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**Learning to let go: Social influence, learning, and the abandonment of corporate venture
capital practices**

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Keywords:

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ABSTRACT

This study examines the abandonment of organizational practices. We argue that firm choices in implementing practices affect how firms experience a practice and their subsequent likelihood of abandonment. We focus on utilization of the practice and staffing, i.e. career backgrounds of managers, as two important implementation choices that firms make. The findings demonstrate that practice utilization and staffing choices not only affect abandonment likelihood directly but also condition firms' susceptibility to pressures to abandon when social referents do. Our study contributes to diffusion research by examining practice abandonment – a relatively unexplored area in diffusion research – and by incorporating specific aspects of firms' post-adoption choices into diffusion theory.

MANAGERIAL ABSTRACT

When do firms shut down practices? Prior research has shown that firms learn from the actions of other firms, both adopting and abandoning practices when their peers do. But unlike adoption decisions, abandonment decisions need to account for firms' own experiences with the practice. We study the abandonment of corporate venture capital (CVC) practices in the U.S. IT industry, which has experienced waves of adoption and abandonment. We find that firms that make more CVC investments are less likely to abandon the practice, and are less likely to learn vicariously from other firms' abandonment decisions, such that they are less likely to exit CVC when other firms do. Staffing choices also matter: hiring former venture capitalists makes firms less likely to abandon CVC practices, while hiring internally makes abandonment more likely. Plus, staffing choices affect how firms learn from the environment, as CVC managers pay attention to and learn more from the actions of firms that match their work backgrounds, i.e., firms that staff CVC units with former venture capitalists are more likely to follow exit decisions of VC firms, while those that staff with internal hires are more likely to follow their industry peers. Our results suggest that firms wanting to retain CVC practices should think carefully about the implementation choices they make, as they may be inadvertently sowing seeds of abandonment.

INTRODUCTION

Decisions to adopt new practices or abandon them are strategic for firms. The adoption and diffusion of market strategies (Aime, Johnson, Ridge, & Hill, 2010; Greve, 1995), innovations (Greve & Seidel, 2014; Simon & Lieberman, 2010), organizational structures (Burns & Wholey, 1993) and other administrative practices (Young, Charns, & Shortell, 2001) play an important role in competitive positioning and advantage. A key finding of the wide literature on practice diffusion is that firms adopt new practices in response to social and institutional pressure, as well as functional expectations (Greve, 2011; Strang & Macy, 2001). Much less is known about why firms *abandon* practices they had formerly adopted. The few studies that directly examine practice abandonment have mostly tested if adoption and abandonment processes follow a symmetrical pattern of social learning and contagion (e.g. Burns *et al.*, 1993; Greve, 1995), such that firms abandon previously adopted practices when they observe referent firms abandoning. However, a theory of abandonment needs to differ from a theory of adoption, because abandonment decisions must also account for firms' direct experience with a practice.

Why do firms abandon practices? First, performance of a practice seems like an obvious reason to abandon, yet performance is an imperfect indicator for abandonment decisions. Practices can have multiple conflicting objectives, or be poorly theorized, or embedded in other organizational systems, making performance hard to evaluate. Even if a practice's past performance is known, its future performance can be uncertain, especially in the face of environmental or competitive change (Greve, 1995). The uncertainty around practice performance makes firms susceptible to social learning about a practice's suitability (Lieberman & Asaba, 2006), even when they hold private information (Bikhchandani, Hirshleifer, & Welch, 1998). Moreover, decision-making about strategic change depends not on past performance per

se, but on managers' interpretations of past experiences and attributions for performance (Fang, Kim, & Milliken, 2014; Hayward & Shimizu, 2006). Next, some practices become discredited after adoption, leading firms to abandon as a result of a collective learning process (Abrahamson & Fairchild, 1999). Therefore, abandonment decisions could depend on social learning and influence as well as experiential learning.

Previous studies of practice abandonment have been more concerned with parallel mechanisms and replacement of practices than abandonment as a standalone event of theoretical interest. For example, Abrahamson and colleagues (Abrahamson & Eisenman, 2008; Abrahamson *et al.*, 1999) study how discourse drives the rise and fall of management practices, and Greve (1995) investigates the abandonment of the "easy listening" radio format, but also its simultaneous replacement by the "adult contemporary" format. These studies show that abandonment is subject to social and contagion influences, but it is not clear if organizations are abandoning a practice or simply eager to replace it with something new. Moreover, prior research on abandonment has primarily focused on the rise and fall of practices in populations, rather than considering firm-level choices. Recent diffusion research suggests that rather than adopting practices wholesale, firms often modify practices as they implement them (Ansari, Fiss, & Zajac, 2010; Boxenbaum & Battilana, 2005). Choices that firms make in staffing a practice, the extent to which the practice is used and the integration of the practice into a firm's existing power and social structures might all influence the way in which practices operate and the likelihood of eventual abandonment. Thus, in order to study abandonment of practices, we also need to look inside firms and account for how practices are implemented.

In this study, we build theory on practice abandonment that accounts for social pressure to abandon *and* choices that firms make in implementing practices. We focus on practice

utilization and staffing, two important aspects of implementation, and propose that these factors will influence abandonment decisions by affecting the kinds of specific expertise available to the firm. We further theorize how these choices affect a firm's responsiveness to abandonment pressures. We investigate these issues in the context of corporate venture capital (CVC) practices in U.S. IT firms. CVC is an excellent context to study practice abandonment because it is a strategically important practice that has experienced waves of adoption and abandonment.

We hypothesize and find that abandonment decisions are influenced by both social influence processes and by a firm's implementation choices. Our findings contribute to the literature on practice diffusion by investigating the drivers of practice abandonment, an important but relatively under studied issue in the diffusion literature. Understanding practice abandonment is important because it can be a source of strategic change. Ceasing activities can interfere with the development and maintenance of capabilities that could influence future strategic directions (Burgelman, 1994; Decker & Mellewigt, 2012). Further, understanding abandonment can yield theoretical insights into the temporal instability of organizational practices and into why and how reasonable practices are discarded or discredited. In reality, only a small minority of practices become institutionalized; most end up fads or fashions (Strang *et al.*, 2001). In addition, we theorize how implementation of a practice affects its susceptibility to social influence, by explicitly recognizing that firms can have multiple social referents and showing that firms' utilization and staffing choices condition how they respond to the actions of different referents.

Study Context: Corporate Venture Capital

CVC units have become a popular vehicle for established firms to make external equity investments in entrepreneurial startups (Gaba & Meyer, 2008). Although firms are undoubtedly enticed by the potential for financial returns from venture capital investing, most firms claim that

their foremost objectives are strategic: learning about new technologies, gaining access to new markets and business models, and identifying prospective acquisition targets (Gompers, 2002) While investors can assess their financial return on their investments by looking to IPO (initial public offering) markets, strategic returns from CVC units are less clear; they are long term, risky, and not easily quantifiable (Gaba & Bhattacharya, 2012). Recent research highlights implementation challenges, including inexperienced managers, complex objectives, lack of timely access to investment opportunities, failure to build relationships with independent venture capitalists and an unstable environment characterized by rapid expansion and contraction of aggregate investment activity (Gompers & Lerner, 2000; Meyer, Gaba, & Colwell, 2005). Despite the implementation challenges, CVC activity promises substantial rewards such as high rates of knowledge creation and technological innovation for established firms (Dushnitsky & Lenox, 2005; Wadhwa & Kotha, 2006).

The unprecedented 1990s boom in the venture capital industry encouraged many corporations to adopt CVC practices (Gaba *et al.*, 2008). The corporate share of overall venture capital investing rose rapidly from 2 percent in 1994 to 15 percent in 2000 when nearly \$16 billion was invested by more than 300 corporations. Then, economic recession and the collapse of equity and IPO markets in 2000 ended the boom in the venture capital industry. During the first quarter of 2001, CVC investments fell 81 percent, and many firms abandoned their CVC practices and dissolved their CVC units. Despite the downturn in investments, a number of units were retained, and CVC practices appear to have become a permanent part of some corporations' strategies. Figure 1 shows the dollar amount of investments as well as the number of information technology firms making CVC investments each year during the time period of our study.

*****Insert Figure 1 here*****

THEORY

Existing diffusion research finds that social influence through contagion, social learning, and mimicry creates pressures to adopt and abandon practices (Abrahamson *et al.*, 1999; Burns *et al.*, 1993; Greve, 1995). However, a theory of practice abandonment must also account for a firm's first-hand experience. Firms vary in the way they implement practices and these choices should affect the likelihood of abandonment. Moreover, even social learning processes could operate differently for adoption and abandonment, in that a firm's experience of a practice is likely to condition its response to social influence (Lieberman *et al.*, 2006). Our model, shown in Figure 2, accounts for both social learning and the experience that firms accrue with a practice by adding direct and contingency effects of post-adoption implementation choices that firms make.

*****Insert Figure 2 here*****

Social influence and practice abandonment

Though prior research has found that social influence processes on practice adoption also operate on abandonment (e.g. Greve, 1995), it is worth explicating why social influence should be considered in a theory of abandonment at all. Social influence that leads firms to imitate one another operates in response to uncertainty (Greve, 2011; Lieberman *et al.*, 2006). Given that managers have direct experience with a practice, uncertainty is reduced in abandonment decisions, relative to adoption decisions. However, it is uncertainty about the *operation* of the practice or about *past* performance that is reduced as managers gain experience with the practice. Significant uncertainty about the future performance of the practice can persist. Abandonment is also a forward-looking decision that depends on an expectation of future performance (Gaba & Terlaak, 2013). Even practices that have performed well in the past might fall out of fit if the environment changes (Greve, 1995). Abandonment decisions are also complicated by attributions for past performance, e.g., the causal attribution made for poor performance of

acquisitions affects the likelihood of divestment (Hayward *et al.*, 2006). Gaba and Terlaak (2013) make the point that venture capital is inherently uncertain, with variability in outcomes for long periods of time. Startup investment typically happens over multiple rounds, usually linked to the achievement of milestones (Gompers, 2002). Corporate venture capital investing shares this characteristic, with added uncertainty due to the need to assess future strategic value of these investments for the firm (Gaba *et al.*, 2012).

In uncertain situations, boundedly rational managers look to the behavior of referent firms to make decisions (Peteraf & Shanley, 1997). For example, in the literature on business exit, foreign subsidiary exit and divestment of foreign investment is influenced by the exit actions of referent firms when there is political uncertainty (Henisz & Delios, 2004; Soule, Swaminathan, & Tihanyi, 2014). Information-based theories of imitation also predict that firms will be influenced by their observations of other firms' behavior (Lieberman *et al.*, 2006). In a model of social learning, where actions of others can be observed but their private information cannot, information cascades can occur where decision-makers take the actions of others as indicative of private information. In such cases, firms may even override their own private information in favor of the signals they infer from others' actions (Bikhchandani *et al.*, 1998).

Reference groups for abandonment

The research on abandonment has focused primarily on industry peers as the relevant reference group. Though a firm's rivals form a natural reference group (Lieberman *et al.*, 2006; Massini, Lewin, & Greve, 2005; Xia, Tan, & Tan, 2008), firms can also see practice experts as social referents. For example, while quality management practices diffused widely into numerous sectors such as healthcare and hospitality (Young *et al.*, 2001; Zbaracki, 1998), they originated in the manufacturing sector. Similarly, CVC practices originated in independent venture capital

(IVC) partnerships, so CVC units could perceive IVCs as a relevant social comparison (Souitaris, Zerbinati, & Liu, 2012), such that IVC closures influence firms to abandon CVC practices and close their units. Therefore, consistent with prior research, we expect a baseline effect of social influences from both industry (IT firms) and practice (IVC) referents.

- a) *Firms are more likely to abandon practices when their industry referents do.*
- b) *Firms are more likely to abandon practices when their practice referents do.*

Effects of practice implementation choices on practice abandonment

In addition to social influence effects, a firm's implementation of a practice is likely to affect its likelihood of abandonment. First, utilization allows firms to gain experience with the practice. Experience is a fundamental source of learning (Argote & Miron-Spektor, 2011) that is specific to the practice. Repeated exercise of a practice increases expertise that yields confidence in the ability to run the practice effectively. Additionally, gaining experience with a practice often requires significant investment that can signify commitment. Firms that commit funds and other resources to a practice should be serious about the practice and intend for the practice to be a strategically relevant activity, to the extent that strategy drives resource allocation (Burgelman, 1983). As firms gain confidence in their expertise with a practice through repeated utilization and commit to it through repeated investment, they are less likely to abandon it, all else equal.

Hypothesis 1: Adopted practices with high levels of utilization will be less likely to be abandoned.

In addition to a firm's utilization of a practice, staffing choices are key components of a firm's implementation of a practice. Individuals carry knowledge and skill from prior career experiences as well as mental models about what behaviors and outcomes are appropriate and valued (Beckman & Burton, 2008; Dokko, Wilk, & Rothbard, 2009). Skill that is specific to a particular aspect of a job can be transferred to other jobs that share that aspect (Castanias &

Helfat, 2001), e.g. firm-specific skills acquired in one job can be productively transferred to other jobs in the same firm, and industry-specific skills can be productively used in other jobs in the same industry (Harris & Helfat, 1997; Mayer, Somaya, & Williamson, 2012). Work backgrounds of the managers who implement and conduct practices can affect practice abandonment by affecting the types of specific expertise available to the firm, and by affecting how much the practice is customized to fit the adopting firm. Two dimensions of career background that could affect practice abandonment are firm-specific experience and practice-specific experience.

Because they have firm-specific experience and worked in other areas of the firm, internal hires have a deeper understanding of the firm, with mental maps of the organization that are in line with the firm's overall strategy (Karim & Williams, 2012). Also, individuals retain their contacts following job moves (Kleinbaum, 2012), and internal hires can use their pre-existing social ties to other parts of the firm to stay connected with strategic issues that might affect the practice. Firm-specific expertise should transfer to the practice unit with the hires and become a basis for coordinating activities with other business units and internal R&D units. Further, practices can benefit from the firm-specific expertise of its internal hires to position outcomes in a favorable light to top management, even if they are negative (Fang *et al.*, 2014). Finally, internal hires are more likely to customize practices to the needs of the adopting firm (Dokko & Gaba, 2012). To the extent that customized practices are more integrated into an adopting firm, they are less likely to be abandoned.

Hypothesis 2: Adopted practices staffed with high levels of internal hires will be less likely to be abandoned.

Staffing a practice with managers who have practice-specific career backgrounds can also reduce the likelihood of abandonment because of their practice-specific expertise and social ties. Especially for poorly theorized practices, staffing can be a key way in which tacit knowledge and

skills are acquired. Implementing complex practices requires intuition, judgment, and skills that are best learned through experience or close social ties. Along with practice expertise, work experience in a practice can provide social ties to other practitioners of the practice. Individuals moving between firms create knowledge conduits between old and new employers (Corredoira & Rosenkopf, 2010). Former co-workers and work contacts can provide ongoing support and learning about the state of the art in the practice. Managers with practice expertise can contribute to the smooth functioning of an adopted practice, such that the practice becomes a non-problematic, routine organizational practice. For example, firms adopting six sigma practices can hire a certified “black belt” who can assure accurate implementation of a six sigma program, and hiring such experts is a success factors for successful implementation (Kwak & Anbari, 2006). In addition to expertise and social connections, managers with practice experience are more likely to implement a “high-fidelity” form of an adopted practice that may be seen as more legitimate (Dokko *et al.*, 2012). Moreover, the legitimacy and expertise that practice experience brings to a complex adopted practice might influence the interpretation of ambiguous performance.

Hypothesis 3: Adopted practices staffed with high levels of practice hires will be less likely to be abandoned.

Implementation choices shape response to abandonment pressures

Not only should practice utilization and staffing have direct effects on abandonment, we expect these choices to affect firms’ responses to abandonment pressures from external sources. First, the expertise gained by firms as they repeatedly conduct a practice gives them confidence in their judgment such that they become relatively independent of social influences. Experience has been shown to shelter business units of multi-unit firms from contagion pressure from competitors (Simon *et al.*, 2010). Though experience with a practice does not preclude

observation of or attention to other firms that use the practice, it reduces a firm's propensity to imitate other firms. Moreover, maintaining a practice while others are abandoning might be a source of strategic distinctiveness for firms with expertise in the practice. For abandonment decisions, firms that repeatedly operate a practice have reduced uncertainty about how the practice operates and greater confidence in their ability to assess its value.

Second, the experiential learning they gain is specific to the firm, enabling inference about the practice's effect on that firm's performance. Firms that have accrued substantial experience in a practice may see other firms' actions concerning the practice as less relevant to their own decision-making because they have their own set of actions and results to refer to when making abandonment decisions. With respect to corporate venturing, each investment that a CVC unit makes provides information that enables the firm to gain specific knowledge about how CVC works within the structure and strategy of the parent corporation and how it contributes to the firm's objectives. Therefore we predict that higher level of practice utilization will buffer the practice from abandonment pressures.

Hypothesis 4a: High levels of practice utilization will weaken the positive relationship between abandonments by industry referents and the likelihood of abandonment by a focal firm.

Hypothesis 4b: High levels of practice utilization will weaken the positive relationship between abandonments by practice referents and the likelihood of abandonment by a focal firm.

Reference groups may differ in their ability to claim managerial attention. Managerial attention is a scarce resource, and managers' actions and decisions depend on where they focus their attention and which information they attend to (Ocasio, 1997). In addition to knowledge and social ties they carry from their career backgrounds, managers bring mental models that affect how they perceive the environment (Dokko *et al.*, 2009), i.e. what information is relevant and

who are appropriate social referents. Career background can shape selective attention, such that information that is congruent with prior work experience is salient, because expertise and pre-existing cognitive structures make such stimuli easier to notice and encode (Ocasio, 2011). Thus, attentional orientation, i.e. "...the degree of attention paid to some category of stimuli" (Cho & Hambrick, 2006: 455), toward a particular reference group is a function of career background. Moreover, attentional orientation leads to action and decisions based on the actions of the salient reference group (Greve, 1998). In addition to attention processes, normative processes may operate by defining what is valued and legitimate. In a qualitative study, Souitaris et al. (2012) found that the professional identity of CVC managers as VCs or corporate managers drove alignment with the norms of IVCs or the corporate parent, respectively.

Though managers of an adopted practice do not necessarily make abandonment decisions; the information and perspective they provide to top managers influence decision-making by directing attention or highlighting particular aspects of the environment that can make abandonment seem more or less desirable. Moreover, they make operational decisions that can suggest a course of action to top management decision-makers. For example, the investment opportunities CVC managers pursue or present to top management might be limited by following the opportunities that their social referents pursue (Ren & Guo, 2011). Therefore, staffing a practice with internal hires or practice hires can have consequences that go beyond the work done or goals pursued by influencing the firm's response to external information or social influence.

In the case of practice abandonment, firms notice the actions of their reference groups, but their responses can be amplified or attenuated according to the salience of the reference group. Given a baseline propensity to abandon if either industry referents or practice referents do, a practice staffed with internal hires is likely to be sensitive to the actions of industry referents,

because they are the firm's competitors. Similarly, a practice staffed with practice hires should feel abandonment pressure more strongly from the practice reference group, because it is composed of former employers. Because managerial attention is limited (Ocasio, 2011), managers' attention to one reference group may reduce their ability to attend to other reference groups. In addition, to the extent that the values or models of one reference group differ from those of the other, managers with one type of background may discount the actions of the other reference group, attenuating reactions to abandonment pressure from those sources. For example, a firm may infer different information from abandonments by different reference groups. When the industry reference group starts to abandon a practice, the internal hires may infer that the practice is not beneficial to industry participants, while practice hires may conclude that industry participants have simply applied the practice incorrectly. By contrast, when the practice reference group starts to abandon a practice, practice hires may take this as evidence of challenging market conditions for all users of the practice, while internal hires may see it as resulting from problems specific to the practice reference group. Therefore, we expect that the salience of different reference groups is contingent on the staffing choices that the firm makes.

Hypothesis 5a: Staffing an adopted practice with high levels of internal hires will strengthen the positive relationship between abandonments by industry referents and the likelihood of abandonment by a focal firm.

Hypothesis 5b: Staffing an adopted practice with high levels of internal hires will weaken the positive relationship between abandonments by practice referents and the likelihood of abandonment by a focal firm.

Hypothesis 6a: Staffing an adopted practice with high levels of practice hires will weaken the positive relationship between abandonments by industry referents and the likelihood of abandonment by a focal firm.

Hypothesis 6b: Staffing an adopted practice with high levels of practice hires will strengthen the positive relationship between abandonments by practice referents and the likelihood of abandonment by a focal firm.

METHODS

Sample

We constructed our sample using the *Corporate Venturing Yearbook and Directory* (2000, 2001, 2002). The Directory lists all firms with an active CVC unit along with information about the year of establishment of the CVC unit. To account for unobserved industry heterogeneity, we restricted our sample to include only IT sector firms (NSF, 2000) that had established CVC units with dedicated staffing. This procedure resulted in a sample of 93 IT firms. Due to missing data from *VentureXpert* or incomplete biographical information our final sample reduced to 70 CVC units over the time period 1992-2008¹. For the analyses of CVC abandonment, the 70 adopters of CVC units comprise the risk set for abandonment decisions. Of these 70 firms, 19 (about 27%) abandoned their CVC unit during the study period. The time of entry into the risk set is conditional on the year of CVC unit adoption, so we have an unbalanced panel of observations.

Dependent Variable

We use *VentureXpert* to code CVC unit abandonment. *VentureXpert* classifies the investment status of every CVC unit as ‘Defunct’, ‘Inactive’, or ‘Actively Seeking New Investments.’ While the database provides the current investment status of a CVC unit, it does not specify the date the status changed. Therefore, all CVC units classified as ‘Defunct’ or ‘Inactive’ were coded as abandoned, and the date of its last investment was used to identify the year of abandonment. We verified and refined our coding by checking the pattern of CVC units’ investments. In interviews with CVC managers, we were told that when IT firms cease new investments in startups for at least two calendar years, they almost always abandon their CVC unit. We took a conservative approach and recoded units that made no CVC investments for at

¹ 1992 is the earliest date for founding of contemporary CVC units in our sample. Though some IT firms had earlier incarnations of CVC units, those earlier activities were generally abandoned after few years.

least four years as abandoned.² We coded the first year in this interval as the abandonment year. The variable *CVC Abandonment*, takes on a value of 1 in the year of abandonment, 0 otherwise.

Econometric Methodology

To estimate how CVC utilization and staffing choices affect CVC abandonment decisions, we utilize dynamic treatment models. These models estimate the average effect of receiving or not receiving a binary treatment (Rosenbaum and Rubin, 1983; Robins, 1999). We analyze three treatments representing our constructs of interest: CVC utilization, internal hires and practice hires.

Firms' staffing and utilization choices are non-random, so traditional regression-based techniques may not permit causal inferences. Furthermore, in the presence of time-varying confounders (variables that affect both the treatment choices and the probability of abandonment), simply including these confounders as covariates is not sufficient for multiple reasons. First, in a dynamic setting, a time-varying confounder, such as CVC unit performance, may not only predict the probability of CVC abandonment but also *subsequent* staffing and utilization choices (selection into treatment). Second, staffing and utilization choices in the past may also predict subsequent CVC unit performance. Third, staffing and utilization choices may themselves be interrelated. For example, experienced CVC units may make different subsequent staffing choices than inexperienced units. In short, with dynamic treatments, the treatment assignments may depend on the sequence of previous treatment assignments, and affect, as well as be affected by time-varying confounders.

To address these challenges, we use dynamic treatment or marginal structural models (Hernán, Brumback, & Robins, 2001; Robins, 1999; Robins, Hernán, & Brumback, 2000). These models mirror the propensity-score matching estimators of Rosenbaum and Rubin (1983), but are

² Our results are robust to a two year threshold.

particularly appropriate in the presence of time-varying treatment and confounders. The model is fitted in two-stages: 1) we estimate each subject's probability of receiving its own treatment history and use these to derive inverse-probability-of-treatment weights (IPTW), and 2) we use the IPTW weights to estimate the treatment–outcome association in a weighted probit model.³

To test our hypotheses, we define three time-varying treatments $A_i^j(t)$, where $A_i^j(t)$ is a dichotomous variable taking the value 1 if firm i receives treatment j in year t and 0 otherwise. j indexes each of the three treatments pertinent to our hypotheses, CVC utilization, internal hires and practice hires. Let $V_i(t)$ denote exogenous characteristics of the firms in the sample and $L_i(t)$ denote the values of the time-varying confounders at time t for subject i . Let $\bar{A}_i(t)$ denote treatment history, a vector of values of all treatments from time 0 to time $(t - 1)$. Similarly let $\bar{L}_i(t)$ denote a matrix of the history of time-dependent confounders for subject i at time t . The inverse-probability-of treatment weight is given by

$$W_i^j(t) = \prod_{\tau=0}^t \frac{1}{\Pr\{A_i^j(\tau) | \bar{A}_i(\tau-1), \bar{L}_i(\tau), V_i\}}$$

where $\Pr(\cdot)$ denotes the conditional probability mass function. It captures informally the conditional probability that firm i received its own observed treatment history for treatment j up to time t , given past treatment, confounder history, and exogenous characteristics. However, in practice these weights tend to be highly variable and fail to be approximately normally distributed, so that the resulting estimator can have a large variance. Therefore, we use the stabilized version, which has a smaller variance:⁴

$$SW_i^j(t) = \prod_{\tau=0}^t \frac{\Pr\{A_i^j(\tau) | \bar{A}_i(\tau-1), V_i\}}{\Pr\{A_i^j(\tau) | \bar{A}_i(\tau-1), \bar{L}_i(\tau), V_i\}}$$

Here, the numerator is a firm's conditional probability of receiving its observed treatment history up to time t , given past treatment history and exogenous characteristics. Using a stabilized

³ See Azoulay, Stuart, and Ding 2009 for a clear exposition of this technique. We thank an anonymous reviewer for suggesting it.

⁴ The stabilized weights have a variance of 0.23 while the unstabilized weights have a variance of 118.94.

version of treatment weights increases the efficiency of the estimates while their consistency remains unaffected.

To estimate the denominator of these weights we use a probit model to predict the probability of each treatment as a function of past treatment history, the time-varying confounders (lagged by a year), exogenous characteristics, and a time-varying intercept. We follow Azoulay et al. (2009) and measure past treatment history as the (lagged) value of *all* three treatments at time $t-1$, and the cumulated treatments up to time $t-2$. Let T_{i1}^j be the time periods where treatment $A_i^j = 1$ and T_{i2}^j be the time periods where treatment $A_i^j = 0$. The estimate of the denominator of $SW_i^j(t)$ is $\prod_{t \in T_{i1}^j} \widehat{p}_i^j(t) \prod_{t \in T_{i2}^j} (1 - \widehat{p}_i^j(t))$ where $\widehat{p}_i^j(t)$ is the predicted probability obtained from the probit equation. For the numerator, we again use a probit model, except that we include only past treatment history, the baseline covariates and a time-varying intercept to predict the probabilities.⁵

Since we are analyzing multiple treatments, our final weights are the product of the individual weights for each treatment j : $SW_i(t) = \prod_j SW_i^j(t)$. The weighting creates a pseudo-population comprised of SW_i copies of firm i . In using these weights we borrow more (less) information from cases with smaller (higher) probabilities of receiving the treatment at any given period, given treatment and covariate history. In this new pseudo-population Robins (1999) shows that the time-varying confounding history does not predict treatment at t given past treatment history, so that the treatment is statistically and causally exogenous.⁶

Finally, we fit a weighted probit regression to estimate $P_i(t)$, the probability that firm i abandons CVC unit at time t , given that it is at risk of doing so. The weights $SW_i(t)$ captures the

⁵ We experimented with higher lags for time-varying confounders. While our results remain qualitatively unaffected, we lose observations which affect the efficiency of the estimates.

⁶ As in all treatment effects model, this assumes that all selection is on observables, which are used to construct the weights. That is, treatment $A(t)$ is sequentially ignorable or randomized given the past.

inverse probability that a firm would have followed its own treatment history up to year t , conditional on observables. The dependent variable for the outcome $P_i(t)$ is related to the covariates and the treatments by the following equation:

$$P_i(t) = \Phi[\alpha + \beta_0 V_i(t) + \beta_1 Utilization_i(t) + \beta_2 Internal_i(t) + \beta_3 Practice_i(t)] + e_i(t)$$

where Φ is the cumulative density function and the vector $V_i(t)$ is the vector of exogenous covariates that affect the abandonment decision. Since weighting each subject by the probability weights introduces within-firm correlation, we use robust variance estimators by clustering standard errors by firm (Hernán, Brumback, & Robins, 2000).

Treatment Variables

To test Hypothesis 1, we created a binary treatment variable *CVC Utilization*. In the traditional VC model, investors – whether independent or corporate – invest multiple rounds in a portfolio company which signifies their commitment to the investment activity (Gompers, 2002). We cumulate the number of investments rounds by each CVC unit invested up to, but excluding, each year t as a continuous measure of utilization. We then convert it into a discrete treatment measure *CVC utilization*, coded as 1 if firm i 's cumulated investment exceeded the median across all firms for that year. We used the VentureXpert database to obtain these data.

For staffing choices, we used the *Corporate Venturing Yearbook and Directory* to identify key personnel in the CVC units. There were 295 unique individuals in the 70 CVC units in our sample. For these individuals, we used their name and the CVC unit name to conduct internet searches for biographies. The searches were conducted between November 2008 and November 2013. We found at least some biographical information for 273 individuals (93%). Typical sources included firm websites, SEC filings and professional networking sites like LinkedIn. Individuals are missing from our sample, if they could not be found, or their names were so common they could not be uniquely identified (e.g. Mike Smith). Many people have biographies

available from multiple sources, and when different sources contained unique work history information, we recorded them separately. We recorded 851 biographies for the 273 managers.

We reconstructed each manager's work history with separate records for each job found, with dates of employment or chronological ordering, if available. The reconstructed work histories yielded 1375 separate job records, including separate listings for title changes. Of the 1375 job we identified, 754 jobs preceded the CVC jobs, 319 jobs were held after the CVC job, and the remaining 302 job records represented the CVC job itself. We coded 754 prior jobs to capture different types of experience and used this coding for our staffing variables.

For a longitudinal measure of staffing choices, we reconstructed the composition of managers in each CVC unit in each year of our sample. Though a manager's prior experience is fixed during his or her tenure in a CVC unit, the changing composition of the unit as managers enter and leave the unit leads to temporal change in this variable.⁷ CVC managers whose job immediately preceding their first CVC job was in the adopting firm were coded as internal hires, and those who had prior experience in independent venture capital (IVC) firms were coded as practice hires. IVC experience was identified by examining job titles and employers for prior jobs, e.g., a General Partner at Frontier Ventures was coded as an IVC job. Note that we treat internal and practice experience as independent, such that managers can have either, neither or both types of experience.⁸

To test Hypothesis 2, we created a treatment indicator *Internals hires* equal to 1 if at least 50% of the CVC team was composed of individuals with firm-specific experience, and 0 otherwise. For practice hires, we observe that 72% of our observations have 0 VCs in the CVC

⁷ Start and end dates were available for only 200 CVC unit jobs, with an additional 38 jobs having either the start or end date. We supplemented the sample by assuming that the manager started in the CVC job the first year his or her name appeared in the Directory or left the CVC job just after the last year his or her name appeared in the Directory. Using these assumptions, the analysis sample increased to 238 managers (87% of the 273 managers).

⁸ Most managers (64%) have one type of experience, 8% have both types and the remainder has neither.

unit, so that the median number of VCs is zero. Therefore, to test Hypothesis 3, we created a treatment indicator for practice hires (*IVC hires*) that takes the value 1 if there was at least one person with independent VC experience on the CVC team. In the CVC context, a single practice hire is a high level relative to CVC units generally, since large differences in compensation structure made former VCs hard to attract into CVC jobs.⁹

The history of treatment variables are also used to predict the treatment probabilities. These include three treatment indicators measured at time $t - 1$ (lagged by a year) and cumulated treatment over time until time $t - 2$ as $\sum_{\tau=0}^{t-2} A_j^i(\tau)$, $j \in \{CVC\ utilization, internal\ hires, IVC\ hires\}$.

Time-Varying Confounders

Along with treatment history, time-varying confounders and exogenous covariates are also used to generate the inverse probability weights $SW_i(t)$. We classified a number of CVC unit level variables as time-varying confounders in our analysis since these may plausibly affect both selection into treatment and the abandonment of the CVC unit, *and* be affected by past treatment history. Following Hernán et al. (2001), we empirically confirmed that each confounder had an independent effect on the outcome, that it affects subsequent treatment, and is itself affected by past values of the treatments. Our time-varying confounders capture the history of confounders, $\bar{L}_i(t)$ since they are measured since the founding of the CVC unit. Time-varying confounders are not included in the second-stage outcome models.

CVC unit performance can be an important driver of abandonment decisions, and can affect and be affected by staffing and utilization choices. Since firms generally do not disclose CVC investment returns, we adopt the usual approach and measure performance indirectly by examining the status of each venture in which the CVC unit invested (Gaba *et al.*, 2013;

⁹ One limitation is that we code the continuous variables, CVC utilization and Internal hires as dichotomous, thereby not fully exploiting all the variation in these measures. However, this is necessitated by the use of the dynamic treatment methodology.

Hochberg, Ljungqvist, & Lu, 2007). Thus *Proportion of successful companies* is defined as the annual cumulated number of the ventures in the CVC portfolio that ended in an IPO or an acquisition divided by the cumulated number of ventures in its portfolio. We complement this “success” measure of performance with a “failure” measure: the variable *Proportion of defunct companies* is similarly defined as the proportion of defunct ventures in the CVC unit’s portfolio. Since VC practices entail frequent interaction with startups and intensive monitoring, we include (logged) *Median distance between portfolio companies and CVC unit*. Firms distant from their portfolio companies may choose different levels of utilization since monitoring costs increases with distance. Similarly staffing choices may expand or shrink the geographic loci of portfolio investments. Finally, Benson and Ziedonis (2009) show that firms with sporadic patterns of investments through CVC units earn lower returns when acquiring startups. To control for a firm's consistency in CVC investing, we follow Benson and Ziedonis (2009) and create a *CVC stability* index that for each year t , is the proportion of years a firm invested in entrepreneurial startups since the year of CVC unit adoption. Firms that exhibit a stable pattern of investments in portfolio companies are likely to be more committed to their CVC units, which may affect later staffing and utilization choices, which in turn, may also affect future values of this variable.

Exogenous Covariates

A number of exogenous characteristics were used as covariates to predict the probability of treatment and the probability of abandonment. We include social influences from both industry and practice reference groups to verify baseline findings and to interact with our utilization and staffing variables. For abandonment pressures from the industry reference group we measure the number of *CVC exits* in the same 4-digit industry and geographic state as the focal firm (Greve, 1998). By confining this measure to similar and proximate others, we recognize that firms tend

to pay greater attention to more comparable organizations. Next, to measure the abandonment pressures from the practice reference group, we calculated the number of *IVC exits* from the IVC industry per year. Both contagion measures are lagged by one year.

CVC units that are geographically closer to VC clusters are better positioned to identify investment opportunities and may also find it easier to staff their CVC units; hence, we include *CVC unit in IVC clusters* as a dummy variable if the CVC unit is situated in one of the three primary IVC clusters (Silicon Valley, Route 128, and New York). Second, early adopters may be more committed to CVC than later adopters, so we include a control for *Age of CVC unit* as the number of years since unit founding. We cross-checked this date with information on the date of first investment by the IT firm from *VentureXpert*.¹⁰ Since the location decision is time-invariant and CVC age simply augments by a year, these variables are not affected by treatment choices, so it is appropriate to treat them as exogenous. We also include firm-level controls using *Compustat* data: *Firm age*, (logged years) and *Firm size* (logged sales). Third, we control for *Firm slack*, measured as firm's current ratio (the ratio of current assets to liabilities), which represents the liquid resources uncommitted to liabilities. Finally, better performing firms may attract higher caliber personnel, which could affect abandonment, so we control for *Firm performance* as income before extraordinary items plus depreciation. All firm level variables are measured at the baseline – the time of CVC unit establishment.

To control for the effect of booms and busts in the venture capital industry on CVC abandonment, we use *Return on NASDAQ*. This variable captures movements in the public equity markets and is measured as the value-weighted annual return on the NASDAQ (including

¹⁰ With annual data, the age of CVC unit captures age-dependence in the baseline hazard rate. The continuous age measure also captures early vs. late adopters without requiring an arbitrary year to classify firms as early vs. late adopters. Regardless, we also coded a dummy for early adopters as 1 if firms adopted prior to 1997. Our results are robust to this alternate way of capturing early adoption.

dividends). Finally, since CVC abandonment may be driven by the availability of startups to invest in we control for the *Availability of investment opportunities*. This variable from the *National Venture Capital Association* measures the number of portfolio companies in existence each year. All the above variables are lagged by a year when predicting either the probability weights or the probability of CVC abandonment.

Table 1 provides summary statistics and correlations for all of the variables including the time varying confounders used only to estimate the treatment weights.

*****Insert Table 1 here*****

RESULTS

*****Insert Table 2 here*****

Table 2 shows the results of the first stage regressions, predicting the probabilities of each treatment that were used to derive treatment weights. The models show the probability of each treatment, i.e. *CVC utilization*, *Internal hires* and *IVC hires*, as a function of treatment history, time-varying confounders and exogenous characteristics (the estimate for the denominator of $SW_i^j(t)$). The results show that CVC unit performance, CVC stability and distance between the CVC unit and portfolio companies all matter for at least one treatment. Similarly, treatment in the previous period strongly predicts treatment in the subsequent period. Finally, cumulated treatment history matters only for CVC utilization.

*****Insert Table 3A here*****

The second stage models used to test our hypotheses are found in Table 3A. Model 1 in Table 3A is a simple unweighted baseline model and includes the two contagion variables (*CVC exits* and *IVC exits*) as well the other control variables. We find that CVC exits in the same industry strongly and positively affect CVC abandonment by the focal firm. Thus, in accordance with the prior research on practice abandonment, we find evidence for a reverse diffusion process

(Abrahamson *et al.*, 1999; Greve, 1995). At the same time in Model 1, the coefficient on *IVC exits* is also positive and significant. This suggests that industry peers are not the only reference group that firms look to in their abandonment decision; IT firms are positively influenced by the abandonment decisions of both their industry and their practice reference groups (Gaba *et al.*, 2008), which confirms our baseline expectation.

Model 2 in Table 3A examines the impact of *CVC utilization* and CVC staffing choices (*Internal* and *IVC hires*) on the likelihood of abandonment for a focal CVC unit. Hypothesis 1 argued that as firms gain experience with a practice through utilization they are less likely to abandon it. The negative and significant coefficient on *CVC utilization* indicates that treated firms that do greater than the median number of investment rounds across firms are less likely to abandon their CVC units, as predicted. Hypotheses 2 and 3 argued that the staffing choices made with respect to the adopted practices are consequential for abandonment. We find a positive and significant coefficient on *Internal hires*, which suggests that the CVC units with higher than median number of CVC managers with firm-specific experience (internal hires) are more likely to be abandoned. Thus, Hypothesis 2 is not supported. On the other hand, a negative and significant coefficient on *IVC Hires* suggests that CVC units with at least one CVC manager with IVC experience are less likely to be abandoned, supporting Hypothesis 3.

Interaction of CVC utilization with CVC exits and IVC exits.

Hypothesis 4a and b predict that greater experience with CVC will attenuate abandonment pressures from industry and practice reference groups, respectively. To test these hypotheses, we interact *CVC utilization* with the two contagion variables. Given the relatively high collinearity between *IVC exits* and *CVC exits* ($r = 0.39$), we include these interactions one at a time.

Model 3 in Table 3A interacts *CVC utilization* with *CVC exits* while Model 4 interacts *CVC experience* and *IVC exits*. In both models, we obtain a positive but insignificant coefficient for the interaction with *CVC utilization*. However, in models with limited dependent variables, the effect of the interaction term (and of the standard error) depends not only on the interaction term's coefficient but also on the coefficients for the two effects and on the values of all other variables. As a result, neither sign nor significance of the interaction coefficients in Models 3 and 4 indicates the actual direction and significance of the interactions (Greene, 2010; Hoetker, 2007). Therefore, in Table 3B we follow best practices (cf. Greene, 2010) and assess the attenuating effect of *CVC utilization* by calculating the average marginal effects of *CVC exits* and *IVC exits* and examine how it changes when the treatment variable *CVC utilization* takes the values 0 and 1.

***** Insert Table 3B about here *****

Row 1 in Table 3B shows (respectively) the marginal effect of *CVC exits* and *IVC exits* at the two treatment levels of *CVC utilization*. Marginal effects and the corresponding standard errors are calculated (via the Delta method) using estimates from Models 3 and 4. The marginal effect of both *CVC exits* and *IVC exits* are significantly lower for firms treated in terms of utilization. Based on the coefficient and standard errors reported in Table 3A, we can test whether these marginal effects are significantly different for treated vs. non-treated firms. For both *CVC exits* and *IVC exits* we can reject the hypotheses that the two marginal effects are the same. These results provide support for Hypotheses 4a and 4b: high levels of experience gained by conducting a practice makes a firm relatively immune to contagion influences from both industry peers and practice experts.

Interaction of internal hires with *CVC exits* and *IVC exits*.

Models 5 and 6 in Table 3A test Hypothesis 5: that treated firms in terms of internal hires are more sensitive to industry referents's abandonments (H5a), and less sensitive to practice referent's abandonments (H5b). Model 5 includes the interaction of the treatment indicator for *Internal hires* and *CVC exits* while Model 6 includes the interaction of the treatment indicator for *Internal hires* and *IVC exits*. The second row of Table 3B reports the marginal effects of *CVC exits* and *IVC exits* at the two levels of *Internal hires*, where these effects are calculated based on the estimates from Models 5 and 6 in Table 3A respectively. The results show that, as hypothesized, the marginal effect of *CVC exits* on the focal firm's exit probability increases for firms where the treatment indicator for internal hires takes the value 1. At the same time, the marginal effect of *IVC exits* declines for these treated firms. Further testing the equality of marginal effects in Table 3B, we find that while the marginal effect of *CVC exits* increases significantly for the treated firms, the decline in the marginal effect of *IVC exits* is not statistically significant, even though it is substantive. This finding provides strong support for H5a, but only weak support for H5b.

Interaction of IVCs hires with CVC exits and IVC exits.

Next, Models 7 and 8 in Table 3A test Hypothesis 6: that social influence of exits by industry peers are attenuated for treated firms with at least one IVC on the CVC team (H6a), while the influence of *IVC exits* are amplified for such firms (H6b). Model 7 shows the interaction of treatment indicator for *IVC Hires* with *CVC exits* while Model 8 shows the interaction of *IVC Hires* with *IVC exits*. In row 3 of Table 3B we report the marginal effects of *CVC exits* and *IVC exits* for treated and non-treated firms where these effects are calculated based on the estimates from Models 7 and 8 respectively. The results show that comparing treated and non-treated firms in terms of IVC experience, the marginal effect of *CVC exits* on the

focal firm's exit propensity is lower for the former while the marginal effect of IVC exits is higher. Further, the decline (increase) in the marginal effects of CVC exits (IVC exits) is significant for treated vs. non-treated firms. Thus, we find support for Hypothesis 6a and 6b: that staffing a CVC unit with high levels of practice hires attenuates the abandonment pressures from CVC exits but amplifies them from IVC exits.

Robustness Checks

Though the method we use account for endogeneity of firm choices over time arising from the time-varying confounders, it does not fully account for selection on unobservables, a common issue in treatment models. For instance, it may be argued that firms are different in terms of some unobservable commitment to CVC practices, and the ones who are relatively serious make more thoughtful staffing and utilization decisions, and that these decisions can reinforce or subsequently weaken the commitment to CVC practices. While we do control for early vs. late adopters, CVC performance, and CVC stability, which could each proxy for seriousness, it is impossible to assert confidently that these controls account for all unobserved heterogeneity. At the same time, Robins (1999) shows that even in the presence of omitted time-varying confounders that prevent causal interpretation, the dynamic treatment method yields unbiased estimates of the treatment. To increase our confidence in the completeness of the models, we tested a range of additional controls as time-varying confounders and as exogenous characteristics, including a dummy variable for whether the parent firm itself received venture financing at founding, a control for the average age of personnel in the CVC unit to control for the possibility that firms serious about CVC may choose to staff their units with more experienced workers, and a dummy variable that indicates if the CEO or President or Chairman of the Board was also part of the CVC unit as an indicator of top management commitment to

CVC. None of these variables affected the abandonment decision. More importantly, our previous findings remain unaffected by their inclusion.

Finally, ten firms in our sample are censored. That is, these firms with CVC units were either acquired or went out of business before experiencing an abandonment event and before the end of the time period of this study. We checked the robustness to censoring by treating censoring as an additional time-varying treatment. Adjusting for censoring in this way is equivalent to estimating the treatment effects on the probability of abandonment if all subjects had remained in the sample. The probability of censoring is predicted in the same way and with the same time-varying and exogenous variables as $SW_i^j(t)$, except that the dependent variable is a dummy variable which takes the value 1 if the firm is censored (drops out of the risk set before 2008). We compute weights $SW_i^*(t)$ corresponding to the probability of censoring given these observables, and multiply this weight with the treatment weight $SW_i(t)$. Finally, we use the product of the weights $SW_i(t) * SW_i^*(t)$ in the probit regression to estimate the probability of CVC abandonment. The weights capture the probability that a subject would have followed his own treatment and censoring history up to year t , conditional on observables. We obtain nearly identical results since the estimated censoring weights are close to 1.

DISCUSSION

This study expands understanding about the abandonment of practices. Existing theory about abandonments posits a contagion effect for abandonment that parallels adoption processes (Abrahamson *et al.*, 1999; Greve, 1995). Our findings support extant theory, plus we build theory about practice abandonment as distinct from adoption by accounting for implementation choices firms make post-adoption. These choices result in variance in both firms' propensities to abandon practices and their susceptibility to contagion pressures for abandonment. Our results

suggest that abandoning practices is a strategic decision that is significantly influenced by everyday operational decisions and by the attention processes of CVC managers.

Managerial choices and practice abandonment

Overall, we found support for the general proposition that firms' implementation choices affect practice abandonment. As expected, we find that a high level of CVC investment in startups reduces the likelihood of abandonment, and that it buffers firms from abandonment pressures from both the industry and practice reference groups. We also found that staffing choices are important to abandonment decisions, though not exactly as we expected. Our hypotheses about practice hires were fully supported: staffing a CVC unit with managers with IVC career backgrounds reduces the likelihood of practice abandonment, and also attenuates abandonment pressure from the industry reference group, but amplifies pressure from the IVC reference group. With respect to internal hires, we found that staffing a practice with internal hires affected the reference groups that the CVC unit responded as predicted: abandonment pressure from the industry reference group is amplified, while pressure from the IVC reference group is reduced. However, we found that CVC units staffed with a higher proportion of internal hires are *more* likely to be abandoned, rather than less. One explanation for this unexpected finding could be that internal hires lack the legitimacy or deep knowledge about the practice to position the practice as valuable to the firm. Internal hires also prioritize strategic objectives of CVC units over financial objectives (Dokko *et al.*, 2012), and strategic returns are often more difficult to quantify and measure (Benson *et al.*, 2009), making units that prioritize strategic returns especially prone to abandonment. This finding calls into question the kinds of skill or knowledge needed to make adopted practices an integral part of firm. Firm-specific skills should be useful for integrating an adopted practice into normal firm operations, but if multiple types of skill are

needed to make a practice sufficiently integral to a firm to reduce the likelihood of abandonment, one type of skill might trump others. The unexpected finding also provokes thought about the way practices vary as they enter new organizations or new populations (Ansari *et al.*, 2010; Gaba *et al.*, 2008), and how variation relates to eventual abandonment. An earlier study found that internal hires were more likely to modify adopted practices to fit a firm's needs (Dokko *et al.*, 2012). However, the resulting practice variation may also create tension with the core of the practice, weakening the benefits an adopting firm expected from the practice and increasing its likelihood of abandonment. Future research should explore the relationships between practice variation, skills and abandonment for a variety of practices.

Limitations and future directions for research

Though the CVC context has many features that make it appropriate for studying practice abandonment, it also has features that might limit the generalizability of our findings. Most previous research in practice abandonment (i.e., Burns *et al.*, 1993; Greve, 1995) has studied practices like strategy and structure that permeate organizations, making them hard to disentangle from other activities and abandon. By contrast, CVC practices are relatively independent of other firm activities. Though this feature of CVC enables us to see abandonment as a standalone event, it might also prevent our findings from generalizing to other practices.

In addition, it is possible that a firm's seriousness about CVC is an underlying factor that drives both implementation choices and abandonment. Though we addressed this issue by using dynamic treatment models, and several robustness checks, it is possible that our model still suffers from omitted variable bias. If a firm's underlying commitment to a practice drives eventual abandonment, this has important implications for firms – suggesting that firms might be better off not adopting practices they are not serious about, and for individuals – suggesting that

individuals considering career moves into newly adopted practice groups should assess a firm's commitment to a practice before moving into a job there.

Contribution and implications

Our study addresses the call for further study about the conditions under which practice abandonment is likely to occur and for the study of practice abandonment in settings that allow abandonment to be separated from replacement of practices (Greve, 1995). Other research has studied practice abandonment as part of a larger agenda to understand adoption and abandonment together – as subject to the same forces, such as bandwagons or aspirations (Abrahamson *et al.*, 2008; Abrahamson *et al.*, 1999; Gaba *et al.*, 2012; Xia *et al.*, 2008). As a result, abandonment has rarely been studied on its own, and it has been difficult to tease apart pressure to abandon from pressure to replace a discredited practice or adopt a fashionable new one. Our theory of abandonment recognizes that adoption and abandonment are fundamentally different, and explicitly accounts for the experience that organizations gain by implementing practices.

Our findings also have implications for diffusion theory more generally. Diffusion theory examines how practices spread by specifying which actors are more susceptible to influence, and whose influence they are susceptible to (Soule *et al.*, 2014). Reference groups for influence have primarily been defined in terms of social or geographic proximity (e.g., industry peers or local competition), or aspiration (e.g., industry leaders). We find that reference groups can also stem from the career backgrounds of managers who operate the practice. The selection of reference groups for influence can be an important source of firm heterogeneity (Massini *et al.*, 2005), e.g., when firms choose different reference groups with different practices, or as an expression of strategic position (Xia *et al.*, 2008). However, our study suggests that, rather than a deliberate strategic choice, the selection of reference groups might be an unintended consequence of

staffing decisions. Therefore, our findings uncover an underlying determinant of imitation between firms that can provide insight on the diffusion of practices as well as their abandonment throughout populations.

Our primary contribution is to diffusion theory, but our findings also have implications for research on the importance of individuals to firm outcomes. Though upper echelons theory delineates the effect of C-level executives and top management teams on firm outcomes (Beckman, Burton, & O'Reilly, 2007; Hambrick, 2007), other work in this stream has sought to understand the effects of mid-level managers to important firm outcomes (Burgelman, 1994; Mollick, 2012). Our study supports these earlier findings and suggests that middle managers who implement and operate practices play an important role in strategic decisions like practice abandonment. Specifically, middle managers' career backgrounds are important to organizations in a way that supersedes the espoused requirements of the job. In addition to knowledge, routines and mental models about what activities and goals are valuable (Aime *et al.*, 2010; Dokko *et al.*, 2009), and we show that career background also shapes attention processes (Ocasio, 1997). Future research can explore other implications of middle managers' attention for strategic change in organizations.

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Figure 1: Corporate Venture Capital Investments

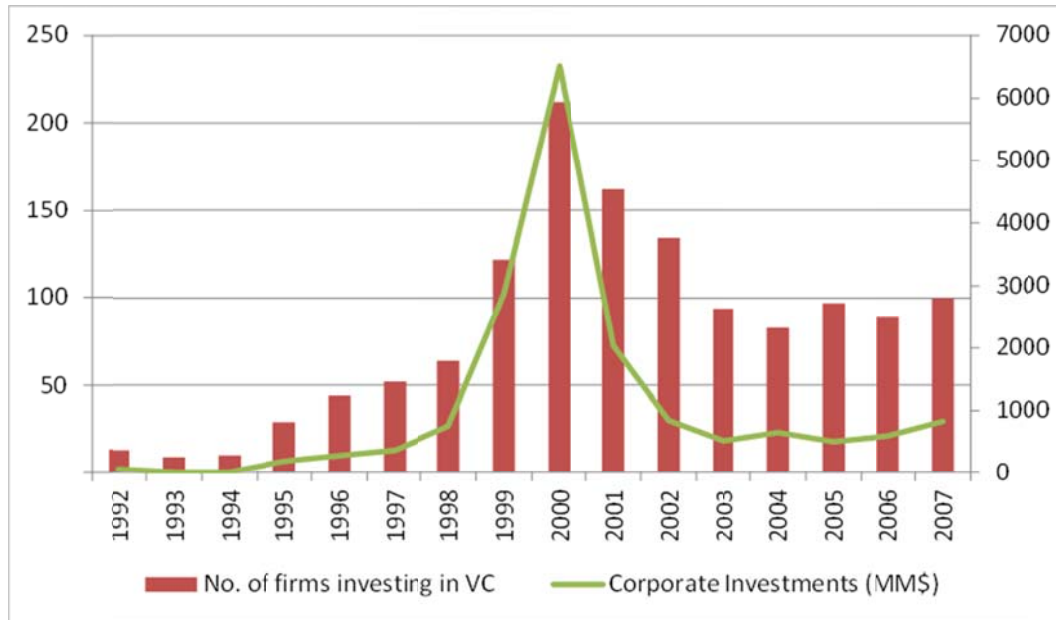


Figure 2: Model of Practice Abandonment

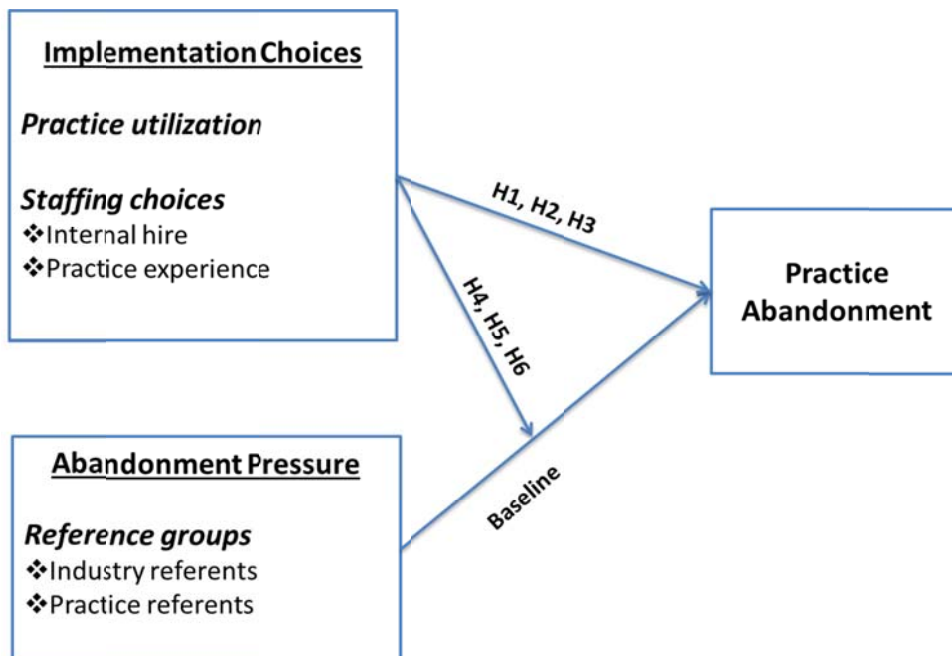


Table 1: Summary Statistics and Correlations (N = 404)

	Mean	S.D.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.
<i>1. Prob. of abandonment</i>	0.04	0.2	1																	
<i>2. CVC utilization</i>	0.6	0.49	-0.15	1																
<i>3. Internal hires</i>	0.68	0.47	0.09	-0.01	1															
<i>4. IVC hires</i>	0.28	0.45	-0.08	0.07	0.03	1														
<i>5. CVC exits</i>	0.17	0.79	0.52	-0.09	-0.01	0	1													
<i>6. IVC exits</i>	25.19	15.57	0.32	-0.05	0.07	-0.03	0.39	1												
<i>7. CVC unit in IVC cluster</i>	0.72	0.45	-0.04	-0.05	-0.02	0.07	0.08	-0.03	1											
<i>8. Age of CVC unit</i>	5.25	3.33	-0.18	0.03	-0.38	-0.07	-0.16	-0.35	0.13	1										
<i>9. Proportion of successful companies</i>	0.16	0.14	-0.16	0.14	-0.05	0.21	-0.11	-0.13	0.11	0.28	1									
<i>10. Proportion of defunct companies</i>	0.14	0.12	0.02	0.14	-0.31	-0.06	0.09	0.1	0.1	0.39	0.02	1								
<i>11. Distance b/w portfolio companies and CVC unit*</i>	5.93	1.91	-0.07	0.07	0.01	-0.03	-0.18	-0.02	-0.33	-0.09	0.14	-0.06	1							
<i>12. CVC stability</i>	0.68	0.31	-0.08	0.4	-0.07	0.11	0.02	0.05	0.09	-0.1	0.01	-0.06	-0.05	1						
<i>13. Firm Age*</i>	3.06	0.71	-0.11	0.31	-0.12	-0.05	-0.11	-0.07	-0.24	0.28	0.05	0.27	0.16	-0.2	1					
<i>14. Firm Size*</i>	7.81	2.82	-0.1	0.25	0.04	0.08	-0.09	-0.02	-0.2	-0.08	0.05	0.14	0.29	0.17	0.27	1				
<i>15. Firm Slack</i>	0.69	0.65	0.03	-0.21	-0.01	-0.08	0.04	0.08	0.1	-0.08	-0.02	-0.19	-0.1	-0.09	-0.11	-0.37	1			
<i>16. Firm performance</i>	973.16	3063.7	-0.12	0.25	-0.11	-0.01	-0.09	-0.27	-0.12	0.16	0.17	0.04	0.11	-0.02	0.35	0.36	-0.03	1		
<i>17. Availability of investment opportunities**</i>	5.79	1.64	-0.04	0.03	0	-0.01	0.02	-0.13	0	0.01	0.03	-0.09	-0.02	0.08	-0.02	0.01	0.02	0.04	1	
<i>18. Return on NASDAQ</i>	0.01	0.33	-0.15	0.06	-0.03	0.04	-0.15	-0.26	0.02	-0.02	0.05	-0.03	0.01	0	0	0.01	0.02	0.1	-0.43	1

*: in natural logs; ** in '000s

Table 2: Probability of Treatment as a Function of Treatment History, Time-Varying Confounders, and Exogenous Covariates

	<i>CVC utilization (t)</i>	<i>Internal hires (t)</i>	<i>IVC hires (t)</i>
<i>CVC utilization (t - 1)</i>	2.883*** (0.318)	0.264 (0.355)	-0.442 (0.317)
<i>Internal hires (t - 1)</i>	-0.151 (0.264)	5.979*** (0.834)	0.141 (0.291)
<i>IVC hires(t - 1)</i>	0.318 (0.365)	-0.115 (0.352)	3.995*** (0.451)
$\sum_{\tau=0}^{t-2} CVC\ utilization(\tau)$	0.144** (0.073)		
$\sum_{\tau=0}^{t-2} Internal\ hires(\tau)$		-0.097 (0.095)	
$\sum_{\tau=0}^{t-2} VC\ hires(\tau)$			-0.117 (0.075)
<i>Proportion of successful companies (t - 1)</i>	-0.013 (0.906)	-0.168 (1.677)	2.017** (0.990)
<i>Proportion of defunct companies (t - 1)</i>	-2.252** (1.133)	-2.092* (1.263)	0.587 (1.087)
<i>Distance b/w portfolio companies & CVC unit (t - 1)</i>	-0.096* (0.054)	-0.071 (0.081)	0.076 (0.060)
<i>CVC stability (t - 1)</i>	0.843** (0.403)	-1.160* (0.608)	0.438 (0.427)
<i>CVC exits (t - 1)</i>	-0.094 (0.112)	-0.148 (0.171)	0.111 (0.111)
<i>IVC exits (t - 1)</i>	-0.010 (0.009)	-0.009 (0.010)	-0.012 (0.011)
<i>CVC unit in IVC cluster</i>	0.429 (0.423)	-0.530 (0.427)	0.058 (0.333)
<i>Age of CVC unit (t - 1)</i>	-0.209*** (0.066)	-0.053 (0.094)	-0.113* (0.059)
<i>Firm Age</i>	0.123 (0.170)	-0.689** (0.309)	-0.254 (0.175)
<i>Firm Size</i>	0.080 (0.081)	0.091 (0.151)	0.109 (0.078)
<i>Firm Slack</i>	-0.595** (0.266)	-0.228 (0.313)	0.070 (0.256)
<i>Firm performance</i>	0.000 (0.000)	-0.000* (0.000)	-0.000 (0.000)
<i>Availability of investment opportunities (t - 1)</i>	-0.086 (0.052)	-0.089 (0.095)	-0.054 (0.057)
<i>Return on NASDAQ (t - 1)</i>	0.336 (0.345)	2.263*** (0.630)	0.573 (0.387)
<i>Constant</i>	-0.353 (1.197)	0.748 (1.468)	-1.364 (1.002)
<i>Observations</i>	404	404	404
<i>Log-likelihood</i>	-57.50	-46.32	-61.88
<i>Pseudo-R²</i>	0.79	0.82	0.74

Robust standard errors in parentheses clustered on firm; * significant at 10%; ** significant at 5%; *** significant at 1% (two-tailed tests)

Table 3A: Impact of CVC Implementation Choices on CVC Abandonment

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>CVC utilization</i>		-0.922*	-1.225***	-1.115*	-0.885*	-0.911*	-0.904*	-0.910*
		(0.494)	(0.471)	(0.662)	(0.509)	(0.498)	(0.489)	(0.490)
<i>Internal hires</i>		1.800**	1.751**	1.795**	6.122***	13.897***	1.810**	1.831**
		(0.884)	(0.822)	(0.885)	(0.786)	(2.608)	(0.899)	(0.903)
<i>IVC hires</i>		-0.945*	-1.052*	-0.953*	-0.919	-0.933*	-0.810	0.236
		(0.569)	(0.622)	(0.563)	(0.571)	(0.566)	(0.508)	(0.792)
<i>CVC utilization*CVC exits</i>			0.150					
			(0.251)					
<i>CVC utilization*IVC exits</i>				0.004				
				(0.019)				
<i>Internal hires *CVC exits</i>					-0.911***			
					(0.338)			
<i>Internal hires*IVC exits</i>						-0.214***		
						(0.059)		
<i>IVC hires*CVC exits</i>							-0.062	
							(0.233)	
<i>IVC hires*IVC exits</i>								-0.025
								(0.020)
<i>CVC exits</i>	0.425***	0.561***	0.494**	0.559***	1.445***	0.554***	0.576***	0.568***
	(0.111)	(0.169)	(0.208)	(0.169)	(0.268)	(0.173)	(0.204)	(0.177)
<i>IVC exits</i>	0.038***	0.045***	0.048***	0.044**	0.045***	0.258***	0.045***	0.050***
	(0.013)	(0.016)	(0.016)	(0.018)	(0.016)	(0.058)	(0.015)	(0.016)
<i>CVC unit in IVC cluster</i>	-0.626*	-0.399	-0.393	-0.394	-0.412	-0.403	-0.401	-0.389
	(0.333)	(0.362)	(0.372)	(0.362)	(0.371)	(0.364)	(0.361)	(0.359)
<i>Age of CVC unit</i>	-0.070	0.084	0.117	0.087	0.079	0.082	0.087	0.092
	(0.171)	(0.121)	(0.119)	(0.115)	(0.123)	(0.122)	(0.122)	(0.121)
<i>Firm Age</i>	0.281	0.515**	0.510**	0.519**	0.517**	0.513**	0.505**	0.516**
	(0.227)	(0.252)	(0.253)	(0.255)	(0.251)	(0.251)	(0.246)	(0.251)
<i>Firm Size</i>	-0.259*	-0.266*	-0.272*	-0.268*	-0.262*	-0.263*	-0.261*	-0.269*
	(0.139)	(0.154)	(0.159)	(0.159)	(0.153)	(0.154)	(0.155)	(0.153)
<i>Firm Slack</i>	-0.165	0.217	0.200	0.213	0.214	0.214	0.220	0.222
	(0.307)	(0.331)	(0.339)	(0.339)	(0.334)	(0.332)	(0.331)	(0.335)
<i>Firm performance</i>	0.000**	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
<i>Availability of investment opportunities</i>	0.094	0.027	0.032	0.028	0.037	0.030	0.030	0.031
	(0.080)	(0.096)	(0.101)	(0.097)	(0.101)	(0.098)	(0.097)	(0.097)
<i>Return on NASDAQ</i>	0.400	0.514	0.554	0.514	0.505	0.504	0.504	0.508
	(0.614)	(0.686)	(0.692)	(0.691)	(0.692)	(0.693)	(0.679)	(0.683)
<i>Constant</i>	-142.361	130.442	189.693	140.123	120.019	116.035	132.101	86.042
	(343.63)	(284.57)	(298.54)	(274.48)	(286.86)	(284.54)	(284.64)	(288.93)
<i>No of firms</i>	70	70	70	70	70	70	70	70
<i>Observations</i>	404	404	404	404	404	404	404	404
<i>Log likelihood</i>	-36.57	-30.97	-30.75	-30.96	-30.82	-30.92	-30.94	-30.75

Robust standard errors in parentheses clustered on firm; * significant at 10%; ** significant at 5%; *** significant at 1% (two-tailed tests)

Table 3B: Marginal effects of exits on CVC Abandonment at various levels of implementation choices

Treatment variables	Marginal effects of CVC exits	Marginal effects of IVC exits
(1)		
<i>CVC utilization</i> = 0	0.031*** (0.011)	0.107** (0.052)
<i>CVC utilization</i> = 1	0.013*** (0.004)	0.058** (0.028)
(2)		
<i>Internal hires</i> = 0	0.010** (0.004)	0.143** (0.067)
<i>Internal hires</i> = 1	0.028*** (0.009)	0.097*** (0.015)
(3)		
<i>IVC hires</i> = 0	0.026*** (0.007)	0.026* (0.014)
<i>IVC hires</i> = 1	0.011** (0.005)	0.098*** (0.033)

Standard errors based on Delta-method in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1% (two-tailed tests); Marginal effects are average marginal effects and are based on estimates in Columns 2-7 in Table 3A