



— THE ASCENT OF —

# Women-Founded Venture-Backed Startups in the United States

Ian Hathaway



FEBRUARY 2019

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## Foreword

Whatever your gender identity, I suspect that like me, many of you have forged careers in male-dominated industries. From industrial supply distribution to software development to tech startups, I've spent over two decades working in environments where I was the only woman on a team, or one of just a handful at any given conference.

Lacking relatable peers and role models, battling stereotypes, and feeling "othered" were and still are representative of the issues facing women in every sector of the workforce. And while these byproducts of a broken system are each hurtful and demoralizing, in combination, they have a cascading effect. Decision-making, performance, and innovation suffer when women work for companies and in environments that lack diversity and devalue individual contributions.

Gender inequity crosses industry and party lines; more Democratic governors are named John than are women leaders of statehouses, fewer Fortune 500 companies are led by women than by men named James, and of the groups of leaders examined in this April 2018 *New York Times* study, "Chief executives and directors of last year's top-grossing films have the lowest rates of women. Top venture capitalists and House Republicans were next."

What are the implications of this lack of representation?

Many have spoken and written eloquently on this topic, but I'll never forget meeting and talking with Illuminate Ventures' Cindy Padnos in 2010, who related her interviews with women VCs and the dynamic of being the only woman venture capitalist in a typical Monday partner meeting when investments are reviewed. To paraphrase her: imagine being the only woman partner in the room, and you've just screened a promising startup led by a woman. You want the fund to back this entrepreneur but recall that just last week you advocated for investment in another woman-led startup, and struggle deciding whether to speak up. Now imagine one of your male counterparts pushing for an investment, when he'd just backed another male CEO the prior meeting: no hesitation on his part. Being the only woman in any room poses a unique set of challenges—for the woman and the men. Representation matters.

Fast forward to 2019, where progress is often difficult to discern despite greater attention paid to gender equity, diversity, and inclusion. Spoiler alert: women in venture capital are still underrepresented, as are VC-backed women-founded startups. Our study breaks this down in detail, but what differentiates it and why I'm thrilled to be a part of the Center of American Entrepreneurship is that (1) our research entails detailed analysis of 13 years of data, and (2) it demonstrates that ventures founded by at least one woman perform as well as or even slightly better than their all-male counterparts on a number of measures. While life experience and intuition have long suggested that investing in women is the *right* thing to do, here we present data to demonstrate it's also the *smart* thing to do.



A handwritten signature in black ink that reads "Rebecca Lovell".

**Rebecca Lovell**  
Chair,  
Center for American  
Entrepreneurship  
Director, Create33

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Women's underrepresentation as technology entrepreneurs and leaders, as detailed in this report, spells trouble for the industry and the future of technical innovation, especially in light of an increasing body of research documenting the significant benefits that diversity brings to innovation.

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Technology innovation is a creative process; multiple people work on a single product or service, from company startup and front-end requirements generation, through design and development, to product rollout and support.

It matters who sits at the design table and in the boardroom working on these innovative efforts. Just as in the creation of great art, inspirational music, or a fine meal, technology creation benefits from diverse life experiences. That's why when women, by and large, are not participating in technical innovation roles or creating technology companies, the range of possibilities cannot be fully explored.

Numerous social and cultural influences are impeding women's contributions to technical value creation. Recognizing women as technology entrepreneurs and innovators requires explicit, conscious effort. Simply adding women to the pot and stirring is not going to make their ideas recognized or used. Investors and technical leaders need to assure all ideas are heard, discussed, and evaluated objectively.

Technology investors and other leaders, both men and women, must perform as champions for female technologists and entrepreneurs. They must be informed and equipped to pass along their guidance and encouragement effectively, with a clear understanding of both the values and unique challenges to gender inclusion embedded in our current systems and operations.

Understanding the facts, such as those reported in this study, is a critical first step. The Center for American Entrepreneurship commissioned this effort because of our belief that inclusive leaders are informed leaders. That's why, after reading this report, we encourage you to share it with a colleague.



*Lucinda M Sanders*

**Lucy Sanders**  
Co-Founder and CEO,  
National Center  
for Women &  
Information Technology

# Introduction

The U.S. venture capital industry, and the high-tech startups supported by it, have a well-known gender gap. In 2017, 16 percent of the nearly \$83 billion invested in U.S. venture-backed startups went to companies with at least one female founder, and just 2.5 percent went to startups with all-female founders.<sup>1</sup> Meanwhile, an estimated 9 percent of general partners (the people making investment decisions) at leading U.S. venture capital firms are women.<sup>2</sup>

Women's underrepresentation among leading venture capital firms and venture-backed startups is especially stark when compared with their rates of participation in the workforce (47 percent), business ownership (36 percent), high-tech industry employment (30 percent), or as alumni of the feeder institutions (universities, degree programs, corporations) that tend to populate the sector (various percentages).<sup>3</sup> This suggests that particular barriers exist for women in entrepreneurship beyond those already faced in related fields.

This report adds to the relatively limited research in this area by studying patterns of women-founded, venture-backed startups in the United States between 2005 and 2017. While others have tended to look at topline aggregates of venture deals and funding amounts by the gender composition of founding teams, we focus on the number of new companies entering the venture-backed pipeline each year by tracking “first financings” (initial venture investments).

We take this approach for two reasons. First, as with our previous work, we want to understand the flow of new companies entering the venture-backed universe each year—those closest to “starting up.”<sup>4</sup> Second, we want to study the relative performance of companies over time. To do that, we must group them into cohorts along a common dimension—in this case, companies that raise a first round of venture capital during the same year.

Thirteen first-financing cohorts were produced for the years 2005 through 2017. Those with at least one identifiable female founder are considered “women-founded”; all others are labeled “non-women-founded.”<sup>5</sup> The number of first financings by founder gender group are examined over time, by industry, and across U.S. metropolitan areas. We also compare outcomes for women-founded companies versus non-women-founded firms—such as the percentage that raise follow-on rounds of capital or reach an “exit” (initial public offering or acquisition).

1 PitchBook analysis of PitchBook data provided to CAE

2 Raina (2017), “VC financing and the entrepreneurship gender gap,” *University of Alberta working paper*.

3 For more on these figures, see footnotes 8-12; for information on feeder institutions and programs, see Gompers and Wang (2017), “Diversity in Innovation,” National Bureau of Economic Research. For a summary of research, see DuBow and Pruitt (2017), “The Comprehensive Case for Investing More VC Money in Women-Led Startups,” *Harvard Business Review*.

4 Hathaway (2018), “America’s Rising Startup Communities,” Center for American Entrepreneurship.

5 For more detail on our approach, see *Appendix A: Data and Methodology*.

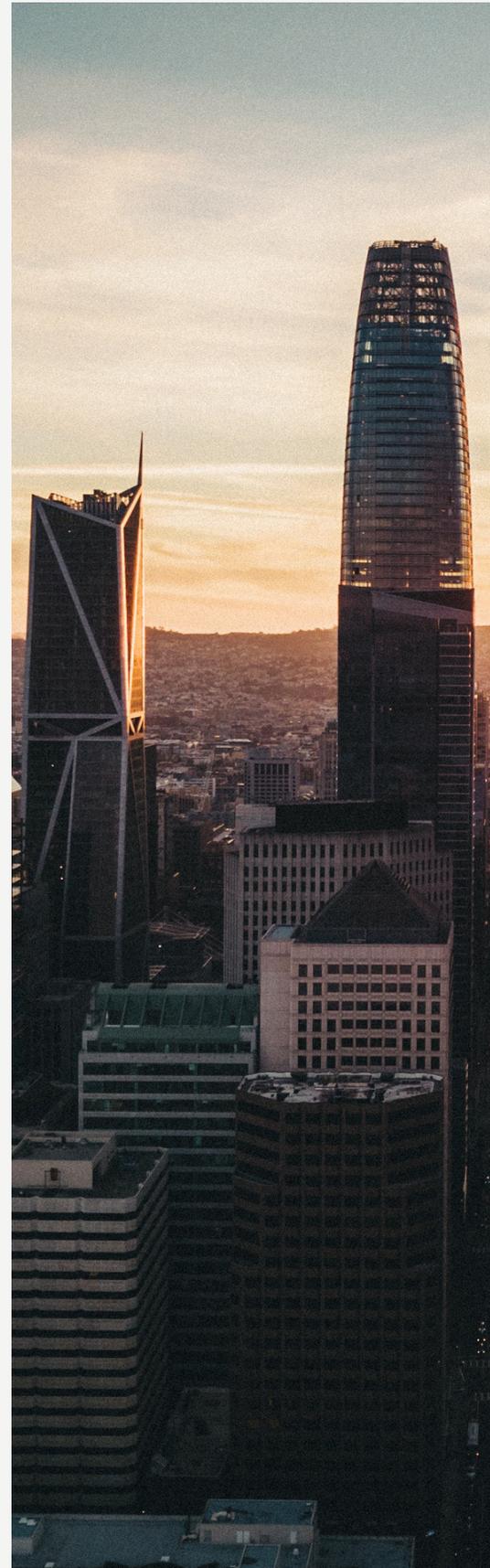


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### THE MAIN FINDINGS ARE AS FOLLOWS:

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- **The women-founded companies represented a small share of venture capital first financings between 2005 and 2017, accounting for just 16 percent of such activity over the period.** However, they also showed remarkable improvement over time, rising from just 7 percent of first financings in 2005 to 21 percent in 2017—expanding the share of total activity accounted for by women-founded companies in all but one year.
- **Once funded, the percentage of women-founded startups that went on to raise additional rounds of capital (a marker of continued performance) was similar to non-women-founded companies.** Fifty-two percent of women-founded startups raised a second round of capital within three years of a first financing and 37 percent raised a third round within five years. Those same figures for non-women-founded companies were 52 percent and 36 percent.
- **Rates of “exit” (sales to another company, a private equity firm, or an initial public offering) tell a more nuanced story.** The percentage of women-founded, venture-backed startups that were acquired is lower than for non-women-founded firms after both eight years from first financing (26 percent versus 32 percent) and after ten years (34 percent versus 38 percent). Ten-year exit rates for initial public offerings were about the same for women-founded and non-women-founded startups (3.8 percent versus 3.7 percent).<sup>6</sup>
- **Women-founded companies exist in nearly every detailed industry in our venture capital database, but are concentrated (relative to all startups) in areas of consumer goods and services and in healthcare.** The software industry produces the largest number of women-founded startups, accounting for 40 percent of women-founded companies. But, software is the most active venture-backed industry overall, and this 40 percent figure is slightly lower than the software industry’s share of all venture-backed startups (44 percent).
- **Women-founded companies are concentrated geographically in America’s leading startup communities, including in San Francisco, New York, Boston, and Los Angeles, which are both large and gender diverse.** The San Jose metro (the heart of Silicon Valley) is the lone exception among the leaders, where the women-founded share is well below average. Additional cities with persistently high rates of women-founded startups include Ann Arbor, Memphis, Philadelphia, Pittsburgh, Boulder, and Washington, D.C, among others.





These findings, considered jointly with other research, suggest a need for greater representation of women-founded companies in venture funding markets, or more to the point, for investors to more adequately capitalize these high-potential entrepreneurs. As the data show, the percentage of women-founded startups that reach key performance milestones (follow-on financings, IPOs) is similar to non-women-founded firms. The lone exception is the acquisition rate, which is lower for women-founded startups. We don't know yet what's causing this disparity, but existing research suggests gender biases and a lack of gender diversity among investors may be partly to blame.<sup>7</sup>

This analysis also points to a need for further research in a few key areas. For example, a lack of female venture capitalists has been identified as a likely contributor to the women's funding gap, and social and cultural factors appear to explain some of the geographic variation in women's entrepreneurship.<sup>8</sup> But, less has been established that explains why women-founded startups are less prevalent in some industries versus others or why they are less likely to be acquired. Finally, a robust analysis of differences in exit values or investment returns of venture-backed companies by founder gender is needed, but availability of the requisite data has been an obstacle.

Overall, a great deal of progress has been made in recent years for women founders at the early stage of the funding market, but there remains plenty of room for improvement for women in venture-capital-funded businesses overall, in the information technology and enterprise services sectors, in a number of startup communities, and among venture capitalists themselves. While there is more yet to learn, the currently available evidence suggests this last point—diversifying the investor base—would be an effective way to improve conditions immediately. Women's entrepreneurship education, mentorship, and peer and other support programs could also help. Gendered processes at home and the workplace more broadly will also determine whether more women choose to pursue hyper-growth entrepreneurship to begin with.<sup>9</sup>

6 Readers should note that the time lags required to produce these calculations limit both the number (three or five) and the recency (through 2007 or 2009) of first financing cohorts that can be included.

7 Raina (2017) shows that the gender exit gap closes when investor syndicates include women. Assenova and Mollick (2018), "What Drives the Gender Gap in Startup Equity Funding? Evidence from The Startup Game," University of Pennsylvania, Wharton School working paper, provide causal evidence that women founders systematically receive lower valuations and raise less equity capital versus identical non-women-founded companies.

8 Raina (2017); Gompers and Wang (2017); and Gompers, Mukharlyamov, and Xuan (2016), "The cost of friendship," *Journal of Financial Economics* 119(3), 626-644.

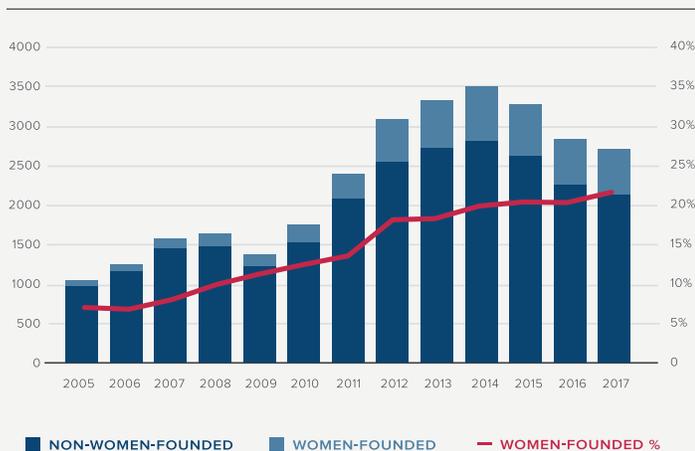
9 Guzman and Kacperczyk (2018), "Gender Gap in Entrepreneurship," Columbia University working paper.

# The Ascent of Women-Founded Startups

To begin, the following chart aggregates the annual number of startups raising a first round of venture capital (bars), segmented by whether companies have at least one identifiable female founder or no female founders (bar colors).

The line demonstrates the women-founded share of these companies overall. The data presented throughout the report come from PitchBook, a leading database for venture capital, private equity, and private company information.<sup>10</sup>

VENTURE CAPITAL FIRST FINANCINGS BY FOUNDER GENDER



Source: CAE analysis of PitchBook data

Note: Women-founded indicates that at least one company founder is female

Three key insights emerge. First, the number of companies entering the venture-backed pipeline has expanded dramatically in recent years—increasing from 1,036 companies in 2005 to a peak of 3,490 companies in 2014. That’s an increase of 237 percent. The number of new companies getting funded annually has fallen some in recent years, to 2,704 in 2017. That is a drop of 23 percent from the 2014 peak, but it is still 161 percent higher than it was in 2005.

10 For more on the data, see *Appendix A: Data and Methodology*.

11 To stay consistent with the rest of the study, “business ownership” here refers to the percentage of employer-businesses that are owned by women alone or jointly with men. See, U.S. Census Bureau, *Annual Survey of Entrepreneurs*.

12 Bureau of Labor Statistics, *Labor Force Statistics from the Current Population Survey*.

Second, the number of women-founded companies entering the venture-backed pipeline is low compared with women’s shares of the adult population (51 percent) or participation in the labor force (47 percent)—accounting for just 16 percent of total first financings over the entire thirteen-year period.<sup>8,9</sup> This number is also lower than women’s shares of overall business ownership (36 percent) or employment in the high-tech industries overall (30 percent).<sup>11,12</sup>

More encouragingly, the women-founded share of companies receiving a first round of venture capital increased over time. In 2005, the women-founded share of such companies was just 7 percent, climbing steadily to reach 21 percent by 2017.

The women-founded share of first financings increased in all but one instance (between 2005 and 2006). While there is still much room for improvement, there is a clear trend toward a more gender-inclusive founder base of venture-backed companies since at least 2005.



# Follow-on Financings for Women-Founded Startups

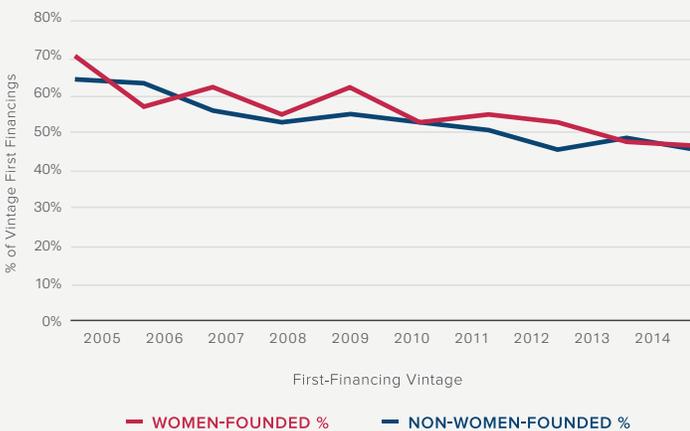
Next, we'll examine how women-founded startups perform subsequent to raising a first round of capital compared with companies that have no women founders.

Performance metrics of these privately-held companies, such as revenue, employment, or activity status, are difficult to obtain. Instead, we'll look at whether companies raised additional rounds of financing within specified time periods. Though imperfect, the ability of venture-backed companies to raise additional rounds of financing can be interpreted as a company more or less performing—otherwise, investors would cease injecting new capital.

To do this, we'll calculate the percentage of companies in each first-financing cohort that raised a second or third round of capital within a specified period of time subsequent to the initial financing.

For the second financing, we'll use a three-year time lag, which means we'll be able to examine the cohorts from 2005 through 2014 (not enough time will have passed for years after that). For the third financing, we'll use a five-year lag (covering cohorts 2005 through 2012).

VENTURE CAPITAL SECOND FINANCING RATES (WITHIN 3 YEARS OF FIRST FINANCING) BY FIRST-FINANCING COHORT AND FOUNDER GENDER (2005-2014 COHORTS)



Source: CAE analysis of PitchBook data

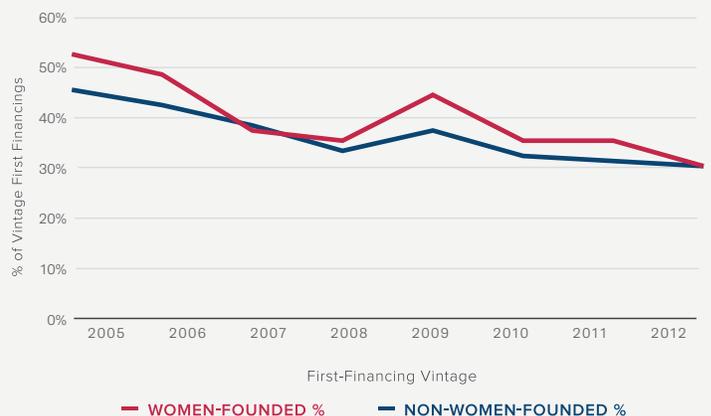
Note: Women-founded indicates that at least one company founder is female

The charts here can be interpreted as follows. Each year on the horizontal axis refers to a first-financing cohort, while the vertical axis demonstrates the percentage of companies in that cohort that went on to either raise a second round of capital within three years (first chart) or a third round of capital within five years (second chart).

Each is broken down by women-founded companies and companies with no women founders.

The data show that women-founded companies are as likely to raise follow-on rounds of venture capital as are startups with no women founders. Over the entire period, 52 percent of both women-founded and non-women-founded startups raised a second round of capital within three years; and within five years, 37 percent of women-founded companies raised a third round of capital compared with 36 percent of non-women-founded companies. However, though the differences are slight overall, women-founded companies did raise second rounds of capital at higher rates in seven of ten possible cohorts, and for seven of eight cohorts for third financings.

VENTURE CAPITAL THIRD FINANCING RATES (WITHIN 5 YEARS OF FIRST FINANCING) BY FIRST-FINANCING COHORT AND FOUNDER GENDER (2005-2012 COHORTS)



Source: CAE analysis of PitchBook data

Note: Women-founded indicates that at least one company founder is female



# Exit Rates for Women-Founded Startups

Now we'll turn to perhaps the most important performance metric for venture-backed startups—the “exit.”

An exit refers to the ability of a venture-backed startup to either reach an initial public offering (IPO) or to be acquired by another corporation (M&A). These “liquidity” events allow venture capitalists to earn a return on their investments—ideally well above the level of funding—and for equity-holding founders and employees to capitalize on a job well done. For these reasons, exits are a critical milestone for companies that turn to this type of financing.

There are two major challenges to studying exit events. First, they take time to unfold—up to a decade or more from the first round of investment. This limits the number of company cohorts we can include in the analysis to the earliest three or five. Second, reliable data on the value produced by these events are infrequently published. It's one thing to be acquired for \$100 million after raising \$10 million from investors; it's quite another to raise the same amount but to be acquired for only a nominal amount (this is typically done to obtain a key technology or team). But since the data needed to do this properly are not available, we cannot make an assessment on the quality of exits—only the *quantity*.

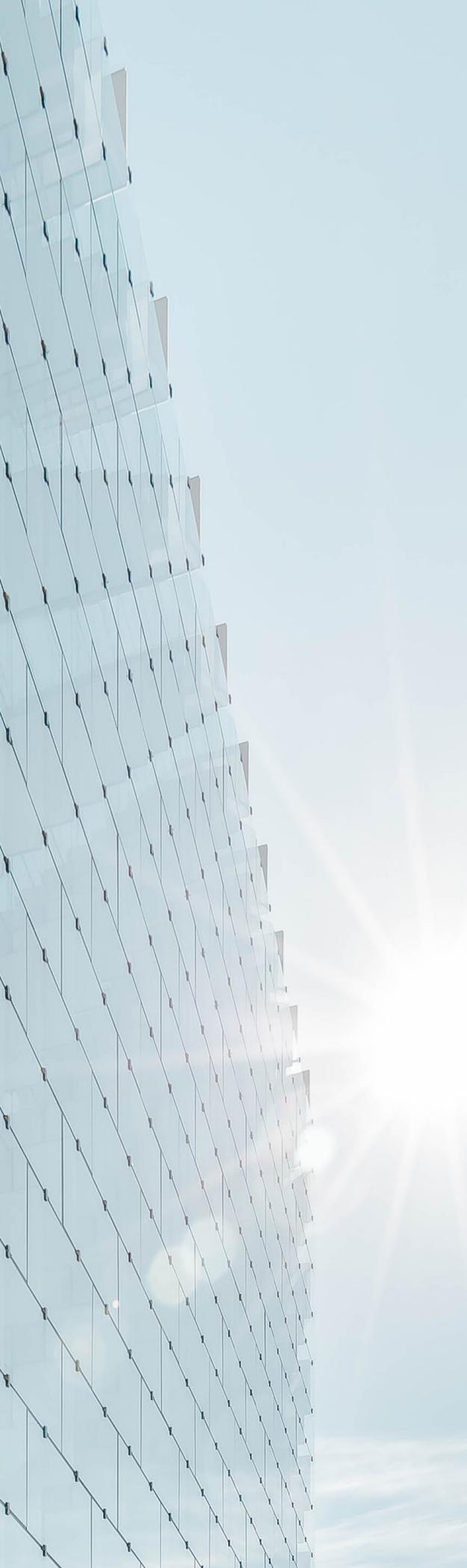
Even so, exit *rates* (versus exit values) are still a useful metric to examine. Academic research demonstrates that, at least at the fund level, exit rates correlate with returns.<sup>13</sup> As a result, the academic literature in general has turned to exit rates as a proxy for success outcomes in the absence of available data on company-level investment returns.<sup>14</sup> Here, we'll look at exit rates by calculating the percentage of companies reaching an acquisition or an initial public offering in a specified period of time subsequent to a first financing (either eight years or ten years), broken down as before by women-founded and non-women-founded companies.

The data reveal the percentage of women-founded companies that are acquired within eight or ten years after a first financing is lower than for non-women-founded startups. Women-founded companies were acquired within eight years 26 percent of the time compared with 32 percent of instances for non-women-founded companies (this calculation includes five cohorts from 2005 through 2009). That gender exit gap narrows for the ten-year time lag, but it is still present—at 34 percent versus 38 percent (this includes just three cohorts from 2005 through 2007).

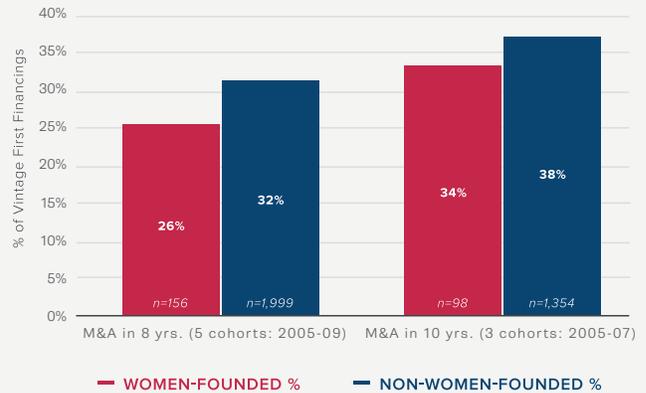
13 See, for example, Hochberg, Ljungqvist, and Lu (2007), “Whom You Know Matters: Venture Capital Networks and Investment Performance,” *The Journal of Finance* 62(1), a study that applies a narrow set of actual fund data and finds broad correlations between fund performance and exit rates.

14 The Hochberg, Ljungqvist, and Lu (2007) work has been used to justify exit rates as proxies for outcomes in other work, including Raina (2017); JMG Consulting, LLC and Wyckoff Consulting (2013), “Venture Capital, Social Capital and the Funding of Women-led Businesses,” Small Business Administration; and Guzman and Kacperczyk (2018).





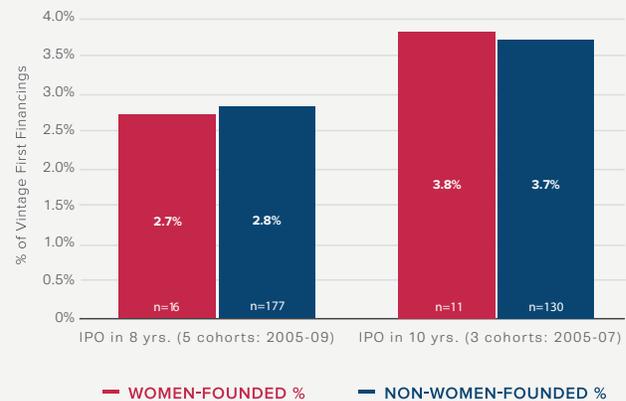
VENTURE-BACKED M&A RATES, BY COHORT, TIME TO EXIT, AND FOUNDER GENDER (2005-2009 OR 2005-2007 COHORTS)



**Source:** CAE analysis of PitchBook data. **Note:** Women-founded indicates that at least one company founder is female

For IPOs, the story is different. In both cases—IPOs occurring eight or ten years following a first financing—the percentage of women-founded and non-women-founded startups that reach an exit is about the same. In the first instance, 2.7 percent of women-founded companies reached an IPO within eight years as did 2.8 percent of non-women-founded firms. For the ten-year time horizon, those figures were 3.8 percent and 3.7 percent. Again, these figures are based on a limited number of annual cohorts (three or five).

VENTURE-BACKED IPO RATES, BY COHORT, TIME TO EXIT, AND FOUNDER GENDER (2005-2009 OR 2005-2007 COHORTS)



**Source:** CAE analysis of PitchBook data. **Note:** Women-founded indicates that at least one company founder is female

# Leading Industries for Women-Founded Startups

The next two sections provide more detail on the types of venture-backed companies women are starting and where they are located.

We begin by examining the industrial composition of women-founded venture-backed startups for the thirteen first-financing cohorts—first by looking at broad industrial sectors and then at more detailed industries.

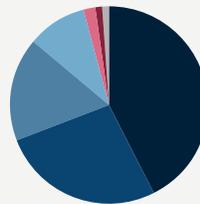
The chart here demonstrates the composition of women-founded startups across the seven broad industrial sectors in the PitchBook database, and compares that against startups that have no women founders. As the data indicate, when compared with non-women-founded companies, venture-backed startups with women founders are more concentrated in consumer products and services and in healthcare. Women-founded companies are underrepresented in information technology, and business products and services.

These broad industrial sectors obscure a fair amount of information at the detailed industry level. The table on the following page shows the number of women-founded companies by industry, along with that industry’s share of total women-founded companies, and a metric that identifies whether that industry has an outsized contribution made by women founders. For this specialization metric, an average women-founded share of activity produces values equal to one, an above-average share of activity produces values greater than one, and a below-average share of activity produces values of less than one. The table also lists the broad sectors associated with each detailed industry.

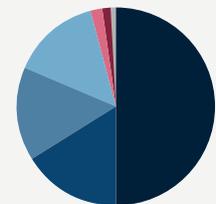


DISTRIBUTION OF FIRST FINANCINGS BY INDUSTRIAL SECTOR AND FOUNDER GENDER (2005-2017 COHORTS)

### WOMEN-FOUNDED



### NON-WOMEN-FOUNDED



Industrial Sector	Women-Founded (%)	Non-Women-Founded (%)
INFORMATION TECHNOLOGY (IT)	43%	49%
CONSUMER PRODUCTS AND SERVICES (B2C)	27%	16%
HEALTHCARE	17%	15%
BUSINESS PRODUCTS AND SERVICES (B2B)	10%	14%
FINANCIAL SERVICES	2%	2%
ENERGY	1%	2%
MATERIALS AND RESOURCES	1%	1%

Source: CAE analysis of PitchBook data

Note: Women-founded indicates that at least one company founder is female

## LEADING INDUSTRIES FOR WOMEN-FOUNDED STARTUPS (2005-2017 COHORTS)

Detailed Industry	Industry Sector	Women-Founded Companies (2005-17)	% of Total Women-Founded Companies	Specialization (Indicated by Values > 1)
Accessories	Consumer Products and Services (B2C)	142	3.0%	2.7
Consumer Non-Durables	Consumer Products and Services (B2C)	297	6.2%	2.3
Retail	Consumer Products and Services (B2C)	200	4.2%	2.1
Services (Non-Financial)	Consumer Products and Services (B2C)	159	3.3%	1.6
Other Healthcare	Healthcare	13	0.3%	1.3
Containers and Packaging	Materials and Resources	5	0.1%	1.2
Healthcare Technology Systems	Healthcare	149	3.1%	1.2
Consumer Durables	Consumer Products and Services (B2C)	152	3.2%	1.2
Pharmaceuticals and Biotechnology	Healthcare	349	7.3%	1.2
Restaurants, Hotels and Leisure	Consumer Products and Services (B2C)	28	0.6%	1.1
Other Consumer Products and Services	Consumer Products and Services (B2C)	16	0.3%	1.1
Textiles	Materials and Resources	2	0.0%	1.1
Media	Consumer Products and Services (B2C)	274	5.8%	1.1
Healthcare Services	Healthcare	81	1.7%	1.1
Chemicals and Gases	Materials and Resources	19	0.4%	1.0
Commercial Transportation	Business Products and Services (B2B)	6	0.1%	1.0
Software	Information Technology	1,920	40.3%	0.9
Capital Markets/Institutions	Financial Services	17	0.4%	0.9
Commercial Services	Business Products and Services (B2B)	384	8.1%	0.9
Healthcare Devices and Supplies	Healthcare	218	4.6%	0.8
Transportation	Consumer Products and Services (B2C)	18	0.4%	0.8

**Source:** CAE analysis of PitchBook data

**Note:** Women-founded indicates that at least one company founder is female

**Note:** The industries included here accounted for 93 percent of women-founded companies in our dataset

By far the biggest industry specializations for women-founded startups are in the consumer products and services and healthcare sectors—a combined 44 percent of funded startups come from these two broad sectors. Twelve detailed industries in these two sectors have above-average concentrations compared with startups as a whole (specialization quotients above one), led by apparel and accessories, consumer non-durable goods, and retail.

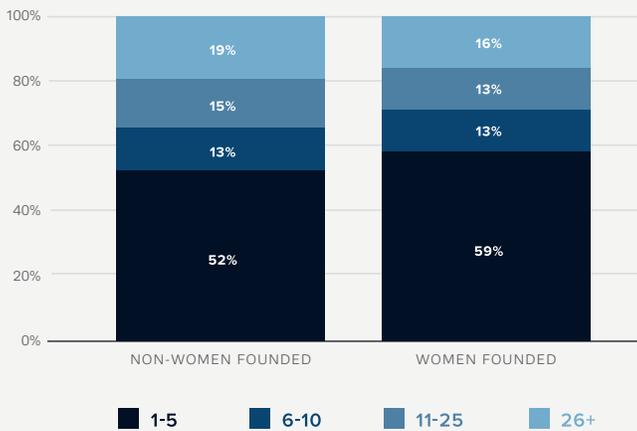
The largest industry in terms of absolute numbers is software—accounting for 40 percent of women-founded venture-backed startups across the thirteen cohorts.

But, software is by far the largest industry overall, and as we can see from the 0.9 specialization quotient, women founders are slightly underrepresented in software. This is because women-founded companies represent 14 percent of software industry startups in our data, but account for 16 percent of all startups.

# The Geography of Women-Founded Startups

We turn next to the location of women-founded venture-backed startups, in particular looking at their spread across U.S. metropolitan areas. To start, let's look at how concentrated they are geographically compared with non-women-founded companies.

SHARE OF FIRST FINANCINGS ACCOUNTED FOR BY THE TOP 5, 10, OR 25 METROPOLITAN AREAS, BY FOUNDER GENDER (2005-17 COHORTS)



Source: CAE analysis of PitchBook data

Note: Women-founded indicates that at least one company founder is female

Venture-backed startups are highly concentrated geographically—especially for women-founded firms. Just five metropolitan areas accounted for 59 percent of women-founded venture-backed startups over the thirteen cohorts, while the top 10 accounted for 71 percent and the top 25 for 84 percent. Those same figures for non-women-founded companies were, respectively, 52 percent, 65 percent, and 80 percent.

Four of the five leading cities for first financings had women-founded shares above the national average of 16 percent—San Francisco (17 percent), New York (23 percent), Boston (17 percent), and Los Angeles (18 percent). Because these four cities are both large and gender diverse, they drive a substantial portion of women-founded startup activity overall. Only one of the top five metropolitan areas, San Jose (the heart of Silicon Valley), has a below-average share of women-founded companies at 12 percent.<sup>15</sup> Said differently, the leading startup hubs (aside from the heart of Silicon Valley) are expanding gender diversity more than the country as a whole.

The next two figures display the leading cities across the nation for having the highest shares of women-founded companies. The cities in each chart meet two conditions: they have women-founded shares of startup activity greater than the U.S. as a whole and they average at least four total first financings each year over the period of observation (to filter noise from cities with a small amount of activity). The first chart and table include cities for the entire period (2005-2017), while the second pair looks at just the last two years (2016-2017).

<sup>15</sup> Although most people consider the cities of San Francisco, Oakland, San Jose, and surrounding areas as one continuous San Francisco Bay Area, the federal agency that determines the official boundaries of metropolitan areas (the Office of Management and Budget) separates San Francisco and Oakland into one metropolitan area and San Jose into its own metropolitan area. The reality is different, but to keep consistent with the rest of the metro areas, we'll report them separately here.

LEADING METROPOLITAN AREAS FOR VENTURE CAPITAL FIRST FINANCINGS OF WOMEN-FOUNDED STARTUPS (2005-2017 COHORTS)



Metropolitan Area	First Financing (2005-2017)		
	Total	Women-Founded	Women's % Total
<b>United States</b>	<b>29,659</b>	<b>4,784</b>	<b>16%</b>
Ann Arbor, MI	119	34	29%
New York-Newark-Jersey City, NY-NJ-PA	3,586	814	23%
Portland-Vancouver-Hillsboro, OR-WA	260	53	20%
Las Vegas-Henderson-Paradise, NV	109	22	20%
Memphis, TN-MS-AR	75	15	20%
Cincinnati, OH-KY-IN	127	25	20%
Boulder, CO	259	50	19%
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	618	115	19%
Pittsburgh, PA	263	47	18%
Los Angeles-Long Beach-Anaheim, CA	1,965	347	18%
Baltimore-Columbia-Towson, MD	234	41	18%
Hartford-West Hartford-East Hartford, CT	63	11	17%
San Francisco-Oakland-Hayward, CA	5,664	980	17%
Durham-Chapel Hill, NC	168	29	17%
Chicago-Naperville-Elgin, IL-IN-WI	734	126	17%
Washington-Arlington-Alexandria, DC-VA-MD-WV	766	131	17%
Boston-Cambridge-Newton, MA-NH	2,059	350	17%

**Source:** CAE analysis of PitchBook data

**Note:** Women-founded indicates that at least one company founder is female. Percentages have been rounded; all displayed city values are greater than the U.S. value

LEADING METROPOLITAN AREAS FOR VENTURE CAPITAL FIRST FINANCINGS OF WOMEN-FOUNDED STARTUPS (2016-2017 COHORTS)



Metropolitan Area	First Financing (2016-2017)		
	Total	Women-Founded	Women's % Total
<b>United States</b>	<b>5,524</b>	<b>1,146</b>	<b>21%</b>
Ann Arbor, MI	24	14	58%
Memphis, TN-MS-AR	11	5	45%
Boulder, CO	49	20	41%
Urban Honolulu, HI	10	4	40%
St. Louis, MO-IL	34	13	38%
Providence-Warwick, RI-MA	14	5	36%
Tampa-St. Petersburg-Clearwater, FL	22	7	32%
New Orleans-Metairie, LA	10	3	30%
New York-Newark-Jersey City, NY-NJ-PA	728	212	29%
Columbus, OH	36	10	28%
Los Angeles-Long Beach-Anaheim, CA	398	100	25%
Sacramento--Roseville--Arden-Arcade, CA	12	3	25%
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	126	30	24%
Boston-Cambridge-Newton, MA-NH	358	79	22%
Indianapolis-Carmel-Anderson, IN	32	7	22%
Kansas City, MO-KS	23	5	22%
San Francisco-Oakland-Hayward, CA	1,088	230	21%
Pittsburgh, PA	57	12	21%
Washington-Arlington-Alexandria, DC-VA-MD-WV	130	27	21%

Source: CAE analysis of PitchBook data

Note: Women-founded indicates that at least one company founder is female. Percentages have been rounded; all displayed city values are greater than the U.S. value



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Over the latest two years of cohorts (2016-17), nineteen cities had above-average shares of women-founded startup activity and met the minimum size threshold of at least eight first financings spread over the two years. Ann Arbor tops the list by a long shot, and at 58 percent of first financings, the women-founded share is nearly three times the national average of 21 percent. Memphis, Boulder, and Honolulu all had women-founded shares of 40 percent or greater, while St. Louis, Providence, Tampa, and New Orleans were all at or above 30 percent.

Collectively, the results produce some interesting patterns. Looking across both lists, four of the leading five communities for startup activity appear in both (New York, San Francisco, Los Angeles, and Boston), along with six additional metro areas: Ann Arbor, Memphis, Philadelphia, Pittsburgh, Boulder, and Washington, D.C. A number of other cities appear in either list, and encouragingly, are spread around the country—spanning the East Coast, Midwest, Great Plains, Southeast, Southwest, Pacific, and Mountain regions.

## Conclusion

Women-founded venture-backed startups have been increasing in number and as a share of total first financings since at least 2005.

However, women-founded startup representation is still quite low, at just 21 percent of total first financings in 2017—that is lower than women’s representation in business ownership (36 percent) and in high-tech industry employment overall (30 percent).<sup>16 17</sup>

Once funded, women-founded startups perform as well as startups with no women founders on several measures—including the percentage raising a second or third round of capital in three or five years, or reaching an IPO within eight or ten years of first financing. Women-founded startups are less likely to be acquired than are non-women-founded companies, which makes the overall rates of women-founded exits lower. Due to the time lags needed for observation, these figures are produced by only a subset of the thirteen cohorts assessed in this report.

### WOMEN-FOUNDED STARTUPS PERFORM AS WELL AS STARTUPS WITH NO WOMEN FOUNDERS

Women-founded startups are highly concentrated in the consumer products and services and healthcare sectors—accounting for a higher share of overall women-founded startups compared with non-women-founded companies.

The largest number of women-founded companies is in the software industry—accounting for 40 percent of all women-founded first financings over the period. Even so, women founders are still under-represented in the information technology (which includes software) and business products and services sectors relative to non-women founders.

Women-founded companies are more geographically concentrated than venture-backed startups as a whole. The top five cities accounted for 59 percent of women-founded first financings, yet just 52 percent of non-women-founded startups. Four of these cities—San Francisco, New York, Boston, and Los Angeles—are more gender diverse than is the U.S. The San Jose metro area (at the heart of Silicon Valley) is the lone exception among the leaders, where the women-founded share is well below average. Additional cities with consistently high shares of women-founded startups are Ann Arbor, Memphis, Philadelphia, Pittsburgh, Boulder, and Washington, D.C., and a number of other cities that had sizable gender diversity rates in recent years.

This work raises some important questions and points to areas of further inquiry for researchers—in particular, the need to better understand the nuanced dynamics that account for the relatively few women-founded venture-backed startups. While some may argue that this is a simple matter of choice—that women disproportionately choose not to participate in the venture economy—a body of research related to gender and occupations suggests that such an interpretation is too simplistic.<sup>18</sup> Research that addresses gender and venture capital directly suggests the same.

We know for example that venture investors tend to fund founders with similar backgrounds and characteristics, a concept known as homophily (like attracts like).<sup>19</sup> This is not unusual given how reliant the venture business is on relationships (professional and personal networks tend to be homogenous), and that the venture capital industry is predominantly male. Holding other factors constant, this helps explain why many venture-backed founders are also men. It may also explain why the investors disproportionately funding women-founded startups are women and/or have a stated preference for funding female entrepreneurs.<sup>20</sup> Gender bias is a common tactic when information is scarce and consequential decisions are made under uncertainty.<sup>21</sup>

<sup>16</sup> To stay consistent with the rest of the study, “business ownership” here refers to the percentage of employer-businesses that are owned by women alone or jointly with men. See, U.S. Census Bureau, *Annual Survey of Entrepreneurs*.

<sup>17</sup> Bureau of Labor Statistics, *Labor Force Statistics from the Current Population Survey*.

<sup>18</sup> For a summary of work on gender and occupations, see Ashcraft, McLain, and Eger (2016), “Women in Tech: The Facts,” National Center for Women & Information Technology.

It is so strong that it holds even despite some evidence that doing so may reduce fund performance.<sup>22</sup> On the entrepreneur side, women are underrepresented as venture-backed founders, even after accounting for their limited presence in the small number of supply channels that dominate such roles (particular universities, degree programs, or employment histories).<sup>23</sup> In other words, female representation in key feeder roles and institutions, while low, predicts higher rates of women-founded venture-backed companies than exists in reality. This suggests that particular barriers exist for women in becoming startup founders compared with related activities. Existing research identifies some likely barriers, including bias in evaluation of pitches or in the ways prospective investors engage with female entrepreneurs.<sup>24</sup>

On the other hand, there is the question of why women are significantly less likely to found high-growth companies to begin with—a fact that has been well-established by researchers.<sup>25</sup> So far, we have tackled the conditions that affect funding, but haven't addressed the issue of conditions that affect founding. These two factors are related for high-growth startups, which often require significant external financing to scale. Financial constraints, therefore, factor prominently into *founding* decisions. But until recently, these factors have not been considered jointly.



19 See, for example, Gompers and Wang (2017); Gompers, Mukharlyamov, and Xuan (2016); and The Diana Project (2014), "Women Entrepreneurs 2014: Bridging the Gender Gap in Venture Capital," Babson College.

20 We conducted an analysis of the individuals and firms investing in women-founded startups, but chose not to publish it. Nearly all of the investors with the highest shares of investments going to women-founded companies (filtered above a quantity threshold) state explicitly a strategy of investing in such companies.

21 Ridgeway and Cornell (2006), "Consensus and the creation of status beliefs," *Social Forces* 85(1), 431–453.

22 See, Gompers, Mukharlyamov, and Xuan (2016), JMG Consulting, LLC and Wyckoff Consulting (2013); and Raina (2017), "VC financing and the entrepreneurship gender gap," *University of Alberta working paper*. See, also from investors, such as First Round Capital (<http://10years.firstround.com/>).

23 Gompers and Wang (2017).

24 Malmström, Johansson, and Wincent (2017), "Gender Stereotypes and Venture Support Decisions: How Governmental Venture Capitalists Socially Construct Entrepreneurs' Potential," *Entrepreneurship Theory and Practice*, 41(5), 833–860; Kanze, Huang, Conley, and Higgins (2018), "We Ask Men to Win and Women Not to Lose: Closing the Gender Gap in Startup Funding," *Academy of Management Journal*, 61(2); and Brooks, Huang, Kearney, and Murray (2014), "Investors prefer entrepreneurial ventures pitched by attractive men," *Proceedings of the National Academy of Sciences*, 4427–4431.

25 For a summary of this research, see Robb, Coleman, and Stangler (2014), "Sources of Economic Hope: Women's Entrepreneurship," Kauffman Foundation.

New academic research tackles this issue by analyzing businesses at the time of founding and financing, attributing just one-third of the gender gap in high-growth entrepreneurship to investor bias and two-thirds to “signaling” and “initial conditions.”<sup>26</sup> In other words, women are much less likely to start companies with the types of characteristics that venture capitalists are looking for in hyper-growth (novel technologies, high-tech industries, corporate structure, and other factors that are predictive of high growth and can be observed at the time of funding). This suggests the need for women’s entrepreneurship education, mentorship, peer and other support programs. But it also points to something much deeper. As the authors of the study note:

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We show that the initial disparities in growth orientation across female- and male-led ventures are the most significant force in generating differences between women and men in the entrepreneurship pipeline. Such disparities are likely to reflect gendered processes which generate structural inequalities in opportunities for women to pursue different types of ventures.

In other words, deeply-engrained gender roles perpetuated at the workplace, at home, and in society impose significant constraints on prospective female founders. These structural obstacles push women away from founding high-potential businesses in the first place. So, rather than focusing on how to get more women funded, the bigger question is what can be done to provide more meaningful on-ramps for women into entrepreneurship at the outset.

The second big question is why are acquisition rates of women-founded startups lower than for non-women-founded firms, particularly when considered alongside other performance metrics? Academic studies that have evaluated this issue provide some limited evidence that investing in more women-founded companies would produce healthy returns.<sup>27</sup> So, why the disconnect?

One simple yet plausible explanation is that these patterns stem from a continuation of the biases that play out in many other



contexts. There’s little reason to think that biases affecting women’s ability to gain employment, earn a promotion, or get funded wouldn’t exist in other contexts as well. However, we were unable to find any evidence linking these factors directly, and because of that, it could be a fruitful area for other researchers to explore in the future.

Another theory, put forward by one academic study, points to a lack of gender diversity among early-stage investors as a cause of lower exit rates for women.<sup>28</sup> It found that the gender exit gap, while sizable, disappears when early-stage investors are female.<sup>29</sup> In other words, the differences in exit rates between women-founded startups and non-women-founded firms are sizable when investor syndicates include no women, but are indistinguishable when female venture capitalists are involved.

26 Guzman and Kacperczyk (2018).

27 See, Gompers, Mukharlyamov, and Xuan (2016); JMG Consulting, LLC and Wyckoff Consulting (2013); and Raina (2017).

28 Raina (2016, 2017).

29 Note that in this context, exits (acquisitions and IPOs) are considered jointly, whereas earlier in the study they were considered separately. However, as a reference, just 9 percent of exits were IPOs during the period of our study. Historically, this figure was much higher. See, Metrick and Yasuda, *Venture Capital and the Finance of Innovation, 2nd Edition* (Hoboken, NJ: John Wiley & Sons, 2010).

30 See, Hochberg, Ljungqvist, and Lu (2007) on the importance of screening by venture capitalists on fund performance and on the value-add that VCs provide to portfolio companies.



A third key question is why women-founded companies are so heavily concentrated in a few industry sectors (consumer products and services, healthcare) and so underrepresented in many others (information technology, business services)? This result is perhaps not surprising given the well-documented masculinization of information technology, as compared to consumer goods or healthcare, which are historically gendered as feminine. These factors may significantly affect any number of businesses' processes, including funding and acquisition decisions.<sup>32</sup>

Finally, what can be learned about the geographic dispersion of women-founded venture-backed startups? Four of the top five cities for overall startup activity and six of the top ten have above-average concentrations of women-founded companies. But looking across all metro areas, there is no statistically meaningful relationship between metro size and the diversity of founder gender. So, if it is not city size that affects the gender diversity rates of venture-backed founders, what are the key factors? Are there any systematic relationships at all?

Early work indicates that social and cultural differences across cities may play a significant role. In this telling, regions characterized as having socially progressive policies and active policymaking towards a more equal and inclusive society tend to have higher women's participation in venture capital and entrepreneurship—even when considering the total level of startup activity.<sup>33</sup> While these findings seem sensible, there is also clearly more space to develop evidence here.

These are just a few of many questions that could be explored by researchers or considered by policymakers and business leaders looking to improve gender diversity among venture-backed startups. While the evidence presented here is informative, it is not without limitations, and there is still a great deal we don't know. As more definitive evidence is uncovered, the information we have available now does point to one factor in particular that could move the needle right away—improving the gender diversity of venture capitalists. If we want more women among the ranks of venture-backed founders, we need more women as investors, plain and simple.

What explains the difference? The author doesn't know for sure, but speculates on two possible factors: women investors are better at selecting high-potential female founders, or they are better at advising them toward a successful exit, or (likely) some of both.<sup>30</sup>

Recent research also establishes a causal link between women founders and startup outcomes due to biases from would-be investors.<sup>31</sup> Using methods from randomized control trials and the observation of a role-playing simulation on startup funding, academic researchers were able to establish systematic biases against women founders that lead to lower valuations of 11 percent on average compared with men founders of identical companies. This provides causal evidence that investor biases actually cause unfavorable outcomes for women by deeming their startups as less investible (or acquirable), even for companies that are identical in every other way.

<sup>31</sup> Assenova and Mollick (2018).

<sup>32</sup> Ashcraft (2013), "The glass slipper: 'Incorporating' occupational identity in management studies," *Academy of Management Review*, 38(1), 6-31; Ashcraft and Ashcraft (2015), "Breaking the 'glass slipper': What diversity interventions can learn from the historical evolution of occupational identity in ICT and commercial aviation," in Schafer and Thierry, *Connecting Women* (Basel, Switzerland: Springer, 2015), 137-155.

<sup>33</sup> See, Gompers and Wang (2017). Though not shown here, we ran an analysis that showed a strong positive correlation between metro area share of votes for Hillary Clinton in the 2016 presidential election and share of women-founded companies. This is true even among the leading fifty or one hundred metro areas for venture capital activity, which are already places with a high share of votes going to.

# Appendix A: Data and Methodology

The primary data in this study come from PitchBook, a leading vendor of information on venture capital deals, and the individuals, companies, and investors involved in them.

All figures here include venture deals that were completed in each particular calendar year between 2005 and 2017 (inclusive) for companies with headquarters in the United States. Deals completed among the “pre-venture” series (accelerator, incubator, angel, or crowdfunding) are excluded (because they are not included in round sequences in the PitchBook database). More than 95 percent of first financing deals are either Seed or Series A.

Central to the work here, PitchBook tracks information on individual founders for companies in the database, and assigns a gender identifier through a two-step process—first manually via a primary research and secondly through an algorithm that assigns gender based on given names. Where results differ, further research is conducted to resolve discrepancies. Individuals are given gender values of female, male, or other/unknown. As a simple check, we conducted a detailed review of a random sampling of companies identified as having at least one female founder by PitchBook and found their results to be entirely accurate.

Companies in this study are considered “women-founded” if they had at least one verified female founder—as opposed to cases where all founders were female. The former was chosen over the latter for a few reasons. First, the size of founding teams varies widely across industries. In life sciences, for example, the number of founders can be quite large, and imposing an all-founders requirement for gender would skew the results. An all-founders requirement would also classify companies with founder-level contributions by women as “non-women-founded,” which not only feels outside the bounds of what we’re trying to understand here, it is arguably inaccurate. Third, imposing an all-women requirement for companies to be women-founded goes precisely against the entire point of promoting diversity in entrepreneurship. Finally, an all-founders requirement would limit our analyses because the pool of companies would be so small.

While many reports on venture capital deals and on women-founded startup funding focus on the entirety of venture activity (deals or capital invested at all stages), this study focuses primarily on the first round of financing by professional investors (“first financings”) for a few reasons. First, we are primarily interested in understanding the venture-backed companies most closely associated with “starting up” (as opposed to “scaling up”), and we do this by capturing the companies as they enter the venture pipeline (a measure of flow). Second, we wanted to better understand the number of companies that get funded, rather than the amount of capital going into them. Finally, since we want to understand how companies are performing over time in a comparable way, we had to construct annual cohorts and observe key outcomes over a similar time horizon.

To produce annual “first financing” cohorts of companies by gender identity of founding teams, a multistep approach was taken. First, we used the PitchBook platform to tabulate annual lists of companies that completed a first round of venture financing in a calendar year for each of the thirteen years. Next, the lists were sent to PitchBook, which used the back end of its database to flag the companies where at least one female founder could be verified. The list was returned to us with indicators for companies with at least one female founder. We then constructed two corresponding lists for each annual cohort of first financings back on the PitchBook platform—one for companies where at least one female founder could be verified and one where at least one female founder could not be identified. That allowed us to conduct most of the remaining analyses contained in the report (the lone example was geography; see below).

The tabulations and plotting of data across all first financings, by industry, and by geography, were relatively straightforward. The number of first financings in a particular year, naturally, were



those completed between January and December. Sector and detailed industry classifications are pre-populated by PitchBook. For geography, PitchBook provided us with lists of first-financing counts by state, city, and zip code. Using files from the U.S. Office of Management and Budget and the Census Bureau, each combination (where the information was available) was mapped back to any one of a metropolitan area, micropolitan area, neither of these, or unknown. This analysis was restricted to metropolitan areas and the United States as a whole.

The analyses for follow-on outcomes were conducted in the following way. Each first-financing cohort (say, 2005 for women-founded companies) was loaded into the PitchBook platform, and search queries were performed based on outcome (e.g., second round of financing, IPO) and the appropriate time lag (three, five, eight, or ten years from first financing). For example, an outcome of acquisition for a company in the 2006 cohort would have had to occur after its first financing in 2006 and before either December 31, 2014 or December 31, 2016 (eight-year and ten-year exits), and so on. Numbers were tabulated for each outcome for the maximum number of cohorts and presented as a share of all first financings for each cohort. All analyses were conducted in the PitchBook platform based on the cohort lists derived as per the above.

Finally, because we took a conservative approach for identifying companies as women-founded and non-women-founded (i.e., those where a female founder could not be confirmed), the latter category may be considered by some as overly expansive, since a number of these companies lacked information on founders entirely. As a check, we replicated our analysis across three groups of founder types: women-founded (at least one verified woman founder), non-women-founded (at least one verified male founder and no women founders), and unknown (where the gender or identity of no founders could be confirmed). The results were strikingly similar.

