Financing a Corporate Venture Capital Program

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Abstract

Firms invest in Corporate venture capital (CVC) for strategic reasons. Consistent with maintaining financial flexibility to fund CVC driven innovation and acquisitions, we find that CVC investing firms hold less debt and more cash. Our results are more pronounced among the *Highest CVC Investors* as such firms maintain the most conservative financial policies. Our results are consistent with studies that advances that firms with growth or investment opportunities maintain financial flexibility. Our analysis reveals that future acquisition is a possible channel that influences the debt and cash levels of CVC investing firms.

Keywords : Corporate Venture Capital, Capital Structure, Cash Holdings

JEL Classification Codes: G31–Capital Budgeting, G32–Financing Policy, M13–New Firms, Startups

1 Introduction

Corporate venture capital (CVC) i.e., minority equity investments by established corporations in entrepreneurial ventures, started in the 1960s and at the time accounted for on average 7% of the venture capital industry. More recently, CVC investors are funding start up firms at an unprecedented rate. A report by CB Insights documents that CVCs invested over $53 billion in over 2,740 deals in 2018, which accounted for 23% of total venture capital industry (Global CVC Report (2018)). Overall, CVC is an important form of corporate investment and continues to attract many established corporations. The CVC triad is made up of a corporate mother firm (CVC investing firm), a CVC unit and an entrepreneurial venture. The CVC unit, which is established by the corporate mother firm, interacts and maintains contact with many small venture companies that are in search of funding. Acting as an intermediary, CVC units invest, support and monitor new entrepreneurial ventures that are likely to help meet the strategic and financial goals of the corporate mother firm.

Despite the strategic importance of CVC investments, little is known about how CVC investments affect the financial policies of CVC investing firms. One could argue that is the scale of CVC meaningful enough to affect the financial policies of established firms? Mohamed and Schwienbacher (2016) find that the stock market reacts positively to the announcement of CVC investments by parent companies. The authors explain that although CVC investments are small relative to parent companies, the announcements is more likely to capture insights into the future strategic orientation of the parent company. Motivated by the strategic reasons behind CVC investment, we predict that CVC investment will affect financial policies of CVC investing firms. We propose that CVC investing firms maintain financial flexibility to ensure that (a) the funds needed to finance CVC driven innovations are available when needed (b) firms can expand their knowledge base through the acquisition of their portfolio companies when it is potentially useful to do so and (c) firms can exercise their growth option through a follow − on investment when uncertainty unfolds to its advantage.

Unlike Independent Venture Capitals (IVCs) that seek purely financial returns, Corporate Venture Capitals (CVCs) pursue strategic objectives. Corporations view CVC investments as an effective way of conducting research and development activities, exploring new technologies, and identifying acquisition opportunities. In a survey of 52 corporate venture programs, Robin Siegel

(1988) report that corporations rank exposure to new technologies and markets as the most important objective for investing in a corporate venture capital programs. The declared mission or approach of Shell Ventures on its website states that "We make minority investments that help to develop new technologies and disruptive business model in areas of strategic interest to shell's business".[1] Focusing on a conservative middle ground Lerner (2000) p.675, find that "a dollar of venture capital appears to be about three times more potent in stimulating patenting than a dollar of traditional corporate R&D". Recent studies have also shown that CVC investment leads to an increase in innovation for the parent company (Dushnitsky and Lenox (2005a), Anu Wadhwa and Kotha (2016), Ma (2020)).

Another prominent reason for investing in start-up companies is to identify acquisition opportunities. A recent empirical evidence by Ma (2020) shows that about one-fifth of CVC investing firms acquire their portfolio companies and those acquisitions represent 20% of all acquisitions by those CVC investing firms. The author explains that such strategic acquisitions are related to a higher level of knowledge transfer from the portfolio companies to CVC investing firms. Related to that, Benson and Ziedonis (2010) reveal that CVCs invest to identify entrepreneurial firm acquisitions. The authors show that top CVC investing firms acquired 20 percent of their portfolio companies from 1987 through 2003. In addition, venture investment creates valuable growth options for CVC investing firms. Due to the uncertainty created by CVC investments, investors stage their financing. The option to grow is obtained after the first equity investment. If the venture meets key milestones, the CVC firm can exercise the growth option through a follow-on or a more substantial investment.

We exploit a sample of CVC units affiliated with US public listed firms from the Refinitiv database and match each CVC unit with a unique corporate parent during 1980 - 2018. We test the relationship between CVC firms and their debt and cash holdings. We denote CVC firm using an indicator variable; one if a firm makes CVC investment and zero otherwise. We control for a battery of variables that explain cash holdings and debt ratios. First, we find that relative to firms that do not invest in CVCs, on average CVC firms hold less debt and more cash, ceteris paribus. These findings support our hypothesis that CVC investing firms maintain financial flexibility that support CVC driven innovation and acquisition opportunities. Moreover, we find that our results are more pronounced among the *Highest CVC Investors*. Firms that invest

[1] source:https://www.shell.com/energy-and-innovation/new-energies/shell-ventures/about.html

at higher levels are likely to have access to a greater number of new ventures and greater access to portfolio companies as such firms have more chances of securing board seats. Such exposure may increase their knowledge stock, improve their understanding of technologies and practices of its portfolio companies on which they may base innovation and acquisition.

We conduct several test to investigate possible endogeneity issues. First, our results are robust to firm fixed effects and an IV-2SLS specification which controls for both firm time invariant and time varying omitted variables, respectively. Second, to investigate issues of reverse causality, we conduct a Granger Causality test which shows that CVC investment Granger causes debt and cash holdings while we find no evidence of reverse causality. Third, we find that our results hold after controlling for firm characteristics using entropy balancing estimation and nearest neighbor matching. Finally, our analysis reveals that a possible channel that influence the debt and cash levels of CVC investing firms is future acquisitions.

This paper contributes to two strands of literature. First, our study extends the literature on CVC investment from the perspective of the parent company (CVC investing firm). From the CVC investing firm's perspective, prior researchers have examined the drivers of CVC adoption and termination (Ma (2020), Joseph J. Cabral and Kumar (2020), Gaba and Bhattacharya (2012), and Dushnitsky and Lenox (2005a)), CVC syndicate networks (Eric Braune and Teulon (2019)), strategic and financial outcomes of CVC investments to parent companies (Ma (2020), Mohamed and Schwienbacher (2016), Benson and Ziedonis (2010) and Dushnitsky and Lenox (2005b)). To the best of our knowledge, our paper is the first paper that links CVC investment to firm financial policies. Our findings show that CVC investment affects the financial policies of CVC Investing firms. Second, our study adds to the literature that links investment opportunities to cash holdings and debt (Gave and Gaver (1993), Jr and Watts (1992), Opler, Pinkowitz, Stulz, and Williamson (1999), Vidhan K.Goyal and Racic (2002)). Such studies show that firms with investment opportunities maintain financial flexibility. Our results are consistent with the view that firms with growth opportunities hold liquid assets to ensure that they will be able to fund profitable investment opportunities when cashflow is low relative to investment Opler, Pinkowitz, Stulz, and Williamson (1999). Also, our results are consistent with studies that find an inverse relationship between growth opportunities and debt. We add to this literature by using CVC investment as a proxy for investment opportunities. CVC investment could lead to acquisition and innovation opportunities and CVC investing will need to maintain financial flexibility to secure such opportunities. Our study provides financial guidance for firms that might begin a CVC program.

The remainder of the paper is as follows. Section 2 describes CVC and the testable hypotheses. Section 3 describes the sample, data sources and methodology. In Section 4 we test our hypotheses and discuss our results. In Section 5, we undertake robustness checks and further analysis. Finally in Section 6, we summarize our main findings.

2 Background and Hypothesis Development

2.1 Background

Corporate Venture Capital is one of the fastest growing portions of the venture capital ecosystem. Trends show that CVCs around the world have invested over $175B between 2013-2018 (Global CVC Report (2018)).

The number of CVC investors fluctuates over-time. One wave of CVC activity occurred in the mid-1980s (until the 1987 stock market crash) and a pronounced flurry of activity was seen in the mid-to-late 1990s that subsided with the plummet in technology companies in 2000 and 2001. Dushnitsky and Lenox (2005b) show that the top 20 CVC investors by 1999 were dominated by (IT) firms that initiated external venturing programs in the 1990s, including prominent investors such as Intel, Cisco Systems, and Microsoft. The over-representation of IT firms among top investors is attributed to several related factors, including uncertainty posed by emerging technologies during the 1990s, concerns about disruptions in core product markets, and corresponding attempts to supplement internal R&D activities with initiatives underway at entrepreneurial firms (Dushnitsky and Lenox (2005a)).

CVC and Independent Venture Capital (IVC) share some similarities but are also characterized by different objectives and corporate structures. More importantly CVCs, differ from IVCs with respect to their strategic mission and objective. IVCs main goal is to pursue financial returns. However, CVCs pursue both financial and strategic goals. Generally, a CVC has a strategic mission to help "grow the business" of the parent company. It achieves this by assisting the parent company to identify new ideas or technologies, develop new products or processes, and enter new markets or enhance existing businesses. In a 2019 survey of over

100 CVCs units by 500 Startups, of those CVCs that succeeded, 55% disclosed that achieving strategic objectives are more important than achieving financial objectives while 17% of the respondents said strategic and financial objectives are equally important (500 Startups' CVC Survey (2019)).[2]

Prior literature highlights several ways through which established firms benefit from CVC activities. We group the literature on CVC investment into several strands. The first strand of literature examines the drivers of CVC adoption and termination. Dushnitsky and Lenox (2005a) reveals that firms with greater cashflows are likely to invest in CVCs. Moreover, Gaba and Bhattacharya (2012) find that corporations tend to establish and are less likely to terminate a CVC unit when their innovation performance is close to their social aspirations. Several other drivers of CVC investments include; the competitiveness of an industry (Sandip Basu and Koth (2011); the intellectual property regime (Dushnitsky and Lenox (2005a); Sandip Basu and Koth (2011)), technology-related circumstances of a firm (Ma (2020)), a firm's network position (Erik Noyes and Smith-Doerr (2014)) and job security of managers (Joseph J. Cabral and Kumar (2020)).

The second strand of literature examines CVC syndicate networks. Eric Braune and Teulon (2019) show that information technology (IT) firms make CVC investments to increase the number of relationships with venture capitalists. The authors reveal that the willingness of industrial companies to maintain their relationships in the VC network drives them to renew their CVC investments. Erik Noyes and Smith-Doerr (2014) show that a firm's commitment to CVC investments can be explained by its board interlocking networks.

The third strand of literature have examined the strategic benefits of CVC investments to CVC investing firms. Dushnitsky and Lenox (2005b) show a positive relationship between CVC investment and firm patenting rates. Ma (2020) shows that CVCs are used by firms experiencing deteriorating internal innovation to expose themselves to new technologies and regain their innovation edge. CVC investors often secure board seats, or at least board observation rights, which provide them with knowledge of ventures' key activities and technologies. These rights are used to increase the stock of entrepreneurial knowledge. Benson and Ziedonis (2010) also

[2] In October 2019, Global venture capital (VC) firm 500 Startups, released the largest Corporate Venture Capital (CVC) report of its kind, which surveyed more than 100 corporate venture capitalists across a wide variety of industries and geographical locations. The report indicates why 500 Startups' believes some corporate venture capital units succeed and others fail, and identifies different models for success that corporate investors can follow, classified as personas. Instead of prescribing a one-size-fits-all approach

reveal that firms use CVC programs as a way to identify acquisition opportunities. They show that 20 percent of start-ups purchased by top corporate investors were in the venture portfolio of its acquirer. In a similar vein, Ma (2020) shows that about one-fifth of CVC investing firms acquire their portfolio companies and those acquisitions represent 20% of all acquisitions by those CVC investing firms.

The fourth strand of literature examines the impact of CVC investment on the parent company's financial performance. Dushnitsky and Lenox (2006) study the relationship between CVC investment and Tobin's Q. The authors report that compared to their industry peers, CVC investing firms have greater firm value as measured by Tobin's Q. Using primary and secondary data, Zahra and Hayton (2008) show that investments made through CVC funds are positively associated with a corporation's ROE and revenue growth. Mohamed and Schwienbacher (2016) finds that the stock market reacts positively to the announcement of CVC investments by parent companies. The authors explain that though CVC investments are small relative to parent companies, the announcements is more likely to capture insights into the future strategic orientation of the parent company.

2.2 Hypotheses Development

The view that established firms face challenges in initiating ground breaking, radical innovation is well documented in the literature (Henderson (1993) and Tushman and Anderson (1986)). To overcome firm's inability to drive innovations internally, firms exploit knowledge externally (Cohen and Levinthal (1990)). CVC represents an important component of a firm's strategy to exploit knowledge externally. Survey responses show that firms pursue CVC investment for strategic reasons, with the objective of benefiting internal corporate innovation (Robin Siegel (1988)). Robin Siegel (1988) in a survey of 52 corporate venture programs, report that corporations rank exposure to new technologies and markets as the most important objective for investing in a corporate venture capital programs. For example, the declared mission or approach of shell ventures on its website states that " We make minority investments that help to develop new technologies and disruptive business model in areas of strategic interest to shell's business".[3] Lerner (2000) p.675 find that "a dollar of venture capital appears to be about three times more potent in stimulating patenting than a dollar of traditional corporate R&D". Recent

[3] source:https://www.shell.com/energy-and-innovation/new-energies/shell-ventures/about.html

studies have also shown that CVC investment leads to an increase in innovation for the parent company (Dushnitsky and Lenox (2005b), Ma (2020)). By investing in CVC, CVC firms get to sit on the boards of portfolio firms and may learn about new technologies or models. Experience with novel, pioneering technologies may increase the probability that established firms will create subsequent breakthrough inventions (Ahuja and Katila (2001)). Hence, we propose that CVC investing firms will need to maintain financial flexibility to fund such breakthrough innovations when they become due.

Another prominent reason for investing in start-up companies is to identify acquisition opportunities. Ma (2020) shows that about one-fifth of CVC investing firms acquire their portfolio companies and those acquisitions represent 20% of all acquisitions by those CVC investing firms. The author explains that such strategic acquisitions are related to a higher level of knowledge transfer from the portfolio companies to CVC investing firms. Consistent with these findings, Benson and Ziedonis (2010) provide further empirical evidence to support the acquisition of CVC portfolio companies by CVC investing firms. The authors show that one out of every five start-ups purchased by CVC investors from 1987 to 2003 were in the venture portfolio company of its acquirer. As aforementioned, CVC investing firms often secure board seats, or at least board observation rights which reduces information asymmetry and helps managers identify acquisition opportunities. Hence we propose that firms, that invest in CVCs will maintain financial flexibility to acquire portfolio companies when it is strategic to do so.

In addition, the real option theory can be used in explaining CVC investments. Prior studies show that investments in venture capital creates valuable real options that are particularly valuable under uncertainty because of the flexibility it affords investors (Li (2008) and Trigeorgis (1993)). Due to the uncertainty created by CVC investments, investors stage their financing. Upon the initial investment in a venture, CVC investing firms have the right but not the obligation to make a subsequent investment and increase their financial commitment. The option to grow is obtained through the first equity investment, and the CVC firm exercises this option if the venture reaches milestones. We propose that CVC investing firms might maintain financial flexibility to exercise these follow-on investment options which might be more substantial in terms of resource commitments.

In summary, we advance that CVC investment represents a strategy to increase a firm's innovation and acquisition opportunities. This competitive strategy will impact a firm's capital structure and cash holdings decision. CVC investing firms maintain financial flexibility to ensure that (a) the funds needed to finance CVC driven innovations are available when needed (b) firms can expand their knowledge base through the acquisition of their portfolio companies when it is potentially useful to do so and (c) firms can exercise their growth option through a follow – on investment when uncertainty unfolds to its advantage.

Prior literature shows that growth opportunities are an important determinant of corporate financial policies. Prior researchers (Vidhan K.Goyal and Racic (2002), Gave and Gaver (1993) and Jr and Watts (1992)) find that there is an inverse relationship between growth opportunities and debt.

The precautionary motive to hold cash advances the vital role of cash reserves when firms anticipate future growth opportunities. The precautionary motive asserts that, firms with better investment or growth opportunities hold more cash. Opler, Pinkowitz, Stulz, and Williamson (1999) reveal that firms with strong growth opportunities hold more cash than other firms. This is consistent with the view that firms hold liquid assets to ensure that they will be in a position to keep investing where cash flow is too low relative to investment opportunities and when external funds are expensive. Baskin (1987) also reveal that firms increase their cash holdings when they envisage profitable investment opportunities and also when they want to rapidly pre-empt new opportunities.

Hence, we test the following hypothesis;

Hypothesis 1. *CVC investing firms hold less debt than non-CVC investing firms*

Hypothesis 2. *CVC investing firms hold more cash than non-CVC investing firms*

3 Data and Methodology

3.1 Data Collection

We collect a sample of Corporate Venture Capital units affiliated with US public listed firms. We start with a list of CVC firms identified from the Refinitiv database. In the database, we predefine Corporate PE/Venture as a firm type in Eikon. We identified potentially 1037 Unique

CVCs for the period 1980-2018. This initial sample served as a starting point for the subsequent data cleaning exercise. As a next step, we drop 31 CVC units described as Undisclosed Investors in the Eikon database leaving us with 1,006.

Using various sources of information such as Google, Factiva, Bloomberg, we manually match CVCs with a unique corporate parent. Accordingly, 438 firms that do not have unique corporate parents were dropped from the sample. The 438 firms that were dropped include independent and private equity investors, NGOs, and Universities. This leaves 568 CVC firms with unique parent companies. Although we limited our search to US investors, we still identify a substantial number of non-US investors from our sample construction among the 568 remaining firms. This is consistent with the findings of Röhm, Merz, and Kuckertz (2019) . For example, European based firms BMW and Dunnhumby, undertake investment vehicles in the USA and are classified as US based CVC Units in the database although their parent companies are based in Germany and the UK respectively. Hence, we remove 35 CVC units with corporate parents from the excluded geographical regions outside the US. This leaves us with 533 distinct CVC firms, out of which 262 are affiliated with unlisted parent firms. Hence, we end up with a final sample of 271 CVC units that are affiliated with US public listed parent firms which we merge with compustat.

3.2 Variable Construction

3.2.1 Capital Structure Measures

To measure capital structure, we use the book measures of total debt and long-term debt. We follow Rajan and Zingales (1995) in constructing our single book debt measure. Thus leverage is defined as total debt divided by total debt plus common shareholder's equity. Total debt is measured by short term debt plus long term debt.

$$BDR1 = (dltt + dlc)/(dltt + dlc + ceq) \tag{1}$$

To construct the long-term book debt ratio, we measure long-term book debt ratio as sum of annual book value of long-term debt divided by the total long – term debt plus common shareholder's equity. The long-term to book debt ratio is defined as;

$$BDR2 = dltt/(dltt + ceq) \tag{2}$$

For variable definitions of *BDR1* and *BDR2* refer to Table 1.

3.3 Cash Measure

We construct cash using a traditional measure of cash from the literature. We follow Opler, Pinkowitz, Stulz, and Williamson (1999) in constructing the Cash variable. Cash is defined as cash and marketable securities scaled by beginning total book assets. Cash is defined as;

$$Cash/TotalAsset = Che/at \tag{3}$$

For variable definitions of *Cash* refer to Table 1.

3.4 Variable of Interest

Our primary independent variable of interest in this study is CVC. *CVC(0/1)* is an indicator variable equal to one if a firm makes a corporate venture capital investment and zero if otherwise.

3.5 Control Variables

In the capital structure regressions, we control for *FirmSize*, *Profitability*, *MarketToBook*, *Tangibility*, *Cashflow*, *Research and Development* , *Investments* and *Industry Cashflow volatility*. We also control for *FirmSize*, *Profitability*, *MarketToBook*, *Cashflow*, *Research and Development* , *BDR1*, *Investments*, *Dividend* and *Industry Cashflow volatility* in the *Cash* regression. *FirmSize* is defined as the natural logarithm of total assets. *Research and Development* is the ratio of Research and Development scaled by total assets. *Profitability* of a firm which is defined as the ratio of the firm's operating income before depreciation to total assets. *MarketToBook* is measured as the ratio of total book assets less the book value of common equity plus the total market value of equity all divided by the total book assets. *Tangibility* is calculated as the ratio of fixed assets to total assets. Moreover, we control for *Cashflow* of a firm which is measured as the ratio of earnings before interest and taxes scaled by total book assets. *Investments* is also measured as the sum of total acquisitions and capital expenditure scaled by total assets. *Dividend* is an indicator variable: one if a firm pays dividend in a year and zero if otherwise. *Industry Cashflow volatility* is measured as Standard deviation of industry average cash flows for the previous 10 years, we require at least 3 years of observations. We winsorize the variables at the 1% and the 99% level to restrict the impact of outliers. Detailed definitions of all variables as well as their sources are in Table (1).

3.6 Univariate Statistics

Table 2 provides summary statistics of key variables used in this study. We report the mean, standard deviation, 25th percentile, median, and 75th percentile. The means of the two categories of capital structure measures show that the more broadly debt is defined the higher book debt ratios. *BDR1* has a mean of 0.317 which includes short-term debt and long-term debt of a firm. The mean of *BDR1* is greater than *BDR2* which has a mean of 0.253 which measures the long-term debt of a firm. On average, firms hold 31% of assets in cash.

Table 3 reports the correlation between the variables used in this study. Table 3 shows that CVC investment is positively correlated with *Cash*, *MarketToBook*, *Research and Development* , and *Investments*. Moreover, there is a negative relationship between CVC investment and *BDR1* , *BDR2* , *FirmSize*, *Profitability*, *Tangibility*, *Dividend.* The coefficients between CVC investment and our dependent variables are as expected. The correlation coefficients between *CVC(0/1)* and the measures of debt are -13.1% and -11.3% for *BDR1* and *BDR2* respectively. Lastly, the correlation coefficient between *CVC(0/1)* and *Cash* is 15.6%. We also control for industry and year.

4 Testing

4.1 Testing Hypothesis 1

To test H1, we estimate;

$$DebtRatio_{i,t} = \alpha + \beta CVC(0/1)_{i,t} + \gamma X_{i,t-1} + \delta_t + \rho_j + \epsilon_{i,t} \tag{4}$$

where $DebtRatio_{i,t}$ is a book debt ratio, thus *BDR1* and *BDR2* and $X_{i,t-1}$ is a matrix of lagged control variables listed in Table 1, δ_t represents year dummies and ρ_j is a set of Fama-French 49 industry dummies to control for industry linear trends. *CVC(0/1)* is the variable of interest and is an indicator variable equal to one if a firm makes cvc investment and zero if otherwise. We cluster standard errors by firm.

Table (4) shows estimation results of Eq.(4). The table shows that the coefficients associated with *CVC(0/1)* are statistically significant at less than the 1% level of significance in explaining our capital structure measures. Each coefficient associated with *CVC(0/1)* is negative implying that investments in entrepreneurial ventures by established firms have a negative and statistically significant impact on a firm's leverage ceteris paribus. Specifically, the coefficients associated with *CVC(0/1)* are -0.058 and -0.061 using *BDR1* and *BDR2* respectively. We use the results in Column (1) to gauge the economic importance of the relationship between CVC investment and leverage. In Column (1), the coefficient associated with *CVC(0/1)* is -0.058. This coefficient translates to 18 percentage point increase in *BDR1* relative to the sample mean. Overall our results support Hypothesis 1.

4.2 Testing Hypothesis 2

To test H2, we estimate;

$$CashHoldings_{i,t} = \alpha + \beta CVC(0/1)_{i,t} + \gamma X_{i,t-1} + \delta_t + \rho_j + \epsilon_{i,t} \tag{5}$$

where $CashHoldings_{i,t}$ is measured as cash divided by beginning asset total. $X_{i,t-1}$ is a matrix of lagged control variables listed in Table 1. We also control for *BDR1* which is a standard control variable for *Cash* regression. δ_t represents year dummies and ρ_j is a set of Fama-French 49 industry dummies to control for industry linear trends. *CVC(0/1)* is an indicator variable where all levels of investment greater than Zero are assigned the value of one and zero for otherwise. We cluster standard errors by firm.

In Table (5), we report the base line regression of Eq.(5). The table shows that the coefficient associated with *CVC(0/1)* in column (1) is 0.044 and is statistically significant at less than the 5% level. This coefficient translates to 14 percentage point increase in cash relative to the sample mean. Overall our results support Hypothesis 1. All in all, the findings reported in Table (5) supports Hypothesis 2.

All in all, our baseline regressions are consistent with our hypotheses. Our results support our argument that CVC investing firms will need to pursue conservative financial policies to ensure that (a) the funds needed to finance CVC driven innovations are available when needed (b) firms can expand their knowledge base through the acquisition of their portfolio companies when it is potentially useful to do so and (c) firms can exercise their growth option through a follow – on investment when uncertainty unfolds to its advantage.

5 Robustness Check and Further Analysis

5.1 Firm Fixed Effects

In our main regression, we include year fixed effects and industry fixed effects to control for time and industry trends. However, an empirical challenge associated with estimating a relation between CVC and firm policies is possible omitted variable bias. It is possible that an unobservable time invariant firm characteristic is correlated with CVC. To address this concern, we use a firm fixed effect specification.

After controlling for firm fixed effects, we observe qualitatively similar results as those reported in our baseline regression.[4] In addition, as reported in Table (6), CVC investing firms also hold less debt as measured by *BDR1* and *BDR2* after controlling for time invariant firm characteristics. Lastly, consistent with our baseline regression for cash holdings and *CVC(0/1)*, Table (7) also shows that CVC investing firms hold more cash, ceteris paribus.[5]

5.2 Alternative Measure of Independent Variable

One could argue that why do we use a dummy variable and not the actual dollar amount invested in CVC? Hence, as a robustness check, we follow Dushnitsky and Lenox (2006) and measure CVC investment as the log of total corporate venture capital invested ($M) by a firm in a year. The CVC investment variable have been log-transformed because they were highly

[4]For example, the coefficient associated with *CVC(0/1)* is -0.058 in explaining *BDR1* with year and industry fixed effects but has a coefficient of -0.036 when controlling for year and firm fixed effects

[5]For example, the coefficient associated with *CVC(0/1)* is 0.044 in explaining *Cash* with year and industry fixed effects but has a coefficient of 0.024 when controlling for year and firm fixed effects

skewed and kurtotic. This variable has the desirable trait of being continuous. Our results are qualitatively similar to our baseline regression as reported in Table (8) and Table (9).

5.3 IV-2SLS Approach

The fixed-effect regressions control for time invariant omitted variables. However, as firms self-select to invest corporate venture capital, the potential problem of time varying omitted variables is still unaddressed. One could argue that is more likely that a time varying omitted variables explain both CVC investment, cash holdings and debt. To deal with this issue, we re-estimate our debt and cash regressions with the IV-2SLS approach. To qualify as a valid instrument, a variable need to be strongly correlated with the instrumented regressors (the validity requirement) but uncorrelated with the error term in the second stage regression.

We use *CVC State Percentage* as our instrumental variable. Previous literature (Butler and Goktan (2013) have documented the importance of location in the VC industry. Established corporations are more likely to invest in CVCs when they operate in a state with high VC activities. Innovative start-up firms choose to locate and operate in high VC concentration states. Established corporations located in such regions are likely to invest in a CVC program with the motive of tapping into the entrepreneurial ideas of the start-up firms. We construct *CVC State Percentage* which measures the percentage of total annual CVC investment per state which is time varying. We estimate the number of CVC investment by state per year and we divide by the total number of CVC investment. Our use of *CVC State Percentage* as an instrument assumes is less likely to be correlated with the debt and cash levels of CVC investing firms except for its effect in facilitating CVC investment. To check this assumption, we include the variable *CVC State Percentage* as a further control in the baseline regressions. The coefficient of the non-instrumented *CVC(0/1)* is still significant, which is consistent with the hypothesis that CVC investment leads to low debt and high cash rather than the *CVC State Percentage*.

In Table (10), we estimate the first-stage regression using a logistic regression where the dependent variable is *CVC(0/1)*. We find that our instrument *CVC State Percentage* satisfy the validity requirement since it is positive and statistically significant at the 1% level in explaining *CVC(0/1)*. We report the second stage results in Table (11). The dependent variables are

BDR1, *BDR2* and *Cash*. The results in column (1) and column (2) of Table (11) shows that the coefficients associated with estimated *CVC(0/1)* are negative and statistically significant at the 1% level in explaining *BDR1* and *BDR2* respectively. In addition, the results in column (3) of Table (11) shows that the coefficient associated with estimated *CVC(0/1)* is positive and statistically significant at 5% in explaining *Cash*. The IV-2SLS approach supports our findings that CVC investing firms hold less debt and more cash.[6].

5.4 Reverse Causality

One empirical challenge of our study is that all our regressions are contemporaneous which opens up reverse causality questions. For example, it may be that a firm with low debt and high cash has financing capacity and so makes a CVC investment. To investigate the reverse causality, we conduct the Granger causality test using the methodology developed by Dumitrescu and Hurlin (2012). We examine both directions of Granger causality for CVC and Debt (a test of H1) and CVC and Cash (a test of H2). In other to evaluate the causal relation between hypothesis (1) and hypothesis (2), first we estimate a panel vector autoregression (PVAR)[7] and then estimate a panel Granger causality test to determine the robustness of the causality results obtained.

We estimate the following panel vector autoregressive regression for Debt and *CVC(0/1)*;

$$DebtRatio_{i,t} = \sum_{j=1}^{2} \alpha_i CVC(0/1)_{t-j} + \sum_{k=1}^{2} \beta_j DebtRatio_{t-k} + \gamma * X_{it} + \epsilon_{1t} \tag{6}$$

$$CVC(0/1)_{i,t} = \sum_{j=1}^{2} \lambda_i DebtRatio_{t-j} + \sum_{k=1}^{2} \delta_j CVC(0/1)_{t-k} + \theta * X_{it} + \epsilon_{2t} \tag{7}$$

where $DebtRatio_{i,t}$ are book debt ratios, thus *BDR1* and *BDR2* and X_{it} is a matrix of lagged control variables listed in Table 1. *CVC(0/1)* is an indicator variable where all levels of investment greater than Zero are assigned the value of one and zero for otherwise.The appropriate lag length for this test is selected based on the Schwarz Information Criterion (SIC).

Table (12) presents the causal relationship between Debt and *CVC(0/1)*. The results show that *CVC(0/1)* causes *BDR1* and *BDR2* and the relationship is negative with no evidence of

[6]Identical results obtained using the control function approach of J.M.Wooldridge (2015)

[7]"The PVAR combines the traditional VAR approach, which treats all the variables in the system as endogenous, with the panel data approach, which allows for unobserved individual heterogeneity" (Love and Zicchino (2006),p.193).

reverse causality. To determine the robustness of the causality results, we estimate the panel Granger causality test which is reported in Table (14). The direction of causality established between debt and *CVC(0/1)* using the panel Granger causality is consistent with the direction of the causality presented in Table (12). Thus, *CVC(0/1)* Granger causes *BDR1* and *BDR2* without a feedback relationship.

Also, we estimate the following panel vector autoregressive regression for *Cash* and *CVC(0/1)*;

$$Cash_{i,t} = \sum_{j=1}^{4} \alpha_i CVC(0/1)_{t-j} + \sum_{k=1}^{4} \beta_j Cash_{t-k} + \gamma * Controls_{it} + \epsilon_{1t} \tag{8}$$

$$CVC(0/1)_{i,t} = \sum_{j=1}^{4} \lambda_i Cash_{t-j} + \sum_{k=1}^{4} \delta_j CVC(0/1)_{t-k} + \theta * Controls_{it} + \epsilon_{2t} \tag{9}$$

where $Cash_{i,t}$ is cash holdings and X_{it} is a matrix of lagged control variables listed in Table 1. *CVC(0/1)* is an indicator variable where all levels of investment greater than Zero are assigned the value of one and zero for otherwise.The appropriate lag length for this test is selected based on the Schwarz Information Criterion (SIC).

Table (13) presents the causal relationship between *Cash* and *CVC(0/1)*. As a robustness check to the results obtained in Table (13), Table (14) shows that *CVC(0/1)* Granger causes *Cash* without a feedback relationship.[8]

5.5 Is the scale of CVC meaningful enough to affect financial policies?

Is the scale of CVC meaningful enough to affect the financial policies of established firms? It is possible that CVC activity, follow-on investments and even the potential funding of innovation and acquisition opportunities are not large enough to affect the financial policies of CVC investing firms. In contrast to this line of argument, Mohamed and Schwienbacher (2016) find that the stock market reacts positively to the announcement of CVC investments by parent companies. The authors explain that though CVC investments are small relative to parent companies, the announcements is more likely to capture insights into the future strategic orientation of the parent company. Analogous to Mohamed and Schwienbacher (2016), the scale

[8]We note that prior research has established that firm's with greater cash flow or slack are more likely to invest in CVCs (Ma (2020), Joseph J. Cabral and Kumar (2020), Gaba and Bhattacharya (2012), and Dushnitsky and Lenox (2005a)). Such studies used operating profit as a measure of cash flow and firm's current ratio as a measure of slack whereas we measure cash holdings

or amount of a CVC investment may not actually have a direct effect on financial policies but may only capture the strategic direction of firms upon which they will base financial policies. However, we propose that firms that invest in CVCs at much higher levels are likely to pursue the most conservative financial policies as such firms may be exposed to more innovative ideas and acquisition opportunities and will need funds to secure such opportunities. To illustrate this point, consider two firms investing in CVCs at different levels. If one firm invests at high levels and the other invests at low levels, the firm that invests at higher levels sits on more venture boards and has more information about these portfolio companies. Such exposure increases their knowledge stock, improves their understanding of technologies and practices of its portfolio companies on which they may base innovation and acquisition. Dushnitsky and Lenox (2005b) find that greater firm investment in entrepreneurial ventures leads to increases in the investing firm's innovation rate. They argue that " The larger a firm's equity investment in new ventures, the greater the stock of entrepreneurial knowledge a firm has access due to either (a) access to a greater number of new ventures (i.e., more opportunities to conduct and learn from due-diligence, as well as board observation rights and witnessing failure), or (b) greater access to their portfolio companies (i.e., greater leverage vis-à-vis the venture and hence more chances to secure board seats and deploy liaisons)" (Dushnitsky and Lenox (2005b), p.619).

In anticipation of funding CVC driven innovations and acquisition opportunities, we expect that our results are more pronounced among firms that invests at high levels of CVC. Such firms are more likely to pursue the most conservative financial policies . Hence, we construct investment levels into *Highest CVC Investors*, *Average CVC Investors* and *Lowest CVC Investors*. Each year we rank CVC investment into terciles with the top tercile representing CVC investors with the highest CVC investment amounts as a percentage of total assets. The firms in the bottom tercile are referred to as the firms with low CVC investment amounts as a percentage of total assets.

Collectively, the results reported in Table (15) and Table (16) are conceptually similar to our baseline regression but the magnitude is much larger for the *Highest CVC Investors*. For example, the coefficient associated with *CVC(0/1)* is -0.058 in explaining *BDR1* in our baseline regression while the coefficient for the *Highest CVC Investors* is -0.108. Also, the coefficient associated with *CVC(0/1)* is 0.044 in explaining *Cash* in our baseline regression while the coefficient for the *Highest CVC Investors* is 0.055. However, we find no evidence that the financial policies of the *Lowest CVC Investors* are affected by CVC investment.

5.6 Entropy balancing estimation

Whereas the documented difference in the Cash and debt output between CVC investing firms and non CVC investing firms appears to be due to CVC investment, our baseline results could be attributed to other potential interpretations. One possible interpretation is that CVC investing firms might differ radically from non CVC investing firms (control group). For example, it is well established in the literature that CVC investing firms are large firms and such differences in firm characteristics may be driving our results.

To address the concern that CVC investing firms are inherently different from non-CVC investing firms, we implement entropy balancing of Hainmueller and Xu (2013). Entropy balancing creates balanced samples between the treatment and control group. It involves a reweighting scheme that directly incorporates covariate balance into the weight function that is applied to the sample units. This recalibration of the unit weights effectively adjusts for systematic and random inequalities. In contrast to other preprocessing methods such as nearest neighbor matching where units are either discarded or matched (weights of zero or one), the reweighting scheme in entropy balancing reweights units to achieve balance, but at the same time keeps the weights as close as possible to the base weights to prevent information loss and thereby retains efficiency for the subsequent analysis.

We match firms on mean of size and all the control variables used in the baseline regression. By using this matching procedure, we ensure that the treatment firms (CVC investing firms) are equivalent to the control firms (non CVC investing firms), which alleviates concern that differences in firm characteristics influence our results. In unreported results, we also use the nearest neighbor matching method which reduces our sample to 29000 firm year observations over our sample period and our results are qualitatively similar in this unreported analysis. As reported in Table (17) and Table (18), we find that, even after controlling for firm characteristics using Entropy balancing estimation, CVC investing firms still hold less debt and more cash.

5.7 Possible Channel that influence the Debt and Cash levels of CVC firms

Our analysis so far shows that CVC investing firms hold less debt and more cash. We next explore future acquisitions as an economic channel that influences the debt and cash levels of CVC firms.

5.7.1 CVC and Acquisition

A possible channel that might influence the debt and cash levels of CVC firms might be attributed to their acquisition motives. As aforementioned, one of the strategic reasons for investing in start-up companies is to identify acquisition opportunities. CVC investments create a possible growth option that is exercised through acquisition. Hence, to finance these growth options, we posit CVC investors maintain financial flexibility. For example, firms actively rebalance their capital structures when they anticipate a high likelihood of making an acquisition Uysal (2011).

In this section, we empirically study whether CVC investment leads to acquisitions in the future. We measure acquisition as total acquisition scaled by total assets. The primary variable of interest is the effect of a firm's CVC investment in prior years on acquisition. To examine this possibility, we estimate the acquisition regression;

$$Acquisition_{i,t} = \alpha + \beta \mathit{CVC(0/1)}_{i,t-k} + \gamma X_{i,t-1} + \delta_t + \epsilon_{i,t}, \tag{10}$$

where $Acquisition_{i,t}$ is the dependent variable and is measured as acquisition expenditure scaled by beginning total book assets $X_{i,t-1}$ is a matrix of lagged control variables listed in Table 1, δ_t represents year dummies. $\mathit{CVC(0/1)}_{i,t-k}$ is the variable of interest and is an indicator variable equal to one if a firm makes cvc investment and zero if otherwise.

Table (19) presents the result of our analysis. We find a positive and statistically significant relationship between CVC investment in prior years and acquisition, particularly CVC investments in years t-8, t-9 and t-10. However, we find no significant relationship in year 1, 2 and 3 following CVC investment and acquisition.

6 Conclusion

Corporate Venture Capital (CVC) investments have become increasingly important and continue to attract many public companies. Unlike Independent Venture Capitals (IVCs) that are established for purely financial returns, CVCs pursue strategic objectives. Despite the strategic importance of CVC investments, there is no research about how CVC investments affect the financial policies of CVC investing firms.

We fill this gap by investigating whether CVC investments affect debt and cash holdings of CVC investing firms. Firms invest in CVCs for strategic reasons. Prior research shows that CVC investment leads to innovation and acquisitions for the CVC investing firm (Ma (2020), Mohamed and Schwienbacher (2016), Dushnitsky and Lenox (2006), Benson and Ziedonis (2010) and Dushnitsky and Lenox (2005b). Moreover, CVC investment creates growth options for firms which can be exercised through a substantial follow-on investment. Motivated by the strategic reasons behind CVC investment, we propose that CVC investing firms will maintain financial flexibility to ensure that (a) the funds needed to finance CVC driven innovations are available when needed (b) firms can expand their knowledge base through the acquisition of their portfolio companies when it is potentially useful to do so and (c) firms can exercise their growth option through a follow – on investment when uncertainty unfolds to its advantage. Consistent with our predictions, we find that CVC investing firm hold less debt and more cash. Moreover, we find that our results are more pronounced among the *Highest CVC Investors*.

We conduct several test to investigate possible endogeneity issues. First, our results are robust to firm fixed effects and an IV-2SLS specification which controls for both firm time invariant and time varying omitted variables, respectively. Second, to investigate issues of reverse causality, we conduct a Granger Causality test which shows that CVC investment Granger causes debt and cash holdings while we find no evidence of reverse causality. Third, we find that our results hold after controlling for firm characteristics using entropy balancing estimation and nearest neighbor matching. Finally, our analysis reveals that a possible channel that influence the debt and cash levels of CVC investing firms is future acquisitions. Our study provides financial guidance for firms that might begin a CVC program.

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Table 1: Variable definitions

This table provides the definition of the key variables used. Accounting data are from Compustat and CVC Investment data is from Refinitiv database

Variable	Definition
BDR1	The ratio of short plus long-term debt to short plus long-term debt plus common shareholder's equity
BDR2	The ratio of long – term debt to long – term debt plus common shareholder's equity
Cash	Cash and marketable securities scaled by beginning total book assets
CVC(0/1)	*CVC(0/1)* is an indicator variable equal to one if a firm makes cvc investment and zero if otherwise.
FirmSize	Natural logarithm of total book assets
Research and Development	Research and Development Expenditure scaled by beginning total book assets
Profitability	Operating income before depreciation scaled by beginning total book assets
MarketToBook	Ratio of total book assets less the book value of common equity plus the total market value of equity all divided by the total book assets
Tangibility	The assets tangibility of a firm is the ratio of net property, plant and equipment scaled by beginning total book assets
Cashflow	Ratio of earnings before interest and taxes scaled by beginning total book assets
Investments	Sum of total acquisitions and capital expenditures scaled by beginning total book assets
Capital Expenditure	Capital expenditure scaled by beginning total book assets
Dividend	Indicator variable; One if a firm pays dividend in a year and zero if otherwise
Industry Cashflow volatility	Standard deviation of industry average cash flows for the previous 10 years, we require at least 3 years of observations
Acquisition	Acquisition Expenditure scaled by beginning total book assets
CVC State Percentage	The number of CVC investment by state per year divided by the total number of CVC investment
Log CVC Investment	The log of total corporate venture capital invested ($M) by a firm in a year.

Table 2: Summary Statistics

This table presents summary statistics of the variables used in this study from 1980 to 2018. All the variables are winsorized at 1% level in both tails of the distribution before the summary statistics are calculated. The table reports the number of observations, mean, 25th percentile, median, 75th percentile and standard deviation. Variable generations are provided in the in Table 1

Variable	Observation	mean	p25	p50	p75	sd
BDR1	246,175	0.317	0.008	0.248	0.515	0.643
BDR2	246,443	0.253	0	0.129	0.406	0.401
Cash	228,034	0.310	0.025	0.096	0.295	0.820
CVC(0/1)	247,398	0.005	0	0	0	0.073
Log CVC Investment	247,398	0.034	0	0	0	0.477
FirmSize	228,201	4.341	2.589	4.290	6.083	2.598
Profitability	227,723	-0.188	-0.050	0.097	0.183	1.713
MarketToBook	207,395	6.067	1.062	1.620	3.000	30.250
Tangibility	227,945	0.350	0.0983	0.244	0.486	0.362
Cashflow	227,824	-0.244	-0.095	0.051	0.129	1.706
Research and Development	241,112	0.110	0	0	0.050	0.370
Industry Cashflow volatility	232,090	1.156	0.151	0.371	1.814	1.500
Acquisition	217,474	0.030	0	0	0	0.4433
Capital Expenditure	224,123	0.092	0.017	0.043	0.096	0.160
Investments	234,252	0.089	0.020	0.051	0.112	0.109
Dividend	247,395	0.268	0	0	0	0.443
CVC State Percentage	241,556	0.068	0	0.024	0.095	0.095

Table 3: Correlations

This table presents the pairwise correlation coefficients between variables.Table 1 defines the variables. Reference numbers in rows and columns refer to the variable associated with the pairwise correlation coefficients.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
CVC(0/1)	1.000														
Cash	0.156	1.000													
BDR1	-0.131	-0.250	1.000												
BDR2	-0.113	-0.219	0.973	1.000											
Industry Cashflow volatility	0.006	-0.326	0.681	0.697	1.000										
Acquisition	0.002	-0.031	0.048	0.046	0.065	1.000									
Capital Expenditure	0.056	-0.042	-0.226	-0.052	-0.014	-0.175	-0.461	1.000							
FirmSize	-0.383	-0.178	0.193	0.180	0.247	0.228	-0.347	1.000							
Profitability	-0.112	-0.013	-0.324	-0.364	-0.453	-0.457	0.018	0.074	1.000						
MarketToBook	0.183	0.565	-0.252	-0.250	-0.410	-0.388	0.299	-0.127	0.363	1.000					
Research and Development	0.117	0.450	-0.023	0.002	-0.153	-0.133	0.535	-0.150	-0.251	0.133	1.000				
Tangibility	-0.072	-0.418	0.074	0.055	0.167	0.152	-0.092	0.005	0.149	-0.208	-0.284	1.000			
Cashflow	-0.125	0.030	-0.307	-0.348	-0.438	-0.441	0.000	0.100	0.967	0.385	-0.247	0.031	1.000		
Dividend	-0.192	-0.338	0.099	0.057	0.146	0.103	-0.273	0.338	0.251	-0.205	-0.293	0.321	0.231	1.000	
Investments	0.004	-0.168	-0.041	-0.061	-0.009	-0.019	-0.008	-0.047	0.179	0.002	-0.0612	0.349	0.110	0.050	1.000

Table 4: Testing Hypothesis 1 - CVC Investment and Capital Structure

This table reports estimation results of Equation (4) which estimates the baseline regression of the effect of CVC Investment on capital structure. *BDR1* and *BDR2* are book measures of total debt and long-term debt respectively. *CVC(0/1)* is the variable of interest and is an indicator variable equal to one if a firm makes cvc investment and zero if otherwise. Table 1 defines the variables. All control variables are lagged. Clustered errors by firm are shown in parentheses with 1%, 5%, and 10% significance levels denoted by ***, **, and *, respectively.

	(1)	(2)
VARIABLES	*BDR1*	*BDR2*
CVC(0/1)	-0.058***	-0.061***
	(0.020)	(0.018)
FirmSize	0.038***	0.039***
	(0.002)	(0.001)
Profitability	-0.021	-0.021**
	(0.028)	(0.012)
MarketToBook	-0.002***	-0.000**
	(0.000)	(0.000)
Tangibility	0.196***	0.167***
	(0.015)	(0.010)
Cashflow	0.035	-0.032***
	(0.028)	(0.012)
Research and Development	-0.131***	-0.048***
	(0.030)	(0.011)
Investments	0.060***	0.071***
	(0.020)	(0.012)
Industry Cashflow volatility	0.001***	0.001
	(0.002)	(0.001)
Dividend	-0.134***	-0.086***
	(0.005)	(0.004)
Constant	0.236***	0.096***
	(0.030)	(0.024)
Year Fixed Effects	Yes	Yes
Industry Fixed Effects	Yes	Yes
Observations	171,493	171,493
R-squared	0.073	0.113

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5: Testing Hypothesis 2 - CVC Investment and Cash Holdings

This table reports estimation results of Equation (5) which estimates the baseline regression of the effect of CVC Investment on Cash Holdings. *Cash* is the dependent variable. *Cash* is measured as cash and marketable securities scaled by beginning total book assets. *CVC(0/1)* is the variable of interest and is an indicator variable equal to one if a firm makes cvc investment and zero if otherwise. Table 1 defines the variables. All control variables are lagged. Clustered errors by firm are shown in parentheses with 1%, 5%, and 10% significance levels denoted by ***, **, and *, respectively.

VARIABLES	*Cash*
CVC(0/1)	0.044**
	(0.019)
FirmSize	-0.025***
	(0.001)
Profitability	-0.155***
	(0.040)
MarketToBook	0.003***
	(0.000)
Cashflow	0.130***
	(0.037)
Research and Development	0.392***
	(0.032)
BDR1	-0.043***
	(0.004)
Investments	-0.203***
	(0.017)
Industry Cashflow volatility	0.009***
	(0.001)
Dividend	0.002
	(0.003)
Constant	0.203***
	(0.021)
Year Fixed Effects	Yes
Industry Fixed Effects	Yes
Observations	171,633
R-squared	0.183

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6: CVC Investment and Capital Structure - Firm Fixed Effects

This table reports estimation results of Equation (4) which estimates the baseline regression of the effect of CVC Investment on capital structure while controlling for firm fixed effects. . *BDR1* and *BDR2* are book measures of total debt and long-term debt respectively. *CVC(0/1)* is the variable of interest and is an indicator variable equal to one if a firm makes cvc investment and zero if otherwise. Table 1 defines the variables. All control variables are lagged. Clustered errors by firm are shown in parentheses with 1%, 5%, and 10% significance levels denoted by ***, **, and *, respectively.

	(1)	(2)
VARIABLES	*BDR1*	*BDR2*
CVC(0/1)	-0.036***	-0.030**
	(0.020)	(0.018)
FirmSize	0.054***	0.033***
	(0.004)	(0.002)
Profitability	-0.042	-0.005
	(0.033)	(0.012)
MarketToBook	-0.001*	-0.000**
	(0.000)	(0.000)
Tangibility	0.193***	0.167***
	(0.015)	(0.010)
Cashflow	0.047	-0.011
	(0.033)	(0.012)
Research and Development	-0.014	-0.005
	(0.033)	(0.012)
Investments	0.042**	0.088***
	(0.020)	(0.012)
Industry Cashflow volatility	0.000	0.001
	(0.002)	(0.001)
Dividend	-0.067***	-0.048***
	(0.006)	(0.005)
Constant	0.023**	0.096***
	(0.015)	(0.009)
Year Fixed Effects	Yes	Yes
Firm Fixed Effects	Yes	Yes
Observations	171,493	171,493
R-squared	0.014	0.016
Robust standard errors in parentheses		
*** p<0.01, ** p<0.05, * p<0.1		

Table 7: CVC Investment and Cash Holdings - Firm Fixed Effects

This table reports estimation results of Equation (5) which estimates the baseline regression of the effect of CVC Investment on Cash Holdings while controlling for firm fixed effects. *Cash* is the dependent variable. *Cash* is measured as cash and marketable securities scaled by beginning total book assets. *CVC(0/1)* is the variable of interest and is an indicator variable equal to one if a firm makes cvc investment and zero if otherwise. All control variables are lagged. Clustered errors by firm are shown in parentheses with 1%, 5%, and 10% significance levels denoted by ***, **, and *, respectively.

VARIABLES	*Cash*
CVC(0/1)	0.024**
	(0.012)
FirmSize	-0.138***
	(0.004)
Profitability	-0.136***
	(0.028)
MarketToBook	0.005***
	(0.000)
Cashflow	0.101***
	(0.028)
Research and Development	0.190***
	(0.043)
BDR1	-0.009**
	(0.005)
Investments	-0.084***
	(0.017)
Industry Cashflow volatility	0.009***
	(0.001)
Dividend	0.051***
	(0.004)
Constant	0.681***
	(0.015)
Year Fixed Effects	Yes
Firm Fixed Effects	Yes
Observations	171,633
R-squared	0.127
Robust standard errors in parentheses	
*** p<0.01, ** p<0.05, * p<0.1	

Table 8: CVC Investment and Capital Structure - Alternative Measure

This table reports estimation results of Equation (4) which estimates the baseline regression of the effect of CVC Investment on capital structure while using an alternative measure of CVC. The independent variable is *Log CVC Investment* which is measured as the log of total corporate venture capital invested ($M) by a firm in a year. Our dependent variables are *BDR1* and *BDR2*. *BDR1* and *BDR2* are book measures of total debt and long-term debt respectively. Table 1 defines the variables. All control variables are lagged. Clustered errors by firm are shown in parentheses with 1%, 5%, and 10% significance levels denoted by ***, **, and *, respectively.

	(1)	(2)
VARIABLES	*BDR1*	*BDR2*
Log CVC Investment	-0.008**	-0.009***
	(0.003)	(0.003)
FirmSize	0.037***	0.038***
	(0.002)	(0.001)
Profitability	-0.018	0.023**
	(0.028)	(0.011)
MarketToBook	-0.002**	-0.000**
	(0.000)	(0.000)
Tangibility	0.195***	0.169***
	(0.015)	(0.010)
Cashflow	0.037	-0.031***
	(0.028)	(0.011)
Research and Development	-0.132***	-0.049***
	(0.030)	(0.011)
Investments	0.062***	0.073***
	(0.020)	(0.012)
Industry Cashflow volatility	0.002	0.002
	(0.002)	(0.002)
Dividend	-0.137***	-0.089***
	(0.005)	(0.004)
Constant	0.240***	0.104***
	(0.029)	(0.023)
Year Fixed Effects	Yes	Yes
Industry Fixed Effects	Yes	Yes
Observations	171,493	171,493
R-squared	0.073	0.113
Robust standard errors in parentheses		
*** p<0.01, ** p<0.05, * p<0.1		

Table 9: CVC Investment and Cash Holdings - Alternative Measure

This table reports estimation results of Equation (5) which estimates the baseline regression of the effect of CVC Investment on capital structure while using an alternative measure of CVC. The independent variable is *Log CVC Investment* which is measured as the log of total corporate venture capital invested ($M) by a firm in a year. Our dependent variable is *Cash*. Table 1 defines the variables. All control variables are lagged. Clustered errors by firm are shown in parentheses with 1%, 5%, and 10% significance levels denoted by ***, **, and *, respectively.

VARIABLES	*Cash*
Log CVC Investment	0.006**
	(0.003)
FirmSize	-0.025***
	(0.001)
Profitability	-0.168***
	(0.038)
MarketToBook	0.003***
	(0.000)
Cashflow	0.131***
	(0.038)
Research and Development	0.394***
	(0.032)
BDR1	-0.044***
	(0.004)
Investments	-0.203***
	(0.016)
Industry Cashflow volatility	0.006***
	(0.001)
Dividend	0.002
	(0.003)
Constant	0.208***
	(0.020)
Year Fixed Effects	Yes
Firm Fixed Effects	Yes
Observations	171,633
R-squared	0.184

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 10: First stage of 2SLS regression

This table reports the estimation results of the first stage regression using a logistic regression. Our instrumental variable is *CVC State Percentage*. To measure our *CVC State Percentage*, we estimate the number of CVC investment by state per year and we divide by the total number of CVC investment. Table 1 defines the variables. Clustered errors by firm are shown in parentheses with 1%, 5%, and 10% significance levels denoted by ***, **, and *, respectively.

VARIABLES	*CVC(0/1)*
CVC State Percentage	4.950***
	(0.300)
FirmSize	0.991***
	(0.026)
Profitability	-0.001**
	(0.000)
MarketToBook	0.029***
	(0.003)
Cashflow	4.409***
	(0.403)
Research and Development	1.505***
	(0.120)
Tangibility	-2.407***
	(0.192)
Investments	0.597
	(0.431)
Industry Cashflow volatility	-0.231
	(0.027)
Dividend	-0.057
	(0.081)
Year Fixed Effects	Yes
Industry Fixed Effects	Yes
Observations	171,440
Pseudo R-squared	0.414
Robust standard errors in parentheses	
*** p<0.01, ** p<0.05, * p<0.1	

Table 11: Second stage of 2SLS regressions

This table reports the estimation results of the second stage regression of the 2SLS regression. We re-estimate our baseline regressions of *CVC(0/1)* on *BDR1*, *BDR2* and *Cash*. Our instrumental variable is *CVC State Percentage*. To measure our *CVC State Percentage*, we estimate the number of CVC investment by state per year and we divide by the total number of CVC investment. *CVC(0/1)* is the variable of interest and is an indicator variable equal to one if a firm makes cvc investment and zero if otherwise. Table 1 defines the variables. All control variables are lagged. Bootstrapped standard errors are shown in parentheses with 1%, 5%, and 10% significance levels denoted by ***, **, and *, respectively.

	Dependent Variables		
Independent Variables	*BDR1*	*BDR2*	*Cash*
$\widehat{CVC(0/1)}$	-0.224***	-0.322***	0.192**
	(0.076)	(0.064)	(0.065)
Control Variables	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes
Observations	171,428	171,428	171,526
R-squared	0.075	0.110	0.170
Robust standard errors in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			

Table 12: Panel Vector Autoregression - CVC Investment and Capital Structure

This table shows the estimated causality test results from the Panel Vector Autoregression (PVAR). It shows the pair regression results of Capital Structure and *CVC(0/1).* The first column shows the lagged variables of *CVC(0/1)*, *BDR1* and *BDR2*, where *CVC(0/1)* and the book measures of debt are used in the pair regression. Columns (2) to Columns (4) reports the results of the regression of lagged values of *CVC(0/1)* on *BDR1* and *BDR2* and further reports the pair regression of the lagged values of *BDR1* and *BDR2* on *CVC(0/1).* The appropriate lag length for this test is selected based on Schwarz information criterion (SIC). 1%, 5%, and 10% significance levels denoted by ***, **, and *, respectively.

	Dependent Variables		
Independent Variables	*BDR1*	*BDR2*	*CVC(0/1)*
CVC(0/1) $_{t-1}$	-0.041**	-0.047***	0.380***
	(0.016)	(0.012)	(0.029)
CVC(0/1) $_{t-2}$	-0.002	-0.018	0.172***
	(0.016)	(0.013)	(0.027)
BDR1 $_{t-1}$	0.314***		-0.000
	(0.019)		(0.000)
BDR1 $_{t-2}$	0.105***		-0.000
	(0.016)		(0.000)
BDR2 $_{t-1}$		0.450***	-0.001
		(0.015)	(0.000)
BDR2 $_{t-2}$		0.109***	-0.000
		(0.011)	(0.000)
Control Variables	Yes	Yes	Yes
Observations	125,039	125,039	125,039
Robust standard errors in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			

Table 13: Panel Vector Autoregression - CVC Investment and Cash

This table shows the estimated causality test results from the Panel Vector Autoregression (PVAR). It shows the pair regression results of *CVC(0/1)* and *Cash*. The first column shows the lagged variables of *CVC(0/1)* and *Cash*. Columns (2) and Columns (3) reports the results of the regression of lagged values of *CVC(0/1)* on *Cash* and further reports the pair regression of the lagged values of *Cash* and on *CVC(0/1)*. The appropriate lag length for this test is selected based on the Schwarz information criterion (SIC). 1%, 5%, and 10% significance levels denoted by ***, **, and *, respectively.

	Dependent Variables	
Independent Variables	*Cash*	*CVC(0/1)*
CVC(0/1) $_{t-1}$	0.062***	0.413***
	(0.027)	(0.036)
CVC(0/1) $_{t-2}$	0.060***	0.166***
	(0.018)	(0.029)
CVC(0/1) $_{t-3}$	0.054***	0.096***
	(0.016)	(0.032)
CVC(0/1) $_{t-4}$	0.099***	0.076***
	(0.021)	(0.029)
Cash $_{t-1}$	0.201***	-0.001*
	(0.019)	(0.001)
Cash $_{t-2}$	0.107***	-0.001
	(0.014)	(0.001)
Cash $_{t-3}$	0.068***	-0.001
	(0.010)	(0.001)
Cash $_{t-4}$	0.022***	-0.000
	(0.006)	(0.000)
Control Variables	Yes	Yes
Observations	90,923	90,923
Robust standard errors in parentheses		
*** p<0.01, ** p<0.05, * p<0.1		

Table 14: Granger Causality Tests

This table uses the Granger causality test to determine the robustness of the causality results obtained by the Panel Vector Autoregression (PVAR) in Table (12) and Table (13). *** ** & * denote rejection of the null hypothesis at 1%, 5% and 10%, respectively; The appropriate lag length for this test is selected based on the Schwarz information criterion (SIC).

	(1)	(2)
Null Hypothesis	chi-squared test	Prob
CVC(0/1) does not Granger Cause *BDR1*	6.494**	0.039
BDR1 does not Granger Cause *CVC(0/1)*	1.769	0.413
CVC(0/1) does not Granger Cause *BDR2*	18.006***	0.000
BDR2 does not Granger Cause *CVC(0/1)*	2.037	0.361
CVC(0/1) does not Granger Cause *Cash*	29.481***	0.000
Cash does not Granger Cause *CVC(0/1)*	5.168	0.271

Table 15: CVC Investment levels and Capital Structure

This table reports the effect of CVC investment levels on debt. Our dependent variables are *BDR1* and *BDR2*. We re-estimate our baseline regression in Eq(4). *BDR1* and *BDR2* are book measures of total debt and long-term debt respectively. The independent variables are; *Highest CVC Investors*, *Average CVC Investors* and *Lowest CVC Investors*. Each year we rank *CVC(0/1)* into terciles based on investment levels. *Highest CVC Investors* represents CVC investors with the highest CVC investment amounts as a percentage of total assets. *Average CVC Investors* represents CVC investors with the average CVC investment amounts as a percentage of total assets. *Lowest CVC Investors* represents CVC investors with the lowest CVC investment amounts as a percentage of total assets. Table 1 defines the variables. All control variables are lagged. Clustered errors by firm are shown in parentheses with 1%, 5%, and 10% significance levels denoted by ***, **, and *, respectively.

	(1)	(2)
VARIABLES	*BDR1*	*BDR2*
Highest CVC Investors	-0.108***	-0.095***
	(0.028)	(0.024)
Average CVC Investors	-0.048*	-0.058**
	(0.027)	(0.025)
Lowest CVC Investors	-0.024	-0.034
	(0.026)	(0.025)
FirmSize	0.038***	0.039***
	(0.002)	(0.001)
Profitability	-0.017	-0.025*
	(0.028)	(0.012)
MarketToBook	-0.002***	-0.000**
	(0.000)	(0.000)
Tangibility	0.196***	0.167***
	(0.015)	(0.010)
Cashflow	0.035	-0.032***
	(0.028)	(0.012)
Research and Development	-0.130***	-0.048***
	(0.030)	(0.011)
Investments	0.060***	0.071***
	(0.020)	(0.012)
Industry Cashflow volatility	0.001	0.002
	(0.002)	(0.001)
Dividend	-0.067***	-0.048***
	(0.005)	(0.004)
Constant	0.236***	0.096***
	(0.030)	(0.024)
Year Fixed Effects	Yes	Yes
Industry Fixed Effects	Yes	Yes
Observations	171,493	171,493
R-squared	0.014	0.016

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 16: CVC Investment levels and Cash Holdings

This table reports the effect of CVC investment levels on *Cash*. Our dependent variable is *Cash*. *Cash* is measured as cash and marketable securities scaled by beginning total book assets. We re-estimate our baseline regression in Eq(5). The independent variables are; *Highest CVC Investors*, *Average CVC Investors* and *Lowest CVC Investors*. Each year we rank *CVC(0/1)* into terciles based on investment levels. *Highest CVC Investors* represents CVC investors with the highest CVC investment amounts as a percentage of total assets. *Average CVC Investors* represents CVC investors with the average CVC investment amounts as a percentage of total assets. *Lowest CVC Investors* represents CVC investors with the lowest CVC investment amounts as a percentage of total assets. Table 1 defines the variables. All control variables are lagged. Clustered errors by firm are shown in parentheses with 1%, 5%, and 10% significance levels denoted by ***, **, and *, respectively.

VARIABLES	*Cash*
Highest CVC Investors	0.055**
	(0.022)
Average CVC Investors	-0.005
	(0.024)
Lowest CVC Investors	0.017
	(0.016)
FirmSize	-0.014***
	(0.001)
Profitability	-0.147***
	(0.038)
MarketToBook	0.003***
	(0.001)
Cashflow	0.125***
	(0.037)
Research and Development	0.343***
	(0.031)
BDR1	-0.041***
	(0.004)
Investments	-0.021***
	(0.017)
Industry Cashflow volatility	0.009***
	(0.001)
Dividend	0.005***
	(0.004)
Constant	0.177***
	(0.015)
Year Fixed Effects	Yes
Industry Fixed Effects	Yes
Observations	171,633
R-squared	0.183

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 17: CVC Investment and Capital Structure - Entropy Balancing

This table examines the effect of *CVC(0/1)* on *BDR1* and *BDR2* from the entropy balanced sample. We match firms on the mean moments of all the control variables used in the baseline regression. Our dependent variables are *BDR1* and *BDR2*. *BDR1* and *BDR2* are book measures of total debt and long-term debt respectively. *CVC(0/1)* is the variable of interest and is indicator variable equal to one if a firm makes cvc investment and zero if otherwise. Table 1 defines the variables. All control variables are lagged. Linearized standard errors are shown in parentheses with less than 1%, 5%, and 10% levels of statistical significance denoted by ***, **, and *, respectively.

	(1)	(2)	(3)	(4)
VARIABLES	*BDR1*	*BDR1*	*BDR2*	*BDR2*
CVC(0/1)	-0.035***	-0.031**	-0.025**	-0.020*
	(0.013)	(0.012)	(0.011)	(0.011)
FirmSize	0.027***	0.029***	0.020***	0.022***
	(0.003)	(0.003)	(0.003)	(0.003)
Profitability	-0.555**	-0.160	-0.503**	-0.087
	(0.263)	(0.245)	(0.244)	(0.203)
MarketToBook	-0.017***	-0.015***	-0.014***	-0.011***
	(0.004)	(0.004)	(0.003)	(0.003)
Tangibility	0.047	0.091***	0.058*	0.080**
	(0.032)	(0.034)	(0.031)	(0.032)
Cashflow	0.226	-0.148	0.227	-0.167
	(0.245)	(0.224)	(0.227)	(0.189)
Research and Development	-0.675***	-0.478**	-0.667***	-0.419**
	(0.188)	(0.223)	(0.188)	(0.211)
Investments	0.071	0.141	0.026	0.092
	(0.096)	(0.093)	(0.059)	(0.059)
Industry Cashflow volatility	0.009**	0.008	0.013***	0.010**
	(0.004)	(0.005)	(0.004)	(0.005)
Dividend	-0.033**	-0.053***	-0.032***	-0.053***
	(0.015)	(0.014)	(0.012)	(0.012)
Constant	0.303***	0.357***	0.288***	0.339***
	(0.049)	(0.059)	(0.045)	(0.055)
Year Fixed Effects	Yes	Yes	Yes	Yes
Industry Fixed Effects	No	Yes	No	Yes
Observations	166,831	166,831	166,831	166,831
R-squared	0.118	0.155	0.124	0.166

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 18: CVC Investment and Cash Holdings - Entropy Balancing

This table examines the effect of *CVC(0/1)* on *Cash* from the entropy balanced sample. We match firms on the mean moments of all the control variables used in the baseline regression. Our dependent variable is *Cash*. *Cash* is measured as cash and marketable securities scaled by beginning total book assets. *CVC(0/1)* is the variable of interest and is indicator variable equal to one if a firm makes cvc investment and zero if otherwise. Table 1 defines the variables. All control variables are lagged. Linearized standard errors are shown in parentheses with less than 1%, 5%, and 10% levels of statistical significance denoted by ***, **, and *, respectively.

VARIABLES	*Cash*	*Cash*
CVC(0/1)	0.017**	0.012*
	-0.007	(0.006)
FirmSize	-0.015***	-0.022***
	(0.002)	(0.003)
Profitability	-0.622***	-0.941***
	(0.112)	(0.137)
MarketToBook	0.020***	0.018***
	(0.003)	(0.003)
Cashflow	0.803***	1.077***
	(0.113)	(0.141)
Research and Development	0.777***	0.549***
	(0.095)	(0.104)
BDR1	-0.075***	-0.052*
	(0.026)	(0.027)
Investments	-0.328***	-0.341***
	(0.049)	(0.047)
Industry Cashflow volatility	-0.007***	0.002
	(0.002)	(0.002)
Dividend	-0.083***	-0.057***
	(0.008)	(0.008)
Constant	0.295***	0.257***
	(0.024)	(0.036)
Year Fixed Effects	Yes	Yes
Industry Fixed Effects	No	Yes
Observations	166,849	166,849
R-squared	0.329	0.372
Robust standard errors in parentheses		
*** p<0.01, ** p<0.05, * p<0.1		

Table 19: CVC Investment and Acquisition

This table reports estimation results of Equation (10), which estimates the effect of CVC Investment on Acquisition. Our Dependent Variable is Acquisition which is measured acquisition expenditure scaled by beginning year total book asset. *CVC(0/1)* is the variable of interest and is an indicator variable equal to one if a firm makes cvc investment and zero if otherwise. In Column (1) to (6), we find out how prior years *CVC(0/1)* affects acquisitions. Table 1 defines the variables. All control variables are lagged. Clustered errors by firm are shown in parentheses with 1%, 5%, and 10% significance levels denoted by ***, **, and *, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
CVC(0/1) $_{t-1}$	0.006					
	(0.004)					
CVC(0/1) $_{t-2}$		0.003				
		(0.004)				
CVC(0/1) $_{t-3}$			0.005			
			(0.005)			
CVC(0/1) $_{t-8}$				0.013**		
				(0.006)		
CVC(0/1) $_{t-9}$					0.011**	
					(0.004)	
CVC(0/1) $_{t-10}$						0.011*
						(0.004)
FirmSize	-0.011***	-0.011***	-0.010***	-0.010***	-0.010***	-0.012***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Profitability	-0.010***	-0.009***	-0.008**	-0.009*	-0.010	-0.009
	(0.003)	(0.003)	(0.003)	(0.005)	(0.006)	(0.006)
MarketToBook	0.000***	0.000***	0.000***	0.000***	0.000**	0.000*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Dividend	0.012***	0.012***	0.011***	0.011***	0.011***	0.012***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
Capital Expenditure	0.008***	0.008***	0.0.007***	0.005	0.009**	0.008**
	(0.002)	(0.003)	(0.003)	(0.004)	(0.004)	(0.005)
Cashflow	0.012***	0.012***	0.011***	0.012**	0.013*	0.013**
	(0.003)	(0.003)	(0.003)	(0.005)	(0.006)	(0.006)
Research and Development	-0.015***	-0.015***	-0.013***	-0.009***	-0.011***	-0.010***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)
Industry Cashflow volatility	-0.001**	-0.001*	-0.000	-0.000	-0.001	-0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.043***	0.045***	0.044***	0.069***	0.073***	0.076***
	(0.002)	(0.002)	(0.003)	(0.005)	(0.005)	(0.005)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	166,168	165,635	154,833	91,230	82,481	74,689
R-squared	0.015	0.015	0.014	0.013	0.013	0.014
Robust standard errors in parentheses						
*** p<0.01, ** p<0.05, * p<0.1						