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Abstract

This dissertation consists of two essays. The first essay documents a significant negative relationship between policy uncertainty and venture capital (VC) investment in startups across emerging venture capital markets (i.e., outside the United States). The adverse effect of policy uncertainty is exacerbated for younger and early-stage startups. By contrast, the effect is attenuated for startups that have headquarters in cities with a high concentration of global venture capital investment or in countries with more developed stock markets. However, the effect is not sensitive to the type of lead venture capital firm investing in the startup. Using close national elections and term limits to alleviate endogeneity concerns, I find that the baseline results continue to hold. Furthermore, I also find that policy uncertainty reduces the amount of cross-border VC investment. Finally, this study provides evidence that uncertainty increases the number of financing rounds, decreases the fraction of investment amount during the first round, and reduces the likelihood of successful exit through acquisition.

The second essay examines the effect of having board members with venture capital experience (i.e., VC directors) on executive compensation finds that such directors are associated with greater CEO and CFO risk-taking incentives (i.e., vega) and pay-for-performance sensitivity (i.e., delta). Such increases in vega and delta are achieved by increasing the share of option compensation at the expense of cash compensation. We also show that VC directors increase excess CEO compensation and total CEO compensation. Using Regulation S-K requirement to disclose attributes of nominated directors as an instrument, we show that these results are causal.

Chapter 1: The Effect of Policy Uncertainty on VC Investments Around the World

1. Introduction

Venture capital (VC) has been an important source of finance for commercializing innovation for many years (Nanda and Rhodes-Kropf, 2013). Given the importance of new technologies in driving the economic growth and creative destruction process in an economy, understanding the policy risk faced by VCs in the United States is a central issue for both academics and policymakers (Aghion and Howitt, 1992; Schumpeter, 1942; Kortum and Lerner, 2000; and Samilla and Sorenson, 2011).

Since the early 2010s, however, there has been a rapid increase in VC investments in emerging venture capital markets (i.e., outside the United States). According to the 2018 Preqin global private equity & venture capital report (Preqin, 2018), there is continued movement of venture capital deals away from North American markets, shifting towards European markets and emerging opportunities in Greater China. For instance, the fourth quarter of 2017 saw several $1 billion or more mega-deals outside the U.S. market, including $4 billion funding rounds to China-based companies Didi-Chuxing and online retail services provider Meituan-Dianping (KPMG Venture Pulse, 2017). While venture capital investment amounts were up dramatically, the venture capital market saw a continued decline in the number of deals. The decline in deal volume only emphasized the increasing importance of mega-deals in the global VC market.

Figure 1 (Subfigure A-C) shows that, while the VC investment activity in the United States has been large and vibrant for many years, the rest of the world saw very little growth in VC activity until the mid-1990s. Recently, however, the cumulative venture capital investment amount in MSCI developed markets and MSCI developing & frontier Markets is to become significantly closer to that in the U.S, especially in 2014. In a similar vein, since 2014, the value of VC investment in MSCI developing & frontier markets is higher than the value of VC investment in the MSCI developed markets. Due to the growing importance of VC investment in startups outside the United States, the role of VC in the economy, and the rising global policy uncertainty, it is, therefore, necessary to understand whether and how policy-induced uncertainty hinders VC investment activity across emerging venture capital markets (i.e., outside the United States).

The amount of VC investment across national borders has also shown a significant increasing trend. As shown in Figure 2, the total value of the cross-border VC deals targeting startups in venture capital emerging markets has increased from $ 14.06 billion in 2000 to $ 19.06 billion in 2015, while the proportion of the number of cross-border VC deals to the aggregate total number of VC deals in venture capital emerging markets has decreased from 62.38% in 1995 to 46.19% in 2015. Hence, I also investigate whether policy uncertainty reduces the value of cross-border venture capital investment deals.

To evaluate the extent to which policy uncertainty influences the decision of VCs to finance startups across emerging venture capital markets, especially outside the United States, I analyze a sample of VC investments occurring in 22 countries between 1987 and 2015. I use a broader sample than the study by Tian and Ye (2018), to investigate whether policy uncertainty decreases the amount of VC investment, the number of VCs investing, and the investment per VCs in a given year. I also analyze whether the adverse effects of policy uncertainty exhibit heterogeneity in the cross-section across several startups, lead VC and geographic characteristics of the VC deals. Furthermore, I examine whether policy uncertainty affects VC investment structure and success. Finally, since cross-border VC investments have been rising in recent years, I also investigate whether policy uncertainty reduces the value of cross-border VC investment deals.

Academic research has documented the impact of policy uncertainty on real economic outcomes. For the United States, Julio and Yook (2012), Bloom et al. (2014) find that uncertainty shocks are followed by a substantial drop in GDP, driving business cycles. Previous literature also shows that firms are less likely to execute IPOs (Colak et al., 2016) and SEOs (Jens, 2016) in gubernatorial election years. Further, Gulen and Ion (2016) show a significantly negative link between capital expenditures and policy uncertainty using the Economic Policy Uncertainty (EPU) Index. A recent paper by Tian and Ye (2018) explores how policy uncertainty impacts the U.S. venture capital market. In a cross-country study, Julio and Yook (2016) and Kelly, Pastor, and Veronesi (2016) also find that election cycles affect corporate investments and equity option values, respectively. My paper aims to expand prior literature to understand the causal effect of policy uncertainty on global VC investment activity.

This study argues that policy uncertainty negatively impacts VC investment in startups across countries. This hypothesis is motivated by the real options literature, which emphasizes that if investment projects are (even partially) irreversible, uncertainty shocks can increase firms' incentives to postpone investment until some of the uncertainty resolves (e.g., Bernanke 1983; Rodrik 1991; Dixit and Pindyck 1994). Several more recent theoretical papers (Chen and Funke, 2003; Bloom et al., 2007) also argue that investors become more cautious in the face of uncertainty since it increases the value of the option to wait. Policy uncertainty is relevant for the dynamics of venture capital investment because the expected returns on investment projects become less predictable when uncertainty increases. This problem is relatively more severe for foreign VCs than domestic ones because foreign investors are more likely to be less informed about the policy environment and may be treated differently than domestic investors. Moreover, VC investment cannot be easily reversed without paying substantial sunk costs as VC investment typically has a long-time horizon (about ten years). Hence, forward-looking VC investors must continuously be anticipating how changes in government policy could affect the expected returns of their investments and/or their barriers to enter and exit the market.

An alternative to the main hypothesis in this study is that venture capital firms may respond positively to heightened policy uncertainty. Some theoretical models are in support of this alternative outcome, predicting the positive effect of policy uncertainty on investments. For instance, Bar-Ilan and Strange (1992) find that policy uncertainty leads to higher investment in a model with costly entry and exit and time-to-build. Roberts and Weitzman (1981) also show a higher uncertainty could lead to a greater incentive to invest if a firm has the option to abandon a project. Additionally, Kulatilaka and Perotti (1998) provide a strategic rationale that increased uncertainty encourages investment in growth options as higher uncertainty means more opportunity in a market with strategic competition.

While this paper complements prior literature, there are several main departures. First, I focus on the effect of political uncertainty on privately held entrepreneurial companies or startups in emerging venture capital markets outside the United States, whereas most of the literature centers attention on the effect of policy uncertainty in the publicly listed firm in major venture capital markets, the United States. There is only limited research in the financial economics literature, such as Megginson (2004), Nahata et al. (2014), Chemmanur et al. (2016), and Phillips and Zhdanov (2017) that have documented the spread of global venture capital investing. Second, using close national election datasets, national term limits, and placebo tests, I provide evidence that the effect of policy uncertainty on venture capital investment across countries is likely causal. Additionally, I also highlight the influence of startups' geographic location and equity market development on the link between policy uncertainty and VC investment activity. Finally, I conduct empirical analysis at various units of observation, including startup-level, industry level, and country-pair level.

The two main challenges in the investment under uncertainty research are to find an appropriate measure of policy uncertainty and to establish causality. Measuring the portion of uncertainty attributed to the political and regulatory system is a difficult task. Despite that, Baker, Bloom, and Davis (2016) fill this gap in the literature by creating a news-based policy uncertainty index as a weighted average of the frequency of articles related to policy uncertainty in the leading domestic newspapers. The news index is, in principle, designed to capture the uncertainty associated with all policy decisions, including those captured by the tax-code components and by government spending and inflation components. This index significantly correlates with events ex-ante predicted to create policy-related uncertainty and withstand a detailed human audit check. In this paper, I will use the news-based policy uncertainty index developed by Baker, Bloom, and Davis Index to estimate the effect of policy uncertainty on venture capital investments.

To address endogeneity concerns, I follow Julio and Yook (2016) and Bhattacharya et al. (2017) and use close national elections as a natural and clean experimental framework to study how politics affect economic decisions because the timing of close elections is beyond the control of investors. I also rely on term limits, which is exogenous to venture capital investments, as an instrumental variable (IV) for a close national election. I predict that term limits will only affect venture capital investment through a close national election channel. Finally, I also consider various fixed effects typically used in the literature to reduce potential omitted variable bias, and these variables do not significantly alter the results.

I begin the empirical analysis at the startup-year level by estimating the effect of policy uncertainty on several benchmark VC investment variables, including VC investment amount, number of VCs investing, and investment amount per VC. Besides the classic investment predictors (Tobin's Q, cash flows, sales growth), I also control for other industry proxies (tangibility, competition) and several macroeconomic proxies for investment opportunities (e.g., stock return, real GDP growth, composite leading indicators, country openness, and inflation rate). In my baseline regression, I also include industry-, stage-, year-, and startups' country fixed effects. This specification aims to address endogeneity concerns stemming from the fact the uncertainty is likely to be countercyclical and maybe capturing the impact of future poor economic performance.

One key finding of this paper suggests that a one standard deviation increase in policy uncertainty at a given year is associated with a 0.141, 0.137, and 0.076 standard deviation decline in venture capital investment amount, number of VCs investing, and investment per VC in the same year, respectively. This corresponds with an 8.05% decrease in the amount of VC investment, a 7.82% decrease in the number of VCs investing, a 4.34% decrease in investment per VCs in the same year. From a time-series perspective, I find no evidence of a subsequent uptick in VCs investment in the following years. I use the residual Economic Policy Uncertainty Index (by regressing each country Economic Policy Uncertainty index on the United States Economic Policy Uncertainty Index) and aggregate observations to industry-country level as robustness checks, and the results continue to hold. Furthermore, I also find that VC investment activity declines during a close national election year.

To identify possible mechanisms through which policy uncertainty affects VC-backed startups, I investigate whether the adverse effect of policy uncertainty on VC investment activity exhibits heterogeneity in the cross-section. I find that the adverse effect of policy uncertainty on VC investment is more pronounced when startups are younger and are in the early stage of development. This finding is consistent with the notion that VCs are more likely to postpone their investment under uncertainty if there are more underlying risks associated with the startups. This result is also consistent with prior literature, which documents that the negative effects of policy uncertainty are more pronounced for less mature startups because these companies have relatively less experience and therefore are riskier to invest in.

Another source of cross-sectional heterogeneity I explore is the geographic location of the startups. Figure 3 Panel A, B & C shows that in the period 2010-2015, VC investments in the United States were geographically concentrated in California, New York, and Massachusetts, while VC investments in emerging venture capital markets (i.e., outside the United States) were geographically concentrated in China (Beijing, Shanghai, and Shenzhen), United Kingdom (London), India (Bangalore and Mumbai), and Canada (Calgary, Toronto). This geographic concentration of VC Investments supports the notion that knowledge and technology know-how spillover are geographically localized (Jaffee,1993). I hypothesize that the resulting concentration of venture capitalists and entrepreneurs may encourage policymakers in cities/regions with high concentrations of venture capital investment to provide incentives for VCs to maintain their investment (Chen et al., 2010). Consistent with this prediction, I find that the dampening effect of policy uncertainty is less pronounced when startups are in cities with a high concentration of VC investments. Further, the effect of policy uncertainty is also less pronounced for VC investments in startups in countries with more developed equity markets. I argue that VCs that invest in these countries are more optimistic about the return of their investment, and therefore are more likely to maintain their investment level in the face of uncertainty.

The other sources of cross-sectional heterogeneity are the types of lead VC investors, particularly whether the startups are backed by corporate and government lead VC firms. I find that the adverse effect of policy uncertainty is not sensitive to the type of lead VC investing in the startups. One explanation of these findings is that captive VC firms (who are affiliated with corporations or banks) are just as sensitive to policy uncertainty as independent VCs.

From a VC investor's standpoint, it is important to ask if the negative effect of policy uncertainty affects the VC investment structure and probability of investment success, respectively. To answer this, I use the number of financing rounds and the fraction of investment amount during the first round (skewness) to measure VC investment structure. Additionally, I use IPO exit dummy (Acquisition exit dummy) that equals one if the startup exits by going public (Acquisitions) and zero otherwise as measures of VC investment success. My cross-sectional test provides support that policy uncertainty affects VC investment structure primarily by increasing the value of the option to wait (e.g., larger rounds and less skewness). Moreover, I find that policy uncertainty has a negative and strong significant effect on the probability of acquisition exit, but it only has a negative and weak significant effect on the probability of an IPO exit.

To investigate more closely the cross-border deal flows from VC countries to startups beyond the prior results, I next study country-pair level cross-border investment of VCs across countries. My results then show that policy uncertainty has a negative and significant effect on cross-border VC investment flows in the same year. Interestingly, I show that the adverse effect is not significant in the following year. To my knowledge, this study is the first to uncover a connection between uncertainty and cross-border venture capital investment activity.

This paper contributes to two streams in the existing literature. One is the literature on investment under general uncertainty, as well as the literature studying political uncertainty. On the theoretical side, predictions from early theory literature on investment under uncertainty were mixed. Roberts and Weitzman (1981), and Bar-Ilan and Strange (1996) predicted that higher levels of uncertainty would increase investment, while Bernanke (1983), Dixit (1989), and Leahy (1993) predicted a decline in investment in times of higher uncertainty. Furthermore, the existing empirical literature starts to expand on international samples, including countries with far greater levels of political uncertainty than is experienced in the U.S. (Julio and Yook, 2012) and distinguishing different types of uncertainty (Baker et al., 2016; Gulen and Ion, 2016, and Jens, 2017).

The other stream of literature this paper contributes to is on venture capital investment. Prior literature has examined how various VC investors' characteristics (e.g., experience) and market characteristics (e.g., industry competition and investment environment) affect VC investment in startups (Nahata, 2008; Da Rin et al., 2013). However, the existing literature has ignored how an important macroeconomic shock, such as policy uncertainty affects VC investment activity and exits. My study fills this gap and explores how policy uncertainty affects VCs' investment and its outcomes.

The remainder of this paper is structured as follows. Section 2 discusses the data and summary statistics. I present the research design and the main empirical results in Section 3. Section 4 concludes the paper with a summary of my findings.

2. Data, sample, and descriptive statistics

This section presents the data and documents several characteristics of VC investment in startups located in emerging venture capital markets (i.e., outside the United States).

2.1. Measuring policy uncertainty

My sample covers startups from 22 countries with complete Economic Policy Uncertainty Index (EPU) values over the 1987-2015 period. The EPU index is developed by Baker et al. (2012), Kroes et al. (2015), and Zalla (2016), who recently expanded the EPU index to include more countries outside the United States.

Baker et al. (2016) initially construct indices of economic policy uncertainty based on newspaper coverage frequency. To meet the Economic Policy Uncertainty (EPU) criteria, an article must contain terms in all three categories pertaining to the economy (E), policy (P) and uncertainty (U). They then scale the raw count by the total number of articles in the same newspaper and month. For each paper, they then standardize the monthly series of scaled counts to unit standard deviation over time. The final step averages the standardized, scaled counts across the ten papers by month to obtain the monthly EPU index.

To construct a news-based Economic Policy Uncertainty (EPU) Index for each country in this study, I proceed as follows: First, I re-normalize each national news-based EPU index available at www.policyuncertainty.com to a mean of 100 based on the base value in January 2010. Second, I compute the yearly average of each national EPU index values.

Furthermore, following the Julio and Yook (2012) and Piotroski (2014) methods, I also collect cross-country sample data pertaining to close national elections across 47 countries as another proxy of policy uncertainty shocks. My study also adopts Brender and Drazen's (2013) approach to limit the national election sample to democracies by including only the years in which the country has a non-negative score in the POLITY IV level of democracy index.

2.2. Startups and venture capital investment data

I combine data from several major sources. My VC investment sample is obtained from Thomson Reuters VentureXpert database and it includes round-by-round investments by VC investors for startups that received their first venture capital financing between January 1, 1987, and December 31, 2015. I only include startups outside the United States and exclude those with missing or inconsistent data. I also collect a number of data items from VentureXpert, including the round investment date, disclosed and estimated investment amount, the number of participating VCs' name, the addresses of the VCs, as well as the startups' names, founding year, primary industry measured by the four-digit Standard Industrial Classification code, and its headquarter address.

I restrict my sample to venture capital deals, defined by VentureXpert as venture capital investments that include startup/seed, early, expansion, and later-stage deals, or any non-venture stage investments made by traditional venture focused firms. I also correct VentureXpert's over-reporting problem by following the procedures of Tian (2011). More specifically, I eliminate repeated rounds within three months if they share the same amount of round financing.

In addition to that, I collect startup exit status by combining the information of IPO exits and M&A exits in VentureXpert with the Securities Data Company (SDC) Global New Issues database and the SDC Mergers and Acquisition database. More specifically, I use the IPO and M&A dates as proxies of startup exits. Following Chemmanur et al. (2014) and Tian and Ye (2018), I classify a startup as being written-off if it does not receive any financing within three-years of its last round of financing and indicate the three-year mark after its last round of financing as its exit date. My startup-year sample covers all startups during their incubation periods, which can be defined as the period between the date of first VC financing and the date of exit. Finally, I follow Gompers (1995) and Tian and Ye (2018) procedure to identify the Lead VC for each startup.

Following the methods of Julio and Yook (2012), I also collect national election, term limits, and national congress year of the Chinese Communist Party data. The major source of data is the Database of Political Institutions. This source provides information about electoral rules and the classification of political platforms for the elected leaders and candidates. I supplement the election data with various internet sources for cases in which election information is missing. To calculate close election variables, I defined close elections as those in which the margin of victory is smaller than 5%. The margin of victory is defined as the vote difference between the winner and the runner-up across all elections for the sample considered. The second proxy for close elections is defined as the elections in which the margin of victory is smaller than the first quartile value of the margin of victory distribution over the sample of countries under consideration. Similarly, I use the national congress year of the Chinese Communist Party as the source of policy uncertainty shocks in China. According to Piotroski (2014), the national congress is the most important event in China with respect to the determination of party leadership, political objectives, and economic policy. During this congress, the key central government and party positions are confirmed and the transition of power takes place.

I also collect accounting data for international companies from Worldscope (Datastream). I need this accounting data to construct various industry control variables that are known to potentially affect VC investment activities. Following Gompers (1995) and Tian and Ye (2018), I compute four main control variables, namely, Tobin's Q, sales growth, cash flow, and tangibility on an annual basis. Tobin's Q is computed as the sum of the book value of total assets and the market value of common equity minus the book value of common equity, scaled by the book value of total assets. Sales growth is computed as the year-on-year growth rate in annual sales. Cash flow is computed as the operating cash flow divided by total assets. A startup's tangibility is computed as net property, plant, and equipment scaled by assets. I measure industry Tobin's Q by taking an average of Tobin's Q in each 3-digit SIC industry annually. I use the same approach to construct industry sales growth, industry cash flow, and industry tangibility. Further, I add additional control variables such as industry competition, currency volatility, stock market returns, real GDP growth, trade openness, and inflation in the full augmented models.

To be included in the analysis, Startups must have non-missing observations for all the investment variables, industry-level accounting variables, and economic policy uncertainty variables. This amounts to a sample of 11,404 distinct startups with 17,641 startup-year observations. This means that there are several one year only observations. One way of interpreting these sample statistics is that some startups stop receiving additional funding after one year. Table 1 Panel A reports the summary statistics of the economic policy uncertainty index. Table 1 Panel B reports the descriptive statistics of the main venture capital investment and startup variables. Table 1 Panel C reports the descriptive statistics of the industry-level control variables. Finally, Table 1 Panel D presents the descriptive statistics of macroeconomic-level control variables. Additionally, the summary statistics for the national elections are provided in Table 2. All variables' definitions are given in Table A1 in the Appendix.

In this paper, I adopt four units of observation. In the first part of the analysis, I focus on VC investment in a given startup at a given year. For this, I construct the unit of observation as a startup-year. Moreover, to alleviate the concern that missing values in VC investment amount between two successive VC financing rounds could bias my findings, I aggregate observations to the industry-country level. In the later part of the analysis, I focus on the relationship between policy uncertainty and investment success, as well as the relationship between policy uncertainty and investment structure. For these parts of the analysis, the observation unit of analysis is startups. In the last part of the analysis in which I analyze the effect of policy uncertainty on cross-border VC investments, the unit of observation is VC country - startup country pair.

3. Empirical results

In this section, I present and discuss my primary empirical results on the relationship between policy uncertainty and VC investments around the world. I also provide preliminary evidence relating to the patterns of VC investment to countries' economic policy uncertainty.

3.1.Preliminary evidence

As a preliminary look at the data, Figure 4 plots the relationship between the natural logarithm transformation of venture capital investment amount in the year 2015 (for each of the 22 countries) and the average natural logarithm of policy uncertainty index over the same period. The graph clearly displays a negative correlation between these two variables. On the one hand, venture capital investment activity is high in countries such as Singapore, where the EPU score is relatively low. On the other hand, VC investment activity is low in countries such as Russia and Greece, where the EPU score is high. If some of the country observations are removed from Figure 4, it is possible that the trend line changes slope or direction. Yet, for the purpose of providing preliminary evidence and having a limited twenty-two countries average sample observations, Figure 4 uses all of the available country observations to plot the relationship between policy uncertainty and venture capital investment.

3.2. Multivariate analysis: the relationship between policy uncertainty and VC investments

My primary empirical tests examine whether VC investment activity is influenced by economic policy uncertainty. I use a panel data model to assess the effect of policy uncertainty on investment decisions of VC firms across 22 countries. The model estimates the level of investment a VC will engage in year *t*, given the level of the policy of uncertainty in the same year. Specifically, I model the panel data regression for VC investment activity as:

$$Investment_{ikjt} = \alpha_{ijt} + \beta_1 Policy\ Uncertainty_{jt} + \beta_2 Controls_t + \varepsilon_{ijt} \quad (1)$$

where *i* indexes startups, *k* indexes industries, *j* indexes countries, and *t* indexes years. I use three variables as the indicator variable for investment: VC amount, number of VCs, and average investment per VCs. I define VC amount as the total VC investment amount a startup receives in a year; Number of VCs as the number of VCs investing in a startup in a year; and Average Investment per VC as total investment amount a startup receives divided by the number of investing VCs in a year.

The *Policy Uncertainty* variable is the annual measure of economic policy uncertainty. To construct this variable, in each year *t*, I take the natural logarithm of yearly arithmetic average of the Baker et al. (2016) EPU index in year *t*. In all regressions, I control for startup age (*Age*) that is the natural logarithm of startup *i*'s age in year *t*, considering that startup age could significantly affect a VC's investment. I add one when taking the natural logarithm to avoid losing observations as some startups receive VC first-round financing when they are younger than one year old. Furthermore, to address the concern that public markets could affect VC investment, I add a set of 3-digit SIC industry corporate financial variables in *Controls*, namely, industry Tobin's Q, industry sales growth, industry cash flow, and industry tangibility. I also add a set of economic control variables, including stock market return and Real GDP growth to capture the expectation of future economic conditions. All variables are measured contemporaneously to the VC investment decision. See Table A1 for the definitions and data sources of my independent variables. All estimations include stage, year, industry, and startup country fixed effects. I use the startup country fixed effect to capture the effect of startup location clusters on VC investment. Following Bhattacharya et al. (2017), standard errors are clustered at the country-industry and year level.

Table 3 presents coefficients from various estimations of the panel-data model in equation (1). I estimate equation (1) using the panel regression model. The coefficient estimates on BBD are negative and significant at the 5% or 1% level in all columns, suggesting that VCs' investment activity declines significantly when policy uncertainty increases. The economic effect of *Policy Uncertainty* on VC investment propensity is substantial: increasing *Policy Uncertainty* by one standard deviation (1.77 = e^0.571) from its mean value (96.15 = e^4.566) is associated with an 8.05% (0.141×Ln(1.77)), a 7.8% (0.137×Ln(1.77)), and 4.3% (0.076*Ln(1.77) lower VC investment amount, number of VCs investing, and Investments per VCs at the same year, respectively.

Table 4 presents the effect of policy uncertainty across time. In column (1) to (6), the coefficient estimates of *Policy Uncertainty* are statistically insignificant, except in column (3), indicating that the effect of policy uncertainty on VC investments does not continue to the following calendar year after the change in policy uncertainty. I do not find evidence suggesting that the VC investment response to policy uncertainty shocks lasts over time. I cautiously interpret these results as showing that VC firms do not somewhat change its investment intensity in startups in the incoming years after an increase of policy uncertainty in a given year.

Tables 3 and 4 further show that the coefficient estimates on startup age are negative and significant, suggesting venture capitals invest less in younger or less experienced startups. The industry Tobin's Q variables have insignificant coefficients. The adjusted R-squared is moderate, ranging from 0.118 to 0.341, depending on the control variable and fixed effects specifications.

3.3.Addressing a variety of concerns

In this section, I conduct additional tests to address various concerns about my main results. The first concern is that my proxy of policy uncertainty, the EPU index, may also capture the effect of other country's economic policy uncertainty. Since these sources of uncertainty could affect VC investment activity, it is important to control them for identification purposes. Since the United States is one of the main trading partners of many countries around the world, I expect the United States to share some common factors with other trading countries. In this paper, I extract the common component between each country's economic policy uncertainty and the U.S. economic policy uncertainty index. To perform this, I regress each country's economic policy uncertainty index on the U.S. Economic Policy Uncertainty Index as the only independent variable and use the residual as an alternative measure for each country policy uncertainty. I report the results of this re-estimation of equation (1) using the residual policy uncertainty index in Table 5. I continue to observe a negative and significant effect of policy uncertainty on VC investment in the same year.

The second concern is that VCs may not invest in a startup every year, creating missing values in the years between rounds of financing. To address this concern, I sum the startup-year level data from previous analysis into three-digit-SIC industry-country level data and repeat my main analysis results. Yet, I continue to observe a negative effect of policy uncertainty on VC amount and Investment per VC in the contemporaneous year. In summary, the findings in Table 6 show that my results are robust to using alternative policy uncertainty proxies and construction of the unit of observation.

3.4. Establishing causality

In this section, I attempt to deal with time-varying omitted variables as well as reverse causality, by relying on plausibly exogenous variation generated by a close national election. As argued by Julio and Yook (2012), elections around the world provide a natural and clean experimental framework for studying how politics influence many economic decisions because the timing of elections is beyond the control of any companies. Bhattacharya et al. (2017) further argue that a close election is unpredictable and reasonably exogenous.

Following the prior literature, I obtain national election information from the Database of Political Institutions - IADB database. This database provides detailed information on each national election. There are a total of 301 national elections take place in my sample period between 1987 and 2015 in 47 countries. Out of those national elections, there 74 elections (25% of total national election sample) that are categorized as close national election I and 107 elections (35% of total national election sample) that are categorized as close national election II. Additionally, the correlation between economic policy uncertainty index and national election in 2015 is 0.52. Overall, the results presented in Table 7 Panel A suggest that VC investment activity declines during a close national election year. In this study, we do not use policy uncertainty index and national election dummy variable simultaneously to avoid multicollinearity issues. Table 7 Panel B also provides evidence from a placebo test where a close national election dummy is randomly assigned to countries in the sample. The placebo tests show that none of the close national election dummies remain statistically significant in the regression.

My second identification attempt is to utilize term limits, which are exogenous to most economic and political factors. Term limits create an increase in political uncertainty by preventing the incumbent government from seeking re-election (Jens, 2017). In other words, the absence of the incumbent results in a closer election. For term limits to be a valid IV, the variable must satisfy both the relevance and exclusion conditions.

To empirically test the relevance condition, I regress the binary closeness variable (close election) on term limits, and other variables used as controls in the second-stage regression (Angrist, and Pischke, 2008; Roberts and Whited, 2012; Candace, 2017). Following Angrist and Pischke (2008), given that the endogenous regressor is a binary variable, I use the fitted values from the probit regression of close election on term limits as an instrument in a regular 2SLS estimation. Thus, in effect, I will have a three-stage regression.

Table 8 presents the results of the estimation of the Instrumental variable. I first regress the close election on term limits using the Probit model. I set close election I to one if the margin of victory of the election is smaller or equal to 5%, where the margin of victory is defined as the difference between the fraction of votes won by the victor and that garnered by the runner-up. Furthermore, I set close election II to one if the margin of victory of the election is smaller than the first quartile value of the margin of victory distribution over the sample of countries under consideration. In Table 8 Panel A and B, Column (1), (3) and (5), I report that the coefficient of term limits in the first-stage regression is 0.55 and 0.84 respectively and both are significant at 1% level for both proxies of a close election (close election I and II), respectively. The pseudo-R-squared of these regressions are 0.19 and 0.17. Following Angrist and Pischke (2008), the fitted values from this regression are then used as an instrument in the common 2SLS regression.

In Panel A and B Table 8, Column (2), (4) and (6), I run the common 2SLS regression using the fitted values from the Probit model as an instrument. The relevance criterion is again satisfied. The individual coefficient on the instrument is positive and significant at the 1% level and the F-stat is well above the typical threshold of 10; the adjusted R-squared of the regressions are 36.5% and 37.7%, respectively. In particular, using the first proxy of Close Election, the F-statistic of the regression is 31.44 and the Adjusted R-squared of the regression is 36.5% while using the second proxy of the Close Election, the F-statistic of the regression is 41.61 and the Adjusted R-squared of the regression is 37.7%, alleviating concerns that the instrument may be weak. The term limits variable is significantly related to election closeness. Finally, I show the coefficient on the second stage regressions are greater in absolute magnitude than those founds in Table 7. The coefficient estimates on the close election are negative and significant at the 5% level in Panel A Column (2) Panel B Column (6) and negative and significant at 1% level in Panel A Column (6), suggesting that VCs' investment activity declines significantly during the close national election year.

I also re-estimate equation (1) using a sample that is limited to startups located in China. In this estimation, I use the congress year of the Chinese Communist Party as a proxy of political uncertainty in China. There are six congress years (1988, 1993, 1998, 2003, 2008, 2013) in my sample period. I re-estimate equation (1) by replacing policy uncertainty with congress year. Table 9 shows that there is also a significantly lower venture capital investment activity during the congress year relative to non-congress year.

These combined results from Tables 7, 8, and 9 mitigate concerns about the endogeneity concern coming from the economic conditions and demand side. They support my main findings that political uncertainty adversely affects VC investment. In summary, relying on plausibly exogenous variation in policy uncertainty generated by close national election, term limits, and congress year, my results support the notion that policy uncertainty appears to have a causal, negative effect on VC investment.

3.5. Heterogeneity effects across cross-sections

In this section, I further investigate the effect of economic policy uncertainty on VC investment by conducting cross-sectional tests that re-estimate equation (1) in various dimensions of the startup and lead VC investors characteristics. Specifically, I add an interaction term between the EPU index and startup characteristics in the baseline regression to study how these characteristics change the effect of policy uncertainty on VC investment.

$$INV_{ikjt} = \alpha_{ijt} + \beta_1 EPU_{jt} + \beta_2 EPU_{jt} * Char + \beta_3 Char + \beta_4 Controls_t + \varepsilon_{ijt} \quad (2)$$

where *i* indexes startups, *k* indexes industries, *j* indexes countries, and *t* indexes years. I use three variables as the indicator variable *INV*: VC amount, the total VC investment amount a startup receives in a year; Number of VCs, the number of VCs investing in a startup in a year; Average Investment per VC, total investment amount a startup receives divided by the number of investing VCs in a year. The variable Economic Policy Uncertainty (*EPU*) is the annual measures of economic policy uncertainty. The unit of observation in this test is startup-year. *Char* represents startup or *Lead VC* characteristics. *EPU* × *Char* is the interaction term of economic policy uncertainty and the startup characteristics that I examine. All other control variables and fixed effects are the same as those included in equation (1).

I consider several dimensions of startups' and Lead VC investors' characteristics (*Char*) that may influence the effect of policy uncertainty on VC investment. First, I explore how startup age and stage of development change my main results. Second, I show how the main findings vary with different types of lead VC investors. Third, I explore the effect of the share of global venture capital investment in the cities where the startups are located. I postulate that the adverse impact of policy uncertainty is less pronounced in a city with many alternative VC investments (supply of funding to startups) available. Finally, I examine how stock market development in a startup country alters the main findings. I conjecture that the dampening effect of policy uncertainty is less pronounced in a country with a more developed startup exit market (demand for startup's exit) available.

The first dimension of cross-section I study is startup maturity, which is proxied by a startup age and development stage. To test this conjecture, I use startup age (*Age*) as Char, and hence *EPU* × *Age* is the main independent variable in equation (2). I show the regression results in Table 10. The coefficient estimates on *Policy Uncertainty* are negative and significant, consistent with my main findings. The coefficient estimates on the interaction term, EPU × Age, are positive and significant at the 1% level in Column 1 & 3, suggesting that the negative effect of policy uncertainty on VC investment is mitigated for older startups.

Similarly, I use startup dummy and early-stage dummy as a proxy for startup maturity. I define the startup dummy to be one if it is in startup/seed and equals zero if the startup is in an expansion, later stage or buyout/acquisition. Moreover, I define early-stage dummy to be one if it is in startup/seed or early-stage and equals zero if the startup is in an expansion, later stage or buyout/acquisition. Hence, *EPU* × *Startup/Early-stage dummy* is the main independent variable in the equation. I provide the regression results in Table 11 panel A and B. The coefficient estimates on Policy Uncertainty (*EPU*) are negative and significant, consistent with my main findings, while the coefficient estimates on the interaction term, *EPU* × *Startup/Early-stage dummy*, are negative and significant at the 1% level in Column 1 & 3 of Table 11 (Panel A & B), suggesting that the negative effect of policy uncertainty on VC investment is mitigated for startups at a later stage of development.

The second dimension I explore is the type of lead VCs investing in the startups. To examine this, I construct a corporate venture capital dummy and bank venture capital dummy variables. Table 12 presents the results regarding VCs' propensity to invest depending upon the type of its VC investors. The marginal effects of the interaction term, *EPU* × *Char*, are both positive and significant at the 5% level in Column (3) Panel A and at 1% level in Column (1) and (3) Panel B. However, an F-test reveals that the sum of these two coefficients (*EPU* & *EPU x Char*) is indistinguishable from zero. Thus, the negative effect of policy uncertainty on VC's total investment is not sensitive to the type of lead VCs investing in the startup.

I next construct the global venture capital investment hubs dummy, which has a value of one if a startup city is in the top 50 ranks of total 3554 emerging venture capital cities which obtain VC round deals/investments during the period 2010-2015 and zero otherwise. Panel A shows estimation results using a proxy of global hubs that is based on the investment amount of VC deals in the city, while Panel B shows estimation results using a proxy of global hubs that is based on the number of VC deals in the city. I then replace the characteristics variable (*Char*) with the global hubs dummy in equation (2) and report the results in Table 12.

Table 12 presents the results on VC investment activity where the coefficient estimates on the interaction term, *EPU* × *Global hubs,* are positive and significant at the 1% level in all columns. This finding suggests that the negative effect of policy uncertainty on VCs' investment is less pronounced if the startups are in cities with a higher intensity of VC investments. All these findings are consistent with the hypothesis that cities with high investment activity may have more stable policies toward VC investments compared to other cities with less VC investment activity.

Similarly, I also test whether equity market development in the startup country affects the magnitude of policy uncertainty effect on VC investment. I argue that VC investors are less sensitive to policy uncertainty in countries with a more developed equity market because the startups have a better chance to exit through IPOs or Acquisitions (Black and Gilson, 1998;

Cumming, 2008). My proxy for equity market development is the market capitalization of the publicly listed firm scaled by total GDP. My second proxy for equity market development is the number of publicly listed firms in a country. I obtain this data from World Development Indicators (WDI).

Table 14 presents the results on VC investment activity where the coefficient estimates on the interaction term, *EPU* × *Equity Market Development*, are positive and significant at the 5% level in Panel A column (1) and Panel B Column (1). This finding suggests that the negative effect of policy uncertainty on VCs' investment amount is less pronounced if startups are located in countries with well-developed equity markets.

3.6. VC Investment structure and investment outcomes

In this section, I examine whether policy uncertainty affects VC investment structure and outcomes. The number of startups included in the sample for this section is larger than that of the previous section because I also include the deals that have missing round amounts here. Moreover, there are typically three investment outcomes for startups that are backed by VCs: going public, being acquired, and being written-off. To understand the effect of policy uncertainty on investment outcome, I regress VC investment outcomes (IPO, acquisition, or both) on economic policy uncertainty in fixed-effect panel regressions. I report the coefficients of the fixed effect regression in Table 16.

The coefficients of policy uncertainty in both columns (2) and (3) in Table 15 are negative and significant at the 1% level, while the marginal effect of policy uncertainty in column (1) is positive but not significant at any level. These findings indicate that a higher level of policy uncertainty during a startup's incubation period is negatively related to the startup's probability of acquisition exit. The economic significance is considerable. For example, according to the coefficient estimates reported in column (1), increasing economic policy uncertainty by one standard deviation from its mean value is associated with a 5.9% (5.4%) lower probability that a startup will have an acquisition exit (successful exit).

If greater economic policy uncertainty is associated with worse investment outcomes and exit prospects, VCs may undertake various investment structures to mitigate such adverse effects of policy uncertainty. I explore two plausible strategies that VCs could use, VC staging and VC investment skewness. I use the number of rounds as the proxy of VC staging and the proportion of first-round VC investment amount to total investment during the incubation period as the proxy of VC investment skewness.

Following that, I regress the number of financing rounds a startup goes through on the *Policy Uncertainty* variable and run a cross-sectional regression. I report the results in Table 14. I find that the marginal effects of EPU are positive and significant at 1% level, suggesting that the average policy uncertainty during the startup incubation period increases the number of rounds taken by the VCs. An increase of one standard deviation of EPU from its mean value is associated with a 26.89% increase in the number of rounds by VC firms.

Similarly, I also run the regression of investment skewness on economic policy uncertainty and find that the marginal effect of EPU is negative and significant at 1% level, indicating that higher averages of policy uncertainty during a startup's incubation period reduce the fraction of investment in the first-round relative to total VC investment in the startup. A one standard deviation increase of EPU from its mean value is associated with a 7.7% decrease of skewness by VC firms.

3.7. Cross-border venture capital investment

In this section, I ask whether policy uncertainty affects cross-border venture capital investment. To observe the effect of policy uncertainty on the cross-border flow of VC investments, I aggregate all cross-border VC investments in pairings of VC country – startups' country. To be included in the sample, each VC-firm country pair must have at least a three-year-long observation during the sample period considered. Following that, I regress cross-border VC investments to the startup country on economic policy uncertainty and various macroeconomic control variables, including real GDP growth distance, culture distance, geographic distance, bilateral trade, common language, common colonizer between VC country and startup country, as well as the market friendliness of startup country.

I present these estimation results in Table 17. The estimates reported in Columns 1 to 2 indicate that economic policy uncertainty has a significant negative impact on cross-border VC investment. The estimated coefficient reported in Column 1 of Table 17 is negative and significant at the 1% level, implying that a one-standard-deviation increase in the policy uncertainty for a given startup - VC country pair is associated with a 21.75% decrease in the amount of cross-border venture capital investment.

4. Conclusions

VC investment plays an integral role in fostering innovative firms and commercializing technology innovation. But macroeconomic risk, such as economic policy uncertainty risk, can cause a delay in VC investments. Motivated by the growing prevalence and importance of venture capital investment in emerging venture capital markets (e.g., outside the United States), I attempt to shed light on how uncertainty surrounding government policies could affect venture capital investment across countries. As VC investors become cautious during uncertain times, they scale back their risky venture capital investment until the policy uncertainty of the startup's country resolves itself.

I present robust evidence that policy uncertainty negatively influences VC investment in the startup, industry, country and aggregate country pair levels. The economic magnitude of the effects is significant. At the startup level, an increase of one standard deviation in policy uncertainty is associated with an 8.05% decrease in VC investment amount, a 7.82% decrease in the number of VCs investing, a 4.34% decrease in investment per VC in the same year. At the industry level, an increase of one standard deviation in policy uncertainty is associated with a 17.18% decrease in venture capital investment amount and an 8.33% decrease in investment per VC in the same year. Additionally, I provide evidence that VC investment amount and investment per VC are lower during a closely-won national election year. Furthermore, I do not observe mean reversion, indicating that venture capital investment tends to be lost rather than simply delayed.

I also find some evidence that the effect of policy uncertainty on venture capital investment activity is more pronounced in younger and early-stage startups. In contrast, the effect of policy uncertainty on venture capital investment is less pronounced in cities with larger shares of global venture investment, and in countries with more developed equity market. However, the effect is not sensitive to the type of lead VC investing in startups. Additionally, economic policy uncertainty lowers the number of VC rounds and fraction of investment amount during the first round and also decreases the likelihood of a successful exit.

Finally, I show that economic policy uncertainty negatively affects cross-border venture capital investment. These results are robust even after controlling for geographic distance, cultural distance, and bilateral trade between VC countries and startup countries. From a policymakers' standpoint, this finding is particularly important since it shows that even a moderate amount of policy uncertainty can act as a hefty tax on VC investment.

5. Appendix

Table A1- Variable definitions:

Variables	Description	Data Sources
Policy Uncertainty	The natural logarithm of the weighted average of the frequency of news articles related to policy uncertainty in a country. The index construction is based on the methods in Baker, Bloom, and Davis (2012).	Baker, Bloom, and Davis (2012), Kroes et al. (2015), Zalla (2016)
VC investment amount	The natural logarithm of one plus total VC investment amount that a startup receives in a year	VentureXpert
Number of VCs	Total number of VCs investing in a startup in a year	VentureXpert
Investment per VC	The natural logarithm of one plus total VC investment amount that a startup receives divided by the number of investing VCs in a year	VentureXpert
Startup Age	The natural logarithm of one plus the number of years since the inception of the startups	VentureXpert
Lead VC Age	The natural logarithm of one plus the number of years since the founding date of the Lead VC firms	VentureXpert
Startup Dummy	Dummy equals to one if the first VC investment in startups occurred at the startup's seed stage of development. Seed stage is defined as a stage at which a startup has only had a business concept – including the production of a business plan, prototypes and additional research – before bringing a product to market and commencing large-scale manufacturing.	VentureXpert
Early-Stage Dummy	Dummy equals to one if the first VC investment in startups occurred at the startup's seed or early stage of development. Early-stage is defined as a stage at which a startup has already had a non-commercial company's product development and marketing	VentureXpert
Number of rounds	The natural logarithm of the total rounds of financing in each startup.	VentureXpert
Skewness	The proportion of first-round investment over total investment in the same startup.	VentureXpert
Industry Tobin's Q	Firm's Tobins' Q is calculated as Assets (WS item 02999) plus market value of equity (WS item 08001) minus book value of equity (WS item 03501) divided by total assets (WS item 02999). Industry Tobin's Q is calculated by taking the average of Tobin's Q in each 3-digit SIC industry annually	Datastream

Industry sales growth	Firm's sales growth is calculated as the year-on-year growth rate in annual sales (WS item 01001). Industry sales growth is calculated by taking the average of sales growth in each 3-digit SIC industry annually	Datastream
Industry cash flow	Firm's cash flow is calculated as net income before extraordinary items (WS item 01551) plus depreciation (WS item 04049) minus capital expenditures (WS item 04601) divided by assets (WS item 02999). Industry cash flow is calculated by taking the average of cash flow in each 3-digit SIC industry annually	Datastream
Industry tangibility	Firm's tangibility is calculated as net property, plant, and equipment (WS item 02501) divided by assets (WS item 02999). Industry tangibility is calculated by taking average of tangibility in each 3-digit SIC industry annually	Datastream
Industry competition	One minus the Lerner index, defined as the industry (three-digit SIC) median gross profit margin (WS item 08306).	Datastream
Currency volatility	The natural logarithm of one plus the standard deviation of the weekly nominal exchange rate against US dollars.	Datastream
Stock market return	The annual change of country-specific stock market index.	Datastream
Trade openness	The sum of exports and imports of goods and services measured as a share of gross domestic product.	WDI
Inflation	The year-on-year change of annual consumer price index	WDI
Real GDP Growth distance	The difference (for each startup – lead VC country pair) of the annual real growth rate of the GDP, expressed in US dollars.	WDI
Market capitalization of listed firms (% of GDP)	The share price times the number of shares outstanding for listed domestic companies scaled by gross domestic product	WDI
IPO Exit	A dummy variable that equals to one if the startups exited via initial public offering (IPO) and zero otherwise	SDC Platinum & VentureXpert
Acquisition Exit	A dummy variable that equals to one if the startups exited via acquisition and zero otherwise	SDC Platinum & VentureXpert
Successful Exit	A dummy variable that equals to one if the startups exited via an IPO or acquisition and zero otherwise	SDC Platinum & VentureXpert
Cultural Distance	Cultural difference between the startup's and VC's countries, as measured by the Cartesian distance between Hofstede's four cultural dimensions for the two countries.	Taras et al. (2012) & Hofstede (1980)
Geographic Distance	The distance between the capitals of countries of startups and VC investors, calculated using the great circle formula	Mayer and Zignago (2005)
Common language	A dummy variable that equals to one if startup's country and VC country has common official or primary language	Mayer and Zignago (2005)
Common colonizer	A dummy variable that equals to one if startup's country and VC country has the same common colonizer post-1945	Mayer and Zignago (2005)
Bilateral trade	The maximum of bilateral import and export between a startup and Lead VC country pair. Bilateral import (export) is calculated as the value of imports (exports) by	IMF-Direction of Trade Statistics

	the startup's country from (to) the Lead VC as a percentage of total imports (exports) by the startup country.	
Market-friendliness	A dummy variable that equals to one if the incumbent government is classified as right-leaning or centrist, and zero otherwise	The Database of Political Institutions - IADB

6. References

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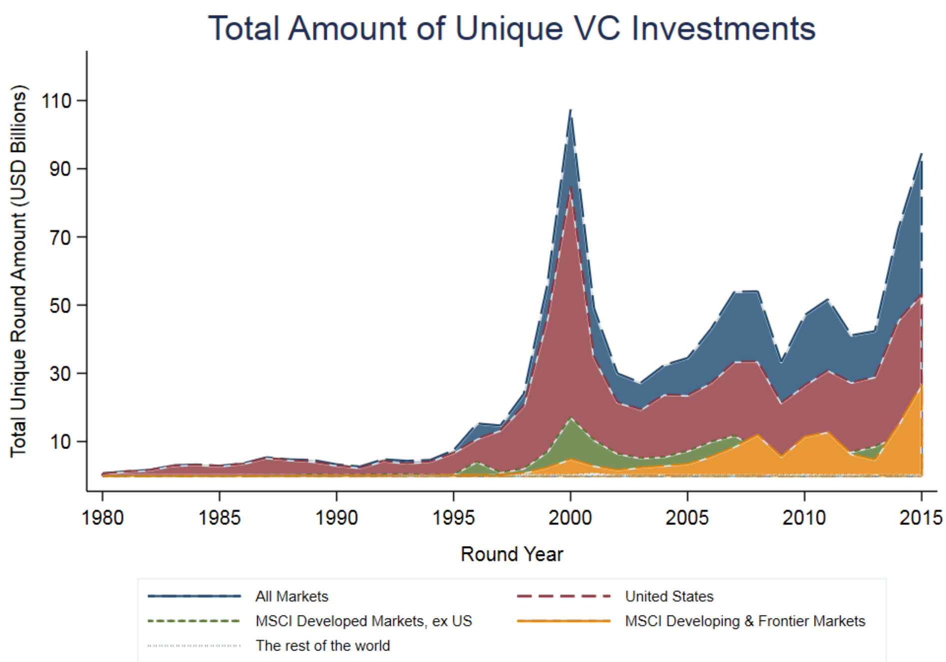
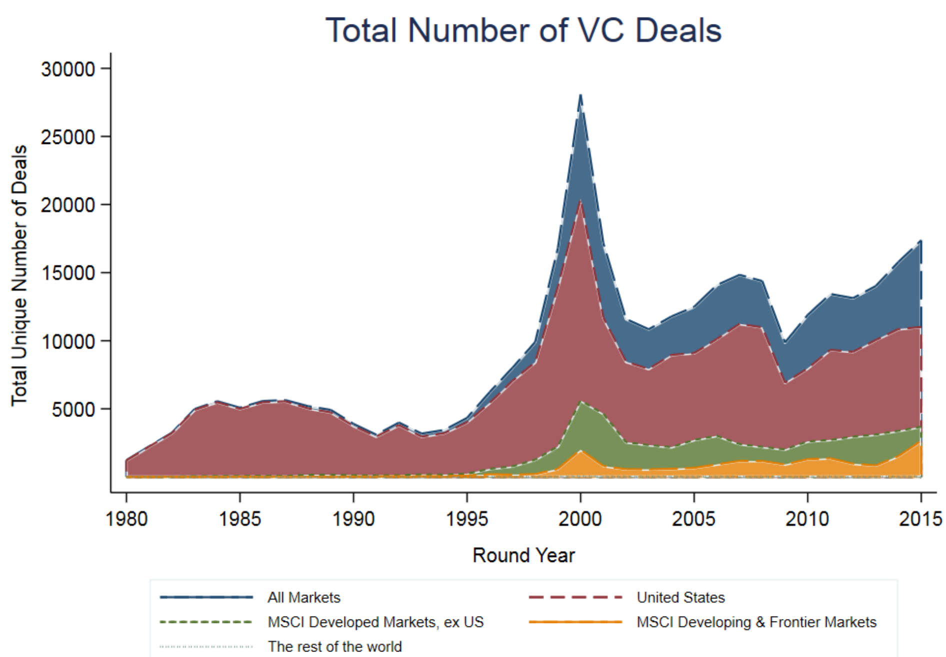
Figure 1 –Total VC investment amounts, total number of VC deals and the number of VCs investing around the world

The figure below displays total venture capital investment amounts, total venture capital deals, and the number of venture capitals investing across countries over the 1980 – 2015 period.

Subfigure A – Total venture capital investment amounts



Subfigure B – Total venture capital deals



Subfigure C – Number of venture capitals investing

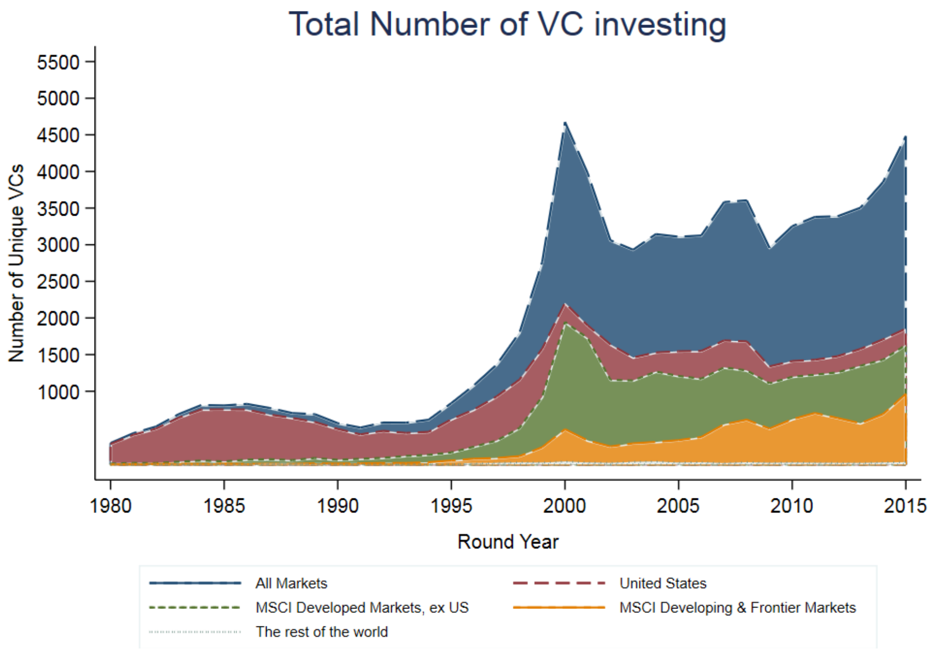


Figure 2 – Total amount of cross-border VC investments around the world

The figure shows the cross-border venture capital investment in emerging venture capital markets (i.e., outside the United States) for period starting from 2000 to 2015.

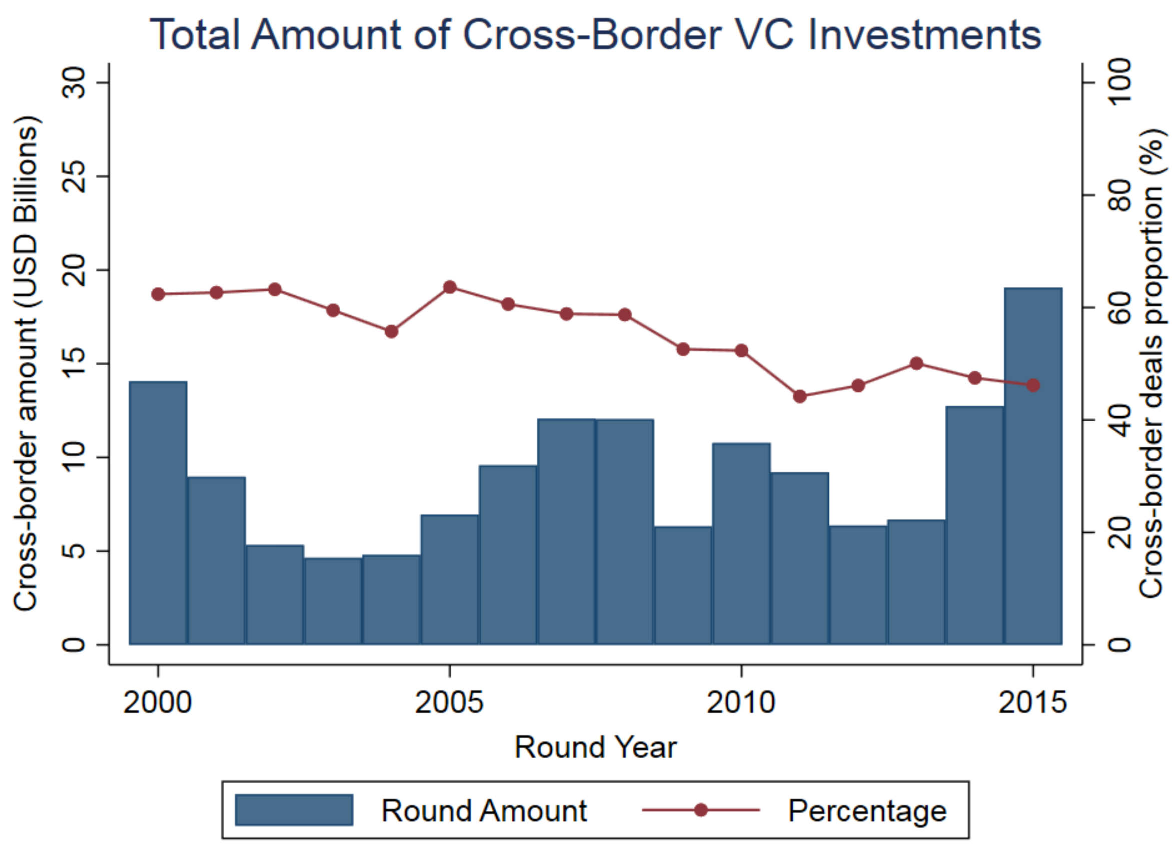
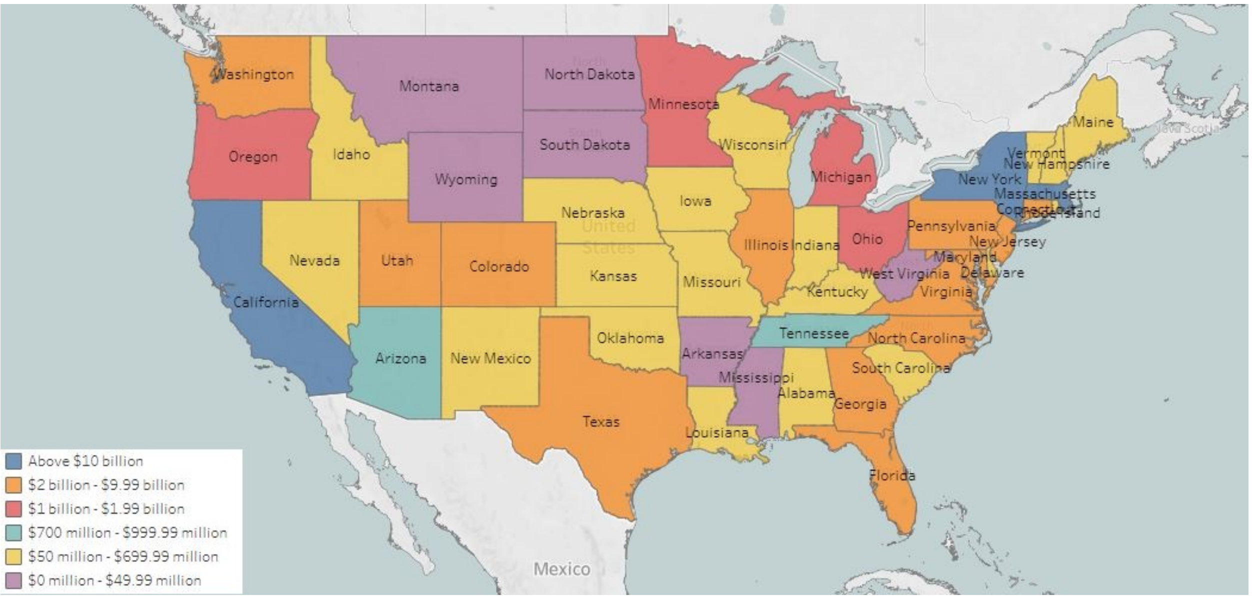


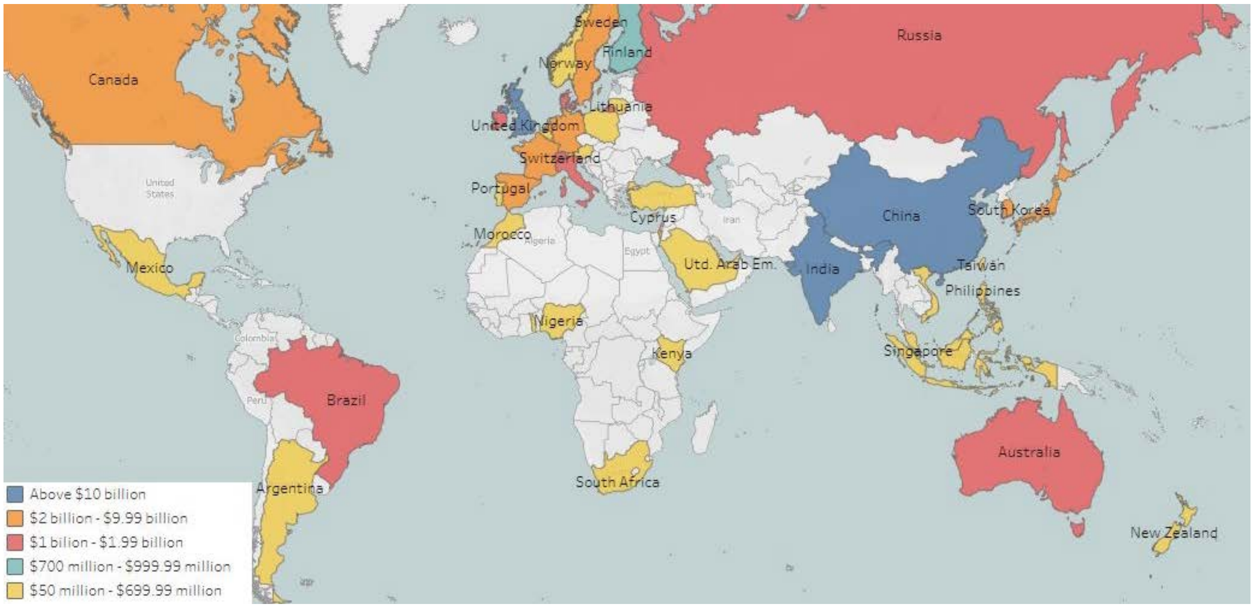
Figure 3 – Venture capital investment across cities and countries around the world

Subfigure A shows the amount of venture capital investment in the 50 states in the United States based on $ values in the 2010-2015 period. The color of the area represents the amount of venture capital investment. Subfigure B shows the amount of venture capital investment in the top 50 countries around the world based on $ values in the 2010-2015 period. The color of the area represents the amount of venture capital investment. Subfigure C shows the amount of venture capital investment in the top 50 cities around the world based on $ value in the 2010-2015 period. The size and the color of the nodes represent the amount of venture capital investment.

Subfigure A – Venture capital investment in the 50 states in the United States based on $ values (2010-2015)



Subfigure B – Venture capital investment in the top 50 countries based on $ values (2010-2015)



Subfigure C - Venture capital investment in the top 50 cities based on $ value (2010-2015)

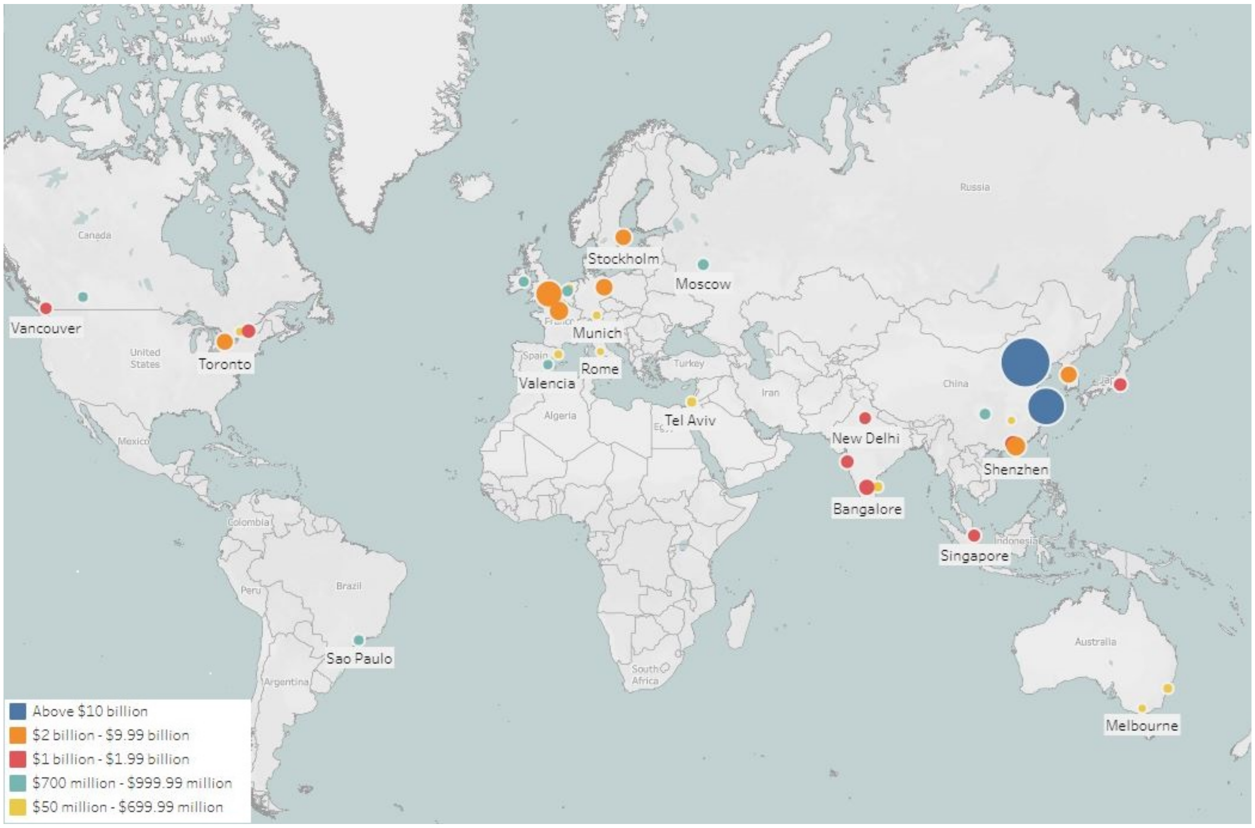


Figure 4 – Policy uncertainty and venture capital investment

The figure plots the natural logarithm of venture capital investment against the economic policy uncertainty of each country, respectively. The venture capital investment of each country is the total annual amount of the venture capital investment in a country calculated in the year 2015. The economic policy uncertainty is from Bloom, Baker, and Davis (2016) and captures the extent to which the country has a high uncertainty about government policy.

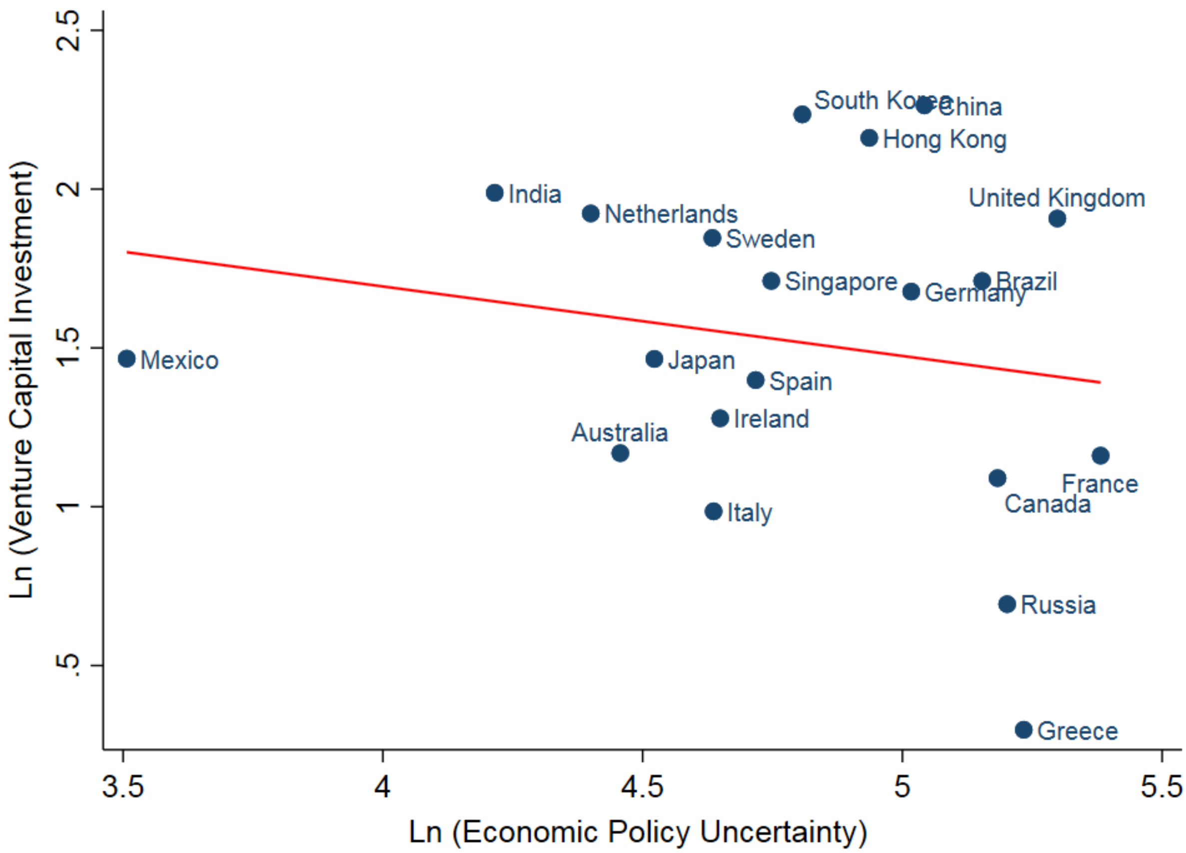


Table 1 - Summary statistics

This table shows the summary statistics of the sample across 22 countries between 1987 and 2015. Panel A reports summary statistics for 23 countries, including the United States for comparison purposes. The rest of the summary statistics and analysis, which includes Baker, Bloom, and Davis (2016) policy uncertainty index, consists of a sample of 22 countries. Panel B reports summary statistics for the startups and venture capital firms used in the analysis. Panel C reports the summary statistics for industry control variables. Industry is based on three-digit SIC industry groups for all industry control variables. Panel D reports the summary statistics for macroeconomic control variables. See the Appendix for variable descriptions as well as the variable sources.

Panel A: Policy Uncertainty Index, by country

Country	N	First Year	Last Year	Mean	Q1	Median	Q3	Standard deviation
Australia	18	1998	2015	106.52	66.54	108.67	132.52	39.33
Brazil	25	1991	2015	77.33	51.69	65.39	86.87	37.17
Canada	29	1987	2015	102.55	57.42	100.03	123.62	45.20
Chile	23	1993	2015	112.52	84.06	99.44	144.43	33.50
China	21	1995	2015	112.92	76.50	111.29	129.98	41.86
Colombia	22	1994	2015	63.65	44.17	59.79	80.64	20.69
France	29	1987	2015	98.34	50.74	76.11	94.29	69.27
Germany	23	1993	2015	107.54	80.24	97.71	125.19	30.70
Greece	18	1998	2015	96.16	67.24	95.31	112.01	39.09
Hong Kong	18	1998	2015	109.22	67.69	92.13	148.81	46.62
India	13	2003	2015	111.18	70.89	96.68	140.65	42.57
Ireland	29	1987	2015	84.41	60.10	75.02	105.09	31.27
Italy	19	1997	2015	105.32	81.83	102.67	121.67	25.13
Japan	29	1987	2015	93.12	76.59	88.52	105.95	22.95
Mexico	20	1996	2015	96.93	60.18	79.05	137.20	48.19
Netherlands	13	2003	2015	94.88	67.58	95.06	119.43	29.82
Russia	22	1994	2015	120.97	83.93	103.73	145.52	51.29
Singapore	13	2003	2015	102.57	72.81	105.89	118.80	32.10
South Korea	26	1990	2015	70.45	40.51	53.50	86.02	38.40
Spain	15	2001	2015	89.50	55.90	97.91	115.66	33.49
Sweden	29	1987	2015	116.38	98.89	108.00	130.82	21.53
United Kingdom	19	1997	2015	98.60	35.15	44.43	204.46	86.12
United States	29	1987	2015	85.35	61.68	79.05	94.00	28.21

Panel B: Aggregate Policy Uncertainty, Main VC investment & startups variables

Variables	N	Mean	Q1	Median	Q3	Standard deviation
Policy uncertainty	17641	4.566	0.571	4.186	4.572	5.017
VC investment	17641	1.424	0.591	1.253	2.126	0.986
Number of VCs investing	17641	1.939	1.000	2.000	2.000	1.163
Average investment per VC	17641	1.079	0.410	0.902	1.580	0.810
Startups age	17641	1.666	1.099	1.609	2.197	0.828
Lead venture age	17641	2.414	1.792	2.485	3.045	0.918

Panel C: Main industry variables

Variables	N	Mean	Q1	Median	Q3	Standard deviation
Industry Tobin's Q	17641	4.032	1.531	2.445	3.844	5.764
Industry sales growth	17641	0.444	0.095	0.240	0.530	0.720
Industry cash flow	17641	-0.218	-0.202	-0.025	0.030	0.498
Industry tangibility	17641	0.182	0.091	0.148	0.236	0.133
Industry competition	17563	0.717	0.574	0.715	0.853	0.277

Panel D: Main macroeconomic variables

Variables	N	Mean	Q1	Median	Q3	Standard deviation
Policy uncertainty	17641	4.566	4.186	4.572	5.017	0.571
Real GDP growth	17641	0.038	0.017	0.030	0.066	0.033
Trade openness	17641	4.076	3.919	4.069	4.193	0.326
Inflation rate	17641	0.024	0.013	0.020	0.028	0.021
Stock market return	17641	0.158	-0.074	0.111	0.288	0.393
Currency volatility	17564	1.019	0.173	0.425	0.973	1.435

Table 2 - National election summary statistics

This table shows national election characteristics for each of the 47 countries in my sample between 1987 and 2015. The number of elections refers to the number of elections with the Polity IV index greater than or equal to zero in the sample. The number of close national elections indicates the number of elections of which the margin of victory is smaller than the first quartile value of the margin of victory distribution over the national election in the sample of countries under consideration. Average Margin of victory is defined as the vote difference between the winner and the runner-up across all elections for the sample considered (also including elections with Polity IV index less than or equal to zero).

Countries	Number of Elections	Number of Close Elections	Average Margin of Victory
Argentina	7	1	22.5
Australia	10	5	4.4
Austria	8	2	5.9
Belgium	8	2	4.0
Brazil	7	1	16.3
Canada	9	0	12.7
Chile	6	1	19.4
Colombia	6	1	19.2
Czech Republic	6	4	3.4
Denmark	10	4	7.7
Finland	8	7	2.2
France	5	3	5.3
Germany	8	2	7.0
Greece	9	2	5.3
Hungary	6	2	12.0
India	7	0	10.9
Indonesia	2	0	5.3
Ireland	7	0	15.4
Israel	4	2	6.0
Italy	8	3	7.0
Japan	8	2	11.4
Luxembourg	6	0	10.2
Malaysia	6	0	25.4
Mexico	5	1	11.2
Netherlands	8	4	3.7
New Zealand	10	2	10.6
Norway	7	1	11.7
Pakistan	5	2	8.5
Peru	5	0	18.5
Philippines	4	0	11.8
Poland	8	2	9.4
Portugal	9	1	12.7
South Korea	5	2	7.7
Russia	5	0	39.1
South Africa	0	0	41.1
Singapore	0	0	51.8
Slovakia	6	1	15.9
Spain	7	1	7.7

Sri Lanka	6	1	10.6
Sweden	8	1	14.8
Switzerland	8	3	4.9
Taiwan	5	2	11.7
Thailand	6	3	12.3
Turkey	8	2	12.7
United Kingdom	7	1	8.1
Venezuela	6	1	14.2
Zimbabwe	1	0	26.2

Table 3 - Policy uncertainty and VC investment

This table shows the results of estimating equation (1). The dependent variables are VC investment amounts (Column 1 & 2), Number of VCs investing (Column 3 & 4), and Investment per VC (Column 5 & 6). Policy uncertainty is measured by the natural logarithm of the average value of the Baker, Bloom, and Davis (2016) index annually. Startup age is measured by the natural logarithm of the age of startup i in year t plus one. Industry control variables include Tobin's Q, sales growth, cash flow, tangibility, and competition. Industry is based on three-digit SIC industry groups. Macroeconomic control variables include stock return and GDP growth. All regressions include industry fixed effects, stage fixed effects, startup country fixed effects, Lead VC country fixed effects, year fixed effects. Standard errors are clustered at the country-industry year are reported in parentheses. All continuous variables are winsorized at the 5th and 95th percentiles. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	VC Inv.	VC Inv.	No. VC	No. VC	Inv. per VC	Inv. per VC
	(1)	(2)	(3)	(4)	(5)	(6)
Policy uncertainty	-0.141***	-0.136***	-0.137**	-0.171***	-0.076**	-0.067**
	(0.042)	(0.040)	(0.065)	(0.056)	(0.033)	(0.032)
Startup age	0.040	0.039	-0.082***	-0.085***	0.059***	0.059***
	(0.026)	(0.027)	(0.021)	(0.022)	(0.021)	(0.021)
Lead VC firm age	0.019	0.020	0.019	0.019	0.012	0.012
	(0.013)	(0.014)	(0.013)	(0.014)	(0.011)	(0.012)
Industry Tobin's Q	0.000	-0.001	-0.004	-0.003	0.000	-0.001
	(0.001)	(0.002)	(0.004)	(0.004)	(0.001)	(0.001)
Industry sales growth	-0.024**	-0.027**	0.007	0.002	-0.021**	-0.022**
	(0.010)	(0.011)	(0.011)	(0.011)	(0.008)	(0.008)
Industry cash flow	-0.041	-0.040	-0.034	-0.024	-0.032	-0.033
	(0.029)	(0.030)	(0.034)	(0.034)	(0.021)	(0.022)
Industry tangibility	0.046	0.062	-0.289**	-0.210	0.084	0.081
	(0.124)	(0.122)	(0.136)	(0.156)	(0.097)	(0.094)
Stock market returns	0.023	-0.011	0.092**	0.059	-0.006	-0.026
	(0.027)	(0.028)	(0.041)	(0.050)	(0.023)	(0.024)
Real GDP growth	-0.337	0.541	-0.747	-0.649	-0.059	0.609
	(0.489)	(0.616)	(0.968)	(1.066)	(0.475)	(0.497)
Industry competition		-0.031		-0.016		-0.017
		(0.042)		(0.037)		(0.037)
Currency volatility		0.120*		0.009		0.095*
		(0.064)		(0.040)		(0.055)
Trade openness		-0.241*		0.330*		-0.237**
		(0.128)		(0.190)		(0.088)
Inflation		1.877*		3.525***		0.652
		(1.053)		(1.151)		(0.988)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Stage fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Startup country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Lead VC country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	16571	16463	16571	16463	16571	16463
Adjusted R-squared	0.301	0.302	0.118	0.120	0.340	0.341

Table 4 - Policy uncertainty and one-year and two-years ahead VC investment

This table shows the results of regressing one-year and two-years ahead VC investment activity measures on contemporaneous economic policy uncertainty index. The dependent variables are one-year and two-years ahead VC investment amount (Column 1 & 2, respectively), one-year and two-years ahead No. of VCs (Column 3 & 4, respectively), and one-year and two-years ahead Investment per VC (Column 5 & 6, respectively). Policy uncertainty is measured by the natural logarithm of the average value of the BBD index annually. Startup age is measured by the natural logarithm of the age of startup i in year t plus one. Industry control variables include Tobin's Q, sales growth, cash flow, tangibility, and competition. Industry is based on three-digit SIC industry groups. Macroeconomic control variables include stock return, and GDP growth. All regressions include industry fixed effects, stage fixed effects, startup country fixed effects, and year fixed effects. Standard errors are clustered at the country-industry year are reported in parentheses. All continuous variables are winsorized at the 5th and 95th percentiles. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	VC Inv. t+1	VC Inv. t+2	No. VC t+1	No. VC t+2	Inv per VC t+1	Inv per VC t+2
	(1)	(2)	(3)	(4)	(5)	(6)
Policy uncertainty	-0.082	-0.004	-0.233**	-0.127	-0.019	0.013
	(0.061)	(0.115)	(0.104)	(0.114)	(0.048)	(0.087)
Portfolio firm age	-0.043	-0.086**	-0.121***	-0.139***	-0.000	-0.033
	(0.031)	(0.036)	(0.042)	(0.039)	(0.025)	(0.025)
Lead VC firm age	0.003	0.008	-0.080*	-0.107**	0.023	0.039
	(0.025)	(0.034)	(0.039)	(0.048)	(0.020)	(0.026)
Industry Tobin's Q	0.006	0.001	0.003	0.004	0.002	-0.003
	(0.004)	(0.008)	(0.006)	(0.010)	(0.003)	(0.006)
Industry sales growth	0.001	-0.006	-0.015	-0.002	0.013	-0.002
	(0.016)	(0.016)	(0.022)	(0.025)	(0.015)	(0.013)
Industry cash flow	0.046	0.006	0.043	-0.024	0.019	0.008
	(0.048)	(0.047)	(0.079)	(0.048)	(0.028)	(0.040)
Industry tangibility	0.325	-0.140	0.418	-0.174	0.124	-0.165
	(0.253)	(0.297)	(0.297)	(0.470)	(0.197)	(0.219)
Industry competition	-0.054	-0.100***	-0.009	-0.049	-0.056***	-0.086***
	(0.032)	(0.025)	(0.044)	(0.066)	(0.017)	(0.026)
Country currency volatility	0.089	0.204	0.003	0.271	0.050	0.075
	(0.102)	(0.124)	(0.132)	(0.189)	(0.070)	(0.082)
Stock market returns	0.018	-0.175**	0.165	-0.160	-0.022	-0.092
	(0.097)	(0.077)	(0.104)	(0.125)	(0.074)	(0.062)
Real GDP growth	-1.681	4.541**	-4.361***	4.982	-0.127	2.459**
	(1.477)	(1.678)	(1.322)	(3.361)	(1.190)	(1.082)
Trade openness	-0.368*	-0.773***	0.672**	0.524*	-0.451**	-0.757***
	(0.208)	(0.233)	(0.270)	(0.269)	(0.171)	(0.186)
Inflation	3.295	3.298	4.510	3.587	1.504	2.827
	(2.481)	(2.149)	(3.861)	(2.586)	(1.754)	(1.685)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Stage fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Lead VC country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3311	2511	3311	2511	3311	2511
Adjusted R-squared	0.335	0.302	0.109	0.115	0.382	0.355

Table 5 - Residual policy uncertainty and VC investment

This table shows the results of the robustness check with residual economic policy uncertainty. I replace each country's economic policy uncertainty by the residual from regressing each country policy uncertainty index on the U.S. economic policy uncertainty. The dependent variables are VC investment amount (Column 1), No. of VCs (Column 2), and Investment per VC (Column 3). Startup age is measured by the natural logarithm of the age of startup *i* in year *t* plus one. Industry control variables include Tobin's Q, sales growth, cash flow, tangibility, and competition. Industry is based on three-digit SIC industry groups. Macroeconomic control variables include stock return, and GDP growth. All regressions include industry fixed effects, stage fixed effects, startup country fixed effects, Lead VC country fixed effects, year fixed effects. Standard errors are clustered at the country-industry year are reported in parentheses. All continuous variables are winsorized at the 5th and 95th percentiles. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	VC Inv.	No. VC	Inv per VC
	(1)	(2)	(3)
Policy Uncertainty - Residual	-0.045***	-0.063**	-0.024*
	(0.012)	(0.019)	(0.010)
Startup age	0.045	-0.079***	0.062**
	(0.028)	(0.021)	(0.022)
Lead VC firm age	0.017	0.014	0.012
	(0.014)	(0.012)	(0.012)
Industry Tobin's Q	0.001	-0.004	0.001
	(0.002)	(0.004)	(0.001)
Industry sales growth	-0.017	0.015	-0.016
	(0.010)	(0.011)	(0.008)
Industry cash flow	-0.045	-0.034	-0.037
	(0.025)	(0.035)	(0.019)
Industry tangibility	0.067	-0.286*	0.096
	(0.129)	(0.117)	(0.105)
Stock market returns	0.033	0.085	0.008
	(0.049)	(0.050)	(0.037)
Real GDP growth	-0.395	-0.467	-0.150
	(0.639)	(0.897)	(0.605)
Industry fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Stage fixed effects	Yes	Yes	Yes
Startup country fixed effects	Yes	Yes	Yes
Lead VC country fixed effects	Yes	Yes	Yes
Observations	15756	15756	15756
Adjusted R-squared	0.299	0.121	0.338

Table 6 - Robustness checks on industry-country level VC investment measures

This table shows the results of the robustness check with industry-country level. The dependent variables are VC investment amount (Column 1), No. of VCs (Column 2), and Investment per VC (Column 3). Industry control variables include Tobin's Q, sales growth, cash flow, tangibility, and competition. Industry is based on three-digit SIC industry groups. Macroeconomic control variables include stock return, and GDP growth. Fixed effects include industry fixed effects, stage fixed effects, startup country fixed effects, Lead VC country fixed effects, year fixed effects. Standard errors are clustered at the country-industry year are reported in parentheses. All continuous variables are winsorized at the 5th and 95th percentiles. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	VC Inv.	No. VC	Inv per VC
	(1)	(2)	(3)
Policy uncertainty	-0.301**	-1.024	-0.146*
	(0.131)	(1.152)	(0.076)
Industry controls	Yes	Yes	Yes
Macroeconomic controls	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes
Observations	2550	2550	2550
Adjusted R-squared	0.444	0.466	0.278

Table 7 - Identification attempt using close national elections

This table shows the results of the panel regressions of VC Investment on close national election year across 47 countries over 1987-2015 period. The dependent variables are VC investment amount (Column 1 &2), No. of VCs (Column 3 & 4), and Investment per VC (Column 5 & 6). For Column 1-3, I set close election year dummy to one if the margin of victory of the election is smaller or equal to 5%, where the margin of victory is defined as the difference between the fraction of votes won by the victor and that garnered by the runner-up. For column 4-6, I set close election dummy to one if the margin of victory of the election is smaller than the first quartile value of the margin of victory distribution over the sample of countries under consideration. Panel A reports the results for all samples. Panel B reports the estimation results when I use randomized national elections. Startup age is measured by the natural logarithm of the age of startup *i* in year *t* plus one. Industry control variables include Tobin's Q, sales growth, cash flow, tangibility, and competition. Industry is based on three-digit SIC industry groups. Macroeconomic control variables include stock return, and GDP growth. All regressions include industry fixed effects, stage fixed effects, startup country fixed effects, Lead VC country fixed effects, year fixed effects. Standard errors are clustered at the country-industry year are reported in parentheses. All continuous variables are winsorized at the 5th and 95th percentiles. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Full samples

	Close Election I			Close Election II		
	VC Inv.	No. VC	Inv. per VC	VC Inv.	No. VC	Inv. per VC
	(4)	(5)	(6)	(1)	(2)	(3)
Close election	-0.099***	-0.110**	-0.067**	-0.097**	-0.090	-0.072***
	(0.036)	(0.052)	(0.031)	(0.037)	(0.053)	(0.024)
Startup age	0.019	-0.102***	0.041**	0.019	-0.102***	0.041**
	(0.022)	(0.019)	(0.019)	(0.022)	(0.019)	(0.019)
Lead VC firm age	0.001	0.006	-0.001	0.001	0.006	-0.001
	(0.012)	(0.018)	(0.010)	(0.012)	(0.017)	(0.010)
Industry Tobin's Q	0.002	-0.005**	0.001	0.002	-0.005*	0.001
	(0.002)	(0.003)	(0.001)	(0.001)	(0.003)	(0.001)
Industry sales growth	-0.023**	0.008	-0.021***	-0.023**	0.009	-0.021**
	(0.010)	(0.013)	(0.007)	(0.010)	(0.013)	(0.008)
Industry cash flow	-0.039	-0.020	-0.032	-0.039	-0.020	-0.032
	(0.029)	(0.038)	(0.020)	(0.029)	(0.037)	(0.020)
Industry tangibility	0.116	-0.116	0.122	0.115	-0.116	0.122
	(0.147)	(0.135)	(0.123)	(0.147)	(0.134)	(0.123)
Stock market returns	0.122	0.158	0.069	0.121	0.155	0.069
	(0.109)	(0.114)	(0.109)	(0.110)	(0.116)	(0.109)
Real GDP growth	0.035	-0.571	0.150	0.008	-0.591	0.129
	(0.862)	(1.831)	(0.949)	(0.867)	(1.824)	(0.952)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Stage fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Startup country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Lead VC country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13489	13489	13489	13489	13489	13489
Adjusted R-squared	0.248	0.125	0.278	0.248	0.125	0.278

Panel B: Placebo tests using randomized national elections

	Close Election I			Close Election II		
	VC Inv.	No. VC	Inv. per VC	VC Inv.	No. VC	Inv. per VC
	(4)	(5)	(6)	(1)	(2)	(3)
Close Election	0.055	-0.060	0.055	0.054	-0.093	0.060
	(0.059)	(0.101)	(0.051)	(0.070)	(0.123)	(0.061)
Startup age	0.019	-0.103***	0.041**	0.019	-0.103***	0.041**
	(0.022)	(0.019)	(0.019)	(0.022)	(0.019)	(0.019)
Lead VC firm age	0.001	0.005	-0.000	0.001	0.005	-0.000
	(0.012)	(0.018)	(0.010)	(0.012)	(0.018)	(0.010)
Industry Tobin's Q	0.001	-0.005*	0.001	0.001	-0.005*	0.001
	(0.001)	(0.003)	(0.001)	(0.001)	(0.003)	(0.001)
Industry sales growth	-0.022**	0.008	-0.020***	-0.022**	0.008	-0.020***
	(0.009)	(0.012)	(0.007)	(0.009)	(0.012)	(0.007)
Industry cash flow	-0.040	-0.018	-0.034*	-0.040	-0.017	-0.034*
	(0.028)	(0.038)	(0.019)	(0.028)	(0.038)	(0.019)
Industry tangibility	0.107	-0.110	0.114	0.107	-0.105	0.113
	(0.146)	(0.133)	(0.123)	(0.147)	(0.133)	(0.123)
Stock market returns	0.096	0.164	0.046	0.095	0.175	0.044
	(0.120)	(0.126)	(0.113)	(0.122)	(0.129)	(0.114)
Real GDP growth	-0.219	-0.242	-0.113	-0.149	-0.191	-0.063
	(0.840)	(1.645)	(0.906)	(0.821)	(1.606)	(0.894)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Stage fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Startup Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Lead VC country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13489	13489	13489	13489	13489	13489
Adjusted R-squared	0.248	0.125	0.278	0.248	0.125	0.278

Table 8 - Identification attempt using term limit as instrumental variable for close elections

This table shows the results when I use term limits as an instrument for close national elections. The first-stage regression is conducted using the probit model, while the second-stage regression is performed using a panel fixed-effects model. The dependent variables are VC investment amount (Column 1 & 2), No. of VCs (Column 3 & 4), and Investment per VC (Column 5 & 6). The variable close national election I and II are the predicted values from the first-stage regression of close national election on term limits and controls. Startup control variables include startup age and Lead VC firm age. Industry control variables include Tobin's Q, sales growth, cash flow, tangibility, and competition. The industry variable is based on three-digit SIC industry groups. Macroeconomic control variables include stock return and GDP growth. Fixed effects include industry fixed effects, stage fixed effects, startup country fixed effects, Lead VC country fixed effects, year fixed effects. Standard errors are clustered at the country-industry year are reported in parentheses. All continuous variables are winsorized at the 5th and 95th percentiles. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Close national election I

	VC Inv.		No. of VC		Inv. per VC	
	First-stage (1)	Second-stage (2)	First-stage (3)	Second-stage (4)	First-stage (5)	Second-stage (6)
Close Election I		-1.932**		0.836		-1.916***
		(0.842)		(1.133)		(0.687)
Term Limits	0.555***		0.555***		0.555***	
	(0.138)		(0.138)		(0.138)	
Startup controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry Controls	Yes	Yes	Yes	Yes	Yes	Yes
Macroeconomic controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3722	3443	3722	3443	3722	3443
Pseudo/Adjusted R-squared	0.1988	0.230	0.1988	0.136	0.1988	0.247

Panel B: Close national election II

	VC Inv.		No. of VC		Inv. per VC	
	First-stage (1)	Second-stage (2)	First-stage (3)	Second-stage (4)	First-stage (5)	Second-stage (6)
Close Election II		-2.531		1.688		-2.827**
		(1.592)		(2.078)		(1.313)
Term Limits	0.845***		0.845***		0.845***	
	(0.138)		(0.138)		(0.138)	
Startup controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry Controls	Yes	Yes	Yes	Yes	Yes	Yes
Macroeconomic controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3722	3443	3722	3443	3722	3443
Pseudo/Adjusted R-squared	0.1799	0.229	0.1799	0.136	0.1799	0.246

Table 9 - Identification attempt using congress year of Chinese Communist Party in China

This table shows the estimation results when I restrict my sample to China and use the national congress of the Chinese Communist Party as plausibly exogenous variation of policy uncertainty. The dependent variables are VC investment amount (Column 1), No. of VCs (Column 2), and Investment per VC (Column 3). The national congress is the most important event in China with respect to the determination of party leadership, political objectives, and economic policy. Congress year dummy is set to one during the year when the congress year is held, and zero otherwise. Startup control variables include startup age and Lead VC firm age. Industry control variables include Tobin's Q, sales growth, cash flow, tangibility, and competition. Industry is based on three-digit SIC industry groups. Macroeconomic control variables include stock return, and GDP growth. All regressions include industry fixed effects, stage fixed effects, and lead VC country fixed effects. Standard errors are clustered at the industry year are reported in parentheses. All continuous variables are winsorized at the 5th and 95th percentiles. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	VC Inv. (1)	No. VC (2)	Inv. per VC (3)
Congress Year	-0.123***	-0.154***	-0.052*
	(0.041)	(0.050)	(0.030)
Startup controls	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes
Macroeconomic controls	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes
Observations	2948	2948	2948
Adjusted R-squared	0.159	0.037	0.180

Table 10 - Cross-sectional heterogeneity on startup age

This table shows the results of the panel regression of VCs' investment on economic policy uncertainty, and the interactions between startup age and policy uncertainty variable. The dependent variables are VC investment amount (Column 1), No. of VCs (Column 2), and Investment per VC (Column 3). Startup control variables include startup age and Lead VC firm age. Industry control variables include Tobin's Q, sales growth, cash flow, tangibility, and competition. Industry is based on three-digit SIC industry groups. Macroeconomic control variables include stock return, and GDP growth. All regressions include industry fixed effects, stage fixed effects, startup country fixed effects, and year fixed effects. Standard errors are clustered at the country-industry year are reported in parentheses. All continuous variables are winsorized at the 5th and 95th percentiles. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	VC Inv. (1)	No. VC (2)	Inv. per VC (3)
Policy uncertainty	-0.311***	-0.128*	-0.219***
	(-6.82)	(-1.72)	(-6.25)
Policy uncertainty * startup age	0.109***	-0.00557	0.0911***
	(6.26)	(-0.27)	(6.94)
Startup controls	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes
Macroeconomic controls	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes
Observations	16571	16571	16571
Adjusted R-squared	0.304	0.118	0.343

Table 11 - Cross-sectional heterogeneity on startup development stages

This table shows the results of the panel regression of VCs' investment on economic policy uncertainty, and the interactions between startup development stage dummy and policy uncertainty variable. The dependent variables are VC investment amount (Column 1), No. of VCs (Column 2), and Investment per VC (Column 3). Startup dummy equals one if the startup is in startup/seed and equals zero if the startup is in early stage, expansion, later stage or buyout/acquisition. Early-stage dummy equals one if the startup is in startup/seed or early stage, and equals zero if the startup is in expansion, later stage or buyout/acquisition. Startup control variables include startup age and Lead VC firm age. Industry control variables include Tobin's Q, sales growth, cash flow, tangibility, and competition. Industry is based on three-digit SIC industry groups. Macroeconomic control variables include stock return, and GDP growth. All regressions include industry fixed effects, startup country fixed effects, and year fixed effects. Standard errors are clustered at the country-industry year are reported in parentheses. All continuous variables are winsorized at the 5th and 95th percentiles. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Startup dummy

	VC Inv.	No. VC	Inv. per VC
	(1)	(2)	(3)
Policy uncertainty	-0.126***	-0.123***	-0.067**
	(0.038)	(0.036)	(0.032)
Policy Uncertainty * Startup Dummy	-0.183***	-0.071	-0.147***
	(0.038)	(0.047)	(0.028)
Startup controls	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes
Macroeconomic controls	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes
Observations	16571	16571	16571
Adjusted R-squared	0.292	0.112	0.326

Panel B: Early-stage dummy

	VC Inv.	No. VC	Inv. per VC
	(1)	(2)	(3)
Policy uncertainty	-0.096**	-0.130***	-0.041
	(0.036)	(0.035)	(0.030)
Policy Uncertainty * Early Stage Dummy	-0.133***	-0.003	-0.111***
	(0.017)	(0.029)	(0.012)
Startup controls	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes
Macroeconomic controls	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes
Observations	16571	16571	16571
Adjusted R-squared	0.298	0.108	0.333

Table 12 - Cross-sectional heterogeneity on venture capital types

This table shows the results of the panel regression of VCs' investment on economic policy uncertainty, and the interactions between venture capital type dummy and policy uncertainty variable. The dependent variables are VC investment amount (Column 1), No. of VCs (Column 2), and Investment per VC (Column 3). Startup control variables include startup age and Lead VC firm age. Industry control variables include Tobin's Q, sales growth, cash flow, tangibility, and competition. Industry is based on three-digit SIC industry groups. Macroeconomic control variables include stock return, and GDP growth. All regressions include industry fixed effects, stage fixed effects, startup country fixed effects, and year fixed effects. Standard errors are clustered at the country-industry year are reported in parentheses. All continuous variables are winsorized at the 5th and 95th percentiles. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Bank Lead VC

	VC Inv.	No. VC	Inv. per VC
	(1)	(2)	(3)
Policy uncertainty	-0.148***	-0.136*	-0.0833**
	(-3.49)	(-1.96)	(-2.53)
Policy uncertainty * Bank Lead VC Dummy	0.0892*	-0.00847	0.0816**
	(1.76)	(-0.12)	(2.30)
Startup controls	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes
Macroeconomic controls	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes
Observations	16571	16571	16571
Adjusted R-squared	0.302	0.117	0.341

Panel B: Corporate Lead VC

	VC Inv.	No. VC	Inv. per VC
	(1)	(2)	(3)
Policy uncertainty	-0.148***	-0.136**	-0.0827**
	(-3.66)	(-2.15)	(-2.59)
Policy Uncertainty * Corporate Lead VC Dummy	0.108***	-0.0156	0.0932***
	(3.11)	(-0.19)	(3.07)
Startup controls	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes
Macroeconomic controls	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes
Observations	16571	16571	16571
Adjusted R-squared	0.303	0.119	0.341

Table 13 - Cross-sectional heterogeneity on startup' city of headquarter

This table shows the results of the panel regression of VCs' investment on economic policy uncertainty, and the interactions between global hubs dummy and policy uncertainty variable. The dependent variables are VC investment amount (Column 1), No. of VCs (Column 2), and Investment per VC (Column 3). Global hubs I equals to 1 if the headquarter of the startups is located in the top 50 cities with the largest total venture capital investment amounts during the period 2010 - 2015 and equals zero otherwise. Global hubs II equals to 1 if the headquarter of the startups is located in the top 50 cities with the largest total number of venture capital deals during the period 2010 - 2015 and equals zero otherwise. Startup control variables include startup age and Lead VC firm age. Industry control variables include Tobin's Q, sales growth, cash flow, tangibility, and competition. Industry is based on three-digit SIC industry groups. Macroeconomic control variables include stock return, and GDP growth. All regressions include industry fixed effects, stage fixed effects, startup country fixed effects, and year fixed effects. Standard errors are clustered at the country-industry year are reported in parentheses. All continuous variables are winsorized at the 5th and 95th percentiles. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Global hubs based on the total VC investment amounts in the startup's city of headquarter

	VC Inv. (1)	No. VC (2)	Inv. per VC (3)
Policy Uncertainty	-0.173***	-0.164***	-0.095***
	(0.041)	(0.058)	(0.032)
Policy Uncertainty * Global Hubs I	0.080***	0.069	0.045**
	(0.028)	(0.056)	(0.020)
Startup controls	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes
Macroeconomic controls	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes
Observations	16571	16571	16571
Adjusted R-squares	0.305	0.119	0.343

Panel B: Global hubs based on the total number of VC deals in the startup' city of headquarter

	VC Inv. (1)	No. VC (2)	Inv. per VC (3)
Policy Uncertainty	-0.168***	-0.161***	-0.091***
	(0.041)	(0.058)	(0.032)
Policy Uncertainty * Global Hubs II	0.065**	0.061	0.035
	(0.029)	(0.057)	(0.021)
Startup controls	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes
Macroeconomic controls	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes
Observations	16571	16571	16571
Adjusted R-squares	0.305	0.119	0.342

Table 14 - Cross-sectional heterogeneity on equity market development

This table shows the results of the panel regression of VCs' investment on economic policy uncertainty, and the interactions between equity market development and policy uncertainty variable. The dependent variables are VC investment amount (Column 1), No. of VCs (Column 2), and Investment per VC (Column 3). Startup control variables include startup age and Lead VC firm age. Industry control variables include Tobin's Q, sales growth, cash flow, tangibility, and competition. Industry is based on three-digit SIC industry groups. Macroeconomic control variables include stock return, and GDP growth. All regressions include industry fixed effects, stage fixed effects, startup country fixed effects, Lead VC country fixed effects, year fixed effects. Standard errors are clustered at the country-industry year are reported in parentheses. All continuous variables are winsorized at the 5th and 95th percentiles. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Market capitalization of all publicly listed companies in the startup' country of headquarter

	VC Inv.	No. VC	Inv per VC
	(1)	(2)	(3)
Policy uncertainty	-0.310***	-0.377***	-0.122**
	(0.076)	(0.102)	(0.057)
Policy Uncertainty * Market cap. listed companies	0.158**	0.068	0.074
	(0.063)	(0.092)	(0.057)
Startup controls	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes
Macroeconomic controls	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes
Observations	14680	14680	14680
Adjusted R-squared	0.312	0.126	0.354

Panel B: Number of publicly listed companies in the startup' country of headquarter

	VC Inv.	No. VC	Inv per VC
	(1)	(2)	(3)
Policy uncertainty	-0.667***	-0.892**	-0.235
	(0.182)	(0.423)	(0.161)
Policy Uncertainty * Number of listed companies	0.080***	0.099*	0.030
	(0.023)	(0.057)	(0.022)
Startup controls	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes
Macroeconomic controls	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes
Observations	15846	15846	15846
Adjusted R-squared	0.307	0.120	0.347

Table 15 - Policy uncertainty and probability of investment success

This table shows the results of regressing the measures of investment outcomes on economic policy uncertainty. The independent variables are IPO Exit Dummy (Column(1)), Acquisition Exit Dummy (Column (2)), and Success Exit Dummy (Column(3)). All continuous variables are winsorized at the 5% and 95% levels. Standard errors clustered at the country-industry level are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	IPO Exit	Acquisition Exit	Successful Exit
	(1)	(2)	(3)
Policy uncertainty	0.008	-0.105***	-0.096***
	(0.011)	(0.014)	(0.015)
Startup age	-0.002	0.010**	0.008*
	(0.003)	(0.004)	(0.005)
Lead VC firm age	-0.013***	0.005	-0.008*
	(0.003)	(0.004)	(0.005)
Industry Tobin's Q	0.003***	-0.000	0.003***
	(0.001)	(0.001)	(0.001)
Industry sales growth	0.015	-0.008	0.006
	(0.009)	(0.011)	(0.012)
Industry cash flow	0.029*	-0.108***	-0.079***
	(0.016)	(0.021)	(0.024)
Industry tangibility	-0.017	-0.108**	-0.125**
	(0.035)	(0.044)	(0.052)
Real GDP growth	0.050***	-0.018***	0.031***
	(0.005)	(0.004)	(0.006)
Fixed effects	yes	yes	yes
Observations	15499	15499	15499
Pseudo R-Squared	0.1793	0.2172	0.2126

Table 16 - Policy uncertainty and VC investment structure

This table shows the results of regressing the measures of VC investment structure on economic policy uncertainty. The independent variables are Number of rounds (Column(1)) and Skewness (Column (2)). Number of rounds is the natural logarithm of total number of financing rounds in each startup. Skewness is the fraction of first round investment over total investment in the same underlying startup. All continuous variables are winsorized at the 5% and 95% levels. Standard errors clustered at the country-industry level are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	No. Rounds	Skewness
	(1)	(2)
Policy uncertainty	0.471***	-0.135***
	(0.101)	(0.027)
Startup age	-0.173***	0.072***
	(0.018)	(0.006)
Lead VC firm age	0.001	0.022***
	(0.016)	(0.005)
Industry Tobin's Q	-0.025***	0.000
	(0.009)	(0.002)
Industry sales growth	0.128***	-0.034**
	(0.047)	(0.015)
Industry cash flow	-0.417***	-0.001
	(0.125)	(0.022)
Industry tangibility	-1.020***	0.213***
	(0.190)	(0.054)
Real GDP growth	-0.131***	0.032***
	(0.028)	(0.008)
Fixed effects	yes	yes
Observations	16087	11208
R-Squared	0.2802	0.36613

Table 17 - Policy uncertainty & cross-border venture capital investments

This table shows the results of regressing the cross-border venture capital investments on economic policy uncertainty. The dependent variables are VC investment amount (Column 1), No. of VCs (Column 2), and Investment per VC (Column 3). All continuous variables are winsorized at the 5% and 95% levels. Standard errors clustered at the startup country and VC country level are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	Cross-Border VC Inv. (1)	Cross-Border VC Inv. *t+1* (2)
Policy uncertainty	-0.381***	-0.275
	(0.129)	(0.169)
Real GDP growth distance	-7.699*	-3.462
	(3.853)	(3.043)
Culture distance	-0.042	-0.041*
	(0.028)	(0.022)
Geographic distance	0.295	0.247
	(0.301)	(0.279)
Bilateral trade	0.061***	0.056***
	(0.008)	(0.007)
Common language	0.111	0.075
	(0.217)	(0.182)
Common colonizer	0.537**	0.714**
	(0.232)	(0.272)
Market-friendliness	0.046	0.149
	(0.096)	(0.087)
Year fixed effects	Yes	Yes
Country fixed effects	Yes	Yes
Observations	1876	1875
Adjusted R-squared	0.229	0.223

Chapter 2: Venture Capitalist Directors and Managerial Incentives

1. Introduction

Prior research has collectively shown that the use of high-powered incentives (e.g., performance-based executive compensation schemes in the form of stock and options) has increased considerably in the last few decades (Murphy, 1999; Perry and Zenner, 2000; Hall and Murphy, 2003; Goldman and Slezak, 2006; Edmans, Gabaix, Jenter, 2017). The effects of this growth have been the significant rise in the sensitivity of CEO wealth to stock price or delta (Hall and Liebman, 1998; Jensen and Murphy, 1990) and the rise in the sensitivity of CEO wealth to stock price volatility or vega (Coles, Daniel, Naveen, 2006). Earlier studies have also documented that venture capitalists (VCs) use both cash and equity compensation to align the private venture-backed company's CEO incentives with those of equity investors (Baker and Gompers, 1999; Hellman, 2000; Hellman and Puri, 2002; Hsu, 2004; Wasserman, 2006; Kaplan, Sensoy, and Strömberg, 2009; Puri and Zarutskie, 2009; Chemmanur, Krishnan, and Nandy, 2009; Bengtsson and Hand, 2011). Our understanding is, however, very limited on whether the presence of VC directors in mature publicly-listed firms has an impact on the use of high-powered incentives in the firm's executive compensation packages, which, in turn, may lead to greater executive vega and delta.

In this paper, we study the role of compensation committee members with venture capital experience (hereafter VC directors) in designing executive compensation packages. We hypothesize that the appointment of VC directors is associated with stronger pay-risk (vega) and pay-performance (i.e., delta) sensitivities. We find support for this hypothesis. Moreover, our findings are in line with Celikyurt, Sevilir, and Shivdasani (2012), who show that firms with a venture capitalist director(s) on their boards have greater research and development intensity, innovation output, and deal activity with other VC-backed firms. They argue the venture capitalist innovation-specific expertise allows boards to better evaluate the merits of increasing research initiatives and set the appropriate strategic priorities for such initiatives.

In our empirical work, we use executive compensation data over the period 1998 - 2016. Our key identification problem arises when VC directors are not randomly distributed among firms and the presence of VC directors is related to the firm's demand for financial expertise. Consider a firm with plans to pursue more risky innovation and generate patents. It is possible that such firms desire greater innovation intensity or that highly innovative firms are more likely to hire VC directors, and this is consistent with a self-selection issue (Hermalin and Weisbach, 2003; Sørensen, 2007; Wintoki, Linck, and Netter, 2012). To mitigate the concern that endogeneity is driving our findings, we use a Heckman selection procedure as well as kernel and propensity matching methods.

We use the 2009 amendment to Regulation S-K as an instrument in our Heckman selection model. This regulatory shock allows us to test the idea that increasing VC experience of directors in the compensation committee affects managerial incentives through compensation contracts. The 2009 Amendment to Regulation S-K lays out reporting requirements for U.S. public firms to describe their reasons for nominating directors in the proxy statement. In particular, the 2009 amendment to regulation S-K requires that U.S. firms must disclose the experience, qualifications, attributes, or skills that led the nominating committee to choose an individual as a director. The new rules become effective as of February 28, 2010, for fiscal years ending on or after December 20, 2009. This regulatory act justifies that qualifications and experience of individual director's matter for corporate outcomes, which in turn may have increased firms' demand for qualified directors, such as VC directors.

We also utilize propensity score matching (PSM) techniques to determine whether firms with VC directors have higher CEO vega and delta compared with firms without VC directors. The PSM technique is based on the likelihood that an observation would be a firm with VC directors conditional on observables (Rosenbaum, Rubin, 1983, Rosenbaum, Rubin, 1984). We use a Probit specification to estimate the probabilities of being a firm with VC directors (= 1; 0 otherwise) on a comprehensive list of observable characteristics, including all the independent variables (size and market-to-book ratio), as well as industry fixed effects. We then use the predicted probabilities, or propensity scores (stratified by industry and year), from this Probit estimation and perform the matching. As our main matching procedure, we use nearest-neighbor matching that allows each treated firm to be matched with multiple controls (i.e., five), running the procedure with replacement. However, to ensure that the results are not sensitive to our choice of matching estimator, we also provide evidence from kernel matching as an alternative.

This paper reexamines the advisory roles of VC directors in public firms to uncover the channel through which such directors affect executive compensation. We contribute to the existing literature in several ways. First, with more recent and comprehensive data on executive compensation, our research delves into the role of VC directors in strategic decision-making. In particular, our research explores the compensation channels through which directors with VC experiences increase corporate risk-taking and also complements the literature focusing on how independent director's characteristics explain the change of executive compensation contracts.[1]

[1] Within an agency framework, independent directors on corporate boards serve key functions for organizations: select, monitor, and reward managers. The advising role of independent directors on the board has a prominent place in the Literature on Chief Executive Officer (CEO) compensation. Faleye, Hoitash, and Hoitash (2011) show that the effects of

Second, our findings contribute to the understanding of the relationship between boards of directors' expertise and executive compensation. Because of selection bias and omitted variables, identifying a causal link between board expertise directors and management compensation is difficult. We attempt to account for the endogeneity of the board of director's appointment and compensation policy using the Heckman self-selection model and matching procedures. Third, we provide supporting evidence to Celikyurt, Sevilir, and Shivdasani (2012) to suggest that VC directors improve executive incentives to innovate by changing the design of top management compensation schemes.

The paper is organized as follows. Section 2 discusses the literature review. Section 3 describes the dataset and the construction of the matched venture capital firm-director data set and presents summary statistics from the sample. Section 4 presents the main results. Section 5 concludes. All appendix material is available as an Online Appendix.

2. Prior literature and hypothesis development

Multi-dimensional boards could add values to the firm by combining monitoring and advisory roles to varying degrees (Hermalin and Weisbach, 2003, Adams and Ferreira, 2007), and through the variation in the relative importance of directors' roles in the firm (e.g., committee membership) and structure of the board (e.g., the number of independent directors). This section provides a review of a growing literature relating board characteristics to firm performance (Fich

directors' effectiveness lower excess executive compensation. On the other hand, Coles, Daniel, and Naveen (2008) assert that Tobin's Q increases in board size and the fraction of insiders on the board. Along the same lines, Core, Holthausen, and Larcker (1999) find that CEO compensation is a decreasing function of the percentage of insider directors on the board.

and Shivdasani, 2006; Perry and Peyer, 2005; Huang, Jiang, Lie, and Yang, 2014) and extends the analysis to compensation policies.

2.1. Independent directors' expertise and board effectiveness

Prior studies have attempted to examine the value added to the firm by board expertise or other relevant qualifications. The evidence on whether and, if so, how board expertise relates to corporate outcomes remains mixed. For instance, Drobetz et al. (2018), Dass et al. (2013), Faleye et al. (2018), and Adams et al. (2018) document that directors' industry experience adds value, while Kang et al. (2018) show that the impact of industry experience is not important in particular settings.

Falato et al. (2014) use the death of directors as a natural experiment to provide a consistent result with numerous studies showing that independent directors are associated with greater monitoring and advising of the firm's management (Weisbach, 1988, Cotter et al., 1997, Core et al., 1999, Güner et al., 2008, Nguyen and Nielsen, 2010) and cross-sectional differences in board structure matter for firm performance (e.g., Klein, 1998; Yermack, 2004). The monitoring and advisory roles of directors are not distinct; they can be performed simultaneously and are complementary (e.g., Adams and Ferreira 2007; Brickley and Zimmerman 2010).

Given that compensation committee membership is likely one of the most strategic assignments in terms of duties among all committee memberships, and the impact of having compensation committee directors is likely to be stronger in weakly governed firms, our findings further reinforce the view that directors view compensation policy as a substitute for another governance mechanism. Unlike audit committees that are more likely to exert monitoring effort on accounting and financial policies, compensation committees are more likely to exert monitoring effort on CEO rent extraction through compensation.

2.2. The presence of VC directors and managerial compensation

Boards of directors formally set executive compensation contracts. Recent literature on director appointments on chief executive officer (CEO) compensation shows that board monitoring when a credible CEO replacement is on the board leads to higher CEO pay-performance sensitivity (Mobbs, 2013), consistent with improved board monitoring. Li and Srinivasan (2011) show that firms in which founders serve as a director have more high-powered incentives (e.g., higher pay-for-performance sensitivity, lower excess compensation, higher CEO turnover-performance sensitivity) than other firms on average. Hallock (1997) investigates a sample of 9804 director positions in America's largest companies and shows that CEOs who lead firms with a reciprocally interlocking board of directors earn significantly higher compensation. This study is a part of studies that investigate the effect of board structure on CEO compensation (Yermack, 1996; Angbazo and Narayanan, 1997; Hallock, 1997; Core et al., 1999; Cyert, Kang, and Kumar, 2002; Vafeas, 2003; Bertrand and Mullainathan, 2001; Grinstein and Hribar, 2004; Chhaochharia and Grinstein 2009; Laux and Laux, 2009; Guthrie, Sokolowsky, and Wan, 2012). Yet, empirical assessments of the role of board structure on CEO compensation are often deemed inconclusive since board structure is an endogenous variable, determined by an unobservable firm and CEO characteristics that, in turn, affect CEO compensation (e.g., Thorburn, 1997; Hermalin and Weisbach, 2003).

On the other hand, venture capitalists have substantial representation on the board of private firms in their portfolios (Barry, Muscarella, Peavy, and Vetsuypens, 1990; Lerner, 1995) and provide monitoring to limit the opportunistic behavior of the manager of their portfolio firms (Rajan, 1992; Admanti and Pfleiderer, 1994). In particular, venture capitalists (VCs) have been shown to play an important role in small and private start-ups by performing key services, including recruiting management and resolving compensation issues (Gorman and Sahlman, 1989). More recent literature shows that VCs also play a significant monitoring role as directors of mature public companies. Celikyurt et al. (2014) have also documented that 30.5% of Standard & Poor's (S&P) 1500 Companies' directors have a VC experience before their board appointments.

With respect to the role of VC investors in private VC-backed companies board of directors, prior theoretical literature has identified several ways that the investor/principal can mitigate conflicts of interest between an agent—an entrepreneur with a venture that needs financing—and a principal—an investor with the funds to finance the venture. First, the VC investor can engage in information collection before deciding whether to invest, in order to screen out ex-ante unprofitable projects and bad entrepreneurs. Second, the VC investor can structure financial contracts, that is, the allocation of cash flow and control rights, between the entrepreneur and investor to provide incentives for the entrepreneur to behave appropriately. And third, the VC investor can engage in information collection and monitoring once the project is underway. According to Kaplan and Strömberg (2003), VCs are real-world entities that closely approximate the investors of theory. VCs invest in entrepreneurs who need financing to fund a promising project or company. VCs have strong incentives to maximize value, but, at the same time, receive few or no private benefits of control. Although they are intermediaries, VCs typically receive at least 20 percent of the profits on their portfolios (Hart, 2001; and Gompers and Lerner, 1999).

By conducting a detailed study of the 213 actual contracts between VCs and entrepreneurs, Kaplan and Strömberg (2003) document several findings. First, VCs change the entrepreneur's equity compensation function, making it more sensitive to performance when incentive and asymmetric information problems are more severe. It means that cash flow rights matter in a way that is consistent with the principal-agent theories of Holmström (1979), Harris and Raviv (1979), Lazear (1986), and others. Second, cash flow rights and control rights can be separated and made contingent on observable and verifiable measures of performance. This is most supportive of theories that predict shifts of control to investors in different states, such as Aghion and Bolton (1992) and Dewatripont and Tirole (1994). Third, the widespread use of non-compete and vesting provisions indicates that VCs care about the hold-up problem explored in Hart and Moore (1994).

Hellman and Puri (2002) hand-collected a sample of 173 start-up firms from California's Silicon Valley. They find that VC-financed firms are more likely and faster to professionalize by adopting stock option plans and hire a vice president of sales. They also find VC-financed firms are more likely and faster to bring in CEOs from outside the firm. In addition to that, in more than a third of the investments, the VC expects to be active in other areas, such as developing a business plan, assisting with acquisitions, facilitating strategic relationships with other companies, or designing employee compensation. In their analysis of risks identified by the VCs, the VC was worried that the investment might require too much time in roughly 20 percent of the investments. In two cases, this involved the VC representation on the board becoming chairman of the company. This indicates that while VCs regularly play a monitoring and advisory role, they do not intend to become too involved in the company.

Furthermore, Bergemann and Hege (1998) also investigate the provision of venture capital in a research venture with sequential development stages. Theoretically, they show that the optimal compensation of the entrepreneur is akin to a nested sequence of option contracts. The options express the value of the intertemporal incentive constraint, and the relational promise of future options works to alleviate the pressure to provide contemporaneous performance-related cash incentives.

We propose two competing hypotheses regarding the relation between VC directors and managerial compensation incentives. In our first hypothesis, the presence of VC directors is positively related to CEO high-powered incentives (e.g., compensation incentives with higher sensitivity of CEO wealth to stock return volatility (vega) and sensitivity of CEO wealth to stock price (delta)). A priori, it is not clear whether venture capitalist director representation on the board (VC director firms) would provide higher or lower CEO vega and delta than other firms. High powered incentives may be used to motivate top executives to take value-adding actions that are difficult to measure or observe (Li and Srinivasan, 2011). However, high-powered compensation contracts could also provide managers with incentives to falsify firm information, particularly if the chance of detection is low (Shleifer and Vishny, 1997; Bergstressr and Philippon, 2006).

Previous theoretical papers (Goldman and Slezak, 2006; Crocker and Slemrod, 2007) imply that board grants more high-powered incentives when it is easier to prevent or detect such manipulation. If VC directors provide better monitoring, our first hypothesis is that vega and delta are higher for CEOs in VC director firms than CEOs in non-VC director firms. For comprehensive reviews of the literature related to CEO high-powered incentives, see Murphy (1999) and Frydman and Jenter (2010). In our alternative hypothesis, the presence of VC directors would not be related to CEO vega. Brunarski, Campbell, and Harman (2015) argue that directors could also be loyal to managers with whom they have business ties or who supported their board appointments. Thus, these directors would be less likely to alter suboptimal compensation contracts to appease shareholders and hence, our alternative hypothesis is that the presence of VC directors is not related to CEO vega.

3. Variable measurement and sample selection

3.1. Sample selection

The data in this study is gathered from various sources. Data about boards and board compensation committees are from the Investor Responsibility Research Center (IRRC), which is now part of Institutional Shareholder Services (ISS). The initial sample contains all firm-years listed on the S&P 1500 between January 1, 1996, and December 31, 2016. As a basic screen, we exclude financial institutions (SIC codes between 6000 and 6999) and utilities (SIC codes 4900 and 4999) from the sample to attenuate the potential effect of industry-specific regulation on the director appointments. We also remove a small number of firms that enter the IRRC database in the year of their IPO or for which the IPO year is not available. The number of firms that meet our selection criteria is 1,309. For all sample years, the IRRC data always contains at least 1,300 firms. The requirement of control data availability further reduces the sample size.

For our regression and heterogeneity analysis, we merge our IRRC sample with the Execucomp database and exclude firms that are not covered by Execucomp. We also merge our data with financial variables in Compustat and trading data from CRSP. Data on IPO information and firm age are collected from Securities Data Company (SDC) and Jay Ritter's website[2].

[2] https://site.warrington.ufl.edu/ritter/ipo-data/

3.2. Measurement of VC experience of directors

To identify directors with VC experiences, we extend the approach of Celikyurt, Sevilir, and Shivdasani (2012). First, we collect detailed director-level employment data items from IRRC between 1996 and 2016. IRRC provides information on the primary employer name, primary employment category, other employment titles, and the type of employment services for each director. A director serving on the board of a public firm in our sample is identified as a possible VC director if the keywords 'venture', 'capital', 'partner', 'fund', 'investor', 'angel', 'finance', 'financial', or 'management' is available in any of these data items, and we record the director as a possible candidate for being a VC director. Next, we link the director's primary employer name to the name of the venture capital firm in SDC VentureXpert database using a fuzzy matching method similar to Bernstein, Giroud, and Townsend (2016). Moreover, we also check the biography of each of the possible VC directors from the proxy statements. In particular, we check whether they have worked for a firm that is registered as a venture capital firm in SDC VentureXpert database. Finally, in our data collection, we manually review the information to refine and evaluate whether the primary employer of each VC director is a venture capital firm that invests in early-stage companies by reading the VC director employer firm's official websites, www.crunchbase.com and www.bloomberg.com.

3.3. Measurement of executive compensation incentives

Following previous literature, we measure executives' equity portfolio vega as the change in the risk-neutral (i.e., Black-Scholes) value of the executive's current year option grant for a 0.01 change in the standard deviation of the underlying stock returns (Guay, 1999; Coles et al., 2006, Low, 2009; Armstrong and Vashistha, 2012, Hayes et al., 2012). Similarly, we measure executives' equity portfolio delta as the change in the risk-neutral value of the executives' equity portfolio for a 1% change in the underlying stock price. We also use the natural logarithm of both variables in our analysis, since both delta and vega are highly skewed.

Table 1 presents summary statistics for the 29,983 firm-year observations. Panel A reports the presence of VC directors by year. The proportion of firms appointing VC directors to the board increases almost monotonically over time. For example, while 17.3% (5.3%) of the firms have at least one VC director on the board (one VC directors in the compensation committee) in 1998, the ratio increases to 22.9% (12.8%) in 2016. Panel B describes the presence of VC directors by industry. Our sample covers all ten remaining Fama and French 12 industries since financial and utility firms were excluded in our initial screen. The business equipment (e.g., computer, software, and electronic equipment) industry has the highest number of VC directors on board (23.2%), followed by the telephone and television industry (21.6%).

Table 2 presents summary statistics on the compensation of top management, including CEO and CFO, CEO characteristics, board of director's characteristics, firm characteristics and other variables used in our compensation regressions. Following past literature (Guay, 1999; Core and Guay, 1999; Coles et al., 2006), we winsorize vega, delta, compensation variables, and other control variables at the 1st and 99th percentile. On average, firms with VC directors on compensation committee have higher total compensation incentives than firms without VC directors on compensation committee. Total CEO (CFO) total compensation averages $4,315,636 = 1000*e^8.37 ($1,900,743 = 1000*e^7.55) for firms with VC directors in compensation committee and $3,568,855 ($1,652,426) for firms without VC compensation committee members. Total CEO (CFO) vega averages $22,103 ($11,182) per one unit for firms with VC directors in compensation committee and $16,461 ($8,874) for firms without VC compensation committee.

Additionally, Total CEO (CFO) delta averages $23,779 ($17,174) per one unit for firms with VC directors in compensation committee and $10,133 ($8,025) for firms without VC compensation committee. Table 2 also provides summary statistics for the key control variables. All numbers are similar to values reported in related studies, such as Guay (1999), Core and Guay (1999), and Coles et al. (2006).

Table 2 also shows that VC directors on the compensation committee are younger than non-VC directors on the compensation committee. Firms with VC directors on compensation committee, on average, have higher research and development expenditure than those with no VC directors on compensation committee. The median firm with VC directors on the compensation committee has research and development expenses as much as five percent of their total assets.

We further examine whether firms with VC director compensation committee were VC-Backed at the time of the IPO. We define an indicator variable that takes the value of one for firms that were VC-backed at the time of their IPO and zero otherwise. This indicator variable has an average value of 0.28 for firms with a VC director on compensation committee and 0.14 for firms without, implying that firms with VC directors on compensation committee are roughly twice as likely to have been VC-backed at the time of their IPO. We find that only 16.55% of firms that have VC directors on compensation committee are VC-Backed at the time of their IPO. Although firms that are VC-backed IPO are more likely to have a VC director on compensation committee, being VC-backed at IPO does not always result in a firm having VC directors on the board later in its life as a public company.

4. VC Directors and executive compensations

To explore the impact of VC directors on a firm's compensation policy, we first investigate whether VC directors affect CEO compensation incentives.

4.1. Baseline regression results

We first perform a multivariate analysis. Particularly, we estimate a panel regression with fixed effects in which the dependent variables are CEO & CFO risk-taking incentives (vega). The primary explanatory variable of interest is the VC directors on compensation committee dummy, number of VC directors on compensation committee, and percentage of VC directors on compensation committee. In addition, we control for a number of other determinants of executive compensations, including size, leverage, market-to-book, ROA, research and development intensity, tangibility, stock return, stock volatility, firm age, VC-Backed Firm dummy, CEO age, CEO tenure, CEO duality, independent board, board size, institutional ownership concentration, and total institutional ownership (Coles et al., 2006; Hayes et al., 2012). To address the possibility that there are other omitted variables, all specifications in the paper include either firm or industry (two-digit SIC) fixed effects. Moreover, we also include state educational attainment, state per capita income, state R&D per capita, and state fixed effects. Throughout the study, all associated t-statistics are computed based on standard errors clustered at the firm level.

4.2. VC Directors and CEO risk-taking incentives

$$CEO\ Vega = \alpha + \beta * VC\ Directorship + \gamma * Year\ dummies + \delta * Industry\ dummies + \varepsilon_{i,t} \quad (1)$$

Table 3 reports estimates from regressing CEO risk-taking incentives (vega) on lagged primary variables of interest and lagged control variables. Column (1) reports that the coefficient of VC directors on compensation committee dummy on CEO vega is 0.0794 and statistically significant at 5% level. The result indicates that CEOs in VC-director firms receive higher Vega then CEOs in non VC - director firms. In terms of economic magnitude, for a representative firm with CEO compensation held at the mean level of our sample, switching from a non VC-director firm to a VC-director firm implies an increase in the sensitivity of the manager's wealth to the volatility of equity value by approximately 2.74%. In column (2), the coefficient of the number of VC directors on the compensation committee is 0.0679 and remains significant. In column (3), the coefficient on the percentage of VC directors on compensation committee is significantly positive (0.251). In column (4), we include both the VC directors on compensation committee variable and the VC director on board but not a member of any committee variable. Again, we find that the coefficient on VC director on compensation committee is significantly positive (0.0813), while the coefficient of VC director on board but not a member of any committee variable is positive but not significant.

For robustness checks, we repeat regression (1), this time using state-level control variables, such as state educational attainment, state per-capita income, and state R&D per capita (Column (5) and (6)), as well as using state-fixed effects (Column (7) and (8)). The coefficients of the VC Director on compensation committee and the percentage of VC directors on compensation committee from Columns (6) to (8) are again positive and significant. For other control variables, our estimated coefficients are similar to those reported in earlier studies. Firms with larger assets, Market-to-Book, ROA and R&D Intensity are associated with higher risk-taking incentives. These results show that CEO risk-taking incentives (vega) have a positive relationship with the presence of VC directors on compensation committee.

4.3. VC Directors and CEO pay-performance sensitivity

$CEO\ Delta = \alpha + \ \beta * VC\ Directorship + \ \gamma * Year\ dummies + \ \delta * Industry\ dummies + \ \varepsilon_{i,t}$ (2)

Columns (1) to (8) in Table 4 report the estimation results of CEO pay-performance sensitivity regressions where the dependent variable is CEO pay-performance sensitivity (delta) and the main independent variable is the presence of VC directors on compensation committee. Estimates of regression (2) contained in Table 4 are consistent with our prediction that CEO delta is positive and statistically significant associated with the presence of a VC director on compensation committee. Columns (1) reports that the coefficient of a VC director on compensation committee dummy is 0.113 and statistically significant. The result indicates that CEOs in VC-director firms receive higher Delta then CEOs in nonVC - director firms. In terms of economic magnitude, for a representative firm with CEO compensation held at the mean level of our sample, switching from a non VC-director firm to a VC-director firm implies an increase in the sensitivity of the manager's wealth to the price of equity value by approximately 3.84%.

Column (2) in Table 4 shows that coefficient of the number of VC directors on compensation committee is 0.102 and remains significant. In column (3), the coefficient of the percentage of VC directors on compensation committee is 0.379 and statistically significant. In column (4), we include both the VC directors on compensation committee variable and the VC director on board but not a member of any committee variable. Again, we find that the coefficient on VC director on compensation committee is significantly positive (0.116), while the coefficient of VC director on board but not a member of any committee variable is positive but not significant. In columns (5) and (6), we account for state control variables. In columns (7) and (8), we control for state-fixed controls.

4.4. Alternative governance mechanisms

Panels A and B of Table 5 report the effect of VC directors on board as a whole and the presence of VC directors outside compensation committee (i.e., audit, governance, nomination committee) on the CEO vega and delta. The result in Panel A of Table 5 indicates that the presence of VC directors on board has a positive and significant effect on CEO vega, while the presence of VC directors outside compensation committee (e.g., governance committee, audit committee, and nomination committee) does not have a significant effect on CEO vega. On the other hand, Panel B of Table 5 reports that the coefficients of the presence of VC directors on audit and governance committee are not significant in any columns. Moreover, the presence of VC directors on board and in nomination committee has a positive and significant effect on CEO delta at 5% level.

4.5. Heckman selection procedure

Most corporate decisions are nonrandom. In our context, VC directors in compensation committee may be elected by the firms that decide to improve CEO compensation, and a firm compensation decision might be influenced by CEO network. To control for such potential self-selection bias, we employ a two-stage Heckman selection model (Heckman, 1979).

In the first stage, we use Probit regression of the likelihood of the presence of VC directors in the compensation committee (Column 1, 3, 5, 7 of Table 6). In the second stage, we add the Inverse Mills ratio as an independent variable in our estimation of executive compensation. The coefficients on our key explanatory variables, the VC Directors dummy and the percentage of VC Directors, remain positive and significantly different from zero at 1% and 5% level and they have the same magnitudes. The estimated coefficients of VC director and VC director (%) on CEO delta, however, are positive but not significant. Finally, in the second-stage Heckman regressions (Columns 2, 4, 6, 8 in Table 6), the inverse Mills ratio does not enter significantly in the regressions, indicating that selection bias does not distort our results. This means that the current incentive compensation is more sensitive to the standard deviation of the stock return than the level of stock price. These results are consistent with our expectations that VC directors motivate innovation by increasing CEO risk-taking incentives.

4.6. VC Directors and CFO risk-taking incentives and pay-performance sensitivities

$$CFO\ Vega\ (Delta) = \alpha + \beta * VC\ Directorship + \gamma * Year\ dummies + \delta * Industry\ dummies + \varepsilon_{i,t} \quad (3)$$

Panel A and B of Table 7 reports estimates from regressing CFO risk-taking incentives (vega) and pay-performance sensitivity (delta) on lagged primary variables of interest and lagged control variables, respectively. Similar to the results in Table 3 and 4, overall, we find that CFO risk-taking incentives (vega) and pay-performance sensitivity (delta) have a positive relationship with the presence of VC directors on the compensation committee.

4.7. VC directors and the level of CEO compensation

$CEO\ Compensation\ Level\ = \alpha +\ \beta * VC\ Directorship +\ \gamma * Year\ dummies +\ \delta * Industry\ dummies +\ \varepsilon_{i,t}$ (4)

We present the effect of VC directors on the level of executive compensation in Table 8. We find that treated firms, on average, change CEO compensation by increasing the level of total excess compensation, total compensation, and options pay. On the other hand, treated firms, on average, change CFO compensation by reducing the level of the total of inside debt.

4.8. VC directors and the composition of CEO compensation

$CEO\ Compensation\ Composition\ = \alpha +\ \beta * VC\ Directorship +\ \gamma * Year\ dummies +\ \delta * Industry\ dummies +\ \varepsilon_{i,t}$ (5)

Panels A and B of Table 9 reveal the possible channel for the incremental CEO risk-taking incentives following the presence of VC directors on the compensation committee. Thus, we decompose top management compensation into the percentage of cash-based pay to total compensation (cash intensity, percentage of stock-based pay to total compensation/stock intensity, percentage of option-based pay to total compensation /option intensity, ratio of vega and delta, percentage of inside-debt, and percentage of termination pay) and rerun the regression. We find that treated firms, on average, restructure CEO compensation incentives to have more option intensity and less cash intensity compared to those in compensation packages of CEO of control firms. Similarly, we find that treated firms, on average, restructure CFO compensation incentives to include more option intensity, and less proportion of inside debt of total pay, less proportion of termination pay, and less cash-based pay compared to those in compensation packages of CFO of control firms.

4.9. Cross-Sectional heterogeneity on corporate governance

Table 10 explores heterogeneity in the effect of having VC directors on executive compensation. We consider variation in the relative importance of directors' roles in the firm, such as VC director committee membership, the degree of the institutional ownership concentration, and the extent of CEO power.

We test whether the magnitude of the compensation effect of the presence of VC director varies depending on internal governance, director, and firm-related characteristics. That is, we test if the coefficient estimates on the VC Directors dummy and percentage varies depending upon whether the firm is categorized into below or above the median of institutional ownership (He et al., 2019), CEO pay gap (Bizjak et al., 2011), CEO pay slice (Bebchuk et al., 2011), number of geographic segments (Fich et al., 2014), and high-tech industry (Jung and Subramanian, 2017).

To demonstrate the robustness of our results, in this section, we investigate the cross-sectional differences in firms with different levels of corporate governance that change their CEO vega following the presence of VC Directors on compensation committee. In Column (1) and (2) in Table 10, we split firm-years by whether they have institutional ownership concentration above or below our sample median. We find that firms with lower institutional ownership concentration significantly increase their CEO vega (at 1% level), while firms with higher institutional ownership concentration do not.

We also find consistent statistically significant evidence in columns (3)-(6), where we split our sample into firms with higher and lower CEO Power (e.g., CEO pay gap and CEO pay slice) using sample median as the cutoff. We find that firm-years with above-median CEO pay gap (in column 3) and above-median CEO pay slice (in Column 5) significantly increase CEO vega, These results are statistically significant at 5% in the subsample of firm-years with above-median CEO pay gap and CEO pay slice, but are not significant in the subsample of firms-years with below-median CEO pay gap and CEO pay slice. Overall we find that firms with VC directors tend to increase CEO vega when they have greater CEO pay gap and CEO pay slice.

In columns (7) and (8) of Table 10, we split our sample of firm-years by the number of geographic segments. In these columns, we find that firms with VC directors in the compensation committee with an above-median number of geographic segments significantly increase the CEO-risk-taking incentives. We postulate that an expansion of geographic segment operations may increase the likelihood of managerial empire building. Thus, providing incentive compensation is more important for firms with a larger geographic segment. Moreover, we find that firms with VC directors on compensation committee significantly increase CEO-risk taking incentives if they are in the high-tech industry. We do not find a similarly significant relationship with firms that are not in the high-tech industry.

4.10. Kernel Matching and Propensity Score Matching

In Tables 11 and 12, we employ kernel matching and propensity score matching methods, which have become standard and commonly employed methodologies for making causal inferences using observational data that are not produced by controlled experimental settings (e.g., Rosenbaum and Rubin, 1983). Using the predicted values arising from the Probit model, we create four types of matched samples. First, we match each treated firm (e.g., firms with VC Directors on compensation committee) with the closest control firms (e.g., VC Directors without VC Directors on compensation committee) in the common support by kernel matching.

Second, we match each treated firm (e.g., firms with VC Directors on compensation committee) with the closest control firms (e.g., VC Directors without VC Directors on compensation committee) in the common support by propensity score matching. Third, we match each treated firm (e.g., firms with VC Directors on Board) with the closest control firms (e.g., VC Directors without VC Directors on Board) in the common support by kernel matching. Fourth, we match each treated firm (e.g., firms with VC Directors on Board) with the closest control firms (e.g. VC Directors without VC Directors on Board) in the common support by propensity score matching with five nearest neighbors, with replacement.

Table 11 reports the panel data estimates using kernel matching. Our findings are in line with those obtained in the previous panel regressions. Table 12 reports the panel data estimates using propensity score matching. Similarly, our findings are consistent with those obtained in the previous panel regressions. Overall, this suggests that the non-random assignment of VC directors on compensation committee and VC directors on board to firms with more executive risk-taking incentives do not explain our findings.

4.11. Robustness checks and the dynamics of CEO risk-taking incentives.

Table 13 reports the effect of the presence of a VC director on compensation committee on CEO risk-taking of mature publicly-listed firms. To avoid studying the role of VCs at the time of the IPO, we drop a small number of firms that enter the IRRC database in the year of their IPO or for which the IPO year is not available. We find that the positive effect of VC director on compensation committee on CEO risk-taking incentives continues to be positive. Consistent with the findings from the OLS specification, the coefficient estimate on the presence of VC director on compensation committee is positive and significant at the 5% level.

Table 14 presents the two-year and three-year ahead of the presence of VC directors on the compensation committee. In Column (1) and (2) the coefficient of two-year ahead VC director on compensation committee on CEO vega is positive but only significant at 10% level, while the coefficient of three-year ahead VC director on compensation committee on CEO vega is positive but not significant. Similarly, in column (3) and (4) the coefficient for two-year ahead VC director on compensation committee on CEO Delta is positive and significant at 5% level, while the coefficient for three-year ahead VC director on compensation committee on CEO Delta is positive but not significant.

Collectively, our findings have important implications for board expertise and compensation policy literature. Moreover, this paper complements the literature on the impact of venture capitalists on firm outcomes by providing evidence that VC directors on compensation committee have a causal impact on higher executive risk-taking incentives and pay-performance sensitivity.

5. Conclusions

We analyze how VC directors affect executive compensation policy. Our results indicate that firms with VC directors in the compensation committee are more likely to increase CEO risk-taking incentives and pay-performance sensitivity. On average, having VC directors on the compensation committee increase the CEO vega by 2.74% and increase CEO delta by 3.84%. The increase of CEO vega is more significant when the firm has low institutional ownership concentration, high CEO power, large geographic segments, and in the high-tech industry. Our results are robust to tests addressing endogeneity concerns.

We also explore the channel through which VC directors increase CEO risk-taking incentives. We find that the presence of VC directors on board is associated with a higher level of excess CEO compensation, total CEO compensation, and total option compensation. Furthermore, we find that directors with VC experience increase CEO vega by lowering cash intensity and increasing option intensity. In addition, we also find similar results for CFO compensation. The presence of CFO compensation increases the CFO risk-taking incentives (vega) and CFO pay-performance sensitivity (delta). At the same time, VC directors increase the level of CFO total excess compensation and decrease the level of CFO inside debt. In addition, they increase the proportion of CFO option intensity while decreasing the proportion of cash total compensation, the proportion inside debt to total compensation, and termination pay to total compensation.

Our work contributes to the vast literature on the effect of director experience on corporate policy. Several fruitful avenues exist for future research. One would be to consider the value of VC directors in other events, such as CEO turnover and nomination. Another would be to examine the effectiveness of VC directors in transactions that require helps from venture capital firms, such as securities offerings.

Appendix A: Variable definitions

The variables used in this study are defined in the Appendix below. We winsorize compensation variables at the 1st and the 99th percentiles and then apply log transformation to compensation variables to overcome the skewness in the data.

Variables	**Description**	**Data Sources**
Size	Natural logarithm of total assets (at).	Compustat
Leverage	Ratio of the book value of debt (dlc + dltt) to the sum of the book value of debt (dlc + dltt) and market capitalization (prcc × csho).	Compustat
Market-to-Book	Ratio of market value of assets (total assets plus market value of equity minus book value of equity) to total assets ((at + csho × prcc_f – ceq)/at).	Compustat
ROA	Earnings before interest, taxes, depreciation and amortization over total assets (ebitda/total assets)	Compustat
R&D/Assets	Ratio of research and development expenditures to total assets (xrd/at).	Compustat
Tangibility	Ratio of net property, plant, and equipment (ppent) to total assets (at).	Compustat
Stock Return	Annual stock return for the fiscal year.	CRSP
Stock Volatility	Annualized standard deviation of daily returns computed over the year.	Compustat
Firm Age	Natural logarithm of number of years since the firm establishes.	Jay Ritter's website
VC-Backed Firm	Dummy variable taking the value of one if the firm is VC-backed and zero otherwise.	SDC Platinum
CEO Age	Natural logarithm of CEO's age in the sample year.	Execucomp
CEO Tenure	Natural logarithm of number of years since the director became CEO	Execucomp
CEO Duality	Dummy variable taking the value of one if the CEO is the chairperson and zero otherwise.	IRRC
Independent Board	Percentage of outside directors on the board identified as independent of the CEO and firm.	IRRC
Board Size	The number of directors on the board at year-end.	IRRC
Institutional Ownership Concentration	Sum of squared individual institutional holdings divided by total institutional holdings.	Thomson Reuters 13F Holdings
Institutional Ownership Total	Aggregate percent of outstanding shares of a company held by all financial institutions.	Thomson Reuters 13F Holdings
Total Compensation	Natural logarithm of total CEO/CFO compensation in $ thousands (tdc1).	Execucomp
CEO Risk-Taking Incentives (vega)	The expected dollar change in the value of the CEO's current year annual option grant (in $ thousands) for a 1% change in stock price volatility. We compute vega using current year option granted. The variable definition is based on Hayes et al. (2012).	Execucomp, CRSP

CEO Pay-Performance Sensitivity (delta)	The expected dollar change in the value of the CEO's current year annual equity-based compensation (in $ thousands) for a 1% change in the stock price. We compute delta using all current option grants + number of shares of current restricted stock grants + number of targeted shares granted. The variable definition is based on Hayes et al. (2012).	Execucomp, CRSP

Appendix B: Merging SDC VentureXpert with Director IRRC database

In this section, we describe the process of merging venture capital companies in the VentureXpert database with IRRC databases through matching venture capital firm names in VentureXpert with the director's primary employment names in the IRRC database.

B.1. Name Standardization

We begin by standardizing company names in VentureXpert and primary employment names from IRRC databases using the name standardization algorithm developed by the NBER Patent Data Project. This algorithm standardizes common company prefixes and suffixes and strips names of punctuation and capitalization; it also isolates a company's stem name (the main body of the company name), excluding these prefixes and suffixes.

B.2. The Matching Procedure

With these standardized and stem company names provided by both VentureXpert and the IRRC database, we merge the databases following the matching procedures similar to Ma (2019) and DiNardo and Lee (2004) as shown below:

1. We match each standardized IRRC company name with standardized names from the VentureXpert data.
    a. If we identify the exact match of standardized names, we consider this as a "successful match".
    b. Otherwise, we consider the rest as "potential match" and follow the next step

2. We match each stem IRRC company name with stem names from VentureXpert data.
    a. If we identify the exact match of stem names, we consider this as "successful match".
    b. Otherwise, we consider the rest as "potential match" and follow the next step

3. For the remaining companies, each standardized and stem IRRC company name is matched with close standardized and stem names from the VentureXpert data using a Spelling distance method. The criterion is based on the possible matching scenarios by translating a keyword into a query containing the smallest distance value. The method evaluates the query and keyword arguments returning non-negative spelling distance values. A derived value of zero indicates an exact match. Generally, derived values are less than 100. We can control the matching process by specifying spelling distance values greater than zero

    a. As a first pass, we modified the program to match only on the firm name, and discovered that in this application, that same threshold led to "too many" matches. As we describe, we, therefore, augmented the process with a manual review. In these cases, we selected the lowest spelling distance as the candidate match. If there was a tie in spelling distance between two candidate comparisons, we selected one match at random. We reviewed every match and dropped those where they judged the two firm names as different companies and categorizes some as a "potential match" and the remaining as "failed to match"

b. The "potential matches" set identified in the procedures above is reviewed by hand, incorporating information from www.crunchbase.com, www.bloomberg.com, including company business descriptions.
c. Pairs confirmed as successful matches through the manual check are moved to the "successful match" set.

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Table 1 - Summary statistics of firms with VC directors for the aggregate sample

Panel A: Distribution of observations by year

Year	Number of firms	Firms with VC director (%)	Firm with VC directors on compensation committee (%)
1998	1389	10.9	5.3
1999	1460	11.4	5.4
2000	1422	13.6	6.0
2001	1337	18.5	10.4
2002	1322	18.9	9.9
2003	1364	16.9	8.9
2004	1368	17.8	9.2
2005	1343	18.1	9.5
2006	1400	18.1	8.9
2007	1599	15.4	8.8
2008	1555	17.5	9.3
2009	1519	19.9	10.8
2010	1495	21.1	12.7
2011	1470	21.0	13.0
2012	1439	20.5	12.2
2013	1422	21.5	12.7
2014	1409	22.2	12.9
2015	1361	21.5	12.6
2016	1309	22.9	12.8
Total	26983	18.3	10.1

Panel B: Distribution of observation by industry

Fama and French Industry	Number of firms	Firms with VC directors (%)	Firm with VC directors on compensation committee (%)
Consumer Durables	988	11.5	5.1
Consumer Nondurables	1956	21.4	11.2
Chemicals Products	1057	11.3	6.0
Manufacturing	3860	13.9	7.7
Other	3951	15.9	7.5
Oil, Gas, and Coal	1501	16.2	8.7
Wholesale and Retail	3824	18.8	9.2
Healthcare, Medical Equipment, and Drugs	2838	19.0	11.1
Telephone and Television	847	21.6	12.9
Business Equipment	6161	23.2	14.3
Total	26983	18.3	10.1

Table 2 - Summary statistics of firm and board characteristics

This table provides the summary statistics of firm and board characteristics for IRRC firms between 1998 and 2017. Panel A provides the descriptive firm statistics of our sample of IRRC firms. Panel B provides the descriptive board characteristics. Independent VC directors on compensation committee are directors serving on public firms' board compensation committee who have worked as venture capitalists in venture capital firms. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	All Sample			Firms with VC Directors On Compensation Committee			Firms with no VC Directors On Compensation Committee			Comparisons between firms with VC- and Non-VC Directors in Compensation Committee	
	N	Mean	Std. Dev.	N	Mean	Std. Dev.	N	Mean	Std. Dev.	t-statistics	z-statistics
Panel A: Firm Statistics											
Log CEO Total Compensation	13125	8.21	1.01	1685	8.37	1.00	11440	8.18	1.01	-0.18***	-6.97***
Log CEO vega	13130	2.89	1.58	1686	3.14	1.54	11444	2.86	1.59	-0.29***	-10.97***
Log CEO delta	13130	2.94	1.60	1686	3.21	1.55	11444	2.90	1.60	-0.31***	-11.75***
Log CFO Total compensation	5651	7.43	0.74	922	7.55	0.71	4729	7.41	0.74	-0.15***	-4.04***
Log CFO vega	5275	2.32	0.99	868	2.50	0.99	4407	2.29	0.98	-0.21***	-5.53***
Log CFO delta	5275	2.24	0.98	868	2.41	1.00	4407	2.20	0.97	-0.20***	-5.47***
Size	13130	7.62	1.51	1686	7.66	1.55	11444	7.61	1.51	-0.05	-1.85*
Leverage	13130	0.19	0.15	1686	0.19	0.17	11444	0.19	0.15	0.00	0.0897
Market-to-Book	13130	3.27	3.39	1686	3.66	3.85	11444	3.22	3.31	-0.45***	-17.12***
ROA	13130	0.05	0.10	1686	0.03	0.12	11444	0.05	0.09	0.02***	0.6323
R&D/Assets	13130	0.03	0.05	1686	0.05	0.07	11444	0.03	0.05	-0.02***	-0.611
Tangibility	13130	0.27	0.21	1686	0.24	0.21	11444	0.27	0.21	0.03***	1.2029
Stock Return	13130	0.15	0.49	1686	0.14	0.53	11444	0.15	0.49	0.01	0.3084
Stock Volatility	13130	0.43	0.20	1686	0.45	0.23	11444	0.42	0.20	-0.03***	-1.0472
Firm Age	13130	2.68	0.82	1686	2.53	0.83	11444	2.70	0.81	0.16***	6.25***
VC-Backed Firm	13130	0.16	0.37	1686	0.28	0.45	11444	0.15	0.35	-0.14***	-5.28***
CEO Age	13130	4.03	0.12	1686	4.02	0.12	11444	4.03	0.12	0.01***	0.4174
CEO Tenure	13130	1.86	0.77	1686	1.93	0.75	11444	1.85	0.77	-0.08***	-3.17***
CEO Duality	13130	0.69	0.46	1686	0.65	0.48	11444	0.70	0.46	0.04***	1.71*

Independent Board	13130	0.72	0.16	1686	0.75	0.14	11444	0.72	0.16	-0.04***	-1.47
Board Size	13130	8.22	2.72	1686	8.35	2.72	11444	8.20	2.72	-0.15**	-5.73***
Institutional Ownership Concentration	13130	0.05	0.05	1686	0.05	0.04	11444	0.05	0.05	0.00**	0.0966
Institutional Ownership Total	13130	0.75	0.19	1686	0.78	0.20	11444	0.75	0.19	-0.04***	-1.4052
Panel B: Board Statistics											
Board Size	13130	8.22	2.72	1686	8.35	2.72	11444	8.20	2.72	-0.15**	-5.73***
Number of VC Directors On Board	13130	0.28	0.57	1686	1.32	0.59	11444	0.13	0.38	-1.19***	-45.46***
Percentage of VC Directors on Board	12986	0.04	0.10	1669	0.19	0.18	11317	0.02	0.06	-0.17***	-6.43***
% of Independent Directors on Board	13130	0.72	0.16	1686	0.75	0.14	11444	0.72	0.16	-0.04***	-1.47
Number of VC Directors on Compensation Committee	13130	0.14	0.39	1686	1.11	0.33	11444	0.00	0.00	-1.11***	-42.63***
Percentage of VC Directors on Compensation Committee	13130	0.04	0.12	1686	0.33	0.14	11444	0.00	0.00	-0.33***	-12.58***

Table 3 - The effect of the presence of VC Director on compensation committee on CEO risk-taking incentives

This table shows the effect of the presence of VC Directors on compensation committee on CEO risk-taking incentives (vega). Vega t+1 is the Sensitivity of CEO compensation to variance of firm value in year t+1. See Appendix A1 for variable definitions. Industry fixed effects, and Year fixed effects are as indicated. P-values are in parentheses. ***, **, and * denote significance levels at 1%, 5% and 10% respectively.

	Ln CEO Risk-Taking Incentives (Vega) $_{t+1}$							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VC Director on Comp. Committee	0.0794**			0.0813**	0.0772**		0.0761**	
	(2.336)			(2.380)	(2.249)		(2.216)	
Number of VC Directors on Comp. Committee		0.0679**						
		(2.374)						
% VC Director on Comp. Committee			0.251***			0.246***		0.249***
			(2.676)			(2.603)		(2.636)
VC Director is on board but not a member on any committee				0.125				
				(1.125)				
Size	0.318***	0.318***	0.318***	0.318***	0.318***	0.318***	0.325***	0.325***
	(18.22)	(18.23)	(18.24)	(18.22)	(17.81)	(17.83)	(18.11)	(18.13)
Leverage	-0.507***	-0.508***	-0.509***	-0.509***	-0.511***	-0.512***	-0.524***	-0.526***
	(-5.273)	(-5.274)	(-5.285)	(-5.285)	(-5.217)	(-5.230)	(-5.236)	(-5.255)
Market-to-Book	0.0361***	0.0362***	0.0361***	0.0361***	0.0366***	0.0367***	0.0386***	0.0386***
	(6.590)	(6.603)	(6.603)	(6.586)	(6.500)	(6.512)	(6.928)	(6.939)
ROA	0.621***	0.619***	0.622***	0.620***	0.613***	0.614***	0.584***	0.584***
	(4.315)	(4.300)	(4.321)	(4.309)	(4.216)	(4.223)	(3.988)	(3.994)
R&D/Assets	1.766***	1.760***	1.750***	1.762***	1.798***	1.782***	1.761***	1.747***
	(5.473)	(5.451)	(5.415)	(5.459)	(5.465)	(5.410)	(5.054)	(5.011)
Tangibility	-0.165*	-0.164*	-0.163*	-0.165*	-0.169*	-0.167*	-0.185*	-0.183*
	(-1.673)	(-1.663)	(-1.652)	(-1.669)	(-1.683)	(-1.664)	(-1.801)	(-1.781)
Stock Return	-0.0639**	-0.0644**	-0.0643**	-0.0644**	-0.0637**	-0.0641**	-0.0613**	-0.0616**
	(-2.269)	(-2.286)	(-2.283)	(-2.287)	(-2.234)	(-2.248)	(-2.140)	(-2.152)
Stock Volatility	-0.555***	-0.554***	-0.557***	-0.556***	-0.560***	-0.562***	-0.542***	-0.544***
	(-6.245)	(-6.240)	(-6.277)	(-6.269)	(-6.284)	(-6.316)	(-6.042)	(-6.070)

Firm Age	-0.0101	-0.0102	-0.00951	-0.00982	-0.0115	-0.0109	-0.0148	-0.0142
	(-0.610)	(-0.618)	(-0.574)	(-0.593)	(-0.686)	(-0.650)	(-0.881)	(-0.845)
VC-Backed Firm	-0.0125	-0.0136	-0.0159	-0.0133	-0.0151	-0.0186	-0.0118	-0.0150
	(-0.303)	(-0.329)	(-0.385)	(-0.322)	(-0.362)	(-0.445)	(-0.272)	(-0.347)
CEO Age	-0.246**	-0.247**	-0.246**	-0.244**	-0.246**	-0.246**	-0.261**	-0.261**
	(-2.170)	(-2.177)	(-2.171)	(-2.156)	(-2.163)	(-2.164)	(-2.245)	(-2.245)
CEO Tenure	0.00862	0.00880	0.00865	0.00836	0.00654	0.00655	0.0128	0.0129
	(0.488)	(0.498)	(0.489)	(0.473)	(0.366)	(0.367)	(0.708)	(0.712)
CEO Duality	0.0577**	0.0576**	0.0580**	0.0579**	0.0605**	0.0607**	0.0568**	0.0569**
	(2.187)	(2.184)	(2.199)	(2.195)	(2.268)	(2.281)	(2.122)	(2.128)
Independent Board	0.479***	0.479***	0.480***	0.478***	0.471***	0.472***	0.440***	0.440***
	(4.791)	(4.789)	(4.808)	(4.782)	(4.670)	(4.686)	(4.285)	(4.298)
Board Size	0.0206***	0.0206***	0.0208***	0.0204***	0.0197***	0.0199***	0.0216***	0.0217***
	(2.936)	(2.927)	(2.958)	(2.908)	(2.796)	(2.817)	(3.051)	(3.069)
Institutional Ownership Concentration	-0.503	-0.500	-0.500	-0.506	-0.632*	-0.629*	-0.589	-0.586
	(-1.434)	(-1.425)	(-1.425)	(-1.443)	(-1.736)	(-1.728)	(-1.636)	(-1.627)
Institutional Ownership Total	0.290***	0.290***	0.288***	0.290***	0.299***	0.297***	0.303***	0.301***
	(3.386)	(3.390)	(3.362)	(3.389)	(3.448)	(3.426)	(3.550)	(3.527)
Log(1+Delta)	0.364***	0.364***	0.364***	0.364***	0.365***	0.365***	0.358***	0.358***
	(20.31)	(20.31)	(20.32)	(20.31)	(20.03)	(20.04)	(19.71)	(19.72)
State Educational Attainment					0.00290	0.00328		
					(0.0180)	(0.0204)		
State per-capita Income					-0.0591	-0.0601		
					(-0.292)	(-0.297)		
State R&D per Capita					0.0204	0.0204		
					(1.240)	(1.242)		
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	No	No	No	No	No	No	Yes	Yes
Observations	11,484	11,484	11,484	11,484	11,262	11,262	11,262	11,262
Adjusted R-squared	0.513	0.513	0.513	0.513	0.513	0.513	0.515	0.515

Table 4 - The effect of the presence of VC director on compensation committee on CEO pay-performance sensitivity

This table shows the effect of the presence of VC Directors on compensation committee on CEO pay-performance sensitivity (delta). Delta t+1 is the Sensitivity of CEO compensation to variance of firm value in year t+1. Delta t+1 is the sensitivity of CEO compensation to firm value in year t+1. Delta t+2 is the sensitivity of CEO compensation to firm value in year t+2. See Appendix A1 for variable definitions. Industry fixed effects, and Year fixed effects are as indicated. P-values are in parentheses. ***, **, and * denote significance levels at 1%, 5% and 10% respectively.

	Ln CEO Pay-Performance Sensitivity (Delta) $_{t+1}$							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VC Director on Comp. Committee	0.113**			0.116**	0.109**		0.109**	
	(2.187)			(2.233)	(2.103)		(2.111)	
Number of VC Directors on Comp. Committee		0.102**						
		(2.346)						
% VC Director on Comp. Committee			0.379***			0.372***		0.372***
			(2.685)			(2.618)		(2.647)
VC Director is on board but not a member on any Committee				0.186				
				(1.240)				
Size	0.473***	0.473***	0.473***	0.473***	0.473***	0.473***	0.475***	0.476***
	(23.98)	(23.99)	(24.00)	(23.96)	(23.38)	(23.40)	(23.23)	(23.26)
Leverage	-0.734***	-0.735***	-0.736***	-0.735***	-0.738***	-0.740***	-0.755***	-0.758***
	(-5.240)	(-5.242)	(-5.255)	(-5.254)	(-5.155)	(-5.173)	(-5.177)	(-5.202)
Market-to-Book	0.0534***	0.0534***	0.0534***	0.0533***	0.0544***	0.0544***	0.0564***	0.0565***
	(6.902)	(6.912)	(6.911)	(6.897)	(6.794)	(6.803)	(7.221)	(7.231)
ROA	1.054***	1.052***	1.056***	1.052***	1.049***	1.051***	0.982***	0.984***
	(5.575)	(5.559)	(5.587)	(5.572)	(5.492)	(5.505)	(5.165)	(5.174)
R&D/Assets	3.759***	3.748***	3.732***	3.753***	3.782***	3.755***	3.554***	3.531***
	(7.673)	(7.641)	(7.611)	(7.657)	(7.552)	(7.493)	(6.791)	(6.746)
Tangibility	-0.334**	-0.332**	-0.331**	-0.333**	-0.321**	-0.317**	-0.342**	-0.339**
	(-2.216)	(-2.205)	(-2.193)	(-2.213)	(-2.085)	(-2.063)	(-2.183)	(-2.162)
Stock Return	0.0946***	0.0939***	0.0940***	0.0938***	0.0940***	0.0935***	0.0905***	0.0900***
	(3.037)	(3.018)	(3.021)	(3.017)	(2.978)	(2.962)	(2.864)	(2.849)
Stock Volatility	0.107	0.108	0.103	0.104	0.104	0.0992	0.0977	0.0939
	(0.868)	(0.874)	(0.833)	(0.845)	(0.836)	(0.801)	(0.793)	(0.763)
Firm Age	-0.0719***	-0.0720***	-0.0709***	-0.0715***	-0.0735***	-0.0725***	-0.0758***	-0.0747***

	(-2.965)	(-2.968)	(-2.923)	(-2.950)	(-2.997)	(-2.955)	(-3.093)	(-3.053)
VC-Backed Firm	0.117*	0.115*	0.111*	0.116*	0.108	0.103	0.0912	0.0859
	(1.781)	(1.742)	(1.690)	(1.761)	(1.625)	(1.534)	(1.337)	(1.258)
CEO Age	-0.570***	-0.571***	-0.570***	-0.567***	-0.575***	-0.575***	-0.583***	-0.583***
	(-3.357)	(-3.363)	(-3.359)	(-3.342)	(-3.368)	(-3.370)	(-3.384)	(-3.385)
CEO Tenure	0.00473	0.00490	0.00467	0.00435	0.00335	0.00327	0.00984	0.00988
	(0.176)	(0.182)	(0.173)	(0.161)	(0.123)	(0.120)	(0.356)	(0.358)
CEO Duality	0.0845**	0.0845**	0.0850**	0.0848**	0.0877**	0.0881**	0.0851**	0.0853**
	(2.224)	(2.224)	(2.239)	(2.232)	(2.282)	(2.298)	(2.237)	(2.245)
Independent Board	0.635***	0.634***	0.636***	0.634***	0.627***	0.628***	0.593***	0.594***
	(4.343)	(4.336)	(4.355)	(4.333)	(4.237)	(4.247)	(3.983)	(3.992)
Board Size	0.0278***	0.0277***	0.0280***	0.0275***	0.0265**	0.0267**	0.0306***	0.0308***
	(2.649)	(2.641)	(2.673)	(2.621)	(2.520)	(2.542)	(2.912)	(2.931)
Institutional Ownership Concentration	-0.868*	-0.864*	-0.863*	-0.873*	-1.070**	-1.065**	-1.014**	-1.009**
	(-1.887)	(-1.877)	(-1.876)	(-1.896)	(-2.236)	(-2.226)	(-2.140)	(-2.128)
Institutional Ownership Total	0.672***	0.672***	0.668***	0.672***	0.689***	0.686***	0.672***	0.669***
	(5.291)	(5.297)	(5.267)	(5.293)	(5.320)	(5.297)	(5.373)	(5.349)
State Educational Attainment					0.199	0.199		
					(0.822)	(0.823)		
State per-capita Income					-0.202	-0.204		
					(-0.667)	(-0.673)		
State R&D per Capita					0.0244	0.0244		
					(0.975)	(0.976)		
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	No	No	No	No	No	No	Yes	Yes
Observations	11,484	11,484	11,484	11,484	11,262	11,262	11,262	11,262
Adjusted R-squared	0.344	0.344	0.345	0.344	0.345	0.346	0.351	0.351

Table 5 - The effect of the presence of VC director on governance, audit, and nomination committee on CEO pay-performance sensitivity and CEO risk-taking incentives

This table shows the effect of the presence of VC Director on compensation committee on CEO risk-taking incentives (vega) and CEO pay-performance sensitivity. Vega t+1 is the Sensitivity of CEO compensation to variance of firm value in year t+1. Delta t+1 is the sensitivity of CEO compensation to firm value in year t+1. See Appendix A1 for variable definitions. Industry fixed effects, and Year fixed effects are as indicated. P-values are in parentheses. ***, **, and * denote significance levels at 1%, 5% and 10% respectively.

Panel A: CEO Risk-Taking Incentives (Vega) $_{t+1}$

	Ln CEO Risk-Taking Incentives (Vega) $_{t+1}$							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VC Director on Board	0.0602**							
	(2.113)							
% VC Director on Board		0.180						
		(1.313)						
VC Director on Governance Committee			0.0181					
			(0.478)					
% VC Director on Governance Committee				0.0912				
				(0.846)				
VC Director on Audit Committee					0.0468			
					(1.358)			
% VC Director on Audit Committee						0.128		
						(1.275)		
VC Director on Nomination Committee							0.0569	
							(1.578)	
% VC Director on Nomination Committee								0.142
								(1.382)
Baseline Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,484	11,356	11,484	8,189	11,484	11,478	11,484	9,786
Adjusted R-squared	0.512	0.511	0.512	0.553	0.512	0.512	0.512	0.521

Panel B: CEO Pay-Performance Sensitivity (Delta) t+1

	Ln CEO Pay-Performance Sensitivity (Delta) $_{t+1}$							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VC Director on Board	0.0959**							
	(2.264)							
% VC Director on Board		0.251						
		(1.240)						
VC Director on Governance Committee			0.0569					
			(1.108)					
% VC Director on Governance Committee				0.248*				
				(1.681)				
VC Director on Audit Committee					0.0816			
					(1.609)			
% VC Director on Audit Committee						0.256*		
						(1.668)		
VC Director on Nomination Committee							0.113**	
							(2.272)	
% VC Director on Nomination Committee								0.312**
								(2.233)
Baseline Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,484	11,356	11,484	8,189	11,484	11,478	11,484	9,786
Adjusted R-squared	0.344	0.341	0.344	0.373	0.344	0.344	0.344	0.357

Table 6 - Heckman analysis of the effect of the presence of VC director on compensation committee on CEO risk-taking incentives

This table shows the effect of the presence of VC Director on compensation committee on CEO risk-taking incentives (vega) and CEO pay-performance sensitivity. Vega t+1 is the sensitivity of CEO compensation to the variance of firm value in year t+1. Delta t+1 is the sensitivity of CEO compensation to firm value in year t+1. See Appendix A1 for variable definitions. Industry fixed effects and year fixed effects are as indicated. P-values are in parentheses. ***, **, and * denote significance levels at 1%, 5% and 10% respectively.

	Ln CEO Risk-Taking Incentives (Vega) $_{t+1}$				Ln CEO Pay-Performance Sensitivity (Delta) $_{t+1}$			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VC Director on Comp. Committee		0.0684*				0.0257		
		(1.889)				(0.501)		
% VC Director on Comp. Committee				0.218**				0.123
				(2.163)				(0.865)
Regulation SK	0.5215***		0.5215***		0.5325***		0.5325***	
	(4.3405)		(4.3405)		(4.4343)		(4.4343)	
Mills Ratio		1.063		1.100		1.497		1.526
		(1.035)		(1.070)		(1.088)		(1.109)
Baseline Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	12,946	11,319	12,946	11,319	12,946	11,319	12,946	11,319
Pseudo R-squared	0.0848	0.511	0.0848	0.5111	0.0837	0.3409	0.0837	0.3411

Table 7 - The effect of the presence of VC director on compensation committee on CFO pay-performance sensitivity and risk-taking incentives

This table shows the effect of the presence of VC Director on Compensation Committee on CFO risk-taking incentives (vega) and CFO pay-performance sensitivity (delta). Vega t+1 is the Sensitivity of CEO compensation to variance of firm value in year t+1. Delta t+1 is the sensitivity of CEO compensation to firm value in year t+1. See Appendix A1 for variable definitions. Industry fixed effects, and Year fixed effects are as indicated. P-values are in parentheses. ***, **, and * denote significance levels at 1%, 5% and 10% respectively.

Panel A: CFO Risk-Taking Incentives (Vega) $_{t+1}$

	Ln CFO Risk-Taking Incentives (Vega) $_{t+1}$							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VC Director on Compensation Committee	0.0579**			0.0591**	0.0535**		0.0592**	
	(2.158)			(2.192)	(1.991)		(2.137)	
Number of VC Directors on Comp. Committee		0.0420*						
		(1.877)						
% VC Director on Compensation Committee			0.156**			0.144*		0.165**
			(1.965)			(1.814)		(2.035)
VC Director is on board but not a member on any committee				0.0904				
				(1.106)				
Baseline Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional Controls	No	No	No	No	Yes	Yes	No	No
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	No	No	No	No	No	No	Yes	Yes
Observations	4,667	4,667	4,667	4,667	4,582	4,582	4,582	4,582
Adjusted R-squared	0.721	0.721	0.721	0.721	0.720	0.720	0.722	0.722

Panel B: CFO pay-performance sensitivity (Delta) $_{t+1}$

VARIABLES	Ln CFO Pay-Performance Sensitivity (Delta) $_{t+1}$							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VC Director on Compensation Committee	0.104**			0.106**	0.0979**		0.107**	
	(2.330)			(2.349)	(2.171)		(2.335)	
Number of VC Directors on Comp. Committee		0.0796**				0.0741**		0.0847**
		(2.136)				(1.972)		(2.188)
% VC Director on Compensation Committee			0.337***					
			(2.591)					
VC Director is on board but not a member on any committee				0.115				
				(0.930)				
Baseline Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional Controls	No	No	No	No	Yes	Yes	No	No
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	No	No	No	No	No	No	Yes	Yes
Observations	4,667	4,667	4,667	4,667	4,582	4,582	4,582	4,582
Adjusted R-squared	0.486	0.486	0.486	0.486	0.485	0.485	0.496	0.496

Table 8 - The effect of the presence of VC director on the compensation committee on the level of CEO and CFO pay

This table shows the effect of the presence of VC Director on CEO Level Pay. Total pay is the natural logarithm of the total compensation of the CEO (CFO). Industry fixed effects and year fixed effects are as indicated. Cash pay is the natural logarithm of CEO (CFO) salary and bonus. Stock pay is the natural logarithm of the value of restricted stock grants. Option pay is the natural logarithm of the value of option grants to the CEO (CFO). Inside debt is the natural logarithm of the present value of each executive's pension benefits under all plans. Termination pay is the natural logarithm of the contractually stipulated severance pay. Industry fixed effects and year fixed effects are as indicated. See Appendix A1 for variable definitions. P-values are in parentheses. ***, **, and * denote significance levels at 1%, 5% and 10% respectively.

Panel A: The level of CEO pay

	Total excess compensation t+1	Total compensation t+1	Cash pay t+1	Stock pay t+1	Option pay t+1	Inside debt t+1	Termination pay t+1
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VC Director on Comp. Committee	0.0633**	0.0584**	-0.00916	-0.00987	0.224**	-0.166	-0.0580
	(2.290)	(2.160)	(-0.385)	(-0.0799)	(2.246)	(-0.984)	(-0.273)
Baseline Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	12,457	12,650	12,659	12,469	12,440	6,181	6,185
Adjusted R-squared	0.197	0.573	0.336	0.347	0.145	0.455	0.132

Panel B: The level of CFO pay

	Total excess compensation t+1	Total compensation t+1	Cash pay t+1	Stock pay t+1	Option pay t+1	Inside debt t+1	Termination pay t+1
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VC Director on Comp. Committee	0.0415*	0.0318	0.00244	-0.134	0.134	-0.395**	-0.189
	(1.664)	(1.343)	(0.156)	(-0.883)	(1.472)	(-2.391)	(-0.935)
Baseline Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5,457	5,508	5,512	5,508	5,508	5,508	5,508
Adjusted R-squared	0.193	0.639	0.544	0.217	0.151	0.443	0.115

Table 9 - The effect of the presence of VC director on compensation committee on the composition of CEO and CFO pay

This table shows the effect of the presence of VC Director on CEO Level Pay. Cash Pay is the natural logarithm of CEO salary and bonus. Stock/Total Pay is the ratio of the value of restricted stock grants to CEO total pay. Option/Total Pay is the ratio of Value of option grants to the CEO to CEO Total Pay. Vega/Delta is the ratio of CEO Risk-Taking Incentives (Vega) to CEO Pay-Performance Sensitivity (Delta). Inside debt/total pay is the ratio of the present value of each executive's pension benefits under all plans to CEO total pay. Termination pay is the ratio of the contractually stipulated severance pay to CEO Total Pay. Industry fixed effects and year fixed effects are as indicated. See Appendix A1 for variable definitions. P-values are in parentheses. ***, **, and * denote significance levels at 1%, 5% and 10% respectively.

Panel A: The composition of CEO pay

	Cash portion/total pay t+1	Stock portion/total pay t+1	Option portion/total pay t+1	Vega/Delta t+1	Inside debt/total pay t+1	Termination pay/total pay t+1
	(1)	(2)	(3)	(4)	(5)	(6)
VC Director on Comp. Committee	-0.0137*	-0.00638	0.0226**	0.0233	0.0195	-0.0708
	(-1.755)	(-0.887)	(2.473)	(1.595)	(0.333)	(-0.884)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	12,638	12,453	12,424	9,963	6,179	6,179
Adjusted R-squared	0.366	0.285	0.202	0.423	0.239	0.060

Panel B: The composition of CFO pay

	Cash portion/total pay t+1	Stock portion/total pay t+1	Option portion/total pay t+1	Vega/Delta t+1	Inside debt/total pay t+1	Termination pay/total pay t+1
	(1)	(2)	(3)	(4)	(5)	(6)
VC Director on Comp. Committee	-0.0117*	-0.00703	0.0237***	0.0307	-0.0942**	-0.101**
	(-1.656)	(-0.718)	(2.667)	(1.341)	(-2.138)	(-2.071)
Baseline Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5,508	5,508	5,508	4,667	5,508	5,508
Adjusted R-squared	0.301	0.162	0.110	0.368	0.200	0.090

Table 10 - The heterogeneity of VC directors on compensation committee impact on CEO risk-taking incentives

This table shows the heterogeneity of the effect of the presence of VC Director on Compensation Committee on CEO Risk-Taking Incentives. Vega t+1 is the Sensitivity of CEO compensation to variance of firm value in year t+1. See Appendix A1 for variable definitions. Industry fixed effects, and Year fixed effects are as indicated. P-values are in parentheses. ***, **, and * denote significance levels at 1%, 5% and 10% respectively.

	CEO risk-taking incentives (Vega) $_{t+1}$									
	Institutional ownership herfindahl		CEO pay gap		CEO pay slice		Geographic segments		High-tech industry	
	High	Low	High	Low	High	Low	High	Low	High	Low
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VC Director on Comp. Committee	0.0370	0.0978**	0.0902**	0.0322	0.118***	0.0553	0.118***	0.0796*	0.184**	0.0478
	(0.714)	(2.158)	(2.011)	(0.532)	(2.647)	(1.039)	(2.647)	(1.695)	(2.239)	(1.267)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,764	6,720	6,444	4,386	6,272	4,573	6,272	6,271	1,723	9,761
Adjusted R-squared	0.486	0.472	0.421	0.345	0.490	0.492	0.490	0.508	0.385	0.539

Table 11 - The effect of the presence of VC director on compensation committee on CEO risk-taking incentives: Kernel Matching

This table shows the effect of the presence of VC Director on compensation committee on CEO Risk-Taking Incentives using Kernel Matching sample. Vega t+1 is the Sensitivity of CEO compensation to the variance of firm value in year t+1. Vega t+2 is the Sensitivity of CEO compensation to the variance of firm value in year t+2. See Appendix A1 for variable definitions. Industry fixed effects and year fixed effects are as indicated. P-values are in parentheses. ***, **, and * denote significance levels at 1%, 5% and 10% respectively.

Panel A: Kernel Matching based on the VC director on board treatment group (CEO risk-taking incentives $_{t+1}$)

	Ln CEO Risk-Taking Incentives (Vega) $_{t+1}$							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VC Director on Compensation Committee	0.0777**			0.0793**	0.0749**		0.0762**	
	(2.287)			(2.323)	(2.187)		(2.221)	
Number of VC Directors on Comp. Committee		0.0601**						
		(2.101)						
% VC Director on Compensation Committee			0.225**			0.219**		0.225**
			(2.427)			(2.343)		(2.403)
VC Director is on board but not a member on any committee				0.103				
				(1.022)				
Baseline Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional Controls	No	No	No	No	Yes	Yes	No	No
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	No	No	No	No	No	No	Yes	Yes
Observations	9,852	9,852	9,852	9,852	9,650	9,650	9,650	9,650
Adjusted R-squared	0.531	0.531	0.531	0.531	0.532	0.532	0.533	0.533

Panel B: Kernel Matching based on the VC director on board treatment group (CEO pay-performance sensitivity $_{t+1}$)

	Ln CEO Pay-Performance Sensitivity (Delta) $_{t+1}$							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VC Director on Compensation Committee	0.122**			0.124**	0.117**		0.120**	
	(2.383)			(2.418)	(2.284)		(2.360)	
Number of VC Directors on Comp. Committee		0.104**						
		(2.409)						
% VC Director on Compensation Committee			0.382***			0.372***		0.379***
			(2.777)			(2.701)		(2.760)
VC Director is on board but not a member on any committee				0.143				
				(1.051)				
Baseline Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional Controls	No	No	No	No	Yes	Yes	No	No
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	No	No	No	No	No	No	Yes	Yes
Observations	9,852	9,852	9,852	9,852	9,650	9,650	9,650	9,650
Adjusted R-squared	0.356	0.356	0.356	0.356	0.357	0.357	0.362	0.362

Panel C: Kernel Matching based on the VC director on the compensation committee treatment group (CEO risk-taking incentives $_{t+1}$)

	Ln CEO Risk-Taking Incentives (Vega) $_{t+1}$							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VC Director on Compensation Committee	0.0802**			0.0827**	0.0769**		0.0773**	
	(2.335)			(2.397)	(2.220)		(2.230)	
Number of VC Directors on Comp. Committee		0.0616**						
		(2.132)						
% VC Director on Compensation Committee			0.230**			0.222**		0.227**
			(2.456)			(2.359)		(2.409)
VC Director is on board but not a member on any committee				0.173*				
				(1.688)				
Baseline Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional Controls	No	No	No	No	Yes	Yes	No	No
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	No	No	No	No	No	No	Yes	Yes
Observations	9,021	9,021	9,021	9,021	8,822	8,822	8,822	8,822
Adjusted R-squared	0.528	0.528	0.528	0.528	0.529	0.529	0.530	0.530

Panel D: Kernel Matching based on the VC director on the compensation committee treatment group (CEO pay-performance sensitivity $_{t+1}$)

	Ln CEO Pay-Performance Sensitivity (Delta) $_{t+1}$							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VC Director on Compensation Committee	0.126**			0.129**	0.120**		0.122**	
	(2.437)			(2.491)	(2.323)		(2.386)	
Number of VC Directors on Comp. Committee		0.106**						
		(2.454)						
% VC Director on Compensation Committee			0.386***			0.375***		0.381***
			(2.790)			(2.701)		(2.763)
VC Director is on board but not a member on any committee				0.225*				
				(1.657)				
Baseline Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional Controls	No	No	No	No	Yes	Yes	No	No
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	No	No	No	No	No	No	Yes	Yes
Observations	9,021	9,021	9,021	9,021	8,822	8,822	8,822	8,822
Adjusted R-squared	0.352	0.352	0.352	0.352	0.353	0.353	0.358	0.358

Table 12 - The effect of the presence of VC director on compensation committee on CEO risk-taking incentives: Propensity Score Matching

This table shows the effect of the presence of VC Director on compensation committee on CEO risk-taking incentives using Kernel Matching sample. Vega t+1 is the Sensitivity of CEO compensation to the variance of firm value in year t+1. Vega t+2 is the sensitivity of CEO compensation to the variance of firm value in year t+2. See Appendix A1 for variable definitions. Industry fixed effects and year fixed effects are as indicated. P-values are in parentheses. ***, **, and * denote significance levels at 1%, 5% and 10% respectively.

Panel A: Propensity Score Matching based on the VC director on board treatment group (CEO risk-taking incentives $_{t+1}$)

	Ln CEO Risk-Taking Incentives (Vega) $_{t+1}$							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VC Director on Compensation Committee	0.0756**			0.0779**	0.0741**		0.0742**	
	(2.133)			(2.181)	(2.066)		(2.065)	
Number of VC Directors on Comp. Committee		0.0592**						
		(1.988)						
% VC Director on Compensation Committee			0.226**			0.223**		0.231**
			(2.339)			(2.292)		(2.356)
VC Director is on board but not a member on any committee				0.108				
				(1.048)				
Baseline Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional Controls	No	No	No	No	Yes	Yes	No	No
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	No	No	No	No	No	No	Yes	Yes
Observations	7,242	7,242	7,242	7,242	7,106	7,106	7,106	7,106
Adjusted R-squared	0.537	0.537	0.537	0.537	0.538	0.538	0.541	0.541

Panel B: Propensity Score Matching based on the VC director on board treatment group (CEO pay-performance sensitivity $_{t+1}$)

	Ln CEO Pay-Performance Sensitivity (Delta) $_{t+1}$							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VC Director on Compensation Committee	0.113**			0.116**	0.109**		0.111**	
	(2.166)			(2.215)	(2.072)		(2.140)	
Number of VC Directors on Comp. Committee		0.0971**						
		(2.213)						
% VC Director on Compensation Committee			0.372***			0.364***		0.373***
			(2.649)			(2.584)		(2.681)
VC Director is on board but not a member on any committee				0.145				
				(1.063)				
Baseline Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional Controls	No	No	No	No	Yes	Yes	No	No
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	No	No	No	No	No	No	Yes	Yes
Observations	7,242	7,242	7,242	7,242	7,106	7,106	7,106	7,106
Adjusted R-squared	0.360	0.360	0.360	0.360	0.361	0.362	0.371	0.371

Panel C: Propensity Score Matching based on the VC director on compensation committee treatment group (CEO risk-taking incentives $_{t+1}$)

	Ln CEO Risk-Taking Incentives (Vega) $_{t+1}$							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VC Director on Compensation Committee	0.0629*			0.0632*	0.0593		0.0564	
	(1.715)			(1.717)	(1.610)		(1.535)	
Number of VC Directors on Comp. Committee		0.0555*						
		(1.811)						
% VC Director on Compensation Committee			0.219**			0.208**		0.201**
			(2.176)			(2.065)		(1.988)
VC Director is on board but not a member on any committee				0.0192				
				(0.107)				
Baseline Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional Controls	No	No	No	No	Yes	Yes	No	No
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	No	No	No	No	No	No	Yes	Yes
Observations	5,492	5,492	5,492	5,492	5,385	5,385	5,385	5,385
Adjusted R-squared	0.523	0.523	0.523	0.523	0.524	0.524	0.526	0.526

Panel D: Propensity Score Matching based on the VC director on compensation committee treatment group (CEO pay-performance sensitivity t+1)

	CEO Pay-Performance Sensitivity (Delta) $_{t+1}$							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VC Director on Compensation Committee	0.0841			0.0854	0.0781		0.0758	
	(1.557)			(1.574)	(1.443)		(1.423)	
Number of VC Directors on Comp. Committee		0.0798*						
		(1.767)						
% VC Director on Compensation Committee			0.313**			0.297**		0.288**
			(2.137)			(2.031)		(1.979)
VC Director is on board but not a member on any committee				0.0855				
				(0.417)				
Baseline Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional Controls	No	No	No	No	Yes	Yes	No	No
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	No	No	No	No	No	No	Yes	Yes
Observations	5,492	5,492	5,492	5,492	5,385	5,385	5,385	5,385
Adjusted R-squared	0.351	0.351	0.352	0.351	0.354	0.354	0.360	0.360

Table 13 - The effect of the presence of VC director on compensation committee on CEO risk-taking incentives of mature publicly-listed firms

This table shows the effect of the presence of VC Director on compensation committee on CEO risk-taking incentives. Vega t+1 is the sensitivity of CEO compensation to the variance of firm value in year t+1. See Appendix A1 for variable definitions. Industry fixed effects and year fixed effects are as indicated. P-values are in parentheses. ***, **, and * denote significance levels at 1%, 5% and 10% respectively.

***Panel A: CEO risk-taking incentives (Vega)** $_{t+1}$*

	Ln CEO Risk-Taking Incentives (Vega) $_{t+1}$							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VC Director on Compensation Committee	0.116**			0.119**	0.109**		0.0980**	
	(2.520)			(2.570)	(2.345)		(2.056)	
Number of VC Directors on Comp. Committee		0.0888**						
		(2.426)						
% VC Director on Compensation Committee			0.251**			0.238**		0.225*
			(2.208)			(2.082)		(1.916)
VC Director is on board but not a member on any committee				0.155				
				(1.128)				
Baseline Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional Controls	No	No	No	No	Yes	Yes	No	No
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	No	No	No	No	No	No	Yes	Yes
Observations	4,979	4,979	4,979	4,979	4,911	4,911	4,911	4,911
Adjusted R-squared	0.486	0.486	0.486	0.486	0.487	0.487	0.490	0.490

Panel B: CEO pay-performance sensitivity (Delta) $_{t+1}$

	Ln CEO Pay-Performance Sensitivity (Delta) $_{t+1}$							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VC Director on Compensation Committee	0.173***			0.178***	0.161**		0.152**	
	(2.719)			(2.783)	(2.525)		(2.335)	
Number of VC Directors on Comp. Committee		0.134***						
		(2.658)						
% VC Director on Compensation Committee			0.394**			0.372**		0.356**
			(2.447)			(2.304)		(2.173)
VC Director is on board but not a member on any committee				0.254				
				(1.253)				
Baseline Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional Controls	No	No	No	No	Yes	Yes	No	No
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	No	No	No	No	No	No	Yes	Yes
Observations	4,979	4,979	4,979	4,979	4,911	4,911	4,911	4,911
Adjusted R-squared	0.341	0.341	0.341	0.341	0.343	0.343	0.353	0.353

Table 14 - The effect of the presence of VC director on compensation committee on two-years and three-years ahead CEO risk-taking incentives

This table shows the effect of the presence of VC director on compensation committee on CEO risk-taking incentives. Vega t+1 is the sensitivity of CEO compensation to the variance of firm value in year t+1. See Appendix A1 for variable definitions. Industry fixed effects and year fixed effects are as indicated. P-values are in parentheses. ***, **, and * denote significance levels at 1%, 5% and 10% respectively.

	Ln CEO Risk-Taking Incentives (Vega)		LN CEO Pay-Performance Sensitivity (Delta)	
	t+2	t+3	t+2	t+3
	(1)	(2)	(3)	(4)
VC Director on Compensation Committee	0.0773*	0.0714	0.111**	0.0950
	(1.920)	(1.488)	(2.029)	(1.609)
Additional Controls	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	10,038	7,585	10,038	7,585
Adjusted R-squared	0.488	0.473	0.346	0.343