrast, column 2 in Table 2 reveals that the average abnormal return to CVC acquisition announcements is *negative* and statistically significant. The average abnormal return to CVC acquisitions is -0.97% for the full sample in Panel A and is -1.05% for the subset of private targets in Panel B. In both samples, the median return to CVC acquisition announcements also is negative and

[5] In reviews of event studies, MacKinlay (1997) and McWilliams and Siegel (1997) recommend using short time windows, both to maximize the power of the statistical tests and to minimize the likelihood of confounding events. Mikkelson and Ruback (1985), Chang (1998), and Song and Walkling (2000) are examples of studies that use a 2-day window. Andrade, Mitchell, and Stafford (2001), Moeller, Schlingemann, and Stulz (2004), and Higgins and Rodriguez (2006) use a 3-day window.

[6] Mean and median values of characteristics for CVC acquisitions included in the estimation sample are statistically indistinguishable from those omitted due to confounding news announcements.

Table 1
Sample distribution by announcement year and acquisition type.

The sample includes acquisitions of entrepreneurial firms (less than 12 years old) made by 61 corporate venture capital (CVC) investors from 1987 through 2003. CVC (non-CVC) acquisitions are acquisitions in which the acquirer had (had not) provided venture funds to the target at an earlier stage of development. Information technology acquirers are firms with primary lines of business in software (SIC 737), computer hardware (SIC 357), semiconductors (SIC 367), telecommunications (SIC 481, 484), communications equipment (SIC 366), and electronic instruments (SIC 381, 382).

Announcement year	Non-CVC acquisitions		CVC acquisitions		Pooled sample		
	#	% All non-CVC	#	% All CVC	#	% Total	% With IT acquirer
1987	7	2%	1	1%	8	2%	50%
1988	6	1%	1	1%	7	1%	57%
1989	10	2%	4	4%	14	3%	86%
1990	6	1%	0	0%	6	1%	67%
1991	3	1%	2	2%	5	1%	100%
1992	8	2%	1	1%	9	2%	67%
1993	8	2%	4	4%	12	2%	100%
1994	13	3%	3	3%	16	3%	75%
1995	30	7%	3	3%	33	6%	64%
1996	31	7%	4	4%	35	7%	83%
1997	28	6%	2	2%	30	6%	80%
1998	48	11%	7	8%	55	10%	82%
1999	77	17%	11	12%	88	17%	83%
2000	67	15%	19	21%	86	16%	78%
2001	37	8%	9	10%	46	9%	67%
2002	33	7%	13	15%	46	9%	74%
2003	29	7%	5	6%	34	6%	76%
Total	441	100%	89	100%	530	100%	76%

Table 2
Acquirer abnormal returns by acquisition type.

This table presents the 2-day (-1,0) cumulative abnormal return (CAR) to 61 corporate venture capital (CVC) investors from acquiring entrepreneurial firms (less than 12 years old) during 1987–2003. CVC (non-CVC) acquisitions 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 results for the full sample, while Panel B restricts the sample to private targets only. Confounding events and acquisitions announced during overlapping event windows are omitted from the sample. Economic impact is calculated as the CAR multiplied by the market capitalization of the acquirer at *t*-30. Column 3 tests for significant differences in the mean and median abnormal returns to non-CVC (column 1) and CVC (column 2) acquisition announcements using *t*-tests for equality in means and non-parametric tests for equality of medians.

	Non-CVC acquisitions (1)	CVC acquisitions (2)	Difference (col 1 vs. col 2) (3)[†]
Panel A: Full sample (n=489)			
$CAR_{(-1,0)}$	0.37%**	−0.97%**	1.33%***
	[0.18%]	[−0.75%]**	[0.93%]***
Economic impact ($M)	$106.5	−708.1*	
	[$8.5]	[−$63.0]**	
N	415	74	
Panel B: Private targets only (n=409)			
$CAR_{(-1,0)}$	0.67%***	−1.05%**	1.72%***
	[0.50%]***	[−0.78%]**	[1.28%]***
Economic impact ($M)	257.3*	−730.1*	
	[$18.7]**	[−$70.2]**	
N	338	71	

*Significant at 10%, **significant at 5%, ***significant at 1%.
[†] Col 3 reports statistical significance of differences in CAR values.

significant at the 5% level. The return to CVC acquisition announcements is significantly different than the returns to non-CVC acquisitions for the full sample (1.33% lower) and subset of private targets (1.72% lower), respectively, as shown in column 3.

On a dollar-value basis, these estimates suggest that the median non-CVC acquisition creates $8.5 million in value for shareholders of these acquirers whereas the median CVC acquisition destroys $63 million in shareholder value for these same acquirers upon announcement of the deal. In Panel B, the gap in returns widens further. For takeovers of private targets, the median non-CVC acquisition creates $18.7 million in value for acquiring-firm shareholders. In contrast, the

Table 3
Acquirer returns and aggregate wealth effect by acquisition type and period.

This table reports the average 2-day (−1,0) cumulative abnormal returns (CARs) to 61 corporate venture capital (CVC) investors when acquiring entrepreneurial firms (less than 12 years old) during 1987–2003. CVC (non-CVC) acquisitions are defined as acquisitions in which the acquirer had (had not) provided venture funds to the target at an earlier stage of its development. Panel A reports results for the full sample, while Panel B restricts the sample to private targets only. In both panels, results are first reported over all years in the sample period. The sample is then subdivided into acquisitions announced before, during, and after the boom period of 1999 and 2000. Confounding events and acquisitions announced during overlapping event windows are omitted from the sample. Economic impact is calculated as the cumulative abnormal return (CAR) multiplied by the market capitalization of the acquirer at *t*-30. Economic impact is then summed (within deal types) to create the aggregate dollar return. Both measures are reported in constant 1996 dollars.

	Non-CVC acquisitions				CVC acquisitions			
	N	Mean CAR (−1,0)	Median CAR (−1,0)	Aggregate dollar return ($M)	*N*	Mean CAR (−1,0)	Median CAR (−1,0)	Aggregate dollar return ($M)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Full sample (n=489)								
All years (1987–2003)	415	0.37%***	0.18%**	44,190.1	74	−0.97%	−0.75%	−52,400.51
Subdivided by period:								
Pre-boom (1987–1998)	188	0.49%**	0.25%**	26,315.7	29	−1.05%	−0.82%	−12,008.43
Boom (1999–2000)	135	0.08%	−0.30%	−13,882.4	24	−0.70%	0.04%	−28,332.26
Post-boom (2001–2003)	92	0.52%*	0.63%	31,756.8	21	−1.15%	−1.84%	−12,059.82
Panel B: Private targets (n=409)								
All years (1987–2003)	338	0.67%***	0.50%***	86,958.4	71	−1.05%	−0.78%	−51,834.1
Subdivided by period:								
Pre-boom (1987–1998)	151	0.64%***	0.41%**	14,956.1	27	−1.08%	−1.10%	−11,412.9
Boom (1999–2000)	114	0.67%	0.58%	32,311.4	24	−0.70%	0.04%	−28,332.3
Post-boom (2001–2003)	73	0.71%*	0.68%*	39,691.0	20	−1.40%	−1.90%	−12,089.0

Columns 2 and 3 report the statistical significance of differences in CAR values for non-CVC vs. CVC acquisitions at 10% (*), 5% (**), and 1% (***) levels.

median takeover of a private portfolio company destroys −$70.2 million in value for shareholders of acquisitive CVC investors.

Table 3 subdivides acquirer returns and aggregate wealth effects into deals announced before, during, and after the boom years of 1999 and 2000. In investigating the "era of massive value destruction," Moeller, Schlingemann, and Stulz (2005) conclude that the value destroyed by the recent merger wave was driven by large takeovers of public targets. A similar pattern emerges for non-CVC acquisitions in our sample. Of the 135 non-CVC acquisitions made in 1999 and 2000, only 21 involved startups that were publicly traded. Nonetheless, inclusion of public targets swings the estimated dollar returns for non-CVC acquisitions from $32 billion in aggregate *gains* (for the subset of deals involving private targets in Panel B for the 1999–2000 period) to $13.8 billion in aggregate *losses* in the same sub-period.

Of particular importance, Table 3 also reveals consistent divergence across subperiods in the returns to CVC and non-CVC acquisitions. For the subset of private startups acquired outright (column 2, Panel B), the mean acquirer return hovers around the 0.67% average in each sub-period. In contrast, the average return to CVC acquisitions remains negative across subperiods, as shown in column 5. Interestingly, the market reaction to CVC acquisitions is more favorable, on average, but still negative at −0.70% in the boom period. These trends provide little indication that value-destroying CVC takeovers are rooted in market dynamics unique to the recent boom period.

3.3. Do CVC acquisition announcements represent disappointing news?

A natural concern when interpreting these statistics is that non-CVC acquisition announcements reveal unexpected news (potentially providing more reliable estimates of the value anticipated from the deals) while CVC acquisitions could be anticipated due to information previously disclosed about the minority equity investment. If CVC acquisitions are fully anticipated by the market, however, we would expect an *insignificant* response—not the significant and negative reaction we observe. Moreover, as discussed earlier, Higgins and Rodriguez (2006) report a *more* favorable market response when acquisitions of former alliance partners are announced, albeit in the context of pharmaceuticals and for a broader range of pre-acquisition alliances.

When investing venture funds, however, there is a positive initial probability that a portfolio company will go public, an event that typically yields the highest returns for investors (Gompers and Lerner, 2000a, 2004).

Table 4
Tests for possible disappointment (CVC acquisitions only).

This table reports the average two-day (−1,0) cumulative abnormal returns (CARs) to 61 corporate venture capital (CVC) investors when acquiring entrepreneurial firms (less than 12 years old) during 1987–2003. CVC acquisitions are defined as acquisitions in which the acquirer had provided venture funds to the target at an earlier stage of its development. Panel A presents the 2-day CAR to CVC acquisition announcements reported in Table 2 overall, then for observations in which the initial CVC investment is (is not) previously disclosed. Panel B presents the returns to acquirers at the time of the initial CVC investment announcement for the subset of observations (n=50) in which venture ties are disclosed prior to acquisition. Panel C reports the 2-day abnormal returns upon the acquisition announcement for non-acquiring corporate investors in the target.

	N (1)	Average excess return, CAR (−1,0) (2)	Percent positive (3)
Panel A: Acquirer returns at acquisition announcement	74	−0.97%**	39%
A.1. Subsample for which prior CVC funding is disclosed	50	−0.72%*	40%
A.2. Subsample for which prior CVC funding is not disclosed	24	−1.48%*	38%
Panel B: Acquirer returns at initial CVC investment announcement	50	−0.52%	42%
Panel C: Returns to non-acquiring CVC investors at acquisition announcement	43	0.99%	53%

*Significant at 10%, **significant at 5%, ***significant at 1%.

As suggested earlier, prior studies find that startups with prominent CVC investors launch IPOs more quickly and with higher valuations than startups lacking such ties (Stuart, Hoang, and Hybels, 1999). When a CVC acquisition is announced, the possibility of an IPO exit is eliminated. The negative reaction to CVC acquisition announcements therefore could represent a downward adjustment of payoffs initially anticipated from the equity investment (i.e., a market correction) rather than overpayment in the focal deal.

We test for possible disappointment in several ways. First, we compare the market reaction to CVC acquisitions where the venture tie is (versus is not) disclosed through a press release or news article prior to the acquisition announcement. For 50 of the CVC acquisitions (68%), the initial funding relationship between the acquirer and startup is announced prior to the acquisition announcement, typically through a press release issued by the startup. For the remaining 24 CVC acquisitions (32%), the venture tie is first announced to the public in the acquisition announcement. In supplemental analyses (available upon request), portfolio companies with identifiable media coverage pre-acquisition attracted more private equity investors and had a greater number of employees when acquired relative to portfolio companies lacking media coverage. Assuming that "newsworthiness" correlates with profit anticipated from the initial CVC investment, investor disappointment should be greater for the subset of CVC acquisitions with prior media disclosure. Similarly, we should expect a downward correction of greater magnitude for disclosed (versus undisclosed) CVC acquisitions if market analysts fail to learn about undisclosed deals through non-media channels. At odds with either view, Panel A in Table 4 reveals a negative reaction of greater magnitude when prior funding is *not* disclosed prior to acquisition.

If our results are due to disappointment, we also should expect the negative reaction to CVC acquisition announcements to be preceded by a positive reaction upon disclosure of the initial CVC investment. For the 50 observations in which the initial CVC funds are clearly revealed pre-acquisition, however, Panel B of Table 4 shows that the market reaction also is negative upon announcement of the initial venture investment (−0.52%).[7] In contrast, Mikkelson and Ruback (1985) find a 2-day acquirer return of 1.17% upon disclosure of toeholds in public firms.

As a final test, we estimate the abnormal returns upon announcement of CVC acquisitions to *non-acquiring* corporate investors in the entrepreneurial target. If the negative response to CVC acquisitions reflects disappointment due to the failure to launch an IPO, we should similarly observe a negative return to other corporate investors upon the acquisition announcement. Alternatively, a positive return to other corporate owners is consistent with overpayment by the acquirer and a transfer of wealth to the other equity owners. As reported in Panel C of Table 4, we find a positive abnormal return of 0.99% to non-acquiring CVC investors.

In each of these tests, we face inherent limitations due to small sample sizes once restrictions are placed on the subset of CVC acquisitions. In combination, however, the evidence is consistently at odds with the disappointment explanation.

3.4. Acquirer, target, and other deal characteristics: CVC vs. non-CVC acquisitions

A separate concern when interpreting abnormal return statistics is that the market response reflects updated investor expectations about the acquiring firm's value for reasons unrelated to the particular deal. Prior studies show, for example, that acquirers experience a lower abnormal return when they purchase companies with stock (e.g., Travlos, 1987). Although this effect does not seem to hold when private targets are acquired (Fuller, Netter, and Stegemoller, 2002; Moeller, Schlingemann, and Stulz, 2004), acquisitions paid for with equity may signal to the market that the acquiring firm's stock is overvalued. If acquirers use stock to purchase CVC targets

[7] Interestingly, in supplemental analyses, the market response to all initial CVC investments made by these frequent investors, regardless of the venture's final outcome, also was negative yet statistically insignificant at mean and median values.

but pay for non-CVC targets with cash, we could observe lower returns to CVC acquisition announcements for reasons unrelated to value expected from focal deals.

Numerous factors can affect the stock market reaction to acquisition announcements. Lang, Stulz, and Walkling (1989) and Servaes (1991) report that firms with a low market-to-book (Tobin's q) ratio have lower announcement returns than do high q bidders, possibly driven by concerns about exhaustion of internal growth opportunities. Using more comprehensive data, however, Moeller, Schlingemann, and Stulz (2004) find that q is an insignificant determinant of acquirer returns in takeovers announced in the 1990s. Instead, they report a significant size effect and show that the market responds more negatively to deals made by large firms relative to smaller-firm acquirers. The market reaction also can hinge on the free cash flow available to acquiring-firm managers (Jensen, 1986), the size of the target relative to the acquirer (Fuller, Netter, and Stegemoller, 2002), and acquirer R&D spending (Higgins and Rodriguez, 2006). Finally, the market could respond more negatively to announcements made by IT acquirers given sector-specific concerns of overvalued stock (Shiller, 2000).

Transaction values (and correspondingly, acquirer returns) also can be affected by the degree of competition in takeover markets and, for startups, the opportunity costs of foregoing an IPO exit. Following Schlingemann, Stulz, and Walkling (2002), we therefore compiled a "Liquidity Index" to proxy for the degree of competition in takeover markets, by dividing the value of mergers and acquisitions (M&A) announced in the target sector by the book value of assets in that sector. As Moeller, Schlingemann, and Stulz (2004) report, firms may offer higher premiums to potential targets in more active takeover markets to deter rival bids. In this case, acquisition premiums may be elevated even if multiple bids are not observed. Since the identities of bidders for private companies are rarely made public, the liquidity index is a useful proxy for competition that otherwise would be difficult to discern. As a robustness check, we divided M&A activity by the market value of firms in the sector instead and obtained similar results.

To capture IPO conditions, we tallied the number of IPOs in the target sector. (Alternative proxies using the dollar value of IPOs in the target sector and the quarterly Nasdaq index were highly correlated and generated similar results.) In unfavorable IPO environments, acquirers may provide a liquidity service to entrepreneurs and venture investors, thus increasing the likelihood of reaping gains from the deal. To allow volatility in annual market conditions, the Liquidity Index and IPO counts are computed in the quarter of the focal acquisition announcement.

Table 5 reports summary statistics of acquirer, target, and deal characteristics by acquisition type (CVC and non-CVC) and for the pooled sample. Variable definitions and data sources are listed in the Appendix. Among top CVC investors, Panel A shows that those making non-CVC acquisitions are similar to those that acquire portfolio companies. In both cases, acquirers are large R&D-intensive firms with high market-to-book ratios. The distribution of deals made by IT firms is similar, at 77% and 76% for non-CVC and CVC acquisitions, respectively. Panels B and C show that both non-CVC and CVC targets are small relative to acquirers, are similarly likely to own patents (an indicator of technological maturity and target bargaining power), and with rare exception are developing products that relate directly to existing businesses of the acquirer. While stock is used to finance a higher share of CVC acquisitions (70% vs. 67% for non-CVC takeovers), the difference is statistically insignificant.

The method of payment is not reported for 37% of the CVC acquisitions and 41% of non-CVC acquisitions. Similarly, transaction values are not disclosed for 26% and 32% of CVC and non-CVC acquisitions, respectively. A recent study by Rodrigues and Stegemoller (2007) shows that SEC requirements failed to require disclosure of information pertaining to many value-relevant private-target takeovers over the past two decades. We therefore include observations with unreported deal values or payment methods in the estimation sample but treat them separately in regressions that follow with the *Deal terms undisclosed* indicator variable. Similar results are obtained if observations with missing terms or prices are removed from the sample.

The main differences revealed in Table 5 pertain to target-firm and environmental characteristics. As seen in Panel C, CVC targets tend to be younger and smaller than non-CVC targets. The median CVC target is 4 years old and has 60 employees whereas the median non-CVC target is older (5 years) and larger (77 employees) when acquired. While 19% of the non-CVC targets are public, CVC acquisitions—with rare exception—occur pre-IPO. Relative to their non-CVC counterparts, CVC acquisitions also tend to occur in less favorable IPO and takeover environments. If corporate investors perform a liquidity service by acquiring portfolio companies in periods with less attractive exit options, we should expect positive (or insignificant) acquirer returns rather than the negative returns shown earlier. Our event study results are even more perplexing in light of these statistics.

3.5. Multivariate regressions

This section investigates more formally whether the difference in acquirer returns to CVC and non-CVC acquisitions stems from other characteristics of the acquirers, targets, or deals that could affect the market reaction. Table 6 reports OLS estimates of 2-day abnormal acquirer returns with acquirer-clustered robust standard errors. Annual time dummies are included in each specification.

Column 1 of Table 6 provides baseline estimates. In line with findings from prior studies, acquirer returns are significantly lower in takeovers of public targets. On average, acquirer returns also are lower in the IT sector and for deals with undisclosed deal terms or prices. Insignificant predictors on other variables could reflect our relatively homogeneous sample of large, R&D-intensive acquirers.

Table 5
Summary statistics by acquisition type.

Sample includes entrepreneurial firms (less than 12 years old) acquired by 61 corporate venture capital (CVC) investors during 1987–2003. In CVC (non-CVC) acquisitions, the acquirer had (had not) provided venture funds to the target at an earlier stage of development. Variable definitions and data sources are listed in the appendix. Financial data are in millions of constant 1996 dollars. Statistical tests are *t*-tests for equality in means, Wilcoxon tests for equality of medians, and one-tail tests of proportions for percentages. Median values are in brackets.

	Non-CVC acquisitions (1)	CVC acquisitions (2)	Pooled sample (3)
Panel A: Acquirer characteristics			
Ln assets	9.1 [9.2]	9.2 [9.5]	9.1 [9.3]
R&D intensity	40.6 [34.1]	46.7 [37.3]	41.5 [34.8]
Tobin's *q*	4.8 [2.9]	4.5 [2.2]	4.7 [2.7]
Free cash flow	0.14 [0.15]	0.14 [0.14]	0.14 [0.14]
In IT sector	77%	76%	77%
In Life science sector	12%	11%	12%
In Other sector	11%	13%	11%
Panel B: Deal characteristics			
Liquidity index in target sector	0.07 [0.04]	0.04** [0.03]	0.06 [0.03]
# IPOs in target sector	25.5 [16.0]	21.9* [14.0]	25.0 [16.0]
Deal value, if reported	379.0 [101.0]	243.4 [107.7]	357.3 [103.1]
Relative size	0.03 [0.01]	0.02 [0.01]	0.03 [0.01]
Payment includes stock	67%	70%	67%
Payment method undisclosed	41%	37%	40%
Deal value undisclosed	32%	26%	30%
Panel C: Target characteristics			
Target age	5.3 [5.0]	4.3*** [4.0]**	5.1 [5.0]
Employees, if identified	215.4 [76.5]	159.8* [60.0]***	206.0 [75.0]
Target is publicly traded	19%	4%***	16%
Target owns patents	36%	34%	36%
Target in same sector as acquirer	97%	97%	97%
Employee data identified?	79%	89%	81%

*,**,***Significant difference between non-CVC and CVC values at 10%, 5%, and 1% levels, respectively.

Column 2 introduces the *CVC acquisition* indicator variable. In univariate results shown earlier (Table 2), the average acquirer return to CVC acquisitions is 1.33% lower than that for non-CVC acquisitions. In Table 6, the gap in returns grows even wider (exceeding 1.5%) once we control for observable acquirer, deal, and target characteristics. In diagnostic analyses (available on request), we obtain similar results in regressions that (a) omit outlier observations at top and bottom 1% values, (b) restrict the sample to takeovers with known payment methods and deal values, (c) allow differential effects for larger (versus smaller) targets, and (d) replace year dummies with period categories defined in Table 3.

Columns 3–6 provide additional robustness checks. First, we explore whether the divergent returns to CVC and non-CVC acquisitions stem from differences in the types of entrepreneurial firms selected for initial funding and subsequent purchase. To investigate this possibility, we impose tighter restrictions on observable characteristics of targets by limiting the sample to venture-backed private targets (in column 3) and to matched pairs of CVC and non-CVC targets (in column 4). For the one-to-one matched sample, we select VC-backed private firms, then match each CVC target with the non-CVC target that is (a) closest by date of acquisition announcement, irrespective of acquirer identity and (b) classified in the same VentureOne product segment. Although VentureOne does not use numeric codes, the business sectors correspond roughly to four-digit Standard Industrial Classification (SIC) codes. For example, "prepackaged software" (SIC 7372) is distinguished from "systems software" (SIC 7371). If a suitable match is unidentified within 2 years of the CVC target's acquisition date, the focal target is removed from the sample. Using these criteria, 65 of the

Table 6
Main results and robustness checks.

OLS estimates of acquirer returns to CVC and non-CVC acquisition announcements. The dependent variable is the two-day (−1,0) cumulative abnormal return. Sample includes entrepreneurial firms (less than 12 years old) acquired by 61 corporate venture capital (CVC) investors during 1987–2003. *CVC acquisition* equals one when the acquirer provided venture funds to the target pre-acquisition; the omitted category is startups acquired outright (non-CVC acquisitions). Other variables are defined in the Appendix. Columns 1 and 2 report the baseline model and main results. The remaining columns report robustness checks. In column 3, the sample is restricted to venture-backed private targets. In column 4, the sample is restricted further to pairs of CVC and non-CVC targets matched by lines of business and acquisition dates. Columns 5 and 6 allow for unobserved heterogeneity among acquirers for the full sample (in column 5) and for the subset that make both CVC and non-CVC acquisitions (in column 6). Each specification includes year dummies and a dummy variable when acquirer R&D is not reported. Financial data are in millions of constant 1996 dollars. Robust standard errors, clustered by acquirer, are in brackets.

	Baseline	Main results	Private targets, VC-backed only	Matched pairs of CVC & non-CVC targets	Full sample: Acquirer fixed effects	Acquires both CVC & non-CVC: Acquirer fixed effects
Variables	(1)	(2)	(3)	(4)	(5)	(6)
CVC acquisition		−0.0173***	−0.0177***	−0.0245***	−0.0152**	−0.0154**
		[0.0058]	[0.0057]	[0.0057]	[0.0058]	[0.0058]
Acquirer characteristics						
Ln assets	−0.0011	−0.0008	0.0011	0.0000	−0.0033	−0.0038
	[0.0012]	[0.0013]	[0.0017]	[0.0028]	[0.0040]	[0.0038]
R&D intensity	0.0002	0.0002*	0.0002**	0.0004***	−0.0004*	−0.0005**
	[0.0001]	[0.0001]	[0.0001]	[0.0001]	[0.0002]	[0.0002]
Tobin's *q*	0.0004	0.0004	−0.0008	−0.0037***	0.0012	0.0010
	[0.0009]	[0.0009]	[0.0008]	[0.0011]	[0.0012]	[0.0014]
Free cash flow as	−0.0012	−0.0008	−0.0142	0.0237	−0.0187**	−0.0369**
% assets	[0.0041]	[0.0040]	[0.0099]	[0.0222]	[0.0092]	[0.0139]
In IT sector	−0.0091**	−0.0097**	−0.0103*	−0.0123	–	–
	[0.0042]	[0.0042]	[0.0052]	[0.0091]	–	–
Target characteristics						
Target age	−0.0002	−0.0004	0.0006	0.0015	−0.0010	−0.0007
	[0.0008]	[0.0007]	[0.0010]	[0.0016]	[0.0008]	[0.0007]
Target owns	−0.0020	−0.0016	−0.0008	−0.0013	−0.0015	−0.0011
patents	[0.0040]	[0.0039]	[0.0042]	[0.0057]	[0.0043]	[0.0046]
Target is publicly	−0.0144***	−0.0175***	–	–	−0.0188***	−0.0166***
traded	[0.0051]	[0.0049]	–	–	[0.0048]	[0.0048]
Target in same	0.0092	0.0095	0.0058	−0.0152	0.0170	0.0124
sector as acquirer	[0.0087]	[0.0085]	[0.0119]	[0.0234]	[0.0108]	[0.0109]
Deal characteristics						
Liquidity index in	0.0103	0.0045	−0.0425	−0.0026	−0.0026	−0.0239
target sector	[0.0224]	[0.0220]	[0.0364]	[0.0537]	[0.0239]	[0.0242]
# IPOs in target	−0.0000	−0.0000	−0.0001	−0.0001	0.0001	0.0001
sector	[0.0001]	[0.0001]	[0.0002]	[0.0002]	[0.0001]	[0.0001]
Relative size	−0.0813	−0.0781	0.0162	0.0782	−0.0820	−0.0819
	[0.0652]	[0.0677]	[0.0532]	[0.0620]	[0.0582]	[0.0652]
Payment includes	−0.0070	−0.0064	−0.0063	−0.0139	−0.0051	−0.0052
stock	[0.0052]	[0.0051]	[0.0060]	[0.0118]	[0.0062]	[0.0058]
Deal terms	−0.0123**	−0.0132**	−0.0129**	−0.0179	−0.0146**	−0.0137**
undisclosed	[0.0053]	[0.0052]	[0.0063]	[0.0119]	[0.0059]	[0.0053]
Constant	0.0337*	0.0353*	0.0131	0.0608	0.0784*	0.0816**
	[0.0196]	[0.0200]	[0.0204]	[0.0376]	[0.0414]	[0.0401]
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes
Firm dummies	No	No	No	No	Yes	Yes
N	489	489	270	130	489	413
Adjusted R^2	0.038	0.059	0.050	0.215	0.113	0.137

*Significant at 10%; **significant at 5%; ***significant at 1%.

74 CVC targets match to 65 corresponding non-CVC targets. As shown in columns 3 and 4 in Table 6, the gap in returns remains similar or greater in magnitude after imposing these restrictions on the target-firm sample.

A separate concern is that the divergent return to CVC and non-CVC acquisitions is due to unobserved heterogeneity among acquirers that is insufficiently captured by the right-hand-side variables. In columns 5 and 6 of Table 6, we allow for this possibility by using an acquirer-specific fixed effects specification. Column 5 uses the full estimation sample. Column 6 restricts the sample to corporate investors that make acquisitions of both types (CVC and non-CVC). These specifications are similar to those used in the Fuller, Netter, and Stegemoller (2002) study of returns to frequent acquirers; they enable us to test for "within acquirer" differences in returns to CVC and non-CVC acquisitions. As shown in columns 5 and 6, the gap in acquirer returns to CVC and non-CVC acquisition announcements narrows slightly to 1.5% but remains negative and significant in each specification.

4. Why would portfolio-company takeovers destroy value for shareholders of acquirers?

This section seeks to unravel these otherwise puzzling findings: *Why* would takeovers of portfolio companies systematically destroy value for shareholders of acquisitive CVC investors? This question is particularly intriguing since these same CVC investors otherwise are "good acquirers" of entrepreneurial firms. We investigate three explanations that figure prominently in the acquisitions literature: (1) competition-induced overbidding (owner's curse); (2) firm-level governance problems; and (3) managerial overconfidence. To gain additional insights, we also spoke with managers involved in corporate venturing programs either directly (as current or former directors of programs) or indirectly through involvement with portfolio companies.[8] Below, we report results from our empirical analyses, then turn to alternative explanations and interview insights.

4.1. Owner's curse

A central insight from models of owner's curse discussed earlier is that minority equity owners may bid aggressively, even overbid, in expectation of triggering higher counteroffers (Burkart, 1995; Singh, 1998). Assuming that bidders are unable to renege on their offers, toehold investors may end up overpaying for some companies. In this view, overpayment is fueled by competition in takeover markets and anticipation of counteroffers.

To test the owner's curse hypothesis, we interact *CVC acquisition* with a variety of indicators for competitive market conditions. First, we compute the total number of corporate investors in the focal target, which represent potential rival bidders. Second, we measure the intensity of M&A activity in the target sector more generally by using the Liquidity Index defined earlier. This index is a particularly useful proxy for competition in these takeover markets since failed bids for private companies rarely are made public. Third, we compute the number of IPOs in the target sector, since higher counteroffers may be easier to provoke in favorable IPO environments.

Table 7 reports the results of this analysis. If owner's curse explains the negative returns to CVC acquisitions, we should observe negative and significant effects when interacting *CVC acquisition* with indicators of competitive market conditions. At odds with this view, each interaction effect in columns 3–5 of Table 7 is statistically indistinguishable from zero.

4.2. Firm-level governance problems

A common criticism launched against corporate venturing programs is their use to fund CEO "pet projects" (Gompers and Lerner, 2000a; Loizos, 2005). It is reasonable to question therefore whether firms with weak corporate governance structures disproportionately make value-destroying takeovers of portfolio companies. In this view, value destruction stems from agency problems long studied by finance and strategy scholars.

To investigate this possibility, we compiled time-varying measures of governance quality using indices developed by Gompers, Ishii, and Metrick (GIM, 2003) and Bebchuk, Cohen, and Ferrell (BCF, 2009). The GIM Index tabulates 24 provisions that protect shareholder rights, as reported by the Investor Responsibility Research Center (IRRC). The BCF Index is derived from a subset of six provisions that, according to Bebchuk, Cohen, and Ferrell (2009), yield greater explanatory precision when predicting firm value and shareholder returns.[9] In both cases, higher scores are used to proxy for greater managerial entrenchment. In turn, lower scores indicate superior governance quality.

Table 8 compares the mean and median governance scores of corporate investors in our sample with those reported for the larger population of 1,500 public U.S. corporations tracked by the IRRC. As shown in columns 1 and 2, the governance quality of top corporate investors is comparable to that of other public U.S. corporations. The only significant difference pertains to median values of the BCF Index, which indicates *superior* governance quality (lower scores) for CVC investors. Columns 3 and 4 of Table 8 report within-sample scores by acquisition type (CVC or non-CVC). If firms with weak corporate governance mechanisms disproportionately acquire portfolio companies, we should expect lower governance quality (higher scores) in CVC acquisitions. Columns 3 and 4, however, reveal no discernible difference in governance scores between the groups.

Results from multivariate regressions in Table 9 corroborate these descriptive statistics. Again, there is little indication that value destruction in CVC acquisitions stems from firm-level governance problems, whether measured indirectly by traditional measures like free cash flow (column 2) or by more direct proxies for governance quality (in columns 3–4). For the sake of brevity, we report results in Table 9 using the BCF Index. Similar results were obtained with the GIM Index. When interpreting these findings, it is important to acknowledge that the BCF and GIM indices may fail to discern heterogeneity among investors in program-level agency problems, a possibility that we return to in Section 4.4. In combination, however, evidence from Tables 8 and 9 suggests that the negative return to CVC acquisitions

[8] In 2005–2007, we met informally with 31 individuals involved in corporate venture finance primarily within the IT sector. Early meetings were open-ended; later meetings were semi-structured and used interview templates. Our objective was to obtain general insights about the CVC and entrepreneurial-firm acquisition experiences of these managers.

[9] The six provisions are (1) staggered boards, (2) limits to shareholder by-law amendments, (3) supermajority requirements for mergers, (4) supermajority requirements for charter amendments, (5) poison pills, and (6) golden parachutes.

Table 7
Tests for competition-driven overpayment (“owner’s curse”).

OLS estimates of acquirer returns to CVC and non-CVC acquisition announcements. The dependent variable is the 2-day (−1,0) cumulative abnormal return. Sample includes entrepreneurial firms (less than 12 years old) acquired by 61 corporate venture capital (CVC) investors during 1987–2003. *CVC acquisition* equals one when the acquirer provided venture funds to the target pre-acquisition; the omitted category is startups acquired outright (non-CVC acquisitions). Other variables are defined in the Appendix. Columns 2–5 use alternative measures of competitive takeover environments, including the total number of corporate investors in the focal target (columns 2 and 3), the M&A liquidity (column 4), and # IPOs (column 5) in the target sector in the acquisition quarter. Each specification includes year dummies and a dummy variable when acquirer R&D is not reported. Financial data are in millions of constant 1996 dollars. Robust standard errors, clustered by acquirer, are in brackets.

Variables	Main results (1)	# Corp investors (2)	# Corp investors * CVC acq (3)	Liquidity * CVC acq (4)	# IPOs * CVC acq (5)
CVC acquisition	−0.0173***	−0.0167***	−0.0158**	−0.0161**	−0.0185**
	[0.0058]	[0.0058]	[0.0064]	[0.0063]	[0.0079]
# Corporate investors		−0.0014	−0.0009		
		[0.0015]	[0.0021]		
# Corporate investors*CVC acquisition			−0.0013		
			[0.0033]		
Liquidity index*CVC acquisition				−0.0251	
				[0.0823]	
Number of IPOs*CVC acquisition					0.0001
					[0.0002]
Acquirer characteristics					
Ln assets	−0.0008	−0.0008	−0.0008	−0.0008	−0.0008
	[0.0013]	[0.0013]	[0.0013]	[0.0013]	[0.0013]
R&D intensity	0.0002*	0.0002*	0.0002*	0.0002*	0.0002*
	[0.0001]	[0.0001]	[0.0001]	[0.0001]	[0.0001]
Tobin's *q*	0.0004	0.0004	0.0004	0.0004	0.0004
	[0.0009]	[0.0009]	[0.0009]	[0.0009]	[0.0009]
Free cash flow as % assets	−0.0008	−0.0009	−0.0010	−0.0008	−0.0008
	[0.0040]	[0.0040]	[0.0040]	[0.0040]	[0.0040]
In IT sector	−0.0097**	−0.0092**	−0.0092**	−0.0096**	−0.0097**
	[0.0042]	[0.0043]	[0.0043]	[0.0042]	[0.0042]
Target characteristics					
Target age	−0.0004	−0.0004	−0.0004	−0.0003	−0.0004
	[0.0007]	[0.0007]	[0.0007]	[0.0007]	[0.0008]
Target owns patents	−0.0016	−0.0012	−0.0013	−0.0017	−0.0016
	[0.0039]	[0.0041]	[0.0041]	[0.0039]	[0.0039]
Target is publicly traded	−0.0175***	−0.0179***	−0.0177***	−0.0175***	−0.0175***
	[0.0049]	[0.0049]	[0.0050]	[0.0049]	[0.0049]
Target in same sector as acquirer	0.0095	0.0093	0.0094	0.0094	0.0097
	[0.0085]	[0.0085]	[0.0086]	[0.0085]	[0.0084]
Deal characteristics					
Liquidity index in target sector	0.0045	0.0048	0.0048	0.0051	0.0050
	[0.0220]	[0.0220]	[0.0220]	[0.0222]	[0.0225]
# IPOs in target sector	−0.0000	−0.0000	−0.0000	−0.0000	−0.0000
	[0.0001]	[0.0001]	[0.0001]	[0.0001]	[0.0001]
Relative size	−0.0781	−0.0758	−0.0763	−0.0785	−0.0785
	[0.0677]	[0.0664]	[0.0667]	[0.0676]	[0.0679]
Payment includes stock	−0.0064	−0.0067	−0.0066	−0.0065	−0.0064
	[0.0051]	[0.0050]	[0.0050]	[0.0051]	[0.0051]
Deal terms undisclosed	−0.0132**	−0.0135**	−0.0133**	−0.0133**	−0.0132**
	[0.0052]	[0.0051]	[0.0051]	[0.0052]	[0.0052]
Constant	0.0353*	0.0356*	0.0353*	0.0354*	0.0355*
	[0.0200]	[0.0198]	[0.0199]	[0.0200]	[0.0201]
Time dummies	Yes	Yes	Yes	Yes	Yes
N	489	489	489	489	489
Adjusted R^2	0.059	0.058	0.056	0.057	0.057

*Significant at 10%; **significant at 5%; ***significant at 1%.

stems from factors other than governance problems at top levels of these firms.

4.3. Managerial overconfidence

A third explanation for value destruction in portfolio-company acquisitions is managerial overconfidence. Overconfidence is generally defined as “the tendency to overestimate one’s own (relative) abilities and resulting outcomes” (Camerer and Malmendier, 2007, p. 14). In this view, managers may seek to maximize shareholder value when acquiring portfolio companies yet may nonetheless fail to do so due to upward biases when forecasting the value anticipated from the deals.

Table 8
Governance quality for CVC investors.

Comparison of firm-level governance quality based on indices by Gompers–Ishii–Metrick (GIM, 2003) and Bebchuk–Cohen–Ferrell (BCF, 2009) compiled from IRRC Corporate Takeover Defense publications. The GIM index is a 24-pt scale, whereas the BCF index is a 6-pt scale. In both cases, lower scores indicate superior governance quality. Mean scores are compared using two-sample *t*-tests. Median scores (reported in brackets) are compared using Wilcoxon equality tests. Columns 1 and 2 compare scores for our acquiring-firm sample with those reported for the population of 1,500 public companies tracked by the IRRC. Columns 3 and 4 report governance scores for acquirers in our sample at the time that CVC and non-CVC acquisitions were announced.

	Sample firms vs. all firms tracked by IRRC		Sample firms only – Governance quality by acquisition type	
	Sample firms (1)	All IRRC (2)	CVC (3)	Non-CVC (4)
GIM governance index	8.8 [9.0]	9.0 [9.0]	8.1 [8.0]	8.2 [8.0]
BCF governance index	1.8*** [2.0]	2.3 [2.0]	1.3 [1.0]	1.4 [1.0]

*,**,***Statistical significance of difference at 10%, 5%, and 1%, respectively.

Building on pioneering work by Roll (1986), the acquisitions literature largely casts overconfidence as an individual-specific personality trait. Estimating the degree of overconfidence among individual CEOs, for example, Hayward and Hambrick (1997) and Malmendier and Tate (2008) show that firms led by hubristic CEOs are more prone to overpay in takeover markets than are firms with less hubristic leaders.

A separate strand of behavioral research attributes the degree of overconfidence bias to an individual's exposure to representative baselines of comparison, or "outside" views through which to frame and calibrate expectations.[10] Following influential work by Kahneman and Tversky (1979), evidence from experiments (Camerer and Lovallo, 1999; Kahneman and Lovallo, 1993) and case studies of technology development programs (e.g., Garud and Ahlstrom, 1997) indicates that individuals lacking exposure to such "base-rates" of comparison are more prone to upward bias when estimating outcomes of uncertain projects, particularly when they are personally committed to the decision. In related work, Cooper, Woo, and Dunkelberg (1988) and Landier and Thesmar (2009) show that entrepreneurs systematically inflate estimates of their own firm's success, particularly when they are founders or key inventors. Similarly, Malmendier and Tate (2005, 2008) find that CEOs with technical backgrounds exhibit greater overconfidence when assessing the returns to investments than CEOs with finance backgrounds, possibly due to differential levels of personal commitment to the projects.

Building on insights from these studies, we undertake two sets of analyses. First, we explore whether firms making value-destroying CVC acquisitions are managed by more hubristic CEOs. Second, we identify organizational contexts likely to yield varying degrees of overconfidence among managers responsible for CVC investing and test for differential effects on investment performance.

4.3.1. CEO-level hubris

To investigate CEO-level hubris, we assembled the names of all CEOs of the 61 investors from annual 10-k filings and re-ran the abnormal returns analysis with a CEO-specific fixed effects specification. This approach allows CEOs to vary in time-invariant ways (e.g., hubristic personalities or finance backgrounds) that might alter the returns to acquiring portfolio companies. The results are reported in Table 10. As column 2 shows, we continue to find a large and significant "within CEO" gap in the returns to CVC and non-CVC acquisitions with this more stringent specification. These findings suggest that, if managerial overconfidence leads to value-destroying takeovers in the context of our study, it resides deeper within these organizations.

4.3.2. Program structure and degree of overconfidence bias

Our second test for overconfidence-related bias exploits differences among firms in the internal organization of CVC programs. Prior studies suggest that firms find it easier to attract managers with backgrounds in finance or private equity investing by organizing CVC programs in autonomous subsidiaries or units (Siegel, Siegel, and MacMillan, 1988; Hill and Birkinshaw, 2008). Doing so not only enables firms to offer responsibility for a broader array of investment projects but also increases the visibility of the program.[11] Others suggest that housing CVC programs in dedicated units reduces expropriation risks for startups seeking funding (Dushnitsky and Shaver, 2009), thus facilitating a broader "deal flow" of investment opportunities. If managers from dedicated CVC units are less involved in technological

[10] As Camerer and Lovallo (1999, p. 315) explain, "[a]n outside view ignores special details of the case at hand, constructs a class of cases similar to the current one, and guesses where the current case is in that class. [In contrast], an inside view forecast is generated by focusing on the abilities and resources of a particular group, constructing scenarios of future progress, and extrapolating current trends." Put differently, "[t]he inside view tells a colorful story; the outside view recites statistics" (Camerer and Lovallo, 1999, p. 315).

[11] In a study of organizational structures used to manage strategic alliances, Kale, Dyer, and Singh (2002) similarly note that the creation of a dedicated alliance group increases the visibility of the program to employees and external parties. The authors do not discuss, however, whether the dedicated alliance structure enables firms to attract more qualified managers.

Table 9
Tests of firm-level governance explanation.

OLS estimates of acquirer returns to CVC and non-CVC acquisition announcements. The dependent variable is the 2-day (−1,0) cumulative abnormal return. Sample includes entrepreneurial firms (less than 12 years old) acquired by 61 corporate venture capital (CVC) investors during 1987–2003. *CVC acquisition* equals one when the acquirer provided venture funds to the target pre-acquisition; the omitted category is startups acquired outright (non-CVC acquisitions). Other variables are defined in the Appendix. Firm-level governance indices by Gompers–Ishii–Metrick (GIM, 2003) and Bebchuk–Cohen–Ferrell (BCF, 2009) are compiled from IRRC Corporate Takeover Defense publications. The GIM index is a 24-pt scale, whereas the BCF index is a 6-pt scale. In both cases, lower scores indicate superior governance quality. Each specification includes year dummies and a dummy variable when acquirer R&D is not reported. Financial data are in millions of constant 1996 dollars. Robust standard errors, clustered by acquirer, are in brackets.

Variables	Main results (1)	Cash flow (2)	BCF index (3)	CVC acq * BCF index (4)
CVC acquisition	−0.0173***	−0.0229**	−0.0173***	−0.0213***
	[0.0058]	[0.0098]	[0.0058]	[0.0069]
CVC acquisition*free cash flow		0.0407		
		[0.0444]		
BCF governance index			−0.0002	−0.0007
			[0.0012]	[0.0014]
CVC acquisition*BCF index				0.0031
				[0.0039]
Acquirer characteristics				
Ln assets	−0.0008	−0.0010	−0.0009	−0.0008
	[0.0013]	[0.0012]	[0.0014]	[0.0014]
R&D intensity	0.0002*	0.0002	0.0002	0.0002
	[0.0001]	[0.0001]	[0.0001]	[0.0001]
Tobin's *q*	0.0004	0.0003	0.0004	0.0004
	[0.0009]	[0.0009]	[0.0009]	[0.0009]
Free cash flow as % assets	−0.0008	−0.0018	−0.0008	−0.0007
	[0.0040]	[0.0038]	[0.0040]	[0.0040]
In IT sector	−0.0097**	−0.0095**	−0.0098**	−0.0099**
	[0.0042]	[0.0041]	[0.0042]	[0.0042]
Target characteristics				
Target age	−0.0004	−0.0004	−0.0004	−0.0004
	[0.0007]	[0.0007]	[0.0007]	[0.0007]
Target owns patents	−0.0016	−0.0020	−0.0016	−0.0015
	[0.0039]	[0.0041]	[0.0039]	[0.0040]
Target is publicly traded	−0.0175***	−0.0172***	−0.0175***	−0.0175***
	[0.0049]	[0.0049]	[0.0049]	[0.0050]
Target in same sector as acquirer	0.0095	0.0093	0.0094	0.0086
	[0.0085]	[0.0086]	[0.0085]	[0.0081]
Deal characteristics				
Liquidity index in target sector	0.0045	0.0049	0.0045	0.0043
	[0.0220]	[0.0218]	[0.0220]	[0.0221]
# IPOs in target sector	−0.0000	−0.0000	−0.0000	−0.0000
	[0.0001]	[0.0001]	[0.0001]	[0.0001]
Relative size	−0.0781	−0.0769	−0.0782	−0.0773
	[0.0677]	[0.0698]	[0.0678]	[0.0681]
Payment includes stock	−0.0064	−0.0071	−0.0063	−0.0064
	[0.0051]	[0.0053]	[0.0051]	[0.0051]
Deal terms undisclosed	−0.0132**	−0.0137**	−0.0132**	−0.0132**
	[0.0052]	[0.0054]	[0.0052]	[0.0052]
Constant	0.0353*	0.0377*	0.0362	0.0370*
	[0.0200]	[0.0205]	[0.0217]	[0.0216]
Time dummies	Yes	Yes	Yes	Yes
N	489	489	489	489
Adjusted R^2	0.059	0.061	0.057	0.056

*Significant at 10%; **significant at 5%; ***significant at 1%.

aspects of the projects yet gain exposure to more representative baselines of comparison, they may be less vulnerable than managers from less systematized programs to overconfidence bias when valuing portfolio companies.

An ideal test for overconfidence bias among lower-level managers would use proprietary data (unavailable to us) on the identities of individuals responsible for funding and/or acquiring portfolio companies, their exposure to deal flow, and their educational backgrounds. Absent that, our empirical strategy rests on the assumption that the degree of overconfidence bias among CVC managers varies systematically with program structure, with lower levels exhibited by managers from dedicated units. This approach is similar to that used by Barber and Odean (2001), where the (unobserved) degree of bias is assumed to correlate systematically with the (observed) gender of investors.

Table 10
Tests of overconfidence-based explanation.

OLS estimates of acquirer returns to CVC and non-CVC acquisition announcements. The dependent variable is the 2-day (−1,0) cumulative abnormal return. Sample includes entrepreneurial firms (less than 12 years old) acquired by 61 corporate venture capital (CVC) investors during 1987–2003. *CVC acquisition* equals one when the acquirer provided venture funds to the target pre-acquisition; the omitted category is startups acquired outright (non-CVC acquisitions). Column 2 tests "within CEO" differences. Column 3 interacts *CVC acquisition* with an indicator set to one if the initial investment in the target originated from a dedicated CVC unit; the omitted category is investments originating elsewhere in the organization (e.g., product groups). Columns 4–6 control for the acquisition experience, CVC investment experience, and governance quality of the acquirer, respectively. Experience measures, the BCF governance index, and other variables are defined in the Appendix. Financial data are in millions of constant 1996 dollars. Robust standard errors, clustered by acquirer, are in brackets. Error terms in column 2 are clustered by CEO.

Variables	Main results (1)	Control for CEO-specific effects (2)	CVC acq * Dedicated unit (3)	Col 3, with CVC experience (4)	Col 3, with Acq experience (5)	Col 3, with Governance quality (6)
CVC acquisition	−0.0173***	−0.0173***	−0.0225***	−0.0226***	−0.0225***	−0.0290***
	[0.0058]	[0.0063]	[0.0062]	[0.0062]	[0.0062]	[0.0067]
CVC acquisition*dedicated CVC unit			0.0220**	0.0218**	0.0206**	0.0243**
			[0.0106]	[0.0106]	[0.0111]	[0.0101]
Acquisition experience				−0.0001		
				[0.0001]		
CVC experience					0.0000	
					[0.0000]	
BCF governance index						−0.0005
						[0.0013]
CVC acquisition*BCF governance index						0.0046
						[0.0038]
Acquirer characteristics						
Ln assets	−0.0008	−0.0095**	−0.0010	−0.0007	−0.0011	−0.0008
	[0.0013]	[0.0043]	[0.0013]	[0.0015]	[0.0013]	[0.0014]
R&D intensity	0.0002*	−0.0005	0.0002*	0.0002*	0.0002*	0.0002*
	[0.0001]	[0.0003]	[0.0001]	[0.0001]	[0.0001]	[0.0001]
Tobin's *q*	0.0004	0.0012	0.0004	0.0004	0.0004	0.0004
	[0.0009]	[0.0013]	[0.0009]	[0.0009]	[0.0009]	[0.0009]
Free cash flow as % assets	−0.0008	−0.0255	−0.0006	−0.0007	−0.0007	−0.0005
	[0.0040]	[0.0169]	[0.0038]	[0.0038]	[0.0038]	[0.0038]
In IT sector	−0.0097**	−0.4419**	−0.0095**	−0.0100**	−0.0098**	−0.0093**
	[0.0042]	[0.1847]	[0.0041]	[0.0045]	[0.0042]	[0.0041]
Target characteristics						
Target age	−0.0004	−0.0013	−0.0004	−0.0004	−0.0004	−0.0004
	[0.0007]	[0.0010]	[0.0007]	[0.0007]	[0.0007]	[0.0007]
Target owns patents	−0.0016	−0.0011	−0.0020	−0.0021	−0.0023	−0.0018
	[0.0039]	[0.0053]	[0.0038]	[0.0038]	[0.0039]	[0.0039]
Target is publicly traded	−0.0175***	−0.0200***	−0.0169***	−0.0171***	−0.0169***	−0.0169***
	[0.0049]	[0.0054]	[0.0048]	[0.0048]	[0.0048]	[0.0048]
Target in same sector as acquirer	0.0095	0.0167	0.0090	0.0093	0.0088	0.0080
	[0.0085]	[0.0125]	[0.0087]	[0.0088]	[0.0086]	[0.0083]
Deal characteristics						
Liquidity index in target sector	0.0045	0.0013	0.0050	0.0048	0.0060	0.0048
	[0.0220]	[0.0279]	[0.0220]	[0.0219]	[0.0221]	[0.0221]
# IPOs in target sector	−0.0000	0.0002	−0.0000	−0.0000	−0.0000	−0.0000
	[0.0001]	[0.0002]	[0.0001]	[0.0001]	[0.0001]	[0.0001]
Relative size	−0.0781	−0.0512	−0.0866	−0.0864	−0.0857	−0.0860
	[0.0677]	[0.0564]	[0.0652]	[0.0654]	[0.0656]	[0.0653]
Payment includes stock	−0.0064	−0.0056	−0.0053	−0.0051	−0.0053	−0.0054
	[0.0051]	[0.0076]	[0.0052]	[0.0053]	[0.0052]	[0.0052]
Deal terms undisclosed	−0.0132**	−0.0135*	−0.0133**	−0.0132**	−0.0132**	−0.0133**
	[0.0052]	[0.0073]	[0.0054]	[0.0054]	[0.0054]	[0.0054]
Constant	0.0353*	0.5581***	0.0368*	0.0348	0.0385*	0.0373*
	[0.0200]	[0.1862]	[0.0201]	[0.0224]	[0.0206]	[0.0216]
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes
N	489	489	489	489	489	489
Adjusted R^2	0.059	0.135	0.064	0.062	0.063	0.063

*Significant at 10%; **significant at 5%; ***significant at 1%.

4.3.3. Program structure and returns to acquiring portfolio companies

If managers from dedicated CVC units are less prone to judgment bias when valuing portfolio companies, they should capture higher returns when acquiring portfolio companies than managers from less systematized programs. To explore this possibility, we categorize structure type based on investor names reported in VentureOne and create a new variable, *Dedicated CVC unit,* which equals one if a dedicated organizational unit (like Motorola Ventures or Intel Capital) is listed; otherwise it is set to zero. Of the 61 corporate investors in our sample, 35 (57%) made investments through autonomous CVC units while 26 (43%) did not.[12] Of the 74 acquired portfolio companies, however, only 17 (23%) received initial backing from a dedicated CVC unit; the remainder (77%) received initial financing from product groups or other corporate departments.

Consistent with the view that program structure correlates with the degree of overconfidence bias among CVC investors, Table 10 shows that the average return for portfolio-company acquisitions is significantly higher when managers from dedicated CVC units are responsible for the initial funding decision. As shown in column 3, the coefficient on the interaction term, *CVC acquisition*Dedicated CVC unit*, is positive and significant at the 5% level. In columns 4–6, we obtain similar results even controlling for differences among firms in CVC investment experience (column 4), acquisition experience (column 5), and governance quality (column 6). Using the coefficients from column 6, these estimates suggest that when initial venture funds originate from a dedicated CVC unit, the average return to CVC acquisitions is only 0.5% lower than the return to non-CVC acquisitions ($-2.90\%+2.43\%$). In contrast, the estimated gap in returns to CVC and non-CVC acquisitions widens to 2.9% when initial funds originate from product groups or other corporate departments.

In unreported regressions (available upon request), we ran numerous diagnostic tests and obtained similar findings. First, we omitted deals made by either Intel Corporation, an unusually prolific investor with a dedicated unit, or Cisco Systems, a frequent acquirer with controversial CVC contract practices (Cohen, 2002). Second, we experimented with alternative measures for acquisition experience (restricting counts to entrepreneurial-firm takeovers only) and CVC experience (using dollar values rather than counts of portfolio companies). Third, we allowed for added sources of variation among acquirers by controlling separately for either the longevity of CVC programs (based on either the total or consecutive number of years in which the acquirer made direct CVC investments) or differences among acquirers in receipt of venture financing pre-IPO. Finally, using prior IPO exits to capture time-varying differences among firms in their levels of success in CVC investing, we investigated whether lower returns to CVC acquisitions systematically follow recent success in CVC investing given evidence that success fuels higher levels of overconfidence (Barber and Odean, 2002; Hilary and Menzly, 2006). The results of this analysis continued to reveal persistent performance differences between dedicated and non-dedicated CVC units rather than time-sensitive effects driven by recent success in venture financing.[13]

4.3.4. Program structure and reinvestments in portfolio companies

If managers in dedicated and non-dedicated CVC units systematically differ in their degree of overconfidence when valuing portfolio companies, then we would expect them to make divergent forecasts more generally—not just when integrating portfolio companies through acquisition. As a final test of the overconfidence hypothesis, we therefore explore whether differences among firms in the internal organization of CVC programs similarly affect their proclivities to "throw good money after bad" (or "escalate commitment" as per Staw, 1976) when investing in portfolio companies. As Gompers and Lerner (2004) and Guler (2007) discuss, knowing when to "pull the plug" on underperforming investments is difficult even for independent venture capitalists. Indeed, Hardymon, Lerner, and Leamon (2007, p. 8) report a common view among professional VCs that "[VCs] don't fail because they back bad companies but because they keep shoveling money into them."

To implement this supplemental test, we compiled investment histories from VentureOne of all portfolio companies for the 61 CVC investors in our sample, including rounds in which the focal investor did not participate. Between 1980 and 2003, these corporate investors financed 2,224 portfolio companies and participated in 3,534 rounds of financing. Roughly half (49%) of the investment rounds involved firms with dedicated CVC units.

Gompers and Lerner (2000b) identify numerous factors unrelated to CVC program structure that can affect the probability that a startup will receive follow-on rounds of financing. Our baseline specification therefore controls for a variety of startup and investor characteristics, including startup age and stage of development and the size and sector of the corporate investor. Following Moeller, Schlingemann, and Stulz (2004) and Gompers, Kovner, Lerner, and Scharfstein (2008), we also control for quarterly conditions in takeover and IPO environments. Finally, to address concerns that investors with dedicated CVC units simply may be better governed or more experienced investors, we control for each investor's *BCF governance index* and *CVC experience*, defined earlier.

We compare the reinvestment behavior of dedicated and non-dedicated CVC units through a series of analyses reported in Table 11. The likelihood that a corporate investor will reinvest in a given portfolio company (after making an initial investment) is computed with a Probit

[12] In earlier work, Siegel, Siegel, and MacMillan (1988) report similar statistics; roughly 40% of 52 CVC investors included in their study organized venture financing programs in autonomous organizational units.

[13] The absence of a time-varying effect could reflect the aggregate nature of our data. Prior evidence that "success breeds overconfidence" is based on studies of individuals, not organizations.

Table 11
Supplemental analysis: Reinvestments in portfolio companies.

Probit regressions for whether a corporate investor reinvested in a portfolio company. Marginal effects are reported. The unit of analysis is an investor-portfolio company investment round. The sample comprises investments made by 61 corporate venture capital (CVC) investors in 2,224 portfolio companies during 1980–2003. *Dedicated CVC unit* equals one if an investment is made by a dedicated CVC unit; the omitted category is investments originating elsewhere in the organization (e.g., in product groups). *Startup failed* is set to one if VentureOne lists the portfolio company as either "Out of business" or "Bankrupt" by the end of 2005. Other variables are defined in the Appendix. Financial data are in millions of constant 1996 dollars. Robust standard errors, clustered by corporate investor, are shown in brackets.

		Subsamples by startup outcomes			Subsamples by program structure		Full sample
Variables	Controls only (1)	Had IPO (2)	Acquired by third parties (3)	Out of business (4)	Investors without dedicated CVC units (5)	Investors with dedicated CVC units (6)	Main results (7)
Dedicated CVC unit		0.1840***	0.1079**	0.0241			0.1477***
		[0.0581]	[0.0544]	[0.0494]			[0.0297]
Startup failed					−0.0301	−0.1152***	−0.0310
					[0.0259]	[0.0275]	[0.0286]
Ded. CVC unit * Startup failed							−0.0669**
							[0.0331]
BCF governance index	−0.0207	−0.0139	0.0368	−0.0003	−0.0029	−0.0087	−0.0078
	[0.0131]	[0.0191]	[0.0289]	[0.0226]	[0.0107]	[0.0284]	[0.0104]
CVC experience	0.0002***	−0.0002	0.0004***	0.0004***	−0.0015**	0.0002	0.0000
	[0.0001]	[0.0003]	[0.0002]	[0.0001]	[0.0007]	[0.0002]	[0.0001]
Corporate investor characteristics							
Ln assets	−0.0100	0.0251	0.0285	−0.0133	−0.0014	0.0056	−0.0105
	[0.0112]	[0.0153]	[0.0242]	[0.0169]	[0.0108]	[0.0272]	[0.0100]
R&D intensity	−0.0005	0.0010	0.0001	0.0000	0.0008	−0.0022	0.0002
	[0.0005]	[0.0012]	[0.0009]	[0.0010]	[0.0006]	[0.0020]	[0.0005]
Tobin's *q*	−0.0054*	0.0024	0.0067	−0.0006	−0.0040	0.0034	−0.0048
	[0.0030]	[0.0052]	[0.0056]	[0.0078]	[0.0030]	[0.0163]	[0.0033]
Free cash flow as % assets	0.0100	−0.0286	−0.2765*	0.0097	0.0201	−0.0239	0.0133
	[0.0447]	[0.0989]	[0.1466]	[0.0615]	[0.0445]	[0.0729]	[0.0431]
In IT sector	−0.1571***	−0.0139	−0.1174	−0.1847**	−0.0796**	−0.2963***	−0.1478***
	[0.0474]	[0.0782]	[0.0759]	[0.0766]	[0.0372]	[0.0542]	[0.0414]
Startup characteristics							
Startup age	−0.0137***	−0.0035	−0.0211*	−0.0108	−0.0097**	−0.0199***	−0.0135***
	[0.0028]	[0.0121]	[0.0109]	[0.0105]	[0.0043]	[0.0031]	[0.0028]
Investment round number	−0.0278***	−0.0555***	−0.0022	−0.0103	−0.0210***	−0.0482***	−0.0296***
	[0.0074]	[0.0187]	[0.0127]	[0.0227]	[0.0077]	[0.0075]	[0.0067]
In Product development stage	−0.0989**	0.0423	−0.1629	−0.2114***	−0.0784	−0.1358***	−0.1013**
	[0.0449]	[0.1664]	[0.1070]	[0.0808]	[0.0643]	[0.0496]	[0.0433]
In Beta testing stage	−0.1188**	−0.1575	−0.2342***	−0.1595*	−0.0836	−0.1712***	−0.1234***
	[0.0462]	[0.1054]	[0.0440]	[0.0897]	[0.0658]	[0.0569]	[0.0442]
In Shipping product stage	−0.1865***	−0.1251	−0.2706*	−0.3090***	−0.1885***	−0.1814***	−0.1935***
	[0.0532]	[0.1348]	[0.1470]	[0.1132]	[0.0690]	[0.0553]	[0.0494]
In Profitable stage	−0.2129***	−0.1348	−0.1984**	−0.2262***	−0.2111***	−0.0837	−0.2144***
	[0.0434]	[0.1120]	[0.0935]	[0.0311]	[0.0315]	[0.1020]	[0.0405]
Startup in IT sector	0.0552*	0.0137	0.0263	0.1164*	0.0367	0.1447***	0.0701**
	[0.0293]	[0.0790]	[0.0684]	[0.0638]	[0.0354]	[0.0298]	[0.0276]
Environment characteristics							
Liquidity index in startup sector	2.0838***	3.2841	3.6692*	2.5367**	2.1469**	2.5065***	2.2367***
	[0.5346]	[2.3786]	[1.9734]	[1.1632]	[0.9746]	[0.4929]	[0.5683]
# IPOs in startup sector	0.0003	−0.0022*	−0.0009	−0.0009	0.0003	−0.0001	0.0002
	[0.0004]	[0.0012]	[0.0014]	[0.0012]	[0.0007]	[0.0004]	[0.0004]
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	2939	504	483	501	1581	1354	2939
Log-likelihood	−1609.25	−263.32	−249.00	−244.62	−771.36		
Pseudo R^2	0.103	0.160	0.156	0.188	0.108	0.126	0.115

*Significant at 10%; **significant at 5%; ***significant at 1%.

estimator and robust standard errors clustered by investor. Results from the baseline specification in column 1 are not surprising. Startups that are older, in later investment rounds, and in more advanced stages of development are less likely than more nascent ventures to receive follow-on rounds of financing. The likelihood of refinancing also is higher in more favorable environmental conditions, as evidenced by the positive and significant coefficient on *Liquidity index*. As a group, corporate investors in the IT sector are less likely to refinance portfolio companies than are investors from other sectors.

In columns 2–4, we divide the sample based on known outcomes of portfolio companies (IPOs, third-party acquisitions, failures) by the end of 2005 and compare

the willingness of investors with different program structures to reinvest in each subsample. Controlling for other factors likely to affect refinancing decisions, dedicated CVC units are significantly more likely than non-dedicated units to reinvest in ventures with successful exits, by 18.4% for IPOs (in column 2) and 10.8% for third-party acquisitions (in column 3). Surprisingly, the absolute likelihood of refinancing failed ventures is statistically indistinguishable for dedicated and non-dedicated CVC units (column 4). The *relative* propensity to refinance promising versus underperforming ventures nonetheless appears to differ between the groups.

Columns 5 and 6 probe this difference further by splitting the sample by organizational structure type and estimating whether, *within* program type, investors systematically discriminate between projects of varying success. For non-dedicated units in column 5, the probability of reinvestment fails to differ significantly for successful and unsuccessful ventures. In contrast, dedicated CVC groups in column 6 are 11.5% *less* likely to reinvest in companies that fail, again implying superior proficiencies in the allocation of reinvestments toward more promising projects.[14]

Finally, column 7 in Table 11 combines the sample and estimates whether reinvestment practices differ significantly *between* group types. To do so, we interact *Dedicated CVC unit* with *Startup failed*, which is set to one if VentureOne lists the company as "bankrupt" or "out of business" by the end of 2005. Controlling for other factors likely to affect reinvestment decisions, column 7 shows that dedicated CVC units have a higher overall baseline probability of refinancing portfolio companies, a fact that the specification in column 5 would fail to discern. Nonetheless, the negative and significant coefficient on the *Dedicated CVC unit*Startup failed* interaction term further indicates that dedicated groups are *less* likely to continue to fund languishing ventures in their investment portfolios.[15]

Following Gompers (1995), our assumption in the above specifications is that failing ventures emit warning signals (e.g., missed milestones or product delays) that are observable to investors in a given round but that are unobservable to us until ex post. We then test whether CVC groups (dedicated/non) respond differently to those warning signals.[16] An alternative interpretation is that the decision of the corporate investor to discontinue investing *causes* the startup to fail, thus calling into question the direction of causality. At apparent odds with this view, column 5 in Table 11 shows that failed and successful ventures are similarly likely to receive follow-on funds from non-dedicated units. For reverse causality to explain the empirical regularities in Table 11, the termination (continuation) of funding by dedicated CVC units also would need to cause greater harm (value) to portfolio companies than equivalent actions of corporate investors with non-dedicated units. Absent a natural experiment or finer-grained data, it is difficult to empirically distinguish between these interpretations. Reverse causality alone seems unlikely to explain, however, the broad consistency in our findings: Investors that house CVC programs in autonomous organizational units realize more favorable outcomes than do corporate investors with less systematized programs—both in the value captured from portfolio-company acquisitions (Table 10) and in the allocation of reinvestments toward successful (versus languishing) venture projects (Table 11).

4.4. Interpretational issues and interview insights

As noted earlier, interpretation of this "dedicated unit" effect is not without ambiguity. Consistent with behavioral theories, managers from dedicated CVC units could be less prone to judgment bias when valuing portfolio companies, possibly due to greater exposure to investment opportunities or superior training in finance. An alternative explanation, which we are unable to rule out, is that housing CVC activities in standalone units enables superior monitoring or compensation of investment activities, thus helping mitigate program-level agency problems. Future research could disentangle these explanations more fully through access to data on the backgrounds and compensation packages of managers involved in CVC financing activities.

Our conversations with corporate venturing and business development managers point simultaneously to overconfidence and agency-based explanations. An executive from a large diversified IT firm explained that his firm's corporate venturing activities were reorganized under one organizational umbrella to ensure greater accountability. In his view, budgets for CVC investments were being used to support discretionary spending within business units with little accountability for results. While not mentioned in the interview, the reorganization also could have improved the firm's ability to attract managers with superior training or experience in private equity investing.

[14] This finding is difficult to explain through a simple selection process whereby non-dedicated units pick lower quality startups for initial funding. If such groups invest in lower quality portfolio companies yet are as adept as dedicated units at "pulling the plug" on failing ventures, then the *Startup failed* variable also should be negative and significant in column 5.

[15] Interpreting the economic significance of this statistic is difficult due to lack of data on specific levels of corporate funding across rounds. In total, however, non-dedicated units in our sample invested $1.776 billion in portfolio companies that were disbanded by 2005. Decreasing that amount by 7% would reduce these collective losses by $123 million ($1.776 billion*0.07).

[16] In estimating the ability of independent VCs to refinance projects of varying success, Gompers (1995, Table VII) similarly uses the final outcomes of startups to predict receipt of multiple rounds of financing. He explains, "*a plausible explanation for these results is that venture capitalists gather information about the potential profitability of projects over time. If venture capitalists receive favorable information about the firm…[they] continue to fund the project. Firms that have little potential are liquidated.*" (p. 1483). Similar specifications have also been used in the labor economics literature to analyze the relationship between women's labor participation and future divorce (Johnson and Skinner, 1986; Sen, 2000, 2002). In that literature, future divorce (used to proxy for "anticipation of divorce") is used as an independent variable to predict current labor participation.

At the same time, several interviewees described the challenges in managing relationships between technical experts from product groups or R&D departments and entrepreneurs from portfolio companies. On one hand, some felt that champions are needed to ensure sufficient "buy-in" so that employees have incentives to provide technical or marketing assistance to portfolio companies when requested. On the other hand, others observed a tendency among engineers to become "overcommitted" to projects of portfolio companies. Consistent with professional VCs interviewed by Guler (2007) and Hardymon, Lerner, and Leamon (2007), corporate investors we met with frequently cited "emotional attachment" to portfolio companies.

Interestingly, CVC managers voiced particular concerns about technical experts "falling in love" with technology under development at portfolio companies or "pushing too hard" to ensure success in the projects. This latter insight resonates with evidence from Malmendier and Tate (2005, 2008) that managers with technical backgrounds are more prone to upward bias when assessing the future value of projects that involve them. More broadly, these interviews reveal both economic and behavioral influences on CVC investment decisions and the outcomes associated with those investments.

5. Conclusion

Despite theoretical attention to the strategic nature of corporate venture capital investments (Hellmann, 2002), empirical research on this topic remains limited. This study contributes new evidence by estimating the returns to 61 top CVC investors when acquiring entrepreneurial firms. Surprisingly, we find that acquisitions of portfolio companies tend to destroy value for shareholders of these corporate investors, even though these same investors otherwise are "good acquirers" of entrepreneurial firms. We explore numerous explanations for these puzzling findings, which appear to stem from managerial overconfidence or agency problems at the CVC program level.

A number of unresolved issues invite further study. First, future studies could probe more deeply into why and how program structure affects overconfidence bias and/or agency problems in CVC investing, ideally through use of individual-level data or more structured qualitative investigation. Similarly, the trade-offs firms face when designing CVC programs warrant more systematic investigation. If dedicated units outperform non-dedicated units, why do so many firms (almost 50% in our sample) relegate venture financing activities to product groups or other corporate departments?

Finally, it is unclear why our findings contrast so sharply with those reported in Higgins and Rodriguez (2006), where pharmaceutical firms are shown to earn positive and significant returns when acquiring former alliance partners. In principle, alliances and corporate venture capital both enable firms to gain information about potential candidates for acquisition. Future research could investigate whether our contrasting findings are due to sector-specific factors, the involvement of venture capitalists as intermediaries, or organizational factors that differentially affect the management and performance of corporate venturing programs.

In a review of the acquisitions literature, Andrade, Mitchell, and Stafford (2001, p. 118) conclude that research on how acquisitions create or destroy value is a "wide open [area of investigation], spanning the fields of corporate finance, industrial organization, organizations, and strategy." Our findings suggest that CVC investing is a fruitful arena in which to further explore how organizational structure affects the value created or destroyed by corporate finance decisions.

Appendix A. Variable definitions and data sources

See Table A1.

Table A1

Variable	Definition	Data sources
Panel A: Acquirer characteristics		
Ln assets	Log of book value of total assets (ITEM 6).	Compustat
R&D intensity	Annual R&D spending (ITEM 46) divided by # of employees (ITEM 29).	Compustat
Tobin's *q*	Market value of assets over book value of assets: (ITEM 6-ITEM 60-ITEM 25*ITEM 199)/ ITEM 6.	Compustat
Free cash flow	Net income before extraordinary items (ITEM 14)+depreciation and amortization (ITEM 18). [Due to high correlations with firm size, we use Free cash flow as a % asset in our regressions, which divides Free cash flow by book value of assets (ITEM 6).]	Compustat
In IT sector	Dummy variable: 1 if information technology is primary sector, 0 otherwise. Set to 1 if primary line of business is in software (SIC 737), computer hardware (SIC 357), semiconductors (SIC 367), telecommunications (SIC 481, 484), communications (SIC 366) or electronic instruments (SIC 381, 382); else set to zero.	Compustat
In Life science sector	Dummy variable: 1 if life science is primary sector, 0 otherwise. Set to 1 if primary line of business is in biopharmaceuticals (SIC 283) or medical devices (SIC 384).	Compustat
In Other sector	Dummy variable: 1 if primary sector in 3-digit SIC other than ones listed above, 0 otherwise. Includes automotive and chemical firms and conglomerates such as General Electric.	Compustat
Panel B: Deal characteristics		
Liquidity index in target sector	The value of all corporate control transactions exceeding $1 million in the target sector in the quarter of the focal acquisition announcement divided by the total book value of	SDC, Compustat

Table A1 (*continued*)

Variable	Definition	Data sources
	assets for Compustat firms in the same two-digit SIC code. Following Schlingemann, Stulz, and Walkling (2002), higher indices indicate more competitive takeover markets.	
# IPOs	Number of initial public offerings completed in target sector in quarter of acquisition announcement.	VentureXpert
Deal value	Total price paid by acquirer minus fees and expenses.	SDC, news articles
Relative size	Deal value divided by equity market capitalization of acquirer at end of prior fiscal year.	Compustat
Payment includes stock	Dummy variable: 1 for deals at least partially stock-financed, 0 otherwise.	SDC, news articles
Payment method undisclosed	Dummy variable: 1 for deals with undisclosed methods of payment, 0 otherwise.	SDC, news articles
Deal value undisclosed	Dummy variable: 1 for deals with undisclosed purchase prices, 0 otherwise.	SDC, news articles
Deal terms undisclosed	Dummy variable: 1 for deals with undisclosed methods of payment or purchase prices, 0 otherwise.	SDC, news articles
Panel C: Target characteristics		
Target age	Acquisition year minus founding year.	VentureOne
Employees, if identified	Number of employees in acquisition year, if identified, or as last reported.	VentureOne, CorpTech, news articles
Target owns patents	Dummy variable: 1 if target was awarded one or more U.S. patents prior to acquisition.	Delphion
Target in same sector as acquirer	Dummy variable: 1 if target competes in acquirer line of business, 0 otherwise. For example, if General Electric, which has a large medical devices business unit, acquires a startup developing technologies used in medical imaging, *Target in same sector* is set equal to one.	VentureOne, Compustat
Target is publicly traded	Dummy variable: 1 if target is public when acquired, 0 otherwise.	SDC
Panel D: Other variables used in regressions (not otherwise listed above)		
CVC acquisition	Dummy variable: 1 if the acquirer provided venture capital to a target prior to acquisition; 0 otherwise.	VentureOne, VenturXpert
Number of CVC investors	Total number of corporate investors in target.	VentureOne, VenturXpert
GIM governance index	Gompers–Ishii–Metrick (2003) governance index based on 24 antitakeover provisions. Higher levels correspond to more managerial power.	GIM (2003)
BCF governance index	Bebchuk–Cohen–Ferrell (2009) governance index based on 6 antitakeover provisions. Higher levels correspond to more managerial power.	BCF (2009)
Dedicated CVC unit	Dummy variable: 1 if investment was made by a dedicated internal unit responsible for corporate venturing (e.g., Intel Capital; Motorola Ventures), 0 otherwise.	VentureOne, VenturXpert
Acquisition experience	Number of companies purchased by acquirer in the three years prior to focal deal.	SDC
CVC experience	Number of direct venture capital investments made by firm in the three years prior to focal deal.	VentureOne
Startup failed	Dummy variable: 1 if a startup is listed as either "Out of business" or "Bankrupt" by the end of 2005.	VentureOne
Investment round number	Ordinal rank of the venture financing round.	VentureOne
In [X] stage	A series of dummy variables for startup stage of development in a given financing round.	VentureOne
Startup in IT sector	Dummy variable: 1 if information technology is listed as primary sector of portfolio company.	VentureOne

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