"Are New Venture Competitions Useful?"
Online Appendix

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1. Tests for differences across competition types

1.1. *Tests for ex-ante distributional differences*

Two types of visual evidence and a formal test find that the distributions of observable characteristics are similar across the two types of competitions. While the levels of observables are not always similar, the demeaned distributions are never measurably different.

First, I show the probability of three characteristics that I expect to predict survival (the inverse of abandonment) as a function of decile rank in Figure A1: whether the founder attended a top 10 college, whether the venture was incorporated at the time of the round, and whether the venture received external financing before the round. All limit the sample to non-winners. There are no obvious differences around the medians between feedback and no-feedback competitions. However, there are level differences. For example, ventures are more likely to be incorporated in the feedback competitions. This is largely due to the difference between the Arizona Innovation Challenge, a large feedback competition that caters to more advanced ventures, and the HBS New Venture challenge, a large no-feedback competition whose participants are typically teams of students deciding whether to enter entrepreneurship. I match on incorporation below, in case it makes rank a more informative signal of quality.

Second, I present histograms of the distributions, and find no obvious differences in skewness or kurtosis across the two types of competitions.[1] Figures

[1] Greater skewness means that the data are more concentrated on one side of the distribution, and greater kurtosis (or peakedness) means that the data are more concentrated around the middle, as opposed to being more spread out (fatter-tailed).

A2 and A3 contain spikes representing the fraction of ventures within narrow z-score bandwidths for observables in feedback and no-feedback competitions.[2] Figure A2 shows venture characteristics, including company incorporation, prior financing, technology type, whether the company is in a VC hub state, and whether the company is social impact-oriented or clean technology. Figure A3 shows founder characteristics, including whether the founder is a student at the time of the round, ever received an MBA, attended a top-20 college, and is of above median age (in years). The distributions are not the same, but in no case does the distribution of non-winners (left tail) appear meaningfully lopsided.

I test for distributional differences around the median among non-winners in Table A16. I calculate each variable's mean above and below the median among non-winners in each round, and subtract the below median mean from the above median mean. Then I conduct a t-test across rounds with and without feedback. Among the nine observables at the time of the round considered in Table A16, the only significant difference is in the probability that the venture is located in a VC hub state. In the no-feedback competitions, above median non-winners are 4 pp more likely than below median non-winners to be in a hub state, while this difference is -1 pp for feedback competitions. Any bias should act against my main result, since ventures in hub states are unconditionally more likely to succeed (Table A6). Note a Kolmogorov-Smirnov test for equality of distribution functions is not appropriate here, as it tests for stochastic dominance rather than differences in shape.

The two types of competitions are also broadly similar. In Table A17, I use t-tests to compare overall competition and round characteristics. The number of ventures, winners, and judges are not statistically different across the two groups. The award amount is higher in the feedback competitions, but this should not engender differences between below and above median non-winners.

[2]For example, I sum the total number of incorporated companies in feedback competitions. Then, again for only feedback competitions, I sum within a 0.1 z-score bandwidth the number of incorporated companies. I divide the second sum by the first. Thus, if Inc_i is an indicator for a company being incorporated, the bar height for 0.1 z-score band z in feedback competitions is: $\frac{\sum_{z,SF} Inc_i}{\sum_{SF} Inc_i}$.

1.2. *Rank reflects quality consistently*

I next test whether rank reflects measures of quality observable at the time of the competition. In Table A18, I regress whether the founder attended a top 10 college, whether the venture was incorporated at the time of the round, and whether the venture received external financing before the round on *Low Rank*, within the sample of non-winners.

The sample is restricted to the no-feedback competitions in columns 1, 3, and 5. These regressions find strong, negative, and statistically significant coefficients on *Low Rank*. I include all competitions and interact *Low Rank* with *Feedback* in columns 2, 4, and 6. The coefficients on the interaction term are uniformly zero. These regressions are within round, so the independent effect of feedback is absorbed. This exercise demonstrates that the mapping between observable quality and rank is not different across the two types of competitions.

1.3. *Selection into feedback*

There may be concern that founders with more uncertainty about their project quality select into feedback competitions, even though competitions did not advertise this feedback explicitly. I test for such selection using ventures that participated in multiple competitions: Among founders that compete in a second competition, I expect high information need founders to disproportionately sort into feedback competitions.

To proxy for information need, I use a low average score or a highly dispersed score in the first competition. Table A19 panel 1 contains summary statistics for the sample used in the test. Panel 2 shows t-tests for whether information need, measured in the first round of the first competition, is associated with participation in a second competition with feedback. None are significant. It is therefore unlikely that founder selection into competition type is affected by information needs.

2. Bayesian theory and calibration

This section presents a simple model of how a Bayesian updater responds to feedback. The modeling choices are designed to hew as closely as possible to the information structure and main results from the preceding sections. Section 1.1 contains the model, and Section 1.2 calibrates it to show how feedback affects a founder's success probability distribution.

2.1. *Theory*

Consider a potential entrant with a business idea. With probability θ, it will succeed and produce value $y = 1$. It will fail ($y = 0$) with probability $1 - \theta$. The founder i has a prior about his probability of success, $\mu_i(\theta) \in [0, 1]$. The venture has not yet paid an irreversible entry cost c. The prospective founder's expected payoff is

$$v_i = -c + \mu_i \left(\theta \mid info_i \right). \tag{1}$$

The founder's decision problem, regardless of whether he is rational or biased, is to go forward if the expected payoff exceeds the entry cost, and drop out otherwise. Here, I assume founders are rational Bayesian updaters, consistent with the evidence in Section 6.3.

Recall the following institutional details: A known number of judges have each independently ranked a set of ventures. The average of these judge-specific ranks becomes a rank for a given venture. Ventures in feedback competitions learn only their own rank, and do not observe judge-specific ranks. The empirical approach coarsened the information into a binary signal: negative feedback (below median rank among non-winners), and relatively positive feedback (above median rank among non-winners).

I model signal precision through the number of judges, consistent with empirical sensitivity of responsiveness to this variable (heterogeneity result available upon request). Other factors doubtless matter as well, but are excluded for simplicity or because they are not empirically related to responsiveness, such as the

number of competitors or competition selectivity. Suppose the founder interprets his rank as the result of a series of Bernouilli trials, where the number of signals is the number of judges (J). Each judge $j \in J$ independently reports a positive or negative signal for each venture. These signals are summed across J and ordered, creating a ranking of the ventures in the round. Let k be the number of positive signals that judges report about a venture, or the number of judges who ranked a venture above median. Then, the observed rank and the presence of "negative feedback" (below median rank) are monotone functions of k. In practice, I find that both responsiveness and venture continuation are roughly linear in rank, suggesting that this monotonicity assumption is plausible.

The conjugate prior for the Bernouilli distribution is the Beta distribution, which is defined by shape parameters α and β, and is defined on the interval $[0, 1]$.[3] The venture begins with a prior distributed $\mathcal{B}\left[\alpha^{all},\ \beta^{all}\right]$, which has mean $\frac{\alpha^{all}}{\alpha^{all}+\beta^{all}}$. I assume all founders have the same α and β, but discuss below how heterogeneity in responsiveness may reflect different parameters.

I separate the information that ventures receive into two stages.[4] In the first stage, the founder learns that he lost, yielding an interim prior that is the rational expectation for success conditional on losing. Let the interim prior be $\mu_i\left(\theta \mid lost_i\right) = E\left[\mathcal{B}\left(\alpha,\ \beta\right) \mid lost_i\right] = \frac{\alpha}{\alpha+\beta} < \frac{\alpha^{all}}{\alpha^{all}+\beta^{all}}$.[5] In the second stage, ventures in feedback competitions learn their ranks, while ventures in no-feedback competitions learn nothing. An informed founder i observes that he had J_i judges, of whom k_i reported positive signals (ranked him above median). His posterior

[3]Beta distributions are useful because they represent a distribution of probabilities. Conjugate prior means that if the prior is a Beta distribution, so is the posterior, and thus the posterior simply alters the parameters of the prior. There is then a closed-form expression for the posterior. The pdf of the Beta distribution is $\frac{(\alpha+\beta-1)!}{(\alpha-1)!(\beta-1)!}\theta^{\alpha-1}\left(1-\theta\right)^{\beta-1}$.

[4]From the perspective of Bayes' rule, the order in which the information is received is irrelevant. In practice, ventures learn whether they lost immediately upon conclusion of the competition, and are subsequently informed of their rank by email.

[5]Note that the interim prior should reflect precision; ventures in both types of competitions can observe the number of judges. However, the goal of the analysis is to focus on differences in signals to non-winners, and the number of judges does not differ systematically between feedback and no-feedback competitions (see Section 4.2.1). Thus there is no loss in omitting the number of judges from consideration in the first stage.

is distributed $\mathcal{B}[\alpha + k_i,\ \beta + J_i - k_i]$. My choice of posterior is the mean.[6] This is:

$$\mu_i(\theta \mid lost_i, k_i, J_i) = \frac{\alpha + k_i}{\alpha + k_i + \beta + J_i - k_i} = \frac{\alpha + k_i}{\alpha + \beta + J_i}. \tag{2}$$

The posterior for the uninformed ventures is unchanged from the interim prior, at $\mu_i(\theta \mid lost_i) = \frac{\alpha}{\alpha+\beta}$.

Given the rank transformation assumptions, negative feedback is when a majority of judges report negative signals for a venture, or $k_i < \frac{J_i}{2}$. Since judges must force-rank ventures, this permits dividing ventures in no-feedback competitions around the median, as in the empirical exercise. If there are I losing ventures in a feedback round, the effect of negative feedback on the probability of success is thus:

$$\mu_i\left(\theta \mid lost_i,\ k_i,\ k_i < \frac{J_i}{2}\right) - \mu_i\left(\theta \mid lost_i,\ k_i,\ k_i \geq \frac{J_i}{2}\right) = \tag{3}$$
$$\left[\frac{2}{I}\sum_{i=1}^{\frac{I}{2}} \frac{\alpha + k_i}{\alpha + \beta + J_i} \mid k_i < \frac{J_i}{2}\right] - \left[\frac{2}{I}\sum_{i=\frac{I}{2}}^{I} \frac{\alpha + k_i}{\alpha + \beta + J_i} \mid k_i \geq \frac{J_i}{2}\right]$$

Note that because the interim prior does not change for uninformed ventures, the second difference (the control) in the difference-in-differences estimator cancels out (i.e. $\frac{\alpha}{\alpha+\beta} - \frac{\alpha}{\alpha+\beta} = 0$).

2.2. *Calibration*

The first object that I need is the interim prior expectation of success. The best proxy is realized outcomes in the no-feedback competitions, within the subsample matched to ventures in the feedback competitions.[7] The mean continuation prob-

[6] The posterior pdf is then $\frac{(\alpha+\beta+J-1)!}{(\alpha+K-1)!(\beta+(J-k)-1)!}\theta^{\alpha+k-1}(1-\theta)^{\beta+(J-k)-1}$. The alternative to using the mean is the mode, which is only defined if α and β are >1. This is $Mo[\mathcal{B}(\alpha,\ \beta)] = \frac{\alpha-1}{\alpha+\beta-2}$.

[7] This is because the actual distribution of venture continuation is selected on information. It is truncated, or left-censored, in the informed group. At the same time, it is inappropriate to use the raw mean from the no-feedback competitions, because the level probability of success is different across the two types of competitions, even though the demeaned distributions are

ability among non-winners in no-feedback competitions exactly matched on observables to non-winners in feedback competitions is 0.4. (Note this is 0.06 higher than the whole-population probability, reflecting the match.) Then $\frac{\alpha}{\alpha+\beta} = .4$, or $\beta = 1.5\alpha$.

The difference-in-differences estimate found that negative feedback reduces the probability of success by 8.6 percentage points (Table 4 Panel 1 column 1). In practice, there are 53 no-feedback rounds, which I index by r. After replacing $\beta = 1.5\alpha$, the Bayesian updating calculation for the difference-in-differences estimate in Equation 3 becomes:

$$\frac{1}{53}\sum_{r=1}^{54}\left\{\left[\frac{2}{I_r}\sum_{i=1}^{\frac{I_r}{2}}\frac{\alpha+k_i}{2.5\alpha+J_i} \mid k_i < \frac{J_i}{2}\right] - \left[\frac{2}{I_r}\sum_{i=\frac{I}{2}}^{I_r}\frac{\alpha+k_i}{2.5\alpha+J_i} \mid k_i \geq \frac{J_i}{2}\right]\right\} = -.086 \quad (4)$$

I demean k_i and J_i to make their magnitude more consistent across rounds.

Equation 4 is easily solved by iterating, yielding $\alpha = 4.5$. Thus $\beta = 6.75$. The interim prior, distributed $\mathcal{B}[4.5,\ 6.75]$, is shown in Figure 3A in the main text. To arrive at the posterior after negative feedback, I consider only the first bracketed object in Equation 4. Taking the "population" shape parameters as given, in the subsample receiving negative feedback the average k_i and J_i are 0.70 and 4.3, respectively. Thus the average posterior after negative feedback is:

$$\mu_i\left(\theta \mid lost,\ k_i,\ k_i < \frac{J_i}{2}\right) \sim \mathcal{B}\left[\alpha + 0.70,\ \beta + 4.3\right] = \mathcal{B}\left[5.2, 10.35\right].$$

The corresponding k_i and J_i in the positive feedback group (above median non-winners; right-hand bracketed term in Equation 4) are 2.2 and 4.3, yielding a positive feedback posterior of:

$$\mu_i\left(\theta \mid lost,\ k_i,\ k_i \geq \frac{J_i}{2}\right) \sim \mathcal{B}\left[\alpha + 2.2,\ \beta + 4.3\right] = \mathcal{B}\left[6.7, 8.85\right].$$

These are shown in Figure 3B and 3C.

not different.

We can interpret the heterogeneity results through this Bayesian calibration. Greater responsiveness within a given group, such as among women, could reflect a lower or a less precise prior. Holding β fixed, a lower α corresponds to a lower prior and a lower variance.[8] For some variables, I am able to distinguish between the two moments. In particular, I find that ventures are much more responsive when there are more judges (Table 5 Panel 2 column 9). A similar exercise to the one above, using the average number of judges when it is above and below median and the corresponding average number of success signals yields the two graphs in Figure 4.[9]

[8] $Var\left[\mathcal{B}\left(\alpha,\ \beta\right)\right] = \frac{\alpha\beta}{(\alpha+\beta)^2(\alpha+\beta+1)}$

[9] For negative feedback, the average k_i and J_i with an above median number of judges in the round are 1 and 6, respectively. This delivers a posterior distributed $\mathcal{B}\left[5.5, 11.75\right]$. The average k_i and J_i with a below median number of judges in the round are 0.4 and 2, respectively. This delivers a posterior distributed $\mathcal{B}\left[4.9, 8.35\right]$.

Table A.1: List of Programs

Panel 1

Competition Name	City	State	Years	# unique ventures	# unique judges	# rounds per comp.
Arizona Innovation Challenge Fall	Phoenix	AZ	2012-2015	489	90	2
Arizona Innovation Challenge Spring	Phoenix	AZ	2012-2015	610	87	2
Angel Capital Summit	Denver	CO	2014-15	195	55	1
BRF Entrepreneur Accelerator Program (EAP)	Shreveport	LA	2014	22	4	1
CU CleanTech New Venture Challenge	Boulder	CO	2012-13	27	35	1
Clean Energy Challenge	Chicago	IL	2013	50	55	2
Cleantech Open: California	Redwood City	CA	2009-14	231	163	2
Cleantech Open: North Central	Minneapolis	MN	2010-13	109	103	2
Cleantech Open: Northeast	Boston	MA	2009-13	233	137	2
Cleantech Open: Pacific Northwest	Portland	OR	2009-13	62	38	2
Cleantech Open: Rocky Mountain	Denver	CO	2009-13	133	61	2
Cleantech Open: South Central	Austin	TX	2011-13	11	12	2
Cleantech Open: Southeast	Atlanta	GA	2011-13	24	37	2
Colorado Capital Conference 2013	Denver	CO	2013	52	23	2
Colorado Digital Health Challenge	Denver	CO	2014	33	46	2
DOE Cleantech Business Plan Competition	Washington	D.C.	2013	6	5	2
Energize 2013	Snowbird	UT	2013	22	12	1
Energy Security Prize, EIA Track	Washington	D.C.	2013	16	18	2
Harvard Business School New Venture Competition	Boston	MA	1999-2015	817	563	2‡

Panel 2

Competition Name	City	State	Years	# unique ventures	# unique judges	# rounds per comp.
Illinois Clean Energy Student Challenge	Chicago	IL	2013	26	9	1
Imagine H2O Infrastructure Challenge	San Francisco	CA	2013-15	160	31	3
Innosphere Admissions	Fort Collins	CO	2013-15	32	46	1
MIT Clean Energy Prize	Cambridge	MA	2013-15	156	80	2-3$^{\diagdown}$
Missouri Clean Energy Student Challenge	St. Louis	MO	2013	14	9	1
OEDIT Advanced Industries Accelerator Energy and Natural Resources	Denver	CO	2015	36	7	1
Ohio Clean Energy Student Challenge	Cleveland	OH	2012-13	12	8	1
TransTech Energy Conference 2012	Morgantown	WV	2012	20	25	1
Massachusetts Clean Energy Center Catalyst Grant Program	Boston	MA	2012-15	250	134	2
Rice University Business Plan Competition	Houston	TX	2004-2015	480	694	3†

Notes: $^{\ominus}$In the main data file, I have transformed scores to ranks (and all ranks to percentile ranks). Therefore, two ventures may have the same rank. ‡First round done in panels of 4-8 ventures and 5-15 judges per panel, varies somewhat year to year (note: there is small finals for top three teams, all of which win a cash prize. Do not have data for this final round) †First round, challenge round, and semifinal rounds all "tracked" into panels (what RBPC calls "flights"). First round tracked by sector, then firms randomized across panels. non-winners of first round go on to "Challenge" round. There is also pre-competition business plan stage. *Have in hand: 2012-16. Hopefully more coming. $^{\mp}$But used in pre-competition business plan stage, and I have those scores. $^{\diagdown}$Depends on year.

Table A.2: Sector and Judge Data

Panel 1: Sectors

	# unique ventures	
Hardware	245	
	Sectors‡	
	Ventures	Judges
Air/water/waste/agriculture	146	31
Biotech	182	64
Clean tech/renewable energy	712	273
Defense/security	64	66
Education	37	118
Energy (fossil)	61	373
Fintech/financial	53	522
Food/beverage	88	24
Health (ex biotech)	270	291
IT/software/web	1,404	586
Manuf./materials/electronics	323	96
Media/ads/entertainment	57	157
Real estate	61	82
Retail/consumer goods	139	159
Social enterprise	42	42
Transportation	136	51

Panel 2: Judge Professions

	# unique judges
All	2,514
Venture Capital Investor	676
Elite VC† (by IRR/Multiple)	21
Angel Investor*	397
Mean (med) AngelList investments	12.8 (8)
Professor/Scientist	44
Business Development/Sales	83
Corporate Executive	498
Founder/Entrepreneur	240
Lawyer/Consultant/Accountant	369
Non-Profit/Foundation/Government	164
Other	193
# judge-venture pairs in which judge personally invested in venture	3
# judge-venture pairs in which judge's firm invested in venture	95
Total # judge-venture score pairs	47,066
# judge-venture pairs in same sector	8,139

Note: This table lists the number of ventures by technology type and the number of judges by profession. †Preqin top 20 VC firm by either IRR or Multiple, as of 2016. *Identifies as angel investor in competition data, or has AngelList profile and at least one investment (160 judges). ‡Venture sectors from competition data; each venture assigned to one sector. Judge sectors based on LinkedIn profile or firm webpage; judges may have expertise in multiple sectors.

Table A.3: Company & Competition States

State	# competitions in state	# ventures located in state	State	# competitions in state	# ventures located in state
Arizona	8	665	Idaho		9
California	7	298	Kentucky		13
Massachusetts	34	1,146	Michigan		24
Colorado	16	250	Rhode Island		9
New York		85	Arkansas		14
Minnesota	2	46	North Carolina		14
Utah	3	48	Montana		7
Washington		40	Florida		16
Illinois		62	Hawaii		6
Nevada		28	Indiana		21
Texas	14	70	Missouri	1	19
Oregon	3	21	South Carolina		4
Wisconsin		28	Vermont		4
Connecticut		20	DC		4
Iowa		17	Kansas		9
Maryland		23	Alaska		2
Maine		8	Tennessee		10
New Jersey		14	New Hampshire		5
Ohio	2	28	South Dakota		3
Pennsylvania		26	Delaware		3
Virginia		20	Wyoming		5
North Dakota		7	Louisiana		13
New Mexico		10	West Virginia	1	2
Georgia		18	Mississippi		1
Oklahoma		4	Foreign		26

Note: This table lists the number of competitions and unique ventures by state. Companies that changed states are assigned their earliest state.

Table A.4: Unconditional association between characteristics and success

Panel 1

Dependent Variable:	Financing after round		≥ 10 employees as of 8/2016	
	(1)	(2)	(3)	(4)
Founder student at round	-.023	.016	.029	.043
	(.047)	(.028)	(.042)	(.028)
Founder top 10 college	.061*	.051***	.035	.032
	(.035)	(.018)	(.037)	(.022)
Founder has MBA	-.052	-.0095	-.061	-.054***
	(.034)	(.017)	(.038)	(.018)
Founder top 10 MBA	-.034	-.029	.042	.028
	(.041)	(.021)	(.046)	(.023)
Venture age > median	-.023		.0091	
	(.028)		(.025)	
Venture in VC hub state	.093**	.088***	.057*	.09***
	(.038)	(.018)	(.034)	(.019)
Financing before round	.088**	.19***	.15***	.16***
	(.038)	(.028)	(.036)	(.023)
Venture incorp. at round	-.0049	.021	.033	.07***
	(.036)	(.018)	(.032)	(.017)
Founder # jobs before round	.029***	.014***	.023***	.0091***
	(.0056)	(.0027)	(.0059)	(.0026)
Founder age > median	-.02		-.063**	
	(.029)		(.031)	
Venture social/ clean tech	-.14***	-.13***	-.024	-.044**
	(.039)	(.015)	(.047)	(.017)
Venture tech type IT/software	.14***	.12***	.068*	.074***
	(.039)	(.021)	(.038)	(.021)
Venture # team members	.03**	.0087	.035***	.017***
	(.014)	(.0063)	(.01)	(.0058)
N	1184	3346	1184	3346
R^2	.072	.1	.06	.061

Note: This panel contains the unconditional association of characteristics and success, using the OLS regression: $Y_i^{Post} = \alpha + \beta' \mathbf{C}_i + \varepsilon_{i,j}$ where $\mathbf{C}$ is a vector of characteristics. Standard errors clustered by competition-round. Columns 2 and 4 have a much larger sample because they omit venture and founder age, which are not available for many ventures.

Panel 2

Dependent Variable:	Financing after round	$\geq$ 10 employees as of 8/2016
	(1)	(2)
Air/water/waste/agriculture	-	-
Biotech	.053	-.012
	(.036)	(.047)
Clean tech/renewable energy	.026	.026
	(.026)	(.027)
Defense/security	.14***	.11*
	(.05)	(.062)
Education	.17***	.18**
	(.063)	(.075)
Energy (fossil)	.12	.11
	(.073)	(.071)
Fintech/financial	.073*	.23***
	(.039)	(.073)
Food/beverage	.12***	.11**
	(.039)	(.048)
Health (ex biotech)	.2***	.12***
	(.04)	(.043)
IT/software/web	.24***	.19***
	(.035)	(.035)
Manuf./materials/electronics	.18***	.13***
	(.043)	(.043)
Media/ads/entertainment	.27***	.11
	(.065)	(.069)
Real estate	.053	-.0049
	(.041)	(.044)
Retail/apparel/consumer goods	.18***	.081*
	(.046)	(.046)
Social enterprise	-.03	.14
	(.085)	(.1)
Transportation	.075**	.13***
	(.031)	(.047)
Competition f.e.	Y	Y
N	3519	3519
R^2	.12	.076

Note: This panel contains the unconditional association of venture sectors and success, using the OLS regression: $Y_i^{Post} = \alpha + \beta' Sector\ f.e._i + \gamma' Comp\ f.e._j + \varepsilon_{i,j}$. The base sector is "Air/water/waste/agriculture". Financing after round is an indicator for the venture raising private external investment after the round. 10+ employees is 1 if the venture had $\geq$ 10 employees besides the founder on LinkedIn as of 8/2016. Competition fixed effects control for the date. Errors clustered by competition-round-panel or judge, depending on f.e. *** indicates p-value<.01.

Table A.5: Representativeness of Sample

Panel 1: Venture Sectors

	% ventures in data	% U.S. VC deals	% U.S. VC deal amt
Air/water/waste/agriculture	3.9%		
Biotech	4.8%	10.8%	12.9%
Clean tech/renewable energy	18.9%	3.3%	2.0%
Defense/security	1.7%		
Education	1.0%		
Energy (fossil)	1.6%		
Fintech/financial	1.4%	1.9%	5.4%
Food/beverage	2.3%		
Health (ex biotech)	7.2%	8.8%	6.1%
IT/software/web	37.2%	40.4%	39.8%
Manuf./materials/electronics	8.6%	7.4%	6.0%
Media/ads/entertainment	1.5%	9.6%	8.0%
Real estate	1.6%		
Retail/apparel/consumer goods	3.7%	6.8%	9.9%
Social enterprise	1.1%		
Transportation	3.6%		

Panel 2: Venture States (top 20 states in data)

	% ventures in data	% U.S. VC deals	% U.S. VC deal amt
Massachusetts	35.5%	9.7%	9.6%
Arizona	20.6%	0.6%	0.2%
California	9.2%	40.6%	57.3%
Colorado	7.8%	2.0%	1.3%
New York	2.6%	10.6%	10.6%
Texas	2.2%	3.7%	2.0%
Illinois	1.9%	2.2%	1.9%
Utah	1.5%	1.3%	1.2%
Minnesota	1.4%	0.7%	0.6%
Washington	1.2%	2.6%	2.0%
Nevada	0.9%	0.1%	0.0%
Wisconsin	0.9%	0.5%	0.2%
Ohio	0.9%	1.6%	0.4%
Pennsylvania	0.8%	4.6%	1.1%
Michigan	0.7%	0.1%	0.6%
Maryland	0.7%	1.6%	1.5%
Oregon	0.7%	1.0%	0.4%
Indiana	0.7%	0.4%	0.1%
Connecticut	0.6%	1.3%	0.8%
Virginia	0.6%	1.7%	0.7%

Note: This table compares the frequency of ventures in my sample with U.S. VC deals from the National Venture Capital Association's 2016 Yearbook.

Table A.6: Top 10 Colleges

Top Twenty U.S. Universities		*Top Ten MBA Programs*	
Rank	Name	Rank	Name
1	PRINCETON	1	HARVARD
2	HARVARD	2	STANFORD
3	YALE	3	CHICAGO
4	COLUMBIA	4	UPENN
5	STANFORD	5	MIT
6	CHICAGO	6	NORTHWESTERN
7	MIT	7	UC BERKELEY
8	DUKE	8	DARTMOUTH
9	UPENN	9	YALE
10	CALTECH	10	COLUMBIA
11	JOHNS HOPKINS		
12	DARTMOUTH		
13	NORTHWESTERN		
14	BROWN		
15	CORNELL		
16	VANDERBILT		
17	WASH ST LOUIS		
18	RICE		
19	NOTRE DAME		
20	UC BERKELEY		

Note: This table describes the university rankings used in analysis. Source: US News & World Report 2016 Rankings.

Table A.7: Additional Robustness Tests of Effect of Winning

Dependent variable: Abandonment

Sample:	University comps		HBS NVC	AIC	No small	Ventures		Founders	
	Omitted	Only	omitted	omitted	comps	in VC hub states	incorp.	with MBAs	students
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Won Round	.12***	.15***	.13***	.13***	.15***	.13***	.14***	.12**	.13**
	(.039)	(.037)	(.029)	(.029)	(.028)	(.049)	(.038)	(.053)	(.056)
Decile rank winners	-.012**	-.01	-.013***	-.01**	-.013***	-.011	-.015**	-.0056	-.014
	(.0057)	(.008)	(.0046)	(.005)	(.0047)	(.0082)	(.0059)	(.011)	(.012)
Decile rank losers	-.022***	-.011**	-.021***	-.015***	-.019***	-.011**	-.025***	-.0091	-.024***
	(.0029)	(.0043)	(.0026)	(.0029)	(.0026)	(.0049)	(.0034)	(.0057)	(.006)
Prize (10,000$)	.0081***	.01*	.0078***	.01***	.0082***	.0074	.0074***	.017*	.012
	(.0026)	(.0057)	(.0024)	(.0039)	(.0025)	(.012)	(.0027)	(.0094)	(.0086)
Comp.-round-panel f.e.	Y	Y	Y	Y	Y	Y	Y	Y	Y
N	3616	2407	5235	4460	5442	1968	3288	1637	1183
R^2	.11	.24	.15	.19	.17	.28	.18	.34	.33

Note: This table shows regression estimates of the effect of winning, rank, and cash prize on whether the venture raised external financing after the competition using variants of Equation 1. The level of observation is a venture-round. Some rounds divide ventures into panels. Financing after round is an indicator for the venture raising private external investment after the round. "Decile rank" is the overall decile rank in the round, while "decile rank winners" and "decile rank non-winners" are, respectively, the decile rank within the round's winners and non-winners. A smaller rank is better (one is best decile, 10 is worst decile). Column 1 excludes competitions organized by universities, while column 2 includes only these competitions. Columns 3 and 4 omit the two largest competitions in the data, the HBS New Venture Competition and the Arizona Innovation Challenge, respectively. Column 5 omits competitions where there are less than 30 participants. Competition fixed effects control for the date. Errors clustered by competition-round-panel. *** indicates p-value$<$.01.

Table A.8: Out-of-Sample Summary Statistics for Exact Match

Sample: non-winners of rounds only

Panel 1: After Exact Matching

Variables (not used in first stage)	Treated (Feedback) N	Mean	Control (No Feedback) N	Mean	Difference	t	p-value
Venture IT/Software-based	1,050	0.494	1,050	0.494	0.000	0	1
Venture in VC hub state	1,050	0.054	1,050	0.096	-0.042	-3.65	0
Venture in same state as competition	1,050	0.550	1,050	0.837	-0.287	-14.99	0
Venture age (years)	847	2.540	967	2.133	0.407	3.12	0.002
Venture received financing before round	1,050	0.193	1,050	0.293	-0.100	-5.37	0
Founder has MBA	1,050	0.086	1,050	0.056	0.030	2.64	0.008
Founder age above median	255	0.776	198	0.838	-0.062	-1.65	0.1
Founder attended top 10 college	1,050	0.026	1,050	0.034	-0.009	-1.15	0.25

Panel 2: Before Exact Matching

	Treated (Feedback) N	Mean	Control (No Feedback) N	Mean	Difference	t	p-value
Venture IT/Software-based	1,075	0.487	3,061	0.452	0.035	1.96	0.05
Venture in hub state (CA/MA/NY)	1,075	0.054	3,061	0.453	-0.400	-25.4	0
Venture in same state as competition	1,075	0.548	3,061	0.514	0.034	1.9	0.057
Venture age (years)	862	2.552	1,362	1.337	1.215	9.75	0
Venture received financing before round	1,075	0.193	3,061	0.136	0.058	4.55	0
Founder has MBA	1,075	0.085	3,061	0.361	-0.276	-17.82	0
Founder age above median	263	0.760	1,515	0.481	0.280	8.56	0
Founder attended top 10 college	1,075	0.025	3,061	0.156	-0.131	-12.89	0

Note: This table contains summary statistics about out-of-sample covariate balance for the treated and control samples used in the exact matching analysis. The samples of above- and below-median non-winners were matched exactly sector (there are 16 sectors), competition year, student status, and company incorporation status. Note that IT/software, a larger category than the sectors, is exactly balanced after the match.

Table A.9: Alternative Models for Effect of Negative Feedback

Panel 1

Dependent variable: Abandonment

	Low rank among non-winners defined as deciles:			Score	Logit	Exact matching	Propensity score matching
	Lowest 3	Lowest 7	5-8 (lowest 2 omitted)				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Low rank·Feedback	.059**	.08*	.07	.055**	.33**	.076***	.056**
	(.03)	(.043)	(.055)	(.021)	(.16)	(.027)	(.022)
Low rank	.065***	.061***	.035	.084**	.3***		
	(.019)	(.022)	(.025)	(.04)	(.096)		
Score				-.046*			
				(.024)			
Comp.-round-panel f.e.	Y	Y	Y	Y	Y		
N	4405	4405	2688	4405	4397	2484	3357
R^2	.17	.17	.23	.18	0.07	-	.095

Note: This panel shows estimates of the effect of negative feedback within the sample of losers. The level of observation is a venture-round. The dependent variable is venture abandonment, which is 0 if the venture had ≥ 1 employee besides the founder on LinkedIn as of 8/2016, and 1 otherwise. Columns 1-3 use alternative definitions for "Low rank" among losers of a round. In column 1, "Low rank" is one if the rank is in the bottom three deciles among non-winners; columns 2-3 use similar definitions. Column 4 controls for score, column 5 uses a logit model, column 6 uses exact matching and column 7 uses propensity score matching. Errors clustered by competition-round-panel. *** indicates p-value$<$.01.

Panel 2

Dependent variable: Abandonment

Sample:	Ventures		Founders		Prelims
	in VC hub states	that are incorporated	with MBAs	who are students	
	(1)	(2)	(3)	(4)	(5)
Low rank·Feedback	.089***	.13**	.14	.07	.11**
	(.03)	(.059)	(.11)	(.048)	(.047)
Low rank	.38***	.017	.17	.93***	.053**
	(.14)	(.047)	(.15)	(.048)	(.023)
Comp.-round-panel f.e.	Y	Y	Y	Y	Y
N	1611	2020	1374	829	3208
R^2	.29	.088	.13	.35	.18

Note: This panel shows estimates of the effect of negative feedback within the sample of losers. The level of observation is a venture-round. The dependent variable is venture abandonment, which is 0 if the venture had ≥ 1 employee besides the founder on LinkedIn as of 8/2016, and 1 otherwise. The sample is restricted to certain types of ventures or founders. Ventures in VC hub state requires the venture to be located in CA, NY, or MA. The sample is restricted to preliminary rounds in column 5. Errors clustered by competition-round-panel. *** indicates p-value$<$.01.

Table A.10: Effect of Negative Feedback within Cleantech Open

Sample restricted to non-winners of round in the Cleantech Open Competitions 2010-12

Dependent variable: Survival

Sample:	2010-12		All years		2010-12	All years
					Logit	
	(1)	(2)	(3)	(4)	(5)	(6)
Low rank·Feedback	.13	.11**	.13*	.11**	.65*	.6*
	(.081)	(.053)	(.069)	(.05)	(.39)	(.32)
Low rank	.061	.064***	-.056	.055***	.32	.3
	(.051)	(.025)	(.037)	(.02)	(.26)	(.19)
Feedback	-.072	.04	-.11	-.024	-.33	-.52
	(.092)	(.072)	(.086)	(.068)	(.43)	(.39)
Venture controls	Y	Y	Y	Y	Y	Y
Judge f.e.	N	Y	N	Y	N	N
N	575	2601	739	3247	571	735
R^2	.15	.3	.12	.26		
Pseudo-R^2					.11	.092

Note: This table shows estimates of the effect of negative feedback; specifically, the effect of a below-median rank among non-winners when non-winners learn their ranks, ("Feedback"), relative to competitions where they do not learn their ranks. The sample is limited to the Cleantech Open Competition. Columns 1 and 2 further limit the sample to the years 2010-2012. Feedback only occurred in 2011. Models are OLS in columns 1-4 and logit in columns 5-6. "Low rank" is one if the venture's rank is below median among non-winners, and 0 if it is above median among non-winners. Survival is one if the venture had at least one employee besides the founder on LinkedIn as of 8/2016. Errors clustered by competition-round or judge, depending on fixed effects. Feedback varies by event, so competition-round fixed effects are not used. Venture controls include sector indicator variables, whether the company is incorporated, and whether the founder is a student. *** indicates p-value$<$.01.

Table A.11: Propensity Score Matching Summary Statistics

Panel 1: After Propensity Score Matching

	Treated (Feedback)		Control (No Feedback)				
	N	Mean	N	Mean	Difference	t	p-value
Venture incorporated	1,064	0.866	2,701	0.866	0.000	0	1
Venture received financing before round	1,064	0.250	2,701	0.253	-0.003	-0.13	0.899
Founder is student	1,064	0.027	2,701	0.029	-0.002	-0.17	0.868
Air/water/waste/ag	1,064	0.023	2,701	0.023	0.000	0	1
Biotech	1,064	0.061	2,701	0.058	0.003	0.23	0.816
Clean tech/renewable	1,064	0.204	2,701	0.204	0.000	0	1
Defense/security	1,064	0.014	2,701	0.018	-0.005	-0.66	0.51
Education	1,064	0.006	2,701	0.006	0.000	0	1
Energy (fossil)	1,064	0.011	2,701	0.012	-0.002	-0.26	0.795
Fintech/financial	1,064	0.003	2,701	0.002	0.002	0.58	0.564
Food/beverage	1,064	0.020	2,701	0.018	0.002	0.2	0.84
Health (ex biotech)	1,064	0.053	2,701	0.053	0.000	0	1
Mobile/IT/software	1,064	0.453	2,701	0.456	-0.003	-0.11	0.912
Manuf/materials/electronics	1,064	0.104	2,701	0.101	0.003	0.18	0.855
Media/ads/entertainment	1,064	0.002	2,701	0.002	0.000	0	1
Apparel/consumer goods	1,064	0.014	2,701	0.008	0.006	1.07	0.283

Panel 2: Before Propensity Score Matching

	Treated (Feedback)		Control (No Feedback)				
	N	Mean	N	Mean	Difference	t	p-value
Venture incorporated	1,075	0.464	3,061	0.367	0.098	34.94	0
Venture received financing before round	1,075	0.194	3,061	0.151	0.043	3.19	0.001
Founder is student	1,075	0.022	3,061	0.218	-0.196	-15.15	0
Air/water/waste/ag	1,075	0.030	3,061	0.044	-0.014	-1.97	0.049
Biotech	1,075	0.086	3,061	0.033	0.053	6.92	0
Clean tech/renewable	1,075	0.133	3,061	0.236	-0.102	-7.03	0
Defense/security	1,075	0.028	3,061	0.010	0.018	4.01	0
Education	1,075	0.007	3,061	0.009	-0.002	-0.6	0.547
Energy (fossil)	1,075	0.010	3,061	0.019	-0.008	-1.79	0.074
Fintech/financial	1,075	0.005	3,061	0.012	-0.008	-2.08	0.038
Food/beverage	1,075	0.015	3,061	0.025	-0.010	-1.9	0.058
Health (ex biotech)	1,075	0.040	3,061	0.100	-0.059	-5.96	0
Mobile/IT/software	1,075	0.484	3,061	0.302	0.182	10.67	0
Manuf/materials/electronics	1,075	0.123	3,061	0.066	0.057	5.74	0
Media/ads/entertainment	1,075	0.004	3,061	0.009	-0.005	-1.65	0.099
Apparel/consumer goods	1,075	0.011	3,061	0.043	-0.032	-4.84	0

Note: This table contains summary statistics before and after propensity score matching across feedback and no-feedback groups within non-winners. The samples were also matched on year, which I do not report. There are three additional sectors that I did not match on as there were too few observations (transportation, social enterprise, and real estate).

Table A.12: Effect of Negative Feedback with Competition-type Interactions

Panel 1: Participant success likelihood measures

Dependent variable: Survival

	(1)
Low rank·Feedback	.098***
	(.038)
Low rank	.047**
	(.02)
Share founders attended top 10 colleges·Feedback	-.81
	(.74)
Share founders attended top 10 colleges	.029
	(.11)
Share ventures received prior financing·Feedback	.11
	(.3)
Share ventures received prior financing	-.69***
	(.24)
Share ventures incorporated at round·Feedback	.28**
	(.13)
Share ventures incorporated at round	.043
	(.063)
Feedback	-.32***
	(.12)
Year f.e.	Y
N	4136
R^2	.078

Note: This panel shows estimates of the effect of negative feedback, from Equation 2, where feedback is also interacted with characteristics likely to be associated with participant diversity, signal quality, and survival probability. Abandonment is 0 if the venture did not have ≥ 1 employee besides the founder on LinkedIn as of 8/2016. Sample restricted to non-winners of round, all rounds included. Errors clustered by competition-round-panel. *** indicates p-value$<$.01.

Panel 2: Competition participant diversity measures

Dependent variable: Survival

	(1)
Low rank·Feedback	.09**
	(.039)
Low rank	.056***
	(.021)
# sectors (out of 16) represented by ventures ·Feedback	.016
	(.012)
# sectors (out of 16) represented by ventures	-.0013
	(.006)
Share ventures software/web/IT·Feedback	.13
	(.18)
Share ventures software/web/IT	-.021
	(.085)
Share ventures clean energy·Feedback	.5*
	(.28)
Share ventures clean energy	-.05
	(.064)
Feedback	-.38**
	(.17)
Year f.e.	Y
N	3796
R^2	.071

Note: This panel shows estimates of the effect of negative feedback, from Equation 2, where feedback is also interacted with characteristics likely to be associated with participant diversity, signal quality, and survival probability. Abandonment is 0 if the venture did not have ≥ 1 employee besides the founder on LinkedIn as of 8/2016. Sample restricted to non-winners of round, all rounds included. Errors clustered by competition-round-panel. *** indicates p-value$<$.01.

Panel 3: Founder success likelihood measures

Dependent variable: Survival	
	(1)
Low rank·Feedback	.067*
	(.035)
Low rank	.05**
	(.02)
Venture incorporated at round ·Feedback	.072
	(.061)
Venture incorporated at round	-.17***
	(.025)
Venture received prior financing·Feedback	.091**
	(.045)
Venture received prior financing	-.34***
	(.034)
Founder BA from top 10 college·Feedback	-.14*
	(.079)
Founder BA from top 10 college	-.0024
	(.026)
Founder PhD from top 20 univ·Feedback	.43***
	(.12)
Founder PhD from top 20 univ	-.045
	(.041)
Founder student at round·Feedback	-.0081
	(.086)
Founder student at round	-.096***
	(.025)
Feedback	-.14**
	(.063)
Year f.e.	Y
N	3765
R^2	.13

Note: This panel shows estimates of the effect of negative feedback, from Equation 2, where feedback is also interacted with characteristics likely to be associated with participant diversity, signal quality, and survival probability. Abandonment is 0 if the venture did not have ≥ 1 employee besides the founder on LinkedIn as of 8/2016. Sample restricted to non-winners of round, all rounds included. Errors clustered by competition-round-panel. *** indicates p-value$<$.01.

Table A.13: Round-level test for distributional differences around median among non-winners

	Feedback			No Feedback				
	N	Mean	S.d.	N	Mean	S.d.	Difference	P-value
Venture characteristics								
Incorporated	127	0.03	0.24	48	0.06	0.20	-0.04	0.35
Financing before round	127	0.05	0.25	48	0.11	0.31	-0.06	0.21
IT/Software-based	127	-0.02	0.24	48	0.00	0.29	-0.02	0.68
Hub state (CA/MA/NY)	127	-0.01	0.17	48	0.04	0.17	-0.06	0.05
Social impact/cleantech	127	-0.02	0.28	48	-0.06	0.24	0.03	0.46
Founder characteristics								
Student at round	127	-0.03	0.14	48	0.00	0.09	-0.03	0.23
Has MBA	127	0.05	0.36	48	0.10	0.37	-0.04	0.51
Attended top 20 college	127	0.03	0.31	48	0.01	0.19	0.02	0.66
Age above median	99	0.05	0.37	26	0.08	0.25	-0.03	0.68

Note: This table compares the difference between above- and below-median non-winners across feedback status. Specifically, for each round the below- and above-median means are calculated. Then the below median mean is subtracted from the above median mean. Finally, a t-test is conducted across rounds with and without feedback.

Table A.14: Competition Characteristics by Feedback Status

	No feedback			Feedback				
	N	Mean	S.d.	N	Mean	S.d.	Difference	P-value
# ventures in round	77	31.81	21.07	53	40.53	46.08	-8.72	0.15
# winners	77	8.38	7.08	53	11.14	11.46	-2.76	0.09
# judges on panel	233	18.51	26.53	55	17.62	14.05	0.89	0.81
Award amount	94	42181	40650	55	183400	89941	-141219	0.00

Note: This table compares the difference between competition rounds by whether they have feedback or not.

Table A.15: Relationship between rank and observable quality

Sample restricted to non-winners of round						
Dependent variable:	Founder attended top 10 college		Venture externally financed before competition		Venture incorporated by competition date	
Sample:	No-feedback		No-feedback		No-feedback	
	(1)	(2)	(3)	(4)	(5)	(6)
Low rank	-.0047	-.0047	-.025	-.025	-.012	-.012
	(.0026)	(.0025)	(.0023)	(.0022)	(.0031)	(.003)
Low rank·Feedback		.0035		.000058		-.00032
		(.0026)		(.0038)		(.0043)
Comp.-round- panel f.e.	Y	Y	Y	Y	Y	Y
N	2453	4513	2453	4513	2453	4513
R^2	.28	.3	.21	.15	.36	.66

Note: This table shows correlations between rank and characteristics expected to predict venture survival, observable at the time of the competition. "Low rank" is 1 if the venture's rank is below median among non-winners. Errors clustered by competition-round. Competition-round fixed effects absorb the independent effect of feedback. Errors clustered by competition-round-panel. *** indicates p-value$<$.01.

Table A.16: Information Provision Test Among Companies Participating in Multiple Competitions

Panel 1: Summary Statistics of Variables used in T-Tests Below

	N	Mean	Median	S.d.	Min	Max
Decile rank in 1st competition 1st round	521	5.06	5	2.81	1	10
Judge score dispersion (uncertainty measure) in 1st competition 1st round	521	1.89	1.92	1.05	0	4.95
Likelihood 2nd competition has feedback	521	0.7	1	0.46	0	1

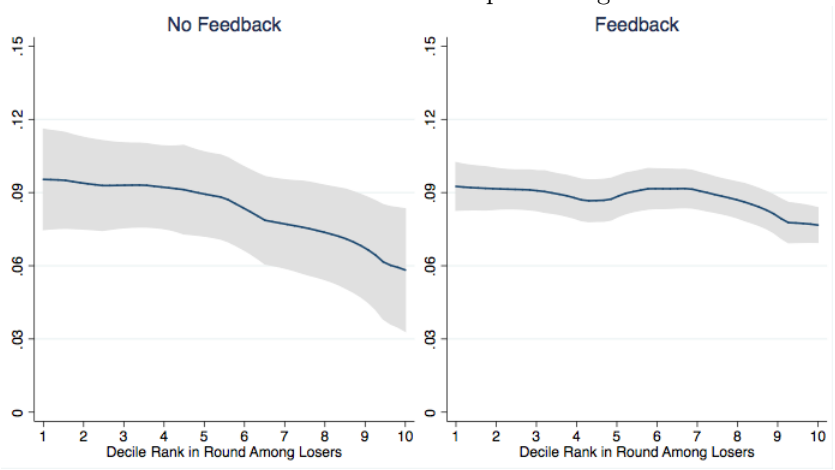
Panel 2: T-tests of propensity to participate in subsequent competition with feedback

Decile rank in 1st competition 1st round:	Above median			Below median				
	N	Mean	S.d.	N	Mean	S.d.	Diff	2-tailed p-value
Likelihood 2nd competition has feedback	238	0.69	0.46	283	0.70	0.46	-0.01	0.81
Judge score dispersion (uncertainty measure) in 1st competition 1st round:	**Above median**			**Below median**				
	N	Mean	S.d.	N	Mean	S.d.	Diff	2-tailed p-value
Likelihood 2nd competition has feedback	224	0.70	0.46	297	0.70	0.46	0.00	0.92

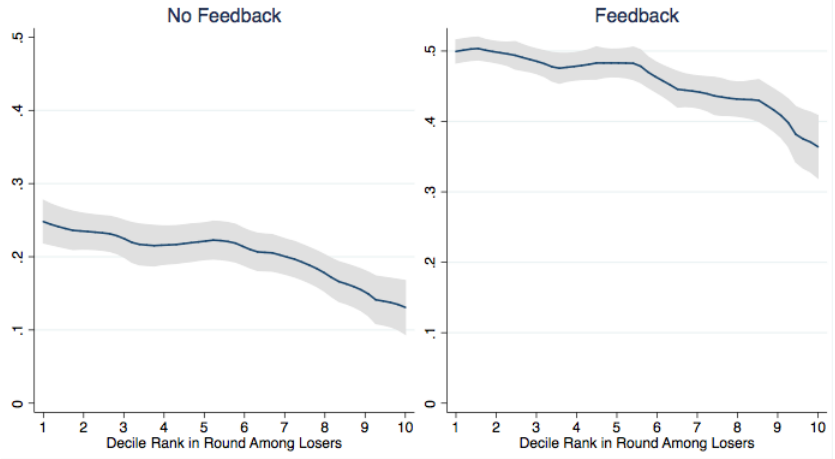
Note: This table tests whether founders with high information needs (below median rank or above median judge score dispersion) are more likely to participate in competitions with feedback. The sample is limited to ventures that participate in multiple competitions. I conduct t-tests for whether the proxies for uncertainty, measured in the first round of the first competition, are associated with a propensity to participate in a second competition that has feedback.

Figure A.1: Ex-ante characteristics among non-winners (decile 1 is best)

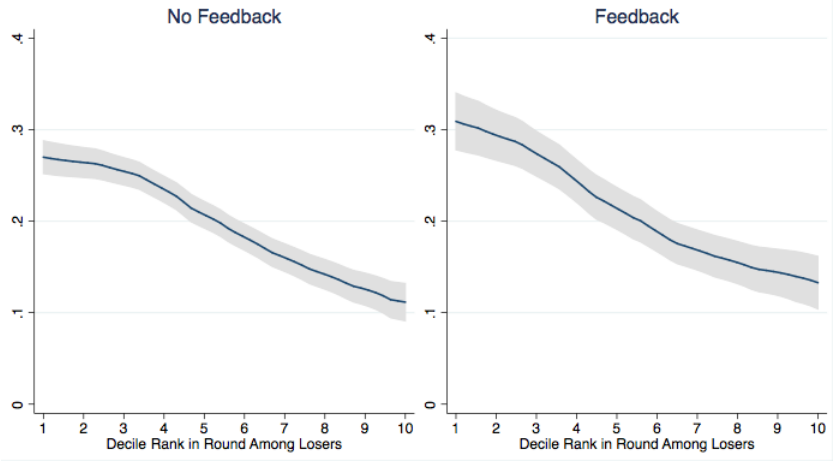
A. Founder attended top 10 college



B. Venture incorporated at time of competition

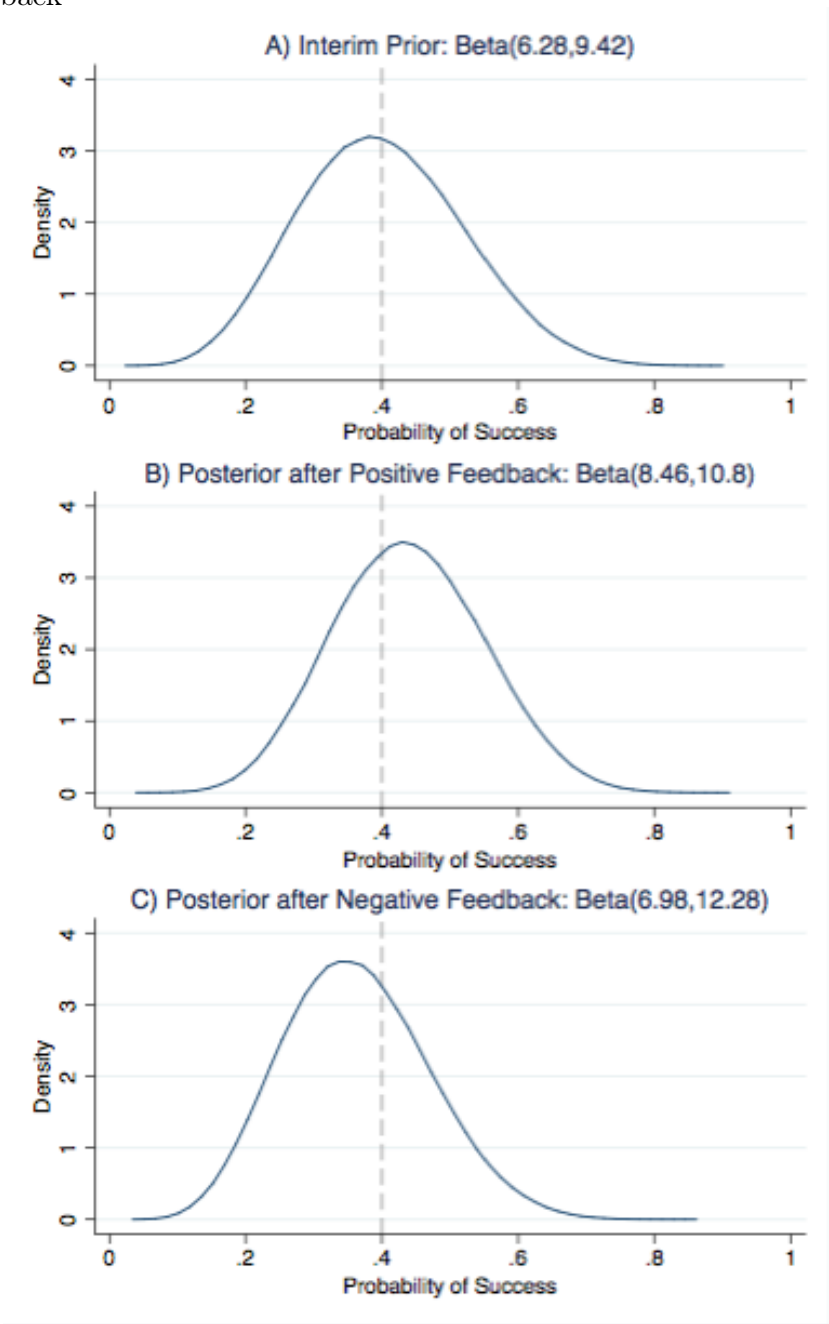


C. Venture received financing prior to the competition



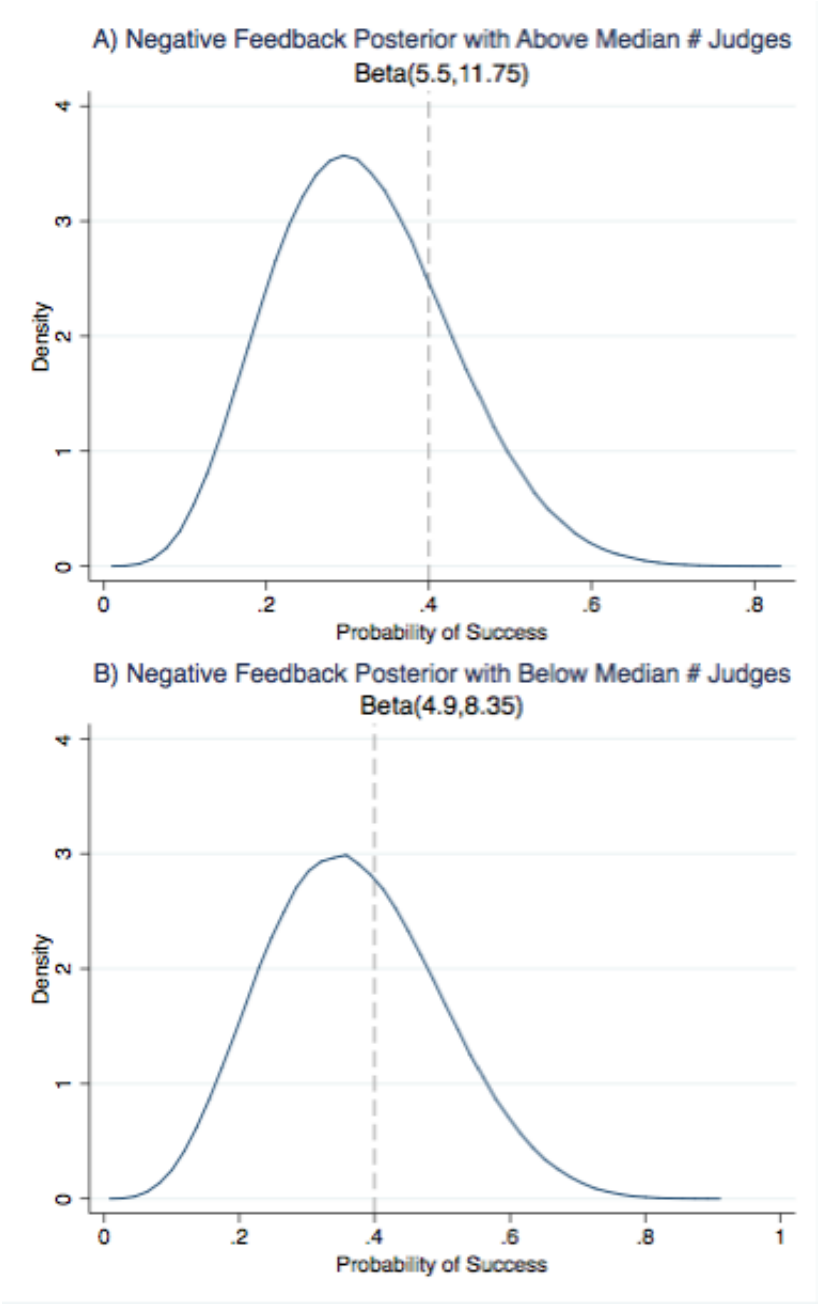
Note: These figures show a characteristic's probability by venture decile rank among non-winners in the round. Only non-winners in preliminary rounds included. Local polynomial with Epanechnikov kernel using Stata's optimal bandwidth; 95% confidence intervals shown.

Figure A.2: PDFs of interim prior and average posteriors after positive and negative feedback



Note: This figure is based on Equation 4 in the Online Appendix. It simulates Beta distributions using 1 million randomly generated numbers. The prior mean is the realized outcome for uninformed exactly matched losers (losers in the no-feedback competitions matched on observables to losers in the feedback competitions). The shape parameters in the bottom two figures reflect average k_i and J_i (success signals and number of judges) among above median losers (positive feedback) and below-median losers (negative feedback).

Figure A.3: PDFs of interim prior and average posteriors after positive and negative feedback



Note: This figure simulates Beta distributions using 1 million randomly generated numbers. The prior mean is the realized outcome for uninformed exactly matched losers (losers in the no-feedback competitions matched on observables to losers in the feedback competitions). The shape parameters in the bottom two figures reflect average k_i and J_i (success signals and number of judges) among above median losers (positive feedback) and below-median losers (negative feedback).