American Economic Review: Papers & Proceedings 2017, 107(5): 308–311
https://doi.org/10.1257/aer.p20171009

Gender Gap in High-Growth Ventures: Evidence from a University Venture Mentoring Program†

By Erin L. Scott and Pian Shu*

In a stark divergence from broader trends in women's labor-market participation and educational attainment over the past several decades (Goldin 2006), US women are still substantially less likely than men to pursue entrepreneurship. This gap is particularly pronounced at high-growth ventures (Brush et al. 2004; Robb, Coleman, and Stangler 2014). Prior studies have shown that female entrepreneurs are less inclined to start businesses in high-growth sectors due to differences in business intentionality, founders human capital, and access to finance (Klapper and Parker 2011). But little is known about the experiences of female entrepreneurs with extensive human capital and an intention to create a high-growth venture.[1] This paper tracks a set of venture ideas, generated by elite STEM talent, from the idea stage to commercialization. We use the resulting data to uncover several stylized facts about the gender gap early in the life cycle of a high-growth venture.

I. Data

Our empirical setting is MIT's Venture Mentoring Service (VMS), a free educational service that provides mentoring to MIT students, post-docs, and alumni who are interested in entrepreneurship and have a nascent business idea.[2] VMS matches each venture idea and entrepreneur with a small team of volunteer mentors, all of whom are seasoned local practitioners with extensive experience in new-business formation and development. At the entrepreneur's request, VMS schedules ad-hoc meetings at which the mentors provide confidential business advice to the entrepreneur. We collected data on 651 venture ideas and 627 entrepreneurs that affiliated with VMS between 2005 and 2012.[3]

Column 1 of Table 1 reports the summary statistics of the ventures in our sample. We observe ventures spanning a range of high-growth sectors, including web/mobile (28 percent), enterprise software (18 percent), hardware (15 percent), and life sciences/medical devices (13 percent). About a quarter of the venture ideas had documented intellectual assets when they joined VMS; that is, they originated from academic research and/or had filed for intellectual-property protection at entry. The vast majority of ventures in our sample (83 percent) had not registered as a business entity when they joined VMS.

We construct a measure of the ex ante perceived quality of a venture idea: the proportion of mentors—a pool of over 100 experts—who express interest in mentoring the venture based on reading an objective, standardized summary of the proposed venture. In Scott, Shu, and Lubynsky (2016), we show that this measure positively and significantly predicts a venture's subsequent outcomes, particularly for ventures with intellectual assets in

* Scott: National University of Singapore Business School, 15 Kent Ridge Drive, BIZ1 6-41, Singapore, 119245 (e-mail: elscott@nus.edu.sg); Shu: Harvard Business School, Soldiers Field Road, Boston, MA 02163 (e-mail: pshu@hbs.edu). We thank the NBER Entrepreneurship Working Group, the Singapore Ministry of Education (AcRF Tier 1 Grant R-313-000-119-112), and the Division of Research at Harvard Business School for financial support. All errors are our own.

† Go to https://doi.org/10.1257/aer.p20171009 to visit the article page for additional materials and author disclosure statement(s).

[1] Guzman and Kacperczyk (2016) find that gender differences in access to venture capital disappear at the top of the venture quality distribution.

[2] See Scott, Shu, and Lubynsky (2016) for a more detailed description of VMS.

[3] For purposes of this analysis, we exclude seven ventures that had already been funded before joining VMS and had thus progressed further than the typical venture that affiliates with VMS at the idea stage. We also exclude ten ventures founded by MIT faculty and one venture for which we do not observe the gender of the primary entrepreneur.

TABLE 1—SUMMARY STATISTICS OF VENTURES

Sample	All ventures (1)	Ventures by male founders (2)	Ventures by female founders (3)	*t* (4)
Mean year the venture joined VMS	2009.9	2009.8	2010.4	3.15
Mean month the venture joined VMS	6.5	6.5	6.5	0.07
Industry sector				
Percent consumer web/mobile	28.0	28.3	26.6	0.37
Percent enterprise software	17.8	18.4	15.3	0.81
Percent hardware	14.6	15.0	12.9	0.59
Percent life sciences/medical devices	13.4	14.8	7.3	2.23
Percent consumer products	13.2	12.3	16.9	1.36
Percent energy	5.8	6.5	3.2	1.38
Percent other	7.2	4.7	17.7	5.12
Entry characteristics				
Percent with intellectual assets at entry	24.7	25.0	23.4	0.39
Percent with business entity at entry	16.9	17.3	15.3	0.52
VMS-related variables				
Mean mentor interest (in percent)	4.44	4.44	4.46	0.08
Mean number of mentor meetings	3.21	3.27	2.95	1.02
Mean number of mentors met at least twice	1.72	1.76	1.53	1.22
Venture outcomes				
Percent full-time entrepreneur	46.4	48.0	39.5	1.71
Percent angel/VC funding	18.6	19.4	15.3	1.04
Percent commercialization	22.3	23.3	17.7	1.35
Observations	651	527	124	

research-and-development-intensive sectors, which consist of hardware, energy, and life sciences/medical devices. We exclude the alternative explanations that aggregate mentor interest systematically influences a venture's access to mentoring resources or the entrepreneur's effort. We also demonstrate that mentors are recognizing high-quality ideas as opposed to excluding nonserious ideas. Table 1 shows that the average venture idea receives interest from around 4.4 percent of the mentors. By the time we collected the data (August 2014), the average venture had had 3.2 meetings with VMS mentors and repeated interactions with 1.7 mentors.

We combine the rich archival data of VMS with web searches to construct three outcome measures that capture the growth and development of a venture by August 2014: receiving full-time commitment from founders, raising funding from angel investors and/or venture capitalists, and reaching commercialization. For around 46 percent of ventures, the entrepreneurs decided to commit full-time to their ventures. Around 19 percent of the ventures in our sample have raised venture financing.[4] Commercialization is defined as having recurring revenue and expenses associated with the sale of products and/or services in keeping with the company's business objective, which was achieved by nearly one-quarter of the ventures in our sample. Around 48 percent of commercialized ventures did so without raising angel/VC funding.

We are able to collect more information beyond gender on 485 primary entrepreneurs. The average founder is around 31 years old at VMS entry. Around 65 percent of the founders majored in engineering (including computer science) during college; nearly 18 percent majored in science. Nearly 80 percent of the founders have a graduate degree at VMS entry; around 31 percent have an MBA degree; and around 29 percent hold a doctoral degree.

[4] Collectively, they raised over $700 million in venture financing.

II. Gender Gap over the Venture Life Cycle

During our sample period, 124 of the 651 early-stage venture ideas were brought to VMS by female founders; female-generated venture ideas grew from 11 percent of all ventures in 2005 to 25 percent in 2012. During the same sample period, by contrast, the percentage of females enrolled in undergraduate and graduate programs at MIT grew from 35 percent to 37 percent.[5] Despite the dramatic increase in female founders, the continuing discrepancy between male and female founders attests to a gender gap among members of the MIT community seeking mentorship for their early-stage venture ideas.

Columns 2 and 3 of Table 1 compare ventures by the gender of their primary entrepreneurs; column 4 reports the *t*-statistics from a two-sample *t*-test for equal means.[6] The primary difference between female- and male-generated early-stage venture ideas is the target industry sector. Ventures with female founders are more likely to target the consumer-products sector and significantly more likely to target "other" industry sectors, a classification that is composed primarily of consulting, nonprofit, and social-entrepreneurship ventures. Ventures with male and female founders do not differ significantly at entry by whether they possess intellectual assets or have formed a business entity. They also elicited similar levels of interest from mentors, indicating a lack of gender differences in idea quality.[7] There are also no gender differences in the degree of interactions with mentors.

Table 1 shows that, on average, ventures with female founders are less likely to achieve subsequent venture outcomes: full-time commitment, angel/VC funding, and commercialization. These differences are primarily driven by venture age. Once we include dummies for year of affiliation with VMS as controls, we find no statistically significant evidence of a gender gap in these outcome measures.

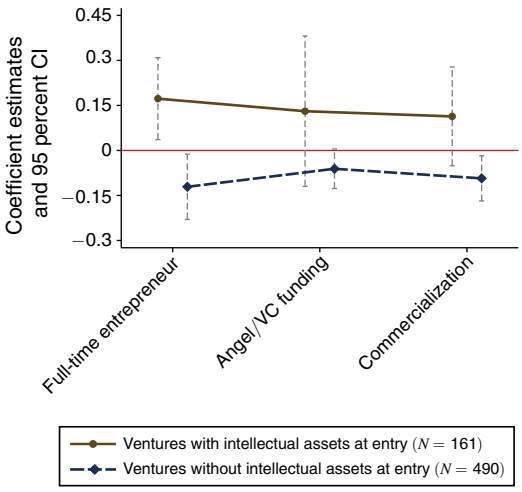

Figure 1. Estimated Gender Gap over the Venture Life Cycle

Notes: This figure plots the marginal effects and 95 percent confidence intervals from logit models with standard errors clustered by sector and year of affiliation with VMS. Each estimate plotted is from a separate regression where the dependent variable is whether the venture reaches a given milestone; the independent variable is whether the primary entrepreneur is female. The sample consists of ventures with intellectual assets at entry (solid line with dots) and ventures without intellectual assets at entry (dashed line with diamonds). All regressions include dummies for year and month of affiliation with VMS, sector, business entity at entry, aggregate mentor interest (quintile defined within a sector), number of mentor meetings (2–3, 4 or more), and number of mentors met at least twice (1–2, 3 or more).

However, the lack of overall gender differences masks important heterogeneity in the sample. Figure 1 plots the estimated gender gap in outcome measures over the venture life cycle for two subsets of venture ideas, distinguished by whether the ventures possess intellectual assets at VMS entry. Among ventures without intellectual assets (three-quarters of the sample), female founders are less likely to reach all three milestones controlling for venture characteristics, initial idea quality, and interactions with VMS; gender differences in full-time commitment and commercialization are statistically significant. Importantly, the gender gap is already evident at the time of entrepreneurs' decision to commit full-time to their venture. Compared to ventures

[5] Source: Enrollment and Degree Statistics from MIT Office of the Registrar: http://web.mit.edu/registrar/stats/ (accessed March 24, 2017).

[6] Some ventures with male primary entrepreneurs may have female cofounders, which we could not observe. These measurement errors could introduce attenuation bias in our estimation results of gender gaps.

[7] The name of the primary entrepreneur is included in the summary that mentors receive; it is therefore possible for mentors to infer the gender of the primary entrepreneur.

with male founders, ventures with female founders are 31 percent less likely to receive full-time commitments from the founders (a 12.1 percentage point reduction from a baseline probability of 38.4 percent). Once we condition on this commitment decision, we see no significant differences in the probability of raising venture financing or the rate of commercialization by primary entrepreneurs' gender.

Among ventures with intellectual assets at VMS entry, by contrast, those with female founders are more likely to reach all three milestones. But the differences are not statistically significant for raising angel/VC funding or for reaching commercialization.

These patterns are robust to excluding ventures in industry sectors with a higher proportion of female-founded ventures (consumer products and "other") and to restricting the analysis to ventures without a registered business entity upon joining VMS. They are also robust to controlling for entrepreneurs' age and education at entry.[8] We also find that, among ventures without intellectual assets, the gender differences in full-time commitment are more pronounced for older founders and for doctoral degree earners.

III. Conclusions

Using data from the MIT Venture Mentoring Service, we find that women with extensive human capital and an interest in entrepreneurship are less likely to pursue their venture ideas full-time if their ventures do not possess documented intellectual assets at the earliest stage of founding. But conditional on full-time commitment to the venture idea, we find no significant gender differences in rates of professional venture financing or achievement of commercialization. Whether this pattern is driven by over-commitment on the part of men and/or under-commitment on the part of women remains a question for future research. Our results suggest that pinpointing the obstacles that potential entrepreneurs encounter during the early stages of venture founding is an important next step in the pursuit of gender parity in the field.

[8] Among the 485 primary entrepreneurs about whom we observe such information, females are on average 2.6 years younger, less likely to have majored in engineering during college, and more likely to have majored in science and nonscience/nonengineering fields. Rates of overall graduate degree attainment are similar across genders, including by graduate degree type (masters, MBA, and doctoral).

REFERENCES

Brush, Candida G., Nancy M. Carter, Elizabeth J. Gatewood, Patricia G. Greene, and Myra M. Hart. 2004. *Gatekeepers of Venture Growth: A Diana Project Report on the Role and Participation of Women in the Venture Capital Industry.* Kansas City: Ewing Marion Kauffman Foundation.

Goldin, Claudia. 2006. "The Quiet Revolution That Transformed Women's Employment, Education, and Family." *American Economic Review* 96 (2): 1–21.

Guzman, Jorge, and Aleksandra Kacperczyk. 2016. "Gender Gap in Entrepreneurship." http://www.olenkak.com/workingpapers (accessed March 24, 2017).

Klapper, Leora F., and Simon C. Parker. 2011. "Gender and the Business Environment for New Firm Creation." *World Bank Research Observer* 26 (2): 237–57.

Robb, Alicia, Susan Coleman, and Dane Stangler. 2014. "Sources of Economic Hope: Women's Entrepreneurship." Kansas City: Ewing Marion Kauffman Foundation Research Report.

Scott, Erin L., Pian Shu, and Roman M. Lubynsky. 2016. "Are 'Better' Ideas More Likely to Succeed? An Empirical Analysis of Startup Evaluation." Harvard Business School Technology & Operations Management Working Paper 16-013.