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## ENTREPRENEURIAL BEACONS: THE YALE ENDOWMENT, RUN-UPS, AND THE GROWTH OF VENTURE CAPITAL

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**Research summary:** This article investigates the social context of entrepreneurship in organizational sectors. Prior research suggests that firm foundings are driven by collective patterns of activity—such as patterns of prior foundings in a given sector. Building on research on social salience and signals, we consider the influence of singular sector-level triggers, which we call entrepreneurial beacons. We argue that the actions or outcomes of single, salient organizations attract and motivate entrepreneurs, thus increasing the rate of foundings. We test this logic by examining the impact of the Yale University endowment's investment choices and of venture-capital-backed IPO run-ups on venture-capital foundings between 1984 and 2011. We find support for the existence and influence of beacons and outline boundary conditions for their effects.

**Managerial summary:** What leads entrepreneurs to found new companies in nascent sectors? In contrast to prior research, which emphasizes patterns of activity, we argue that entrepreneurial activity can sometimes be driven by the actions of a singular trigger—what we call an entrepreneurial beacon. We examine the influence of two such beacons, Yale University's endowment investments and exceptional venture-capital-backed IPO run-ups, on the founding of new venture-capital firms over a 28-year period. We find that Yale's increased allocations to the venture-capital asset-class has a significant influence on the founding of new venture-capital firms, while exceptional venture-capital-backed IPO run-ups only influence venture-capital foundings under certain conditions. Overall, we offer an explanation for heretofore anecdotal accounts of certain organizations or events that appear to have an outsized influence on entrepreneurial activity. Copyright © 2016 John Wiley & Sons, Ltd.

## INTRODUCTION

Organizations do not exist in isolation; they are embedded in a social context (Anderson and Tushman, 1990; Hiatt and Park, 2013; Pfeffer,

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1997; Scott and Davis, 2007). Researchers have recently begun to examine the social context of entrepreneurship and the decision to found a new enterprise (Carnahan, Agarwal, and Campbell, 2012; Stuart and Sorenson, 2007). Such studies have elucidated how a sector's social environment influences entrepreneurial activity by shaping aspiring entrepreneurs' behaviors (Fern, Cardinal, and O'Neill, 2012) by socially constructing and labeling the concepts by means of which the sector is understood (Rao, 1994), and by convincing

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key audiences (customers, investors, and alliance partners) to support entrepreneurship (Aldrich and Fiol, 1994; Diestre and Rajagopalan, 2012; York and Lenox, 2013). But which aspect of the social environment matters most for the entrepreneurial process?

From a theoretical standpoint, existing work has been surprisingly consistent about linking entrepreneurial activity to *collective patterns* of activity in the environment. One set of collective patterns, *patterns of foundings and density*, has generated the argument that prior foundings in a sector encourage subsequent foundings (Agarwal and Tripsas, 2008; Carroll and Hannan, 2000). According to organizational ecology, the accumulation of enterprises (an increase in density) provides aspiring entrepreneurs a template that helps them explain the organizational form's function and importance to employees and potential customers (Barron, 1999). Accumulation also indicates that a sector is legitimate and offers a "fertile niche" for further activity (Baum and Singh, 1994; Singh and Lumsden, 1990), making it easier to assemble the resources to found a firm (Carroll and Khessina, 2005).

A parallel body of research argues that foundings are encouraged by *patterns of support* from influential stakeholders in related sectors. When institutional investors and legislators support a particular sector, the entire sector becomes more legitimate and conducive to entrepreneurial activity (Audia, Freeman, and Reynolds, 2006; Bruton et al., 2010; Moore et al., 2012). For example, Greve, Pozner, and Rao (2006) found that in U.S. counties with many influential nonprofit organizations, new LPFM radio stations (a related noncommercial sector) proliferated. Similarly, Hiatt, Sine, and Tolbert (2009) showed that foundings of nonalcoholic soft-drink producers were higher in states with numerous members of the Woman's Christian Temperance Union and the American Medical Association; these influential actors created a social environment hostile to alcohol and welcoming to soft-drink producers.

Also consistent with these arguments, researchers studying *patterns of institutional activism* have described how the activities of pioneers and activists within a sector encourage entrepreneurial activity. Collectively, these groups establish the social artifacts, beliefs, identities, and infrastructures that make a sector amenable to entrepreneurship (Navis and Glynn, 2010;

Raffaelli, 2015; Sine and Lee, 2009; Wry, Lounsbury, and Glynn, 2011; Wry, Lounsbury, and Jennings, 2014). For example, Weber, Heinze, and DeSoucey (2008) showed that shared cultural codes articulated by a coalition of activists in the grass-fed-meat-and-dairy industry helped convey the sector's importance and stimulate entry by new producers.

Overall, these studies offer a compelling and consistent explanation of how a sector's social environment makes it conducive to entrepreneurial foundings. They argue that a sector's collective pattern of vigorous activity (prior foundings, influential support, or activism) promotes awareness of the possibility of further foundings and persuasively establishes the legitimacy of entrepreneurial activity (Aldrich and Fiol, 1994). In other words, these various forms of collective patterns serve as signals (Spence, 1974) that influence the behavior of entrepreneurs and their supporters.

Despite the elegance of this characterization, anecdotal accounts indicate that entrepreneurs are often influenced less by collective patterns than by *singular triggers*. For example, few Internet companies existed before Netscape's IPO in 1995, but many new Internet ventures formed rapidly thereafter (Goldfarb, Kirsch, and Miller, 2007). Similarly, given Sequoia Capital's reputation for supporting "niches that blossom" (Southwick, 2001: 73), entrepreneurs and their backers pay close attention when this storied venture-capital firm makes a bet in a new technology sector. In both cases, entrepreneurs appear to be influenced more by singular triggers than by collective patterns.

This article offers an alternative conceptualization of how a sector's social environment influences new foundings. Drawing on research on signaling and social salience, we argue that singular triggers attract entrepreneurs and their supporters to specific sectors. We call these salient triggers *entrepreneurial beacons*, and identify two distinct types. An *endorsing beacon* is a singular organization that observes and monitors several sectors closely, actively supports a carefully selected subset, and is perceived as having exceptional insight into opportunities within sectors. Due to its unique standing, when it provides greater support to entrepreneurial firms, its actions raise awareness of the entire sector, not just the supported firm, and signals the sector's viability to others. A *demonstrating beacon*, by contrast, is an organization within a

given sector that has a salient and favorable outcome event that signals the sector's attractiveness.

Our empirical context is the U.S. venture-capital sector where the focal entrepreneurs are venture capitalists. Adopting a multimethod approach (Edmondson and McManus, 2007), we test the logic of our theory of entrepreneurial beacons using longitudinal data on new venture-capital firm foundings in the 1984–2011 period, profiles of early venture capitalists, and field interviews with present-day venture-capital founders. To test our concept of endorsing beacons, we show that support from Yale University's vaunted endowment for the venture-capital sector has a positive impact on the founding of new venture-capital firms that surpasses the impact of other elite endowments' collective support. To test our concept of demonstrating beacons, we examine venture-capital-backed enterprises whose IPOs experience a dramatic increase in stock price.

## THEORY AND HYPOTHESES

Past research has asserted that collective patterns of activity alert entrepreneurs to a given sector and enhance its legitimacy, leading to increased foundings (Hiatt *et al.*, 2009; Rao, 2004). But many anecdotal accounts of founding decisions are difficult to reconcile with this logic (Livingston, 2007). The Netscape and Sequoia Capital examples both suggest a different dynamic, based on the influence of singular triggers, and a compelling body of cognition research identifies singular triggers as key motivators of attention and action (Fiske and Taylor, 1991). Accordingly, we argue that certain organizations—due to their unique characteristics and via their actions—shape the entrepreneurial process.

### Entrepreneurial beacons: signals and salience in a social context

We define an entrepreneurial beacon as a single organization that attracts widespread attention due to its social salience, and that signals the prospects for entrepreneurship within a sector it occupies or supports. Its actions are interpreted as signals of viability, and viability, in turn, constitutes both a resource component (resources will be available to new entrants) and an opportunity component (new entrants will have opportunities

to prosper). Because an entrepreneurial beacon is socially salient, its signals are conspicuous to the degree that "all eyes have a single target" (Fiske and Taylor, 1991: 248); it captures the near-universal attention of audiences in and around the sector.

By definition, an entrepreneurial beacon's actions must be perceived as a credible signal of the sector's potential for entrepreneurship. When information is limited and asymmetrically distributed, signals that are correlated with otherwise unobservable qualities reassure market participants about purchasing a product (Podolny, 1993; Spence, 1974), forming an alliance (Pollock and Gulati, 2007), enacting a competitive move (Chen *et al.*, 2010), or supporting a new enterprise (Stuart, Hoang, and Hybels, 1999). Such signals may be persuasive to would-be entrepreneurs and supporters when uncertainty prevails about the prospects for entrepreneurship due to uncertain demand in the sector or competition. Prior research suggests, however, that a signal's impact is limited to audiences that are attentive to it (Greve, 2008), which is why social salience matters.

An organization possesses social salience to the extent that it stands out relative to other organizations in the environment (Fiske and Taylor, 1991). One driver of salience is *contextual novelty*; novel, unanticipated, and extreme properties or behaviors elicit more attention than their more mundane counterparts (Haunschild and Miner, 1997; Hoffman and Ocasio, 2001; Rindova, Pollock, and Hayward, 2006). Another driver is *vividness*: audiences attend more closely to phenomena (exemplars) whose public representations are clear, concrete, and amenable to succinct and vivid description (Nigam and Ocasio, 2010). Entrepreneurial beacons exhibit both characteristics, and are thus evocative by vividly standing out in their context.

Social salience elicits attention to the signals arising from an organization's actions and influences what audiences notice (Hoffman and Ocasio, 2001; Rindova *et al.*, 2006). People are also more likely to process and recall information originating with salient actors (McGill and Anand, 1989). Thus, social salience is apt to amplify an entrepreneurial beacon's signalling actions since audiences are more likely to notice such signals and to contemplate their implications. These salient signals may have both pull and push effects: pulling would-be entrepreneurs and resource providers to a sector by encouraging them to further consider the potential opportunities in a sector, and pushing those already interested in a sector to

finally commit. Much as the light emitted from a lighthouse captures the attention of ship captains and influences their course, an entrepreneurial beacon's actions attract the attention of aspiring entrepreneurs and influence their founding decisions.

### Endorsing beacons

We have defined an endorsing beacon as an organization that closely observes and monitors numerous sectors, actively supports a certain number of them (e.g., by investing in them), and is perceived as having exceptional insight into opportunities within sectors.<sup>1</sup> Such organizations are widely recognized as effective identifiers of future trends, either lending support to sectors that later take off or withdrawing support from sectors whose early promise wanes. An example is Sequoia Capital, a venture-capital firm that has achieved unique standing by backing successful entrepreneurial companies in several industries. When Sequoia invests, it does not merely benefit the recipient company; it also signals Sequoia's belief in the sector's viability.

An endorsing beacon is likely to influence entrepreneurial foundings in a sector in several ways. First, endorsing beacons' preexisting reputations for backing sectors that continue to grow suggest that their skills and/or networks enable them to identify a promising sector despite prevailing uncertainty about its prospects. Accordingly, an increase in an endorsing beacon's support for a sector is a credible signal of its viability and promise. Second, having already won recognition for bucking prevailing norms and expectations, endorsing beacons are viewed as novel. Furthermore, their singularity and conspicuousness are apt to make their actions vivid in observers' minds. A shift in an endorsing beacon's support for a sector thus serves as a focal point for a large and diverse audience's attention, and is likely to prompt potential founders and their backers to seek

information relevant to the signal of viability and to reinforce predispositions toward founding in the sector.

Accordingly, we expect entrepreneurs and their backers to monitor endorsing beacons' actions, to follow their media coverage, and to discuss shifts in their support for a sector. Increases in an endorsing beacon's support for a sector may thus instigate further entrepreneurship both directly (when potential entrepreneurs decide to enter the sector) and indirectly (when entrepreneurial backers attend to beacons that increase their willingness to support more entrepreneurs in a sector). We thus argue—as a complement to the collective patterns logic, which posits that it takes many influential endorsements to encourage foundings—that the supporting actions of a *single* endorsing beacon can trigger entrepreneurial activity in a sector.

*Hypothesis 1: The endorsement of a single salient organization will generate an increase in the rate of foundings above and beyond prevailing collective patterns of foundings and support in the endorsed sector.*

### Demonstrating beacons

We have defined a demonstrating beacon as an enterprise whose exceptional outcome or event is viewed as a signal of its sector's attractiveness. Unlike an endorsing beacon, which triggers foundings by acting on its favorable assessment of a given sector's future viability, a demonstrating beacon signals viability by manifesting its own achievement. In other words, its outcome tends to persuade entrepreneurs and key constituencies that they too can experience something similar in the sector. By definition, exceptional outcomes are contextually novel—far outstripping more ordinary results in the sector. Moreover, demonstrating beacons are likely to be vivid, serving as memorable shared reference points that are readily and repeatedly invoked in conversation. An example is Netscape, a startup whose high-profile public offering was seen as a precursor of the first Internet boom. Netscape's IPO drew attention as indicative of its capture of a major opportunity in the Internet sector, signaling the sector's viability to diverse audiences.

We argue that, like those of endorsing beacons, demonstrating beacons' salient signals of viability promote foundings. By exhibiting an exceptional but presumably imitable outcome, a demonstrating

<sup>1</sup>We distinguish endorsing beacons from related constructs such as status and prominence, which affect perceptions of an organization. *Status* refers to social deference, embodied in and influenced by a firm's pattern of affiliations; as a socially constructed concept, status may be only loosely coupled with an organization's past behaviors (Chandler et al., 2013; Rindova, Pollock, and Hayward, 2006). *Prominence* is the “collective knowledge about and recognition of a firm” (Rindova et al., 2005: 1035). A key distinguisher of endorsing beacons is that they are perceived as having exceptional insight into opportunities within a sector.

beacon signals to entrepreneurs and their potential backers that they too can benefit by founding or supporting new enterprises in the sector. And because individuals and organizations tend to look to conspicuous exemplars (Haunschild and Miner, 1997), such events are likely to be noticed and remarked on throughout the sector. Furthermore, a concrete demonstration of opportunity capture (Nigam and Ocasio, 2010) is apt to be especially persuasive to entrepreneurs and their backers. Even if a demonstrating beacon is deemed a noisy signal, it may still spur new foundings and support by rendering information about it concrete, and easy to process and recall (much as a conspicuous billboard celebrating a lottery winner prompts both habitual lottery players and nonplayers to consider buying tickets). Departing from the logic of collective patterns, which posits that multiple foundings beget new foundings, we argue that a single demonstrating beacon's signal can trigger foundings.

*Hypothesis 2: A single organization's salient outcome will generate an increase in the rate of foundings in its sector above and beyond prevailing collective patterns of foundings and support.*

### The relative influence of endorsing and demonstrating beacons

Endorsing and demonstrating beacons are both likely to spur new foundings. However, our logic suggests that in many contexts, including ours, there are several reasons to expect endorsing beacons to have a greater magnitude effect than demonstrating beacons. First, in environments with moderate dynamism and lags between foundings, endorsing beacons may offer a more reliable signal of current opportunity in a sector. That is, a demonstrating beacon arises from an exceptional outcome by an enterprise *already in the sector*. Yet, there may be a lag between when that enterprise was founded and its success; the underlying attractiveness of the market and the availability of resources may have changed considerably as new competitors have entered and potential investors have committed resources with other enterprises. By contrast, an endorsing beacon signals that a supporting organization with a track record of accurate forecasting views *future* opportunities in the sector positively. To entrepreneurs and their backers, an endorsing beacon's support serves as a stamp of

forward-looking approval—an indicator of belief in the sector's continuing viability (in terms of both resource availability and opportunity). In other words, endorsing beacons may be expected to offer a more insightful and credible signal predicting the *current* attractiveness of a sector for both entrepreneurs and resource providers.

The second reason we expect endorsing beacons to have a greater magnitude of effect on foundings is that they are more likely to trigger resource availability that alleviate the resource constraints that inhibit foundings. Because an endorsing beacon is forward-looking and resembles other resource providers, its increased support for a sector may be especially likely to capture the attention of other resource providers. Accordingly, in contexts where entrepreneurs are highly resource-constrained and normally have trouble attracting sufficient resources for their ventures (Aldrich and Fiol, 1994; Stinchcombe, 1965), we expect endorsing beacons to have a particularly dominant effect on subsequent foundings. Overall, just as a political candidate's prospects may be indicated more clearly by a key endorsement than by a strong debate performance, an endorsing beacon in dynamic and resource-constrained environments is likely to provide a more reliable and impactful signal of a sector's long-term prospects than a demonstrating beacon's short-term results.

*Hypothesis 3: In dynamic and resource-constrained environments, a single salient organization's support for a sector will have a stronger influence on its founding rate than will a single company's favorable outcome.*

## METHODS

### Sample and data sources

To test our theory, we analyzed foundings of private U.S. venture-capital firms between 1984 and 2011. Following Wasserman (2002), the entrepreneurs in our sample are founders of new venture-capital firms, or alternatively, "the investor acting as entrepreneur and seeking a return from effort and ideas as well as capital" (Wilson, 1985). Venture-capital firms typically offer young startups financial capital, advice, and status in exchange for equity and certain board-control rights (Gorman and Sahlman, 1989; Matusik and Fitza, 2012;

Wasserman, 2008). They obtain the capital they invest in startups from financial investors known as limited partners. Venture-capital firms seek returns well above those of investments in public markets; thus, they have become a frequent investment choice for a variety of institutions, including university endowments (Hochberg, Ljungqvist, and Lu, 2007; Kaplan and Schoar, 2005). Venture-capital firms earn revenues from management fees (typically, 2% of assets) and from a share of their investment profits (typically, 20%) (Gompers and Lerner, 1999; Gorman and Sahlman, 1989). The latter source of revenue—the most lucrative—is generated when a venture-capital firm's portfolio companies go public or are acquired.

The venture-capital setting satisfies several assumptions useful for testing our theory. First, uncertainty prevails about the attractiveness of founding a new venture-capital firm; thus, potential entrepreneurs look to external indicators (e.g., endorsing and demonstrating beacons) for help in determining a sector's conduciveness to founding. Second, entrepreneurs in the sector are linked to supportive resource providers. A new venture-capital firm cannot be "bootstrapped"; it requires external funds, and funding depends on, in turn, backers' (limited partners') assessments of their likelihood of success. Third, limited partners' (that is, endorsing beacons') returns depend on the sector's opportunities; thus, their support can be interpreted as evidence of belief in the sector's future viability. Parenthetically, we focused on venture capitalists rather than on other types of investors such as corporate venture capitalists who may pursue benefits other than financial return (e.g., access to technology) (Hallen, Katila, and Rosenberger, 2014; Pahnke, Katila, and Eisenhardt, 2015a).

We focused on venture-capital firm foundings between 1984 and 2011, a period during which third parties had begun to collect pertinent data. Systematic data on university endowments' allocations (which we use to measure endorsing beacons' support) are available beginning in 1983; data on venture-capital returns (an important control variable for the financial climate) are available after 1981. We restricted our sample to foundings during and after 1984 to allow for a one-year lag in estimated models. We chose this lag based on our interviews with would-be venture-capital founders, who stated that although beacons were noticed relatively quickly, it took some time for founders to act on the

signal—to hire people and raise the necessary funds from limited partners to found a venture-capital firm and begin investing in startups (which our field-work indicated could be especially challenging at times). These observations are consistent with practitioner accounts that detail the institutional features of the venture-capital sector (Ramsinghani, 2011) and that describe the process that aspiring venture capitalists follow: raising capital from limited-partner investors, hiring people, and completing the necessary legal work to register the firm and fund. This informed the one-year lag structure used in our study. One-year lags are also common in organizational studies of foundings (i.e., Baum and Singh, 1994). As described in the robustness tests, we also ran our models with longer lag periods. Our time period restriction also ensured that the entire sample postdates the U.S. Department of Labor's clarification of its 1979 "prudent-man rule," which allowed pension-fund managers to invest in high-risk assets, including venture capital. This important regulatory change preceded the modern form of venture-capital firms (note that additional robustness tests starting in 1980 and omitting variables missing values in early years produced results consistent with those reported). Finally, we excluded firms founded after 2011 (to avoid undersampling recently founded firms) and non-U.S. firms (to prevent variation in regulatory environments from introducing unobserved heterogeneity).

Though our sample captured a significant portion of the evolution of the venture-capital industry, data limitations restricted our analysis to a time period unrepresentative of the industry's entire life cycle.<sup>2</sup> Our study period did not include the emergence period, which began in the 1940s and included the formation of the first venture-capital limited partnership in 1959. This period is well documented both historically (Hsu and Kenney, 2005) and theoretically (Pacheco, York, and Hargrave, 2014; Suarez, Grodal, and Gotsopoulos, 2015) in other research. Instead, we examined the period after the emergence of the "dominant design" (Garud, Jain, and Kumaraswamy, 2002), or predominant organizational model: the limited partnership.

<sup>2</sup>The concept of an industry life cycle is attributable to a theoretical model in which industries progress through predictable stages: emergence, growth, maturity, and decline (Abernathy and Utterback, 1978; Klepper, 1996). Our sample does not cover the life cycle's front end. (See Suarez *et al.*, 2015, for a study that does so.)

Our primary source of data was the VentureXpert database, which compiles information on venture-capital firms' founding date, location, investment focus, capital under management, and investment history. The industry's primary trade group, the National Venture Capital Association, gathers and updates the data in VentureXpert directly from venture-capital firms on an ongoing basis. VentureXpert data have been shown to provide a highly accurate representation of U.S. venture-capital firms and their activities (Kaplan, Sensoy, and Strömberg, 2002), and has been used extensively in prior research (Guler, 2007; Hallen, 2008; Pahnke *et al.*, 2015b). We included firms classified as "private equity firm investing its own capital," and excluded those focused on later-stage investments and buyouts (which our fieldwork revealed to be private equity, not venture capital). In total, we gathered information on the founding of 1,283 new U.S. venture-capital firms between 1980 and 2011.

#### *Endorsing beacons: the Yale endowment*

In the venture-capital context, endorsing beacons are drawn from the limited-partner investors, such as university endowments, that provide capital for investment (Gompers and Lerner, 2001a; Rider, 2009). The special importance of university endowments as limited partners is well documented.<sup>3</sup> Discussions with venture-capital founders and limited-partner investors led us to identify Yale University's endowment as the key endorsing beacon in the venture-capital sector. The Yale endowment fits the definition of an endorsing beacon as being perceived as having exceptional insights into opportunities within sectors it supports; it also exhibits the markers of social salience, notably contextual novelty within the asset-management industry, where it has attracted widespread attention for its novel approach to investing and its support for alternative

asset sectors. Early on, Yale boldly shifted away from stocks and bonds into higher-yielding illiquid assets, including venture capital and real assets (Golden and Nolan, 2009). This aggressive and unorthodox investment strategy "bucked the trend" (*Economist*, 2000) by deviating from the prevailing norm that endowment money "should be invested conservatively" (Myers, 2009). Now known as "the Yale model," this investment approach is the subject of a popular business school case study (Lerner and Light, 1995). Yale's chief investment officer has been called "one of the greatest investors of all time" by Warren Buffet (Rose, 2009), "one of only a handful of investment geniuses on the planet" by Vanguard Group founder John Bogle, and "the best in the business" by Harvard's former endowment manager, Jack Meyer (Fabrikant, 2007). Because Yale does not court the media and the CIO is "ambivalent about promoting himself," the salience of the Yale model remains largely confined to audiences in the investing world (Fabrikant, 2007).

Informed audiences pay close attention to Yale's actions. Like other endowments, Yale routinely reports its asset-allocation targets, making its decisions public information. An investment professional at an elite university endowment told us that his colleagues routinely download the Yale endowment report immediately after its release and review its most recent allocations. "Yale's investment process is closely watched in the asset management world," *The Economist* has reported. "Its portfolio is now one of the most closely scrutinized in the country" (*Economist*, 2000). One group that pays attention is other asset managers, including university endowments, which are potential backers of entrepreneurial firms. "In the endowment world, going to see [Yale's CIO] for advice is like going to the pope," one Ivy League asset manager commented. An industry analyst concurred: "Yale is the bellwether and the benchmark against which every endowment measures itself" (Fabrikant, 2007). A second audience consists of venture capitalists and aspiring venture-capital firm founders. Because analysts have concluded that "[Yale's] private equity experience—venture capital in particular—is the unique source of its excess returns" (Mladina and Coyle, 2010), the endowment's investment decisions have become a *de facto* signal of the viability of the venture-capital sector.

Confirming the importance of Yale's "imprimatur" (Kedrosky, 2005), such prominent venture-capital founders as Bill Gurley (Benchmark

<sup>3</sup>As venture capitalist Dana Mead, of Kleiner, Perkins, Caufield, and Byers, remarked: "[Venture capital] went from a very small boutique industry to an asset class. And how did that happen? It was really driven by university endowments . . . And what they saw was . . . you need to have part of that allocation in venture capital. That wasn't a big allocation—it was two to three percent—but they said you needed to have venture capital. And so those endowments really drove the growth of the industry" (Speech given at Stanford University, November, 16, 2011, available at <http://ecorner.stanford.edu/authorMaterialInfo.html?mid=2841>).

Capital), Marc Andreessen (Andreessen-Horowitz), and Igor Sill (Geneva Venture Partners) have publicly acknowledged monitoring Yale's asset allocations as a leading indicator of the sector's future and of favorable timing for entry (Andreessen, 2007; Gurley, 2009; Sill, 2011). One venture capitalist who recently founded a firm acknowledged that she was more strongly influenced by Yale's actions, given its "focus on generating returns over long cycles," than by those of limited partners that provide "hot money that flows in and out of investment strategies based on the latest fad or short-term past performance." Every founder we interviewed identified Yale as a standout limited partner in the venture-capital asset class. To corroborate this insight from our field-work, we followed Pollock and Rindova (2003), and counted references to university endowments in periodicals that discuss venture-capital activity. Under a variety of scenarios, Yale's endowment garnered many more mentions than other endowments included in our study. Compared to other elite endowments (and other limited-partner investors), only the Yale endowment met our criteria for an endorsing beacon.<sup>4</sup>

We gathered data on the percentage of its endowment that Yale allocated to the venture-capital asset class. To ensure that Yale was truly a beacon, and not merely a representative of a broader trend, we also sought to ascertain other influential actors' collective support of venture capital. Thus, we gathered data on the average percentage allocation to venture capital of the top 20 university endowments (by size), and on total investment dollars that flowed into venture capital. Our field-work indicated that the largest endowments were the relevant comparison group; our informants suggested, furthermore, that those endowments tended to be more sophisticated than others, and were better able to attract an experienced staff capable of allocating to the venture-capital asset class. We collected annual endowment allocation data from Yale's reports, available on its website, and from the NACUBO (National Association of College and University Business Officers) Endowment Study, a

yearly survey of endowments' operations, including size, investment performance, and asset allocations. Because endowment data are only available for the period after 1983, we restricted analyses involving endorsing beacons to foundings occurring after that year to allow for a one-year lag.

### *Demonstrating beacons: venture-capital-backed IPOs*

A demonstrating beacon, is an enterprise whose salient outcome events signal its sector's current attractiveness. Venture capitalists told us that high-profile public offerings tend to attract attention; as one early venture capitalist pointed out, "The ultimate goal [for portfolio companies] ... was to go public" (Myers, 2009: 43). Prior research on IPOs has also noted the attention garnered by firms that experience a dramatic first-day run-up in their stock price (Loughran and Ritter, 2004). Exceptionally large IPO run-ups generate substantial media attention and customer interest (Demers and Lewellen, 2003; Pollock, Rindova, and Maggitti, 2008) and elicit unusual coverage by stock analysts (Aggarwal, Krigman, and Womack, 2002; Cliff and Denis, 2004). In theoretical terms, an IPO run-up is contextually novel—an extreme increase in an offering price stands out from normal stock movements—and distinctive,<sup>5</sup> and represents a concrete demonstration of capturing an opportunity. As one venture-capital founder observed, "High-profile venture-[capital]-backed IPOs have a tendency to attract more people to VC ... [IPO] exit events are good for VC. So when noticeable exits happen, more people want to be in VC."

Our informants also emphasized the signal generated by a high-profile IPO, suggesting that the value of a single IPO may mean the difference between the parent venture-capital firms having below-average or top-tier performance. Thus, our focal demonstrating beacons were venture-capital-backed enterprises whose IPOs experience dramatic stock-price run-ups. Following prior work in finance (Ritter, 2012), we defined a *run-up* as a doubling (or greater) of the price

<sup>4</sup>We ascribed the role of endorsing beacon to Yale independently of entrepreneurs' characterizations of it. We defined beacons theoretically (not empirically) by drawing on research on signaling and social salience. This enabled us to avoid a tautological stance. Employing these theoretical criteria, we could then identify organizations that occupy a similar position in other contexts—an exercise we undertake later in the article.

<sup>5</sup>Pollock and Gulati (2007: 344) asserted that a run-up is a "useful signal ... likely to be salient because it is figural; that is, it stands out against the background of most stock price movements because of its extremity." They added that run-ups that "substantially exceed the norms for the period are considered noteworthy and attract attention."

of an offering on its first day of trading. Because some of our robustness tests include venture-capital foundings between 1980 and 2011, we gathered data on IPO run-ups between 1979 and 2010 to allow for a one-year lag between explanatory variables and firm foundings. Because some of our control variables and robustness tests utilized general IPO information, we gathered data on IPOs from the Securities Data Corporation's (SDC) new-issue database, frequently used in prior studies (Loughran and Ritter, 2004; Podolny, 1994). In total, we gathered data on 7,793 IPOs between 1979 and 2010.

### *Qualitative data*

For purposes of contextual orientation, we reviewed articles about the Yale endowment and about venture-capital-backed IPO run-ups from such prominent news outlets as *The New York Times*, *The Wall Street Journal*, and *BusinessWeek*. To gain sensitivity to contextual factors that may have influenced founders in the sector, we read oral histories of early venture capitalists. We also conducted 15 semi-structured interviews, 12 with founders of venture-capital firms and 3 with university endowment managers. These interviews had two objectives: (1) to gain further understanding of the context of the statistical results, and (2) to clarify the mechanisms whereby social environments may (or may not) have motivated would-be founders. This qualitative data, in conjunction with quantitative data on venture-capital foundings, IPO run-ups, and endowment allocations, contributed to the assembly of a rich multimethod dataset.

### **Measures**

Following prior studies (Cattani, Pennings, and Wezel, 2003; Greve *et al.*, 2006), our dependent variable was an event count of the number of U.S. venture-capital foundings in each quarter.

### *Independent variables*

We selected the Yale endowment as our focal endorsing beacon to test Hypothesis 1. We constructed this variable, *Yale endowment's % VC allocation*, as the percentage of Yale's endowment allocated to venture capital.<sup>6</sup> We considered using

<sup>6</sup>We focused on the % allocation rather than the change in Yale's allocation, since our fieldwork indicated that would-be

the absolute amount of assets allocated and then controlling for total assets, but opted to use a percentage because our informants emphasized that number as the key signal of Yale's support for venture capital relative to other asset classes. This measure was consistent with the endorsing-beacon construct. To better isolate the singular influence of the Yale endowment, we also included a corresponding collective-support measure, described in the section on control variables.

To test Hypothesis 2 on demonstrating beacons, we created a dummy variable that indicated whether a given venture-capital firm's portfolio company went public and experienced a doubling (or more) between its issue price and its closing price on the first day of trading (Loughran and Ritter, 2004; Pollock *et al.*, 2008; Ritter, 2012). Thus, the variable *VC-backed IPO run-up* has a value of one if at least one venture-capital-backed company went public and experienced a run-up during the quarter. As in the case of endorsing beacons, we also included a corresponding collective-pattern measure to distinguish the influence of demonstrating beacons. This measure is described in the section on controls.

### *Control variables*

Prior theory proposes collective patterns of activity, in the form of prior foundings (or more precisely, the set of recently founded organizations that have survived in the sector) as the main driver of the number of new foundings in the sector (Carroll and Hannan, 2000; Sine, Haveman, and Tolbert, 2005). Thus, to measure the legitimacy influence of collective patterns of activity on the part of similar firms, we included *VC firm density* as a measure of the total number of U.S. venture-capital firms that existed in a given quarter.<sup>7</sup> We also included the square of density, *VC firm density*<sup>2</sup>, to account for curvilinear effects. We calculated U.S. venture-capital firm density using the primary sample from VentureXpert of venture-capital foundings. We identified as defunct those firms listed as

venture-capital founders often attended to its allocation relative to broad and relatively persistent industry norms (e.g., an allocation of 8% or more was always viewed as indicating a strong outlook in the venture-capital sector). As a robustness check, we also ran estimates using the change in the venture-capital allocation of Yale's endowment and our results were highly similar.

<sup>7</sup>We considered including a general time trend, but found this measure to have a 0.98 correlation with venture-capital firm density. Accordingly, and for consistency with prior research, we include only *VC firm density* in reported models.

“defunct,” “inactive or unknown,” and “making few if any new investments,” and corroborated deaths by cross-checking the date on which a firm made its last investment. This data were collected from VentureXpert. To reduce possible multicollinearity bias between linear and quadratic measures of density, we followed prior work and orthogonalized the quadratic density measure relative to the linear component using the Gram-Schmidt procedure and the *orthog* command in Stata.

As noted, we included corresponding collective-pattern measures to better isolate our beacons’ singular influence. We constructed one of these variables, *Top 19 endowments’ % VC allocation*, as the average percentage allocation to venture-capital firms of the largest university endowments (the top 20, excluding Yale) by amount of capital managed by the endowment. Including this measure in our models helped distinguish between the actions of an endorsing beacon, the Yale endowment, and the supporting actions of several other elite university endowments. Empirically, this measure helped distinguish our hypothesis about the singular impact of endorsing beacons from past explanations of foundings as influenced by collective patterns of support (Baum and Oliver, 1992; Greve *et al.*, 2006). We considered including each of the other endowments separately, but their allocations were often highly correlated with one another (and with other control variables). Thus, we reported the average allocation of other elite endowments to avoid potential multicollinearity bias in the estimates.

To distinguish the influence of a singular demonstrating beacon from that of a broader trend in financial markets, we also included *Additional VC-backed IPO run-ups*. This second collective-pattern measure captured the presence of a broader pattern of salient events in the venture-capital sector. It is measured as the count of venture-capital-backed IPOs in a given quarter, after the first, that experienced at least a run-up. (That is, if three venture-capital-backed IPO run-ups occurred in a given quarter, then *VC-backed IPO run-ups* = 1 and *Additional VC-backed IPO run-ups* = 2; if there was only one such IPO, then *VC-backed IPO run-ups* = 1 and *Additional VC-backed IPO run-ups* = 0.) Counting only the additional IPO run-ups beyond the first helped reduce multicollinearity and enabled us to better distinguish between periods characterized by a single demonstrating beacon and periods characterized by a pattern of beacons.

We also sought to account for other potential drivers of foundings in order to rule out alternative explanations. One of these explanations was that a favorable economic climate encourages the founding of new venture-capital firms. Accordingly, we included three measures of economic favorability that build on prior organizational and financial research on the venture-capital industry. First, we controlled for “heat” in the market for venture-capital-backed IPOs and the prevailing perception of opportunities for venture-capital firms (Gulati and Higgins, 2003; Sorenson and Stuart, 2008) by measuring the number of IPOs that were venture-capital-backed during the quarter (*Number of VC-backed IPOs*). Second, because recent attractive financial returns to venture capital may attract both potential founders and potential backers (Gompers and Lerner, 2001b), we controlled for the average quarterly return of venture-capital firms to their limited partners (*VC returns*). For this measure, we used the Cambridge Associates venture-capital index, a highly reliable indicator of returns in the industry. Third, given that the viability of new venture-capital firms depends on the availability of investment capital, we included the amount of capital (in \$ billions) flowing into the venture-capital industry on a quarterly basis (*Net VC Inflows*). Though this measure exhibited some skew, we included it in its original form because the logged measure exhibited higher correlation (0.76) with *VC-firm density* (i.e., including the unlogged version provides more unique information relative to other controls; alternative robustness tests run using the logged measure, however, yielded nearly identical results). We also accounted for the opportunities available to new venture-capital investors by including a measure for *Number of Total VC Deals*, which represented the total number of annual venture-capital “deals” as reported by the National Venture Capital Association Yearbook. The values for this variable were not available for the first two years of our sample; thus, results for those years were subject to listwise deletion. To prevent this loss, we imputed the missing values with predicted values from the regression of the *Number of Total VC Deals* on all the nonmissing regressors. The results of our reported analysis were essentially equivalent to models run without the missing observations.

Finally, our interviews with venture-capital partners and tax accountants informed us that aspiring venture-capital founders tend not to leave their

current employment in the fourth quarter because of (1) tax regulations on individual partners and (2) the prospect of forgoing year-end bonuses. New venture-capital firms are most likely to be founded in the first quarter for these reasons and due to the internal budget cycles of limited partners (i.e., endowments). Accordingly, to account for seasonal variance in the founding rates of venture-capital firms, we included quarterly dummy variables with the first quarter as the omitted variable.

## Analysis

Our dependent variable is an event count of the number of foundings in a quarter. This focal dependent variable is a count variable that takes on only discrete, nonnegative values. In line with existing approaches to estimating founding rates, we rely on event-count models. Given the underlying data-generating process, Poisson methods are appropriate (Long, 1997). The count variable, however, exhibits overdispersion such that the conditional variance exceeded the conditional mean. Consistent with similar studies (i.e., Baum and Oliver, 1992), we use the negative binomial model, which includes a gamma-distributed term to account for such overdispersion. While the variables generally exhibit low correlation, *Number of Total VC deals* exhibits high correlation with

*Top 19 Endowments' % VC Allocation, Net VC Inflows, and VC Firm Density* (0.86, 0.87, and 0.72, respectively); accordingly, we include in our regression equations a version of venture-capital deals that was orthogonalized relative to these other measures using Stata's *orthog* command (thus, ensuring a correlation of 0). Likewise, since *Net VC Inflows* exhibits high correlation with *Top 19 Endowments' % VC Allocation* ( $r=0.78$ ), we orthogonalize *Net VC Inflows* with respect to *Top 19 Endowments' % VC Allocation*. We present the unorthogonalized versions of these measures in the descriptive statistics for clarity. Finally, given the moderate degree of correlations in some of the independent measures, we test for multicollinearity in the models and find that all variance inflation factors (VIFs) are less than the traditional threshold of 10, indicating that the reported models are unlikely to be biased by multicollinearity.

## RESULTS

Table 1 presents descriptive statistics and correlations for the variables in the analysis. On average, 11 new venture-capital firms were founded during each quarter. Across the total time period of our study, the Yale endowment's average allocation to venture capital was just over five percent of

Table 1. Descriptive statistics and Pearson correlations

Variable	Mean	Std. Dev.	Min.	Max.	1	2	3	4	5	6	7	8	9
1. VC Firm Foundings (lagged 1 year)	10.83	18.68	0.00	109.00									
2. VC Firm Density/100	5.57	3.00	1.58	10.32	0.13								
3. Number of VC-backed IPOs/100	0.24	0.21	0.00	0.87	0.05	-0.18							
4. VC Returns	0.04	0.11	-0.19	0.84	0.17	-0.07	0.63						
5. Net VC Inflows/1000 <sup>a</sup>	3.92	5.05	-0.83	27.65	0.13	0.48	0.32	0.32					
6. Number of Total VC Deals <sup>b</sup>	686.82	422.10	140.76	2160.00	0.20	0.72	0.23	0.27	0.87				
7. Yale Endowment's % VC Allocation	5.26	2.67	1.50	12.50	0.36	0.34	0.54	0.46	0.54	0.64			
8. Top 19 Endowments' % VC Allocation	3.77	2.26	0.90	12.70	0.19	0.58	0.31	0.12	0.78	0.86	0.66		
9. VC-Backed IPO Run up (Dummy)	0.17	0.38	0.00	1.00	0.23	0.01	0.56	0.49	0.47	0.44	0.69	0.50	
10. Additional VC-Backed IPO Run ups (Count)	1.23	5.03	0.00	33.00	0.24	0.11	0.58	0.75	0.58	0.59	0.54	0.52	0.54

<sup>a</sup> Given Net VC Inflows' high correlation with Top 19 Endowments' % VC Allocation ( $r=0.78$ ), we include in our regression models a version of this measure that has been orthogonalized using the Gram-Schmidt procedure.

<sup>b</sup> Given Number of Total VC Deals high correlations with VC Firm Density ( $r=0.72$ ), Net VC Inflows ( $r=0.87$ ), and Top 19 Endowments' % VC Allocation ( $r=0.86$ ), we include in our regression models a version of this measure that has been orthogonalized relative to these other measures using the Gram-Schmidt procedure (Cohen *et al.*, 1983; Hiatt *et al.*, 2009; Saville and Wood, 1991; Sine *et al.*, 2005).

total assets; this allocation ranged, however, from 1.5 percent to 12.5 percent. Large increases in the first-day offering price (*VC-backed IPO run-ups*) occurred in roughly 17 percent of quarters. We plotted quarterly venture-capital firm foundings and industry density over the sample time period and found that density alone does not account for annual oscillations in foundings.

Table 2 reports the results of the negative binomial estimates predicting the number of quarterly venture-capital foundings. Model 1 in Table 2 represents a baseline model of control variables only. Overall, these results are largely consistent with the prior organizational research on sector-level

foundings (Sine *et al.*, 2005) and with finance research on the venture-capital industry (Gompers and Lerner, 2004).

Model 2 introduces the endorsing-beacon variable: the support provided to venture capital by Yale (*Yale endowment's % VC allocation*). Hypothesis 1 posits that the support of a salient organization leads to an increase in the founding rate in the endorsed sector. As predicted, the coefficient for *Yale endowment's % VC allocation* is positive and significant in Model 2 ( $p < 0.01$ ). The coefficient remains positive and significant ( $p < 0.01$ ) after including the demonstrating-beacon measure in the full Model 4. Our results thus offer strong support for Hypothesis

Table 2. Negative binomial estimates of the number of venture-capital firm foundings

	Model 1	Model 2	Model 3	Model 4
VC Firm Density/100 <sup>a</sup>	0.444*** (0.123)	0.227** (0.112)	0.484*** (0.113)	0.269** (0.115)
VC Firm Density^2/10^4 <sup>a</sup>	-0.631*** (0.142)	-0.273* (0.143)	-0.527*** (0.116)	-0.256* (0.138)
Number of VC-backed IPOs/100	-0.542 (0.502)	-0.785* (0.461)	-0.501 (0.483)	-0.717 (0.464)
VC Returns	1.628 (1.375)	0.429 (1.208)	1.009 (1.202)	0.252 (1.139)
Net VC Inflows/1000 <sup>b</sup>	0.165** (0.083)	0.189** (0.088)	0.167** (0.073)	0.188** (0.082)
Number of Total VC Deals <sup>c</sup>	0.116 (0.077)	0.078 (0.071)	0.092 (0.074)	0.072 (0.070)
Quarter 2	-2.450*** (0.181)	-2.400*** (0.167)	-2.469*** (0.176)	-2.418*** (0.165)
Quarter 3	-2.778*** (0.183)	-2.726*** (0.168)	-2.754*** (0.176)	-2.718*** (0.166)
Quarter 4	-3.185*** (0.193)	-3.098*** (0.201)	-3.162*** (0.181)	-3.091*** (0.192)
Top 19 Endowments' % VC Allocation	0.033 (0.056)	-0.038 (0.050)	-0.024 (0.055)	-0.058 (0.051)
Additional VC-Backed IPO Run ups (Count)	-0.008 (0.032)	-0.001 (0.025)	-0.006 (0.029)	-0.000 (0.024)
Yale Endowment's % VC Allocation		0.195*** (0.040)		0.173*** (0.041)
VC-backed IPO Run-up (Dummy)			0.626*** (0.221)	0.297 (0.201)
Constant	3.213*** (0.214)	2.608*** (0.228)	3.341*** (0.202)	2.737*** (0.239)
In(alpha) constant	-1.407*** (0.217)	-1.941*** (0.267)	-1.640*** (0.240)	-2.057*** (0.309)
Observations	112	112	112	112
Log-likelihood	-269.902	-259.342	-266.562	-258.532
Chi2	519.535	639.087	628.132	706.788

<sup>a</sup> The linear and quadratic terms of *VC Firm Density* were orthogonalized relative to one another using the Gram-Schmidt procedure (Cohen *et al.*, 1983; Hiatt *et al.*, 2009; Saville and Wood, 1991; Sine *et al.*, 2005).

<sup>b</sup> *Net VC Inflows/1000* has been orthogonalized relative to *Top 19 Endowments' % VC Allocation* using the Gram-Schmidt procedure.

<sup>c</sup> *Number of Total VC Deals* has been orthogonalized relative to *VC Firm Density/100*, *Net VC Inflows/1000*, and *Top 19 Endowments' % VC Allocation* using the Gram-Schmidt procedure.

\* $p < 0.10$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$ ; two-tailed test for all variables. Robust standard errors are in parentheses. All covariates are lagged one year.

1 that an increase in an endorsing beacon's support (i.e., Yale's allocation) has a positive and significant influence on the rate of venture-capital foundings.

In contrast, the collective-support measure, *Top 19 endowments' % VC allocation*, is not significant in any of the models. Taken together, these findings bolster confidence that the Yale endowment is a singular endorsing beacon and indicates that we are not simply picking up a general trend of greater venture-capital investing by elite endowments. The results are also consistent with the interviews we conducted with venture-capital founders. As one founder, that we interviewed under conditions of anonymity, observed about Yale, "There is no question that they are sought after by the VCs and managers follow their lead.... They are important to the industry, sought after and followed." Overall, the null effect of *Top 19 endowments' % VC allocation* on venture-capital firm foundings offers further support for our theory.

Model 3 introduces the demonstrating-beacon variable, *VC-backed IPO run-ups*. This measure indicates whether a venture-capital firm invested in a company that experienced a run-up in its stock price at IPO. Hypothesis 2 asserts that a salient event on the part of an enterprise in a given sector leads to an increase in the rate of foundings in that sector. The coefficient is positive and significant in Model 3 ( $p < 0.01$ ), but not in the full Model 4 that also accounts for the influence of the endorsing beacon of *Yale Endowment's % Allocation to VC*. The corresponding collective-pattern control measure, *Additional VC-backed IPO run-ups*, is not significant in any of the models. Overall, we do not find support for Hypothesis 2 that a demonstrating beacon positively influences a sector's founding rate. We return to this hypothesis in the Additional Analyses section.

Finally, the full model (Model 4) compares the influence of endorsing and demonstrating beacons on founding rates. Because the coefficient for *Yale endowment's % VC allocation* is positive and significant in the full model (which is less likely to exhibit omitted variable bias), while the coefficient for *VC-backed IPO run-ups* is not significant in the full model, our results support Hypothesis 3. In terms of magnitude, the results indicate that a one-standard-deviation increase in Yale's venture-capital allocation (increasing its allocation by 2.67%) is associated with a 58.7 percent increase in foundings ( $\exp(0.173 \times 2.67)$ ). To further explore our results testing Hypothesis 3, we reran

(unreported) estimates of Model 4 after transforming Yale's allocation into a *z-score* and, using the *test* command in Stata, evaluated whether the Yale allocation coefficient was statistically equivalent to the venture-capital-backed IPO run-ups dummy. The measure of *Yale endowment's % VC allocation* is continuous, while *VC-backed IPO run-ups* is a binary measure; thus, we contrasted a binary change in venture-capital run-ups with various degrees of change in the Yale allocation. We found a two-standard-deviation increase in Yale's allocation was statistically greater than the presence of a venture-capital-backed IPO run-up ( $p = 0.0710$ ). It is important to note, however, that this is a conservative test for Hypothesis 3 as it compares a relatively small change in the Yale endowment allocation to the maximum change in run-ups. Overall, these results offer support for Hypothesis 3 that endorsing beacons influence the founding rate more strongly than demonstrating beacons.

## ADDITIONAL ANALYSES

We conducted a number of supplemental tests that provide additional explanations for how the beacon mechanism operates; these listed results are excluded due to space constraints, but are available on request.

### Beacons as a resource provider

One alternative explanation for our results is that the Yale endowment is simply a resource provider. However, the net capital invested in new venture-capital firms far exceeds the Yale endowment's annual allocations, effectively ruling out this alternative explanation. We also added models to explore the possible influence of each of the other top-20 university endowments. None of the coefficients for the other endowments were both positive and significant, providing additional support for our assertion that Yale is an endorsing beacon in this context and other endowments are not.

### Temporal influence of beacons

We explored temporal shifts over time in the influence of endorsing and demonstrating beacons by using two-, three-, and four-year lags. The coefficient for *VC-Backed IPO Run-up* is not significant in these models; however, the coefficient for

*Yale Endowment's % VC Allocation* is significant across two- and three-year lags, but is not significant with a four-year lag, suggesting that a single change by a beacon may have a persistent effect, a notion supported by our fieldwork that indicated it may take a few years for venture-capital founders to raise sufficient funds to launch a firm. We also explored how the influence of beacons may change as a field evolves by interacting both beacon measures with a logged linear time trend. The coefficient for the demonstrating beacons interaction is not statistically significant; the interaction for endorsing beacons is positive and statistically significant. Although this may indicate that endorsing beacons are most influential in more established sectors, we are hesitant to draw conclusions from these models as they have VIFs of over 10.

### Environmental constraints on beacon effect

We explored how differences in resource constraints between subsectors of the venture-capital industry result in differences in the relative strength of endorsing and demonstrating beacons. First, we re-estimated our models separately on foundings of *early-stage-focused* venture-capital firms and *late-stage-focused* venture-capital firms (Wasserman, 2008; Zarutskie, 2010). Consistent with the boundary conditions articulated in our theory, the results for Hypothesis 3 hold as late-stage venture-capital firm foundings, which are more resource constrained, are positively affected by endorsing beacons, but unaffected by demonstrating beacons. This comparative effect, however, does not hold for early-stage venture-capital firm foundings, which are driven by both endorsing and demonstrating beacons.<sup>8</sup> Second, we re-estimated our models by focusing on foundings of venture-capital firms in entrepreneurially-dense regions (i.e., Silicon Valley, Boston, and New York) and entrepreneurially sparse regions (everywhere else). We found that endorsing beacons have a stronger impact than demonstrating beacons in entrepreneurially-sparse regions where environmental resources are more constrained. This differential effect does not hold in entrepreneurially-dense regions (i.e., less resource constrained environment) where both endorsing and demonstrating beacons have a statistically

<sup>8</sup>This test offers support for Hypothesis 2, but with the nuance that demonstrating beacons may primarily influence entrepreneurs subject to relatively smaller resource constraints.

significant effect. Together, these additional tests help further validate the explicated boundary conditions around Hypothesis 3.

### Characteristics of founding firms

We conducted additional analyses to explore if the results supporting Hypothesis 3 are driven by founding firm characteristics. Namely, if endorsing beacons attract earlier and more informed entrants, while demonstrating beacons attract later imitators. We reasoned that venture-capital firms that are able to raise multiple follow-on funds from limited partners could be considered more informed than venture-capital firms that raised fewer follow-on funds (Hochberg, Ljungqvist, and Vissing-Jørgensen, 2014). We ran split-sample analyses distinguishing between venture-capital firms that raised three or more follow-on funds (more-informed venture-capital firms) and venture-capital firms that raised fewer than three follow-on funds (less-informed venture-capital firms). For more-informed venture-capital firms, the *Yale Endowment % VC Allocation* coefficient was positive and significant, and the venture-capital-Backed IPO Run up coefficient was not significant. For the less-informed venture-capital firm sample, neither coefficient was statistically significant. These results suggest that the differential effect of endorsing beacons compared to demonstrating beacons is stronger for more-informed venture-capital firm foundings.

### Endogeneity of beacon effect

We used a difference-in-differences analysis to further validate the causal influence of endorsing beacons (Azoulay, Zivin, and Manso, 2011; Kacperczyk, 2009). We identified the private equity (PE) industry as our control sector because it exhibits similar dynamics and is influenced by similar environmental forces,<sup>9</sup> but is unlikely to

<sup>9</sup>Firms in both industries invest on behalf of limited partners and focus on investment skill to seek abnormal returns by investing in private, illiquid companies and taking an active role in those companies (Kaplan and Schoar, 2005), and subsequently, court many of the same types of investors, including pension funds, endowments, and high-net worth individuals. Both venture-capital and PE firms involve a handful of founding individuals who must raise an initial investment fund from the aforementioned sources (Kaplan and Stromberg, 2009; Sahlman, 1990). Finally, the potential rewards are highly similar in both industries, with firms being paid both a small percentage of assets under management

be influenced by our focal beacons. We validated the appropriateness of PE as a comparison sector by comparing founding patterns in the two sectors before and after 1995, as the largest movements in Yale's venture-capital allocation occurred after that date. Foundations in the two sectors were highly correlated before 1995, but significantly less so afterward when larger swings in Yale's allocation lead to a greater decoupling between foundations across the sectors. To test this logic, we used the following difference-in-differences specification:

$$\begin{aligned}
 & \text{Firm Foundations} = \text{Treatment Sector} \\
 & + \text{Yale Endowment's \% VC Allocation} \\
 & + \text{Treatment Sector} \times \text{Yale Endowment's \% VC Allocation} + \text{VC-Backed IPO Run-ups} \\
 & + \text{Treatment Sector} \times \text{VC-Backed IPO Run-ups} \\
 & + \text{Controls},
 \end{aligned}$$

where *treatment sector* is a dummy variable equal to one for venture-capital firm foundations and zero for PE firm foundations. There is a positive and significant ( $p < 0.01$ ) interaction between *Treatment Sector* and *Yale Endowment's \% VC Allocation*, but the effect of *Yale Endowment's \% VC Allocation* is not statistically significant after controlling for the interaction. This indicates that Yale's allocation to venture capital only effects foundations in the venture-capital sector. Neither the direct effect nor the interaction of *VC-Backed IPO Run up* with *Venture Capital Sector Dummy* is significant in the full model, further validating that demonstrating beacons do not have a statistically significant effect in our context. Overall, this analysis helps empirically disentangle the impact of our focal beacons from other, perhaps unobservable, developments in the industry.

## DISCUSSION AND CONTRIBUTIONS

This article builds on a growing body of work that recognizes the critical role of social context in shaping organizational decisions (Hiatt and Park, 2013; Mishina *et al.*, 2010; Pfarrer *et al.*, 2008; Pollock and Rindova, 2003; Pollock *et al.*, 2008). To

annually and a share of any investment gains (Gompers and Lerner, 1999; Metrick and Yasuda, 2010).

determine which aspect of the social context matters most for entrepreneurship, we examine how salient triggers that we call entrepreneurial beacons influence foundings within a sector. By emphasizing singular triggers, our work departs from (but complements) prior work on entrepreneurial foundings that emphasizes collective patterns of foundings (Cattani *et al.*, 2003; Sine, David, and Mitsuhashi, 2007), influential support (Baum and Oliver, 1992; Hiatt *et al.*, 2009), and institutional activism (Rao, 2004; Weber *et al.*, 2008). We introduce the concept of entrepreneurial beacons and the related logic that links social salience to signaling; we also describe two types of beacons—endorsing beacons and demonstrating beacons—and theorize their impact on founding rates. Using quantitative data on U.S. venture-capital foundings over a quarter century (1984–2011), and qualitative insights from venture-capital founders, we find empirical support for our theory.

Our results make a case for revisiting and extending findings from research on institutional change and organizational foundings. In contrast to prior research emphasizing the collective nature of the growth of new sectors (Hiatt *et al.*, 2009; Rao, Monin, and Durand, 2003), our study identifies singular organizations as important additive drivers of foundings.<sup>10</sup> Disentangling the influence of demonstrating and endorsing beacons from that of collective patterns of activity remains an intriguing question that warrants further empirical exploration.

## Social environments and entrepreneurial foundings

By anchoring our theoretical arguments in the literature on signals (Spence, 1974) and social salience (Fiske and Taylor, 1991; Higgins, 1996), we offer a conceptualization—grounded in the socio-cognitive triggers of entrepreneurial activity—of an overlooked mechanism whereby social environments shape foundings. Macro entrepreneurship research has flourished (see Tolbert, David, and Sine, 2011 for an overview), but has been criticized for lacking a comprehensive and realistic formulation of entrepreneurial motivations (Thornton, 1999). One promising direction is

<sup>10</sup>See Briscoe and Safford (2008), Mishina *et al.* (2010), and Tilcsik and Marquis (2013) for related arguments outside the realm of entrepreneurship.

to incorporate psychological insights and notions of bounded rationality into macro-theoretical models of entrepreneurship in order to explore motivations and actions more deeply (Bingham and Eisenhardt, 2011; Carnahan *et al.*, 2012; Hallen and Pahnke, 2016; Sarasvathy, 2001). To this body of research, we contribute a theoretical model of foundings that acknowledges socially salient singular actors in the environment. It suggests that a small number of environmental changes can trigger outsized shifts in entrepreneurial activity.

Endorsing beacons such as the Yale endowment have attracted would-be founders and potential supporters to the venture-capital sector by signaling the sector's potential. Beacons function as a direct form of influence that, in the words of one venture-capital founder, operates by "shedding more light on the venture-capital industry and causing people to want to get in on the next hot company." In other words, a beacon's actions make the entire sector appear more conducive to founding. But beacons also exert more subtle *indirect* influence by capturing attention and revising backers' beliefs about the sector. As one venture-capitalist founder said of Yale, "They are seen as thought leaders.... They tend to influence the investments made by other limited partners, and their allocations." In other words, Yale's allocations encourage more entrepreneurial backers to enter the sector by supporting new venture-capital firms. Thus, the salience of a single beacon may influence not merely an entrepreneur's interest in a sector, but also the ability to attract resources to found a firm.

Though we find support for our argument that endorsing beacons have greater impact than demonstrating beacons, our logic rests on boundary conditions that may not prevail in other contexts. We attribute the greater impact of endorsing beacons (such as the Yale endowment) to the dynamism of the venture-capital sector and the substantial resource-constraints facing many venture-capital firm founders. Our field research suggests that these entrepreneurs and limited-partner backers view an endorsing beacon's actions as credible signals of a highly sophisticated actor's beliefs about future opportunities in venture capital—and our findings indicate that such signals may be especially important for venture-capital firm founders who either need more resources or have less legitimacy. In contrast, we find that demonstrating beacons matter more for less resource-constrained entrepreneurs and those with greater legitimacy. This also suggests that demonstrating beacons may also have a greater

influence in sectors where entrepreneurs are less sophisticated and resource-constraints less pressing. One limitation of our data is that we are unable to distinguish between foundings by entrepreneurs with varying degrees of human and social capital, and between entrepreneurs who are new to the industry versus those who are already participants in it, and we believe these are other interesting avenues for future research.

### **Beacons and inadvertent institutional change**

Our findings also provide insight regarding the debate about directed institutional change—or the deliberate shaping of a sector's social environment to encourage entrepreneurial activity. Some scholars emphasize the intentional and purposive actions of organizations to create new markets or expand existing ones (Fligstein, 1997; Gurses and Ozcan, 2015; Hardy and Maguire, 2008; Khanna and Palepu, 2010; Reid and Toffel, 2009); others object that ascribing too much agency to "heroic change agents" (Powell and Colyvas, 2008) "endows them with strategic intentions, foresight, and well-rehearsed social skills" that may not exist (Aldrich, 2010). Clearly, disagreement persists on whether institutional change is purposive and directed.

Recent conceptual research has suggested an alternative pathway: Some actors unintentionally depart from prevailing practices, and their actions yield unintended consequences (Pacheco *et al.*, 2010). For example, Battilana, Leca, and Boxenbaum (2009) argued that "institutional change might be occasioned by unintended actions" on the part of those who "break with institutionalized practices without being aware of doing so" (Battilana *et al.*, 2009: 89). By acknowledging the possibility of unintended disadvantageous outcomes of entrepreneurial beacons' actions, our theoretical and empirical analysis supports the concept of *inadvertent* institutional change that may reconcile opposing views on institutional change. Organizations that function as entrepreneurial beacons can effect broad social change by focusing on myopic everyday goals (for endowments, investing in good asset classes, and for venture capitalists taking portfolio companies public). These beacons can be "heroic change agents" even though they did not intentionally pursue institutional change. Indeed, for all of Yale endowment's "success" at changing the rate of entrepreneurship in the venture-capital sector, that

change has probably threatened Yale's own profits by contributing "too much money chasing too few deals" (Gompers and Lerner, 2001b). As one analyst put it, "Everybody who has any aspirations in the medium-size endowments and foundations [and now pension funds] has been following them as fast as they can.... There's a wall of money moving into 'Let's All Look Like Yale'" (Chernoff, 2008). Thus, our empirical analysis supports other scholars' conceptual arguments that institutional change may often be an inadvertent spillover of organizations' myopic pursuit of their own goals.

### Limitations and future directions

Several nuances and limitations of this study warrant mention. We initially compared the Yale endowment and venture-capital-backed run-ups to lighthouses, and suggested that the actions of salient organizations constitute signals that attract entrepreneurs and their backers to particular sectors. Such triggers seem to have sped up the process of entrepreneurial entry, but they are only one aspect of what is likely an evolutionary trend. Indeed, even though real beacons help guide ships to destinations, their captains' decisions are almost certainly influenced by other factors, including nautical charts, knowledge of the channels, and current weather conditions. A similar logic applies here, and we must be appropriately circumspect in our claims: many factors influence foundings, and it is important not to overemphasize a few by overlooking the rest. Entrepreneurial beacons are simply one mechanism (though an important and previously unidentified one). Nonetheless, our results indicate that singular beacons have a clear impact on founding rates. Beacons operate above and beyond a host of factors identified by previous research, and can be both conceptually and empirically distinguished from collective patterns. We also note that our theory suggests that beacons may play an important role in drawing attention to other evolutionary trends in an industry.

Several avenues of inquiry merit further exploration. One is to examine the nature of entrepreneurial beacons in other sectors. For example, some emerging sectors may lack identifiable beacons, either because its participants disagree on which organizations are salient or because few events have attracted near-universal attention in the sector. Despite the relatively successful IPOs of the electric-car company Tesla

Motors and battery maker A123 Systems, for example, John Doerr of Kleiner Perkins has argued that clean tech (a newly emergent sector) is still awaiting its "Netscape moment" (Ha, 2010). Our theory suggests that Doerr's emphasis on singular triggers is appropriate, but the clean-tech sector may be slow to expand without an endorsing beacon to provide a credible signal of the sector's potential and future viability. More broadly, some sectors appear to lack entrepreneurial beacons, reinforcing our caveat that they are only one mechanism among several that spur entrepreneurial foundings.

Another avenue for research is to seek other entrepreneurial beacons—particularly versions that do not involve investment or financial success. For example, a demonstrating beacon such as a book or film in a previously dormant genre may attract critical acclaim enabling the publisher or producer to attract entry by others who now view the genre as attractive. Similarly, directors, actors, or authors might serve as endorsing beacons in such contexts. Likewise, "lighthouse customers"—large firms that partner with unknown startups (Bagley, 2012) may signal the viability of a startup's sector. Finally, salient organizations are not necessarily limited to those that generate (positive) signals of potential. Extreme failures (such as A123s bankruptcy and Webvan's demise in online groceries) can also be salient (Hoffman and Ocasio, 2001) and deter new foundings or induce exits. These avenues of inquiry could identify further sector-specific triggers, yield deeper insights into the social drivers of firm formation, and enrich our understanding of the dynamics of organizational and social structures.

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