Gender Gap in Entrepreneurship[1]

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ABSTRACT

Using data on the entire population of businesses registered in the states of California and Massachusetts between 1995 and 2011, we decompose the well-established gender gap in entrepreneurship. We show that female-led ventures are 63 percentage points less likely than male-led ventures to obtain external funding (i.e., venture capital). However, investors' gendered preferences can, at most, explain about 35 percent of this differential (or 22 percentage points). The most significant portion of the gap (65 percent) stems from gender differences in initial startup orientation, with women being less likely to found ventures that signal growth potential. Moreover, consistent with theories of statistical discrimination, the residual gap diminishes significantly when stronger signals of growth are available to investors for comparable female- and male-led ventures or when focal investors are more sophisticated. Finally, conditional on the reception of external funds (i.e., venture capital), women and men are equally likely to achieve exit outcomes, through IPOs or acquisitions.

JEL Codes: L26 (Entrepreneurship), J16 (Economics of Gender), G24 (Venture Capital).

INTRODUCTION

Entrepreneurship is one of the most important features of today's economy (Kacperczyk, 2012; 2013; Elfenbein et al., 2010; Carnahan, Agarwal, and Campbell, 2012). But launching a new venture appears to be particularly disadvantageous for women, who are significantly less likely to succeed as entrepreneurs (U.S. Department of Commerce, Economics and Statistics Administration, 2010; Canning, Haque, and Wang, 2012). This imbalance is especially stark among high-growth ventures, with females representing a much smaller share of founders able to achieve high-growth equity outcomes (e.g., high-value acquisitions or IPOs) (e.g., Robb, Coleman, and Stangler, 2014; Balachandra, et al., 2017). But despite the gender-based gap being well documented, our understanding of where in the entrepreneurial process such disparities originate remains limited. Entrepreneurship involves a number of stages, from founding a new venture, to seeking capital, to exit (e.g., Aldrich and Ruef, 2003). But we currently know little about the relative importance of each stage in generating the disparities between female and male entrepreneurs. From a policy perspective, such understanding is critical for effectively addressing gender inequality in an entrepreneurial setting and increasing female representation among high-growth entrepreneurs. If the gender gap arises primarily at the investment stage, then policies designed to reduce the gap should target investors and their biases. But if such disparities arise primarily at founding, then policies designed to reduce the gap should target entrepreneurs and their initial choices.

The vast majority of studies have focused on the early-investment stage as the key locus of differences between women and men. Scholars have found stark disparities between female and male entrepreneurs in access to capital (e.g., Canning et al., 2012; Greene et al., 2003;

Gatewood et al., 2003; Brush et al., 2014; Coleman and Robb, 2009; 2016; Thébaud and Sharkey, 2014), suggesting that women are much less likely than men to obtain external capital from investors (Canning et al., 2012; Greene et al., 2003; Gatewood et al., 2003; Brush et al., 2014). Such differences have been attributed to investors' bias against female-founded ventures (e.g., Brush et al., 2014; Thébaud, 2010; Gompers et al., 2014), in part due to tendencies of predominantly male investors to form relations with demographically-similar entrepreneurs (e.g., Gompers et al., 2014; Pitchbook, 2017), or to rely on negative stereotypes about gender when evaluating entrepreneurs' competences (e.g., Thébaud, 2010; Bird and Brush, 2002; Gupta, et al., 2009; Baughn, Chua and Neupert, 2006; Gupta and Turban, 2012).

But, though important, investors' bias might not be the primary driver of such disparities; instead, we propose that the largest differences between female and male entrepreneurs arise elsewhere. In making this argument, we build on a growing line of research which suggests that startup growth potential, defined as a new venture's aspirations and intentions to achieve high-growth equity outcomes, influences the reception of external capital (Carter, et al., 2003; Chen, Yao and Kotha, 2009; Gompers and Lerner, 2001). Critical to the question at hand, we argue that female-founded ventures tend to signal to potential investors weaker growth aspirations, and this growth orientation itself is less favorable to external investment. We therefore extend the current research by accounting for different stages in the entrepreneurial process: the initial choices of entrepreneurs regarding growth orientation and the subsequent choices of investors regarding the provision of external funds. More generally, we decompose the gender gap in entrepreneurship to evaluate the relative contribution of each entrepreneurship stage to the observed imbalance between female and male founders.

By shifting the focus of our analysis from differences in investors' bias to differences in

new ventures' initial growth orientation, as perceived by investors (Guzman and Stern, 2015, 2016, 2017), we advance our understanding of the origins of the gender gap in entrepreneurship, for two main reasons. First, our approach allows for a relative assessment, shedding light on how different stages in entrepreneurship contribute to the imbalance between female- and male-led ventures. Prior literature, by contrast, has primarily focused on a single stage in the process: the external investment (e.g., Canning et al., 2012; Greene et al., 2003; Gatewood et al., 2003; Brush et al., 2014; Coleman and Robb, 2009; 2016; Thébaud and Sharkey, 2014).

Second, our approach sheds light on the initial growth orientation amongst female- and male-founded ventures, examining the way in which a startup's attributes influence subsequent access to external funding. Researchers have argued that certain startup characteristics affect the odds of growth outcomes, such as IPOs or high-value acquisitions, and that this growth orientation is responsible for attracting external investment (e.g., Kaplan and Lerner, 2010; Kerr, Nanda, and Rhodes-Kropf, 2015; Alvarez and Busenitz, 2001). But measuring growth orientation empirically is challenging for several reasons. First, data on new ventures are often collected in the later stages of development (such as during the receipt of venture capital), but sample selection bias might arise because lower-quality ventures are likely to fail long before they are recorded. Moreover, extant accounts have often relied on surveys to measure a venture's initial attributes that influence investment chances (Reynolds, 2000), but these data may suffer from important biases, as entrepreneurs reconstruct past events, attitudes, and motivations (Kepler and Shane, 2007). Finally, though a number of studies have considered variation in industries in which men and women choose to launch new ventures (Carter and Shaw, 2006; Coleman and Robb, 2009; Coleman and Robb, 2009; Cliff, 1999; Heilman and Chen, 2003; Morris, et al., 2006), startup growth orientation can vary even within a single industry (Guzman and Stern,

2015, 2016, 2017), suggesting the need for more granular measures at the firm level. More generally, accounting for initial growth orientation requires developing indicators that leverage objective measures based on a population of new firms.

We leverage data on the population of entrepreneurs in the United States between 1995 and 2011, in which differences in the initial venturing choices that predict subsequent growth outcomes can be readily observed and measured directly. Following Guzman and Stern (2015), we use a novel approach that captures these underlying differences for each start-up, using publicly available business registration records. We construct a novel dataset containing *all* California and Massachusetts for-profit start-up corporations, limited liability companies, and partnerships from 1995 to 2011. We focus on California and Massachusetts as our focal states because entrepreneurship and venture capital activity are more prevalent in these regions (NVCA, 2015).

In the resulting comprehensive empirical analysis, we decompose the entrepreneurial process into a number of stages and identify the gender gap at each of those stages. First, we find that women are much less likely than men to start new ventures. In particular, female-led start-ups account for 21 percent of all startups registered in California or Massachusetts. Subsequently, female-led startups are much less likely to receive external funding, with women founders representing only 10 percent of all venture-backed startups, and 7 percent of those that achieve an equity growth outcome. However, a substantial share of this gap (65 percent) can be explained by the initial differences in startup growth orientation, as indicated by observable attributes: the legal form of organization (e.g. corporation, LLC, or partnership), the state of jurisdiction in which they choose to organize the firm (e.g. Delaware or local), startup name, industry, founders' name, and whether a startup has patents and trademarks filed close to the

time of registration. For example, although women represent 22 percent of all registered companies, they account for only 12 percent of Delaware registrations (a jurisdiction usually associated with growth intentions), 10 percent of companies with patents at founding, and 15 percent of all companies in the IT sector. They also account for a higher (25 percent) share of all companies with names related to local industries (rather than traded industries[4]). When these observables are included in a predictive model to account for a single index of growth orientation, female-founded startups represent only 13 percent of the top 5 percent high-growth startups, and 10 percent of the top 1 percent high-growth startups.

Together, these differences (including their interaction with other observables such as having a trademark, eponymy,[5] a short name, and a relationship to other industries like e-commerce, biotechnology, or semiconductors) explain the majority of the gender gap in external financing. The residual difference – only some of which reflects investors' biases and stereotypes about gender – is much smaller, accounting only for 35 percent of the disparity between men and women in access to funding. Further, among comparable female- and male-founded ventures, this gap in funding diminishes significantly with a stronger growth orientation of a new venture (i.e., as it moves towards the top 5 percent, 1 percent, or 0.1 percent).

Overall, our findings indicate that the initial stages of the entrepreneurial process, such as the early choices regarding a new venture's growth orientation, account for the majority of the gender gap in entrepreneurship. More generally, our findings imply that interventions that influence these early stages of the founding process might be the most critical for reducing

[4] Traded industries are those whose products are sold outside the local economic area in which they are created. Examples include manufactured goods, internet services, and some financial services. Local industries are industries where the product or service is mostly sold locally, such as restaurants.

[5] Eponymy refers to the use of the founder's personal first or last name in the name of the company itself (e.g. Ford Motor Company). The use of eponymy in entrepreneurship has a recent active line of research (e.g. Belenzon *et al*, 2017; Guzman and Stern, 2015).

gender inequality in high-growth entrepreneurship.

THEORY AND HYPOTHESES

Past Research

Gender inequality is a persistent feature in entrepreneurship outcomes: women are less likely to become entrepreneurs than men (Aldrich, 2005; Ruef, Aldrich, and Carter, 2003) and less likely to outperform once a new venture is founded (Kim, Aldrich, and Keister, 2006; Yang and Aldrich, 2014). But though the gender-based gap in high-growth entrepreneurship has been well documented, the precise origins of such disparities along the entrepreneurial process remain less well understood. Entrepreneurship involves a number of stages, from founding a new venture, to seeking capital, to exit (e.g., Aldrich and Ruef, 2003), but the majority of previous research has focused on early-stage investment, with numerous studies documenting that external investors (i.e., venture capitalists or angels) are less likely to provide capital to female entrepreneurs (e.g., Canning et al., 2012; Greene et al., 2003; Gatewood et al., 2003; Brush et al., 2014).

A number of explanations have been advanced to account for investors' willingness to favor male over female entrepreneurs. First, scholars have attributed tendencies to underinvest in female startups to investors' preferences for homophily, similarity-attraction, and in-group preference – based on the premise that individuals tend to informally associate with others who share salient demographic characteristics (e.g., McPherson, Smith-Lovin, and Cook, 2001). And given that investors are predominantly male (Gompers et al., 2014; Brush et al., 2015), similarity attraction, homophily and in-group biases (e.g., Tajfel and Turner, 1979) will lead to a higher degree of intergroup (investor/entrepreneur) interaction or greater liking and attraction (e.g., Tsui and O'Reilly, 1989), thereby increasing the probability of an

entrepreneurial investment. Hence, investors may prefer demographically similar start-ups — those led by men.

Another common explanation is the prevalence of negative biases about gender among investors. Theories of discrimination posit that gender inequalities arise because females endure disparate treatment from key resource holders due to discrimination and negative stereotypes about gender (Ridgeway and Correll, 2006; Castilla, 2008). These mechanisms are particularly likely to apply to the entrepreneurial setting because job-related schemas and stereotypes associated with entrepreneurship trigger systematic biases against individuals who are not males. For example, scholars have argued that entrepreneurship is a male-typed activity (Yang and Aldrich, 2014; Cavalluzzo, Cavalluzzo, and Wolken, 2002; Shane et al., 2012), and that resource holders therefore tend to discount the competence of female entrepreneurs and the investment-worthiness of their enterprises. Moreover, because female-led ventures are relatively rare, women may appear as unusual or unnatural fits for founder positions, additionally reducing their odds of being funded. Regardless of the actual performance of female-led start-ups, the stereotypes associated with entrepreneurship are thought to trigger bias against female-led ventures, leading to lower rates of venture-capital deals for start-ups founded or run by women. Based on the premise that investors play an important role in propelling high-growth entrepreneurship (Kortum and Lerner, 2000; Nanda and Rhodes-Kropf, 2013), scholars have generally suggested that investors' biases against female founders put women at a significant disadvantage in entrepreneurship (Canning et al., 2012; Brush et al., 2014, 2015).

Yet not all accounts attribute the gender gap in funding to investors' assessments of female entrepreneurs. For example, numerous studies on access to debt capital have failed to confirm funding disadvantages for female-led firms (e.g., Blanchflower, Levine, and

Zimmerman, 2003; Carter et al., 2007; Cavalluzo et al., 2002). And many other studies have not found that investors or lenders use different criteria to evaluate female-led ventures (e.g., Haines, Orser, and Riding, 1999; Orser et al., 2006). One reason for these inconclusive findings might be that gender disparities observed at the investment stage tend to reflect differences that arise elsewhere in the entrepreneurial process.

In what follows below, we shift the attention of previous studies to focus on earlier stages of the entrepreneurial process in order to probe the origins of gender disparities. Specifically, we propose that the initial venture characteristics – which signal to investors a startup's growth orientation and thus predict equity growth outcomes – might differ across female- and male-founded ventures, accounting for a significant share of the observed gap in funding. Some studies have established that the gender gap in funding exists even in experimental conditions (e.g., Bigelow et al. 2014; Brooks et al. 2014; Thébaud 2015), implying that such differentials would persist even when female- and male-founded ventures were observationally equivalent. Yet this line of research has not examined whether female- and male-run ventures differ along the characteristics that are responsible for attracting investors, and researchers have not quantified the relative contribution of each stage in the process to the gender gap in entrepreneurship.

Startup Growth Orientation and VC Funding

Among new ventures, there exists considerable heterogeneity in their growth orientation, or characteristics that predict equity growth outcomes, such as an IPO or a high-value acquisition. For example, not all new ventures are created equal and that startups vary significantly in their growth potential (Hurst and Pugsley, 2010; Kaplan and Lerner, 2010; Schoar, 2010);

importantly, such variation can be observed even within a single industry and even among innovative ventures (Guzman and Stern, 2015, 2016, 2017). Building on this insight, others have proposed that it is the high-growth start-ups that drive economic growth, such that growth is concentrated in a relatively small share of new ventures which can successfully achieve key performance milestones, including access to venture capital and profitable exit through acquisitions or IPOs (Kaplan and Lerner, 2010; Kerr, Nanda, and Rhodes-Kropf, 2015; Alvarez and Busenitz, 2001; Mosakowski, 1997). Guzman and Stern (2015, 2016, 2017) find, for example, that over seventy percent of realized growth outcomes occur in the top 5 percent of growth-oriented ventures (and nearly 50 percent in the top 1 percent of growth-oriented ventures), implying that initial differences across startups play a significant role in whether new ventures can secure external funds.

To the extent that startups vary in their characteristics in a way that influences how attractive they are to external investors, these signals of growth orientation might be unequally distributed across female- and male-led ventures. First, we expect that women will found and run less growth-oriented businesses because structural gender inequalities in occupation status are likely to carry over into entrepreneurship and hinder women's willingness and ability to pursue high-quality startups. For example, women tend to be concentrated in low-profitability industries and low-status positions (Fernandez and Sosa, 2005), and such sorting into less attractive industries and occupations can affect the kinds of ventures founded if it limits the ability to identify lucrative opportunities or gain resources for new ventures (Loscocco et al., 1991; Kalleberg and Leicht, 1991).[6] A related line of research suggests that women may pursue ventures of lower growth potential due to differences in human capital and educational

[6] Studies have shown that women are more likely to found ventures in consumer-oriented and personal services, retail, and trade (Anna et al., 2000; Brush et al., 2006).

background. Studies in economics and sociology have shown that skills and education, rather than gender, primarily account for the well-known differences in wages across women and men (Tomaskovic-Devey, 1993; Kilbourne et al., 1994; Petersen and Morgan, 1995). Other work has similarly found that women are underrepresented in STEM disciplines, and that they are less likely to patent (Brush et al., 2006; Ding et al., 2006). Collectively, these studies imply that women will face significant obstacles when attempting to mobilize resources and/or develop skills necessary to start high-growth businesses. More generally, if women occupy less attractive positions in less attractive industries, they will be less likely to start and lead growth-oriented, resource-attractive ventures.

Second, women and men hold different motivations and preferences for starting new ventures (Brush et al., 2003; 2006; Sexton and Bowman-Upton, 1990). The notion that these differences partly shape women's assessment of the kinds of careers that are suitable has been well established (Correll, 2004). For example, women's preferences are influenced by the disproportionate work-life demands that women face due to childrearing and household chores, which tend to fall to a greater extent on women and to generate an acute conflict for female workers (e.g., Brett and Stroh, 2003; Rothbard, 2001). Such demands shape the perceived attractiveness of the occupational paths available to women (Aldrich and Cliff, 2003; Barbulescu and Bidwell, 2013), encouraging them to choose self-employment (Carter et al., 2003; Birley, 1989) or part-time jobs to accommodate family needs (Ginther and Kahn, 2006). These kinds of preferences push women into entrepreneurship in hope of developing more flexible work schedules, balancing work and family demands (Georgellis and Wall, 2004; Lombard, 2001), or reducing the cost of child care (Connelly, 1992; Presser and Baldwin, 1980; Thébaud, 2015). The probability of self-employment increases when a woman becomes a parent (Boden, 1996), and

the need for flexibility and work-family balance increases (Boden, 1999; Carter et al., 2003; Connelly, 1992). Finally, based on the presumption that women face more competing demands for their time (e.g., Brett and Stroh, 2003), they might devote less effort to the process of forming and developing a new venture. These differences in career preferences imply that women are more likely to use entrepreneurship to accommodate work-life demands (e.g., self-employment), and less likely to found growth-oriented ventures.

Finally, women may be involved in ventures of lower-growth potential because of stark differences in network structure and composition (Aldrich, 1989; Cromie and Birley, 1992). Although social ties are the most important resource for entrepreneurs (Stewart, 1990), women have generally less valuable networks (Moore, 1990; Smith, 2000), and this tendency has been found to carry over into entrepreneurship (Aldrich, Reese, and Dubini, 1989; Renzulli, 1998; Ruef et al., 2003). For example, women tend to overinvest in strong ties (Fischer and Oliker, 1983) and develop relatively small and homogenous networks (e.g., Ruef et al., 2003; Renzulli, 1998), thereby limiting access to diverse information and instrumental support which is central to entrepreneurial entry (Aldrich, 1989). Such profound differences in network structure might limit women's access to opportunities and resources, reducing the probability that they are engaged in founding and managing higher-potential, growth-oriented ventures.

Overall, this literature offers multiple reasons to expect female entrepreneurs to found ventures that signal to investors a weaker growth orientation and are therefore less likely to attract external financing. However, by focusing mostly on investors' bias, prior research has paid little attention to this early stage in the entrepreneurial process. Consequently, little progress has been made in assessing the relative contribution of these different stages in entrepreneurship to the overall gender gap in entrepreneurship. Hence, in what follows below, we examine the

gender disparity at different stages of the entrepreneurial process and quantify where this gap appears to be the most substantial.

METHODOLOGY

Empirical strategy

Our empirical strategy relies on conceptually separating the entrepreneurial pipeline into events occurring before and after firm founding. Although many past events and individual attributes influence the type of a company an entrepreneur will found, most of this heterogeneity will be reflected in observable indicators of startup orientation toward growth. Hence, new ventures could exhibit stronger or weaker growth orientation and thus be more or less attractive to investors.

Using administrative business registration records, we track all new registered[7] ventures at the time of their legal founding, and document startup attributes at founding, shown to predict subsequent growth outcomes: the legal form of organization (e.g. corporation, LLC, or partnership), the state of jurisdiction in which they choose to organize the firm (e.g. Delaware or local), startup name, industry, founders' name, and whether a startup has patents and trademarks filed close to the time of registration. Because these attributes predict subsequent growth outcomes (Guzman and Stern, 2015), they offer a suitable measure of a startup growth orientation (or expected productivity) from the investor's perspective. Thus, in decomposing the gender gap in entrepreneurship, it is critical to account for these underlying differences across startups.

We follow the approach of Guzman and Stern (2015) of using predictive analytics with

[7] We include all corporations, partnerships, and limited liability companies, but exclude sole-proprietorships. Fairle et al (2018) present a comprehensive survey of all firms using US Census data, and show there is little transition between sole-proprietorships and registered businesses.

ex-post growth outcomes and out-of-sample predictions to examine these numerous founding choices, and to compute a summary statistic of "growth orientation." Specifically, we estimate a proxy measure of the orientation towards the outcome that the venture capitalists institutionally seek: the ability to sell equity invested in a startup in a short period of time either through an IPO or a high-value acquisition.

As such, for all startups, irrespective of funding source or outcome, with founding characteristics X_i, and an indicator of an equity growth event g_i six years after founding, we define this growth orientation θ_i as the predicted probability of:

$$\theta_i = P(g_i|X_i)$$

and use its empirical counterpart ($\hat{\theta}_i$) as our central measure in interest in understanding the underlying differences across firms.

This predictive algorithm allows us to create a single measure of startup growth orientation. Guzman and Stern (2015, 2016, 2017) find that, though no single observable predicts growth completely, together these observables have a high predictive power.[8] Using this measure to understand differences in potential gains (and therefore new venture's *ex-ante* attractiveness) to investors (i.e., venture capitalists), we begin to decompose the gap in funding into variation accounted for a startup's growth orientation, versus that which still remains and is partly attributable to investors' bias against female founders.

Data sources and sample selection

Business registration records are public records created when individuals register a business.

[8] For example, in out of sample tests, they separate up to 70% of all companies that eventually are IPO or are acquired. These analyses are conducted on a small sub-sample accounting for only 5% of firms.

Since business registration is a requirement for growth (and for receiving venture capital), it is possible to observe a quasi-population of all startups at risk of receiving such financing at a similar foundational moment.

Our sample consists of all for-profit start-up business registrants in the states of California and Massachusetts from 1995 to 2011. These states are particularly suitable for our purpose because more than 50 percent of the VC market is located in California, and 10 percent of the VC market is located in Massachusetts (by dollars invested in 2014; NVCA, 2015). During the period covered by our sample, it was possible to register several types of businesses: corporations, limited liability companies, limited liability partnerships, and general partnerships.

Our analysis draws on the complete population of firms satisfying one of the following conditions: (a) a for-profit firm whose jurisdiction is in California or in Massachusetts, or (b) a for-profit firm whose jurisdiction is in Delaware but whose principal office address is in California or Massachusetts. We exclude companies whose primary location is external to California or Massachusetts. Finally, we merge this database with VentureXpert data, which contains detailed information on venture-capital funding. All venture investments in VentureXpert are matched by exact name with start-ups registered in California and Massachusetts. These selection criteria yield a sample of 1,875,087 start-ups.

Measures

Dependent variable

Venture-Capital Funding. Our primary dependent variable is the reception of VC funding. We focus on access to VC funding as the main outcome for several reasons. First, venture capital has been a central source of external finance for commercializing innovations in the U.S. economy over the past several decades (Kortum and Lerner, 2000; Samila and

Sorenson, 2011). Second, though venture-backed start-ups represent only a very small fraction of all new firms (about 1/6 of 1 percent), over 60 percent of IPOs since 1999 have been venture-backed (Kaplan and Lerner, 2010). The main dependent variable is a dummy equal to "1" if a start-up receives VC funding within 2 years after the founding date. We consider a 2-year window to control for any potential time heterogeneity, but the results are also robust to different time frames. Seventy percent of VC events occur within 2 years.[9] For robustness, we consider the total amount of capital raised, conditional on VC investment, and find similar results (available upon request).

Independent variables

Female-led start-up. The main independent variable is a dummy equal to "1" if a start-up is female-run. The identification of female-led start-ups relies on two conditions: (a) gender could be identified for at least one of the main managers of the firm (i.e., the president or the CEO of the corporation), and (b) if gender is identified for the management team, all members for which we can identify gender are female. We construct a measure of gender based on first names provided by the business registration records for individuals in the above-mentioned positions. To do so, we use the Social Security Administration list of names registered at least five times in a year from 1950 to 2000. To handle ambiguous names (e.g., Taylor), we use only names that are five times more common in females than males (or vice versa). Following this procedure, we are able to confidently identify gender for 84 percent of firms in our sample.

Startup Growth Orientation. We use the at-founding characteristics established by Guzman and Stern (2015, 2016, 2017) as indicators of follow-on, start-up growth. Specifically,

[9] This result is consistent with other samples of business registration records containing more states (Catalini, Guzman, and Stern, 2018) and samples matching the receipt of VC funds to the U.S. Census Longitudinal Business Database (Puri and Zerutskie, 2012).

Guzman and Stern (2015, 2016, 2017) establish that certain startup characteristics strongly predict whether a startup achieves high growth outcomes, including IPO or a high-value acquisition. Following this approach, we use business registration records to construct measures of startup growth.

We first construct two binary measures that relate to how the firm is registered, *Corporation,* whether the firm is a corporation rather than an LLC or partnership, and *Delaware jurisdiction,* whether the firm is registered in Delaware. C*orporation* is an indicator equal to "1" if the firm is registered as a corporation, and "0" if it is registered either as an LLC or a partnership. *Delaware jurisdiction* is equal to "1" if the firm is registered in Delaware but has its main office in California (all other foreign firms are dropped before analysis). We then construct two additional measures based directly on the name of the firm. *Eponymy* is equal to "1" if the first, middle, or last name of the top managers is part of the name of the firm itself. Our second measure relates to the length of the firm name. Based on our review of naming patterns of growth-oriented start-ups versus the full business registration database, a striking feature of growth-oriented firms is that the vast majority of their names consist of two words. We define *Short name* to be equal to "1" if the entire firm name has three or fewer words, and "0" otherwise. Based on findings of Guzman and Stern (2015), we additionally examine the type of traded cluster a firm is associated with, focusing on whether the firm is in a high-tech cluster or a cluster associated with resource-intensive industries.[10] Finally, an important indicator of a startup growth orientation is the presence of patents or trademarks. These measures are constructed using a name-matching algorithm that connects the firms in the business registration data to

[10] For our high-tech cluster group (*Traded High Technology*), we draw on firm names from industries in 10 U.S. Cluster Mapping Project clusters: Aerospace Vehicles, Analytical Instruments, Biopharmaceuticals, Downstream Chemical, Information Technology, Medical Devices, Metalworking Technology, Plastics, Production Technology and Heavy Machinery, and Upstream Chemical.

external data sources. We include patents filed by the firm within the first year of registration and patents assigned to the firm within the first year from another entity (e.g., an inventor or another firm). Our second measure, *Trademark,* is equal to "1" if a firm applies for a trademark within the first year of registration.

Measuring startup growth orientation

Following the methodology in Guzman and Stern (2015), we estimate the firm-level probability of achieving a growth outcome based on observable start-up characteristics. First, we estimate the model presented in our methodology section with a growth outcome equal to "1" if a firm achieves an IPO or acquisition within 6 years, and include all early-stage observables, as described above.

Although multiple definitions of growth are possible, we use this outcome to correctly characterize the venture capital process: growth orientation at founding indicates the potential to achieve a successful exit. Accordingly, we construct a dummy variable equal to "1" if the start-up achieves an IPO or a high-value acquisition within 6 years of registration.[11] Both outcomes are drawn from Thomson Reuters SDC Platinum. We observe 1,099 positive growth outcomes for the 1995–2005 start-up cohorts (used in all our regressions). The median acquisition price is $77 million (ranging from a minimum of $11.9 million at the 5th percentile to $1.92 billion at the 95th percentile). Finally, we use this model to predict the probability of a growth outcome for a firm, given its observable characteristics at founding. This probability is a measure of growth orientation at the time of firm founding.

Our initial model excludes gender to allow for estimates of growth orientation to be

[11] Thomson Reuters limits acquisitions to known values over $1M dollars. In unreported analyses, we have experimented with higher thresholds of this, finding no significant differences in the analysis. Similar analyses are also in the Supplementary Materials of Guzman and Stern (2016).

independent of whether a start-up is female or male-run. Thus, for any given firm, our measure estimates its likelihood of achieving a growth outcome, given early-stage observables without considering the effect of gender on growth. This allows us to further estimate the effect of gender while controlling for growth orientation, as indicated by initial startup characteristics.

Before we turn to analyses of gender, we first discuss our computation of the growth orientation metric, as can be seen in Table A1. We begin by estimating a logit regression specification with all startup observables, estimated for all firms registered in California and Massachusetts between 1995 and 2005. We use the observables shown to have a good fit as well as a strong predictive power in out-of-sample tests (Guzman and Stern, 2015, 2016, 2017). We find that, amongst new ventures, startups with a "corporation" form are 5.8 times more likely to grow relative to the baseline; startups with a short name are 2.5 times more likely to grow; and eponymous startups are 70 percent less likely to grow. New ventures with a trademark are almost 4 times more likely to grow, startups with a patent are 35 times more likely to grow, and startups registered in Delaware are 52 times more likely to grow. Startups that both have a patent and are registered in Delaware are 269 times more likely to grow. Finally, firms associated with high-tech industries are 53 percent more likely to grow, whereas firms associated with local industries are 33 percent less likely to grow. Interestingly, this small number of observables accounts for 34 percent of all statistical variation (*pseudo*-R-squared).

Summary statistics

Table 1 lists descriptive statistics for the main covariates. The mean of our independent variable, *Female*, is 22 percent, indicating the share of startups in our sample led by women. Figure A1 plots this measure through time, for both California and Massachusetts. Our main dependent variable is a startup access to VC funding (in 2 years and 6 years). We also consider

subsequent outcomes, such as IPOs and mergers and acquisitions. We provide summary statistics for controls, including firm observables, intellectual property observables, industry characteristics, and VC-targeted industry controls.

Table 2 and Figure 1 together provide simple measures of the incidence of female founders on all our measures, categorized into three different groups: equity events including both VC financing and growth outcomes; growth orientation; and at-founding observables. We describe each one in turn.

In terms of equity events, women-led startups represent a relatively small share (22 percent) of all startups that achieve any of these events. Female-led startups further account for only 10 percent of venture-backed firms, and 7 percent of those that are sold or have an IPO. These initial findings strongly suggest that gender gap in entrepreneurship might reflect, at least in part, differences in the kinds of startups and women and men launch. A similar pattern can be detected when considering the incidence of female-founded ventures at higher levels of growth orientation. Among startups in the top 5 percent by growth orientation, startups led by women account for only 13 percent. And among startups in the top 1 percent by growth orientation, female-founded startups account for only 10 percent.

We next turn to firm-level differences at founding to account for such disparities in entrepreneurial outcomes across female and male-founded ventures. The results suggest that women create startups that differ from those created by men along a number of dimensions, including industry, the type of jurisdiction taken (a proxy for intent to both raise venture capital and grow), and the use of innovation technology (e.g., patenting). Although women represent 22 percent of all firms, they account for only 10 percent of startups that have a patent, 12 percent of those registered in Delaware, 15 percent of those oriented towards IT, and 14 percent of those

oriented towards semiconductors. Notably, patenting and registering in Delaware were also the characteristics most associated with growth in our predictive model.

***** Insert Tables 1 and 2 about here *****

RESULTS

Main results

In Table 3, we assess the baseline hypothesis by considering the probability of obtaining VC funding by female-led ventures relative to their male-run counterparts. As shown in column 1, female-led ventures are 63 percent less likely than male-led ventures to obtain VC funding. In column 2, we re-estimate this baseline specification but match female- and male-run ventures on our measure of growth orientation. As can be seen, the gender gap decreases to 24 percent, suggesting that as much as 65 percent of the observed differential in access to entrepreneurial funding is due to systematic sorting of females and males into ventures of varying growth orientation. Finally, in column 3, we re-estimate the baseline specification using the Monte Carlo procedure;[12] these findings mirror previous estimates, with the estimated gender gap equal to 22 percent.

Overall, our results lead to two important conclusions. First, while women are less likely to access venture capital than men, most of this gap arises because of the underlying differences with respect to startup growth orientation. Therefore, the initial stages of the entrepreneurial process play a much larger role in generating disparities between female and male entrepreneurs than do subsequent stages. At the same time, female-run ventures continue being less likely to access VC funding even when compared to male-run ventures of similar growth orientation. In

[12] Given the small number of female-founded firms at the high end, we prefer to match it with multiple different male-led firms. To do so, we find 100 random matches (with replacement) for each female firm, then estimate the coefficient 100 times and report the coefficient's empirical distribution.

the following section, we perform additional analyses to probe deeper into the mechanisms that may potentially explain these residual gender-based differences we observed.

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

Auxiliary results: Statistical versus taste-based discrimination

Although our results indicate that most of the gender-based gap in entrepreneurship is driven by the initial differences in growth orientation across female- and male-founded ventures, as much as 35 percent of this differential persists even when such initial heterogeneity is taken into consideration. Hence, in additional analyses, we probe the mechanisms likely to explain the residual gender differences in the reception of VC funding.

Our argument implies that, once differences in growth orientation are netted out, the residual variation will partly reflect differences in investors' bias against female entrepreneurs. We conduct additional analyses to examine if our supplemental analyses are consistent with this explanation.

An important source of investors' bias is statistical discrimination, which arises when stereotypes are activated when information is limited or ambiguous (Arrow, 1977; Phelps, 1972). Importantly, reliance on gender decreases as additional cues to individual merit or quality become more easily observable (Petersen and Saporta, 2004; Ridgeway and Correll, 2006), and as evaluators are themselves more experienced and more capable of discerning quality directly (e.g., Jensen, 2006; Podgorny, 1995). A direct implication of these theories is that the gender gap should diminish when (a) growth-orientation signals are stronger and therefore more salient to investors; and (b) when investors are more sophisticated. In what follows below, we consider each possibility in turn.

The growth-orientation strength

We begin by examining whether gender bias diminishes for ventures with a stronger growth orientation. The results are presented in Table 4 Panel A. Panel A in this table estimates gender-based differences in VC funding at different levels of growth orientation. We classify entrepreneurial ventures in the following way: (1) 0–95th percentile of growth orientation, (2) 95–99th percentile, (3) 99th percentile, (4) 99.5th percentile, and (5) 99.9th percentile. This partition is particularly suitable to the VC context because the modal investment outcome is a failure, and over 50 percent of VC investments are concentrated in the top 1 percent of the predicted distribution (see Catalini *et al,* 2018). For example, Hall and Woodward (2010) report that about 50 percent of the VC-backed start-ups in their sample had zero-value exits. Similarly, Sahlman (2010) finds that 85 percent of returns can be attributed to just 10 percent of investments. Because successful exits are rare for VCs, the latter tend to focus on investments with the highest potential.

As shown in columns 1 through 5, conditional on matching on at-founding observables, the gender gap is wider at lower levels of growth-orientation—or for new ventures associated with greater uncertainty. In column 1, within the 0–95th percentile, a start-up run by a female is 33 percent less likely to receive VC funding than a comparable growth orientation start-up run by a male. Column 2 shows that the gap decreases for ventures that fall into the 95–99th percentile of the distribution: within this category, female-led ventures are 23 percent less likely to obtain VC funding than comparable male-led ventures. Column 3 estimates the probability for new ventures that fall within the top 1 percent of the distribution. Gender-based differences in access to VC capital continue to decrease: female-led ventures are 16 percent less likely to

receive VC funding than comparable male-led ventures. Columns 4 and 5 further estimate the probability of VC funding for ventures at the top 0.5 percent and 0.1 percent of the estimated growth-orientation distribution, respectively. Gender-based differences disappear entirely within those subsamples, indicating that female-run start-ups at the top of the distribution are as likely as equivalently positioned male-run start-ups to secure important entrepreneurial resources.

In additional analyses, we tested whether the coefficients in these different models were different statistically. Our results are significant between firms in the bottom of our distribution (bottom 95%) and the 95–99th group; among the bottom 95 percent and the top 1 percent, and among the top 0.1 percent, and the top 1 percent.

Overall, these findings are consistent with the theories of statistical discrimination, indicating that gender-based differences in access to funding are not uniform across different levels of growth orientation; instead, as ventures seem more oriented towards growth (and uncertainty decreases), evaluators rely less on gender to assess the potential exit value of a new venture.

Non-sophisticated evaluators

As a second test, we examine whether the effect of gender varies with the evaluators' sophistication. If statistical discrimination accounts for the residual gap in funding, then we should expect the remaining disparities to be greater among non-sophisticated investors.

To account for investors' sophistication, we follow Krishnan and Masulis (2012), who calculate a reputation score for the top 1,000 VCs between 1996 and 2002 based on past IPO performance. We use their score, expanded to the period 1995–2005. At the firm level, VC quality is the maximum of the Series A investors. We consider VCs to be less sophisticated when

they fall into the bottom quartile of VC-backed firms, based on the reputation score presented in Krishnan and Masulis (2012).[13]

In Panels B and C of Table 4, we examine the heterogeneous effect of gender on the probability of accessing VC funding for sophisticated and non-sophisticated VCs. To do so, we re-estimate the baseline specification for the two kinds of VCs, separately. Columns 6 through 8 report the estimates for the association between female-run ventures and VC funding for sophisticated VCs. Columns 9 through 11 re-estimate the same baseline specifications for non-sophisticated VCs. As can be seen in columns 6 and 9, the overall gender gap is greater for non-sophisticated VCs (an increase from 14 percent to 22 percent), consistent with the notion that less capable evaluators are less likely to rely on gender stereotypes in inferring the potential value of a new venture. A further decomposition of these effects by growth-orientation levels leads to an important conclusion: differences by investor sophistication stem primarily from startups placed outside the top of the growth distribution (columns 7 and 10). Once startups have a strong growth orientation (i.e., they are placed within the top of the distribution), the effect is indistinguishable from zero for both types of investors.

Taken together, these results provide evidence consistent with the proposition that the residual gap in funding might reflect – at least in part – investors' bias against female entrepreneurs.

***** Insert Table 4 about here *****

Auxiliary analyses: Alternative explanations

We conduct a number of auxiliary analyses to examine other potential explanations for

[13] Notably, during the period 1995–2002 there were a considerable number of non-sophisticated investors in the market. Our list is mostly composed of short-lived funds such as the Boston University Community Technology Fund and corporate venture capital funds such as the Compaq Computer Corporation.

the residual gap in funding between female and male-founded startups. Specifically, we consider whether such gap might reflect (a) differences in investment complementarities across female and male-founded ventures; (b) differences in investors' risk taking; and (c) differences in individual characteristics of female and male entrepreneurs.

Gender differences in complementarities of VC funding

We first assess whether the residual gap in access to VC funding might partly arise because female entrepreneurs are less likely to benefit from receiving VC funding than male entrepreneurs. For example, fewer complementarities might exist between male-dominated VCs and female-run ventures *ex-post*, reducing investors' motivation to make bets on female-run ventures. Alternatively, female-led ventures that receive funding may be less motivated than male-led ventures to pursue successful exit strategies *ex-post*, which would again discourage external investors from making *ex-ante* investments in female-run ventures. If this were the case, female-run ventures would underperform male-run ventures even conditional on access to VC funding.

To investigate this possibility, we examine whether the benefits of getting VC funding (i.e., its positive impact on growth outcomes) accrue differently for female- and male-led ventures. We consider the two key equity growth outcomes relevant for VC investments—IPOs and acquisitions. We then assess the heterogeneous effect of VC funding on those outcomes. As can be seen in Table 5, columns 1 and 3, VC funding has a positive and statistically significant impact on the probability of filing for an IPO as well as being acquired. The interaction effect added in Columns 2 and 4 further shows that the positive impact of VC funding on liquidity events is homogenous across male- and female-led ventures. Together, these results suggest that female-led ventures and male-led ventures are equally likely to benefit from access to venture

capital.

***** Insert Table 5 about here *****

VC risk-taking

Another explanation for the residual gap we observe is that higher-quality VCs might be more able and more willing to take risks than lower-quality VCs. If so, then investment in female-led ventures may reflect greater propensity to invest in risky ventures. We follow the approach of Nanda and Rhodes-Kropf (2013) to investigate whether investors are more likely to invest in female-led ventures during hot markets.

In Table 6 Panel A and Panel B, we re-estimate the baseline specification from Table 3 separately for boom years (Panel A) and bust years (Panel B). The results in columns 1 and 4 are comparable and similar to those shown in Table 4, and are not statistically different across boom and bust periods. That is, the *Female-led start-up* coefficient is less than 1 and statistically significant (column 1) in both Panel A and Panel B. Columns 2 through 3 and 5 through 6 further show that the gender gap decreases as the growth potential of a new venture increases; the gap further decreases at the top 1 percent of the growth-orientation distribution. Hence, VCs appear to be equally likely to invest in female-led ventures in boom and bust years. In Panel C, we compare the results from Panel A and Panel B directly by estimating an interaction term between the female dummy and the boom-years dummy. As shown in column 7, we find that access to VC funding is indeed less constrained during boom periods, consistent with prior findings (Nanda and Rhodes-Kropf, 2013). However, the impact of hot markets on investments in entrepreneurial ventures does not vary across male- and female-led ventures. Hence, given these findings, it is unlikely that VCs selectively invest in female-led ventures as a form of experimentation and risk taking.

***** Insert Table 6 about here *****

Top female founders

Another possibility is that women who pursue high-growth ventures may differ along observable and unobservable characteristics that influence VC evaluation processes and willingness to invest. For example, those female founders who are less likely to receive investment may have relatively weaker networks than female founders who successfully receive funding. Because many studies have related lower performance of female-run ventures to gender differences in network structure and composition (Aldrich, 1989; Cromie and Birley, 1992), this explanation is credible. Nevertheless, this concern is unlikely to explain our results, for a number of reasons. First, if the growth-orientation of female-led ventures is systematically correlated with women's access to networks, then we would expect that sophisticated investors would better evaluate such differences. This implies that the gender gap in funding should be greater when investors are more sophisticated—given that such investors are better able to evaluate differences across entrepreneurs. However, in Table 4 Panel B and C, we find the opposite: as shown in columns 7 and 10, the gender gap is greater for non-sophisticated than for sophisticated investors.

Another possibility may be that women who pursue opportunities with lower growth potential lack the confidence to seek funding. However, this would imply that a female entrepreneur will be (intrinsically) more capable than a male counterpart at a similar level of growth orientation. Hence, female-led ventures should be more likely to raise financing than comparable male-led ventures. However, in Table 4 columns 1 and 2, we find the opposite: among lower-growth ventures, those run by females are less likely to obtain funding than those run by males.

It might also be that female entrepreneurs differ along some unobserved dimensions

correlated with the propensity to obtain funding. Although we expect our measure of growth orientation to account for such differences, based on the premise that these differences would incline women to found new ventures of different expected returns, we nonetheless conduct additional analyses to probe this effect further. Specifically, we estimate a model with individual-fixed effects to remove time-invariant individual heterogeneity. A limitation of the model is that it cannot be estimated for individuals who never received funding. Although we lose many observations, we can estimate this model for serial entrepreneurs who founded more than one venture and who obtained funding for some (but not all) founded ventures.

In Table 8, we interact the *Female-led start-up* dummy with a dummy indicating that an individual has been a serial entrepreneur. Serial entrepreneurs are less likely than non-serial entrepreneurs to obtain funding. At the same time, when the results are estimated "within the individual," the odds of getting financing are even lower when an entrepreneur is a female, as indicated by the coefficient on the interaction term (*Serial entrepreneur* × *Female*). This result is consistent with the notion that female-led ventures are less likely to receive funding than male-led ventures. Thus, our results are unlikely to reflect unobserved qualities and skills of female entrepreneurs.

***** Insert Table 7 about here *****

Robustness checks

Falsification test

If gender, at least in part, drives differences in access to VC funding, gender differences will be *at least* mitigated when new ventures are composed of mixed-gender management teams. Presumably, male representation on the management team will compensate for negative stereotypes, if such were associated with female founders. To assess this possibility, we re-

estimate our specification for new ventures with mixed-gender management teams—in this case, we consider the gender of individuals registered as president, treasurer, or secretary. These data on top management teams are only available for the subsample of business registrants registered in Massachusetts. As shown in Table 8 column 1, we are able to replicate the gender gap in funding, when a firm registers in Massachusetts. Column 2 additionally shows that the effect becomes zero for ventures with mixed-gender management teams. Our inability to replicate the results for these ventures reinforces the notion that our results might reflect the effect of gender.

***** Insert Table 8 about here *****

Generalizability

While our analyses focus on businesses registered in California and Massachusetts, one concern may be that these results capture the effect of California only and are not generalizable to other locations, either because (a) female-led ventures outside California are much less growth oriented, or because (b) investors are less likely to statistically discriminate based on gender in other states. Although plausible, the possibility that bias toward female-run ventures is systematically higher in California is unlikely—because California is home to Silicon Valley and a vibrant entrepreneurial culture. However, to address this possibility formally, we re-estimate our baseline specification for the universe of business registrants in Massachusetts (for the same study period) and Texas. Because new ventures in Massachusetts are more commonly founded within the biotech sector, the gender gap in obtaining funding may be different. Similarly, because Texas is a Southern state, it is worth investigating whether the gender gap can be replicated in this setting to alleviate the concern that our results are driven by ventures in Northern states alone.

In Table 9, we replicate similar findings for businesses registered in Texas (columns 1–2)

and Massachusetts (columns 3–4): the coefficient of the *Female-led start-up* dummy continues to be less than 1, and highly significant statistically across all model specifications. Indeed, the gender gap appears to be even wider in Texas, with female-led start-ups having 70 percent lower odds of getting funding than male-led start-ups, and in Massachusetts, 33 percent lower.

***** Insert Table 9 about here *****

VC funding time window

Another potential concern is that gender differences in access to funding may be an artifact of the 2-year window we chose. Although the majority of ventures tend to obtain VC funding within the first 2 years, it is possible that women take longer than men to access venture capital. This raises the possibility that female-led ventures might be as likely to obtain VC funding as male-led ventures when a longer time window is considered. To address this concern, in Table 10 Panel A, we re-estimate the baseline specification to examine (a) getting VC funding within a 6-year window, and (b) getting funding "ever"—or within the entire period under study. As can be seen in Table 10 Panel A, our results are unchanged if we focus on a longer time window. Hence, our results are not merely an artifact of different time horizons that female- and male-run start-ups might adopt.

***** Insert Table 10 about here *****

Alternative time periods

Another concern with our identification strategy might be the period under study. Perhaps the gender gap in entrepreneurship has disappeared as female entry into entrepreneurship has increased over time. If so, then our results are simply an artifact of the time period chosen. To see whether this possibility affects our results, in Table 10 Panel B, we re-estimate our baseline specification for different time windows: 1999–2000, 2001–2007, and 2008–2011. As shown in

columns 7 and 8 of Table 10 doing so is immaterial for our results: we find significant gender differences in access to funding in each of the windows considered.

DISCUSSION

Previous research has shown a stark gender gap in entrepreneurship, with women being less successful entrepreneurs than men (e.g., Aldrich, 2005; Reynolds et al., 2004; Ruef et al., 2003; Yang and Aldrich, 2015). But despite this inequality, our understanding of its origins along the entrepreneurial process remains limited. Although entrepreneurship involves a number of stages, a majority of research has focused on the gender imbalance that arises at the early-investment stage: scholars have emphasized investors' bias against female entrepreneurs as the primary driver of such inequality (e.g., Canning et al., 2012; Greene et al., 2003; Gatewood et al., 2003; Brush et al., 2014; Coleman and Robb, 2009; 2016; Thébaud and Sharkey, 2014). This study, by contrast, decomposes the gender gap into separate stages in the entrepreneurial process and assesses the relative contribution of each stage to the imbalance between female and male founders.

We apply a novel empirical approach to separate the initial differences in startup characteristics that signal to investors a new venture's growth orientation and assess their magnitude relative to the residual disparity. Building on recent studies using at-founding observables to characterize the expected returns of different startups (Guzman and Stern, 2015, 2016, 2017; Catalini *et al*, 2018), we theorize and empirically assess differences in initial growth orientation across female and male entrepreneurs.

Our findings confirm the well-established pattern that female-led ventures are significantly less likely to obtain funding. But contrary to the common assumption that investors'

bias is the key culprit, the majority of the gap reflects differences that originate elsewhere in the process. As much as 65 percent of the total disparity in funding can be attributed to differences in startup growth potential at the time of founding. In this regard, our findings suggest that women are significantly less likely than men to found ventures that exhibit growth orientation and are appealing to investors. Specifically, women are less likely to found and run startups that have appropriable and differentiated technology (as evidenced by patents), to found companies in sectors associated with venture capital such as biotechnology, IT, or semiconductors, and to register the company in Delaware—a jurisdiction associated with an intent to raise external financing. Women are also more likely to start firms in industries associated with a local business activity, rather than traded.

The residual gap (i.e., 35 percent of the gap, or 18 percentage points) can be attributed to other factors, including, at least in part, investors' preferences and bias. Further analyses provide evidence to link this remaining difference with investors' biases or beliefs about gender. Specifically, we find that the gap between female and male entrepreneurs closes when signals of growth orientation become stronger or when investors are more sophisticated. Both findings are consistent with theories of statistical discrimination, suggesting that gender is only used as a cue to infer information about a new venture when signals of growth potential are weaker or when evaluators are less capable and less experienced.

Collectively, our findings make several contributions. First, we contribute to the growing line of research on female entrepreneurship. Our analyses enrich recent and vibrant line of work on gender and entrepreneurship (e.g., Kim et al., 2006; Loscocco et al., 1991; Kalleberg and Leicht, 1991), as well as work that relates to the processes of discrimination on the part of investors (e.g., Jennings and Brush, 2013). We show that, while these processes play a role in

generating gender imbalance in access to funding, they are not the key source of the gap. Instead, initial disparities in growth orientation across female- and male-led ventures are the most significant force in generating differences between female and male entrepreneurs. Finally, we offer additional evidence to link the residual gap to investors' preferences. In particular, we find that the residual differences in funding diminish when quality signals are stronger and when investors are more experienced.

More generally, our study contributes to work on gender in the strategic context. A vast number of strategy scholars have recognized the role of gender in strategy, but these studies have mostly focused on female participation rates in corporate boards (e.g., Helfat et al., 2006; Hillman, Shropshire, and Cannella, 2007), CEO and executive positions (Cook and Glass, 2014; Hill et al., 2014; Heilman et al., 1989), or managerial roles (Blum, Fields, and Goodman, 1994; Petersen and Morgan, 1995)—and examined its influence on important firm outcomes, ranging from firm performance (e.g., Dezso and Ross, 2012; Hillman et al., 2007; Matsa and Miller, 2011) to investors' reactions (e.g., James and Lee, 2007). Yet, the role of gender in driving strategic outcomes in the entrepreneurial context has been less well explored. Hence, our study contributes to this line of inquiry, shedding light on how gender might shape strategic outcomes, such as access to funding, in the context of entrepreneurial firms.

Our results have important policy implications. Findings presented in the study lead to a natural focus on interventions that improve the net-new creation of high-growth entrepreneurship rather than the performance of existing ones. Policies aimed at allowing women to create more and higher-potential firms—such as improving technological education, mentoring and career aspirations, and developing support mechanisms within the family—are likely to have a higher impact in reducing the gender gap in entrepreneurship we documented in this study.

Our findings open up attractive opportunities for future research. First, while our study provides evidence that initial differences in the growth orientation of startups across gender drive the well-established gender gap in access to venture capital, it does not shed any light on the drivers of such differences. Future research could therefore profitably explore the reasons why women tend to found and lead ventures of lower expected economic potential. While these reasons are theorized in our study, further empirical inquiry could investigate the differences in growth orientation we document. Moreover, our study shows that gender differences are likely to be weaker and even non-existent for top-performing firms, opening up attractive opportunities for further inquiry. Future studies may, for example, want to assess whether top-performing start-ups led by females may, under some conditions, gain advantage over start-ups led by males, and reach critical entrepreneurial milestones. For example, future studies may want to assess when investors are more likely to invest in top-performing female entrepreneurs.

REFERENCES

Aldrich HE. 2005. Entrepreneurship. In *The Handbook of Economic Sociology* (2nd ed), NJ Smelser, R Swedberg (eds). Princeton University Press: Princeton, NJ; 451–477.

Alvarez SA, Busenitz LW. 2001. The entrepreneurship of resource-based theory. *Journal of Management* **6**: 755–775.

Barney JB. 1991. Firm resources and sustained competitive advantage. *Journal of Management* **17**(1): 99–120.

Belenzon S, Chatterji A, Daley B. 2017. Eponymous Entrepreneurs. *American Economic Review* **107**(6): 1638-1655.

Birley S. 1989. Female entrepreneurs: are they really any different? *Journal of Small Business Management* **27**(1): 32–37.

Blanchflower DG, Levine P, Zimmerman D. 2003. Discrimination in the small-business credit market. *The Review of Economics and Statistics* **85**(4): 930–943.

Brush CG, Carter NM, Gatewood E, Greene PG, Hart M. 2003. Venture capital access: is gender an issue? In *The Emergence of Entrepreneurship Policy: Governance, Start-ups and Growth in the U.S. Knowledge Economy,* D Hart (ed). Cambridge University Press: London; 141–154.

Brush C, Carter N, Gatewood E, Greene P, Hart M. 2006. Women's entrepreneurship in the United States. In *Growth Oriented Women Entrepreneurs and Their Businesses,* Brush C, Carter N, Gatewood E, Greene P, Hart M (eds). Edward Elgar: Cheltenham, UK.

Canning J, Haque M, Wang Y. 2012. *Women at the Wheel: Do Female Executives Drive Start-Up*

Success? Dow Jones and Company.
Carnahan S, Agarwal R, Campbell BA. 2012. Heterogeneity in turnover: the effect of relative compensation dispersion of firms on the mobility and entrepreneurship of extreme performers. *Strategic Management Journal* **33**: 1411–1430.
Carter N, Allen K. 1997. Size-determinants of women-owned businesses: choice or barriers to resources. *Entrepreneurship and Regional Development* **9**(3): 211–220.
Carter N, Gartner W, Shaver K, Gatewood E. 2003. The career reasons of nascent entrepreneurs. *Journal of Business Venturing* **18**: 13–39.
Carter S, Shaw E, Lam W, Wilson F. 2007. Gender, entrepreneurship, and bank lending: the criteria and processes used by bank loan officers in assessing applications. *Entrepreneurship Theory and Practice* **31**: 427–444.
Castilla EJ. 2008. Gender, race, and meritocracy in organizational careers. *The American Journal of Sociology* **113** (6): 1479–1526.
Catalini C, Guzman J, and Stern S. 2018. Hidden in Plain Sight: Venture Growth with and without Venture Capital. MIT Working Paper.
Cavalluzzo K, Cavalluzzo L, Wolken JD. 2002. Competition, small business financing, and discrimination: evidence from a new survey. *The Journal of Business* **75**(4): 641–679.
Coleman S, Robb A. 2009. A comparison of new firm financing by gender: evidence from the Kauffman firm survey data. *Small Business Economics* **33**: 397–411.
Gatewood EJ, Carter NM, Brush CG, Greene PG, Hart MM. 2003. *Women Entrepreneurs, Their Ventures, and the Venture Capital Industry: An Annotated Bibliography.* Entrepreneurship and Small Business Research Institute: Stockholm.
Greene PG, Hart MM, Gatewood EJ, Brush CG, Carter NM. 2003. Women entrepreneurs: Moving front and center: An overview of research and theory. Coleman White Paper Series. Available at http://www.usasbe.org.
Guzman J, Stern S. 2015. Where is Silicon Valley? *Science* **347**(6222): 606-609.
Guzman J, Stern S. 2016. The State of American Entrepreneurship: New Estimates of the Quality and Quantity of U.S. Entrepreneurship for 15 U.S. States. 1988-2014. NBER working paper 22095. National Bureau of Economic Research http://dx.doi.org/10.3386/w22095
Guzman J, Stern S. 2017. Nowcasting and Placecasting: Entrepreneurial Quality and Performance. In Meausuring Entrepreneurial Businesses: Current Knowledge and Challenges. Eds. John Haltiwanger, Erik Hurst, Havier Miranda, and Antoinette Schoar. National Bureau of Economic Research, Cambridge, MA. http://dx.doi.org/10.3386/w20954
Haines GH Jr, Orser BJ, Riding AL. 1999. Myths and realities: an empirical study of banks and the gender of small business clients. *Canadian Journal of Administrative Sciences* **16**: 291–308.
Jennings JE, Brush CG. 2013. Research on women entrepreneurs: challenges to (and from) the broader entrepreneurship literature? *Academy of Management Annals* **7**(1): 663–715
Kalleberg A. Leicht K. 1991. Gender and organizational performance: determinants of small business survival and success. *Academy of Management Journal* **34**(1): 136–161.
Kim PH, Aldrich HE, Keister LA. 2006. Access (not) denied: the impact of financial, human, and cultural capital on entrepreneurial entry in the United States. *Small Business Economics* **27**(1): 5–22.
Kortum SS, Lerner J. 2000. Assessing the contribution of venture capital to innovation. *Rand Journal of Economics* **31**(4): 674–692.
Krishnan CVN, Masulis R. 2012. Venture Capital Reputation: A Survey. In *Handbook of Entrepreneurial Finance, Venture Capital and Private Equity,* Cummings D (ed). Oxford University Press: Oxford.
Lippman SA, Rumelt RP. 2003. A bargaining perspective on resource advantage. *Strategic Management Journal* **24**(11): 1069–1086.
Loscocco KA, Robinson J, Hall RH, Allen JK. 1991. Gender and small business success: an

inquiry into women's relative disadvantage. *Social Forces* **70**(1): 65–85.
McPherson M, Smith-Lovin L, Cook JM. 2001. Birds of a feather: homophily in social networks. *Annual Review of Sociology* **27**: 415–444.
Nanda R, Rhodes-Kropf M. 2013. Innovation and the financial guillotine. Unpublished working paper. Harvard University: Cambridge, MA.
Orser BJ, Riding AL, Manley K. 2006. Women entrepreneurs and financial capital. Entrepreneurship Theory & Practice **30**: 643–665.
Petersen T, Saporta I. 2004. The opportunity structure for discrimination. *American Journal of Sociology* **109**: 852–901.
Reynolds P. 2000. National panel study of U.S. business start-ups: background and methodology. In *Databases for the Study of Entrepreneurship,* vol. 4 of *Advances in Entrepreneurship, Firm Emergence, and Growth,* Katz JA, Brockhaus RH (eds). JAI Press: Greenwich, CT; 153–227.
Ridgeway CL, Correll SJ. 2006. Consensus and the creation of status beliefs. *Social Forces* **85**: 431–453.
Robb A, Coleman S, Stangler D. 2014. Sources of economic hope: women's entrepreneurship. Retrieved from http://www.kauffman.org/~/media/kauffman_org/research%20reports%20and%20covers/2014/11/sources_of_economic_hope_womens_entrepreneurship.pdf
Ruef M, Aldrich HE, Carter N. 2003. The structure of organizational founding teams: homophily, strong ties, and isolation among U.S. entrepreneurs. *American Sociological Review* **68**(2): 195–222.
Schoar A. 2010. The divide between subsistence and transformational entrepreneurship. in *Innovation Policy and the Economy* (vol. 10), Lerner J, Stern S (eds). University of Chicago Press: Chicago; 57–81.
Shane S, Dolmans S, Jankowski J, Reymen I, Romme G. 2012. Which inventors do technology licensing officers favor for start-ups? *Frontiers of Entrepreneurship Research* **32**(18): Article 1.
Sørensen JB, Sharkey AJ. 2014. Entrepreneurship as a mobility process. *American Sociological Review* **79**(2): 328–49.
Tajfel H, Turner JC. 1979. An integrative theory of intergroup conflict. In The Social Psychology of Intergroup Relations, Austin WG, Worchel S (eds). Brooks/Cole: Monterey, CA.
Thébaud S. 2015. Business as Plan B institutional foundations of gender inequality in entrepreneurship across 24 industrialized countries. *Administrative Science Quarterly* **60**: 671–711.
Tsui AS, O'Reilly CA. 1989. Beyond simple demographic effects: the importance of relational demography in superior-subordinate dyads. *Academy of Management Journal* **32**: 402–423.
Yang T, Aldrich HE. 2014. Who's the boss? Explaining gender inequality in entrepreneurial teams. *American Sociological Review* **79**(2): 303–327.

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Table 1. Summary statistics

	N	Mean	St. Dev.	Sum
Year	1875087	2004.1653	4.4917	3.76E+09
Gender Measures				
Female-led Start-Up	1875087	0.2212	0.415	414682
Firm Outcome Measures				
Growth (IPO or M&A in 6 years)	1875087	0.0008	0.0278	1455
VC Series A in 2 Years	1875087	0.0021	0.0454	3871
VC Series A in 6 Years	1875087	0.0026	0.0506	4815
Less Sophisticated VC	2064	0.2485	0.4323	513
Firm Observables				
Corporation	1875087	6.30E-01	0.4828	1.18E+06
Short Name	1875087	0.5064	0.5	949510
Eponymous	1875087	1.67E-01	0.3727	312607
Delaware	1875087	0.0466	0.2108	87366
Intellectual Property Observables				
Patent	1875087	0.0045	0.0666	8349
Trademark	1875087	0.003	0.0548	5643
Broad Industry Controls				
Local	1875087	0.1556	0.3625	291774
Traded High Technology	1875087	0.0534	0.2249	100159
Traded Resource Intensive	1875087	0.1091	0.3118	204610
Traded	1875087	0.5365	0.4987	1006077
VC Targeted Industry Controls				
IT Sector	1875087	0.0281	0.1652	52633
Biotech Sector	1875087	0.0028	0.0529	5255
Ecommerce Sector	1875087	0.0458	0.2091	85915
Semiconductor Sector	1875087	0.001	0.0309	1788

Table 2. Growth orientation indicators and female-led start-ups

Share of Female-Led Start-ups Across Observables

All Start-ups	22%
Start-up Outcomes	
IPO or Acquired	7%
Gets Venture Capital	10%
Incidence Across the Distribution of Growth Orientation	
In Top 10%	17%
In Top 5%	13%
In Top 1%	10%
Corporate Form and Naming Observables	
Corporation	24%
Short Name	22%
Eponymous	22%
Registered in Delaware	12%
Intellectual Property Observables	
Has Patent	10%
Has Trademark	21%
Industry Sector Observables	
Local Industries	25%
Traded Industries	21%
IT	15%
Biotechnology	20%
Ecommerce	17%
Medical Devices	20%
Semiconductors	14%

Table 3. The probability of female-led ventures getting VC funding in 2 years

	Estimate Effect of Female-led start-up		
	(1)	**(2)**	**(3)**
	Logit Regression		**Bootstrapped Estimate**
Female-led Start-up	0.368***	0.756***	0.781***
	(0.0202)	(0.0439)	(.0285)
Corporation		19.04***	
		(1.783)	
Short Name		4.010***	
		(0.236)	
Eponymous		0.117***	
		(0.0277)	
Delaware Only		143.7***	
		(8.416)	
Patent Only		47.82***	
		(6.442)	
Patent and Delaware		554.3***	
		(38.02)	
Trademark		1.373***	
		(0.124)	
Broad Sector Dummies	No	Yes	
VC-Targeted Sector Dummies	No	Yes	
Observations	1875087	1875087	
Pseudo R-squared	0.008	0.483	

Table 4. Logit regression female-led ventures at different levels of firm and VC sophistication. Matched estimates on entrepreneurial growth orientation.

Panel A: P(VC Financing in 2 Years)					
	(1) **0–95 percentile**	**(2)** **95–99 percentile**	**(3)** **top 1%**	**(4)** **top 0.5%**	**(5)** **top 0.1%**
Regression Coefficient					
Female-led Start-up	0.674***	0.771***	0.842**	0.892	1.02
	(0.066)	(0.060)	(0.053)	(.071)	(0.175)
Summary Stats					
Observations	1,763,556	74,255	18,564	9282	1,857
Total Funded Firms	302	736	2,121	1,324	480
# Female-led VC Funded Firms	48	72	192	115	40
Share of All Observations	0.0027%	0.10%	1.03%	1.24%	2.15%
# Male-led Growth Firms	254	664	1929	1209	440
Share of All Observations	0.0144%	0.89%	10.39%	13.03%	23.69%
t-tests	**Cols (1) & (2)**	**Cols (1) & (3)**	**Cols (2) & (3)**	**Cols (3) & (4)**	**Cols (3) & (5)**
T-Statistic of Difference in Means	1.54	2.87	1.25	0.10	1.38
T-Statistic p-value (df=100–1)	0.06	0.00	0.11	0.46	0.09

Panel B: P(VC Financing in 2 Years by Sophisticated VC) (1995–2005 Only)(1)					
	(6) **All Firms**	**(7)** **0–99 percentile**	**(8)** **top 1%**	***t*-test of Difference in Means for Cols (7) & (8)**	
Regression Coefficient					
Female-led start-up	0.857*	0.749**	0.947	*t-statistic*	1.92
	(0.074)	(0.097)	(0.109)	*p-value*	0.03

Ratios reported; Bootstrapped standard errors in parentheses * p<0.05 ** p<0.01 *** p<0.001.

Panel C: P(VC Financing in 2 Years by Non-Sophisticated VC) (1995–2005 Only)(1)					
	(9) **All Firms**	**(10)** **0–99 percentile**	**(11)** **top 1%**	***t*-test of Difference in Means for Cols (10) & (11)**	
Regression Coefficient					
Female Start-up	0.775*	0.440**	1.033	*t-statistic*	3.30
	(0.137)	(.104)	(0.232)	*p-value*	0.00

Ratios reported; Bootstrapped standard errors in parentheses. * p<0.05 ** p<0.01 *** p<0.001

Table 5. Impact of VC on growth outcomes (Only 1995–2005)

	DV: IPO		*DV: Acquisition*	
	(1)	**(2)**	**(3)**	**(4)**
	IPO Firms	**IPO Firms**	**Acq All Firms**	**Acq All Firms**
VC Series A in 2 Years	1.822***	1.835***	4.274***	4.375***
	(0.213)	(0.219)	(0.358)	(0.375)
VC Series A in 2 Years * Female-led start-up		0.914		0.731
		(0.328)		(0.191)
Corporation	21.87***	21.87***	4.453***	4.455***
	(5.884)	(5.885)	(0.404)	(0.404)
Short Name	1.798***	1.798***	2.134***	2.135***
	(0.165)	(0.165)	(0.122)	(0.122)
Eponymous	0.474***	0.474***	0.344***	0.344***
	(0.106)	(0.106)	(0.0469)	(0.0469)
Delaware Only	75.87***	75.88***	31.28***	31.29***
	(8.098)	(8.099)	(1.833)	(1.833)
Patent Only	66.38***	66.40***	31.44***	31.48***
	(13.06)	(13.06)	(3.847)	(3.850)
Patent and Delaware	517.0***	517.1***	144.7***	144.7***
	(67.93)	(67.94)	(12.31)	(12.32)
Trademark	4.784***	4.782***	5.322***	5.314***
	(0.592)	(0.592)	(0.527)	(0.527)
Broad Sector Dummies	Yes	Yes	Yes	Yes
VC-Targeted Sector Dummies	Yes	Yes	Yes	Yes
Observations	1442015	1442015	1442015	1442015
Pseudo R-squared	0.415	0.415	0.333	0.333

Incidence ratios reported; Standard errors in parentheses * p<0.05 ** p<0.01 *** p<0.001. Only firms up to 2005 used to allow enough time for growth events to occur in our sample.

Table 6. Logit regression impact of female-led start-ups at different levels of firm and VC sophistication during boom and bust cycles

Panel A: P(VC Financing in 2 Years) during Boom Years (1996–2001)—Split

	(1) All Firms	(2) 0–99 percentile	(3) top 1%	*t*-test of Difference in Means for Cols (1) & (4)	
Regression Coefficient					
Female-led start-up	0.811**	0.690**	0.946	*T-Statistic*	0.67
	(0.063)	(0.080)	(0.114)	*p-value*	0.25

Panel B: P(VC Financing in 2 Years) during Bust Years (2002–2005) Split

	(4) All Firms	(5) 0–99 percentile	(6) top 1%
Regression Coefficient			
Female-led start-up	0.857*	0.704**	0.877
	(0.074)	(0.112)	(0.144)

Panel C: Interaction

	(7) All Firms
Regression Coefficient	
Female-led start-up	0.826+
	(0.093)
Boom	2.37**
	(0.357)
Female-led start-up * Boom	0.993
	(0.150)

Incidence ratios reported. + p< 0.1, * p<.05, ** p < .01.

Table 7. Serial entrepreneurship using individual fixed effects

	(1) VC Series A in 2 Years
Female-led start-up	0.200
	(1.502)
Serial Entrepreneur	0.385**
	(0.118)
Serial Entrepreneur * Female-led start-up	0.0288*
	(0.0474)
Observations	489
Pseudo R-squared	0.535

Only relevant covariates included. Exponentiated coefficients; Standard errors in parentheses. * p<0.05 ** p<0.01 *** p<0.001. Column 1 defines serial entrepreneurs as individuals with the same name, state, and city. Regressions are run at the individual level—this means that in the cases of more than one firm manager (e.g., LLCs), the firm appears once per each manager.

Table 8. The probability of female-led ventures on getting VC funding in 2 years: Massachusetts firms. Includes mixed-gender teams.

	(1)	(2)
Female-led start-up	0.584**	0.523***
	(0.108)	(0.101)
Mixed-Gender-led start-up		1.031
		(0.138)
Cluster Dummies	Yes	Yes
N	289278	367267
Pseudo R2	0.449	0.445

All models include all controls for venture quality, as in Table 4 Model 2. Model 1 only includes firms with all female or all male founders, model 2 includes mixed-gender teams. Mixed-gender teams compose 42% of the sample. Female-led start-ups compose 11.23% of the sample. We consider part of the team only those registered as president, treasurer, or secretary.

Table 9. The probability of female-led ventures on getting VC funding in 2 years: Texas and Massachusetts

	(1) Texas	(2) Texas	(3) Massachusetts	(4) Massachusetts
Female-led start-up	0.0995***	0.295**	0.301***	0.667**
	(0.0412)	(0.125)	(0.0439)	(0.101)
Broad Sector Dummies	No	Yes	No	Yes
VC-Targeted Sector Dummies	No	Yes	No	Yes
Observations	702455	702455	396635	396635
Pseudo R-squared	0.017	0.392	0.010	0.428

All models include all controls for venture quality, as in Table 4 Model 2. Exponentiated coefficients; Standard errors in parentheses. * p<0.05 ** p<0.01 *** p<0.001.

Table 10. Robustness tests

Panel A: Distribution of effect by time to VC financing

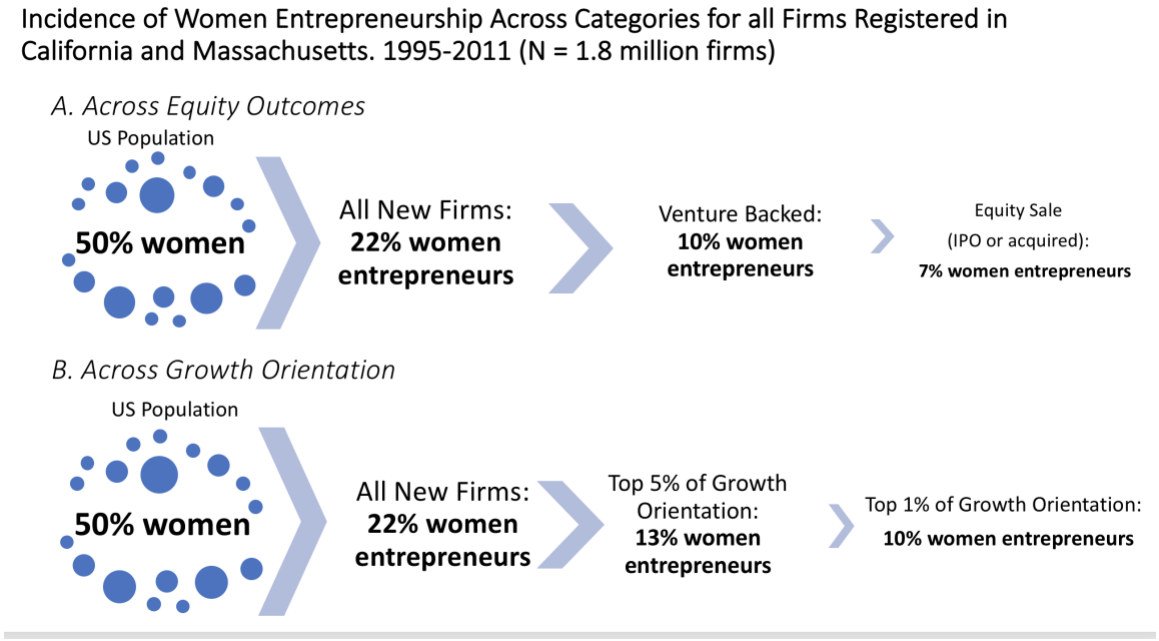
	(1) Gets VC in 2 Years	(2) Gets VC in 6 Years	(3) Gets VC Ever
Female-led start-up	0.781***	0.771***	0.798***
	(.028)	(.025)	(.027)

Panel B: Distribution of effect through time periods

	(4) 1995–2000	(5) 2001–2007	(6) 2008–2011
Female-led start-up	0.805***	0.744***	0.766***
	(.054)	(.044)	(.056)

Only firms between 1995 and 2005 used in analysis. Incidence ratios. Robust standard errors in parenthesis. Matched sample. Quality ranges: Very High, top 1%; High, 95% to 99%; Medium, 75% to 95%; Low, less than 75%. Panels C and D use as a dependent variable a dummy equal to 1 if a firm patents (trademarks) between years 2 and 6, thus excluding the first year, which is included in the quality calculation of the company.
+ p<.10 * p<0.05 ** p<0.01.

FIGURE 1.


Incidence of Women Entrepreneurship Across Categories for all Firms Registered in California and Massachusetts. 1995-2011 (N = 1.8 million firms)
A. Across Equity Outcomes
US Population
50% women
All New Firms:
22% women
entrepreneurs
Venture Backed:
10% women
entrepreneurs
Equity Sale
(IPO or acquired):
7% women entrepreneurs
B. Across Growth Orientation
US Population
50% women
All New Firms:
22% women
entrepreneurs
Top 5% of Growth
Orientation:
13% women
entrepreneurs
Top 1% of Growth Orientation:
10% women entrepreneurs

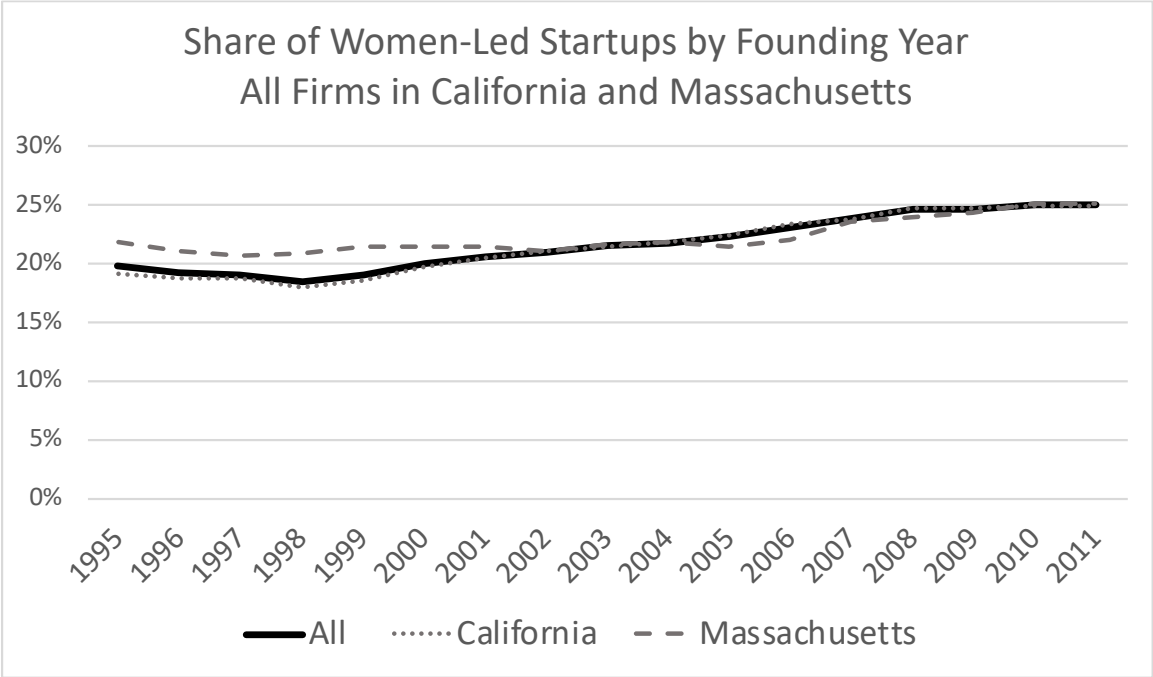
APPENDIX TABLES

Table A1. Growth Orientation Estimation Model

	(1)
Corporation	5.751***
	(0.681)
Eponymous	0.301***
	(0.067)
Short Name	2.458***
	(0.202)
Trademark	3.874***
	(0.470)
interactions	
Patent Only	34.70***
	[6.858]
Delaware Only	51.67***
	(4.374)
Patent and Delaware	268.93***
	(26.672)
Industry Dummies	
Local	0.668*
	(0.120)
Traded High Technology	1.525***
	(0.146)
Traded Resource Intensive	0.766*
	(0.093)
Traded	1.107
	(0.079)
Observations	1,064,914
Pseudo R-squared	0.34

Standard errors in brackets. Incidence ratios reported.

FIGURE A1


Share of Women-Led Startups by Founding Year
All Firms in California and Massachusetts
30%
25%
20%
15%
10%
5%
0%
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
All
California
Massachusetts