

## APPENDIX

### Industry clusters (Study 1)

Startups in Crunchbase are labeled using one or more industry category tags. A total of 45 unique tags appeared in our dataset. Startups were labeled with between 1 and 12 tags, for an average of 3.6 tags per firm. We assigned firms to one of 10 industry clusters based on these tags, using hierarchical clustering analysis, and linking observations according to Ward's method of clustering. We labeled each of the ten industry clusters obtained based on the most common tags appearing within that cluster (Table A1).

*Table A1: Industry clusters*

Industry cluster label	Nb. of firms in cluster
Design & fashion	44
Healthcare	572
Media & entertainment	143
Fintech	143
Mobile & apps	165
Sales & marketing	141
IT	323
Electronics	290
Analytics & A.I.	168
Biotech	147

Table A2: Covariate balance in full and matched samples, Study 1

**Panel A: Full sample**

Variables	<i>Male-founded</i> ( <i>N=1846</i> )		<i>Female-founded</i> ( <i>N=290</i> )		Absolute difference of means
	Mean	s.d.	Mean	s.d.	
Obtained round 2	71.34	1.05	70.35	2.68	1.00
Male VC	90.74	0.67	87.24	1.96	3.50†
Female VC	2.98	0.40	6.90	1.49	3.92***
Mixed VC team	6.28	0.56	5.86	1.38	0.42
Amount raised in R1 (logged)	3.14	0.03	2.85	0.10	0.30**
Age of firm at R1 (in days)	820	31	632	45	189*
Nb. of VC partners in round	1.68	0.03	1.53	0.05	0.15*
Include prominent VC partner	7.80	0.62	7.59	1.56	0.21
Size of founding team	2.16	0.02	2.47	0.70	0.31***
Female-typed business	2.55	0.37	23.45	2.49	20.90***
Patent applications at R1	0.06	0.02	0.25	0.06	0.19**

**Panel B: Matched sample of male and female-founded firms**

Variables	<i>Male-founded</i> ( <i>N=272</i> )		<i>Female-founded</i> ( <i>N=272</i> )		Absolute difference of means
	Mean	s.d.	Mean	s.d.	
Obtained round 2	71.69	2.73	70.96	2.75	0.74
Male VC	88.24	1.95	87.13	2.03	1.10
Female VC	2.94	1.02	6.99	1.55	4.04*
Mixed VC team	8.82	1.72	5.88	1.42	2.94
<i>Controls used in CEM</i>					
Amount raised in R1 (logged)	2.82	0.10	2.82	0.10	0.00
Age of firm at R1 (in days)	610	34	575	36	35
<i>Other controls</i>					
Nb. of VC partners in round	1.69	0.07	1.53	0.05	0.15†
Include prominent VC partner	7.35	1.58	7.35	1.58	0
Size of founding team	2.23	0.06	2.50	0.07	0.27**
Female-typed business	4.04	1.19	21.32	2.48	17.28***
Patent applications at R1	0.41	0.15	0.27	0.17	0.14
Serial entrepreneurs	0.65	0.05	0.50	0.05	0.14*

*Firms in this sample are also matched on industry*

**Panel C: Matched sample of female-founded firms (treatment = female VC)**

Variables	Control (male VC) (N=20)		Treated (female VC) (N=20)		Absolute difference of means
	Mean	s.d.	Mean	s.d.	
Obtained round 2	70	10.25	45	11.12	25
<i>Controls used in CEM</i>					
Amount raised in R1 (logged)	3.17	0.40	3.31	0.37	0.14
Age of firm at R1 (in days)	512	71	521	74	10
<i>Other controls</i>					
Nb. of VC partners in round	1.6	0.28	1.2	0.16	0.4
Include prominent VC partner	0	0	10	6.71	10
Size of founding team	2.85	0.31	1.85	0.15	1**
Female-typed business	25	9.68	35	10.67	10
Patent applications at R1	0.15	0.11	0.10	0.10	0.05

\*\*\* p<0.001, \*\* p<0.01, \* p<0.05, † p<0.10

*Table A3: Cox proportional hazards model of time to second round, on matched sample of female-founded firms, Study 1*

Dependent variable: Second round	(1)
Male VC partner(s)	1.0979* (0.545)
Investment Round Controls	Yes
Industry FE	Yes
Observations	40
Wald $\chi^2$	20.01

Notes. Estimates from a Cox proportional hazards model of receiving a second round on a sample of female-founded firms. Firms that raised a first round from only female VC partners were matched with firms that raised a first round from only male VC partners based on the amount raised in R1 and age of the firm at R1, using the coarsened exact matching procedure. Investment round controls include amount raised in R1 (logged) and age of firm at R1. Robust standard errors in parentheses.

\*\*\* p<0.001, \*\* p<0.01, \* p<0.05, † p<0.10.

Table A4: Cox proportional hazards model of time to second round, excluding mixed gender founding teams, Study 1

Dependent variable: Second round	(1)
Firm-investor combination	
Male-founded– male VC partner(s)	1.3133† (0.690)
Male-founded– female VC partner(s)	1.2779† (0.707)
Male-founded – male & female VC partners	1.3785* (0.699)
Female-founded – male VC partner(s)	1.5082* (0.696)
Female-founded – male & female VC partners	1.6274* (0.758)
Investment Round Controls	Yes
VC Controls	Yes
Firm Controls	Yes
Industry FE	Yes
Observations	1,930
Wald $\chi^2$	91.29

Notes. Estimates from a Cox proportional hazards model of receiving a second round on a sample of firms with either all-female or all-male founding teams. Omitted category is female-founded–female VC partner(s). Investment round controls include amount raised in R1 (logged) and age of firm at R1; VC controls include total number of VC partners and presence of prominent VC partner; firm controls include size of founding team, firm location, and whether business is female-typed. Robust standard errors in parentheses.

\*\*\* p<0.001, \*\* p<0.01, \* p<0.05, † p<0.10.

## Investor gender in follow-on rounds (Study 1)

To better understand the patterns of investment in our context, we collected additional data on a subsample of firms that were able to secure a second round of capital, in order to explore the extent to which existing investors bring in new investors, how often existing investors participate in follow-on rounds, and whether these behaviors differ depending on the gender of the entrepreneur and/or first round investors. This provides us with a richer understanding of the process by which firms move from first to second round.

We began with the sample of 544 matched firms, of which 388 successfully completed a second round in our observation window. Of these, we were able to get information on round 2 investors for 350 firms. In 72% of cases, at least one of the first round investor partners (or their firms) was present in the second round. At least one new investor was present in all but 16% of second round financings. In over 57% of cases, the second round involved both at least one of the first round investors, and at least one new investment firm. This is consistent with the literature on venture financing, which shows that staged rounds allow early-stage investors to bring in new investors as a way of increasing the funding available to the growing startup.

We then investigated whether these trends differed depending on the gender of first round entrepreneurs or investors. We also note the gender of the partners present in the second round, when partner information was available (n=290). The descriptive data is set out in the table below.

*Table A5: Descriptive statistics on round 2 investors (n=350), Study 1*

<b>Entrepreneur-investor gender combination</b>	<b>Data on R2</b>	<b>R2 includes R1 investor(s)</b>	<b>R2 includes new investors</b>	<b>Gender make-up of R2 investors (excl. missing)</b>
Female E - female I	n=9	78%	100%	Male: 12.5% Female: 37.5% Mixed: 50%
Female E - male I	n=149	67%	85%	Male: 91% Female: 1% Mixed: 8%
Female E - mixed I	n=12	75%	92%	Male: 27% Female: 0 Mixed: 73%
Male E - female I	n=7	57%	71%	Male: 40% Female: 60% Mixed: 0
Male E - male I	n=158	75%	82%	Male: 97% Female: 1% Mixed: 2%

While the numbers are small for firms backed by female partners, these figures suggest that successful second rounds almost always involve attracting new investors, regardless of the gender of the first round investors. We also see that follow-on investment rounds are dominated by male investment partners. Out of the 290 firms in this sub-sample for which we have data on the gender of round 2 investor partners, 84% of second rounds involve only male partners, less than 3% involve only female partners, and under 13% involve both male and female partners).

## Experiment design and materials (Study 2)

We recruited 134 full-time MBA students from a top-tier business school to participate in our study, and asked them to help us screen pitch videos for an early-stage startup competition. Participants were recruited on campus during class hours. Recruiters approached students using the following script: “Hello, my name is [name] and I am a [position at the school]. Do you have a few minutes? We are screening pitches for an early-stage entrepreneurship competition and could use your help. It would involve watching a two-minute pitch and then answering a few questions. If you would like to help us, you can enter a lottery to win a prize that we will be raffling off later this afternoon.”

Once students agreed to participate, they were given an individual tablet and headphones, and proceeded to complete the study online. All participants were shown the following survey instructions:

Thank you for helping us screen video entries for an upcoming **competition for early-stage entrepreneurs**.

We are now conducting a first round of screening of the submitted videos. Only the pitches that achieve above a certain score on this round will be reviewed by our second round judges.

We will ask you to watch a video entry and then rate the **quality of the venture**.

**Please watch each video from beginning to end, and answer the rating questions thoughtfully. Remember to switch on your sound.**

*Introduction and instructions, common to all participants.*

After this, participants were randomly assigned into one of four conditions using the randomization function in Qualtrics, where each condition was chosen roughly an equal number of times. Participants were assigned to watch one of four versions of a pitch video in a two (male versus female entrepreneur) by two (male versus female investor) between-subject design.

Each video is approximately 1 minute and 45 seconds long, and consists of a slide deck containing five slides, narrated by the founder and CEO of the fictional startup “Careerday.com,” an online platform where job seekers connect to company insiders to obtain information about companies they are interested in, and possible referrals. Each script provides an overview of the business as well as revenue projections.

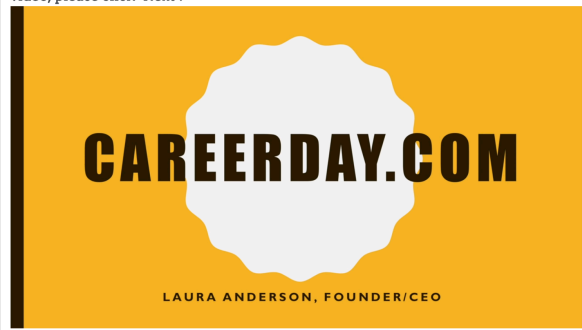
At the end of the pitch, the founder mentions that the startup is currently raising a \$600,000 seed round, and that an investor from the fictional VC firm “Pegasus Ventures Fund” has already invested in the business. The slides and narration script are identical across conditions, with the exception of the name of the founder (David vs Laura Anderson) and the name and the picture of the venture capital investor providing early-stage financing (John vs Katherine Clark). We pre-tested the photographs for similarity in perceptions of age, attractiveness, and professionalism. The name pairs had been tested in prior research (Pedulla 2016; Thébaud 2015).

Please click below to watch pitch video #4111. After you have finished watching the video, please click "Next".



*Beginning of pitch video – male entrepreneur conditions*

Please click below to watch pitch video #2113. After you have finished watching the video, please click "Next".



*Beginning of pitch video – female entrepreneur conditions*



*End of pitch video – female investor conditions*



*End of pitch video – male investor conditions*

## *Measures*

After watching the video, participants were asked to evaluate the quality of the pitch, as well as the competence of the entrepreneur. Both variables were composite measures adapted from prior research (Brooks et al. 2014) as well as scoring criteria from a business school pitch competition, aggregating ratings on 7-point Likert scales. We also asked participants to evaluate the investor. We made no prediction regarding participants' perceptions of the investor but included this measure to ensure that it did not drive our results. Scores were aggregated across each set of items to obtain average measures of pitch quality (Cronbach's  $\alpha = 0.82$ ), entrepreneur competence (Cronbach's  $\alpha = 0.83$ ), and investor competence (Cronbach's  $\alpha = 0.91$ ).

### Pitch quality

“Please rate the competition entry along the following criteria:

- How original was the idea?
- How persuasive was the pitch?
- How fact-based was the pitch?
- How logical was the pitch?
- How clear was the description of the product or service?
- How solid were the financial forecasts and valuation?”

### Entrepreneur competence

“Please rate [the founder] in terms of:

- Persuasiveness and credibility
- Industry knowledge
- Confidence.”

### Investor competence

“Please rate [the investor] in terms of:

- Expected ability to help [the founder] identify and capture growth opportunities
- Expected ability to find additional capital for the business

- Expected ability to take this business to IPO/acquisition
- Expected ability to provide [the founder] with coaching and support.”

At the end of the survey, participants were asked to provide their gender. They were also asked if they experienced any technical difficulties while watching the video, and if they could recall the business idea being pitched.

## Replications of Study 2

We tested the external validity of our findings from Study 2 by replicating the study design first with a large online panel of adults, and then with a narrower sample of investors who reported having made investments in startups (essentially through crowdfunding platforms).

### 1) Online study with general population (Study 3a)

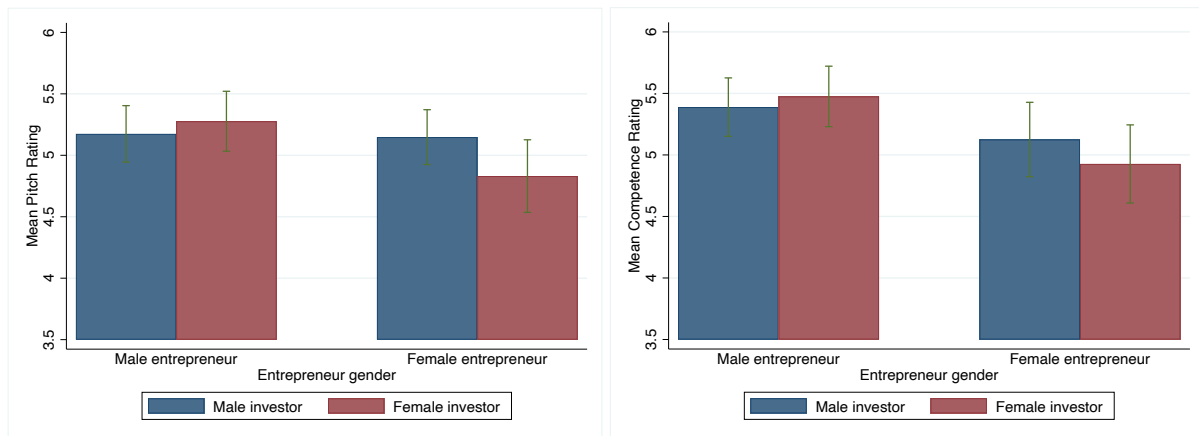
We recruited adult participants residing in the United States, Canada, and the United Kingdom through Amazon’s Mechanical Turk platform to complete an online experiment in exchange for US\$1.00. Participants were prevented from taking the survey if they failed preliminary Captcha and attention checks. We excluded an additional 37 participants who had duplicate IP addresses, failed simple memory checks, or provided nonsensical responses to open-ended, qualitative questions, leaving a total of 271 participants, which provided 80% power to detect  $d=.21$ . Excluding these participants did not affect our results.

Participants were told that their help was needed to screen short pitch videos submitted to a prestigious entrepreneurial pitch competition. They were randomly assigned to watch one of four versions of a pitch in a two (male versus female entrepreneur) by two (male versus female investor) between-subject design. These videos were the same as those used in the study with the MBA population. After watching the video, participants were asked to evaluate the pitch, the entrepreneur, and the investor. They were also asked to recall the business idea presented in the video. As noted above, participants who were unable to do so were removed from the analysis.

We measured pitch quality and entrepreneur competence using the same items as those used in the MBA population study, and created aggregate scores of pitch quality ( $\alpha=0.83$ ) and entrepreneur competence ( $\alpha=0.83$ ).

We first ran a series of analyses of variance tests to determine if perceptions of pitch quality and entrepreneur competence differed by condition. These revealed a marginally significant main effect of entrepreneur gender on perceptions of pitch quality, with female-led pitches ( $M = 5.00, SD = 0.09$ ) receiving lower pitch ratings than male-led pitches ( $M = 5.23, SD = 0.27$ ),  $F(1, 271) = 3.59, p = 0.06$ . We also found a significant main effect of entrepreneur gender on perceptions of entrepreneur competence, with female entrepreneurs ( $M = 5.00, SD = 0.09$ ) rated as less competent than male entrepreneurs ( $M = 5.43, SD = 0.11$ ),  $F(1, 269) = 8.50, p = 0.004$ . There was no significant main effect of investor gender on either the pitch quality ( $F(1, 271) = 0.74$ ) or the entrepreneur competence ( $F(1, 269) = 0.16$ ) measure.

Our main analyses show that, as expected, investor gender had a significant effect on ratings for female, but not male, entrepreneurs. Analyses of variance with t-tests of mean differences between conditions revealed that when entrepreneurs were backed by a male investor, female-led pitches were perceived as being of a similar quality ( $M = 5.15, SD = 0.94$ ) as male-led pitches ( $M = 5.17, SD = 0.93$ ),  $t = -0.15$ . Female entrepreneurs ( $M = 5.13, SD = 1.26$ ) were also perceived as not significantly less competent as male entrepreneurs ( $M = 5.39, SD = 0.97$ ),  $t = -1.34$ . However, when entrepreneurs received backing from a female investor, the gap between male and female entrepreneur ratings increased, with females receiving lower pitch quality scores ( $M_{female} = 4.83, SD = 1.20$ ;  $M_{male} = 5.28, SD = 1.01$ ;  $t = -2.52, p = 0.012$ ), and lower competence scores than their male counterparts ( $M_{female} = 4.93, SD = 1.29$ ;  $M_{male} = 5.28, SD = 1.02$ ;  $t = -2.78, p = 0.006$ ).



*Investor gender effect on perceptions of pitch quality*

*Investor gender effect on perceptions of competence*

We conducted a moderated mediation analysis (Hayes 2013) to investigate the conditional indirect effect of entrepreneur gender on pitch quality through perceptions of entrepreneur competence, at different levels of our moderator (male or female investor). We found that perceptions of competence significantly mediate the relationship between entrepreneur gender and pitch quality ratings when the entrepreneur was backed by a female investor (bootstrap coefficient -0.373, 95% CI [-0.638, -0.095]), but not when she was backed by a male investor (bootstrap coefficient -0.179, 95% CI [-0.433, -0.069]).

*Table A6: Conditional indirect effect of investor gender on pitch quality, general population study*

Mediator	Investor gender	Effect	Bootstrap SE	Bootstrap CI
Competence	Male	-0.179	0.130	[-0.433, 0.069]
Competence	Female	-0.373	0.135	[-0.638, -0.095]

*N=271; bootstrap sample = 1000*

## 2) Online study with startup investors (Study 3b)

We also replicated our study design using a sample of startup investors recruited on the Prolific platform. Using the observed effect sizes from Study 3a, we conducted an a priori power analysis using G\*Power (Faul et al. 2007) to calculate appropriate sample sizes. G\*Power indicated that a sample size of 134 would be needed to detect the observed effect size for pitch quality ( $d=.29$ ) and 430 for competence ( $d=.16$ ) with 80% power.

We recruited a total of 420 participants on the Prolific platform, applying the following screening criteria: participants needed to be at least 30 years old; residents of the United Kingdom, the United States, Ireland, Australia, Canada or New Zealand; have English as their first language; have at least an undergraduate degree; and have some investment experience. After eliminating participants who failed attention checks, we were left with 404 individuals.

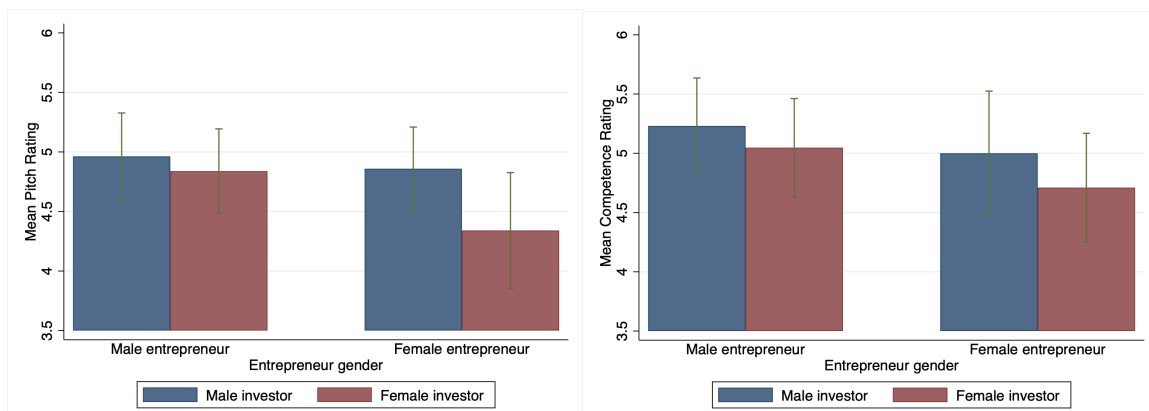
We narrowed down the sample further by applying our own screening question: “Have you ever invested in a startup?” This left us with a final sample of 103 participants (43% female). Of these, 86 reported having invested their own money, and 17 reported having invested on behalf of others. 46 percent declared that the total amount they invested was greater than £1000. Just under 50 percent of the sample held an undergraduate degree, 41 percent a graduate degree, and 10 percent a doctorate.

Participants were told that their help was needed to assess pitch competition videos, as part of an effort to train an artificial intelligence algorithm to predict startup success. After reading the instructions,

participants were randomly assigned to watch one of four versions of a pitch in a two (male versus female entrepreneur) by two (male versus female investor) between-subject design. These videos were the same as those used in the study with the MBA population, and the general population. After watching the video, participants were asked to evaluate the pitch, the entrepreneur, and the investor. They were also asked to recall the business idea presented in the video, and the gender of the investor. Participants who failed these attention checks were removed from the analysis.

We measured pitch quality and entrepreneur competence using the same items as those used in the MBA and general population studies, and created aggregate scores of pitch quality ( $\alpha=0.85$ ) and entrepreneur competence ( $\alpha=0.85$ ).

While the experiment is underpowered (80% power to detect  $d = .33$ ; expected  $d = .29$  (pitch quality) and  $d = .16$  (competence)), our results are qualitatively similar to those obtained with our original study. The entrepreneur in the female-female condition received pitch evaluation ratings, as well as competence ratings, that were the lowest across the four conditions, as illustrated in the figure below:



Investor gender effect on perceptions of pitch quality

Investor gender effect on perceptions of competence

We found no evidence of a participant gender effect in this sample. If anything, we found that while female evaluators gave slightly higher pitch quality and entrepreneur competence ratings across conditions, they were more likely to give lower scores to the female-female pair relative to the other conditions, compared to male evaluators.

## References

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