Strategy Science

Publication details, including instructions for authors and subscription information:
http://pubsonline.informs.org

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To cite this article:
Ji Youn (Rose) Kim, Haemin Dennis Park (2017) Two Faces of Early Corporate Venture Capital Funding: Promoting Innovation and Inhibiting IPOs. Strategy Science 2(3):161-175. https://doi.org/10.1287/stsc.2017.0032

http://pubsonline.informs.org/journal/stsc/

STRATEGY SCIENCE
Vol. 2, No. 3, September 2017, pp. 161–175
ISSN 2333-2050 (print), ISSN 2333-2077 (online)

Two Faces of Early Corporate Venture Capital Funding: Promoting Innovation and Inhibiting IPOs

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Received: October 23, 2016
Revised: May 27, 2017; June 27, 2017
Accepted: June 28, 2017
Published Online: August 18, 2017

https://doi.org/10.1287/stsc.2017.0032

Abstract. We examine the dual effects of corporate venture capital (CVC) funding in a startup's early stage on the startup's long-term innovation rate and exit outcome. Based on a sample of 473 startups funded by independent venture capitalists and/or corporate venture capitalists, we find that startups that received CVC funding in their first three years of life tend to patent more but are less likely to go public, after accounting for their propensity to receive early CVC funding. Moreover, the detrimental effect of early CVC funding on the likelihood of an IPO is more pronounced when the startup's founders are novice entrepreneurs. It appears that the incentives and capabilities of corporate investors leave a strong imprinting effect on a startup's long-term innovation rate and exit outcomes. Our study has implications for CVC research, and more broadly, for the literature on the rate and direction of innovation by startups.

Keywords: corporate venture capital • innovation • IPO • imprinting effect

1. Introduction

Startups are important originators of innovations that foster economic prosperity, yet they often have to collaborate with incumbent firms to appropriate returns from their innovations due to their lack of complementary assets (Gans and Stern 2003, Spulber 2011, Teece 1986). An increasingly common collaborative arrangement between startups and incumbent firms occurs through corporate venture capital (CVC) investments—the practice of established firms taking a minority equity stake in private entrepreneurial firms (Dushnitsky 2006, Gompers and Lerner 2004). Unlike independent venture capital (IVC) firms pursuing purely financial returns from their investment, corporate investors primarily pursue CVC investment activities to tap into novel technologies developed by startups (Chesbrough 2002). Thus, they provide not only financial capital but also complementary resources that facilitate innovative activities in startups (Alvarez-Garrido and Dushnitsky 2016, Chemmanur et al. 2014, Park and Steensma 2013).

CVC funding, however, entails a unique risk to startups. As a part owner of startups, corporate investors can influence the strategic direction of young startups for their subsequent development. In particular, corporate investors pursue strategic objectives ultimately to benefit their parent firms and may direct the activities of startups in a certain way that is advantageous to them but not necessarily to the startups. Once startups have developed a certain strategic orientation early on by being exposed to the influence of their corporate investors, it is difficult to change their course later on (Gersick 1991).

We examine the effect of receiving CVC funding in terms of a startup's innovation rate and exit outcome. In particular, we explore the influence of CVC funding in the first three years of a startup's life. This is arguably the most important period for two reasons. First, startups are still in the process of establishing organizational routines, processes, and structures that tend to have long-term consequences. Second, lacking resources of their own, startups in this period tend to be more malleable to the demands of external investors. As a result, the influence of external investors such as corporate investors is likely to be strongest during this period (Stinchcombe 1965).

Our empirical sample consists of 473 startups in the information and communications technology (ICT) sector in the United States that received at least one round of IVC/CVC funding between 1990 and 2006. The ICT sector is an appropriate setting for examining our research question due to the high level of CVC activities in it (Dushnitsky 2006, Gaba and Meyer 2008). Moreover, innovation rates and IPOs are important milestones for startups in this sector. The innovation rate, in terms of patent productivity, is critical in this sector as technology races often determine market dominance (Cohen et al. 2000, Hall et al. 2001), and IPOs are an important vehicle for entrepreneurs to obtain returns from their innovations. In examining the

effect of early CVC funding on a startup's innovation rate and exit outcome, we recognize that some startups may be more likely to receive early CVC funding. Thus, we address the potential endogeneity in our empirical analyses by using an instrumental variables approach and proper statistical models.

We report several important findings. First, we find that CVC funding in the early stage of a startup has a positive effect on the startup's innovation rate in terms of its patenting productivity. Specifically, the expected number of annual patents for startups receiving early CVC funding (3.18) is far greater than that of startups receiving late CVC funding (0.42) or those solely funded by IVCs (0.53). These findings offer a more nuanced understanding of the underlying mechanism of how CVC funding influences startup innovation. Although prior research examined the effect of CVC funding on a startup's innovation rate, the empirical findings are rather mixed. Some found a positive effect of CVC funding on startup innovation (e.g., Alvarez-Garrido and Dushnitsky 2016, Chemmanur et al. 2014, Park and Steensma 2013), whereas others found no significant effect (Pahnke et al. 2015a). We incorporate the timing aspect of when startups receive CVC funding to reconcile this debate. Although corporate investors' complementary assets and strategic incentives to encourage startup innovations are important, we find that early CVC funding increases startup innovation, whereas late CVC funding has little effect on it. This finding suggests that the timing is critical in establishing the imprinting effect of CVC funding on the strategic orientation of early-stage startups to focus on innovation.

Second, although startups backed by CVC funding early in their life tend to have a higher innovation rate, we find that these startups are less likely to go public. Startups that received early CVC are 63% less likely to go public, compared with those that did not. Moreover, we find that the negative effect of early CVC funding on the likelihood of an IPO is stronger for startups founded by novice entrepreneurs. Entrepreneurs with prior founding experience possess experiential knowledge of actually starting and managing a fledging organization under substantial uncertainty (Baron and Ensley 2006, Brüderl et al. 1992). Our findings suggest that first-time entrepreneurs lacking such experience may not be able to deal with the influence of corporate investors and thus, suffer more from the disadvantages of early CVC funding. Specifically, we find that, upon receiving early CVC funding, startups founded by novice entrepreneurs are 28% less likely to go public, compared with their counterparts founded by experienced entrepreneurs.

Our study contributes to CVC research by examining how early CVC funding affects a startup's innovation rate and exit outcome, and the associated contingency of entrepreneurial experience influencing the relationship between early CVC funding and the likelihood of an IPO. More broadly, our paper contributes to the long-standing discussion of the rate and direction of innovative activities (Lerner and Stern 2012, Nelson 1962). Specifically, we advance the literature on the consequences of contracting for innovation activities. Prior research in this field has generally used the property rights framework (Grossman and Hart 1986, Hart and Moore 1990) and has prescribed the control rights to be granted to the party who can benefit the most from the returns from the innovation (Aghion and Tirole 1994, Lerner and Merges 1998). However, innovation-related activities are typically characterized by a high degree of uncertainty involving boundedly rational agents, making it difficult to assign optimal control rights ex ante. Moreover, the governance structures and distribution of control rights of modern entrepreneurial firms tend to be much more complex and dispersed in nature, as heterogeneous types of external investors tend to get involved in the early phase of startups with complex covenants (Kaplan and Strömberg 2003). Thus, which external investors invest in startups and when they do so are likely to lead to different outcomes for startups. Scholars have called for more research on how incentives matter for innovation (Lerner and Stern 2012). We respond to this call by examining a distinct type of external investor, CVC investors, and how their strategic incentives influence startup innovation in conjunction with the characteristics of the startup, such as when it receives CVC funding and the entrepreneurs' prior firm-founding experiences.

2. The Corporate Venture Capital (CVC) Context

In 2016, established firms invested approximately $24.9 billion in startups in exchange for a minority equity stake in 1,352 deals, representing roughly 20% of all venture capital investments during the year (CB Insight 2016). CVC funding is more prevalent among established firms in technology-intensive sectors where technological advancements occur at a rapid pace and are critical to sustaining a firm's competitive advantage (Dushnitsky and Lenox 2005a, Gaba and Meyer 2008).

Although financial returns are a factor, the vast majority of corporate investors generally consider strategic objectives more important than financial ones (Dushnitsky 2006). Many corporate investors seek to learn about new technological advancements through due diligence and post-investment nurturing activities. Some established firms use CVC investments as a real option to acquire the startups at a later time (Benson and Ziedonis 2009), particularly when exogenous uncertainty levels are high (Tong and Li 2011). In contrast, others use the CVC programs to develop

new businesses, such as finding new buyers or suppliers, and promoting the demand for complementary products (Chesbrough 2002, Winters and Murfin 1988). Research documents that CVC investment benefits established firms in terms of their innovation rate (Dushnitsky and Lenox 2005b, Wadhwa and Kotha 2006), financial performance (Dushnitsky and Lenox 2006), and their managers' ability to recognize technological discontinuity (Maula et al. 2013).

CVC funding can also be beneficial for startups. Startups can access not only financial capital but also valuable complementary assets often held by industry incumbents (Chemmanur et al. 2014, Katila et al. 2008), particularly when they need relationship-specific assets (Park and Steensma 2012). These assets are critical for the commercialization of startup technologies (Gans and Stern 2003, Teece 1986), but they are often difficult to be accessed through an open market transaction. Relative to research on the benefits of CVC investment for corporate investors, there is limited empirical evidence on the effect of CVC funding on startups. A handful of studies examined the effect of CVC funding on startup innovation, but the results remain mixed. Some find that startups receiving CVC funding in several high tech industries have a larger number of patents compared to those funded solely by IVCs (Alvarez-Garrido and Dushnitsky 2016, Chemmanur et al. 2014, Park and Steensma 2013), whereas others find little effect of CVC funding on a startup's innovation rate in the medical device industry (Pahnke et al. 2015a).

To better understand the underlying mechanism of how CVC funding influences a startup's innovation rate, we incorporate the timing aspect of CVC funding into our analysis. Specifically, we categorize startups into three groups depending on the type of investors and the timing of the investment: (1) startups receiving early CVC funding in the first three years since the startup's founding; (2) those receiving late CVC funding three years or later after being founded; and (3) startups backed solely by IVC funding. Although we acknowledge that three years is an arbitrary choice, we reason that this is arguably the most critical period for startups as a formative period; the organizational routines and culture formed at this stage are likely to have a long-lasting imprinting effect on their subsequent development (Stinchcombe 1965). In our empirical tests, we consider situations in which the definition of "early" applies to within two and four years after the startup's founding and discuss our results. We also created a series of dichotomous variables to indicate at what age a startup received CVC funding and examined their effects.

We expect that receiving early CVC funding is likely to increase a startup's innovation rate. Because of their strong interest in the startup's innovations, corporate investors often provide complementary resources and financial capital that can help startups successfully develop new innovations (Alvarez-Garrido and Dushnitsky 2016, Park and Steensma 2013). For instance, our qualitative interviews with entrepreneurs revealed that startups often seek complementary assets such as beta product testing sites (in the wireless software industry), help with legal advice about regulatory compliance processes (in the biopharmaceutical industry), or help with establishing manufacturing relationships with semiconductor fabrication plants (in the fabless semiconductor industry). The influence of corporate investors is likely to be particularly strong during the early stage of life of a firm, because startups tend to be more susceptible and malleable to the demands of external investors at this point. Corporate investors can also influence the startups' strategic orientation to develop internal structures, routines, practices, and other activities that are more conducive to innovation. Because a firm's early strategic choices often shape its subsequent strategic choices by influencing organizational structures, resource allocation, and value systems (Gersick 1991), the organizational routines geared for innovation in a startup's early phase are likely to persist and create path dependencies for subsequent development (Beckman and Burton 2008, Boeker 1989).

However, the advantages of early CVC funding on startup innovation may come at a cost. Innovation requires the recombination of different knowledge components in new ways, and its outcome is very uncertain ex ante (Fleming 2001, Schumpeter 1934). Its commercial value is often not realized immediately. Although innovation may lead to a long-term boost in a startup's profitability by enabling it to differentiate its products from others, an excessive focus on innovation can be detrimental to its short-term profitability (Hyytinen et al. 2015). Moreover, managers often make suboptimal decisions due to their bounded rationality in calculating the return on investment for various corporate activities (Cyert and March 1963). The risky nature of innovation can be particularly devastating for startups as they lack the legitimacy and slack resources that can help them continue their operation if their innovation efforts fail. As a result, startups with a strong focus on innovation-driven activities resulting from forming early relationship with corporate investors may not achieve success in other areas

We examine this proposition empirically by testing the effect of early CVC funding on the likelihood of a startup's going public. Initial public offerings (IPOs) are typically considered the most successful exit outcome for startups. Acquisitions are also viewed as another significant outcome for startups (e.g., Graebner and Eisenhardt 2004, Waguespack and Fleming 2009). Thus, we consider acquisition as an alternative exit outcome

of startups as well as IPOs in our empirical analysis. However, we focus on IPOs and their relationship with early CVC funding because corporate investors and entrepreneurs tend to show divergent interests on this particular exit mode. Entrepreneurs typically prefer IPOs as the most desirable exit choice for two reasons. First, financial returns tend to be the greatest with an IPO exit. For instance, investors realized an average return of 95% through an IPO exit as opposed to 40% through an acquisition exit (Gompers and Lerner 2004). Second, entrepreneurs can retain control over their firms through an IPO exit, whereas they would give up most of their control rights when they are acquired by another firm. In contrast, corporate investors are likely to find an IPO exit less attractive. Corporate investors seek to benefit strategically through technology spillovers from their portfolio firms, but a portfolio firm that has gone public offers fewer such benefits because they are now required to disclose information about their technology to the public market. Corporate investors are also likely to lose control over the direction of the startup's technological development, because their influence is undermined by the incoming public investors. Given the scrutiny of financial investors, it is likely that public firms are more concerned about their financial performance rather than their pure innovation rate. Indeed, recent studies show that IPOs generally have a negative effect on innovation outputs (Aggarwal and Hsu 2014, Bernstein 2015). In sum, the strategic value of a portfolio firm is likely to decrease when the startup goes public. This lack of a strong incentive for corporate investors to take their portfolio ventures public is more likely to be manifested if they formed an investment relationship with the startups early on. Such startups are more likely to develop a stronger orientation toward innovation-related activities, possibly at the expense of other activities needed for balanced growth. At the same time, startups are likely to be ill-prepared by their corporate investors to go public due to their desire to keep their investees private. We thus expect that early CVC funding will have a negative effect on the likelihood of a startup's going public.

We also examine how entrepreneurs' prior firm-founding experience plays a role in considering the effect of early CVC on the likelihood of an IPO. Entrepreneurs with prior founding experience possess a unique set of skills and experiential knowledge pertaining to actually starting and running a new organization under substantial uncertainty (Baron and Ensley 2006, Brüderl et al. 1992). They also have experience dealing with external entities. In contrast, novice entrepreneurs lack such detailed knowledge and skills needed to deal with the intricacies of running their fledgling organizations. For example, novice entrepreneurs may tend to focus more on novel ideas than feasible ideas for new products and services or their ability to generate cash flow (Baron and Ensley 2006). They are also less likely to be aware of the ramifications of over-investing in a particular activity such as innovation. Moreover, the tendency of corporate investors to prefer keeping their portfolio firms private is more likely to be realized when working with inexperienced entrepreneurs who are less capable of defending their own interests regarding the exit mode. We thus expect that the negative influence of early CVC funding on the likelihood of an IPO for startups is particularly pronounced when the venture management team lacks prior entrepreneurial experience.

3. Data and Measurement

3.1. Data

We gathered a sample of 501 startups in the information and communications technology (ICT) sector in the United States between 1990 and 2006. To be included in our sample, the startups had to have been founded between 1990 and 2002, and received at least one round of VC financing between 1990 and 2006. We continued collecting data for all of the firms through 2006, the end of our study period. The ICT sector provides an appropriate setting, because there were significant CVC investment activities during the sample period in the U.S. economy (Dushnitsky and Lenox 2005a, Gaba and Meyer 2008). Firms in this sector also show a strong propensity for filing patents (Cohen et al. 2000, Hall et al. 2001), which we used to measure innovation rate. Specifically, we sampled startups in the following industry subsectors: computer hardware (SIC code 357); communication equipment (SIC code 366); electronics components (SIC code 367); and telecommunication (SIC codes 481–484, 499). Of the 501 startups, 28 startups were eventually dropped due to missing values in some of the variables in our models. Thus, our final sample consists of 473 startups.

A primary source of data was VentureXpert from Thompson One, which provides detailed information about startups, their investors, and funding rounds including investment dates. We collected patent data from the U.S. Patent and Trademark Office (USPTO) and patent citation data from the National Bureau of Economic Research's (NBER) patent database (Hall et al. 2001). We also collected data on founders' prior employment experience through an online search process using multiple sources including company websites, Businessweek's executive profiles and biography database, and professional networking websites such as LinkedIn. We used the COMPUSTAT and Securities Data Corporation (SDC) Platinum Alliances databases to collect data for various control variables.

Table 1. Descriptive Statistics

(a) Definitions of variables and summary statistics

Variables	Definitions	Mean	S.D.	Min	Max
1 *Count of patents*	Count of patents for each startup i at year t (based on application year of patents that were subsequently granted)	1.26	3.55	0	72
2 *IPO*	1 if a startup went public; 0 otherwise	0.02	0.12	0	1
3 *Early CVC*	1 if a startup received funding from at least one corporate investor within the first three-year period since the firm was founded	0.22	0.41	0	1
4 *Novice entrepreneurs*	1 if none of the founder(s) of a startup had company founding experience prior to founding the focal venture	0.67	0.47	0	1
5 *CVC indicator*	1 from the observation year that a startup received CVC and thereafter; 0 otherwise	0.30	0.46	0	1
6 *Alliance*	1 from the year that the alliance occurred, assumed to be influential for the next three years; 0 otherwise	0.06	0.24	0	1
7 *Cumulative no. of patents*	The number of forward citations that a startup's patents received that were granted within the last five years including a focal year using a five-year window	4.41	10.56	0	145
8 *Funding round*	Funding round of a startup in a given year	2.70	2.01	0	14
9 *Total investment amount* (Ln)	Cumulative amount invested until $t-1$	1.10	3.35	−4.61	6.46
10 *Total no. of investors*	Total number of unique investors for each round	3.94	3.49	0	26
11 *VC reputation* (Ln)	Total number of portfolio ventures taken public prior to a given year t in the lead VC's portfolio	1.11	3.54	−4.61	5.63
12 *Prior industry experience*	1 if any of the founding teams had any work experience in the ICT sector prior to founding the focal startup, and 0 otherwise	0.73	0.45	0	1
13 *No. of IPO firms*	Total number of startups that went public in a given year	218.35	162.38	63	676
14 *CVC availability*	Number of startups that received CVC within a subsector in the ICT industry in which a focal startup operates during the first three years since the startup was founded	119.01	88.39	15	272
15 *Alliance in the first three years*	1 if a startup had an alliance in the first three years since it was founded	0.08	0.26	0	1
16 *Patents in the first three years* (Ln)	Total number of patents that a startup was granted in the first three years since it was founded	−1.23	2.89	−4.61	4.52
17 *Investment received in the first three years* (Ln)	Cumulative amount invested during the first three years since the startup was founded	0.62	3.32	−4.61	6.46

(b) Number of startups for each category

	CVC	No CVC	Total
IPO	19	33	52
No IPO	173	248	421
Total	192	281	473

	Early CVC	Late CVC	IVC only	Total
IPO	14	5	33	52
No IPO	111	62	248	421
Total	125	67	281	473

3.2. Measurements

Our goal is to assess the influence of CVC funding in a startup's early life on its innovation rate and the likelihood of an IPO. In this section, we describe how we measure innovation rate, IPOs, and other control variables included in our model specifications. Table 1(a) shows the definitions of all variables.

3.2.1. Outcome Variables. We examined two types of startup outcomes. For innovation rate, we measured *Patents* as a count of patents (applied and subsequently granted) for each startup i at year t. We also measured IPOs as a binary variable that took a value of 1 if a startup went public during the study period, and 0 otherwise. Both investors and entrepreneurs generally view an IPO as the most successful financial outcome and numerous prior studies use the event of an IPO to measure a venture's success (e.g., Gompers and Lerner 2004, Shane and Stuart 2002, Stuart et al. 1999).

3.2.2. Predictor Variables. We coded *Early CVC* with a value of 1 if a startup received funding from at least one corporate investor within the first three-year period since it was founded. Consistent with prior research, we excluded diversified banks and insurance companies as CVC investors, because they appeared to have

no strategic motivation for acquiring external technology, and the resources they provided were not directly related to the technology commercialization of startups (Dushnitsky and Lenox 2005a, Dushnitsky and Shaver 2009).

We coded *Novice entrepreneur* with 1 if *none* of the founder(s) of a startup had company founding experience prior to founding the focal venture. We gathered data on the founders' prior entrepreneurial experience through a rigorous online search process using multiple sources including company websites, Businessweek's executive profiles and biography database, and professional networking websites such as LinkedIn. Prior research has employed a similar approach to collect entrepreneurs' career history data (e.g., Winston-Smith and Shah 2013). When there were multiple founders, we collected career history data for all of them.

3.2.3. Other Covariates. Prior research has shown a whole host of factors that might also be relevant in determining a startup's innovation rate and exit outcome. We therefore included those variables in our models. Most importantly, to examine the effect of early CVC funding on innovation rate and exit outcome, one needs to tease out the effect of the startup's contemporaneous external investor syndicate (Beckman and Burton 2008). In other words, one needs to show that early CVC funding would have an independent effect on innovation rate and the likelihood of an IPO over and above the effect of CVC funding in general. For instance, for startups that received CVC funding three years after their founding, we need to account for the effect of "late CVC funding." Therefore, we included *CVC indicator* for whether a startup received CVC funding. This binary indicator is coded as 1 from the observation year that a startup received CVC funding and thereafter. Because all of our sample startups received at least one round of IVC or CVC funding (with the two variables *Early CVC* and *CVC indicator* included in the model), our reference category is the startups that were backed solely by IVC funding.

We included *Alliance* because collaboration with external partners benefits innovation and provides endorsement benefits for successful firm performance (Baum and Silverman 2004, Hsu 2006, Stuart et al. 1999). Using the SDC database, we examined whether the startups had any alliances in a given year t. Although the data on the formation of alliances tend to be easily available and accurate, the data on the dissolution of the relationships are rarely available. Given the specific and short-term nature of alliances in general, we assume that alliance would be influential for three years from the year that the relationships were formed (Ahuja 2000).

We included a startup's *Total investment amount* by measuring the cumulative amount invested until $t-1$ (Aggarwal and Hsu 2014, Alvarez-Garrido and Dushnitsky 2016). Because total investment amount measure was highly skewed, we used a log transformation. We also included *Funding round* to account for the growth of the venture. Another factor is *Total no. of investors*, measured by the total number of unique investors for each round (Pahnke et al. 2015b). To account for the human capital of the entrepreneurs, we included *Prior industry experience.* We coded it as 1 if any of the founding teams had any work experience in the ICT sector prior to founding the focal startup, and 0 otherwise based on their biographic information. We included a startup's location using three indicator variables, *California* (63% of our sample), *Massachusetts* (7% of our sample), and *Texas* (7% of our sample), with others as a reference category. We included binary indicator variables for each ICT subsector based on the three-digit SIC code.

To estimate the likelihood of an IPO exit, we included *VC reputation* to account for a startup's lead VC's reputation. We took several steps to create this measure. Specifically, we designated a startup's lead IVC for each year to be the first IVC investor who invested in the first round with the largest amount of investment. Then, we examined their investment portfolio to see the exit outcomes of the startup investees. Finally, for a given year t, we counted the total number of portfolio ventures taken public prior to t. We also included *No. of IPOs* to account for the macro-environmental factors for the year. Using data obtained from Ritter's database,[1] we created this variable by counting the total number of startups that went public in a given year. For innovation performance, we included *Cumulative no. of patents* to account for the technological capability of the startups. We measured this factor by counting the number of forward citations that a startup's patents granted within the last five years, including the focal year, received using a five-year window (Jaffe and Trajtenberg 2002, Trajtenberg 1990). We also used year fixed-effects in all of the models for innovation rate to account for the influence of macro environments during our study period.

4. Results

Of the 473 startups, 192 (41%) received CVC funding. Of those that received CVC funding, 125 (65%) received the funding within the first three years since the founding of the firm. Three hundred and sixty-five startups had at least one patent on record, whereas 313 startups were founded by entrepreneurs who did not have any firm-founding experience prior to founding the focal startups. On average, our sample startups received approximately four rounds of funding from 6.2 investors. The startups were on average 4.7 years old when they received their last round of funding. As for the exit outcomes, of the 473 startups, 52 (11%) went public. Fourteen out of 125 startups (11%) that received

Table 2. Correlation Table

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1 *Count of patents*																
2 *IPO*	0.05															
3 *Early CVC*	0.04	0.02														
4 *Novice entrepreneurs*	−0.11	0.02	0.01													
5 *CVC indicator*	0.05	0.01	0.81	0.03												
6 *Alliance*	0.07	0.07	0.01	−0.03	0.06											
7 *Cumulative no. of patents*	0.50	0.07	0.07	−0.12	0.11	0.14										
8 *Funding round*	0.04	0.06	0.22	−0.02	0.30	0.11	0.18									
9 *Total investment amount* (Ln)	0.04	0.06	0.27	−0.02	0.33	0.08	0.18	0.65								
10 *Total no. of investors*	0.03	0.03	0.33	0.02	0.37	0.04	0.07	0.45	0.51							
11 *VC reputation* (Ln)	0.05	0.03	0.17	0.01	0.19	0.08	0.06	0.36	0.40	0.34						
12 *Prior industry experience*	0.07	−0.04	−0.01	−0.36	0	0.04	0.09	0.03	0.04	0	0.03					
13 *No. of IPO firms*	−0.02	0.11	−0.15	0.06	−0.19	0.05	−0.13	−0.23	−0.40	−0.19	−0.13	−0.08				
14 *CVC availability*	0.06	−0.08	0.15	−0.09	0.07	−0.03	0.04	0.03	0.15	0.13	0.13	0.15	−0.42			
15 *Alliance in the first three years*	0.02	0	0.01	−0.01	−0.02	0.38	0.04	0.03	0.07	0.05	0.08	0.04	0.05	−0.08		
16 *Patents in the first three years* (Ln)	0.29	0	0.09	−0.14	0.02	0.09	0.36	0.14	0.18	0.18	0.08	0.14	−0.11	0.20	0.13	
17 *Investment received in the first three years* (Ln)	0.04	−0.01	0.31	−0.05	0.22	0.03	0.04	0.42	0.56	0.46	0.40	0.08	−0.20	0.38	0.08	0.30

Note. $N = 3{,}540$.

CVC funding within three years since the founding of the firms went public, whereas five out of 67 startups (7%) that received CVC funding later in their lives went public. Finally, 33 of 281 startups (12%) that were backed solely by IVC funding went public. Tables 1 and 2 present the descriptive statistics and bivariate correlations, respectively.

4.1. Innovation Rate

We first examine the effect of receiving early CVC funding on the rate of innovation in a startup, measured by a yearly count of patents. We recognize that a startup's resource needs and environmental conditions may influence whether the startup seeks CVC funding early. We thus employed empirical strategies to address the selection effect by estimating a nonlinear structural model (Alvarez-Garrido and Dushnitsky 2016, Cameron and Trivedi 2009, Terza 1998, Wooldridge 2002).

Specifically, the conditional mean of y_i is

$$E[y_i \mid x_i, d_i, \varepsilon_i] = \exp(x_i\beta + \varepsilon_i),$$

where the dependent variable y_i is the number of patents for which startup i applied (and were subsequently granted) for a given year t; x_i denotes the explanatory variables except for the endogenous regressor. Specifically, the vector x_i in our model consists of the following variables: CVC indicator, alliance, total number of investors for each funding round, cumulative number of patents, funding rounds, total investment amount raised until $t-1$, novice entrepreneurs, entrepreneurs' prior work experience in the ICT industry, indicator variables for three major states (CA, MA, TX), indicators for subsector of the ICT industry, and year indicators. The variable d_i is an endogenous dichotomous variable, which in our context indicates whether a startup received early CVC funding. Given that unobservable factors related to a startup's innovation rate might be correlated with a startup receiving early CVC funding, d_i in this case, we model the selection effect of a startup receiving early CVC funding using the following equation:

$$d_i = z_i\alpha + v_i,$$

where v_i is the random error term and z_i includes the following variables: alliance in the first three years, number of patents in the first three years, total investment amount raised in the first three years, entrepreneurs' prior firm founding experience, prior work experience in the ICT industry, location indicators, industry indicators, and year indicators. Moreover, z_i includes an instrument variable, *CVC availability*, denoting the number of startups within the subsector of the ICT industry in which a focal startup operates that received CVC funding during the first three years since its founding.[2] This instrument reasonably meets the exclusion restriction, because the aggregate CVC investment supply at the industry level is unlikely to influence the outcomes of individual startups such as innovation rate or exit strategy (Alvarez-Garrido and Dushnitsky 2016, Guo et al. 2015, Park and Steensma 2013).

Tables 3 and 4 provide the nonlinear two-stage model results. Table 3 shows the first-stage probit estimates predicting whether a startup receives CVC funding early during the three-year period after the firm's founding. From this first-stage model, we computed residuals, which were then included as an additional regressor in the second stage negative binomial models (Table 4).

Table 3. Propensity to Receive Early CVC Funding (Probit Model)

	Model 1
CVC availability	0.0004
	(0.00)
Early alliance	−0.18
	(0.24)
Patents in the first three years	0.01
	(0.03)
Investment amount raised in the first three years	0.15**
	(0.03)
Novice entrepreneurs	0.12
	(0.15)
Prior industry experience	−0.11
	(0.16)
Location indicators	Yes
Industry indicators	Yes
Year indicators	Yes
Observations	3,481
Loglikelihood	−1,560.18

Note. Robust standard errors clustered by startups in parentheses.
$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$.

Table 4. Estimates for Number of Patents (Negative Binomial Model)

	Model 1	Model 2
Early CVC		1.87**
		(0.68)
CVC indicator	−0.13	−0.25
	(0.19)	(0.20)
Alliance	0.21	0.26
	(0.19)	(0.18)
Total number of investors	0.03	0.02
	(0.02)	(0.02)
Cumulative number of patents	0.08**	0.08**
	(0.01)	(0.01)
Funding round	−0.03	−0.04
	(0.04)	(0.04)
Total investment amount	0.02	−0.01
	(0.02)	(0.02)
Novice entrepreneurs	−0.28*	−0.35**
	(0.12)	(0.12)
Prior industry experience	0.29*	0.32*
	(0.13)	(0.13)
First stage residual	0.03	−0.68*
	(0.08)	(0.29)
Location indicators	Yes	Yes
Industry indicators	Yes	Yes
Year indicators	Yes	Yes
Observations	3,421	3,421
Loglikelihood	−4,175.81	−4,165.05
AIC	8,409.63	8,390.10

Note. Robust standard errors clustered by startups in parentheses.
$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$.

The results from Model 1 in Table 4 show that startups managed by entrepreneurs with prior working experience in the ICT sectors are likely to experience higher innovation rates, whereas those managed by novice entrepreneurs are likely to experience lower innovation rates. Startups that have been historically more technologically capable (measured by the cumulative number of patents) are also likely to show greater innovation performance. In Model 2, we add the *early CVC* variable. We find that the coefficient for the early CVC funding in Model 2 is positive and significant ($\beta = 1.87$, $p < 0.01$), suggesting that receiving early CVC funding in the first three years since being founded has a positive effect on innovation performance. Using a statistical simulation technique (King et al. 2000, Zelner 2009), we calculated the expected number of patents depending on whether the startups received early CVC funding. All of the simulation results are based on 10,000 draws. Assuming all other variables are held at their means, receiving early CVC funding significantly increases the expected number of patents by 2.7. We computed the predicted number of patents for three different scenarios.

As shown in Figure 1, while holding all of the other variables at their means, (1) when startups received early CVC funding in the first three years of founding, the predicted number of patents was 3.18; (2) when startups received late CVC funding, the predicted number of patents was 0.42; and (3) when startups received no CVC funding (i.e., were funded solely by IVC), the predicted number of patents was 0.53. Interestingly, startups that were backed solely by IVCs had more expected patents than those that received CVC funding late in their lives.

These results suggest that receiving early CVC funding in the first three years contributes to the innovation rate. To investigate the timing effect further, we created a series of dichotomous variables to indicate at what age a startup received CVC funding and examined their effects. Sample startups in our data set received CVC funding at various stages of their lives, ranging from the first year after CVC funding up to the tenth year, depending on the timing of the investment. Because there were relatively few observations

Figure 1. (Color online) Expected Number of Patents (Model 2 in Table 4)

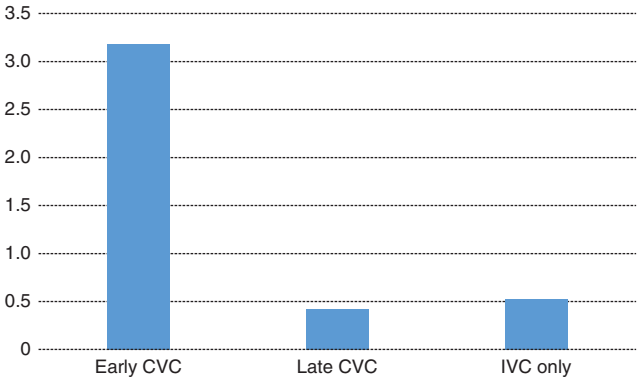


Table 5. Number of Patents with Varying Time Indicators (Negative Binomial Model)

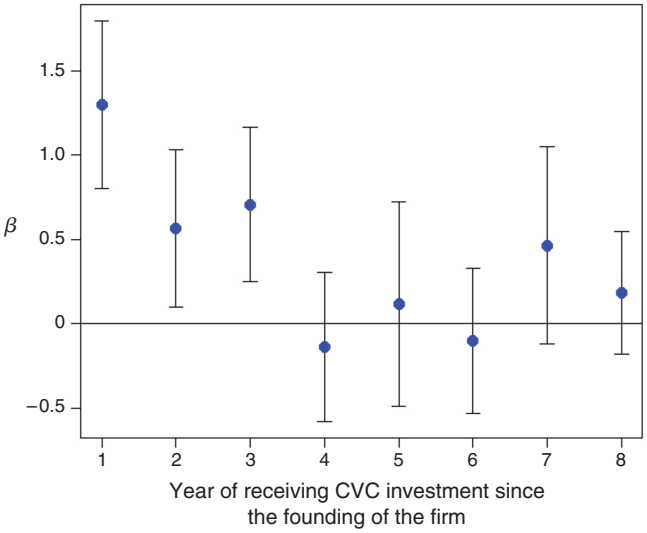
	Model 1
CVC in the 1st year	1.30**
	(0.25)
CVC in the 2nd year	0.56*
	(0.24)
CVC in the 3rd year	0.71**
	(0.23)
CVC in the 4th year	−0.14
	(0.23)
CVC in the 5th year	0.11
	(0.31)
CVC in the 6th year	−0.10
	(0.22)
CVC in the 7th year	0.46
	(0.30)
CVC in the 8th year and beyond	0.18
	(0.19)
Alliance	0.22
	(0.18)
Total no. of investors	0.02
	(0.02)
Cumulative no. of patents	0.01
	(0.02)
Funding round	0.08**
	(0.01)
Total investment amount	−0.03
	(0.04)
Novice entrepreneurs	−0.33**
	(0.11)
Prior industry experience	0.29*
	(0.13)
First stage residual	−0.36**
	(0.09)
Location indicators	Yes
Industry indicators	Yes
Year indicators	Yes
Observation	3,421
Loglikelihood	−4,154.20
AIC	8,380.40

Note. Robust standard errors clustered by startups in parentheses.
$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$.

for those that received CVC funding in the ninth and tenth years, we included eight indicators ranging from *CVC in the first year* to *CVC in the eighth year and beyond*.

The results shown in Table 5 suggest that early CVC funding in the first three years generally has a significant, positive effect on the innovation rate. CVC funding in later years has little effect on that rate. Figure 2 shows the pattern of the coefficients of the timing indicators from Table 5. These results are consistent with what we reported earlier when we divided the startups into two groups, with one group receiving CVC funding in the first three years and the other group receiving CVC funding afterwards.

Figure 2. (Color online) The Timing Effect of Early CVC Funding (Table 5)



Note. The vertical lines denote 95% confidence intervals.

We also used different time thresholds to indicate early CVC funding. In an untabulated analysis, the coefficient for early CVC funding was statistically significant at the 5% level when we use a two-year threshold. However, the coefficient becomes insignificant when we use a threshold extending four years and beyond. It appears that the positive effect of CVC funding is strongest when a startup receives such an investment in the first three years of its life.

4.2. The Likelihood of an IPO

We now examine the effect of early CVC funding on a startup's likelihood of going public. Again, we used an empirical strategy to address the potential endogeneity that some ventures may self-select to receive early CVC funding. Unlike innovation rate, our dependent variable in this case is binary. We therefore estimate a bivariate probit model. This model is appropriate for making causal inferences when both the dependent variable and an endogenous explanatory variable are dichotomous (Greene 2003, Wooldridge 2002). The bivariate probit model consists of two seemingly unrelated equations:

$$y_1 = y_2\beta_1 + x\beta_2 + \varepsilon_1$$
$$y_2 = z\beta_3 + \varepsilon_2$$

where y_1 is the dependent variable (i.e., an IPO), whereas y_2 is the endogenous explanatory variable (i.e., early CVC funding); x denotes covariates for the treatment equation, and z denotes explanatory variables as well as the instrumental variable (availability of CVC funding) for the selection equation.

Tables 6 and 7 present the results of the bivariate probit model predicting the likelihood of receiving early

Table 6. Propensity to Receive Early CVC Funding (Bivariate Probit Model)

	Model 1
CVC availability	0.001
	(0.001)
Early alliance	−0.15
	(0.23)
Patents in the first three years	0.01
	(0.02)
Investment received in the first three years	0.15**
	(0.03)
Novice entrepreneurs	0.13
	(0.15)
Prior industry experience	−0.11
	(0.16)
Industry indicators	Yes
Location indicators	Yes
Observations	3,540

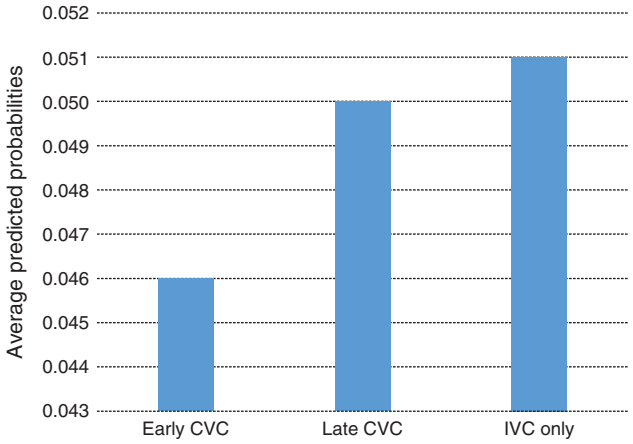
Notes. The results are from the first-stage selection in Model 3 of Table 7. Robust standard errors clustered by startups in parentheses.
***$p < 0.001$, **$p < 0.01$, *$p < 0.05$.

CVC funding (i.e., selection equation) and the likelihood of going public (i.e., treatment equation). Table 6 shows the results of the selection equation estimating the propensity for startups to receive early CVC funding from Model 3 in Table 7. Model 1 in Table 7 is a baseline model. In Model 2, we introduce the main effect of *Early CVC*. In Model 3, we add the interaction term *Early CVC* × *Novice entrepreneurs* to examine whether entrepreneurs' prior founding experiences enhance the effect of early CVC funding.

In Model 3 in Table 7, we found a negative and significant effect of early CVC funding on the likelihood of an IPO for startups ($\beta = -1.07$, $p < 0.01$). Simulation results (10,000 draws) show that the relative risk ratio of an IPO for startups receiving early CVC relative to those who did not is 0.37, suggesting that startups that received early CVC are 63% less likely to go public, compared with those that did not. We also computed the average predicted probabilities of going public for three different groups of startups using the results of Model 3 in Table 7. As shown in Figure 3, when all other variables are held at their means, startups that had early CVC funding have an average 0.046 likelihood of going public. That number is 0.05 for startups that received CVC funding later in their lives. For startups that were backed solely by IVCs, that number is 0.051.[3]

More interestingly, we find that the negative effect of receiving CVC funding early is stronger for startups led by novice entrepreneurs. The coefficient on the interaction term, *Early CVC* × *Novice entrepreneurs*, in Model 3 of Table 7 is negative and significant ($\beta = -0.70$, $p < 0.05$). Simulation results show that the relative risk ratio of an IPO for novice entrepreneurs relative to experienced entrepreneurs is 0.72, suggesting that when receiving early CVC funding, startups founded by novice entrepreneurs are 28% less likely to go public than startups created by experienced entrepreneurs. We also computed the average predicted probabilities of going public for the three different groups of startups depending on whether they were run by novice entrepreneurs, while holding all other variables at their means. As demonstrated in Figure 4, on average, novice entrepreneurs that received early CVC funding are the least likely to go public.

Figure 3. (Color online) Average Predicted Probabilities of an IPO (Model 3 in Table 7)



Although we focus on IPOs as an important exit outcome of startups, some previous research views acquisition as another significant outcome for such firms (e.g., Graebner and Eisenhardt 2004, Waguespack and Fleming 2009). In our data, of the 473 startups, 52 went public and 156 were acquired during the study time. Thus, we ran a model using an alternative measure in which acquisition exits as well as IPOs were coded as a measure of exit events. The results with this alternative measure (Model 4 of Table 7) are qualitatively similar to our main results.[4]

Moreover, one might view acquisition as a competing event that impedes an IPO event. Thus, we ran a

Figure 4. (Color online) Average Predicted Probabilities of an IPO: Novice vs. Experienced Entrepreneurs

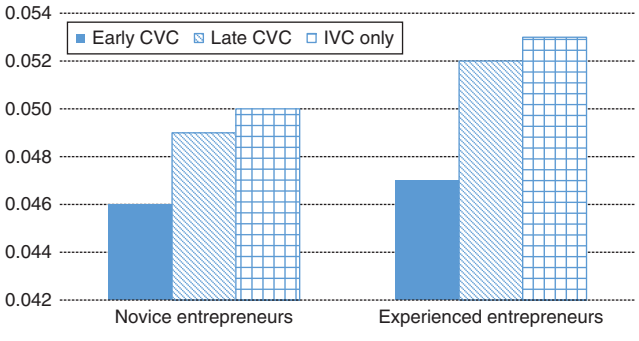


Table 7. Likelihood of an IPO for Startups

	Model 1	Model 2	Model 3	Model 4	Model 5
	DV: *IPO*	DV: *IPO*	DV: *IPO*	DV: *IPO* or *Acquisition*	DV: *IPO, competing risk event* (Acquisition)
	Biprobit	Biprobit	Biprobit	Biprobit	Competing risk model
Early CVC		−0.91**	−1.07**	−0.65*	−4.19**
		(0.26)	(0.36)	(0.27)	(1.27)
Novice entrepreneurs		0.21	0.17	0.16	0.26
		(0.14)	(0.16)	(0.08)	(0.41)
Early CVC × Novice entrepreneurs			−0.70*	−0.53*	−3.41**
			(0.29)	(0.25)	(1.10)
CVC indicator	−0.57	−0.23	−0.23	0.20*	−0.40
	(0.33)	(0.18)	(0.18)	(0.09)	(0.49)
Alliance	0.39*	0.30	0.30	0.15	0.67
	(0.18)	(0.16)	(0.16)	(0.13)	(0.43)
Cumulative number of patents	0.00	0.00*	0.00*	0.00	0.00*
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Funding round	0.02	0.02	0.01	0.03	0.12
	(0.04)	(0.03)	(0.03)	(0.02)	(0.08)
Total investment amount	0.18**	0.18**	0.17**	0.13**	0.45**
	(0.05)	(0.04)	(0.04)	(0.02)	(0.14)
Total no. of investors	−0.00	0.01	0.01	−0.00	−0.02
	(0.02)	(0.02)	(0.02)	(0.01)	(0.05)
VC reputation	−0.01	−0.01	−0.01	−0.01	−0.02
	(0.02)	(0.02)	(0.02)	(0.01)	(0.05)
Prior industry experience	−0.33**	−0.22	−0.22	−0.07	−0.67*
	(0.13)	(0.14)	(0.14)	(0.07)	(0.33)
No. of IPO firms	0.00**	0.00**	0.00**	0.00**	0.01**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
First stage residual	—	—	—	—	1.78**
	—	—	—	—	(0.36)
Location indicators	Yes	Yes	Yes	Yes	Yes
Industry indicators	Yes	Yes	Yes	Yes	Yes
Loglikelihood	−1,805.39	−1,800.62	−1,800.40	−2,295.46	−253.43
Observations	3,540	3,540	3,540	3,481	3,481.00

Note. Robust standard errors clustered by startups in parentheses.
***$p < 0.001$, **$p < 0.01$, *$p < 0.05$.

competing risks regression model in the event history analysis (Fine and Gray 1999). The competing risk refers to the chance that we will observe an alternative event (i.e., acquisition in our context) instead of the event of interest (i.e., an IPO in our context). It is important to note that a competing event is not to be confused with the conventional right-censoring observations that occur due to loss in follow-ups after the study period (Cameron and Trivedi 2009). We still consider startups lost to follow-ups after our study period as being at risk of going public. In contrast, acquisition is a qualitatively different condition that prevents an IPO event from occurring altogether. Competing risk models in event history analysis accommodate both competing risk and right censoring. The results from this analysis are presented in Model 5 in Table 7. To address the endogeneity that startups may self-select to receive early CVC funding, we include the first-stage residuals as an additional control, as we did when running the negative binomial models for innovation rate. The results from this analysis are consistent with other analyses based on the biprobit specifications. The coefficient on *Early CVC* is negative ($\beta = -4.19$, $p < 0.01$), and the coefficient on the interaction *Early CVC*×*Novice entrepreneurs* is also negative ($\beta = -3.41$, $p < 0.01$).

5. Discussion and Conclusion

This study explores the influence of early CVC funding on startup outcomes in terms of its innovation rate and exit mode. Although there has been research on the effect of CVC funding in general, little attention has been given to the timing of CVC funding and its implications for various organizational outcomes from a startup perspective. However, receiving CVC funding, particularly when a startup is in its early stage,

offers both advantages and disadvantages. Our findings based on the analysis of 473 startups in the ICT sector provide strong support for this notion. We find that receiving CVC funding in the first three years since a firm was founded increases the startup's innovation rate but reduces its likelihood of going public. The negative effect of early CVC funding on the likelihood of going public is more pronounced when a startup is managed by novice entrepreneurs. Our results are robust to different model specifications.

This study makes several important contributions to multiple research streams. First, our findings contribute to the CVC literature by offering a more nuanced understanding of how CVC funding influences a startup's innovation rate. Several studies have examined the effect of CVC funding on startup innovation, but the results are ambiguous (e.g., Alvarez-Garrido and Dushnitsky 2016, Pahnke et al. 2015a, Park and Steensma 2013). Although the use of different theoretical reasoning and research contexts in their studies may explain the mixed results, our findings suggest that the timing of CVC funding is one potential explanation to reconcile the inconsistent findings. In our analysis, controlling for a firm's selection, receiving early CVC funding is associated with more innovation in a startup, whereas late CVC funding has little effect. The pattern shown in Table 5 and Figure 2 is particularly illustrative. Receiving CVC funding during the first three years since the firm was founded has significant, positive effects, whereas CVC funding from the fourth year onward has virtually no effect. These results suggest that despite the incentives and capabilities of corporate investors to promote startup innovation, when startups receive CVC funding relatively late, its actual influence tends to be minimal. By the time corporate investors join a startup's investment syndicate, mature startups that have already been guided by other IVC investors are likely to focus on obtaining financial returns on their investment as quickly as possible. Thus, those startups are less likely to emphasize innovation than their counterparts that received CVC funding in their early stages. Moreover, mature startups tend to have already developed organizational structures and routines with the help of IVC investors before receiving CVC funding. Once organizations have their structures put in place, they tend to be less flexible (Gersick 1991). Therefore, the role of corporate investors in enhancing the innovation rate of startups by influencing strategic orientations is likely to be relatively small. Previous studies examining the general effect of CVC funding by aggregating without properly accounting for the specific timing of the investment may have washed out the pattern and produced inconsistent results.

More broadly, our paper contributes to the long-standing discussion of the rate and direction of innovative activity (Lerner and Stern 2012, Nelson 1962). Extant research has investigated how to allocate control rights among different participants with different incentives and resources in innovation-oriented activities (e.g., Aghion and Tirole 1994, Lerner and Merges 1998). However, high levels of uncertainty around innovation-oriented activities make it difficult to assign optimal contracts to various constituents ex ante. In addition, there are also high levels of heterogeneity in terms of the types and timing of investments by external investors in entrepreneurial firms. Recent research has considered the incentives and capabilities of each type of investor and their implications for innovation rates (e.g., Alvarez-Garrido and Dushnitsky 2016, Pahnke et al. 2015a, Park and Steensma 2013). Specifically, corporate investors have received particular attention due to their possession of complementary assets and incentives to accelerate the innovative activities of startups (Alvarez-Garrido and Dushnitsky 2016, Chemmanur et al. 2014, Park and Steensma 2013). However, empirical evidence about the effect of CVC funding on a startup's innovation rate has been inconsistent and the underlying mechanism remains unclear. Although some studies have shown a positive effect of CVC funding on startup innovation rates (Alvarez-Garrido and Dushnitsky 2016, Chemmanur et al. 2014, Park and Steensma 2013), others point out that certain characteristics of established firms such as dispersed authority, complex decision-making processes, and internal conflicts may sometimes make it difficult for the advantages of CVC funding to be fully realized (Pahnke et al. 2015a). We complement this research by examining how the strategic incentives of corporate investors interact with the stage of life of a startup when receiving CVC funding to influence the venture's strategic orientation and subsequent innovation rate. In this regard, we respond to the call for more research on how incentives matter for innovation (Lerner and Stern 2012). Moreover, we find that for startups there is a trade-off for receiving early CVC funding. Despite its benefits for their innovation rate, receiving early CVC funding appears to direct startups to give excessive attention to innovation at the expense of other activities. Consequently, startups may experience disadvantages later in terms of obtaining financial returns through an IPO. The disadvantage of early CVC funding seems to be greater for novice entrepreneurs who lack the skills and know-how to handle the unique challenges of running a new organization including the difficulty of dealing with their relationships with powerful external investors such as corporate investors.

In this regard, our study has practical implications for entrepreneurs regarding whether and when to receive investment from corporate investors. The advantages of receiving CVC funding on a startup's innovation rate may be too attractive to forgo, especially

for entrepreneurs operating in technology-intensive industries. However, our findings suggest that they should also be aware of the consequences of early CVC funding for other value-appropriating activities. Novice entrepreneurs may find this caveat particularly useful. On the other hand, experienced entrepreneurs may be better able to take advantage of the CVC funding opportunity early on, because their prior founding experiences help them withstand the pressures that accompany the influx of such investment from outside sources.

Our study also speaks to the literature on the imprinting effect (Beckman and Burton 2008, Stinchcombe 1965). Prior research has established that the initial state of a new organization has profound and long-lasting effects on the subsequent development and outcomes of the organization (e.g., Beckman and Burton 2008). Studies have examined a variety of factors such as the background of the founders, their education, and the composition of the founding team as important sources of imprinting (e.g., Beckman 2006, Brüderl et al. 1992, Geroski et al. 2010, Pennings et al. 1998). External conditions at the time of the startups' founding (Dobrev and Gotsopoulos 2010, Swaminathan 1996) as well as the network position of the founders (McEvily et al. 2012) affect the survival chances or growth rate of startups. However, there has been relatively little consideration of a new organization's early relationship with external investors as a potential source of imprinting, although external investors have been playing an increasingly important role in recent decades in speeding up the growth of those startups, particularly in high-tech industries where a great deal of upfront capital is often required in advance of profits (Kortum and Lerner 2000). Our study reveals that CVC funding in the early phase of a startup is another significant imprinting force that shapes the firm's initial strategic orientation and has important consequences for its later life. Furthermore, the literature often stresses prior experiences as a source of imprinting, but our findings show that first-time entrepreneurs *without* prior founding experiences may be a "tabula rasa" or a clean slate for imprinting (Levinthal and Myatt 1994, Simsek et al. 2015).

Our study is not without limitations that offer opportunities for future research. First, we restricted our sample to high technology ventures in the ICT sector in the U.S. economy. This research design helps us examine the effect of early CVC funding on startup outcomes while controlling for unobserved heterogeneity in industries and different institutional systems. However, future studies might try to generalize our findings to other industry and national contexts. Second, although we find a relationship between early CVC funding and startup outcomes, we were unable to directly observe the decision-making process of entrepreneurs or the actual interactions between CVCs and a startup. Future studies with rich qualitative data could perhaps describe the mechanisms at play more precisely. Third, our study uses the quantity of subsequent patents filed by startups to measure their innovation rate. Future research could consider the quality and types of innovation outputs. In particular, it would be interesting to find out whether corporate investors direct the attention of the startup to a particular type of innovation related to their strategic agenda or complementary products.

In sum, in light of the increasing heterogeneity of funding sources available for startups, the type of investor and timing of the investment are critical for improving our understanding of the growth and outcomes of entrepreneurial firms. A startup's early relationships with corporate investors in a sensitive period are particularly important because of their potential to influence the startup's strategic orientation, which, in turn, has a profound effect on its innovation rate and exit outcome. We hope this paper offers insights to startups in technology-intensive industries that are considering CVC funding to better exploit their entrepreneurial opportunities.

Endnotes

[1] Available at http://bear.warrington.ufl.edu/ritter/ipodata.htm.

[2] An alternative measure for CVC availability is total investment amount by CVC investors. Not surprisingly, the number of CVC-backed startups and the total amount of funding that CVC investors put into the startups are highly correlated ($r = 0.91$). Both measures provide similar results.

[3] These probabilities may appear low at a first glance because they indicate a startup's likelihood of going public in a particular year during the period.

[4] We caution that an acquisition outcome is qualitatively very different from an IPO outcome for startups and corporate investors alike. For startups, an acquisition is typically a less preferred outcome than an IPO because financial returns tend to be lower (Gompers and Lerner 2004) and entrepreneurs typically lose control over their startups once they are acquired. In contrast, corporate investors have relatively little incentive to take their portfolio companies public because a startup gone public provides fewer strategic benefits to them. However, most corporate investors prefer not to acquire their own portfolio firms either, because (a) they might over-pay for the startups (Benson and Ziedonis 2009), and/or (b) they often have difficulty justifying additional strategic value beyond access to technologies and partial control rights that come with holding a minority equity ownership.

Acknowledgments

The authors thank the editor-in-chief Daniel Levinthal and two anonymous reviewers for their thoughtful comments on the manuscript. They also thank Jung-hyun Kwon for his excellent research assistance.

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