Startups' Strategies for ESG Funding Adoption

Ye Zhang

Stockholm School of Economics, Finance Department

GRASFI Annual Conference 2024

Question: Do Firms Embrace Green Funding?

Most industrial greenhouse gas (GHG) emissions come from private firms.

- matching between investors and firms (investment in the private market)

Extant literature: the investor side (supply)

This paper: the firm side (demand)

Question: how do firms choose between green investors and profit-driven investors during fundraising?

(Startup-VC context)

Question: Do Firms Embrace Green Funding?

Most industrial greenhouse gas (GHG) emissions come from private firms.

- matching between investors and firms (investment in the private market)

Extant literature: the investor side (supply)

This paper: the firm side (demand)

Question: how do firms choose between green investors and profit-driven investors during fundraising?

(Startup-VC context)

Question: Do Firms Embrace Green Funding?

Most industrial greenhouse gas (GHG) emissions come from private firms.

- matching between investors and firms (investment in the private market)

Extant literature: the investor side (supply)

This paper: the firm side (demand)

Question: how do firms choose between green investors and profit-driven investors during fundraising?

(Startup-VC context)

Question: Do Firms Embrace Green Funding?

Most industrial greenhouse gas (GHG) emissions come from private firms.

- matching between investors and firms (investment in the private market)

Extant literature: the investor side (supply)

This paper: the firm side (demand)

Question: how do firms choose between green investors and profit-driven investors during fundraising?

(Startup-VC context)

Question: Do Firms Embrace Green Funding?

Most industrial greenhouse gas (GHG) emissions come from private firms.

- matching between investors and firms (investment in the private market)

Extant literature: the investor side (supply)

This paper: the firm side (demand)

Question: how do firms choose between green investors and profit-driven investors during fundraising?

(Startup-VC context)

What I Do: Field Experiments in the US

Participants: 409 anonymous founders + 65 founders on Crunchbase (replication)

Experimental Setting: provide real investor recommendation services

Experimental Method

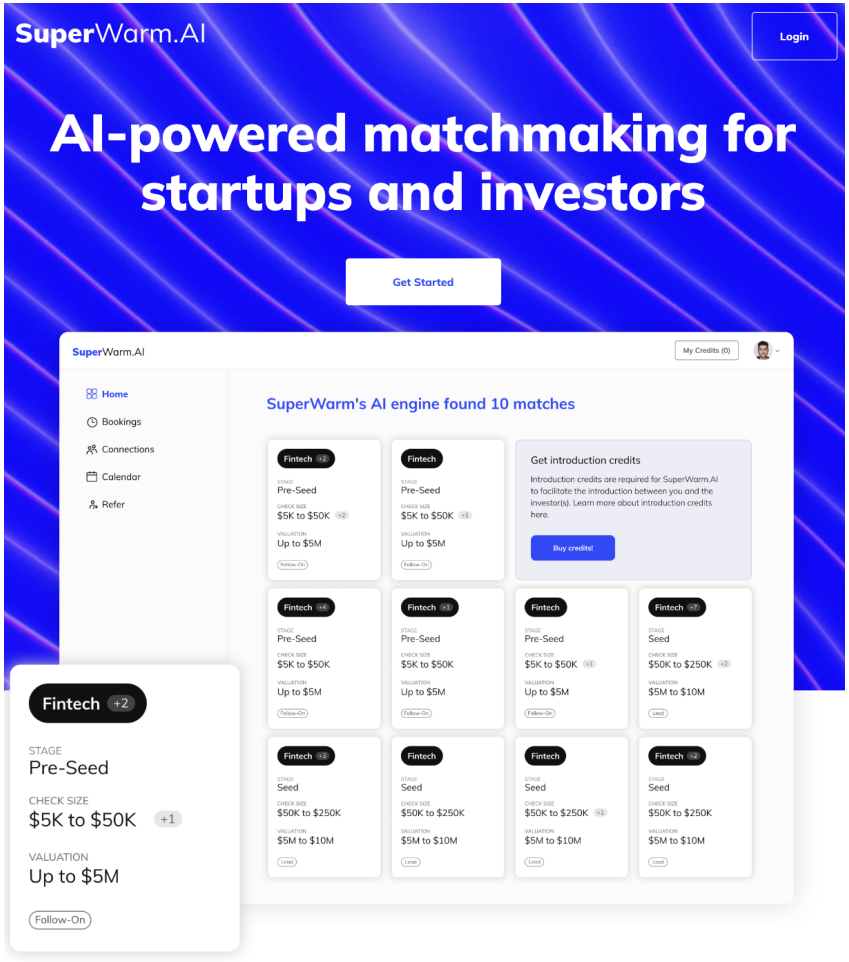
- IRR Experiment (Test belief-driven mechanisms — financial reasons)

  (Link startups' fundraising data to experimental behaviors)

- Payment Game (Test taste-driven mechanisms — preference)

  Novel design to elicit non-pecuniary preference in a field setting

- A Complementary Survey



What I Do: Field Experiments in the US

Participants: 409 anonymous founders + 65 founders on Crunchbase (replication)

Experimental Setting: provide real investor recommendation services

Experimental Method

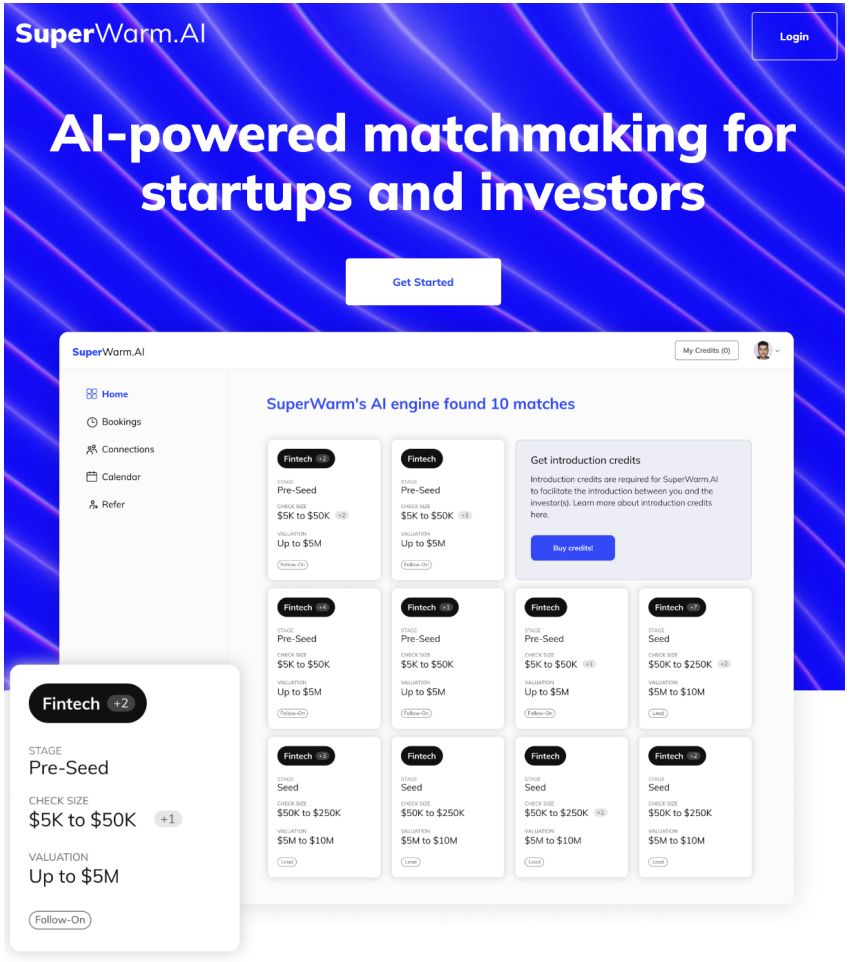
- IRR Experiment (Test belief-driven mechanisms — financial reasons)

  (Link startups' fundraising data to experimental behaviors)

- Payment Game (Test taste-driven mechanisms — preference)

  Novel design to elicit non-pecuniary preference in a field setting

- A Complementary Survey



What I Do: Field Experiments in the US

Participants: 409 anonymous founders + 65 founders on Crunchbase (replication)

Experimental Setting: provide real investor recommendation services

Experimental Method

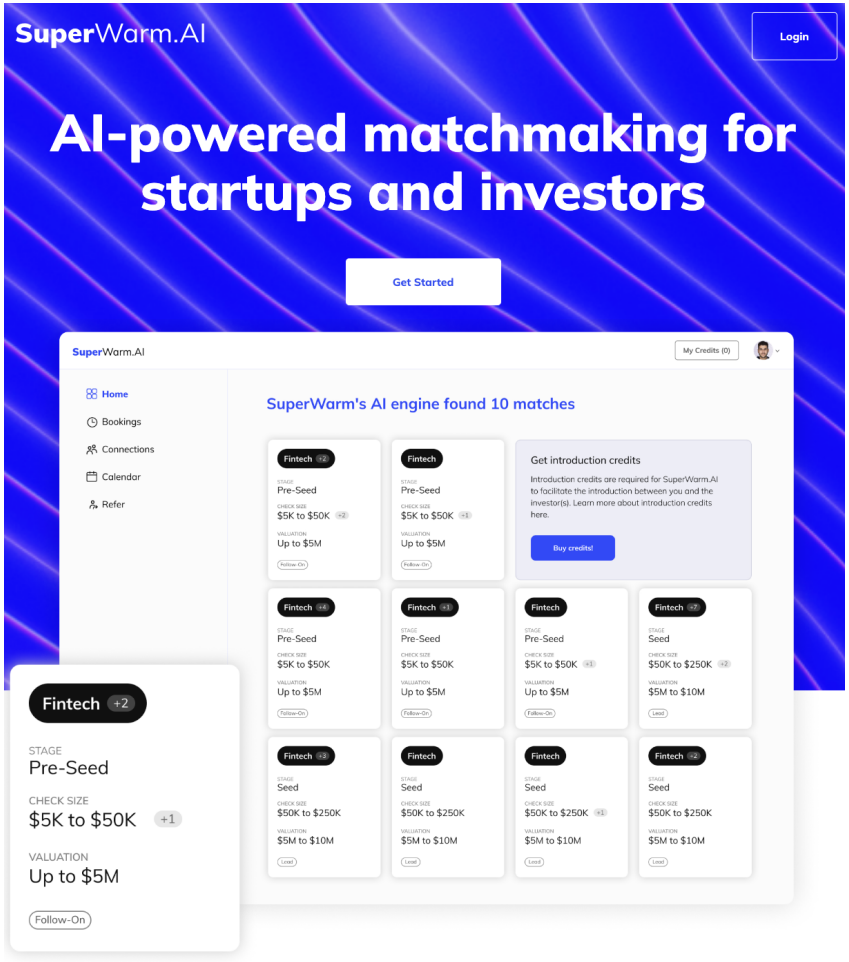
- IRR Experiment (Test belief-driven mechanisms — financial reasons)

  (Link startups' fundraising data to experimental behaviors)

- Payment Game (Test taste-driven mechanisms — preference)

  Novel design to elicit non-pecuniary preference in a field setting

- A Complementary Survey



What I Do: Field Experiments in the US

Participants: 409 anonymous founders + 65 founders on Crunchbase (replication)

Experimental Setting: provide real investor recommendation services

Experimental Method

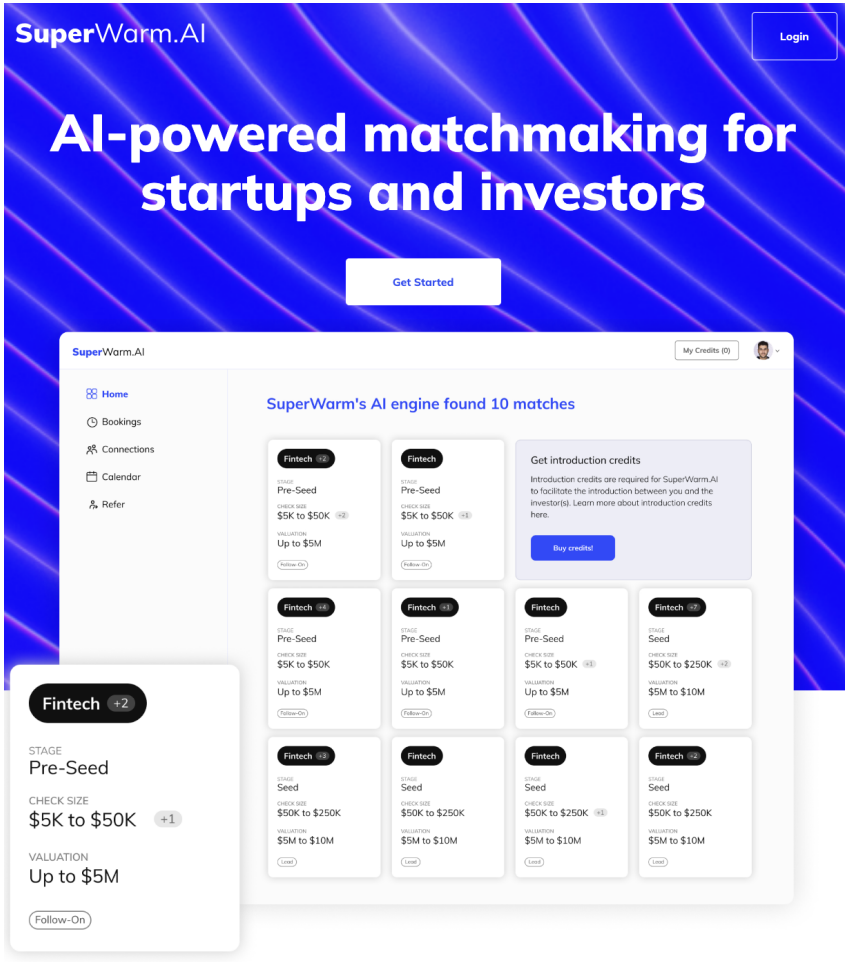
- IRR Experiment (Test belief-driven mechanisms — financial reasons)

  (Link startups' fundraising data to experimental behaviors)

- Payment Game (Test taste-driven mechanisms — preference)

  Novel design to elicit non-pecuniary preference in a field setting

- A Complementary Survey



What I Do: Field Experiments in the US

Participants: 409 anonymous founders + 65 founders on Crunchbase (replication)

Experimental Setting: provide real investor recommendation services

Experimental Method

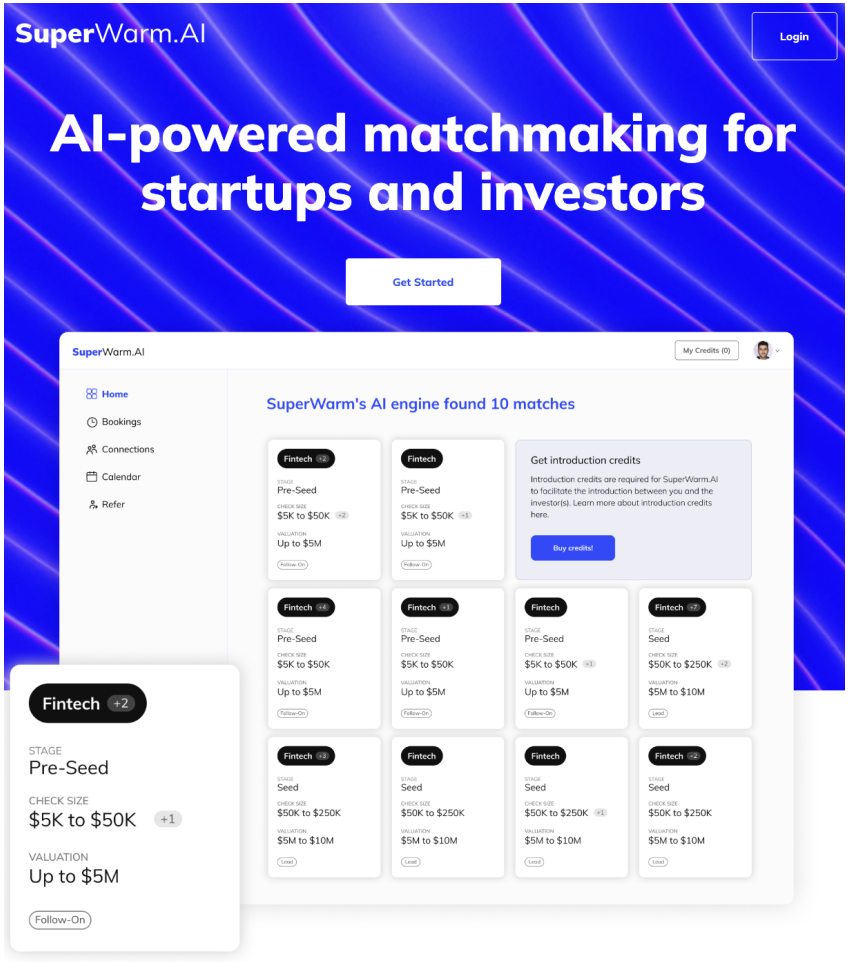
- IRR Experiment (Test belief-driven mechanisms — financial reasons)

  (Link startups' fundraising data to experimental behaviors)

- Payment Game (Test taste-driven mechanisms — preference)

  Novel design to elicit non-pecuniary preference in a field setting

- A Complementary Survey



What I Do: Field Experiments in the US

Participants: 409 anonymous founders + 65 founders on Crunchbase (replication)

Experimental Setting: provide real investor recommendation services

Experimental Method

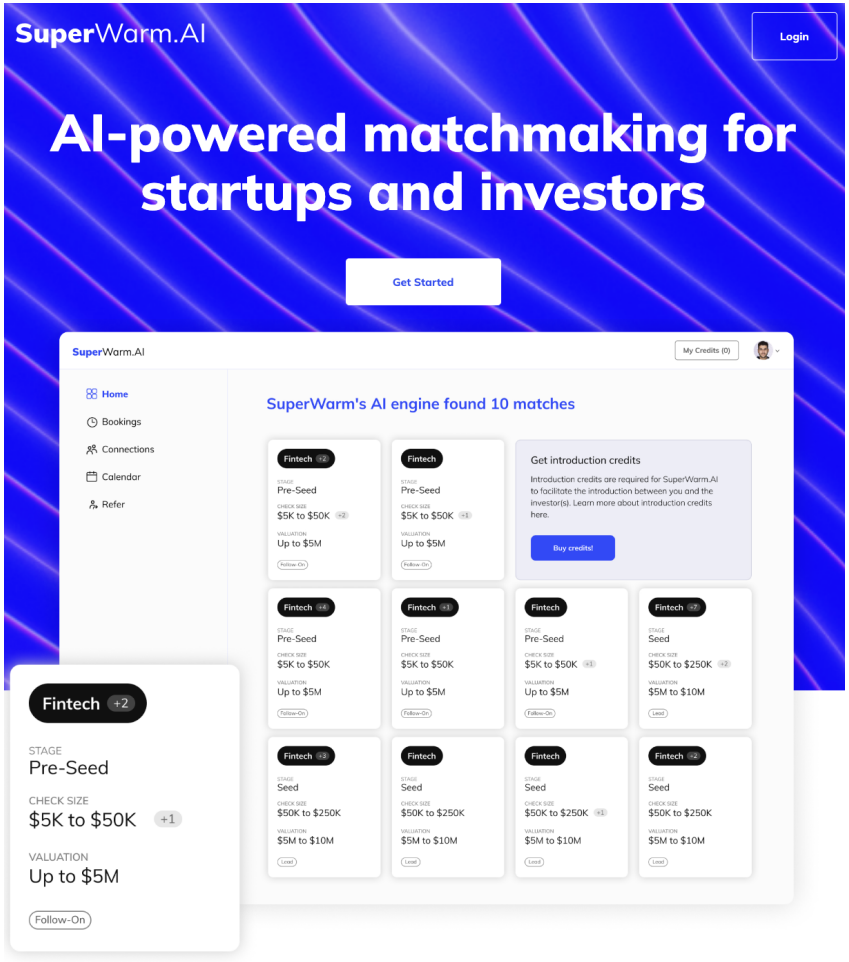
- IRR Experiment (Test belief-driven mechanisms — financial reasons)

  (Link startups' fundraising data to experimental behaviors)

- Payment Game (Test taste-driven mechanisms — preference)

  Novel design to elicit non-pecuniary preference in a field setting

- A Complementary Survey



What I Find: Startups Dislike Green Funding

Startups: a tension between profits and preference

- Dislike VCs focusing on environmental impact

  Financial reasons:

  - hurt profitability
  - less likely to secure funding

- Founders have positive non-pecuniary ESG preference
- (Substantial Heterogeneity)
  - ESG-based matching: ESG startups prefer ESG VCs
  - founders' political affiliations, startup size, industry backgrounds

What I Find: Startups Dislike Green Funding

Startups: a tension between profits and preference

- Dislike VCs focusing on environmental impact

  Financial reasons:

  - hurt profitability
  - less likely to secure funding

- Founders have positive non-pecuniary ESG preference
- (Substantial Heterogeneity)
  - ESG-based matching: ESG startups prefer ESG VCs
  - founders' political affiliations, startup size, industry backgrounds

What I Find: Startups Dislike Green Funding

Startups: a tension between profits and preference

- Dislike VCs focusing on environmental impact

  Financial reasons:

  - hurt profitability
  - less likely to secure funding

- Founders have positive non-pecuniary ESG preference
- (Substantial Heterogeneity)
  - ESG-based matching: ESG startups prefer ESG VCs
  - founders' political affiliations, startup size, industry backgrounds

What I Find: Startups Dislike Green Funding

Startups: a tension between profits and preference

- Dislike VCs focusing on environmental impact

  Financial reasons:

  - hurt profitability
  - less likely to secure funding

- Founders have positive non-pecuniary ESG preference

- (Substantial Heterogeneity)

  - ESG-based matching: ESG startups prefer ESG VCs
  - founders' political affiliations, startup size, industry backgrounds

What I Find: Startups Dislike Green Funding

Startups: a tension between profits and preference

- Dislike VCs focusing on environmental impact

  Financial reasons:

  - hurt profitability
  - less likely to secure funding

- Founders have positive non-pecuniary ESG preference
- (Substantial Heterogeneity)
  - ESG-based matching: ESG startups prefer ESG VCs
  - founders' political affiliations, startup size, industry backgrounds

Literature & Contribution

- **Empirical Contribution**

  Literature on impact investing in the private market — the firm side (**demand**)
  Kovner and Lerner (2015), Barber et al. (2021), Zhang (2021), etc

  Literature on sustainable finance theory — empirical micro-foundations for firms' ESG preferences Geelen, Hajda and Starmans (2022)

  Literature on ESG initiatives — E and S are different

  Lindsey, Pruitt and Schiller (2021), Hong and Liskovich (2015) , etc

  Literature on entrepreneurial finance — VCs' ESG matter
  Hsu (2004), Sørensen (2007), etc.

- **Methodological Contribution**

  Experimental literature on preference elicitation — a novel payment game

  a. complement IRR experiment (check whether subjects value incentives)

  b. elicit preference in the field setting

Outline

Theoretical Framework (Bayesian Model): Setup

Candidate: a VC with an observable type $g \in \{E, P\}$ and unobservable quality $q = \underbrace{\alpha}_{\text{VC's value-added}} + \underbrace{\beta}_{\text{VC's investment likelihood}} + \underbrace{\epsilon}_{\text{independent shock}}$, where $\epsilon \sim N(0, \frac{1}{\tau_\epsilon})$

Evaluator: observes a noisy signal $s = q + \eta$ of the VC's hidden quality, $\eta \sim N(0, \frac{1}{\tau_\eta})$

Belief Updating.

the founder's prior belief about quality: $q \sim N(\hat{\mu}_g, \frac{1}{\tau_q})$,

the founder's posterior belief about quality: $q|s \sim N(\frac{\tau_q \hat{\mu}_g + \tau_\eta s}{\tau_q + \tau_\eta}, \frac{1}{\tau_q + \tau_\eta})$.

Theoretical Framework (Bayesian Model): Setup

Candidate: a VC with an observable type $g \in \{E, P\}$ and unobservable quality $q = \underbrace{\alpha}_{\text{VC's value-added}} + \underbrace{\beta}_{\text{VC's investment likelihood}} + \underbrace{\epsilon}_{\text{independent shock}}$, where $\epsilon \sim N(0, \frac{1}{\tau_\epsilon})$

Evaluator: observes a noisy signal $s = q + \eta$ of the VC's hidden quality, $\eta \sim N(0, \frac{1}{\tau_\eta})$

Belief Updating.

the founder's prior belief about quality: $q \sim N(\hat{\mu}_g, \frac{1}{\tau_q})$,

the founder's posterior belief about quality: $q|s \sim N(\frac{\tau_q \hat{\mu}_g + \tau_\eta s}{\tau_q + \tau_\eta}, \frac{1}{\tau_q + \tau_\eta})$.

Theoretical Framework (Bayesian Model): Setup

Candidate: a VC with an observable type $g \in \{E, P\}$ and unobservable quality $q = \underbrace{\alpha}_{\text{VC's value-added}} + \underbrace{\beta}_{\text{VC's investment likelihood}} + \underbrace{\epsilon}_{\text{independent shock}}$, where $\epsilon \sim N(0, \frac{1}{\tau_\epsilon})$

Evaluator: observes a noisy signal $s = q + \eta$ of the VC's hidden quality, $\eta \sim N(0, \frac{1}{\tau_\eta})$

Belief Updating.

the founder's prior belief about quality: $q \sim N(\hat{\mu}_g, \frac{1}{\tau_q})$,

the founder's posterior belief about quality: $q|s \sim N(\frac{\tau_q \hat{\mu}_g + \tau_\eta s}{\tau_q + \tau_\eta}, \frac{1}{\tau_q + \tau_\eta})$.

Theoretical Framework: Utility Maximization

Each startup founder chooses evaluation v to maximizes her expected payoff

$$v_i(s,g) \equiv \text{argmax}_{v \in R} \hat{E}_i[-(v - (\underbrace{q}_{\text{hidden quality}} - \underbrace{c_g^i}_{\text{taste parameter}}))^2 | s, g]. \quad (1)$$

$$v(s,g) = \hat{E}_i[q|s,g] - c_g^i = \frac{\tau_q \hat{\mu}_g + \tau_\eta s}{\tau_q + \tau_\eta} - c_g \quad (2)$$

Conditional on observing the same signal,

$$\underbrace{D_i(s)}_{\text{Demand for ESG \$}} \equiv v_i(s,P) - v_i(s,E) = (\frac{\tau_q}{\tau_q + \tau_\eta})(\hat{\mu}_P - \hat{\mu}_E) + c_E - c_P$$
$$= \underbrace{(\frac{\tau_q}{\tau_q + \tau_\eta})(\hat{\alpha}_P - \hat{\alpha}_E) + (\frac{\tau_q}{\tau_q + \tau_\eta})(\hat{\beta}_P - \hat{\beta}_E)}_{\text{Belief-driven Mechanisms}} + \underbrace{c_E - c_P}_{\text{Taste-driven Mechanisms}} . \quad (3)$$

The direction of demand for ESG funding ($D_i(s)$) is unclear — an empirical question

Theoretical Framework: Utility Maximization

Each startup founder chooses evaluation v to maximizes her expected payoff

$$v_i(s,g) \equiv \text{argmax}_{v \in R} \hat{E}_i[-(v - (\underbrace{q}_{\text{hidden quality}} - \underbrace{c_g^i}_{\text{taste parameter}}))^2 | s, g]. \quad (1)$$

$$v(s,g) = \hat{E}_i[q|s,g] - c_g^i = \frac{\tau_q \hat{\mu}_g + \tau_\eta s}{\tau_q + \tau_\eta} - c_g \quad (2)$$

Conditional on observing the same signal,

$$\begin{aligned} \underbrace{D_i(s)}_{\text{Demand for ESG \$}} &\equiv v_i(s,P) - v_i(s,E) = (\frac{\tau_q}{\tau_q + \tau_\eta})(\hat{\mu}_P - \hat{\mu}_E) + c_E - c_P \\ &= \underbrace{(\frac{\tau_q}{\tau_q + \tau_\eta})(\hat{\alpha}_P - \hat{\alpha}_E) + (\frac{\tau_q}{\tau_q + \tau_\eta})(\hat{\beta}_P - \hat{\beta}_E)}_{\text{Belief-driven Mechanisms}} + \underbrace{c_E - c_P}_{\text{Taste-driven Mechanisms}} . \end{aligned} \quad (3)$$

The direction of demand for ESG funding ($D_i(s)$) is unclear — an empirical question

Theoretical Framework: Utility Maximization

Each startup founder chooses evaluation v to maximizes her expected payoff

$$v_i(s,g) \equiv \text{argmax}_{v \in R} \hat{E}_i[-(v - (\underbrace{q}_{\text{hidden quality}} - \underbrace{c_g^i}_{\text{taste parameter}}))^2 | s, g]. \quad (1)$$

$$v(s,g) = \hat{E}_i[q|s,g] - c_g^i = \frac{\tau_q \hat{\mu}_g + \tau_\eta s}{\tau_q + \tau_\eta} - c_g \quad (2)$$

Conditional on observing the same signal,

$$\begin{aligned} \underbrace{D_i(s)}_{\text{Demand for ESG \$}} &\equiv v_i(s,P) - v_i(s,E) = (\frac{\tau_q}{\tau_q + \tau_\eta})(\hat{\mu}_P - \hat{\mu}_E) + c_E - c_P \\ &= \underbrace{(\frac{\tau_q}{\tau_q + \tau_\eta})(\hat{\alpha}_P - \hat{\alpha}_E) + (\frac{\tau_q}{\tau_q + \tau_\eta})(\hat{\beta}_P - \hat{\beta}_E)}_{\text{Belief-driven Mechanisms}} + \underbrace{c_E - c_P}_{\text{Taste-driven Mechanisms}} . \end{aligned} \quad (3)$$

The direction of demand for ESG funding ($D_i(s)$) is unclear — an empirical question

IRR Experiment Identifies Belief-driven Mechanisms

$$\underbrace{D_i(s)}_{\text{Demand for ESG \$}} = \underbrace{(\frac{\tau_q}{\tau_q+\tau_\eta})(\hat{\alpha}_P - \hat{\alpha}_E) + (\frac{\tau_q}{\tau_q+\tau_\eta})(\hat{\beta}_P - \hat{\beta}_E)}_{\text{Belief-driven Mechanisms}} + \underbrace{c_E - c_P}_{\text{Taste-driven Mechanisms}} .$$

- The IRR experiment observes $(\frac{\tau_q}{\tau_q+\tau_\eta})(\hat{\alpha}_P - \hat{\alpha}_E)$ and $(\frac{\tau_q}{\tau_q+\tau_\eta})(\hat{\beta}_P - \hat{\beta}_E)$
- The existence of belief-driven mechanisms predicts a distributional effect. Differential ratings between E and P mainly affect among low-quality VCs.

IRR Experiment Identifies Belief-driven Mechanisms

$$\underbrace{D_i(s)}_{\text{Demand for ESG \$}} = \underbrace{(\frac{\tau_q}{\tau_q+\tau_\eta})(\hat{\alpha}_P - \hat{\alpha}_E) + (\frac{\tau_q}{\tau_q+\tau_\eta})(\hat{\beta}_P - \hat{\beta}_E)}_{\text{Belief-driven Mechanisms}} + \underbrace{c_E - c_P}_{\text{Taste-driven Mechanisms}} .$$

- The IRR experiment observes $(\frac{\tau_q}{\tau_q+\tau_\eta})(\hat{\alpha}_P - \hat{\alpha}_E)$ and $(\frac{\tau_q}{\tau_q+\tau_\eta})(\hat{\beta}_P - \hat{\beta}_E)$
- The existence of belief-driven mechanisms predicts a distributional effect.

  Differential ratings between E and P mainly affect among low-quality VCs.

Payment Game Identifies Taste-driven Mechanisms

$$\underbrace{D_i(s)}_{\text{Demand for ESG \$}} = \underbrace{\left(\frac{\tau_q}{\tau_q+\tau_\eta}\right)(\hat{\alpha}_P - \hat{\alpha}_E) + \left(\frac{\tau_q}{\tau_q+\tau_\eta}\right)(\hat{\beta}_P - \hat{\beta}_E)}_{\text{Belief-driven Mechanisms}} + \underbrace{c_E - c_P}_{\text{Taste-driven Mechanisms}} .$$

- In the payment game, $\hat{\alpha}_P - \hat{\alpha}_E = 0$ and $\hat{\beta}_P - \hat{\beta}_E = 0$, then $D_i(s) = c_E - c_P$
- If the payment game does not completely freeze the belief-driven mechanisms

  $D_i(s) < 0, \hat{\alpha}_P - \hat{\alpha}_E > 0, \hat{\beta}_P - \hat{\beta}_E > 0 \implies c_E - c_P < 0$ (prefer ESG)

Payment Game Identifies Taste-driven Mechanisms

$$\underbrace{D_i(s)}_{\text{Demand for ESG \$}} = \underbrace{\left(\frac{\tau_q}{\tau_q+\tau_\eta}\right)(\hat{\alpha}_P - \hat{\alpha}_E) + \left(\frac{\tau_q}{\tau_q+\tau_\eta}\right)(\hat{\beta}_P - \hat{\beta}_E)}_{\text{Belief-driven Mechanisms}} + \underbrace{c_E - c_P}_{\text{Taste-driven Mechanisms}} .$$

- In the payment game, $\hat{\alpha}_P - \hat{\alpha}_E = 0$ and $\hat{\beta}_P - \hat{\beta}_E = 0$, then $D_i(s) = c_E - c_P$
- If the payment game does not completely freeze the belief-driven mechanisms

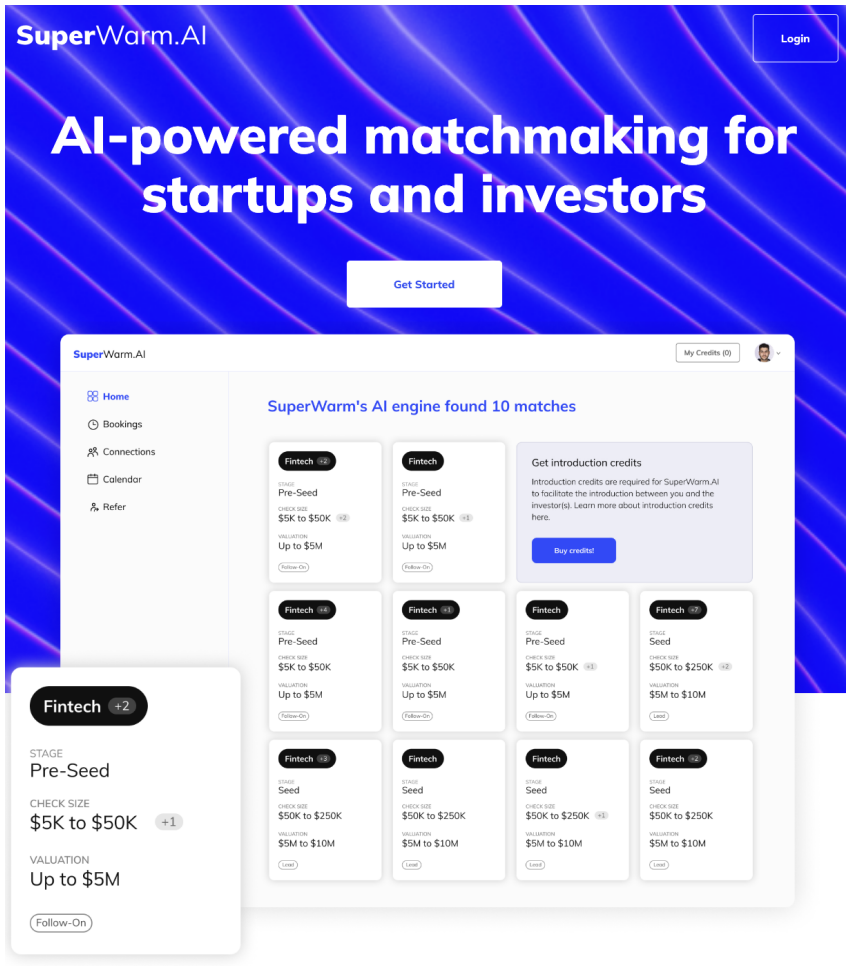
  $D_i(s) < 0, \hat{\alpha}_P - \hat{\alpha}_E > 0, \hat{\beta}_P - \hat{\beta}_E > 0 \implies c_E - c_P < 0$ (prefer ESG)

Roadmap

Experimental Design (Part I): IRR Experiment

(Design) evaluate 20 randomized VC profiles (exogenous) to obtain real matched VCs' information (incentive)

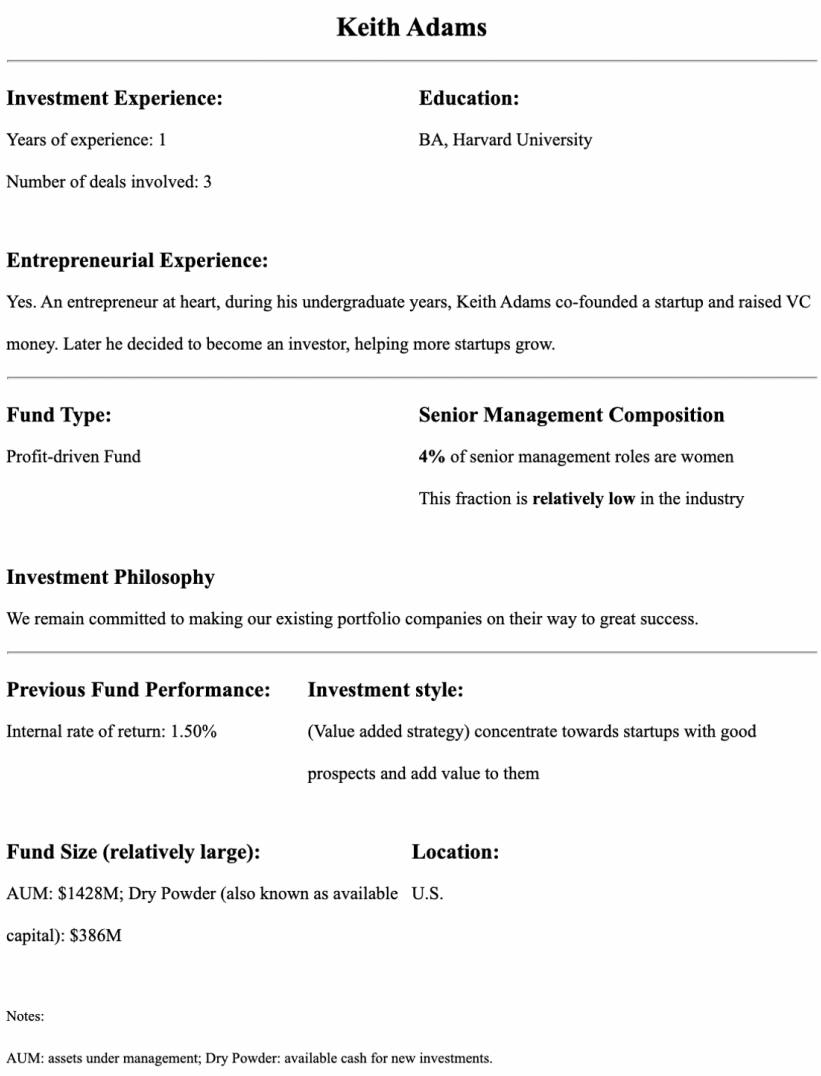
(Real-world Setting): personalized real VC recommendation services



Experimental Design (Part I): IRR Experiment

VC characteristics are orthogonally randomized.

(Real-world Setting): personalized real VC recommendation services



Keith Adams

Investment Experience:

Years of experience: 1

Number of deals involved: 3

Education:

BA, Harvard University

Entrepreneurial Experience:

Yes. An entrepreneur at heart, during his undergraduate years, Keith Adams co-founded a startup and raised VC money. Later he decided to become an investor, helping more startups grow.

Fund Type:

Profit-driven Fund

Senior Management Composition

4% of senior management roles are women

This fraction is **relatively low** in the industry

Investment Philosophy

We remain committed to making our existing portfolio companies on their way to great success.

Previous Fund Performance:

Internal rate of return: 1.50%

Investment style:

(Value added strategy) concentrate towards startups with good prospects and add value to them

Fund Size (relatively large):

AUM: $1428M; Dry Powder (also known as available capital): $386M

Location:

U.S.

Notes:

AUM: assets under management; Dry Powder: available cash for new investments.

Experimental Design (Part I): IRR Experiment

VCs are randomly assigned to profit-driven VCs and ESG VCs (E, S, G, ESG) wording

Evaluation questions:

- **(Mechanism questions)**
  - (Profitability $\hat{\alpha}$) ability to improve startups' profitability
  - (Matching $\hat{\beta}$) the likelihood to receive VC funding
  - (Informativeness τ_η) informativeness of the VC profile
- **(Decision questions)**
  - (Contact) $D_i(s)$ the likelihood to contact the VC
  - Funding amount to be raised

Incentive Structure:

Standard "matching incentive" Kessler, Low and Sullivan (2019)

Experimental Design (Part I): IRR Experiment

VCs are randomly assigned to profit-driven VCs and ESG VCs (E, S, G, ESG) wording

Evaluation questions:

- **(Mechanism questions)**
  - (Profitability $\hat{\alpha}$) ability to improve startups' profitability
  - (Matching $\hat{\beta}$) the likelihood to receive VC funding
  - (Informativeness τ_η) informativeness of the VC profile
- **(Decision questions)**
  - (Contact) $D_i(s)$ the likelihood to contact the VC
  - Funding amount to be raised

Incentive Structure:

Standard "matching incentive" Kessler, Low and Sullivan (2019)

Experimental Design (Part I): IRR Experiment

VCs are randomly assigned to profit-driven VCs and ESG VCs (E, S, G, ESG) wording

Evaluation questions:

- **(Mechanism questions)**
  - (Profitability $\hat{\alpha}$) ability to improve startups' profitability
  - (Matching $\hat{\beta}$) the likelihood to receive VC funding
  - (Informativeness τ_η) informativeness of the VC profile
- **(Decision questions)**
  - (Contact) $D_i(s)$ the likelihood to contact the VC
  - Funding amount to be raised

Incentive Structure:

Standard "matching incentive" Kessler, Low and Sullivan (2019)

Roadmap

Experimental Design (Part II): Payment Game

Control Group: normal recommendation list

Treatment Group: conditional on the same matching quality, prefer to recommend ESG investors

Price of the service is orthogonally randomized (estimate WTP)

- an incentivized experiment

NANO-SEARCH FINANCING TOOL

Finding investors. Your Way

9. We will provide a lottery opportunity and randomly pick 2 participants as the lottery winners. The lottery winners have the following two options.

Option 1: receive $500

Option 2: receive ${e://Field/residue} and a full investor recommendation list containing 200 most matched venture capitalists' information. (To promote the social responsibility campaign in the entrepreneurial community, we would prefer to recommend impact investors conditional on the same matching quality based on your indicated beliefs.)

If you win the lottery, which option would you like to choose?

Note:
Your answers will not affect your chance of winning the lottery.

- ○ Option 1
- ○ Option 2

Result 1: Startups Dislike Environmental VCs, $D(s) > 0$

Less likely to contact VCs focusing on environmental impact

(i.e., $D(s) > 0$)

Belief-driven mechanisms

- profitability concern
- matching concern

Column (4): No evidence on preference against ESG

paid founders | Crunchbase founders

Dependent Variable	Q1 Profitability	Q2 Availability	Q4 Contact	Q4 Contact
	(1)	(2)	(3)	(4)
ESG Fund	-1.35*	-1.26*	-1.28	-0.31
	(0.74)	(0.76)	(0.80)	(0.37)
Environmental Fund	-3.17***	-3.40***	-3.47***	-0.69
	(0.94)	(0.90)	(0.98)	(0.46)
Social Fund	0.43	1.12	1.64*	0.70
	(0.82)	(0.79)	(0.89)	(0.49)
Governance Fund	-0.85	-0.70	-0.15	0.31
	(0.87)	(0.89)	(0.95)	(0.44)
Q1				0.35***
				(0.02)
Q2				0.42***
				(0.03)
Q5				0.27***
				(0.02)
Mean of Dep. Var.	62.63	58.98	59.90	59.90
Subject FE	Yes	Yes	Yes	Yes
Observations	8,180	8,180	8,180	8,180
R-squared	0.45	0.51	0.45	0.83

Result 1: Startups Dislike Environmental VCs, $D(s) > 0$

Less likely to contact VCs focusing on environmental impact

(i.e., $D(s) > 0$)

Belief-driven mechanisms

- profitability concern
- matching concern

Column (4): No evidence on preference against ESG

paid founders | Crunchbase founders

Dependent Variable	Q1 Profitability	Q2 Availability	Q4 Contact	Q4 Contact
	(1)	(2)	(3)	(4)
ESG Fund	-1.35*	-1.26*	-1.28	-0.31
	(0.74)	(0.76)	(0.80)	(0.37)
Environmental Fund	-3.17***	-3.40***	-3.47***	-0.69
	(0.94)	(0.90)	(0.98)	(0.46)
Social Fund	0.43	1.12	1.64*	0.70
	(0.82)	(0.79)	(0.89)	(0.49)
Governance Fund	-0.85	-0.70	-0.15	0.31
	(0.87)	(0.89)	(0.95)	(0.44)
Q1				0.35***
				(0.02)
Q2				0.42***
				(0.03)
Q5				0.27***
				(0.02)
Mean of Dep. Var.	62.63	58.98	59.90	59.90
Subject FE	Yes	Yes	Yes	Yes
Observations	8,180	8,180	8,180	8,180
R-squared	0.45	0.51	0.45	0.83

Result 2: Low-quality Environmental VCs Are More Affected

Consistent with belief-driven mechanisms, "distributional effect":

Q1: $(\frac{\tau_q}{\tau_q+\tau_\eta})(\hat{\alpha}_P - \hat{\alpha}_E)$

Q2: $(\frac{\tau_q}{\tau_q+\tau_\eta})(\hat{\beta}_P - \hat{\beta}_E)$

Method I: use other orthogonally randomized VC characteristics to measure VC quality ($\hat{Q}_4$)

Similar results exist among Crunchbase founders

Dependent Variable	Q1 Profitability	Q2 Availability	Q5 Informativeness	Q4 Contact
	(1)	(2)	(4)	(3)
Panel A: High-quality Investors (i.e., $\hat{Q}_4 > 50$)				
ESG Fund	-0.25	0.23	0.24	0.16
	(0.63)	(0.63)	(0.54)	(0.65)
Environmental Fund	-0.78	-0.71	0.21	-1.33
	(0.83)	(0.83)	(0.63)	(0.86)
Social Fund	0.42	1.80**	1.51**	1.84**
	(0.80)	(0.75)	(0.61)	(0.72)
Governance Fund	1.17	1.14	1.09	1.60*
	(0.75)	(0.81)	(0.66)	(0.82)
Mean of Dep. Var.	73.08	70.41	75.51	74.10
Subject FE	Yes	Yes	Yes	Yes
R-squared	0.39	0.43	0.47	0.33
Panel B: Low-quality Investors (i.e., $\hat{Q}_4 < 50$)				
ESG Fund	-2.10	-2.74**	0.40	-2.43*
	(1.33)	(1.35)	(1.09)	(1.31)
Environmental Fund	-5.71***	-6.26***	-2.57**	-4.76***
	(1.42)	(1.25)	(1.11)	(1.23)
Social Fund	-0.33	-0.62	0.50	0.32
	(1.55)	(1.52)	(1.28)	(1.60)
Governance Fund	-3.28*	-3.40**	0.99	-1.68
	(1.71)	(1.54)	(1.46)	(1.60)
Mean of Dep. Var.	40.30	34.54	48.75	29.54
Subject FE	Yes	Yes	Yes	Yes
R-squared	0.47	0.47	0.61	0.24

Result 2: Low-quality Environmental VCs Are More Affected

Consistent with belief-driven mechanisms, "distributional effect":

Q1: $(\frac{\tau_q}{\tau_q+\tau_\eta})(\hat{\alpha}_P - \hat{\alpha}_E)$

Q2: $(\frac{\tau_q}{\tau_q+\tau_\eta})(\hat{\beta}_P - \hat{\beta}_E)$

Method I: use other orthogonally randomized VC characteristics to measure VC quality ($\hat{Q}_4$)

Similar results exist among Crunchbase founders

Dependent Variable	Q1 Profitability (1)	Q2 Availability (2)	Q5 Informativeness (4)	Q4 Contact (3)
Panel A: High-quality Investors (i.e., $\hat{Q}_4 > 50$)				
ESG Fund	-0.25	0.23	0.24	0.16
	(0.63)	(0.63)	(0.54)	(0.65)
Environmental Fund	-0.78	-0.71	0.21	-1.33
	(0.83)	(0.83)	(0.63)	(0.86)
Social Fund	0.42	1.80**	1.51**	1.84**
	(0.80)	(0.75)	(0.61)	(0.72)
Governance Fund	1.17	1.14	1.09	1.60*
	(0.75)	(0.81)	(0.66)	(0.82)
Mean of Dep. Var.	73.08	70.41	75.51	74.10
Subject FE	Yes	Yes	Yes	Yes
R-squared	0.39	0.43	0.47	0.33
Panel B: Low-quality Investors (i.e., $\hat{Q}_4 < 50$)				
ESG Fund	-2.10	-2.74**	0.40	-2.43*
	(1.33)	(1.35)	(1.09)	(1.31)
Environmental Fund	-5.71***	-6.26***	-2.57**	-4.76***
	(1.42)	(1.25)	(1.11)	(1.23)
Social Fund	-0.33	-0.62	0.50	0.32
	(1.55)	(1.52)	(1.28)	(1.60)
Governance Fund	-3.28*	-3.40**	0.99	-1.68
	(1.71)	(1.54)	(1.46)	(1.60)
Mean of Dep. Var.	40.30	34.54	48.75	29.54
Subject FE	Yes	Yes	Yes	Yes
R-squared	0.47	0.47	0.61	0.24

Result 2: Low-quality Environmental VCs Are More Affected

Method II (Quantile Regressions): Aiming for E mainly hurts low-quality VCs

	Contact Interest Ratings (i.e., Q_4)									
	10th [1]	20th [2]	30th [3]	40th [4]	50th [5]	60th [6]	70th [7]	80th [8]	90th [9]	Mean [10]
ESG VC	-4.00**	-5.00**	-2.00*	-2.00	-1.00	-1.00	-0.00	-0.00	-1.00	-1.28
	(1.81)	(2.35)	(1.16)	(1.26)	(1.09)	(0.88)	(0.70)	(0.77)	(1.16)	(0.80)
Environmental VC	-6.00***	-8.00***	-7.00***	-4.00**	-4.00***	-2.00	-3.00***	-1.00	0.00	-3.47***
	(1.93)	(2.52)	(2.06)	(1.60)	(1.32)	(1.27)	(0.84)	(1.38)	(1.27)	(0.98)
Social VC	1.00	1.00	1.00	3.00**	4.00***	3.00***	2.00**	1.00	0.00	1.64*
	(2.26)	(4.03)	(1.49)	(1.48)	(1.21)	(1.00)	(0.80)	(0.86)	(1.27)	(0.89)
Governance VC	-2.00	-5.00*	-3.00	1.00	3.00**	1.00	1.00	2.00*	1.00	-0.15
	(1.90)	(2.84)	(1.97)	(1.75)	(1.18)	(0.91)	(0.92)	(1.16)	(1.16)	(0.95)
Mean of Dep. Var.	15	32	48	56	65	72	79	85	95	59.90
Observations	8,180	8,180	8,180	8,180	8,180	8,180	8,180	8,180	8,180	8,180

Results are similar when using profitability/quality ratings

Result 3: Founders Have Positive ESG Preferences

(Payment Game) when ESG and profit-driven VCs have similar matching quality, founders are more likely to pay for ESG VCs' information

WTP is positive, ranging from \$50 to \$77.

Similar results in the replication experiment

Dependent Variable:	1{Pay for Recommendation List}			
	OLS (1)	OLS (2)	Probit (3)	Probit (4)
Treatment1 (Gender)	0.07	0.07	0.19	0.19
	(0.06)	(0.06)	(0.15)	(0.15)
Treatment2 (ESG)	0.13**	0.13**	0.35**	0.35**
	(0.06)	(0.06)	(0.15)	(0.15)
Reliable Algorithm	0.01***	0.01***	0.01***	0.01***
	(0.00)	(0.00)	(0.00)	(0.00)
Control	No	Yes	No	Yes
Observations	409	409	409	409
R-squared	0.06	0.06	0.05	0.05

Result 4: Heterogeneous Effects

Substantial heterogeneous effects exist:

- **ESG-based matching:** Profit-driven (ESG) Founders prefer profit-driven (ESG) VCs.
- **Political views:** Republican founders are more against ESG compared to Democrats.
- **Size effect:** Smaller startups are more against E due to financial reasons.
- **Industry background:**

  (stronger preference for ESG) IT, CleanTech, and Education

  (less preference for ESG) Transportation & Logistics and Energy

▸ Tables

Conclusion: Startups' Lukewarm Response to Green Funding

Question: how do firms choose between ESG investors and profit-driven investors during fundraising? (Startup-VC context)

Identification: experiments with real US startup founders + a complemetary survey

Findings: startups face the tension between profits and preferences

- Reluctant to partner up with green VCs due to financial reasons (beliefs) (Dominant force)
- Have positive preference towards ESG investors (taste)
- Substantial heterogeneous effects
  - ESG-based matching
  - Political views, industry background, startup size

Conclusion: Startups' Lukewarm Response to Green Funding

Question: how do firms choose between ESG investors and profit-driven investors during fundraising? (Startup-VC context)

Identification: experiments with real US startup founders + a complemetary survey

Findings: startups face the tension between profits and preferences

- Reluctant to partner up with green VCs due to financial reasons (beliefs) (Dominant force)
- Have positive preference towards ESG investors (taste)
- Substantial heterogeneous effects
  - ESG-based matching
  - Political views, industry background, startup size

Conclusion: Startups' Lukewarm Response to Green Funding

Question: how do firms choose between ESG investors and profit-driven investors during fundraising? (Startup-VC context)

Identification: experiments with real US startup founders + a complemetary survey

Findings: startups face the tension between profits and preferences

- Reluctant to partner up with green VCs due to financial reasons (beliefs) (Dominant force)
- Have positive preference towards ESG investors (taste)
- Substantial heterogeneous effects
  - ESG-based matching
  - Political views, industry background, startup size

Conclusion: Startups' Lukewarm Response to Green Funding

Question: how do firms choose between ESG investors and profit-driven investors during fundraising? (Startup-VC context)

Identification: experiments with real US startup founders + a complemetary survey

Findings: startups face the tension between profits and preferences

- Reluctant to partner up with green VCs due to financial reasons (beliefs) (Dominant force)
- Have positive preference towards ESG investors (taste)
- Substantial heterogeneous effects
  - ESG-based matching
  - Political views, industry background, startup size

Acknowledgement

Experimental Design (Part I): Wording

- Profit-driven VCs

  (e.g., "We'll do everything we can to help you rapidly scale.")

- VCs focusing on both environmental and social impact

  (e.g., "As a pioneering impact investor, we are dedicated to generating lasting positive impact for communities and the environment")

- VCs focusing only on environmental impact
  (e.g., "We exist for more than returns and our mission is to develop the world's most environment friendly, sustainable, inclusive and mission-driven ecosystem.")

- VCs focusing only on social impact
  (i.e., "We are an impact investment firm. Our mission is to mobilize massive amounts of capital that will build a foundation of equity, inclusiveness, and cooperation for communities.")

- VCs focusing only on governance impact
  (i.e., "We are a fund manager, in support of driving capital to high growth companies with women leaders.")

back

Result 1: Stronger Results for "Paid Founders"

"Paid founders": decide to purchase the recommendation list

back

Dependent Variable	Q1 Profitability	Q2 Availability	Q4 Contact	Q4 Contact
	(1)	(2)	(3)	(4)
ESG Fund	-1.61	-2.31**	-1.84	-0.22
	(1.13)	(1.12	(1.14)	(0.48)
Environmental Fund	-3.46**	-4.83***	-4.65***	-1.10
	(1.45)	(1.40)	(1.51)	(0.70)
Social Fund	1.18	2.11*	3.89***	2.13***
	(1.34)	(1.22)	(1.34)	(0.68)
Governance Fund	-1.45	-0.78	-0.39	0.23
	(1.27)	(1.32	(1.40)	(0.65)
Q1				0.34***
				(0.03)
Q2				0.43***
				(0.04)
Q5				0.28***
				(0.03)
Mean of Dep. Var.	63.93	60.56	62.36	62.36
Subject FE	Yes	Yes	Yes	Yes
Observations	4,040	4,040	4,040	4,040
R-squared	0.37	0.42	0.39	0.83

Result 1: Stronger Results for "Crunchbase Founders"

"Crunchbase founders": their startups are listed on Crunchbase and their identity is observable

(recruited in the replication experiment)

back

Dependent Variable	Q1 Profitability	Q2 Availability	Q4 Contact	Q4 Contact
	(1)	(2)	(3)	(4)
ESG	-5.08*	-5.47*	-4.59	0.20
	(2.82)	(3.00)	(3.23)	(1.18)
Environment	-13.24***	-13.95***	-13.80***	-0.61
	(3.21)	(3.46)	(3.61)	(1.54)
Social	-10.35***	-11.61***	-12.11***	-1.28
	(2.99)	(2.98)	(3.35)	(1.31)
Governance	-12.05**	-14.26***	-15.14***	-2.02
	(3.62)	(3.46)	(3.60)	(1.48)
Q1				0.33***
				(0.05)
Q2				0.46***
				(0.06)
Q5				0.30***
				(0.05)
Mean of Dep. Var.	50.45	44.54	49.36	49.36
Subject FE	Yes	Yes	Yes	Yes
Observations	1300	1300	1300	1300
R-squared	0.46	0.48	0.50	0.85

Result 4 (Heterogeneous Effects): ESG-based Matching

Profit-driven (ESG) Founders prefer profit-driven (ESG) VCs.

Similar results exist among Crunchbase founders.

▸ Matching based on E and S ▸ back

Dependent Variable	Q1 Profitability	Q2 Availability	Q4 Contact	Q4 Contact
	(1)	(2)	(3)	(4)
ESG Fund	-4.46***	-5.10***	-4.63***	-0.44
	(1.46)	(1.45)	(1.46)	(0.59)
Environmental Fund	-6.72***	-8.02***	-8.08***	-1.25
	(1.73)	(1.61)	(1.75)	(0.82)
Social Fund	-0.93	-1.53	-0.38	0.76
	(1.52)	(1.41)	(1.60)	(0.81)
Governance Fund	-2.53	-2.54	-2.29	-0.10
	(1.59)	(1.57)	(1.72)	(0.75)
ESG Fund × ESG Startup	4.87***	6.02***	5.25***	0.20
	(1.65)	(1.67)	(1.72)	(0.74)
Environmental Fund × ESG Startup	5.56***	7.25***	7.22***	0.88
	(2.04)	(1.91)	(2.09)	(1.01)
Social Fund × ESG Startup	2.13	4.15**	3.17*	-0.08
	(1.79)	(1.69)	(1.92)	(1.02)
Governance Fund × ESG Startup	2.63	2.87	3.36	0.64
	(1.89)	(1.90)	(2.06)	(0.93)
Q1				0.35***
				(0.02)
Q2				0.42***
				(0.03)
Q5				0.27***
				(0.02)
Mean of Dep. Var.	62.63	58.98	59.90	59.90
Subject FE	Yes	Yes	Yes	Yes
Observations	8180	8180	8180	8180
R-squared	0.45	0.51	0.46	0.83

Result 4 (Heterogeneous Effects): Founders' Political Views

Republican founders are more against ESG compared to Democrats.

back

Dependent Variable	Q1 Profitability (1)	Q2 Availability (2)	Q4 Contact (3)	Q4 Contact (4)
ESG Fund	-3.22***	-2.97**	-2.92**	-0.24
	(1.14)	(1.17)	(1.27)	(0.56)
Environmental Fund	-4.92***	-4.61***	-5.53***	-1.43**
	(1.55)	(1.38)	(1.52)	(0.70)
Social Fund	0.60	1.98*	2.50*	1.08
	(1.25)	(1.18)	(1.31)	(0.73)
Governance Fund	-2.33*	-2.09	-1.82	-0.20
	(1.29)	(1.30)	(1.40)	(0.64)
ESG Fund	3.71**	3.40**	3.26**	-0.12
× Democratic	(1.46)	(1.50)	(1.59)	(0.72)
Environmental Fund	3.47*	2.40	4.10**	1.48
× Democratic	(1.88)	(1.79)	(1.95)	(0.94)
Social Fund	-0.35	-1.70	-1.72	-0.74
× Democratic	(1.63)	(1.59)	(1.78)	(0.99)
Governance Fund	2.95*	2.75	3.33*	1.01
× Democratic	(1.73)	(1.77)	(1.90)	(0.88)
Subject FE	Yes	Yes	Yes	Yes
Observations	8180	8180	8180	8180
R-squared	0.451	0.509	0.456	0.832

Result 4 (Heterogeneous Effects): Size Effect

"Size effect":

Smaller startups are more against E due to financial reasons.

back

Dependent Variable	Q1 Profitability (1)	Q2 Availability (2)	Q4 Contact (3)	Q4 Contact (4)
ESG Fund	-1.81**	-1.71*	-1.53	-0.21
	(0.92)	(0.94)	(0.99)	(0.43)
Environmental Fund	-3.88***	-4.16***	-4.16***	-0.88
	(1.16)	(1.10)	(1.21)	(0.57)
Social Fund	0.44	1.30	2.05*	0.97*
	(0.99)	(0.97)	(1.10)	(0.58)
Governance Fund	-1.43	-1.25	-0.70	0.19
	(1.05)	(1.09)	(1.18)	(0.53)
ESG Fund × Larger Startup	2.14*	2.09*	1.19	-0.46
	(1.16)	(1.22)	(1.34)	(0.81)
Environment Fund × Larger Startup	3.29**	3.53**	3.23**	0.87
	(1.58)	(1.54)	(1.63)	(0.84)
Social Fund × Larger Startup	-0.04	-0.80	-1.90	-1.26
	(1.53)	(1.46)	(1.53)	(1.08)
Governance Fund × Larger Startup	2.68	2.53	2.57	0.54
	(1.68)	(1.59)	(1.60)	(0.86)
Subject FE	Yes	Yes	Yes	Yes
Observations	8180	8180	8180	8180
R-squared	0.450	0.509	0.456	0.832

Result 4 (Heterogeneous Effects): Industry Background

Industries that prefer ESG:

IT; CleanTech; Education

Industries that prefer E:

IT; CleanTech; Finance

Industries that are against E:

Transportation & Logistics; Energy;

back

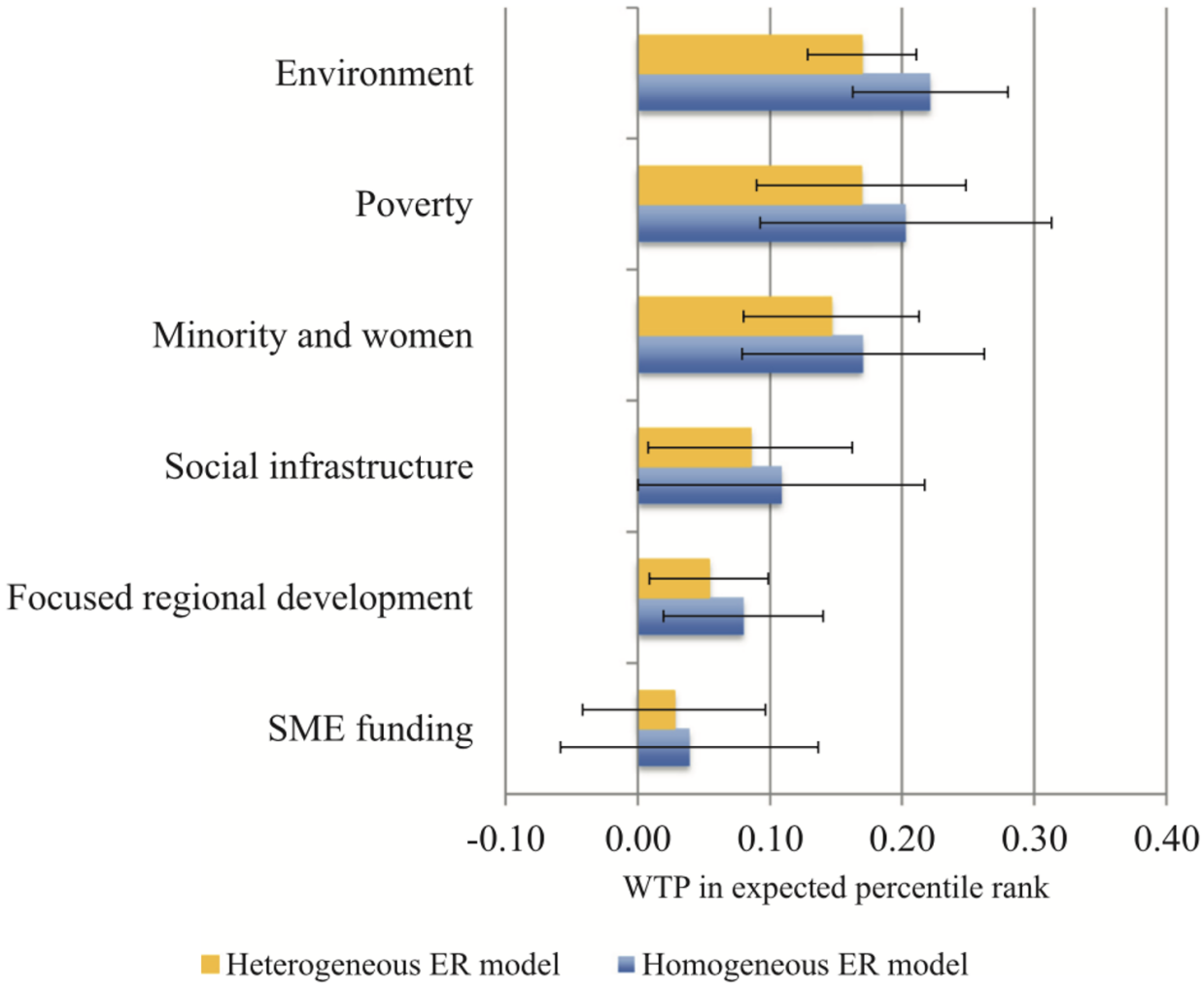
Rank	Industry	Coefficients of "ESG Funds"
1	Education	10.39
2	Clean Technology	4.47
3	Others	1.99
4	Life Sciences	0.97
...		
12	Transportation & Logistics	-4.5

Rank	Industry	Coefficients of "E Funds"
1	Clean Technology	2.72
2	Life Sciences	-0.31
3	Information Technology	-0.92
4	Finance	-2.66
...		
12	Transportation & Logistics	-10.28

Returns of S VCs Might Be Higher Than E VCs

Figure 2 in Barber, Morse, and Yasuda (2020)

back



Result 4: Matching based on E and S

Panel A: Decision Outcomes

Dependent Variable:	Contact Interest Ratings Q_4		Intended Fundraising Amount Q_3	
	E Startups	S Startups	E Startups	S Startups
	(1)	(2)	(3)	(4)
E Fund	1.78	-2.85**	1.02	-1.48
	(1.65)	(1.25)	(2.43)	(1.86)
S Fund	2.05	3.53***	0.60	2.10
	(1.60)	(1.15)	(1.94)	(1.59)
Subject FE	Yes	Yes	Yes	Yes
Observations	2,020	4,840	2,020	4,840
R-squared	0.48	0.44	0.68	0.61

Panel B: Mechanism Outcomes

Dependent Variable:	Profitability Ratings Q_1		Availability Ratings Q_2	
	E Startups	S Startups	E Startups	S Startups
	(1)	(2)	(3)	(4)
E Fund	0.15	-2.27*	1.20	-2.69**
	(1.70)	(1.15)	(1.60)	(1.12)
S Fund	0.80	1.94*	2.03	2.90***
	(1.39)	(1.01)	(1.34)	(1.02)
Subject FE	Yes	Yes	Yes	Yes
Observations	2,020	4,840	2,020	4,840
R-squared	0.50	0.44	0.56	0.49

back

Discussion: What Drives the "Profitability Concern"?

back

Venture capital funds that aim to generate positive environmental impact, address climate change, and tackle other environmental challenges are referred to as **"environmental VC funds"**.

In this part, you will compare solely profit-driven VC funds and environmental VC funds.

1. Compared to "profit-driven VC funds", would you prefer to collaborate with "environmental VC funds"?

Work with Profit-driven VC Funds — Indifferent — Work with Environmental VC Funds

0 10 20 30 40 50 60 70 80 90 100

Likelihood of Working with "Environmental VC Funds"

Compared with collaborating with "profit-driven VC funds", how would collaborating with "environmental VC funds" affect your startup's future profitability?

Decrease future profitability — Similar Effects on Profitability — Improve future profitability

0 10 20 30 40 50 60 70 80 90 100

How "Environmental Funds" Affect Profitability

2. Compared to the mandates imposed by "environmental VC funds", how costly are mandates imposed by "profit-driven VC funds" to your business?

Less Costly — Equally Costly — More Costly

0 10 20 30 40 50 60 70 80 90 100

Cost of "Profit-driven Funds'" Mandates

3. Compared to venture capitalists working in "profit-driven VC funds", how capable are venture capitalists working in "environmental VC funds" in supporting startups to achieve higher profitability? (please consider investors' expertise and networks when providing your evaluations.)

Less Capable — Equally Capable — More Capable

0 10 20 30 40 50 60 70 80 90 100

Ability of Investors in "Environmental Funds"

4. If a VC fund's website mentions, "We invest in breakthrough venture companies developing solutions addressing our global environmental challenges.", which of the following categories do you believe the VC fund mostly belongs to?

- The VC fund only aims for positive environmental impact
- The VC fund aims for both profits and positive environmental impact
- The VC fund only aims for profits as it might perceive startups that address environmental challenges are more profitable
- None of the above