Financial Contracting with Strategic Investors: Evidence from Corporate Venture Capital backed IPOs*

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Abstract: We analyze financial contracting in start-ups backed by corporate venture capitalists (CVCs). CVCs' strategic goals can economically hurt or benefit the start-ups, depending on product market relationships between start-ups and CVC parents. Empirically, start-ups receive funding from both complementary and competitive CVC parents. However, start-up insiders commonly limit the influence of competitive CVCs, awarding them lower board power, while retaining higher board representation for themselves. Second, lead CVCs receive lower board representation, indicating heightened concerns about their greater influence in start-ups' early stages. Finally, start-ups extract higher valuations from competitive CVCs, reflecting greater moral hazard problems. Overall, CVC strategic objectives affect their early inclusion in VC syndicates, their control rights and share pricing.

JEL Classification Code: G24

Keywords: Venture Capital; Corporate Venture Capital; Strategic Investing, Financial Contracting, Product Market Relationships

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* We thank an anonymous referee for very valuable suggestions toward improving this paper. We are grateful to Craig Lewis for his detailed conversations on the subject. Helpful comments from Nick Bollen, Paul Chaney, Francesca Cornelli, Doug Cumming, Thomas Hellmann, Jennifer Marietta-Westberg, Ernst Maug, Manju Puri, Hans Stoll, Per Stromberg, Tracy Wang, conference participants at the ECGI/JFI conference on Financial Contracting at the University of Mannheim, the FIRS conference in Anchorage, the 2007 European Finance Association Meetings, the 2007 Financial Management Association Meetings, and seminar participants at Baruch College, University of Washington, and Vanderbilt University are gratefully acknowledged. Financial support through the PSC-CUNY grant program at the City University of New York is gratefully acknowledged. All errors are ours.

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1. Introduction

Since the early 1990s, U.S. corporations have invested billions of dollars in young entrepreneurial companies (start-ups). By the late 1990s, at the height of their investment activity, corporate venture capital (CVC) accounted for nearly 15% of total venture investment in the US economy. Given that CVCs' parent corporations are often active players in new technologies and products markets in which start-ups are positioned, they appear to be natural candidates to engage in venture investment activity. This is especially true, given that CVC parents can offer start-ups valuable production capacity, technical expertise, strategic alliances and customer-supplier relationships, in addition to venture capital funding. Since many start-up companies innovate in existing markets, established firms in these markets can be particularly keen to invest in start-ups. Gompers and Lerner (2000a), Dushnitsky and Lenox (2006), and Yost and Devlin (1993) report that most value-creating CVCs invest in start-ups to realize strategic benefits. CVC pursuit of strategic objectives can often benefit start-up firms, but they can also adversely affect start-ups creating a conflict of interest between CVCs and other start-up shareholders. In this study, we empirically assess the importance of strategic relations between CVC parents and start-ups and how it affects CVC participation and contracting terms in VC syndicates.

Hellmann (2002) develops an insightful theoretical analysis of the competitive advantages and disadvantages start-ups face when accepting corporate venture capital funding. A central feature of his model is that a corporate investor's quest for strategic benefits can turn into a competitive disadvantage for start-ups when the wealth gains CVCs realize from their actions are misaligned with the economic benefits accruing to other start-up investors. Given that CVCs can hold important control rights, economically damaging decisions can be forced upon start-up firms. From this perspective, Hellmann examines conditions under which start-up entrepreneurs prefer strategically oriented CVCs and when they prefer traditional venture capital (TVC) investors. In addition to strategic objectives, CVCs differ from TVCs in several other important dimensions.

CVCs generally make later-stage venture investments and CVC managers have weaker performance incentives compared to TVC general partners. For example, in a related study, Hellmann et al. (2008) explore the strategic nature of bank-VC investments and provide evidence that their investment choices appear closely aligned with their strategic objectives and thus, they have fundamentally different incentives from TVCs. Strategically-motivated investors (banks, corporations etc.) are endogenously less inclined to build value-added support capabilities that TVCs typically excel in, and this is highlighted by their typically later stage venture capital investments. Second, TVC general partners are primarily compensated through 'carried interest'

which is typically 20 to 30% of the VC fund profits, while CVC managers seldom receive similar compensation (Dushnitsky and Shapira, 2008). Both of these differences are likely to reduce the value-added support and quality of effort provided to start-ups by CVC managers. The lower compensation received by strategic VCs is also likely to diminish their risk taking incentives. Cumming (2006), for instance, notes that compared to traditional VCs, corporate VCs typically write contracts focused more on downside protection than upside potential.

Hellmann's (2002) analysis raises a number of interesting economic questions. How strong are start-up entrepreneur preferences toward VC investor types, and when will a start-up accept funding from strategic CVC investors? More importantly, is the allocation of shares and control rights among VC syndicate members consistent with concerns about unwanted interference by strategic CVCs toward start-up operating decisions? Are start-up control rights and shareholdings allocated in ways that motivate all stakeholders, including CVCs, TVCs and entrepreneurs, to provide strong financial, technical and managerial support to these ventures? These are issues that VCs often grapple with when deciding whether to involve strategic CVCs, based on our conversations with VCs. Finally, do the start-up share prices paid by strategic investors depend on the strategic nature of the CVC parent–start-up relation?

The challenge to testing the Hellmann (2002) predictions is the lack of data on CVC contracts. By focusing on CVC-backed IPOs where public disclosure is required, we are able to obtain detailed information about these start-up firm relationships with CVCs, allowing us to empirically analyze the nature of a CVC's strategic objectives and then investigate how they affect CVC participation in venture syndicates, the allocation of start-up shares and control rights among entrepreneurs and various classes of venture investors, and the prices paid by CVCs for start-up shares. From this investigation, we are able to test a number of predictions derived from Hellmann's theoretical analysis. The downside of using this data is the constraint of only studying CVC-backed IPOs, rather than all CVC-backed companies, which limits the scope of our conclusions. We investigate the representativeness of our sample in greater detail in Section 3.

To preview our results, we find that start-ups receive funding from both complementary and competitive CVC investors. However, founder entrepreneurs appear to be wary of CVC investors when their parents are potential competitors of these start-up firms, since even modest venture investments can lead to substantial VC shareholdings and control rights in start-ups.[1] Consistent

[1] The incentives of competitive CVC investors are fundamentally different from those of complementary CVC investors. Anecdotal evidence suggests that established corporations often make investments in emerging technologies that pose a threat to their existing products and services. Even if such technologies are unsuccessful,

with this argument, we find that even after controlling for the size of CVC venture investments and their share ownership positions, CVC board representation as a fraction of total board seats is significantly higher when a CVC parent has a complementary relationship with a start-up. A complementary CVC investor has strong strategic and financial incentives to provide favorable support to a start-up since a CVC is not only concerned about a start-up's share valuation, but also with the impact of a start-up's commercial success on the CVC parent's operations and earnings.

Second, insider board seats as a fraction of board size is significantly higher when a CVC parent is a potential competitor of a start-up. Since syndication is quite common in the VC industry, insiders may fear formation of a controlling block of shareholders or directors dominated by a potentially unfriendly CVC parent. Other VCs may align with a CVC if they have other ongoing business relationships with the CVC or if its parent firm is a member in their other VC syndicates or is an important investor in their VC funds. Other motives for VCs to align with CVCs are future benefits from having CVC parents as potential customers, suppliers or acquirers of their other portfolio companies or providers of future deal flow. Thus, start-up insiders appear to rationally retain more board power when CVC parents are viewed as likely competitors.

Third, we examine the importance of a lead VC's identity and also assess whether there is a difference in the allocation of control rights between TVCs and CVCs when they take a syndicate leadership role. Usually, the lead VC originates the deal and is among the first venture investors in the start-up firm. We define the lead VC from among the investors that participated in the start-up's initial funding round and invests the maximum amount in the company across all funding rounds. When CVCs invest in start-ups at their earliest stages of development, it is relatively easier for strategic investors to influence a start-up's development in a direction more to their own liking. The start-up's founder/entrepreneur(s) may be wary of strategic investors in the earliest stages of its lifecycle and be especially reluctant to allocate board seats and other control rights to them. Consistent with this argument, we find that even after controlling for their shareholdings, CVCs are much less likely to lead VC syndicates, and when they are lead investors, CVCs receive board seats in about 70% of VC syndicate deals. In contrast, lead TVC investors almost always receive board seats. Thus, the overall evidence indicates that strategic motivations of CVCs significantly influence whether or not they are included in VC syndicates. Furthermore, CVC board

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corporations realize a strategic benefit by hedging the risk of technological obsolescence of their existing products. The corporate venturing experience of Analog Devices in 1980s serves as an interesting example of the strategic benefits that accrue to established corporations ('The Money of Invention: How Venture Capital Creates New Wealth' pp. 153-154, Paul Gompers and Josh Lerner, 2001, HBS Press).

representation is strongly related to the nature of its strategic relationship (complementary or competitive) with a start-up.

Finally, we look at the valuations offered to strategic VC investors when they buy start-up shares. Existing empirical evidence suggests that start-ups are able to extract higher valuations from strategic venture investors relative to TVCs because they are keen to partner with start-ups (Gompers and Lerner, 2000a). When we separate CVC investors by complementary and competitive interests, we find that start-ups are able to extract higher valuations from CVCs with parents that are potential competitors. This is consistent with standard bargaining theory which predicts that start-up entrepreneurs can extract higher valuations when a CVC parent is a potential competitor who wants access to a start-up's technologies or influence over a start-up's product development (Hellmann, 2002).

A critical issue is how to categorize strategic relations between CVC parents and start-ups. Our approach to categorizing the relatedness (complementary or competing) of start-ups and CVC parents is to use the CorpTech Directory, whose detailed classification provides information on the specific niche in which a company operates and gives detailed product level characterizations. This is supplemented by statements on strategic relations made in a start-up's IPO prospectus. As detailed in section 3, the CorpTech's classification is much finer and more detailed than the more conventional SIC categories. Classification of CVC–start-up relations by SIC codes is presented in section 5.2 and is found to be inferior to our primary approach based on the CorpTech Directory.

In our sample, 45% of CVCs are found to be strategic competitors, which is both surprising and intriguing.[2] A natural question to ask is why start-ups accept funding from potential competitors. Several explanations come to mind. First, start-ups are not only resource constrained, but they also face stiff competition in the race to obtain a first mover advantage in introducing their products and services to the market (Lieberman, 2007). Thus, timely access to funding can often be critical to a start-up's ultimate success. If TVC and complementary CVC investors are not interested in funding a start-up or if their offers are not financially attractive, then a time and resource constrained start-up can be forced to accept funding from competitive CVC investors who often have strong strategic reasons for making such start-up investments. Second, start-ups are often plagued by severe information asymmetry problems because little public information exists about them. This can result in start-ups facing minimal investor demand for their illiquid stocks.

[2] We find few financially oriented CVC investments in our sample, consistent with Yost and Devlin (1993). The financially oriented CVC investments are classified as such, when we do not find evidence of a strategic relation between the CVC parent and the start-up (see section 3.2.).

Thus, equity investments by well-known corporations can help overcome the twin problems of inadequate funding and need for firm and product quality certification, resulting in greater subsequent interest in start-ups by both private (and public) investors and potential customers. Third, start-ups are able to extract higher valuations from potentially competitive CVC investors and this leads to a lower dilution of equity ownership and control rights for the same level of investment, which can partially compensate for the greater risk associated with such investors.

Our analysis reveals that after accepting funds from CVCs with potentially competitive parents, start-ups appear to limit possible interference by these strategic investors through limits on their board power and shareholdings. Thus, start-ups appear to recognize the moral hazard problems introduced by inclusion of potentially competitive corporate investors in VC syndicates and accordingly negotiate to limit the allocations of control rights to them.

This study is related to several streams of research. The study adds to a large literature on the principal-agent problem in financial contracting. Most financial contracting theories focus on the conflicts between a principal (investor) and an agent (entrepreneur) and devise contracting mechanisms to mitigate those conflicts.[3] In particular, this study adds to our understanding of VC financial contracting by empirically investigating important determinants of financial contracts between entrepreneurs and corporate venture investors. In a path breaking analysis, Kaplan and Stromberg (2003) investigate the allocation of cash flow rights, board rights, voting rights, liquidation rights, and other contingent rights among the VCs and entrepreneurs for a large sample of VC investments and then relate these rights allocations to existing contracting theories. In their analysis VCs are treated as a single class of investors with no distinction made between TVCs and CVCs. We extend their investigation by analyzing the strategic objectives of CVCs and examine how their strategic motives affect the allocation of start-up voting and board rights among CVCs and TVCs, and particularly among CVCs with competitive and complementary interests.

While evidence that venture capitalists have a positive effect on their portfolio companies is presented by Barry et al. (1990), Brav and Gompers (1997), Gompers and Lerner (2001), Hellmann and Puri (2000, 2002), Hochberg (2008), Hochberg et al. (2007), Lerner (1994, 1995), Lindsey (2008) and Megginson and Weiss (1991), our focus is different. We want to further our

[3] See Hart (2001) for a relatively recent overview on the topic. Other studies that discuss mechanisms used to solve potential agency problems between investors and entrepreneurs, particularly in the context of venture capital financing, include Admati and Pfleiderer (1994), Lerner (1995), Hellmann (1998) and Kaplan and Stromberg (2001, 2004). The contractual and monitoring-based approaches for overcoming agency problems facilitate financing of early-stage ventures whose assets are largely intangible and knowledge based.

understanding of strategic investing and corporate venture capital. Previous research suggests that the presence of a strong strategic focus is critical to the success of corporate venture funds (Gompers and Lerner, 2000a). However, our interest is not in measuring CVC and start-up performance, but instead centers on the allocation of board and control rights and CVC share pricing. While Hellmann (2002) provides a rigorous theoretical framework, we empirically assess whether these contracting decisions reflect an attempt to minimize the potential conflicts of interest associated with having strategic CVC investors. In related studies, Anton and Yao (1994, 1995), Anand and Galetovic (2000), and Gans and Stern (2000) analyze contracting between entrepreneurs and well established corporations in the presence of weak intellectual property rights where expropriation of start-ups' intellectual property by these other corporations is possible. We extend this line of research by examining potential expropriation of start-ups when they have product market relationships with CVC parents.

Our analysis also offers new insights into the interaction between firm financial decisions and their product market relationships, building on prior work of Brander and Lewis (1986), Chevalier (1995) and Maksimovic and Titman (1991). We empirically examine the effect of product market relationships on the sources of financing and the types of financial contracts that result from complementary versus competitive product market interactions. Finally, this study adds to the literature on strategic alliances and joint ventures by examining the strategic interactions between start-ups and the corporations that make venture investments in them, which can lead to various types of strategic relationships (Allen and Phillips, 2000).

The remainder of the paper is organized as follows. Section 2 reviews the impact of corporate venturing on entrepreneurial ventures and develops testable hypotheses. Section 3 discusses data collection procedures and describes sample properties. Empirical results follow in Section 4. Robustness checks are presented in Section 5. Finally Section 6 summarizes our findings.

2. Hypothesis Development

Several studies have highlighted the positive role of CVC on start-up firms' development and success. Gompers and Lerner (2000a) document differences between corporate and traditional venture capital investments and analyze the causes for their success, reporting a higher likelihood of successful exits when CVC investments are strategic, rather than financially driven. In a similar vein, while analyzing CVC influence on start-ups, Santhanakrishnan (2003) shows that product market support by CVC parents is a primary mechanism through which CVCs help complementary start-ups attain successful exits. Maula and Murray (2002) examine VC-backed IPOs belonging to

the telecommunications and internet sectors during the 1998-1999 period and show that CVC-backed IPOs have higher market valuations than their TVC-backed counterparts. A positive effect of CVC involvement on start-up valuations is also documented by Ivanov and Xie (2009) and Chemmanur and Loutskina (2008). Overall, the evidence suggests that the presence of CVC investors increases start-up valuations, particularly when their investments are strategic in nature.[4]

However, participation of strategic investors in start-ups can impose costs as well. When strategically motivated CVCs invest in start-ups, their interests can be in conflict with those of entrepreneurs and TVC investors. Because a CVC parent is focused on its own profitability, it may want to influence the start-up's development in a direction supportive of its own (long-term) strategic objectives, which may not maximize the start-up's value. For example, there can be a CVC–TVC conflict of interest over a start-up's optimal development strategy. A CVC may oppose promising product development in areas that directly compete with the CVC's parent and support development of less profitable products that complement the CVC parent's products or services. A CVC parent can also use its knowledge about a start-up's technology, products and services to develop competitive products and services of its own at the start-up's expense.

CVC conflicts with TVCs can also be rooted in disagreement over the optimal exit strategy, which can have an adverse financial impact on TVC investments. For example, CVCs can support early acquisitions that accelerate the commercialization of a start-up's complementary products and services at the cost of lower acquisition prices. CVCs can also oppose financially attractive acquisition bids made by competitors of the CVC parent. Alternately, CVC toeholds in start-ups are likely to facilitate the development of strategic relationships with CVC parents and provide these parents with a favorable negotiating position in any subsequent acquisition discussions with start-ups. In line with these arguments, Cumming and Johan (2008) find that corporate VCs are more likely to seek additional veto rights over some important decisions in anticipation of potential conflicts of interest with the entrepreneurs. Furthermore, CVC toeholds can diminish the value of start-ups to other prospective buyers because of CVC parents' access to start-up technologies and the existence of strategic relationships between these start-ups and CVC parents.

Hellmann (2002) notes that CVCs have better incentives to provide support to start-ups whose products and services are complementary to operations of CVC parents and are consistent with the parents' strategic goals. Complementarity, defined as a start-up having a positive strategic

[4] Dushnitsky and Lenox (2005, 2006) document that CVC parents who engage in strategic investing realize benefit from increased firm value and product patents. Hellmann et al. (2008) show both bank-VCs and their portfolio companies benefit when banks make strategic venture capital investments to build lending relationships.

impact on a CVC parent's asset value, aligns CVC incentives with the start-up because a start-up's commercial success positively affects a CVC parent's earnings. On the other hand, when the start-up is a potential competitor (having a negative strategic impact on a CVC parent's asset value) the likelihood of conflicts of interest between the start-up and the CVC parent increases. Competing CVC parents are particularly interested in obtaining equity stakes in start-ups to obtain access to potentially successful technologies or to obtain a window into the start-ups' future development, presenting a potential threat to their success.[5]

Thus, start-ups with investments by competing CVC parents are more likely to suffer from moral hazard problems (Hellmann, 2002). As a result, entrepreneurs and other venture capital investors are likely to cede fewer control rights to this group of strategic investors.[6] To the extent shareholdings convey voting rights (convertible preferred stock with voting rights is a standard feature of venture investments), a start-up's equity ownership structure is also likely to reflect this moral hazard concern. Furthermore, allocating CVCs greater board power and larger equity stake in start-ups when their parents have complementary strategic objectives also provides CVCs with greater incentives to support and influence these new ventures. For example, Intel invests largely in new ventures and technologies that are based on Intel's microprocessors and systems. Thus, if successful, these venture investments should increase demand for Intel's own products. A key prediction in Hellmann (2002) is that competitive CVC investors are more likely to be passive investors without board seats or with weaker control rights. This leads to the following hypothesis:

H_1: Complementary strategic CVC investors obtain higher board representation and shareholdings in start-ups, while competing CVC investors (whose parents are potential

[5] According to Mark Heesen, president of the National Venture Capital Association (NVCA), companies that are "very early stage and cutting-edge" could be seriously hurt by people who use disclosed information to copy or otherwise appropriate the companies' intellectual property. He also notes that the information could compromise negotiations between start-up companies and their suppliers, landlords, or banks. "Other investors," he said, "do not want to be in companies whose returns can be jeopardized by excessive disclosure." (http://www.legalaffairs.org/issues/May-June-2005/argument_bayon_mayjun05.msp)

[6] A typical example from the business press which highlights the CVC moral hazard problem faced by start-up firms is: "CCBN.com, Inc., the global leader in internet-based investor communications, today charged that Thomson Corporation and its Thomson Financial Inc. subsidiary breached its fiduciary duty by using confidential information from CCBN board meetings to compete against the firm." Thomson Financial Inc. was the largest investor in CCBN at the time. Business Wire, Inc., July 30, 2002.

competitors of start-ups) obtain lower board representation and shareholdings for the same level of investment.

As discussed earlier, entrepreneurs / founders are likely to be particularly cautious about accepting strategic investments from CVCs with competing parents, who might be influential in the VC syndicate. This could be a serious concern since syndication among VCs is quite common. Thus, other VCs may support the CVC's position if some of these VCs are in other syndicates with the CVC or expect to realize future benefits from the CVC parent, such as access to new deal flow.[7] To mitigate the threat of a VC coalition being influenced by a potentially competing CVC parent, we expect to find relatively higher board control by company insiders/entrepreneurs in these circumstances. The following hypothesis summarizes this analysis:

H_2: *Insiders are willing to accept lower board representation when complementary strategic CVC investors are involved, whereas they require higher board representation in the presence of competing strategic CVC investors.*

CVCs are less likely to be early stage investors given their strategic orientation and the fact that in early stage start-ups products and services are not clearly defined and can change radically over time, which could undercut the strategic benefits available to a CVC parent from its venture investment. This should reduce CVC incentives to invest at earlier stages in a start-up's life. This CVC disincentive is also reinforced by founder / manager preferences. When lead VCs invest in start-ups at their earlier stages of development, they may find it easier to influence start-ups' development to their own liking. The potential for opportunistic behavior by both complementary and competing CVC parents is high because in the earlier stages of a start-up's life, its relations with a CVC is predominantly built on technology collaborations and licensing, which are easier to expropriate. Start-up relationships with other firms such as customer-supplier linkages, advertising

[7] For example, see "Venture capital trio forms a telecom 'coalition' with IBM": Venture capital firms Mayfield, 3i and Worldview Technology Partners are cozying up to IBM. Not because they want Big Blue's money. They aren't even lobbying IBM to purchase their start-ups. In general, IBM will get a window into complementary service-related telecom start-ups using Linux and funded by the well-heeled VC firms. IBM gets a chance to influence start-ups early on to develop IBM-friendly applications. Mayfield, 3i and Worldview get a better relationship with IBM and a look at its technology road map. (Source: Silicon Valley/San Jose Business Journal, February 14, 2003; http://www.bizjournals .com/sanjose/stories/2003/ 02/17/smallb3.html)

and marketing support, or strategic alliances and joint ventures, tend to be established in later stages of a start-up's life, and are likely to make expropriation relatively more difficult.

Thus, we expect start-up founders and managers to be wary of strategic CVC investors, particularly in the early stages of a start-up's lifecycle. While this concern is primarily aimed at competitive CVCs, in a start-up's early developmental stages, its ultimate products and services are yet to be determined, so an initially complementary strategic CVC could potentially become a competitor later. This leads to our third hypothesis:

H_3: CVCs are more likely to be later stage start-up investors and less likely to be lead investors.

Because start-ups and their entrepreneurs are capital constrained, strategic CVC investors could exploit their capital needs by offering funding when other VCs are reluctant to invest. CVCs could then pursue rent seeking behavior, unless they are constrained by co-investing TVCs. The rent-seeking behavior can get particularly exacerbated if CVCs also hold board seats. Thus, if an entrepreneur has no alternative investors, then it may reluctantly accept a lead CVC investor, but more determinedly limit its control rights. Thus, it follows that ceteris paribus, entrepreneurs are more likely to give board representation to a lead TVC over a lead strategic CVC. The following hypothesis captures this intuition:

H_4: Lead CVC investors are likely to have lower board representation than lead TVC investors.

Our analysis has so far focused on the allocation of control rights among VC syndicate members and start-up insiders so as to mitigate unwanted interference by competitive CVC investors. We now turn our analysis to the valuations offered to strategic CVC investors when they buy start-up shares. Because CVC investors are motivated by both financial and strategic benefits, start-ups are likely to be able to extract higher valuations from these investors. A start-up can demand even higher valuations when a CVC parent is a potential competitor that is seeking access to sensitive intellectual property or to influence the direction of a start-up's technological and product development. This conflict also increases the expected costs to the insiders of accepting funding from potentially competitive CVCs. Standard bargaining models predict that in the face of serious moral hazard concerns, start-up entrepreneurs have incentives to extract a higher fraction of the value created by competing CVC investments, relative to complementary or financially-motivated CVC investors (see propositions 3 and 5 in Hellmann, 2002). The following hypothesis captures the predictions of this analysis:

H_5: Competing strategic CVC investors are likely to pay higher prices when funding start-ups than complementary CVC investors.

These predictions raise an important question, namely why are competitive CVCs willing to give up board seats and pay higher prices for access to new ventures compared to their less "related" counterparts? One answer is that corporate venture investment provides an effective means of scanning and tapping novel technologies and practices, and the exposure to new innovations and product markets can be an important CVC objective in their investment decisions (Siegel et al., 1988). CVCs whose current product lines are similar to those of start-ups are likely to benefit the most from such exposure: the important knowledge gained from interacting with and learning from these start-ups can be directly applied to their existing product lines to make them more competitive and in some cases may even save the product lines from becoming obsolete. Therefore, competitive CVCs have greater incentives to give up board seats and pay premium prices for access to potentially valuable information on start-up technologies relative to other VCs. Next, we explore the descriptive power of these hypotheses using a sample of CVC-backed IPOs.

3. Data and Sample Characteristics

We describe variable definitions, data sources, sample criteria, sample properties and descriptive statistics in this section.

3.1. Data Sources and Sample Criteria

The initial data are taken from the SDC VentureXpert database, which identifies venture investments made by corporate divisions, subsidiaries and venture capital funds directly affiliated with corporations. Our sample comprises such corporate venture investments in privately-held US companies that go public between 1996 and 2001. Examining IPO prospectuses of CVC backed companies, we uncover additional CVC investments (after excluding strategic alliances and joint ventures), which are not reported in VentureXpert.[8] To test our theoretical predictions, we exclude start-ups created by corporate spin-offs and carve-outs or founded by public corporations because CVC parents have much greater influence over start-up managers in such cases and these transactions involve very different incentives, while raising a different set of economic issues.

[8] Examples of CVC investments missed by VentureXpert are investments in i) Broadvision Inc by Ameritech Development Corp. (VC subsidiary of Ameritech Corp.), ii) Rhythms Net Connections by Enron Communications Group (an Enron Corp. subsidiary) and iii) Nanogen Inc. by Oracle Strategic Partners, L.P. (an Oracle subsidiary).

From the VentureXpert database, we also collect the round-wise and total investments made by each VC in the start-up, as well as the aggregate investment made by all VC firms in the start-up. Other data obtained from the VentureXpert database include each VC's cumulative number of portfolio companies taken public prior to the start-up's IPO year, which is our proxy for VC reputation, size of the VC syndicate in each start-up, total start-up funding rounds, and aggregate VC industry investment. When faced with missing information from VentureXpert, we supplement our data by obtaining additional information from IPO prospectuses. Appendix 1 details the construction and data sources of all variables utilized in this study.

Start-up specific information is largely hand-collected from IPO prospectuses, which is our second major data source. From IPO prospectuses, we collect founder shareholdings, CEO shareholdings and founder status, management (insider) shareholdings, aggregate TVC shareholdings, CVC shareholdings, aggregate outsider shareholdings and the number of board seats allocated to start-up insiders, TVCs, CVCs and other outside investors. Start-up insiders include CEOs, founders and other managers whose shareholdings are available. Aggregate outsider shareholdings include shares owned by TVCs, CVCs, venture arms of commercial and investment banks, outside directors, consulting firms, pension funds, investment management firms, proprietorships, trusts and retirement funds.

Dates of the initial venture investment rounds by each TVC and CVC are extracted from prospectuses to determine the identity of the lead VC investor. A lead VC is defined as the VC investor in the initial VC investment round, who makes the largest total investment in the company up to the IPO. If two or more VCs initiate funding at the same time, then the VC with the largest start-up investment is designated as the lead VC. The lead venture capitalist usually originates the deal. Our primary results are robust to classifying the lead VC based only on a VC's aggregate investment in the company prior to the IPO.

Our third major data source is the CorpTech Directory, which classifies companies, including start-ups, into categories based on industry and product markets, whose classifications are much finer or more detailed than the more commonly used SIC classification. As explained in the next sub-section, the CVC–start-up's strategic relation is classified as complementary or competitive based on the CorpTech directory, which predominantly covers U.S.-based corporations and their subsidiaries. CorpTech directory has emerged as the largest directory of US-based high-technology firms with almost 100,000 entries. Lerner (1999, 2001) and Santhanakrishnan (2003) also use the CorpTech directory in their analyses to classify the relatedness of two corporations. Some start-ups receive financing from multiple CVCs, in which case we analyze each CVC–start-up pair, resulting

in 273 unique CVC–start-up pairs in 177 start-up firms.9 Of the 273 CVC–start-up pairs in our sample, 224 are reported in the VentureXpert database, and the remaining pairs are obtained from IPO prospectuses. In this analysis, a unique CVC–start-up pair is included only once in the sample, even though the CVC may have participated in multiple rounds of VC funding. For our analysis, detailed data must be hand-collected from IPO prospectuses and the CorpTech directory. As a result, our dataset is extensive and much richer than those available in commercial databases.

IPOs by CVC-backed start-ups are non-randomly selected. Firms going public represent at most 20% of all VC-backed firms and are generally the most successful of VC investments (see Gompers and Lerner (2001) on the profitability of venture investment exits and Cochrane (2005) and Peng (2003) on the frequency of IPO exits). One possible concern this raises is that the relation observed between CVC strategic investor types and the nature of their financial contracts could be because of a start-up's performance, which can create an ex post selection bias. Competitive CVC parents, for example, might join VC syndicates only after start-ups demonstrate good performance, which could explain some of the provisions in their financial contracts. A second concern is that start-ups funded by competitive CVCs are less likely to be in our sample of successful IPOs if an objective of competitive CVCs is to "slow down" or "steal" start-up firms' technology.

Examining the frequency of IPOs backed by competitive CVCs compared to complementary CVCs, we find that the former group makes up 45% of our sample, while the latter group makes up 52% of the sample. Given there are almost as many successful IPOs by start-ups with competitive CVC backing as there are start-ups with complementary CVC backing, one of two alternatives would need to hold. Either the moral hazard problems faced by start-ups relying on competitive CVC backing does not lead to a substantial reduction in the likelihood of IPOs, possibly because of different contracting solutions or else there are relatively more venture investments by competitive CVCs than by complementary CVCs. However, the latter possibility seems unlikely since complementary CVCs should be more attractive investors to start-ups. Hence although we cannot

[9] From the VentureXpert database, we find that 3,680 companies (out of 15,847 VC-backed companies based in U.S.) received CVC funding during the 1991-2001 period. We use this period to measure VC investments that result in IPOs during the 1996-2001 period. A total of 917 VC-backed companies went public during 1996-2001. The IPO frequency for companies backed by CVCs is understated in our sample because some CVC parents and start-ups that are not covered by the CorpTech Directory (about 8.8% of the CVC-backed IPO sample) are excluded from our sample. The slightly lower IPO rate of CVC-backed companies suggests that CVCs may not receive the best deal flow, consistent with the notion that entrepreneurs may find them less attractive as investors.

completely rule it out, we do not believe that selection bias in favor of complementary CVC-backed start-ups is likely to be a serious problem.

By examining cross sectional differences within our sample of CVC-backed IPOs, we limit the concern that the relationship observed between the type of strategic CVCs and their financial contracts is the result of start-up performance since we only examine successful start-ups that have attracted CVC investments. Second, the allocations of shareholdings and board seats, and the terms of share pricing are determined before it is known whether a start-up is going public. Finally, even though many CVC investments in these successful start-ups are categorized as competitive, appropriate financial contracting can limit the adverse effects of conflicts of interest and improve manager incentives through the allocation of shareholdings and control rights, which can then lead to the eventual success of these start-ups. Thus, this study also adds to our understanding of the factors that influence start-up success by identifying syndicate structures associated with more successful VC outcomes.

Our analysis cannot completely eliminate selection biases arising from start-up performance, given the lack of prior performance data for privately-held start-ups when they receive CVC funding. However, we can analyze well-known measures of company performance such as Tobin's Q and return on assets following the IPO (e.g., three years after the IPO) to alleviate concerns that a CVC's financial contract with a start-up could be a function of a start-up's prior performance. Thus, for example, post-IPO performance of start-ups that went public in 2001 is measured over the years 2002-2004. Although an imperfect proxy for pre-IPO start-up performance, the post-IPO performance is likely to at least partially reflect the performance expectations when the start-up received CVC funding. More importantly, an insignificant performance difference across competing and complementary CVCs would suggest CVC contracts and the involvement of the two CVC types are not driven by a common factor namely, a start-up's prior performance. To obtain the necessary financial and accounting information to study the post-IPO performance, we use the Compustat database, which is our fourth data source. A brief analysis of the post-IPO start-up performance is reported in section 5.4.

3.2. Measures of Complementary and Competitive Firm Relationships

The extant literature on product market competition, strategic alliances, joint ventures and knowledge transfers between companies generally uses SIC codes to assess whether two companies are competitors. Several studies that take this approach include Mowery et al. (1996), Grullon et al. (2006) and Asker and Ljungqvist (2008). The approach used in the existing literature treats two

companies as competitors if they have the same 4-digit SIC code. However, SIC-based measures of relatedness have several limitations, with the most important being that they only provide relatively broad description of two companies' relatedness. This makes it particularly challenging to assess the relatedness of start-ups and CVC parents when VC-backed start-ups are generally concentrated in a small number of SIC codes. Furthermore, Fan and Lang (2000) list many serious drawbacks to SIC-based classification of companies' relatedness. Specific limitations of using a SIC-based classification for our CVC-backed start-up sample are discussed in section 5.

Our approach for categorizing the relatedness of start-ups and CVC parents is to use the CorpTech Directory's detailed classifications of the specific market niches a company operates within and its product level characterizations. The directory classifies companies into broad categories such as telecommunications & internet, software, hardware, biotechnology, pharmaceuticals etc. These broad industries are further classified into sub-categories such as internet search services, internet multimedia services, internet data aggregation services etc. providing a second level of characterization of companies. Then a third level denotes the specific niche in which a firm operates and gives product level characterizations. Multiple industry and product codes are often assigned to a specific company. For instance, a CorpTech covered company sells goods under the following distinct product codes: "Business planning systems software", "Sales forecasting software", "Direct marketing software", "Customer service software", "E-commerce applications software", and "Order management software", while the firm is assigned a single SIC code 7372. Thus, the CorpTech Directory provides much finer product-level classifications with its more than 3000 product level codes, and facilitates more accurate measurement of CVC parent-startup relatedness than SIC based classifications, particularly for high-tech companies concentrated in a small number of 4-digit SIC codes. In our start-up sample, there are 309 different tier-3 CorpTech codes (the most detailed), and 95 unique tier-2 CorpTech codes. In contrast, the CorpTech directory reports only 58 different 4-digit SIC codes associated with these same start-up firms, and only 32 unique 3-digit SIC codes. While CRSP and Compustat generally report only a single primary SIC code per firm, particularly for young start-ups that have recently gone public, the CorpTech directory often gives multiple SIC codes per firm, which offers greater product information.[10] Even then, SIC classifications continue to be much more aggregated and accordingly less informative.

[10] Both 3- and 4-digit SIC codes for our CVC backed start-ups exhibit high industry concentration, using either the CRSP or Compustat database. CRSP reports 55 unique 4-digit SIC codes in our sample of start-ups, while Compustat has 45 different 4-digit SIC codes. Turning to the 3-digit SIC classifications in our sample, CRSP has

Thus, we follow Lerner (1999, 2001), and Santhanakrishnan (2003) who also use the CorpTech Directory to classify the relatedness of start-ups and CVC parents. The first step in this process is to hand-collect industry and product codes for our sample of start-ups and their corporate VC investors from the CorpTech Directory. These industry and product codes are used to measure the degree of complementarity or competitiveness in the start-up - CVC relationship. A CVC parent is defined as a potential competitor of a start-up if any of the product codes of the start-up and CVC parent match at all three product classification levels. Since complementary operations means that a CVC parent and a start-up are related, but pursue somewhat different product lines, a start-up and a CVC parent are defined as complements if their product codes match at the first or second level.

If the product codes do not match at any level, we pursue a further analysis based on SIC codes. We classify the relationship as competitive if the companies' SIC codes match at the 4-digit level and complementary if they match at the 2-digit or 3-digit levels. We are able to classify the strategic relationships of 6 additional CVC–start-up pairs using this SIC based approach. Finally, if the CVC–start-up relationship remains unclear, we examine the start-up's IPO prospectus to determine its operating relationship with the CVC parent. For instance, if the CVC parent is a customer of, a supplier to or a technology licensor to the start-up, we classify such relationships as complementary in nature. This procedure allows us to classify the strategic relationships of 6 more CVC–start-up pairs. In unreported robustness tests, we also include indicator variables for each CVC-start-up pair, denoting whether the CVC parent is a customer of, a supplier of or a technology licensor to the start-up. However, none of these indicator variables are statistically significant and all our primary results remain qualitatively similar.

Finally, when the IPO prospectuses explicitly mention a CVC parent as a potential competitor for 43 CVC-start-up pairs, we code the relationship between the start-up and the CVC parent as competitive overriding our earlier classifications based on CorpTech, SIC codes and IPO prospectuses, which results in 7 of the 43 CVC-start-up pairs being reclassified as competitive. When we find no product code matches using the CorpTech product or SIC codes, or any evidence of a strategic relationship from the IPO prospectuses, we classify the CVC investment in the start-up as a financially motivated investment.

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36 unique SIC codes, while Compustat has only 29 different SIC codes. We also find that a number of CRSP and Compustat SIC codes are undefined at the 4-digit level and appear to have an arbitrary zero appended as a 4th digit.

3.3. Sample Properties

Table 1A provides information on CVC-backed IPOs in the 1996-2001 period. Over this six year sample period, the average number of CVCs investing in one of our IPO firms is 1.54. The average number of CVCs per IPO firm shows an upward trend across our sample period, which is consistent with other studies that find rising CVC investments in the mid to late 1990s. The frequency of CVC-backed IPOs peaks in 1999-2000 and is markedly higher than other sample years. Equally noteworthy is their drop in 2001, when only 3 CVC-backed IPOs are completed. More generally, year 2001 accounted for only 4.20% of all VC-backed IPOs that occur in the 1996-2001 period (Source: Thomson Financial Venture Economics). Table 1B shows a peak in the annual number of CVC investments per start-up in 1999-2000, when 107 CVCs invested in 76 start-ups. As noted earlier, our sample comprises 273 unique CVC–start-up pairs associated with 177 start-ups that eventually go public.

Although 74% of CVC-backed firms in our sample go public in 1999-2000, only about 40% of all CVC investments occur in those years (Table 1B). It is noteworthy that while 45% of all CVC investments in our sample are classified as competitive, during the 1999-2000 period when CVC investors are most active, the percentage of competitive CVC investments remains quite similar, i.e. 47%. Nevertheless, we control for year fixed effects in our analysis to account for time-varying market conditions, which could affect the investments of complementary or competitive CVCs.

Table 2A reports descriptive statistics on the percentages of shareholdings in CVC-backed companies by major venture capital investor categories. Pre-IPO equity of all outside investors (TVCs, CVCs, VC arms of banks, and external directors) average 58.15% of shares outstanding. In more than 95% of the cases, there is hardly any non-VC private equity investment. Therefore, we do not report it separately. If there is any, it is reflected in the 'total outsiders shareholdings' variable. For VC syndicates composed of TVCs, CVCs, and VC arms of banks, pre-IPO shareholdings are on average 51.11%. CVC shareholdings when they have (don't have) board seats average 12.17% (8.09%). These numbers are similar to TVC shareholdings which average 11.89% (7.76%) when TVCs have (do not have) board representation. Total pre-IPO TVC shareholdings average 35.76%. Since there are 273 CVCs investing in 177 companies, we present the shareholdings of each individual CVC investor in a start-up, whereas all other shareholdings are company level totals. Finally, pre-IPO insider shareholdings composed of the shares owned by founders, CEOs and inside officers/directors, is on average 19.39%. Total reported shareholdings do not add up to 100% for several IPO samples because prospectuses are only required to report shareholdings levels of 5% or more for non-officer-directors.

Among insiders, entrepreneurs/founders hold the largest stake, which averages 15.76%. In 41% of start-ups, founders are no longer CEOs, although they continue to occupy board seats in a majority of companies. This is consistent with earlier evidence that VCs exert considerable board control and frequently exercise their power to replace founder-CEOs with professional managers in order to professionalize firms and bring in more experienced management prior to an IPO. Of course, floundering start-ups frequently experience CEO turnover as well, though far fewer of these start-ups ever go public. As expected, non-founder CEO shareholdings are considerably lower, averaging only 5.56%. These statistics on founder equity stakes, the presence of non-founder CEOs, and non-founder CEO equity stakes are remarkably similar to those reported in Kaplan et al. (2009) in their study of VC-backed IPOs.

We report board representation in CVC-backed companies in Tables 2B and 2C. The top rows in Tables 2B and 2C refer to each CVC investor in the start-up, while the other rows are company-specific. As observed in Table 2B, the median CVC-backed IPO has no board seats allocated to the CVCs. At the same time, TVCs hold two seats on the board. Of the 7 board seats in the median firm, a large majority of 5 seats are held by outsiders, who include venture capitalists. This is consistent with existing empirical evidence that the proportion of outsiders on boards of venture backed firms is significantly higher than that for non-venture backed firms. Prior research shows that this has important implications for corporate governance practices in these firms (Baker and Gompers, 2003; Hochberg, 2008).

Finally Table 2C reports the proportional board representation in CVC-backed companies. For company insiders, the median level of control is 25% of the board seats. For the median CVC backed IPO firm, CVCs have no board power. At the same time, TVCs control a third of the board seats in the median CVC backed company. This is consistent with entrepreneurs being reluctant to give CVC investors substantial control rights. We next discuss the empirical results pertaining to each of the hypotheses in the next section.

4. Empirical Results

In this section, we present a detailed analysis of how CVC strategic objectives are related to the allocation of control rights among CVCs, start-up insiders and lead VC investors. Finally, we relate CVC strategic motives to the prices they pay for start-up shares.

4.1. Allocation of Board Seats to Strategic VC Investors

Table 3 reports the distribution of shareholdings and board seats across strategic categories of CVC investments. While 45% of all CVC investments are classified as competitive, in about 52% of CVC investments, CVCs and start-ups are complementary partners.[11] Though complementary CVC investments are more frequent in our CVC backed IPO sample, it is intriguing how large the proportion of competitive CVC investments is. In Appendix 2, we report the identities of CVC parent corporations, which make venture investments in two or more companies that go public during the 1996-2001 period. We also report the strategic profiles of their investments in start-ups (competing; complementary), their exchange listing, and the number of IPO companies funded by each parent company. As expected, the list is predominantly populated with companies that operate in high-tech industries, consistent with their largely strategic motivation for venture investing.

Comparing median shareholdings across investor groups in Table 3, we see that strongly complementary corporate investors have the highest shareholdings, followed by weakly complementary investors, while potential competitors have the smallest shareholdings. This evidence is consistent with Hypothesis 1, which predicts that shareholdings of complementary CVC investors should exceed those of competing CVC investors, though the difference in shareholdings is not statistically significant. This is interesting given that competing CVC investors have a larger amount of capital invested in these start-ups than do complementary CVC investors. Turning to the board seat allocation, we observe that board seats held by CVCs show significant variation across types of strategic CVC investors. Strongly complementary CVC investors receive the most board seats, followed by weakly complementary CVCs, with the competitive CVCs having the fewest seats. A similar monotonic pattern is observed for the percentage of CVC board seats to total board seats. The difference in CVC board seats and CVC board power (ratio of CVC board seats to total board seats) across complementary and competing CVC investments is statistically significant at conventional levels. This evidence is consistent with Hypothesis 1, which predicts that board representation should depend on the type of strategic investment involved.

[11] Among the complementary CVC investments, 33% of CVC parents share a strong complementarity with the start-ups' operations, while the remaining 67% have weakly complementary relationship with the start-ups. Strong complementary relation is when the product codes match at both the first and the second level, while weak complementary relation is when they match only at the first level. When the CorpTech product codes do not match, strong (weak) complementarity is based on SIC codes matching at the 3-digit (2-digit) level. Finally, absent any CorpTech product code or SIC code matches, if a CVC–start-up operating relation can be determined from the prospectus, and the firms are not competitive, then the relation is classified as weakly complementary.

We find that on average both competitive and complementary CVCs initiate their investments in start-ups between the third and fourth funding rounds (see Table 6) and the initial funding round is not significantly different across competitive and complementary CVCs. We include the CVC's initial funding round, deflated by total funding rounds that the start-up receives as a regressor in our multivariate analysis of CVC control rights and share pricing. Beginning in the next section, we employ multivariate analysis to address the concern that our univariate results may be driven by different deal characteristics across the two samples. We also find that TVCs on average receive greater board representation than CVCs, even when they initiate their investments in the same rounds as the CVCs (see the evidence in support of Hypothesis 4 in subsection 4.3). However, comparing CVCs with TVCs is not the main goal of this study. Our focus is on share pricing and allocation of ownership and control rights across CVCs with different strategic motivations.

4.1.1. CVC Board Power

To test Hypothesis 1 in a more rigorous multivariate framework, CVC board power is regressed on a set of explanatory variables including an indicator variable 'CVC Strategic Competitor' which takes a value of one if a CVC's strategic relationship is classified as competitive and is zero otherwise (i.e., for complementary and financial relationships). Since there can be significant heterogeneity in board size across start-ups, which can have important implications for the amount of board influence that a CVC wields, we use the number of board seats allotted to an individual CVC divided by total board seats as our measure of CVC board power. Since a start-up can have several CVC investors, it can have multiple observations in the regression analysis, reflecting each unique CVC-startup pair.

The control variables include a CVC's portion of a VC syndicate's total start-up investment, a CVC's earliest funding round divided by total funding rounds in the start-up, number of funding rounds, the CVC's reputation relative to the lead VC's reputation, CVC shareholdings, VC syndicate size, aggregate VC industry investment at the time of a CVC's initial funding round, the start-up's age measured at the time of the CVC's initial funding round, median market-to-book ratio in the start-up's primary industry at the CVC's initial funding round, which acts as a measure of investment opportunities, and indicator variables denoting whether the CVC is lead investor in the VC syndicate and whether the CEO is a founder.

For calculating industry market-to-book ratios, firms are drawn from the Compustat universe based on their primary 3-digit SIC codes. The market to book ratio is measured by the sum of book value of assets plus market value of equity minus book value of equity, all divided by book value of

assets. VC reputation is measured by the cumulative number of portfolio companies taken public as of the year-end prior to the IPO. This reputation measure gives greater weight to older VCs. The number of funding rounds, VC syndicate size, aggregate VC industry investment, and start-up age are measured in natural logs. Higher CVC shareholdings are likely to denote their greater negotiating power and influence in the VC syndicate. We include CVC firm, industry and year fixed effects as additional controls and the standard errors are robust to heteroscedasticity. As noted in Appendix 2, the eight largest CVCs account for more than a third of our sample (with the four largest accounting for nearly a quarter of the observations). To account for this concentration, we use the standard errors clustered at the CVC-firm level, and our regressions include CVC fixed effects for the eight most-active CVCs. Our results are also robust to clustering at the start-up level. The industry fixed effects cover the six high-tech industries belonging to SIC codes 283 (biological products, genetics and pharmaceuticals), 481 (high-tech communications), 365-369 (electronic equipment), 482-489 (communication services), 357 (computers) and 737 (software services).

Table 4A reports estimates for four OLS regression models along with a tobit model to test Hypothesis 1, which predicts a relation between CVC board power and the type of CVC strategic investment. The first model excludes CVC shareholdings and the lead CVC indicator as potentially endogenous. In Models 2 and 3 we include CVC shareholding and lead CVC indicator respectively. The fourth model includes both variables. We report these alternate specifications to assess the robustness of our estimates to potential endogeneity of CVC shareholdings and the lead CVC indicator. Finally the fifth model includes all variables in a two-boundary tobit framework since the dependent variable, CVC board power, is bounded from below at zero and above at unity. In all five models, we observe a significantly negative coefficient on the 'CVC Strategic Competitor' indicator, which is consistent with the predictions of Hypothesis 1 that start-ups offer a lower number of board seats to potentially competitive CVC investors.

Turning to the other explanatory variables in Table 4A, the coefficient on a CVC's portion of total VC syndicate investment in a start-up is positive and significant indicating CVCs receive more board seats when they invest relatively more. However, when CVC shareholdings is introduced in models 2, 4, and 5, a CVC's portion of total VC syndicate investment becomes insignificant, while CVC shareholdings is positive and significant. These results are consistent with larger shareholders receiving more board seats and CVC shareholdings capturing the effect of a CVC's proportional investment in a start-up. It is noteworthy, but perhaps not surprising, that when CVCs invest in earlier rounds relative to the start-up's total funding rounds, they hold greater board power. However, after controlling for a CVC's earliest funding round, a CVC's board representation is

unaffected by its lead syndicate status. The negative, albeit insignificant, coefficient on the start-up's age suggests that insiders in relatively well established start-ups have greater leverage in their negotiations with CVCs over the allocation of board seats. The coefficient on VC syndicate size is negative and significant in three of the five models, suggesting that the larger the number of VC investors, the lower is CVC board representation. Finally, when CEOs are founders in start-ups, CVCs have less board power, indicated by the negative coefficients in all five regressions, which are statistically significant in two of the five models.

We undertake a number of other robustness checks. First, we consider two alternative measures of the length of association of a CVC with a start-up: the time between a CVC's first investment in the start-up and its IPO date, and this measure scaled by the time between the first TVC's initial investment in the start-up and the IPO date. The mean (median) time between a VC's initial investment and the start-up's IPO is 565 (383) days for CVCs and 1103 (989) days for the earliest TVC investor, indicating that CVCs tend to be later stage investors. Second, we include the CVC's final funding round in the start-up (or its value divided by the total number of funding rounds) as an additional control variable. This variable addresses the concern that some CVCs may not participate in later VC funding rounds, and as a consequence may lose their board seats. In univariate comparisons, the final CVC funding round (or its value divided by the total number of funding rounds) does not differ across competing and complementary CVC investors. On average, the final investment rounds of both competing and complementary CVCs average between four and five rounds. Our results are qualitatively similar in the robustness tests that include these control variables; furthermore these additional variables are statistically insignificant. Finally we exclude VC syndicate size from our regressions to address a potential endogeneity concern with this control variable. Our results are robust to this modification as well.

As a further robustness check, we estimate instrumental variables (IV) regressions in which we instrument CVC firm shareholdings using aggregate VC industry investment and median market-to-book ratio in the start-up industry. These variables, which capture aggregate VC investment activity, are likely to affect start-up valuations, and therefore CVC shareholdings, but are not expected to affect CVC board power directly, as is observed in Table 4A. For example, in univariate regressions of CVC firm shareholdings on median market-to-book ratio and aggregate VC industry investment, we find both variables have negative coefficients as expected. However, while aggregate VC industry investment is highly significant (p-value < 0.001), the median market-to-book ratio emerges significant only at the 14% level. Using these instruments for CVC firm shareholdings, our primary results (not reported) remain qualitatively similar to each of the five

specifications presented in Table 4A. In summary, the various robustness tests support the reliability of the conclusion that CVC board power is significantly reduced when CVCs have competitive strategic goals, at least for the case of successful start-ups completing IPOs.

4.1.2. Aggregate CVC Board Power

In section 4.1.1, each observation represents a unique CVC–start-up pair. As a result, a start-up can have multiple observations when more than one CVC investor is involved. This outcome could introduce some dependence across the observations, which could overstate the model estimate's degrees of freedom and result in downward biased standard errors. To address this concern, regressions in Table 4B aggregates all the CVC investors in an individual start-up into a single observation. The dependent variable is the ratio of board seats held by *all* CVCs divided by board size. The explanatory variable of primary interest is the 'Net Strategic Competitor', defined as the sum of the strategic relationships across all CVCs investing in a start-up firm. For each CVC, its strategic relationship is given a value from plus one to minus one. A competitive strategic relationship is given a value of one, a purely financial relationship is given a value of zero and a complementary strategic relationship is given a value of minus one. For example, if two different CVCs invest in the same start-up where the strategic relationship with the first CVC is complementary, while the relationship with the second CVC is competitive, then the indicator variable 'Net Strategic Competitor' takes a value of zero (the results remain qualitatively unaltered if we weight multiple CVCs by their relative shareholdings in a start-up). The higher the value of 'Net Strategic Competitor', the greater is the potential for competition between a start-up and its CVC investors. In 63 (83) start-ups, *net strategic competitor* takes a strictly positive (negative) value indicating a competitive (complementary) CVC syndicate. We use the term CVC syndicate to refer to the CVC members of the VC syndicate.

The other explanatory variables used in Table 4B are the portion of VC syndicate investment contributed by all CVCs, the earliest funding round by any CVC in the VC syndicate divided by the start-up's number of funding rounds, lead VC reputation, number of funding rounds, VC syndicate size, aggregate VC industry investment at the time of first funding round by any CVC, start-up age at the first funding round by any CVC, median market-to-book ratio in the start-up industry at the initial funding round by any CVC, CVC syndicate shareholdings defined as the sum of the shareholdings of all CVCs in the VC syndicate, and two indicator variables denoting whether a CVC is a VC syndicate lead and whether the CEO is founder. We include industry, year and CVC firm fixed effects as additional controls and the standard errors are robust to heteroscedasticity and

clustering at the lead VC firm level. CVC firm fixed effects are captured by eight indicator variables denoting start-ups backed by the 8 most-active CVC investors.

To assess the robustness of the results reported in Table 4A, five similar equations are estimated as in Table 4B. The first model excludes CVC syndicate shareholdings and the lead CVC indicator as potentially endogenous. In models 2 and 3 CVC syndicate shareholdings and lead CVC indicator are respectively included, while models 4 and 5 include both variables. Turning to the estimates in Table 4B, the 'Net Strategic Competitor' coefficient is negative and significant across all five models. Higher competition between a start-up and its CVC investors is associated with lower aggregate CVC board power. Consistent with the results in Table 4A, the coefficient on CVC syndicate shareholdings is positive and significant in models 2, 4, and 5. While the coefficient on the portion of VC syndicate investment contributed by all CVCs is insignificant in models 1 and 3, the coefficient is negative and marginally significant in models 2, 4, and 5 when CVC syndicate shareholdings is introduced, which could be due to the two variables being highly correlated. Both CVC syndicate's earliest funding round and VC syndicate size have significantly negative coefficients, similar to the results in Table 4A. Overall, the results are robust to aggregation across the strategic relationships of multiple CVCs in the same start-up.

4.2. Insider Board Power

In this section we evaluate the prediction of Hypothesis 2 that insider board power will be greater when a competitive strategic CVC is an investor. Directors in VC backed start-ups can be classified into four groups: TVCs, CVCs, insiders and independent directors. We start by measuring the distribution of insider board power based on the type of strategic relationship that exists between a start-up and its CVC syndicate members, as captured by 'Net Strategic Competitor'. Recall that it sums the strategic relationships across all CVCs investing in the same start-up firm, where competitors take a value of one and complements take a value of minus one. For strictly positive values, CVC syndicate members on average are start-up competitors, while for strictly negative values the CVC syndicate members on average have complementary relationships. We find that insider board power is significantly higher when CVC syndicates are viewed as competitors, with a mean (median) value of 30.7% (28.6%). This is significantly larger than average (median) insider board power of 24.8% (25%) when CVC syndicates are viewed as strategic complements. Thus, insiders retain more power and influence when CVCs are viewed as having conflicts of interests, which is consistent with the prediction of Hypothesis 2. Turning to insider shareholdings, we find they are not significantly different across the types of strategic relationships

that exist between a start-up and its CVC syndicate, although the average insider shareholdings of 21.6% in start-ups backed by syndicates with primarily competitive CVCs is slightly higher than the 18.3% in start-ups backed by syndicates with primarily complementary CVCs.

To test Hypothesis 2 in a multivariate framework which controls for other differences in deal characteristics across the two samples, we use the same framework as in the previous sections. The dependent variable is insider board power defined as the ratio of insiders' (officer-directors) board seats divided by total board seats. The correlation between CVC board representation and insider board representation is -0.24, whereas the correlation between CVC shareholdings and insider shareholdings is -0.20. These low correlations suggest that the results for CVC board representation do not automatically lead to inferences about insider board representation. Most explanatory variables used in the analysis of insider board power are as defined earlier. However, there are three differences from Table 4B's specification for explaining aggregate CVC board power. First, instead of the portion of VC syndicate investment by all CVCs, we include total VC syndicate investment (including CVCs) to reflect a VC syndicate's negotiating power, which should result in reduced insider board power. Second, instead of CVC syndicate shareholdings, we include insider shareholdings because higher insider shareholdings should strengthen insider negotiating power and consequently increase insider board power. Third, instead of CVC reputation, we include lead VC reputation since more reputable lead VCs are likely to have more negotiating power, which can result in insiders retaining fewer board seats. Similar to the analysis of aggregate CVC board power, we include industry, year and CVC firm fixed effects. The standard errors are robust to heteroscedasticity and clustering at the lead VC firm level.

We estimate four alternate OLS regression models and one two-boundary tobit model whose specifications are the same as in Table 4B. In unreported results, we observe a significant positive coefficient on 'Net Strategic Competitor' in all five models, which indicates that a higher degree of potential competition between a start-up and a CVC parent is associated with higher insider control of the board. Although the results are not reported to conserve space, they are available on request.

4.3. Choice of Lead VCs

As discussed earlier, insider concerns regarding CVC conflicts are likely to be greater when CVC investments occur in start-ups' earlier stages, and especially when CVCs are lead investors. As such, the likelihood of a CVC firm becoming an influential VC syndicate lead and the expected size of its board representation are likely to reflect such entrepreneur/founder moral hazard concerns. Table 5A presents summary statistics on shareholdings and board representation of CVCs

in lead investment positions and contrasts them with shareholdings and board representation of lead TVCs. Consistent with Hypothesis 3, CVCs are much less likely to be lead investors with only about 12% of start-ups having CVCs as lead VCs. The remaining 88% of start-ups have TVCs as lead syndicate members. Since the earliest developmental stages in a start-up's lifecycle are the riskiest and the most time-consuming for VCs, these investors receive substantially more shares and control rights. The average and median shareholdings of a lead TVC investor is 17.63% and 16.10% respectively, while the average and median shareholdings of a lead CVC investor is 15.07% and 11.95% respectively. The larger average shareholding of lead TVCs relative to lead CVCs is not significantly different, although the difference in median shareholdings is significant at the 5% level. However, there is a large difference in board seat allocations. Strikingly, lead TVCs obtain board seats in more than 99% of their venture investments, whereas only about 73% of lead CVCs get board representation. Among lead CVCs, complementary (competitive) CVC parents have board seats in 75% (70%) of their investments. Finally, consistent with Hypothesis 4, average board representation (not reported) of lead TVC and CVC investors across all start-ups are respectively 17.31% and 11.64%; the difference being statistically significant at the 1% level.

In Table 5B, we present summary statistics for all VC investors in a start-up's initial funding round. We focus on the initial funding round since many corporations may not invest in early stage companies and as a consequence they are likely to receive weaker control rights. Yet, we find that many CVCs do invest in the initial funding round alongside TVCs. In this analysis, we examine the board representation and shareholdings of all first round VC investors. In our sample of 177 start-ups, there are 332 VC investors that participated in the *first* funding round. More than 82% of these investors are TVCs, while nearly 18% are CVCs, which is again consistent with Hypothesis 3. We observe that while average shareholdings are not statistically different across the two investor types, board representation is markedly different. Of all the TVCs that invested in the first funding round, 83% are allocated board seats. Yet, only 56% of the CVCs are allocated board seats in return for their investments. Similar to the results in Panel A, complementary CVC parents receive board seats in more venture investments relative to competitive CVC parents when they are among the initial round investors. Thus, the results in Table 5 are consistent with Hypotheses 3 and 4, and indicate that moral hazard concerns make insiders particularly wary when strategic CVC investors participate in the earlier stages of a start-up's life and when CVCs act as VC syndicate leads. In further support of Hypothesis 3, it is noteworthy that CVCs typically initiate their start-up funding in much later rounds relative to TVCs, on average joining the VC syndicate only after the third round of start-up funding (see Table 6).

In our multivariate analysis, we separately estimate the determinants of (1) the likelihood of lead VCs (including CVCs) receiving board seats and (2) the level of lead VC board power, by examining the effects of the following two primary variables: two indicators denoting whether a lead VC is a strategic competitor and a strategic complement respectively (notice that if the lead VC is not a CVC, the two indicator variables carry a value of zero). We employ many of the same control variables used in the insider board power analysis with a few differences. We include the shareholdings of the lead VC investor as well as aggregate VC industry investment and the start-up industry's market-to-book ratio, both measured at the lead VC's initial funding round. The standard errors are robust to heteroscedasticity and clustering at the lead VC firm level. While the likelihood of board seat allocation is estimated in a logit framework, the lead VC board power is estimated using OLS and two-boundary tobit models. Consistent with the univariate results, our findings (not reported) indicate that lead CVCs, particularly strategic competitors, (1) have a lower likelihood of receiving board seats and (2) expect to obtain less board power than lead TVCs.

4.4. Pricing Strategic Investments in Start-ups

Beyond the allocation of control rights, start-up investors also have some choice over the pricing terms they agree to in selling shares to VCs. According to Hypothesis 5, start-up entrepreneurs are likely to extract higher valuations when a CVC parent is a potential competitor. In this section, we analyze the average purchase prices paid by CVC investors for their shares relating them to their strategic objectives (competitive or complementary). While VentureXpert identifies CVC investments in different rounds of start-up funding, it does not track the price paid per share in each funding round. However, it does report a CVC investor's total investment in a start-up. Therefore, we can take a CVC's aggregate investment across rounds and divide it by start-up shares held by the CVC at the IPO date to arrive at the average share purchase price paid by each CVC.

In Table 6A, we observe that the average purchase price paid per start-up share is significantly higher for competing CVCs relative to complementary CVCs. On average, a competing (complementary) CVC parent pays $5.82 ($3.98) per share. The corresponding median numbers are $3.88 and $3.21 respectively for competing and complementary CVCs. The differences in mean and median share purchase prices are statistically significant across the two types of strategic CVC investors. However, part of this difference could be caused by differences in average IPO offer prices across the two samples. For a more meaningful comparison, we deflate our measure of CVC share prices (average purchase price per share) by the start-up's IPO offer price to control for differences in otherwise unobserved start-up characteristics.

Across all funding rounds, complementary CVC investors on average pay 30% of the IPO offer price for their venture investments in these start-ups, while competitive CVC investors on average pay 49%, a difference of 63 percent. This difference in CVC investment pricing relative to IPO offer price is statistically significant at the 1% level. We also obtain a statistically significant (at the 2% level) difference in the median ratio of CVC purchase price to IPO offer price (across all funding rounds)**,** which equals 0.25 for complementary CVCs and 0.30 for competitive CVCs. These findings support the prediction of Hypothesis 5.

Turning to Table 6B, the mean purchase price paid by TVC investors relative to the mean IPO offer price in start-ups backed by competing and complementary CVCs is 0.24 and 0.20 respectively, which is not significantly different. The mean share purchase price paid by TVCs is defined as the total investment in a start-up by all TVC syndicate members divided by their total shareholdings as of the IPO date. We obtain similar results for median values of the ratio of the TVC purchase price to the IPO offer price, which suggests that differences in the characteristics of the two samples are not causing the observed difference in CVC share pricing. Thus**,** we conclude TVCs pay lower purchase prices than CVCs, which is consistent with the evidence reported in Gompers and Lerner (2000a). There are at least two possible reasons for higher CVC pricing. First, CVCs have to pay a higher valuation to compensate other venture investors for the potential conflicts of interests they introduce because of their strategic objectives. Second, the higher CVC pricing is due to the later stage of CVC investments. Consistent with this conjecture, both competing and complementary CVCs on average initiate their start-up investments between the third and fourth funding rounds. The similarity in the timing of the investment by the two types of CVCs also suggests that the difference in their purchase prices is not due to one group of CVCs investing earlier and thus, at lower prices.

Table 7 presents regression estimates for CVC share pricing in the same framework as Table 4A. The dependent variable is the average purchase price paid by CVC investors for their shareholdings, divided by the IPO offer price. In unreported robustness tests, our results are insensitive to winsorizing the ratio at the 1% and 99% levels. Our results are also similar when we scale the mean purchase price paid by CVC investors by the first day closing price of the IPO issuer's stock. The explanatory variables in the multivariate analysis are the same as in Table 4A. In all five specifications, the coefficient on the 'CVC Strategic Competitor' variable is positive and statistically significant. This indicates that start-up insiders extract higher valuations from CVCs when their parent corporations are seen as potential competitors. Among other significant results, we find when CVCs initially invest in later rounds they pay more for their shareholdings, which is

to be expected given that our sample consists of successful IPO firms, in which later venture rounds are typically funded at higher purchase prices. The coefficient on CVC firm shareholdings is significantly negative suggesting that higher CVC shareholdings could reflect higher CVC bargaining power, which results in lower per share prices paid by CVCs. An alternative interpretation is that when CVCs hold proportionally larger equity in start-ups, this reflects a proportionally weaker demand by other venture investors and as a consequence CVCs are in a stronger negotiating position to demand more favorable pricing.

As a further robustness check, we measure the price paid by CVC investors for each percent of the outstanding shares they receive and relate this variable to the type of strategic investment involved. The purchase price per one percent of equity is akin to a start-up's implied "post-money" valuation, a standard valuation measure in the VC industry. The so-called post-money valuation measures start-up value based on the equity stake purchased by the investor, which is what our variable captures, albeit averaged across all funding rounds. Since VentureXpert does not report prices paid per share in individual funding rounds, we are unable to determine either the "pre-money" or the "post-money" start-up valuations in a given funding round. In subsection 5.3, we analyze round-wise CVC investments in further support of Hypothesis 5.

We find that on average, competitive CVC investors pay $1.60 million for each shareholding percentage, while complementary CVC investors pay $1 million for each shareholding percentage, which represents a statistically as well as an economically significant difference. Estimating the impact of a strategic CVC relationship on the price paid for each shareholding percentage in a multivariate framework with the same control variables as in Table 7, we find the coefficient on the 'CVC Strategic Competitor' variable is positive and statistically significant. We do not report these results to conserve space; however they are available upon request. Overall, our results strongly support Hypothesis 5, which predicts that start-up insiders are able to extract higher valuations from CVCs when their parent corporations are seen as potential competitors.

5. Robustness Analysis

In this section, we evaluate the robustness of our results to endogeneity, analyze the investment patterns of all VCs that syndicate with CVCs in the same funding round to determine the robustness of our CVC pricing results, compare the CorpTech and SIC classifications of CVC parent's strategic relationships with start-ups and examine pre and post-IPO start-up performance.

5.1. Controlling for Endogeneity Using the Heckman Correction

If factors that cause a competing (or complementary) CVC parent to fund a start-up also lead to differences in contract features such as board power and share pricing, then selection bias could result, leading to inconsistent model estimates. To address this concern, we use the Heckman correction procedure to first estimate the likelihood of venture investments by competing CVC parents using a probit regression. In the second step we estimate a linear regression that includes the inverse Mills ratio obtained from the first-step estimation as an additional regressor in our earlier CVC board power (Table 4A) and CVC share pricing (Table 7) equations.

The instruments used in the first step selection model of competing CVC investments include the natural log of start-up age at the time the CVC first invests, an indicator denoting a lead CVC, the natural log of aggregate VC industry investment, the median market-to-book ratio in the start-up industry, and industry fixed effects. The younger a start-up is, the more financially constrained it is likely to be. Thus, insiders of younger start-ups could be more willing to accept funding from competing CVC investors as timely access to funding is more likely to be critical to its future success. Furthermore, relations with complementary CVC investors, which often involve customer-supplier arrangements, marketing and advertising support and joint ventures are more likely at relatively later stages of a start-up's development. Start-up founders are also likely to be reluctant to accept a competing CVC as a VC syndicate lead.

To capture the possibility that higher VC industry activity reduces the likelihood of competing CVC investors becoming syndicate members, we include aggregate VC industry investment in the month prior to the initial CVC investment as another regressor. Finally, in the spirit of Gompers and Lerner (2000b) and Hochberg et al. (2007), we control for the investment environment a VC firm faces using the median market-to-book ratio in the start-up industry, measured in the first year the CVC invests in the start-up. A higher market to book ratio indicates a more favorable investment climate, which should affect VC investment decisions.

In unreported results, the Heckman first-step regression indicates that competitive CVCs are not any more likely to lead VC syndicates than complementary CVCs. Furthermore, neither the aggregate VC industry investment nor the median industry market-to-book ratio has a significant impact on the likelihood of competitive (or complementary) CVC backing, suggesting that hot or cold market periods do not influence the type of strategic CVC investments that are selected. Although the evidence is weak (p-value=0.08), older, more established start-ups are less likely to accept competing CVCs as investors. Finally, competing CVC investors are more likely for start-ups in the biotech/pharmaceuticals and electronic equipment industries. The presence of competing

CVC investors in certain industries suggests that obtaining venture investment in these industries may be more difficult, possibly because of long product gestation periods, high funding costs and low probabilities of success. In second-step regressions that explain CVC board power and share pricing respectively, the inverse Mills ratio is insignificant. Most other estimates are qualitatively similar to those reported in Tables 4A and 7. This indicates that while selection bias is a concern, controlling for it does not change the sign or statistical significance of our earlier findings.

5.2. Comparing CVC-Startup Relations implied by CorpTech and SIC Classifications

To further assess the advantages of classifying competitive and complementary CVC parents using the CorpTech Directory rather than SIC codes, we first compare the accuracy of the two methods in identifying competitive CVC parents, explicitly mentioned as such in IPO prospectuses. We obtain 43 such instances of potentially competitive CVC–start-up pairs. CorpTech correctly categorizes competing CVC parents in 84% of cases, while the SIC classification (matches at 2-, and 3-digit levels indicating complementary partners; matches at the 4-digit level denoting potential competitors) correctly categorizes 77% of cases. For the purpose of this classification, SIC codes are taken from the CorpTech database. As a further comparison, we repeat the analysis with SIC codes taken from the CRSP and Compustat databases. However, they perform substantially worse than the CorpTech Directory SICs, with CRSP (Compustat) SICs correctly classifying competitive CVC parents in only 21% (23%) of cases.

There are three possible reasons for the poorer categorization of competing CVC parents based on CRSP or Compustat data. First, unlike CorpTech, these databases usually report only one primary SIC code per firm, particularly for stocks that have recently gone public. Second, a number of CRSP and Compustat SIC codes are undefined at the 4-digit level and appear to be 3-digit classifications with an arbitrary zero appended, which makes the classification of some of these relationships (based on 4-digit SIC codes) unreliable. Finally, the SIC codes for our start-up sample, particularly those taken from Compustat, are concentrated in especially small number of 4-digit SIC industries as discussed earlier.

Similarly, we analyze the frequencies that CorpTech and SIC based classifications successfully identify complementary CVC parents. We define a CVC parent as having a complementary relation with a start-up when IPO prospectuses report that the CVC parent has a significant business relationship with the start-up (for example, a customer, supplier, technical collaborator, licensor, licensee, provider of marketing and advertising support, or joint manufacturer) and makes no mention that the CVC parent is a competitor. We obtain 177 such

instances of CVC–start-up pairs. Comparing the percentage of cases successfully identified as complementary, we find that the CorpTech classification correctly identifies 67% of cases, whereas the SIC classification correctly identifies only 23% of cases.

Thus, the low success rate for SIC based classification appears to be due to its coarsely defined industry categories relative to the CorpTech Directory's three-tiered product-level characterization. Hence, the CVC parent–start-up relation is much more likely to be erroneously classified based on the SIC classification method. Finally, relying solely on IPO prospectus information to classify the CVC parent's relation to the start-up has drawbacks as well. The prospectuses do not specify a strategic or business relationship for nearly 20% of the CVC parent-startup pairs, even though the CVC investment is clearly strategic in nature, based on both the CorpTech and SIC classifications. Based on the above analyses, we conclude that the CorpTech Directory classifications are a more accurate and reliable method of assessing competitive and complementary CVC parent relationships with start-up firms. However, as mentioned earlier, we supplement the CorpTech based classifications with an SIC based approach and prospectus information when the CVC–start-up relationships are indeterminate or when IPO prospectuses explicitly mention a CVC parent as a potential competitor. Finally, supporting our classification system, we find systematic patterns in the allocation of control rights and investment valuations, which are economically consistent with the classifications we employ. If our classifications were not economically meaningful, then no systematic patterns should be observed in our analyses.

5.3. Funding Round Analysis for CVC Investments

As a further check that our CVC share pricing results support Hypothesis 5, we next analyze investments by *all* those VC investors that participated in the *same* funding round as the CVC. Because participating VCs usually receive the same pricing terms in a given funding round, by including all VC investors who syndicated in the same funding round, we are able to more clearly determine whether competing CVCs invest higher amounts than complementary CVCs. Recall that over the course of the VC funding process, competing and complementary CVC investors end up having similar shareholdings in the start-up at the IPO date. Thus, if we find that competing CVCs contribute a higher fraction of round-wise investments, but obtain the same or fewer shareholdings, then we would have stronger evidence that competing CVCs pay higher prices for their equity stakes in the start-ups, relative to complementary CVCs. Recall that a CVC's final funding round relative to all the start-up's funding rounds does not differ across competing and complementary CVC investors, so differential pricing is not due to one group of CVCs leaving the syndicate early.

We employ three model specifications in this robustness analysis of CVC share pricing at the funding round level as shown in Table 8. The explanatory variables include four indicator variables denoting whether a CVC's parent is a strategic competitor, a strategic complement, a syndicate lead, and whether the CEO is a company founder, in addition to a number of the same control variables used earlier. The VC reputation, aggregate VC industry investment, median market-to-book ratio in the start-up industry, and the start-up's age are measured at the time of each funding round. We add the funding round number divided by total start-up funding rounds to capture VC investment at different phases in a start-up's development, and the number of VC investors participating in the funding round as additional controls. Fixed effects for the year of the funding round, industry, and the eight most-active CVCs are also included. The standard errors are heteroscedastic robust and are clustered by each start-up funding round.

Examining model 1, we observe that both competitive and complementary CVCs contribute significantly larger portions of the total venture investment in a funding round, relative to other venture investors. Moreover, the contribution by competitive CVC investors relative to total investment in the round is significantly higher than that of complementary CVC investors. Several other interesting observations follow. First, the higher a VC firm's reputation, the lower is its investment contribution in the round relative to total round amount. Second, as the number of VC investors in a funding round increases, an individual VC's round investment relative to total round investment decreases. Third, start-ups run by founder-CEOs have relatively higher proportions of VC investments in these funding rounds, suggesting that founders who continue to be CEOs may be leading relatively more successful companies, thereby attracting larger VC investments.

In model 2, we interact the two indicators for CVC strategic motives with the VC funding round divided by total funding rounds. Since CVC strategic investor types and their interactions are highly correlated (pair-wise Pearson correlation coefficients are found to exceed 0.92) we only report the interaction terms in model 2. We continue to find that competitive CVCs contribute a larger fraction of funding round investment relative to complementary CVCs, while their equity stakes are insignificantly different from each other. Finally, in model 3, we obtain very similar results using a tobit framework. This evidence is consistent with our hypothesis that competing CVC investors pay higher prices for their equity stakes in start-ups than complementary CVCs.

5.4. Pre- and Post-IPO Performance of CVC backed Start-ups

Since CVC-backed IPOs are not a random sample, one possible concern is that the relationships observed between CVC strategic investor type and the nature of their financial

contracts could be a result of start-up performance, which would create an ex post selection bias. For example, competitive CVC parents may join VC syndicates only after start-ups demonstrate good performance, which could explain the higher prices they pay for their shareholdings. On the other hand, a start-up with good initial performance may not accept funding from competitive CVC investors. While it is extremely difficult given the data available in VentureXpert to analyze the performance of privately-held start-ups when they receive CVC funding, we can evaluate a start-up's post-IPO performance across CVC types as an additional robustness check. Although the results of these analyses are not reported to conserve space, they are available upon request.

First, for CVC-backed IPO issuers distinguished by CVC strategic objectives, we analyze Tobin's Q and the return on assets, two standard accounting metrics of post-IPO financial performance. They are defined in terms of Compustat's annual database as (item6 - item60 + item25*item199) / item6, and item18 / (item6 - item60 + item25*item199) respectively, after excluding firms that delist within 3 years of their IPOs. We find that the median Tobin's Qs for start-ups backed by complementary (Net strategic competitor < 0) and competing (Net strategic competitor > 0) strategic investors are 2.00 and 2.29 respectively, which are statistically indistinguishable. A similar pattern emerges when analyzing the return on assets (ROA) for the two types of CVC backed start-up firms. It is also notable that for both sets of strategic investors, the median ROA is negative.

Second, we analyze the frequencies that CVC-backed start-ups are delisted due to mergers, acquisitions or financial distress over the subsequent 3 years, distinguished by strategic investor objectives. In all, twenty-four (eight) start-ups backed by complementary (competitive) CVC syndicates, measured by *net strategic competitor*, were acquired or merged during the three years following their IPOs. Nine (six) start-ups backed by complementary (competing) CVC syndicate appear to go out of business, based on the delisting codes available from the CRSP database, during the same three years post-IPO period. Scaling these failures by the respective number of complementary or competitive CVC syndicate backed IPOs, about 10% of start-ups go out of business within three years of their IPOs in each of the two samples.

Finally, we analyze three measures of start-up pre-IPO performance distinguished again by the strategic goals of CVC investors. Pre-IPO performance is measured by: (1) length of time between a CVC's initial investment and the IPO date, and (2) start-up equity value scaled by total VC investment where equity value is based on either (a) the IPO offer price or (b) the first day's market closing price. Across all three measures, we fail to find significant differences in pre-IPO performance of start-ups backed by CVCs with differing strategic goals. Overall, the evidence on

pre- and post-IPO performance of these start-ups suggests that the relationships observed between CVC strategic types and the nature of their financial contracts do not appear to be caused by differences in start-up performance in the two samples.

6. Conclusion

Corporations have significantly increased VC funding to entrepreneurial companies since the early 1990s. One of the two primary reasons corporations engage in venture investing is the strategic benefits that they can realize. CVCs can pursue strategies that benefit their parent corporations either at the expense or to the benefit of start-up firms' economic well being. Hellmann (2002) carefully explores the potential CVC conflicts of interest with both entrepreneurs and other traditional VC investors and develops a number of theoretical predictions on how start-up firms should respond to these moral hazard problems. While excluding CVCs from VC syndicates is one obvious solution, Hellmann shows that this is not necessarily optimal. Indeed, CVCs are often included in VC syndicates investing in a wide range of industries. The primary focus of this study is to examine the effects of including CVCs in VC syndicates and to test the validity of Hellmann's (2002) theoretical predictions.

We empirically investigate VC syndicate structure and examine several important questions. How important is the type of VC investor to a start-up entrepreneur, and when will a start-up accept funding from strategic CVC investors? Given the potential expropriation of start-ups by strategically-motivated CVCs, how can conflicts of interest among various venture capital investors be managed or minimized? More specifically, do certain syndicate structures and allocations of shareholdings and control rights occur more frequently, suggesting that they mitigate the adverse effects of conflicts of interest among these private investors? Finally, do start-ups realize differential share prices from CVCs depending on their strategic goals?

The main findings of this study are as follows. While start-ups receive funding from both complementary and competitive CVC investors, start-up insiders award lower board representation to competitive CVC investors, which is consistent with the greater moral hazard concerns associated with them. Second, start-up insiders retain greater board power when faced with competitive CVC investors. Third, there are significant differences in board representation of lead investors depending on whether they are corporate or traditional VCs. Not only are CVCs less likely to be lead investors, but also lead CVCs have lower board representation than lead traditional VCs, which is consistent with the entrepreneur's desire to limit CVC influence, particularly at the earliest stages of a start-up's life. Finally, start-up managers are able to extract higher valuations

when CVC parents are potential competitors, which is consistent with the predictions of standard Nash bargaining models. These results are also broadly consistent with Hellmann's theoretical predictions. Overall, our results indicate that the potential synergies CVCs offer to start-ups based on their strategic relationships affects their board representation and share pricing in start-ups.

The findings of our study raise some intriguing questions. First, what is the impact of shareholdings and control right allocations on start-up performance? Second, do some syndicate structures influence the likelihood of a start-up's success? Although previous research suggests that a complementary strategic relationship between a CVC and a start-up significantly improves the likelihood of a successful exit, there are a significant number of start-ups that have potentially competing relationships with CVCs in our IPO sample. Perhaps, limiting the moral hazard problems and creating good management and VC incentives through proper allocation of shareholdings and control rights, i.e. selecting optimal contracting, holds the key to a start-up's success. These are important questions that future research can potentially answer.

Appendix 1: List of variables

Variable	Explanation	Data sources
CVC Board Power	Ratio of CVC board seats to total board seats	IPO Prospectus
Aggregate CVC Board Power	Ratio of all CVCs' board seats to total board seats	IPO Prospectus
CVC's portion of VC syndicate investment	Total dollar investment by a CVC in the start-up across all rounds of funding divided by the total VC syndicate investment in the start-up	IPO Prospectus, VentureXpert Database
CVC firm's earliest funding round	The first round in which the CVC invested in the start-up	VentureXpert Database
CVC firm shareholdings	CVC shareholdings (%) in the start-up	IPO Prospectus
CVC firm average share purchase price to IPO offer price	CVC's average purchase price for start-up shares divided by the IPO offer price. CVC's average share purchase price is the total investment by a CVC divided by total shares held in the start-up by the CVC as of the IPO date	IPO Prospectus VentureXpert Database
CVC strategic competitor	An indicator variable denoting when a CVC's parent has a competitive strategic relationship with a start-up	Corporate Technology Directory
CVC strategic complement	An indicator variable denoting when a CVC's parent has a complementary strategic relationship with a start-up	Corporate Technology Directory
CVC syndicate's earliest funding round	The first round in which any of the CVCs invested in the start-up. We use the term CVC syndicate to refer to the CVC members of the VC syndicate.	VentureXpert Database
Portion of VC syndicate investment by all CVCs	Total dollar investment by all CVCs in the start-up divided by total VC syndicate investment in the start-up as of the IPO date	IPO Prospectus, VentureXpert Database
CVC syndicate shareholdings	Total shareholdings (%) of all CVCs in the start-up	IPO Prospectus
Founder-CEO	An indicator variable denoting when a CEO is a founder	IPO Prospectus
Industry market-to-book ratio	Median annual market-to-book in the start-up industry at the time of initial CVC investment in the start-up	Compustat
Insider board power	Officer-director board seats divided by total board seats	IPO Prospectus
Insider shareholdings	Officer-director shareholdings (%)	IPO Prospectus
Lead CVC indicator	When a CVC is the VC syndicate lead. A lead VC firm is defined as the VC firm that participated in the first funding round and invests the largest amount in the start-up across all funding rounds.	IPO Prospectus VentureXpert Database
CVC reputation relative to lead VC reputation	Reputation of the CVC divided by the reputation of the VC syndicate lead in the start-up. VC reputation is proxied by the cumulative number of companies that VC has brought public prior to the start-up's IPO year	VentureXpert Database
Lead VC Board Power	Number of board seats held by the lead VC firm divided by total board seats	IPO Prospectus
Net strategic competitor	An indicator variable that aggregates individual CVC strategic relationship with a start-up into a single observation by summing up these individual strategic relationships (The individual strategic relationship is one if the CVC–startup relationship is competing, zero if financial and minus one if complementary).	Corporate Technology Directory
VC's proportional funding round investment	An individual VC's investment divided by total VC investment in that funding round	IPO Prospectus VentureXpert Database
Number of VCs in funding round	Number of VCs investing in a start-up's funding round	VentureXpert Database
Round Number	VC funding round number	VentureXpert Database
Start-up Age	Age of the start-up when a CVC first invested in the start-up	IPO Prospectus
VC syndicate size	Size of the total VC syndicate	IPO Prospectus VentureXpert Database
Total funding rounds in the start-up	Number of funding rounds received by the start-up	VentureXpert Database
VC syndicate investment	Total investment by all VCs in the start-up	VentureXpert Database
Aggregate VC industry investment	Monthly aggregate investment in the VC industry	VentureXpert Database

Appendix 2: CVC parent corporations and strategic investments

CVC Parents	Listed on Exchange	Competing Investments	Complementary Investments	Total Investments
GE	NYSE	2	20	22
Microsoft Corp.	NASDAQ	5	10	15
AT&T	NYSE	7	7	14
Intel Corp.	NASDAQ	10	4	14
Cisco Systems Inc.	NASDAQ	6	3	9
AOL Time Warner	NYSE	4	3	7
Dell	NASDAQ	3	4	7
Johnson & Johnson	NYSE	2	4	6
Smith Kline Beecham Corp.	NYSE	2	3	5
Ameritech Development Corp.	NYSE	2	2	4
Compaq Computer Corp.	NYSE	1	3	4
Cox Enterprises Inc.	NYSE	0	4	4
Hewlett-Packard	NYSE	4	0	4
Sony Corp.	NYSE	2	2	4
Adobe Systems	NASDAQ	2	1	3
CMGI, Inc.	NASDAQ	2	1	3
Genentech Corp.	NYSE	2	1	3
Medtronic Inc.	NYSE	2	1	3
Motorola	NYSE	1	2	3
The Tribune Company	NYSE	0	3	3
TRW Inc.	NYSE	1	2	3
Abbott Laboratories	NYSE	2	0	2
Excite Inc.	NASDAQ	2	0	2
General Motors	NYSE	0	2	2
Lucent Technologies	NYSE	1	1	2
News Corp.	NYSE	1	1	2
Staples Inc.	NASDAQ	0	2	2
Texas Instruments	NYSE	0	2	2
Thomson Corp.	NYSE	0	2	2
US West Inc.	NYSE	0	2	2
WorldCom	NASDAQ	1	1	2
Yahoo Inc.	NASDAQ	1	1	2

Of the total sample of CVC-backed IPOs by U.S. firms completed in the 1996-2001 period, CVC parent corporations, which invested in at least two companies that went public are reported. CVC parent investments by their strategic profile (competing or complementary), CVC Parents' exchange listing, and the number of IPO companies funded are reported.

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Table 1
Annual frequency of CVC-backed firms' IPOs and CVC investments

Panel A: Annual frequency of IPOs by CVC-backed companies

Year	Number of CVC backed IPOs	Number of CVC investors	Average number of CVCs per IPO	Average VC syndicate size
1996	15	19	1.27	8.40
1997	16	21	1.31	8.25
1998	11	17	1.55	7.45
1999	69	109	1.58	8.94
2000	63	102	1.62	9.79
2001	3	5	1.67	10.33
Total	177	273	1.54	9.07

Panel B: CVC investors in portfolio companies by initial funding year

Year	Number of portfolio companies receiving CVC investments	Number of CVC investors	Number of CVCs making competing investments in same portfolio companies	Average number of CVCs investing in a portfolio company per year
1985-1990	1	2	1	2.00
1991	1	1	1	1.00
1992	2	2	1	1.00
1993	4	4	3	1.00
1994	10	10	3	1.00
1995	16	17	10	1.06
1996	33	35	14	1.06
1997	39	48	17	1.23
1998	45	47	22	1.04
1999	61	84	36	1.38
2000	15	23	14	1.53
Total	227	273	122	1.20

The sample includes 177 CVC-backed IPOs by U.S. firms completed in the 1996-2001 period and listed on major U.S. stock exchanges. The sample contains 273 CVC-portfolio company pairs of which 122 involve competitive CVC parents.

Table 2
Shareholdings and board power at the IPO in CVC-backed companies

Panel A: Shareholdings of major investors in CVC backed companies

	Mean	Median	Minimum	Maximum	Standard Deviation	Obs.
Total outsiders shareholdings	58.15	59.20	8.40	89.70	20.41	177
VC shareholdings	51.11	52.60	1.10	84.30	19.86	177
CVC shareholdings	9.94	8.23	0.50	46.40	6.81	273
Shareholdings of CVCs with board seats	12.17	9.78	1.00	46.40	8.31	124
Shareholdings of CVCs without board seats	8.09	6.80	0.50	33.80	4.50	149
TVC shareholdings	35.76	35.00	0.00	82.60	19.07	177
Average shareholdings of TVCs with board seats	11.89	11.20	0.00	34.00	6.09	169
Average shareholdings of TVCs without board seats	7.76	7.40	0.00	27.07	4.40	87
Insider shareholdings	19.39	14.60	1.00	91.60	15.31	175
Founder shareholdings	15.76	11.20	1.80	63.30	13.56	145
Shareholdings of non-founder CEOs	5.56	3.99	1.00	56.10	7.11	72

Panel B: Board seats in CVC backed companies

	Mean	Median	Minimum	Maximum	Standard Deviation	Obs.
Individual CVC board seats	0.48	0	0	3	0.56	273
Aggregate CVC board seats	0.68	1	0	4	0.77	177
TVC board seats	2.31	2	0	6	1.18	177
Outsiders board seats	5.02	5	1	11	1.70	177
Insiders board seats	1.84	2	1	5	0.78	177
Total board seats	6.86	7	3	13	1.68	177

Panel C: Proportional board representation (board power) in CVC backed companies

	Mean	Median	Minimum	Maximum	Standard Deviation	Obs.
Individual CVC board power	0.067	0.000	0.000	0.375	0.080	273
Aggregate CVC board power	0.095	0.111	0.000	0.500	0.106	177
TVC board power	0.338	0.333	0.000	0.833	0.164	177
Insiders board power	0.277	0.250	0.091	0.750	0.118	177
Outsiders board power	0.723	0.750	0.250	0.909	0.118	177

The sample of CVC-backed IPOs comprises of completed offerings by U.S. firms that list on major US exchanges over the 1996-2001 period. Shareholdings and board seats are measured pre-IPO and are taken from the IPO prospectuses**.** Panel A presents the shareholdings of outside and inside investors. Except the CVC shareholdings which are presented for each CVC investor, all other shareholdings are company-specific. Total outsiders' shareholdings include shareholdings of venture capitalists including the TVCs, CVCs, venture arms of investment or commercial banks, and external directors. Total insiders' shareholdings include those of founder(s), CEO and insider officers/directors. Panel B presents the board seats allocation to outside and inside investors at the time of the IPO. The same classification as in shareholdings is followed to determine outsider and insider board seats. CVC board seats is for each CVC investor whereas aggregate CVC board seats aggregates the board seats held by all CVCs that have invested in the company. Panel C presents the proportional board representation by each class of investor. Board power is measured as a percentage of total board seats. CVC board power is for each CVC investor whereas aggregate CVC board power aggregates the board power held by all CVCs that have invested in the company.

Table 3
CVC investment, shareholdings and board power at the IPO categorized by its strategic relationship

CVC-startup strategic relationship	CVC investment ($Million)			CVC shareholdings (%)			CVC board seats			CVC seats as a % of total board seats	
	Mean	Median	Obs.	Mean	Median	Obs.	Mean	Median	Obs.	Mean	Median
Strongly complementary	8.93	5.77	46	10.48	9.00	46	0.609	1.00	46	0.091	0.100
Weakly complementary	7.65	5.00	95	9.64	8.20	95	0.537	1.00	95	0.075	0.000
Competitive	11.34	5.78	122	9.80	7.75	122	0.410	0.00	122	0.056	0.000
Financial	4.78	4.33	10	12.11	8.60	10	0.200	0.00	10	0.029	0.000
Total	9.41	5.50	273	9.94	8.23	273	0.480	0.00	273	0.067	0.000
Tests of equality (p-value)											
Strongly complementary and competitive	0.233	0.883		0.562	0.490		0.035	0.023		0.010	0.023
Weakly complementary and competitive	0.011	0.939		0.861	0.738		0.093	0.100		0.085	0.100

The CorpTech Directory, used to classify strategic relations between CVC parents and start-ups, lists the industry and product codes for nearly 100,000 high-tech companies based in the US. These industry and product codes are used to measure the degree of complementarity between start-ups and CVC parents. A start-up and a CVC parent are defined as competitors if any of the start-up and CVC parent product codes match at all three levels of the industry code. A start-up and a CVC parent are defined to be strong complements if their product codes match only at the first two levels. If the companies' product codes match only at the first level, they are defined to be weak complements. If the product codes do not match at any of the levels, we impose a second check based on SIC codes. We classify relationships as weakly complementary, complementary and competing based on matches at 2-digit, 3-digit and 4-digit levels respectively. Finally, if CVC - Start-up relationships remain yet unclassified, we read the IPO prospectuses for each of the start-ups and determine the operating relationship between the two parties. For instance, if the CVC parent is a customer of, a supplier to or a technology licensor to the start-up, we classify such relationships as weakly complementary in nature. In addition, if the IPO prospectuses mention a CVC parent as a potential competitor, we code the relationship between the start-up and the CVC parent as such, overriding our earlier classifications based on the CorpTech directory, SIC codes and IPO prospectuses. When we do not find a product code match using the CorpTech product or SIC codes, or any evidence of a strategic relationship from the IPO prospectuses, we classify the CVC investment in the start-up as a financially motivated investment. The sample includes CVC-backed IPOs completed in the 1996-2001 period by U.S. firms that list on major U.S. stock exchanges.

Table 4
CVC board power

Panel A: Determinants of individual CVC's board power

	CVC board power				
	OLS	OLS	OLS	OLS	TOBIT
	(1)	(2)	(3)	(4)	(5)
CVC strategic competitor	-0.020**	-0.016**	-0.021**	-0.017**	-0.016**
	[0.017]	[0.038]	[0.018]	[0.037]	[0.047]
CVC's portion of VC syndicate investment	0.079**	-0.014	0.079**	-0.013	-0.015
	[0.023]	[0.724]	[0.026]	[0.748]	[0.674]
CVC firm's earliest funding round	-0.057***	-0.037**	-0.053***	-0.034*	-0.033*
(divided by total funding rounds)	[0.001]	[0.034]	[0.002]	[0.052]	[0.057]
CVC reputation relative to lead VC	0.002	0.001	0.002	0.001	0.001
reputation	[0.215]	[0.621]	[0.193]	[0.533]	[0.760]
ln start-up's total funding rounds	0.006	0.006	0.008	0.007	0.006
	[0.659]	[0.642]	[0.572]	[0.568]	[0.584]
ln VC syndicate size	-0.018	-0.022*	-0.017	-0.021*	-0.021**
	[0.156]	[0.078]	[0.184]	[0.089]	[0.013]
ln VC industry investment	0.008	0.014	0.008	0.013	0.013
	[0.416]	[0.127]	[0.398]	[0.119]	[0.183]
Founder-CEO	-0.018*	-0.011	-0.017*	-0.011	-0.011
	[0.052]	[0.185]	[0.057]	[0.194]	[0.217]
*l*n start-up age	-0.008	-0.006	-0.008	-0.007	-0.007
	[0.415]	[0.469]	[0.383]	[0.439]	[0.431]
Industry market-to-book ratio	-0.005	-0.004	-0.004	-0.003	-0.003
	[0.292]	[0.391]	[0.475]	[0.566]	[0.605]
CVC firm shareholdings		0.004***		0.004***	0.004***
		[0.000]		[0.000]	[0.000]
Lead CVC			0.029	0.022	0.021
			[0.123]	[0.151]	[0.200]
Intercept	0.256**	0.097	0.237**	0.086	0.091
	[0.027]	[0.313]	[0.035]	[0.371]	[0.409]
CVC firm fixed effects	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	273	273	273	273	273
Adjusted R^2 / Pseudo-R^2	17.49%	26.25%	18.00%	26.42%	30.99%

The panel presents OLS and Tobit estimation. The dependent variable is a CVC's board power, defined as the ratio of a CVC's board seats to total board seats, for each CVC investing in a start-up. The key explanatory variable is an indicator variable denoting CVCs with parents that are potential competitors of the start-up. The definitions of the other control variables are in Appendix 1. CVC firm, industry, and year-fixed effects are included, but not reported. The year fixed effects are based on each CVC's earliest investment round in the start-up. Robust p-values adjusted for CVC firm clustering are in brackets beneath the parameter estimates. The sample includes CVC-backed IPOs completed in the 1996-2001 period by U.S. firms that list on major U.S. stock exchanges. The pseudo-R^2 is based on the Aldrich-Nelson measure.

Panel B: Determinants of aggregate board power of *all* CVCs

	Aggregate CVC board power				
	OLS (1)	OLS (2)	OLS (3)	OLS (4)	TOBIT (5)
Net strategic competitor	-0.015***	-0.011**	-0.015***	-0.011**	-0.019**
	[0.005]	[0.017]	[0.006]	[0.018]	[0.046]
Portion of VC syndicate investment by all CVCs	0.012	-0.059*	0.011	-0.060*	-0.091*
	[0.781]	[0.072]	[0.796]	[0.068]	[0.098]
CVC syndicate's earliest funding round (divided by total funding rounds)	-0.085***	-0.055*	-0.083***	-0.053*	-0.103**
	[0.005]	[0.063]	[0.007]	[0.080]	[0.040]
ln lead VC reputation	0.004	0.008*	0.005	0.008*	0.013
	[0.403]	[0.092]	[0.367]	[0.077]	[0.147]
ln start-up's total funding founds	-0.001	0.007	-0.001	0.007	-0.002
	[0.949]	[0.707]	[0.974]	[0.682]	[0.938]
ln VC syndicate size	-0.036*	-0.041**	-0.035*	-0.040**	-0.063***
	[0.065]	[0.021]	[0.074]	[0.024]	[0.006]
ln VC industry investment	0.001	0.009	0.003	0.010	0.020
	[0.906]	[0.434]	[0.844]	[0.398]	[0.336]
Founder-CEO	0.013	0.018	0.014	0.019	0.016
	[0.433]	[0.223]	[0.407]	[0.199]	[0.549]
ln start-up age	-0.017	-0.017	-0.017	-0.017	-0.024
	[0.199]	[0.148]	[0.193]	[0.144]	[0.321]
Industry market-to-book ratio	-0.011	0.001	-0.010	0.001	-0.003
	[0.416]	[0.947]	[0.449]	[0.948]	[0.890]
CVC syndicate shareholdings		0.004***		0.004***	0.006***
		[0.000]		[0.000]	[0.000]
Lead CVC			0.009	0.009	0.011
			[0.737]	[0.708]	[0.788]
Intercept	0.367**	0.210	0.348**	0.189	0.163
	[0.020]	[0.115]	[0.040]	[0.197]	[0.515]
CVC firm fixed effects	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	177	177	177	177	177
Adjusted R^2 / Pseudo-R^2	9.62%	23.91%	9.07%	23.45%	28.99%

The panel presents OLS and Tobit estimation. The dependent variable is aggregate CVC board power, defined as the *aggregate board representation* of *all* CVCs in the start-up (CVC board seats divided by total board seats). The key explanatory variable is the 'Net Strategic Competitor', which is a discrete variable that sums up the individual CVC parents' strategic relationships with a start-up into a single observation, where a CVC–Startup's strategic relationship is given a value of one if competitive, zero if financial, and minus one if complementary. The definitions of the other control variables are in Appendix 1. CVC firm, industry, and year-fixed effects are included, but not reported. The year fixed effects are based on CVC syndicate's earliest investment round in the start-up. Robust p-values adjusted for lead VC firm clustering, are in brackets beneath the parameter estimates. The sample includes CVC-backed IPOs completed in the 1996-2001 period by U.S. firms that list on major U.S. stock exchanges. The pseudo-R^2 is based on the Aldrich-Nelson measure.

Table 5
Lead VC shareholdings and board power

Panel A: Comparing traditional and corporate VCs as lead investors

	Percent of all start-ups	Shareholding % Mean	Shareholding % Median	Percent with board seats	Number of start-ups
Lead TVCs	87.57	17.63	16.10	99.35	155
Lead CVCs	12.43	15.07	11.95	72.73	22
CVC strategic complement	6.78	14.89	13.35	75.00	12
CVC strategic competitor	5.65	15.29	11.00	70.00	10
Lead TVCs vs. Lead CVCs Tests of equality of Means and Medians (*t* test and Wilcoxon Rank Sum test): p-values		0.20	0.03**	0.00	177

This panel measures percentages as a proportion of all VC-backed IPOs contrasting lead VC investor types. The sample includes CVC-backed IPOs completed in the 1996-2001 period by U.S. firms that list on major U.S. stock exchanges.

Panel B: Comparing traditional and corporate VCs as initial round investors

	Percent of VC investors	Shareholding % Mean	Shareholding % Median	Percent with board seats	Number of VC investors
TVCs	82.23	13.49	11.95	83.51	273
CVCs	17.77	12.44	10.80	56.45	59
CVC strategic complement	10.24	12.02	11.35	58.13	34
CVC strategic competitor	7.53	13.06	10.50	54.17	25
TVCs vs. CVCs Tests of equality of Means and Medians (*t* test and Wilcoxon Rank Sum test): p-values		0.23	0.10	0.00	332

This panel measures percentages as a proportion of all VC-backed IPOs with a syndicate of initial round VC investors. The sample includes CVC-backed IPOs completed in the 1996-2001 period by U.S. firms that list on major U.S. stock exchanges.

Table 6

Panel A: Average start-up share purchase price paid by CVCs

CVC-startup strategic relationship	Funding round CVC joins syndicate: Mean	Median	CVC avg. share purchase price ($): Mean	Median	Obs.	CVC avg. share purchase price relative to IPO offer price: Mean	Median	Obs.	Company equity valued at IPO offer price ($ Million): Mean	Median	Obs.
CVC strategic competitor	3.75	3.00	5.82	3.88	122	0.49	0.30	122	538.20	318.55	122
CVC strategic complement	3.86	4.00	3.98	3.21	141	0.30	0.25	141	414.10	288.85	141
CVC financial	4.60	5.00	3.07	2.42	10	0.27	0.22	10	254.96	149.88	10
Tests of equality (p-value) (CVC strategic competitor vs. strategic complement)	0.72	0.35	0.00***	0.03**		0.00***	0.02**		0.21	0.76	

Panel B: Average start-up share purchase price paid by the TVC syndicate

CVC-startup strategic relationship	TVC syndicate avg. share purchase price ($): Mean	Median	Obs.	TVC syndicate avg. share purchase price relative to IPO offer price: Mean	Median	Obs.
CVC strategic competitor	2.76	1.74	116	0.24	0.14	116
CVC strategic complement	2.63	1.98	137	0.20	0.15	137
CVC financial	8.33	3.24	10	0.72	0.28	10
Tests of equality (p-value) (CVC strategic competitor vs. strategic complement)	0.73	0.55		0.32	0.64	

The sample includes CVC-backed IPOs completed in the 1996-2001 period by U.S. firms that list on major U.S. stock exchanges. In Panel A, the first set of figures show the funding round a CVC's joins the VC syndicate investing in the start-up. The primary variable of interest is the average price per start-up share paid by corporate VC investors across all funding rounds. This is calculated as the total investment made in the start-up by the corporate investor divided by the number of shares held as of the IPO date. The investing CVCs are segregated into three groups: potential competitors, complementary players and financially motivated. The next set of figures shows the average CVC purchase price divided by the offer price at the IPO. Finally, company value at IPO based on the IPO offer price and number of outstanding shares comprises the last set of figures. As a comparison, Panel B shows the average price per share paid by the traditional VC investors, and their average share purchase price divided by the IPO offer price, across all funding rounds received by the start-up. The average share price is calculated as the total investment made in the start-up by the traditional VC syndicate divided by the number of shares held by them as of the IPO date.

Table 7
Determinants of average CVC share purchase price to IPO offer price

	CVC firm average share purchase price to IPO offer price				
	OLS (1)	OLS (2)	OLS (3)	OLS (4)	TOBIT (5)
CVC strategic competitor	0.214***	0.215***	0.214***	0.214***	0.186***
	[0.001]	[0.001]	[0.001]	[0.001]	[0.000]
CVC firm's earliest funding round (divided by total funding rounds)	0.432***	0.400***	0.436***	0.407***	0.280***
	[0.001]	[0.003]	[0.002]	[0.003]	[0.001]
CVC reputation relative to lead VC reputation	0.013	0.016	0.014	0.017	0.010
	[0.432]	[0.323]	[0.435]	[0.321]	[0.334]
ln start-up's total funding rounds	0.115	0.106	0.117	0.109	0.109*
	[0.134]	[0.162]	[0.135]	[0.158]	[0.082]
ln VC syndicate size	0.006	-0.001	0.008	0.002	0.021
	[0.879]	[0.976]	[0.829]	[0.961]	[0.573]
ln VC industry investment	0.098*	0.075	0.098*	0.075	0.093*
	[0.085]	[0.199]	[0.085]	[0.203]	[0.057]
Founder-CEO	-0.072	-0.086**	-0.072	-0.085*	-0.060
	[0.135]	[0.070]	[0.131]	[0.067]	[0.164]
ln start-up age	-0.033	-0.036	-0.034	-0.037	-0.039
	[0.509]	[0.467]	[0.488]	[0.438]	[0.370]
Industry market-to-book ratio	0.035	0.036	0.036	0.038	0.039
	[0.223]	[0.195]	[0.205]	[0.178]	[0.169]
CVC firm shareholdings		-0.011***		-0.011***	-0.011***
		[0.001]		[0.002]	[0.000]
Lead CVC			0.030	0.051	0.038
			[0.816]	[0.684]	[0.605]
Intercept	-0.831	-0.318	-0.851	-0.344	-0.333
	[0.166]	[0.608]	[0.173]	[0.584]	[0.504]
CVC firm fixed effects	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	273	273	273	273	273
Adjusted R^2 / Pseudo-R^2	17.97%	20.30%	17.66%	20.05%	26.55%

The table presents OLS and Tobit estimation. The dependent variable is average CVC share purchase price divided by IPO offer price. The average CVC share purchase price is calculated as the total investment by each CVC firm divided by total shares held by the CVC as of the IPO date. The key explanatory variable is an indicator variable denoting CVCs whose parents are potential competitors of the start-ups. The definitions of the other control variables are in Appendix 1. CVC firm, industry and year-fixed effects are included, but not reported. The year fixed effects are based on each CVC's earliest investment round in the start-up. Robust p-values adjusted for CVC firm clustering are shown in brackets beneath the parameter estimates. The sample includes CVC-backed IPOs of U.S. companies completed in the 1996-2001 period that list on major U.S. stock exchanges. The pseudo-R^2 is based on the Aldrich-Nelson measure.

Table 8
Determinants of funding round investments by CVCs co-investing with other VCs

	VC's proportional funding round investment	VC's proportional funding round investment	VC's proportional funding round investment
	OLS	OLS	TOBIT
	(1)	(2)	(3)
CVC strategic competitor	0.110***		0.101***
	[0.000]		[0.000]
CVC strategic complement	0.077***		0.071***
	[0.000]		[0.000]
CVC strategic competitor * Funding round number divided by total rounds		0.114***	
		[0.000]	
CVC strategic complement * Funding round number divided by total rounds		0.077***	
		[0.001]	
Funding round number divided by total rounds	-0.038	-0.070**	-0.030
	[0.200]	[0.023]	[0.189]
ln VC reputation at funding round	-0.006**	-0.008***	-0.006**
	[0.037]	[0.003]	[0.036]
ln number of VCs in funding round	-0.245***	-0.250***	-0.224***
	[0.000]	[0.000]	[0.000]
ln VC industry investment at funding round	-0.007	-0.007	-0.009
	[0.537]	[0.519]	[0.375]
Founder-CEO	0.021*	0.021*	0.018**
	[0.097]	[0.097]	[0.035]
ln start-up age at funding round	-0.001	-0.001	-0.003
	[0.938]	[0.868]	[0.628]
Industry market-to-book ratio at funding round	0.150	0.168	0.150
	[0.739]	[0.713]	[0.742]
Lead CVC	0.008	0.024	0.002
	[0.805]	[0.464]	[0.950]
Intercept	0.432	0.446	0.407
	[0.593]	[0.592]	[0.625]
CVC Fixed Effects	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
Observations	1355	1355	1355
Adjusted R^2 / Pseudo-R^2	56.65%	56.00%	46.86%

The dependent variable is each VC's proportional investment in a funding round, defined as a VC's investment divided by total investment in the funding round. Estimation is based on OLS and Tobit models and the key explanatory variables include an indicator denoting whether a CVC is a potential competitor of the start-up, and an indicator denoting whether a CVC is a strategic complement to the start-up. The definitions of the other control variables are in Appendix 1. CVC firm, industry and funding year fixed effects are included, but not reported. Robust p-values are adjusted for clustering by company and funding round number, and are in brackets beneath the parameter estimates. The sample includes CVC-backed IPOs completed in the 1996-2001 period by U.S. firms that list on major U.S. stock exchanges. The pseudo-R^2 is based on the Aldrich-Nelson measure.