What Motivates Innovative Entrepreneurs? Evidence from a Global Field Experiment

Jorge Guzman,[a] Jean Joohyun Oh,[a] Ananya Sen[b]

[a] Columbia University, New York, New York 10027; [b] Carnegie Mellon University, Pittsburgh, Pennsylvania 15217
Contact: jorge.guzman@columbia.edu, https://orcid.org/0000-0002-0826-8306 (JG); jean.oh@columbia.edu,
https://orcid.org/0000-0001-7071-8155 (JJO); ananyase@andrew.cmu.edu, https://orcid.org/0000-0002-9082-6871 (AS)

Abstract. Entrepreneurial motivation is important to the process of economic growth. However, evidence on the motivations of innovative entrepreneurs, and how those motivations differ across fundamental characteristics, remains scant. We conduct three interrelated field experiments with the Massachusetts Institute of Technology Inclusive Innovation Challenge to study how innovative entrepreneurs respond to messages of money and social impact and how this varies across gender and culture. We find consistent evidence that women and individuals located in more altruistic cultures are more motivated by social-impact messages than money, whereas men and those in less altruistic cultures are more motivated by money than social impact. The estimates are not driven by differences in the type of company, its size, or other observable characteristics, but, instead, appear to come from differences in the underlying motivations of innovative entrepreneurs themselves.

1. Introduction

Innovative entrepreneurs are central to the process of economic growth. They create companies that produce novel products and services, which, in turn, increase productivity and aggregate well-being.[1] However, there is limited evidence on what motivates innovative entrepreneurs to participate in this process. Although economic theory has almost solely focused on the profit motive (Schumpeter 1942, Romer 1990, Aghion and Howitt 1992), stories about the motives of successful entrepreneurs often focus instead on the importance of social impact.[2] In fact, the role of prosocial motivations in economic activity has been gaining increasing relevance in research (Cassar and Meier 2018) and in the media.[3] Moreover, there is also a recognition that there are ample differences in the salience of such motivations across fundamental dimensions, such as gender and culture (Croson and Gneezy 2009, Falk et al. 2018). What motivates innovative entrepreneurs? To what extent do prosocial and profit motivations matter? And how does their relative importance vary across gender and culture?

In this paper, we present large sample evidence from a set of three, preregistered, interrelated experiments to assess what motivates innovative entrepreneurs and how their motivations differ across gender and culture. Working with the Massachusetts

Institute of Technology Inclusive Innovation Challenge (MIT IIC)—a premier competition focused on helping innovative entrepreneurs—we perform randomized messaging experiments encouraging individuals to learn more or apply to the competition. The sample includes more than 14,000 entrepreneurs, pulled from the MIT IIC, AngelList, and Dunn and Bradstreet. We send each individual a randomly assigned social-impact message, money message, or neutral technology-focused message and interpret their response as evidence on the motivations of innovative entrepreneurs themselves. Following our preregistration, we focus particularly on relative differences across culture and gender. For all our outcomes, which range from privately clicking on emails or websites to learn more about the competition to submitting a detailed and time-costly application, our results document large and heterogeneous differences in the motivations of innovative entrepreneurs. We find that women and individuals located in more altruistic cultures are more motivated by social-impact messages than money, whereas men and those in less altruistic cultures are more motivated by money than social impact. These differential responses appear to mostly be driven by different responses to the social message, as there is little difference in responses to the money message and neutral technology message.

Together, these findings constitute novel insights into the motivations of innovative entrepreneurs and expand existing research in at least three directions.

First, by studying innovative entrepreneurs, we move beyond the self-employed, which has been the focus of the bulk of prior work on entrepreneurial motivations (Hamilton 2000, Hurst and Pugsley 2011). It is important to underline that innovative entrepreneurs represent only a small fraction of new firms (Schoar 2010, Guzman and Stern 2020), and entrepreneurial motivations vary by growth intentions (Cassar 2007). The psychological traits of innovative entrepreneurs also appear to be distinct from other groups (Kerr et al. 2019). Hence, it is questionable whether results from the self-employed translate directly to "growth-oriented" innovative entrepreneurs. This is, to the best of our knowledge, the first study to provide direct evidence on the motivations of innovative entrepreneurs who are pivotal to the growth process.

Second, we expand the set of entrepreneurial motivations under consideration by going beyond the profit motive. Even though there is a booming interest in the economics literature on the "nonpecuniary" incentives of work (such as the meaning of work (Cassar and Meier 2018)), the dominant paradigm of innovation and entrepreneurship continues to rely on a model of profit goals, leading to investment, innovation, and growth. One exception to this could be the literature on "social enterprises," where social impact has been documented as an important entrepreneurial motive (e.g., Dacin et al. 2011, Hockerts 2017, and Ganguli et al. 2018). Our results have implications for this literature by bringing in the role of gender and culture. We also contribute to this literature by expanding the role of social impact into the domain of innovative entrepreneurs, who are unique actors in the process of economic growth.

Third, our study also provides novel evidence on entrepreneurial motivations by focusing on (preregistered) fundamental dimensions of heterogeneity, namely, culture and gender.[4] Prior studies, in an effort to have a more homogeneous sample, have often focused on males residing in the United States (e.g., Hamilton 2000). Additionally, although one strand of the literature documents a "gender gap" in entrepreneurship (Ding et al. 2013, Brooks et al. 2014, Bapna and Ganco 2020, Kanze et al. 2018, Lee and Huang 2018, Guzman and Kacperczyk 2019, Howell and Nanda 2019, Ewens and Townsend 2020), this work often makes the implicit assumption that motivations themselves are not different across genders. This assumption has implications for both the theoretical and the econometric approach adopted. Our results provide nuance to these studies, expanding on the important role of culture and demographics in

entrepreneurship, which can have broad implications for policy and business strategy. Our results also complement previous studies by providing a better picture of how institutional constraints, messaging, identity, and motivations can lead to "missing entrepreneurs," who might slip through the cracks in the process of innovation.

Empirically, our results also join a growing set of studies using experiments to understand entrepreneurship (Camerer and Lovallo 1999, Astebro and Hoos 2016, Boudreau and Lakhani 2016, Bapna 2017, Lee and Huang 2018, Chatterji et al. 2019, Ganguli et al. 2018). One paper close to ours in this set is Ganguli et al. (2018), who study similar social and money messages across 431 "nascent social entrepreneurs"—those who have not paid any salaries or wages or have not had positive operating revenue in the past three months—in the United Kingdom. Whereas they focus on the main effects of different messages on firm outcomes, our study focuses on heterogeneous effects on a small set of preregistered outcomes with the goal of specifically capturing motivations, using a larger sample of more than 14,000 entrepreneurs connected to the innovation process. In areas of overlap, however, their results and ours are roughly consistent.

The remainder of the paper proceeds as follows. Section 2 describes our empirical setting, the MIT Inclusive Innovation Challenge. Section 3 provides details on the experimental design. Section 4 presents the results of our three experiments. Section 5 concludes.

2. Empirical Setting: The MIT Inclusive Innovation Challenge

The MIT Inclusive Innovation Challenge is a premier global competition run within MIT to help innovation-driven entrepreneurs who are using technology to generate economic opportunity. As Erik Brynjolfsson, the cofounder of the IIC put it, the IIC's motto is, "It's not what technology does to us, it's what we do with technology" (MIT IIC 2019a). Thus, the mission of the IIC is "to accelerate the success of the changemaking entrepreneurs." Since its launch in 2016, the IIC has generated much economic and social impact itself: The IIC's impact report states that IIC winners currently operate in 43 countries, so far generating $180 million in revenue and more than 6,800 jobs (MIT IIC 2019b). Screenshots of the IIC's mission statement and impact report are included in the online appendix (Figure A.1).

The global scale and diversity of the IIC makes it an attractive setting to study the motivations of entrepreneurs across culture and gender. In contrast to many other business-plan competitions across universities (including at MIT), the MIT IIC does not

focus on companies that are student- or alumni-led or affiliated with MIT in other ways. Rather, the IIC seeks to select early stage startups beyond the "idea phase" with an innovative component and the potential to grow, independent of any affiliation. The IIC also attracts its fair share of women entrepreneurs, in that 41% of IIC winners are startups with a woman leader or executive (MIT IIC 2019b). In addition, the IIC works with organizations across five continents to recruit innovative entrepreneurs from more than 150 countries to date, providing us an opportunity to observe a culturally diverse pool of innovative entrepreneurs.

The MIT IIC provides various types of support to its entrepreneurs, including feedback given by judges to all companies that submit an application, large cash prizes that winning companies can use to scale and grow (which total more than $1 million annually across all winners), and public recognition at regional and global events for those who win the challenge. To select the IIC winners, expert judges in each region evaluate applications to select 60 companies that will proceed to regional pitch events. Twenty regional winners are awarded at these events, who then proceed to the global pitch event, where four global winners are announced. Winners in recent years reflect the broad range of innovative entrepreneurship that the MIT IIC focuses on, from AdmitHub, which developed an artificial intelligence-based messaging tool to help students excel in college, to ftcash, an Indian venture empowering micromerchants through loans using digital payments.

Because finding innovative startups and encouraging them to apply is no easy task, the MIT IIC devotes substantial effort and resources to marketing and outreach, including a professional website, email marketing campaigns, and outreach events with local partners to encourage companies to apply. We engaged with the IIC in May 2018 and partnered with them for their 2019 competition (which began the following March), by supporting their outreach effort through email campaigns. Our study thus focuses on outreach activities in the time leading up to the MIT IIC application deadline.

The application process consists of two stages: a registration stage and an application stage. The registration stage asked interested individuals to perform the small task of registering for the MIT IIC by May 9th. This required creating a user account and filling out a short form, which we estimate takes about five minutes. The application stage then asked registrants to submit a full application. The application form was composed of 16 long-form questions that together amounted to a short business plan,[5] which formed the basis upon which applicants were evaluated in the first round. We estimate that this process of filling out the complete application form would

take at least two hours for most applicants. All the teams who had registered but not yet submitted an application had two more weeks after the registration deadline, till May 23rd, to do so.

3. Experimental Design

As described in our preregistration, our experiments sent entrepreneurs email messages encouraging them to apply to the MIT IIC. We emphasized one of three narratives in each of the randomized messages: the opportunity for social impact through the IIC (the social condition), the potential monetary benefits of participating in the IIC (the money condition), or simply the possibility of winning the competition, with an emphasis on technology and innovation (the neutral technology condition). We emailed them in three experiments using four distinct samples. We then assessed responses to each of these three messages across gender and culture. We interpret differences in the estimated rate of response as evidence of differences in the underlying motivations of entrepreneurs themselves.

Our main messages were the following in the email subject and body for each condition, with only slight variations otherwise:[6]

- Social condition
  – **Subject**: Create Greater Shared Prosperity. Register Today for the MIT IIC!
  – **Body**: …Win the opportunity to maximize the difference you are making in the world using tech for good!…
- Money condition
  – **Subject**: More than $1.6 Million in Prize Money. Register Today for the MIT IIC!
  – **Body**: …Win prize money and additional opportunities for funding!…
- Neutral Technology condition
  – **Subject**: Register Today for the MIT IIC!
  – **Body**: …Win by presenting your innovative tech solutions!…

3.1. Sample Selection and Randomization
3.1.1. Registration Email Experiment. Our first experiment (the "registration email experiment") pools together two lists of email addresses, the MIT IIC mailing list and a list of contacts purchased from Dunn and Bradstreet (D&B). The MIT IIC mailing list contains 9,156 contacts after initial cleaning to remove IIC affiliates, prior winners, and other nonentrepreneur groups. These contacts represent a reasonable set of potential applicants, who opted to receive updates on the competition. We appended to this list 3,633 contacts purchased from D&B that we considered mapped to our definition of innovative entrepreneurs. Specifically, building from Guzman and Stern (2020) on the idea that founding choices can represent

innovation and growth intent, we developed stringent criteria that we think capture reasonably well individuals who are leading young firms built around novel ideas that have the potential to increase economic productivity and well-being (i.e., innovative entrepreneurs). We included all contacts available in the D&B database that (1) were for-profit corporations (in the spirit of Guzman and Stern (2020)); (2) were founded between 2014 and 2019; (3) had between 2 and 50 employees; (4) had a yearly revenue of less than $2 million; (5) had a web address; and *either* of (6a) had as the contact the most senior member of the firm whose job title was either founder, president, chief executive officer (CEO), or chief operating officer (COO), and is in a "high-tech" industry—which are (i) manufacturing, (ii) information services, and (iii) professional, scientific, and technical services; *or* (6b) the contact has the title of chief technology officer (CTO) or chief information officer (CIO).[7] We admittedly used our discretion to determine these criteria, but we see several advantages to appending this D&B list to the MIT IIC contacts for our experiment. In particular, doing so provides us with more variation in geographic coverage (the MIT IIC list is much more international than D&B), increases the external validity of our estimates to allow for entrepreneurs that are not tied to the IIC, and increases statistical power of our analysis.

For each sample, we randomly assigned individuals to one of the three conditions—social, money, and neutral—using the complete randomization procedure. Table A.1, (a) and (b) in the online appendix show the summary statistics of pretreatment observables for the IIC and D&B sample, respectively, and the estimated *p*-values of two-sided *t*-tests between observations in each treatment arm. We present balance tests of each sample independently because the pretreatment observables available to us (and, hence, the variables on which we test for balance) were different. Table A.1(a) in the online appendix shows that the MIT IIC mailing list sample is balanced on the main pretreatment covariates available to us: gender, age, whether they are in the United States, whether they have clicked or opened a prior MIT IIC email, and whether they have previously applied or registered with the IIC. Each treatment group was approximately 33% female and 66% from the United States. Table A.1(b) in the online appendix shows that the D&B sample is also balanced on a number of pretreatment covariates: gender, altruism, job title of CTO or CIO, company revenue, number of employees, whether they are located in the biggest state in the sample (California), and major industries.[8]

3.1.2. Registration AngelList Experiment. Our second experiment (the "registration AngelList experiment") consists of AngelList newsletter recipients who clicked on the "Learn More" link. AngelList entrepreneurs represent the quintessential growth-oriented founders commonly studied in research, and there is a growing stream of studies using this sample for this reason (e.g., Bernstein et al. 2017 and Ewens and Townsend 2020). On May 2nd, AngelList emailed all subscribers its weekly newsletter, in which it included an announcement about the MIT IIC with a link we had provided to them (Figure A.3 in the online appendix). We configured a special server at the destination of the URL that randomly showed a version of the IIC website mimicking one of three messages we emailed. Once individuals clicked on any of the links on this landing page, they were directed to the main website and continued their visit as a normal IIC website visitor.[9] The newsletter resulted in 1,196 participants landing on our server. Table A.1(d) in the online appendix shows that the samples are balanced on observable measures, including location, days between receiving the email and clicking, and device used. Because of the nature of the data, we could not observe visitor gender.

3.1.3. Application Experiment. The final experiment (the "application experiment") occurred after the registration stage closed on May 9th, when registrants had two weeks to submit a full application. On May 10th, we sampled all individuals who had already registered but had not yet submitted an application.[10] We selected the 802 individuals that met two criteria. First, we required that the individuals did not overlap with our first experiment to avoid contamination across messages.[11] Second, to guarantee that our analysis would be able to solicit the motivations of actual entrepreneurs, we focused only on individuals who designated themselves as CEOs of their company in the registration form (which was asked explicitly). We used complete randomization to assign these subjects to one of the three treatment groups: social, money, or neutral. Table A.1(e) in the online appendix shows that the groups are well balanced with respect to pretreatment observables, including gender, altruism, the region in which they registered, the percentage of the application completed at the time of the first email, award category, for-profit versus nonprofit, number of female employees, and revenue. We sent three waves of emails with slightly varied messages encouraging registrants to apply, two to four days apart during the two weeks leading up to the application deadline.

3.2. Variable Definitions and Summary Statistics
3.2.1. Independent Variables. We defined *Female* as a binary variable equal to one if a subject's gender is female, and zero if male. We determined the gender of participants as predicted by the online marketing

tool or from their first name and country using an online API.

We measured culture by taking advantage of the recent work by Falk et al. (2018) that systematically measures global economic preferences along various dimensions across the world. The data included nationally representative samples from more than 70 countries that were asked survey questions that relate to economic preferences. We focused on the variable *Altruism*, which captures the prosocial preferences we seek to measure in our experiment. Altruism is measured by Falk et al. (2018) using two survey items related to donation decisions. On the suggestions of these authors, we aggregated this measure at the U.S. state level by using population weights in the disaggregated data, which provided us with U.S. variation.[12] For each participant, we matched this measure to their location based on their IP address (except for the D&B sample, for which company location was provided by D&B). We dropped a small number of participants in the altruism regressions whose location could not be identified.

3.2.2. Outcomes. Based on data availability and experiment design, we estimated entrepreneurs' interest in our messages through five outcome measures. In the registration email experiment, we used two outcome measures that capture revealed interest from responses to treatment messages, both directly in the email and on the website. *Total Clicks*, our preferred outcome, represents the total number of times a subject clicks on any of the links on the email or IIC website within the first 72 hours after sending the email. *Website Clicks* represents the total number of clicks on the website alone, within the first 72 hours. In the registration AngelList experiment, we only randomized among those that actually arrived at our website and, hence, focused on the time spent on the website as a measure of interest in the IIC. We defined two outcome variables. *Time Spent* (*first visit*) represents the duration of a subject's first visit to the website (in seconds), and *Time Spent* (*all visits*) is the sum of time spent across all visits within 72 hours of receiving the email. We collected data by tracking each visit on our server and on Google Analytics. Finally, in the application experiment, we measured whether a registrant actually applied to the MIT IIC. We defined *Has Applied* as a binary variable that equals one if a registrant has submitted their application by the application deadline of May 23rd, and zero otherwise. Table 1 presents the summary statistics of each of these variables.

4. Results
We now proceed to the centerpiece of our analysis: the differential effects of money and social messages in each of our experiments on motivating entrepreneurs' interest in the MIT Inclusive Innovation Challenge. We analyze each experiment in turn.

4.1. Registration Email Experiment
For our registration email experiment, we report the estimated coefficients of Poisson regressions on the count of clicks in Table 2. Columns (1) and (2) report differences in *Total Clicks*, which is our preferred outcome, whereas columns (3) and (4) report differences in *Website Clicks*. The excluded category is the social message. Finally, we clustered standard errors by country to account for the possibility of within-country correlation. Throughout the text, we often translate the coefficient to incidence rate ratio (IRR) for interpretability.

Column (1) reports the variation in *Total Clicks* for each treatment condition and gender. Our focus was the relative response of men or women to the money message, compared with social. We estimated a positive coefficient of 0.435 for *Money*, suggesting that men responded more to the money message by 54.5% with clicks compared with social messages on average ($p = 0.002$).[13] This effect went in the opposite direction when we considered women. The interaction of *Female* and *Money* has a coefficient of −0.812 that is highly statistically significant. This reflects a net response of −0.377 for women once the main effect is added ($p = 0.03$); that is, women responded with 31.4% *fewer* clicks to the money message compared with the social message. We saw the same qualitative effects across gender with the neutral message, albeit with slightly smaller effect sizes. The coefficient of 0.172 for *Neutral* implies that, for men, the incidence rate of total clicks increased by 18.7% in the neutral condition vis-á-vis the social ($p = 0.095$). For women, however, the rate of total clicks decreased by 24.9% ($p = 0.09$). We also display the aggregate effects in Figure 1 for ease of interpretation.

These estimates indicate striking differences in the responses of men and women to money and social messages, as revealed through their clicks. Women responded more to social messages and less to money messages, whereas men responded in the opposite way.[14] This difference between men and women appears to be most strongly driven by their different (and opposing) responses to the social message than to the money or neutral message. In particular, women did not seem to treat the money message significantly differently from the neutral condition (statistically and economically). Men seemed to slightly prefer money incentives over the neutral technology condition, but this effect is not statistically significant at conventional levels.

Column (2) reports differences in responses across culture, captured by our altruism measure, to the experimental conditions. The results show some interesting

Table 1. Summary Statistics

	(1)	(2)	(3)	(4)	(5)
Variables	Mean	Standard deviation	Minimum	Maximum	Observations
Independent variables					
Altruism	−0.043	0.341	−0.939	0.906	75
Female recipients (registration)	0.295	0.456	0	1	12,511
Female recipients (application)	0.249	0.432	0	1	802
Registration stage outcomes: Email experiment					
Number of website clicks	0.114	1.185	0	67	12,511
Number of email clicks	0.048	0.490	0	28	12,511
Registration stage outcomes: AngelList experiment					
Time spent (first visit)	70.778	137.51	0	828	1,196
Time spent (all visits)	558.46	3157.09	0	73188	1,196
Application stage outcomes					
Applications	0.379	0.485	0	1	802

parallels with the gender results. The coefficient for *Money* is positive and significant, with a value of 0.494 ($p = 0.001$), suggesting that our subjects, on average, responded more to the money message than the social message, but the interaction of *Altruism* and *Money* is negative and significant, with a coefficient

Table 2. Registration Round—Main Effects on Clicks

	(1)	(2)	(3)	(4)
Variables	Total clicks	Total clicks	Website clicks	Website clicks
Money	0.435***	0.494***	0.404*	0.389***
	(0.137)	(0.153)	(0.210)	(0.145)
Neutral	0.172*	0.117	0.109	−0.0571
	(0.103)	(0.159)	(0.144)	(0.183)
Female	0.342***		0.434***	
	(0.111)		(0.124)	
Female × Money	−0.812***		−0.855***	
	(0.224)		(0.321)	
Female × Neutral	−0.458**		−0.647***	
	(0.202)		(0.204)	
Altruism		0.764		0.631
		(0.786)		(0.823)
Altruism × Money		−2.190***		−2.452***
		(0.277)		(0.280)
Altruism × Neutral		−0.679		−0.586
		(0.812)		(1.062)
Observations	12,511	10,950	12,511	10,950
Estimated % difference in click rate (vs. Social)				
Female/high altruism: Money	−31.4%	−59.8%	−36.3%	−69.4%
Female/high altruism: Neutral	−24.9%	−27.3%	−41.6%	−35.1%
Men/low altruism: Money	54.5%	67.0%	49.7%	50.7%
Men/low altruism: Neutral	18.7%	13.1%	11.5%	−5.1%

Notes. Robust standard errors clustered by country are in parentheses. The empirical model is a quasi-maximum-likelihood Poisson model with the total number of clicks on email links and the IIC website in columns (1) and (2) and the number of IIC website clicks in columns (3) and (4). The unit of observation is the individual recipient. Controls include a dummy indicating whether the recipient was in the IIC or Dunn and Bradstreet list; whether the recipient was a registrant or applicant to the IIC in prior years; and the "member rating" assigned by the marketing tool based on prior activity. The reduction in observations in columns (2) and (4) is due to altruism values not being available in the Global Preferences Survey data set for a few countries. Estimated percent differences in total clicks show the Incidence Rate Ratio minus one. High and low altruism compare the 90th and 10th percentiles of the altruism measure. Magnitudes are computed with the social treatment as the base. The first two rows compute this for females in columns (1) and (3) and for high altruism in columns (2) and (4). The first row is a comparison of money versus social, while the second is for neutral versus social. The analogous calculations are made for males and low altruism in rows (3) and (4).

   *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

Figure 1. (Color online) Registration Stage Email Results
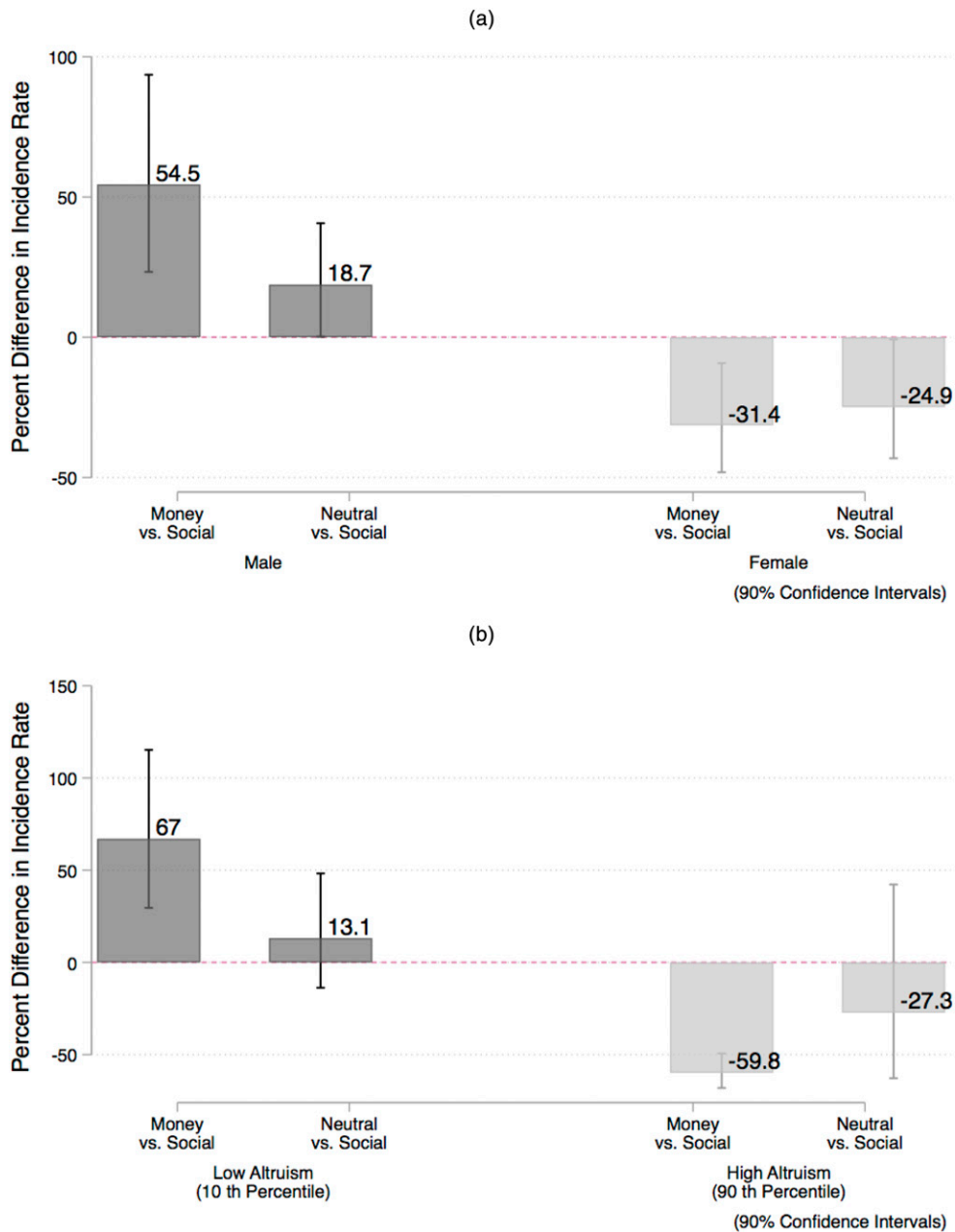
Notes. (a) Gender. Registration email: Response by gender. Percent difference in rate of total clicks. (b) Culture. Registration email: Response by altruism. Percent difference in rate of total clicks.

of −2.190 ($p < 0.001$). Interpreting this within our data suggests that a subject that moved from the 10th percentile of altruism to the 90th percentile of altruism moved from an estimated 67% higher relative risk of clicks to the money incentive (compared with the social message), to a 59.8% *lower* risk of clicks ($p = 0.001$ and $p < 0.001$, respectively). The pattern is similar with the neutral technology condition, though the estimates are less precise and are not significant at conventional levels. The coefficient for the interaction of *Altruism* and *Neutral* suggests that, on average, our subjects

were less likely to click on the neutral message the higher the level of altruism.[15]

The altruism results seem analogous to the gender estimates earlier. We find significant and systematic heterogeneity, where individuals in less altruistic countries responded to the money condition more than social, and those in more altruistic countries showed an opposite effect. Moreover, the differences appear to be driven by a differential response to the social condition across cultures. Overall, these estimates suggest that it is important to have a broader

conceptualization of the motivations of innovative entrepreneurs that focuses on other motivations beyond profit and that accounts for fundamental dimensions of heterogeneity such as gender and culture.

4.1.1. Robustness Tests and Validations. We now consider a few robustness and validation checks to ensure that our measures adequately capture both motivations and their heterogeneity. First, we asked whether clicks can actually be used as strong enough proxies for the motivations of entrepreneurs to engage in business activity. For instance, there might be a concern that the entrepreneurs' true motivation for social incentives could be short-lived, or that it could simply reflect other elements of their personal identity beyond being an entrepreneur. In Table 3, we carried out an exercise similar to Bapna and Ganco (2020) and considered whether total clicks and email clicks in our data actually predict registration.[16] To do so, we estimated Logit regressions with the dependent variable being a binary indicator of whether a participant has registered by the registration deadline and the independent variable the individual response in clicks on the email, the website, or both. Column (1) shows a coefficient of 0.201 for total clicks, implying that an additional click on either the email or website is associated with a 22% increase in the likelihood to register. Column (2) shows a similarly high coefficient for website clicks. An additional click on an email is correlated with a 25% higher likelihood of registering. Finally, column (3) shows the highly significant relationship between number of email clicks and registration with a similar magnitude. We interpret these results as strong evidence that individuals' responses to emails are reflective of their underlying entrepreneurial motivations.

Table 3. Registration Round—Do Clicks Matter? Correlations with Registration

Variables	(1) Registered after	(2) Registered after	(3) Registered after
Total clicks	0.201*** (0.0388)		
Website clicks		0.227*** (0.0619)	
Email clicks			0.222*** (0.0527)
Observations	12,511	12,511	12,511

Notes. Robust standard errors clustered by country are in parentheses. The empirical model is a Logit model with whether the individual entity registered after the email campaign as the dependent variable. The independent variables of interest are total clicks (sum of email link clicks and website clicks) in column (1), only the number of clicks on the IIC website in column (2), and only the number of email link clicks in column (3).

***p < 0.01.

Next, we considered the validity of our measure of altruism within its broader economic context. Given that altruism is measured at the regional level, one potential concern is that altruism is correlated with other regional characteristics such as economic conditions and institutional constraints, which, in turn, affect entrepreneurs' funding availability and needs. In Table A.2 in the online appendix, we investigated a number of country-level characteristics using data from the World Bank's World Development Indicators, such as gross domestic product (GDP) per capita, which would be a proxy for overall levels of development, and consider how they relate to our measure of altruism.[17] The estimates from bivariate ordinary least squares (OLS) regressions show that altruism is not correlated in a statistically or economically significant way with any of the World Bank measures we include: female education, log(GDP per capita), Gini coefficient, labor force participation, and log(health expenditure per capita).[18] Finally, in Table A.8 in the online appendix, we show how male and female entrepreneurs are not systematically different in their relevant observables across samples, which provides additional credibility to our findings.

4.2. Registration AngelList Experiment

We report the results of our registration AngelList experiment in Table 4. Columns (1) and (2) report differences in the response rate of individuals in our AngelList experiment. These regressions report OLS estimates of the time spent during the first visit (column (1)) and across all visits (column (2)). We focused on all visits as our preferred outcome, but highlight the fact that the main results are qualitatively the same across columns. Consistent with the results of our registration email experiment, we observed a positive coefficient for the money message, but a negative and significant coefficient for the interaction of money and altruism. On average, individuals who saw the money message stayed on the website 237 seconds longer across all visits than those who saw the social message. However, they spent 850 seconds less on the website for each point increase in the level of altruism. Considering the same range of values as in the registration email experiment (for comparability), an individual at the 10th percentile of altruism would stay 244 seconds more on the website in response to the money message (compared with the social message), whereas a person in the 90th percentile of altruism would remain 309 seconds *less* in the money condition than the social condition. We saw largely similar patterns for the neutral condition versus the social condition. Although there was no statistically significant difference at the 10th percentile of altruism ($p = 0.4$), an individual at the 90th percentile of altruism was expected to spend

Table 4. Main Estimates for AngelList Newsletter and Application Experiment

Variables	AngelList (1) Time spent (first visit)	AngelList (2) Time spent (all visits)	Application stage (3) Applied to IIC	Application stage (4) Applied to IIC
Money	12.56	236.9*	0.676***	0.278
	(11.27)	(132.1)	(0.259)	(0.199)
Neutral	7.621	−43.60	0.615***	0.312*
	(8.989)	(55.99)	(0.205)	(0.183)
Female			1.102***	
			(0.335)	
Female × Money			−0.954**	
			(0.467)	
Female × Neutral			−1.013***	
			(0.390)	
Altruism	40.29***	1,191***		1.003**
	(15.00)	(250.9)		(0.408)
Altruism × Money	−59.51**	−850.3**		−1.431**
	(29.12)	(325.5)		(0.576)
Altruism × Neutral	−62.75***	−1,017***		−0.684
	(23.40)	(207.1)		(0.516)
Observations	1,128	1,128	802	711
R^2	0.008	0.008	—	—
Estimated difference in outcome (vs. Social)				
Female/high altruism: Money	−25.6 seconds	−309 seconds	−24.3%	−47.3%
Female/high altruism: Neutral	−32.7 seconds	−696 seconds	−32.8%	−11.9%
Men/low altruism: Money	13.1 seconds	244 seconds	96.5%	33.7%
Men/low altruism: Neutral	8.2 seconds	−34.8 seconds	85.0%	37.5%

Notes. Robust standard errors clustered by country are in parentheses. The empirical model is a OLS model with the time spent (in seconds) in the first visit and total time spent (in seconds) in columns (1) and (2) as the dependent variable. We include date fixed effects in columns (1) and (2). The empirical model is a Logit model with whether the company has applied in columns (3) and (4). In columns (3) and (4), we control for which category they are registered in, whether they are for-profit, whether any employees are over age 60, whether they serve marginalized populations, and number of female employees (log). The unit of observation is the individual registrant. The difference in observations in columns (3) and (4) is due to altruism values not being available in the Global Preferences Survey data set for a few countries. For estimated differences, we compare high and low altruism using the 90th and 10th percentiles of the altruism measure from the registration round sample for comparability. Estimated percent differences in total clicks in columns (3) and (4) show the Incidence Rate Ratio minus one. Magnitudes are computed with the social treatment as the base. The first two rows compute this for females in column (3) and for high altruism in columns (1), (2), and (4). The first row is a comparison of money versus social, while the second is for neutral versus social. The analogous calculations are made for males and low altruism in rows (3) and (4).

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

696 seconds less on the website in the neutral condition compared with the social ($p = 0.001$).

These AngelList results replicate our baseline results with a highly relevant sample of entrepreneurs. We believe this consistency provides strong evidence of the validity of our results and, more generally, of the importance of heterogeneity in entrepreneurial motivations across cultures.

4.3. Application Experiment

Finally, we move to the application stage experiment. As mentioned before, we randomized our messages to companies who had incurred the low cost of registering but had yet to undertake the time-intensive task of filling out a lengthy application form and actually applying to the IIC. Columns (3) and (4) of Table 4 report the results. The regressions are Logit

models with control variables from our balance table as controls in the regression specification to improve precision of estimates.[19]

The results are remarkably similar to the registration experiments. Column (3) presents results for gender. The coefficient for money is positive and significant, with a value of 0.676, suggesting that men were 96.5% more likely to apply under the money condition than the social condition. However, the interaction of money and female is again negative and significant, with a coefficient value of −0.954. That is, whereas men had a stronger response to the money message, women were 24.3% *less* likely to respond to the money message compared with the social one. Once again, we see similar results when comparing the neutral message to the social: Men were 85% more likely to apply in the neutral message, whereas women were 32.8% *less* likely.

Column (4) reports the treatment effects across culture. We estimate a positive coefficient of 0.278 for the money message on average ($p = 0.16$) and a negative coefficient of -1.431 for the interaction of altruism and money ($p = 0.01$). These coefficients imply that an entrepreneur in the 10th percentile of altruism of our registration sample would be 33.7% more likely to apply to the IIC (if registered) with the *money* message, whereas an entrepreneur in the 90th percentile would be 47.3% more likely to do so with the *social* message. Comparing to the neutral message, subjects on average were 37% more likely to apply when they received the neutral message than the social message, and we saw the same change in the direction of the effect as we increased in altruism. The effect varies when we compare the 10th and 90th percentiles of altruism. Subjects in less altruistic countries were 37.5% more likely to apply with the neutral message than the social message, whereas those in more altruistic countries were 11.9% less likely to do so.[20]

These results are reassuring in that we find consistent evidence across all three experiments. There exist consistent differences by gender and altruism in entrepreneurs' responses across the three experiments, even as we move to high-cost activities and focus on the startup CEOs themselves. Furthermore, these results appear to be particularly driven by a differential response to the social condition. The motives of "high-growth" innovative entrepreneurs seem more nuanced and complex than existing theory allows.

4.4. Alternative Explanation

The randomization of the messaging, preregistration of our heterogeneous treatment effects, and consistent results across the three experiments provide us confidence in our estimates. However, we briefly discuss a potential alternative explanation of our results. One alternative explanation of the gender differences is that innovative entrepreneurs could be engaging in sense-making and behaving strategically. For example, women entrepreneurs might respond more to the social message because they want to signal their fit to the IIC, as opposed to following their "sincere" underlying motivations. Although strategic behavior is possible, it is unlikely to be driving our results, in part, due to the broad range of our experimental outcomes. Strategic incentives would be absent, in particular, during the registration stage, where clicking on the email and/or website is a spontaneous response and is carried out privately, as far as the subjects are concerned. Thus, consistent results between application and click behaviors lend support to underlying motivations driving the results, as opposed to strategic thinking. We also carry out (unreported) exploratory analysis to find that it is indeed the more socially motivated women entrepreneurs applying in

the social condition by the heterogeneity in our effects. We gauge "sincere" prosocial motivation by analyzing whether women from more altruistic regions respond more to the social message. Subsample analysis points in that direction qualitatively confirming our hypothesis, though the resulting small sample size lacks precision.

5. Conclusion

Entrepreneurial motivation is central to the process of economic growth. We performed three interrelated experiments with the MIT Inclusive Innovation Challenge to investigate what motivates innovative entrepreneurs to register and apply. Our results show large, systematically heterogeneous effects across our sample of entrepreneurs: Women and individuals located in more altruistic cultures are more motivated by social-impact messages than money, whereas men and those in less altruistic cultures are more motivated by money than social impact. These results highlight the importance of heterogeneous incentives in the choices of innovative entrepreneurs. A significant amount of research has studied the environmental characteristics that promote or hinder entrepreneurship, such as the institutions that protect the profit motive (e.g., patents) and the structural inequalities that preclude certain groups from engaging in innovation. But much less is known about the preferences and motivations of entrepreneurs themselves and their variation across demographics and culture. Our results provide an initial step toward investigating the role of different human motivations that impact the entrepreneurial process. How these motivations are created and shaped, as well as what can be done to influence them, is a central question for future research, with implications for generating greater shared prosperity.

Our findings could help partially explain disparities in entrepreneurship. Differing motivations could lead to inequities in what entrepreneurs pursue, how they pitch their commitment to their startup, and who is funded. For example, innovative entrepreneurs often pitch to investors like venture capitalists for funding. Given that most venture capitalists operate on the profit motive, women entrepreneurs' relative emphasis on prosocial motivations might hinder their likelihood of receiving funding.

From a policy perspective, our results also have implications for the design of interventions aimed at fostering innovative entrepreneurship. Interestingly, the heterogeneity we found might suggest an important trade-off in the design of entrepreneurship policies and programs: Seeking to connect fairly well across different groups might not motivate any group particularly well, whereas focusing on one particular approach to motivate entrepreneurship (e.g., money)

might systematically drive away some groups. We view the outcomes of tailored messages, as well as the trade-offs highlighted in such a process, as important topics for follow-on studies in our agenda.

Finally, from a managerial perspective, our results emphasize the important role of identity and individuality for developing strategic advantages at the early stages of the firm. Gans et al. (2017), for example, emphasize the importance of identity in allowing innovative entrepreneurs to find a defensible position from which to build their entrepreneurial strategies. Our work shows that motivations (and not only skills or experiences) constitute an important component of identity and, presumably, how entrepreneurial competitive advantage is shaped.

Endnotes
[1] Consistent with the literature, we consider a broad definition of innovators (e.g., spans much beyond "inventors"). However, only a small portion of entrepreneurship is, in fact, innovative and has the potential to significantly improve well-being and productivity. See Guzman and Stern (2020) for evidence on skewness in the innovative potential of startups and Catalini et al. (2019) for an in-depth discussion of the relative importance of innovative entrepreneurship in realized startup growth vis-á-vis other processes (e.g., random growth).

[2] For example, in his Harvard Commencement Address, Bill Gates emphasized how innovation and discoveries should be "applied to reduce inequity" (https://news.harvard.edu/gazette/story/2007/06/remarks-of-bill-gates-harvard-commencement-2007/).

[3] *The Economist* questions "what companies are for," pointing out how companies are now starting to acknowledge the need to incorporate wider social responsibilities as part of their mandate. See https://www.economist.com/briefing/2019/08/22/big-business-is-beginning-to-accept-broader-social-responsibilities.

[4] Empirical evidence also documents important differences in preferences across these dimensions in the general population. Croson

and Gneezy (2009) review a large number of experimental studies documenting that women have higher prosocial preferences, risk aversion, and inequality aversion. Similar variation exists across culture: Falk et al. (2018) report wide differences in economic preferences across culture, including time preference, risk preference, and altruism. We believe that such systematic differences would also manifest in the motivations of innovative entrepreneurs and, hence, choose to focus on them directly.

[5] The application questions covered the company's vision, strategy, impact, competitive advantage, risks, and others. All questions are available at https://www.mitinclusiveinnovation.com/the-challenge/#toc-application.

[6] Templates for all experiments are provided in the online appendix (Figures A.2–A.6). In the design of the emails, we particularly focused on emphasizing different incentives for applying to the IIC, while keeping constant any other characteristics, such as template design, general length, general information about the IIC, and links to the website for more information.

[7] In Table A.9 in the online appendix, we present a series of robustness tests relaxing criteria (1) to include partnerships and not-for-profits, and criteria (6a) to include all industries rather than only these "high-tech." We also present results using either criteria (6a) or (6b) separately as well as results using the IIC mailing list only. Our results remain unchanged.

[8] Table A.1(c) in the online appendix shows that the treatment groups are also well balanced in the extended D&B sample, which includes all industries, partnerships, and not-for-profits.

[9] Because of the nature of the online experiment, we could not randomize visitors ex ante.

[10] A total of 1,889 individuals registered by the registration deadline of May 9th, 2019. Reflecting the global nature of the competition, 662 of the registrants were in Africa, 382 in Asia, 208 in Europe, 332 in Latin America, and 305 in the United States or Canada.

[11] It is important to note that the IIC uses a variety of marketing approaches beyond our emails, offline and online. The majority of registrants came from these other channels, giving us a sizable sample nonoverlapping with our registration stage experiments.

[12] We thank Benjamin Enke for his guidance on this choice.

[13] The implied incidence rate ratio is 1.545, estimated as $exp \wedge (0.435) = 1.545$.

[14] This also shows on the extensive margin when we look at the probability of any click as opposed to the number of clicks. In Figure A.7 in the online appendix, we plot the raw probability of any clicks by gender across the money and social treatment to see a similar pattern. Moreover, in column (1) of Table A.7 in the online appendix, we find qualitatively similar results when we use the probability of clicking as the outcome variable in the regression.

[15] Again, we find qualitatively similar results when we use the probability of clicking as the outcome variable in column (2) of Table A.7 in the online appendix. As an additional check, we controlled for altruism in the gender regressions and for gender in the altruism regressions in Table A.5 in the online appendix. We find the results to be qualitatively and quantitatively similar to the baseline estimates described here.

[16] We were unable to address this concern directly due to registrations being sparse throughout our mailing lists. It is important to keep in mind that the MIT IIC has a large outreach program with regional partners across the world, well beyond the mailing lists to which we have access.

[17] We also present additional robustness checks in Table A.6 in the online appendix to show that all our results (across experiments) are robust to controlling for GDP per capita.

[18] We also use "(positive) reciprocity" as an alternative measure of culture to ensure robustness of our results in columns (3)–(8) of Table A.7 in the online appendix. Falk et al. (2018) use two measures to arrive at an estimate of reciprocity based on the willingness of individuals to return a favor. Although not a perfect proxy, this measure of "prosociality" in culture could be related to the sense of giving back to society. It has a correlation coefficient of 0.7 with the altruism measure. The results are qualitatively similar, while quantitatively slightly smaller relative to the altruism measure. This is in line with our logic of using the altruism measure, which might capture the culture of "creating shared prosperity" better.

[19] These variables include *Award Category*, which is a categorical variable that indicates which of the four categories a subject has registered; and *For-profit*, a binary variable that equals one if a registrant indicated her startup as a for-profit organization. We also control for the *Number of female employees* in a subject's organization, whether the company serves *marginalized populations*, and if they have any *employees above the age of 60*. For robustness, we tested the effect using Probit and OLS regressions, as well as alternative measures for determining whether the registrant is the CEO of the company. These results are reported in Tables A.3 and A.4 in the online appendix.

[20] Like in the previous analysis, we highlight how female and male CEOs were similar across many characteristics, as reported in Table A.8 in the online appendix.

References

Aghion P, Howitt P (1992) A model of growth through creative destruction. *Econometrica* 60(2):323–351.

Astebro TB, Hoos F (2016) The effects of a training program to encourage social entrepreneurship. HEC Paris Research Paper SPE-2016-1128, HEC Paris, Paris.

Bapna S (2017) Complementarity of signals in early-stage equity investment decisions: Evidence from a randomized field experiment. *Management Sci.* 65(2):933–952.

Bapna S, Ganco M (2020) Gender gaps in equity crowdfunding: Evidence from a randomized field experiment. Working paper, University of Minnesota, Minneapolis.

Bernstein S, Korteweg A, Laws K (2017) Attracting early-stage investors: Evidence from a randomized field experiment. *J. Finance* 72(2):509–538.

Boudreau KJ, Lakhani KR (2016) Innovation experiments: researching technical advance, knowledge production, and the design of supporting institutions. *Innovation Policy Econom.* 16(1):135–167.

Brooks AW, Huang L, Kearney SW, Murray FE (2014) Investors prefer entrepreneurial ventures pitched by attractive men. *Proc. Natl. Acad. Sci. USA* 111(12):4427–4431.

Camerer C, Lovallo D (1999) Overconfidence and excess entry: An experimental approach. *Amer. Econom. Rev.* 89(1):306–318.

Cassar G (2007) Money, money, money? A longitudinal investigation of entrepreneur career reasons, growth preferences and achieved growth. *Entrepreneurship Regional Development* 19(1):89–107.

Cassar L, Meier S (2018) Nonmonetary incentives and the implications of work as a source of meaning. *J. Econom. Perspect.* 32(3):215–238.

Catalini C, Guzman J, Stern S (2019) Passive vs. active growth: Evidence from founder choices and venture capital investment. Working paper, Massachusetts Institute of Technology, Cambridge.

Chatterji A, Delecourt S, Hasan S, Koning R (2019) When does advice impact startup performance? *Strategic Management J.* 40(3):331–356.

Croson R, Gneezy U (2009) Gender differences in preferences. *J. Econom. Literature* 47(2):448–474.

Dacin MT, Dacin PA, Tracey P (2011) Social entrepreneurship: A critique and future directions. *Organ. Sci.* 22:1203–1213.

Ding WW, Murray F, Stuart TE (2013) From bench to board: Gender differences in university scientists' participation in corporate scientific advisory boards. *Acad. Management J.* 56(5):1443–1464.

Ewens M, Townsend R (2020) Are early stage investors biased against women? *J. Financial Econom.* 135(3):653–677.

Falk A, Becker A, Dohmen T, Enke B, Huffman D, Sunde U (2018) Global evidence on economic preferences. *Quart. J. Econom.* 133(4):1645–1692.

Ganguli I, Le Coq C, Huysentruyt M (2018) Do nascent social entrepreneurs respond to rewards? A field experiment on motivations in a grant competition. Working paper, University of Massachusetts, Amherst, Amherst.

Gans J, Scott EL, Stern S (2017) Entrepreneurial strategy. Accessed May 6, 2020, https://www.entrepreneurial-strategy.net.

Guzman J, Kacperczyk AO (2019) Gender gap in entrepreneurship. *Res. Policy* 48(7):1666–1680.

Guzman J, Stern S (2020) The state of American entrepreneurship: New estimates of the quantity and quality of entrepreneurship for 32 U.S. States, 1988-2014. *Amer. Econom. J.: Econom. Policy.* Forthcoming.

Hamilton B (2000) Does entrepreneurship pay? An empirical analysis of the returns to self-employment. *J. Political Econom.* 108(3):604–631.

Hockerts K (2017) Determinants of social entrepreneurial intentions. *Entrepreneurship Theory Practice* 41(1):105–130.

Howell S, Nanda R (2019) Networking frictions in venture capital, and the gender gap in entrepreneurship. Harvard Business School Entrepreneurial Management Working Paper 19-105, Harvard Business School, Boston.

Hurst E, Pugsley BW (2011) What do small businesses do? NBER Working Paper No. 17041, National Bureau of Economic Research, Cambridge, MA.

Kanze D, Huang L, Conley MA, Higgins ET (2018) We ask men to win and women not to lose: Closing the gender gap in startup funding. *Acad. Management J.* 61(2):586–614.

Kerr SP, Kerr WR, Dalton M (2019) Risk attitudes and personality traits of entrepreneurs and venture team members. *Proc. Natl. Acad. Sci. USA* 116(36):17712–17716.

Lee M, Huang L (2018) Gender bias, social impact framing, and evaluation of entrepreneurial ventures. *Organ. Sci.* 29(1):1–16.

MIT IIC (2019a) 2019 MIT inclusive innovation challenge rewards entrepreneurs reinventing the future of work. Accessed November 11, 2019, https://www.youtube.com/watch?v=9YSHVDU8jNo.

MIT IIC (2019b) The MIT IIC 2019 impact report. Accessed November 11, 2019, https://www.mitinclusiveinnovation.com/wp-content/uploads/2019/10/MIT_IIC_2019_IMPACT_REPORT_Summit_edition_July_10_DIGITAL.pdf.

Romer PM (1990) Endogenous technological change. *J. Political Econom.* 98(5, Part 2):S71–S102.

Schoar A (2010) The divide between subsistence and transformational entrepreneurship. *Innovation Policy Econom.* 10(1):57–81.

Schumpeter JA (1942) *Capitalism, Socialism and Democracy* (Routledge, Abingdon, UK).