Research Policy 54 (2025) 105169

Contents lists available at ScienceDirect

Research Policy

journal homepage: www.elsevier.com/locate/respol

Gender diversity in academic entrepreneurship: Social impact motives and the NSF I-corps program☆

April Burrage [a], Nilanjana Dasgupta [b], Ina Ganguli [c,*]

[a] Department of Management Science and Engineering, Stanford University, United States of America
[b] Department of Psychological and Brain Sciences, University of Massachusetts Amherst, United States of America
[c] Departments of Economics & Management, University of Massachusetts Amherst, NBER and IZA, United States of America

ARTICLE INFO

Keywords:
Academic entrepreneurship
Commercialization
Gender
Innovation
Social impact
Motivation

ABSTRACT

This study examines gender differences in the social impact and commercial motives for academic entrepreneurship using the National Science Foundation's Innovation Corps (NSF I-Corps) program. I-Corps provides experiential entrepreneurship training to faculty and graduate student researchers at local I-Corps university sites and through a nationwide program. Since the inception of I-Corps, only 20 % of participants have been women. We first use survey data from one I-Corps university site to show that women had higher social entrepreneurial intentions compared to commercial entrepreneurial intentions, and their social entrepreneurial intentions were higher than men's. We then extend and generalize this finding by analyzing 1267 publicly available project summaries from the National I-Corps Program from 2011 to 2019. We find that women PIs' project proposals emphasized social impact significantly more than men, while projects for all PIs emphasized commercial impact to a similar degree. We next ran a field experiment to estimate the causal impact of social impact vs. commercial motives by experimentally manipulating the recruitment email messages inviting researchers to participate in the I-Corps training program. We find that women were more likely to show interest in a social impact version of a message compared to a commercial version, while men showed equal interest in both types of messages. Taken together, our results indicate that women are more interested in pursuing commercialization and entrepreneurship activities when they are tackling societal problems. They suggest that low-cost interventions that emphasize the social impact value of entrepreneurial opportunities may increase gender diversity in entrepreneurship activities.

1. Introduction

The commercialization activities of academic scientists have the potential to bring innovative and often life-changing products to consumers, with important implications for economic growth and societal well-being. To address the challenges facing society, there is a growing recognition that the participation of talented experts from diverse perspectives is essential. However, in various domains, there is a lack of diversity among individuals involved in scientific and technological innovation. Women and racial and ethnic minorities are underrepresented among entrepreneurs and inventors more broadly, but individuals from these groups with expertise in science, technology, engineering, and mathematics (STEM) research are also less likely to be involved in entrepreneurship and commercialization activities converting fundamental STEM research into products and services (Cook et al., 2022; Koffi and Marx, 2022; Abreu and Grinevich, 2017; Cook and Kongcharoen, 2010; Whittington and Smith-Doerr, 2008; Ding et al., 2006).

Increasing the participation of underrepresented groups in entrepreneurship and commercialization is particularly important in light of growing evidence that the demographic diversity of scientists and inventors influences the research topics they pursue and the resulting discoveries. This, in turn, helps fill knowledge gaps and address unmet needs. For example, higher rates of misdiagnosis of heart disease among

☆ We appreciate support from the University of Massachusetts I-Corps Site team, including Karen Utgoff, Kenneth Carter, Allison Koss, Sundar Krishnamurty, Michael Malone, Burnley Jaklevic, and Maryanne Laukaitis. This research was supported by NSF Award #1829219. This study was approved by the University of Massachusetts Amherst IRB (Protocol ID 2018-509).

* Corresponding author.
E-mail address: iganguli@econs.umass.edu (I. Ganguli).

https://doi.org/10.1016/j.respol.2024.105169
Received 2 August 2023; Received in revised form 20 December 2024; Accepted 20 December 2024
Available online 16 January 2025

women is correlated with inadequate research on women's health and relatively low numbers of women scientists compared to men engaged in biomedical research (Criado-Perez, 2019). Similarly, other studies have shown that inventors are more likely to create products relevant to and purchased by consumers similar to themselves (Einio et al., 2022; Burrage et al., 2024; Koning et al., 2021). Moreover, scientific teams that are gender-diverse produce more novel and highly cited research papers than single-gender teams (Yang et al., 2022), and increased gender diversity among venture capital firms' partners has been shown to improve venture capital fund performance (Gompers and Wang, 2017). Collectively, this evidence suggests that the underrepresentation of women and minorities in the innovation process leads to a loss of talent, negatively impacting societal welfare and economic growth (Hsieh et al., 2019; Einio et al., 2022).

While research on race and gender gaps in entrepreneurship and innovation has highlighted barriers that hinder broader participation, solution-focused research identifying potential remedies is surprisingly scarce (see Cook et al., 2022 for a discussion of interventions). In understanding how to diversify who participates in academic entrepreneurship, we turn to recent work that has expanded beyond traditional self-interest and extrinsic reward motivations for entrepreneurship to investigate the role of intrinsic social motivations in driving the choices of academic researchers (Cohen et al., 2020). Recent empirical evidence suggests that women entrepreneurs are more motivated by prosocial motives to pursue innovation activities (Guzman et al., 2020), but less is known about the role of these motives in academic scientists, whose research has the potential to become commercialized. Survey evidence from women researchers involved in innovation activities points to the importance of social impact and real-world applications of research as motivating factors (Muir et al., 2022). However, there is a lack of analysis on whether motivations for participating in innovation activities differ between men and women scientists and whether these differences have causal impacts on the likelihood of academic scientists pursuing commercialization opportunities.

In this paper, we investigate whether women academic researchers are more motivated by social impact and men by commercialization, and whether emphasizing the social impact of commercialization can increase the representation of women in these activities. For our setting, we draw on the National Science Foundation's Innovation Corps (NSF I-Corps) program to shed light on these questions. NSF I-Corps was launched in 2011 and is the United States' premier federally-funded program to help researchers at universities gain training in entrepreneurship to be able to "translate a promising idea from the laboratory to the marketplace". The program provides experiential entrepreneurship training to faculty and graduate student researchers at local I-Corps university sites and through a nationwide program. NSF I-Corps was developed and is taught by entrepreneurs, with influence from prominent figures such as Steve Blank, the founder of the Lean Startup business methodology. Since the inception of the I-Corps program, only 20 % of participants have been women (National Science Foundation, 2023). Prior research has documented gender differences in entrepreneurial intentions and entrepreneurial experience among I-Corps participants using nationwide survey data (Epstein et al., 2022). Results of this survey revealed that female I-Corps participants self-reported lower entrepreneurial intentions, technology commercialization readiness, and entrepreneurial experiences compared to male I-Corps participants. Female I-Corps participants also reported less positive social interactions with their teams compared to men, and the authors suggest a need for more equitable division of labor among teams for a better experience for female team members.

In this paper, we begin by examining gender differences in local and national I-Corps participant data to explore the extent to which these differences in entrepreneurial intentions and experiences may arise because women academic researchers are more motivated to pursue socially oriented entrepreneurial projects. First, we use new survey data from participants at one I-Corps university site to provide initial evidence that women in the sample exhibit higher social entrepreneurial intentions compared to commercial entrepreneurial intentions, and that these social entrepreneurial intentions are higher than those of men. We extend the general entrepreneurial intentions measures by drawing on the recent social entrepreneurship literature, which focuses on 'hybrid' entrepreneurs combining dual missions – social value creation combined with profits or commercial success (e.g. Mair and Marti, 2006). This literature has pointed to the role of intrinsic motives in determining who selects into social entrepreneurial activities (Ganguli et al., 2021).

Next, we extend and generalize this finding by analyzing project summaries of 1267 NSF grants funded by the nationwide I-Corps program from 2011 to 2019. We coded the degree to which social impact and commercial impact of each project was emphasized by the PIs in their publicly available project summaries. In this larger national dataset, we find that although all principal investigators (PIs) emphasized the commercial benefits of their projects more than the social benefits in their project summaries, women placed significantly greater emphasis on the social benefits compared to men. The gender difference in the social framing remained significant after accounting for academic discipline and PI age.

These patterns in the local survey data and national project data maybe due to other factors documented in the literature on gender differences in STEM fields and innovation and entrepreneurship activities, such as discrimination, individual preferences, or self-selection in the evaluation process (see discussions in e.g. Cook et al., 2022 and Ceci et al., 2014). For example, research shows that participants are aware that women-led projects have a better chance of being evaluated favorably if they fit stereotypical gender norms, whereby women are expected to engage in altruistic behavior (Lee and Huang, 2018) – which could also explain the gender differences we observe.

To address endogeneity concerns and identify the causal mechanism behind the observed gender differences in our local survey data and national project summaries, we next investigate whether social impact framing plays a causal role in attracting individuals, particularly women, to entrepreneurship activities. To do this, we ran a field experiment where we experimentally manipulated recruitment messages for the I-Corps training program at one I-Corps site at a large public research university. We sent researchers one of two versions of an email inviting them to participate in the I-Corps training program. Here, we intervened by randomly assigning half of the researchers to read a recruitment email message that framed the I-Corps program as an opportunity to use science to tackle a social challenge, while the other half were randomly assigned a message that framed the program as an opportunity to translate science into commercial or business ventures. We

find that women researchers were more likely to open email messages with the social impact version of the message in the subject heading than the business version, while men were equally likely to open both versions. These results indicate that social impact messages increase women's interest in entrepreneurial activities like I-Corps.

Taken together, our results suggest that women are more interested in pursuing science-based commercialization and entrepreneurship activities when they are framed as tackling a societal problem. Low-cost interventions like emphasizing entrepreneurial opportunities in terms of social impact are a promising avenue to boost gender diversity in innovation activities. More research is needed to understand the generalizability of these findings across a range of settings and types of participants in order to tailor them to most effectively match women's goals and interests. In the remainder of the paper, we first describe the I-Corps program in more detail, then we describe the data and methods used for each of the three types of datasets, followed by a discussion of the results and the conclusion.

2. Background: The National Science Foundation's Innovation Corps (NSF I-Corps)

The National Science Foundation's Innovation Corps (NSF I-Corps), established in 2011 offers entrepreneurial training to academic researchers, assisting them in evolving basic research into "deep technology ventures" (DTVs). This program aims to facilitate the transition of research from the lab to the marketplace by assessing the commercial viability of their technologies.

The I-Corps initiative currently includes two main components: hubs and teams. I-Corps Hubs are a regional network of universities, NSF-funded researchers, entrepreneurs, and regional partners designed to build and develop innovation networks. I-Corps Hubs are the operational foundation of the National Innovation Network. Within the I-Corps Hubs, the participating universities are known as I-Corps Sites. I-Corps Sites are individual universities providing internal support to scientists and engineers for entrepreneurial training, preparing them for the marketplace. I-Corps Teams are small groups of NSF-funded researchers or groups that participate in a regional I-Corps program, engaging in entrepreneurial training with a focus on the Lean Methods and customer discovery to assess commercial viability and explore whether their research can meet industrial and societal needs (see Leatherbee and Katila, 2020). Each team comprises three members: a technical lead (faculty member or postdoctoral researcher), an entrepreneurial lead (graduate student or postdoctoral researcher), and an industry mentor. According to the I-Corps Teams selection criteria, three key components are considered: team composition, potential market impact, and time horizon to impact. The project must have commercial potential and clearly address a need in the marketplace. Teams are evaluated on their structure, customer discovery learning, commercialization vision, and commitment to the program.[1] Important for our analysis, we note that selection is based on commercial potential and not on the social impact potential.

I-Corps Hubs were established in 2020. Prior to the establishment of I-Corps Hubs, the program relied on I-Corps Nodes, which were regional consortia of universities responsible for delivering a standardized curriculum for the I-Corps training program to I-Corps university sites across their regions. Our analysis spans both the period of I-Corps Nodes and Hubs. However, our participant data comes from an I-Corps Site that operated during both phases. It is important to note that our I-Corps Site data and National I-Corps data does not include participants from other funding sources introduced by NSF solicitation 20–529, such as the Department of Defense (DOD).

After the successful completion of a regional I-Corps program at an I-Corps site, I-Corps teams are eligible to apply for a spot in the National I-Corps Program. Teams participating in the national program can receive up to $50,000 to support customer discovery and related expenses. Applicants must be affiliated with a higher education institution and have received an NSF-related research award within the five years prior to applying to the national I-Corps program, or must have completed a regional I-Corps program and obtained a letter of recommendation. National I-Corps teams undergo a rigorous seven-week entrepreneurial training program, involving a weekly entrepreneurial curriculum, workshops, and customer discovery for their proposed business or invention. Teams are expected to conduct interviews with at least 100 individuals within their target customer base and partners, sharing insights with cohort members in a collaborative learning environment. Upon completing the National I-Corps Teams entrepreneurial training program, teams with a Minimum Viable Product are encouraged to advance the commercialization process and seek additional funding support by continuing market research, exploring licensing and patenting opportunities, or applying for federal grants through programs like the Small Business Administration's Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs.

Research on impacts of I-Corps so far appears limited to one site and using observational approaches rather than a focus on causal impact of the program. This research suggests that I-Corps has a positive impact on research and commercialization outcomes at the university (see Schultz et al., 2022). The NSF reports that >5800 individuals have been trained and over 2500 teams have participated in I-Corps since the program's inception. Almost 1400 of these teams created startups, and these startups raised $3.16 billion in subsequent funding.[2]

Under the directive of the American Innovation and Competitiveness Act (AICA), the NSF I-Corps program is mandated to "continue to promote a strong innovation system by investing in and supporting female entrepreneurs through mentorship, education, and training because they are historically underrepresented in entrepreneurial fields" (Public Law 114–329, Section 601). To align with AICA's objectives, NSF I-Corps has implemented the "Entrepreneurial Workforce" metric, aspiring to mirror the demographic composition of the US population within its entrepreneurial community. Since its inception, the cumulative share of female participants in the I-Corps program is 20 % (National Science Foundation, 2023).

3. Data & methods

3.1. Local I-Corps site survey

We collected and analyzed survey data from seven cohorts of I-Corps participants at one large I-Corps university site (cohorts from Fall 2018, Fall 2019, Spring 2020, Fall 2020, Spring 2021, Fall 2021, Spring 2022).

[1] https://www.nsf.gov/pubs/2018/nsf18057/nsf18057.jsp

[2] NSF I-Corps Impact data, available at: https://new.nsf.gov/funding/initiatives/i-corps/impact-data

All I-Corps participants (faculty, graduate students, postdoctoral fellows, and STEM research staff) were asked to complete an intake survey prior to completing the I-Corps training. The survey asked questions related to participants' career goals, entrepreneurial intentions, prosocial motives, diversity and inclusion, and general product information. Our sample includes 104 survey responses from 33 women and 71 men. Appendix Table A1 shows summary statistics for entire the sample. The survey was voluntary and some chose not to complete the entire survey, leading to 52 respondents who completed the survey in its entirety (20 women and 32 men).

Here, we focus on measures collected in the survey of participants' entrepreneurial intentions, including general measures used in the entrepreneurship literature and social entrepreneurial intentions used in the social entrepreneurship literature (Hockerts, 2017). Entrepreneurial intentions measures are based on factors that shape an individual's decision to pursue entrepreneurship. Entrepreneurial intentions measure the effort, time, and capabilities to become an entrepreneur (Meoli et al., 2020). For our measure of general entrepreneurial intentions, respondents rated their level of agreement on four statements on 7-point Likert scales ranging from 1(strongly disagree) to 7(strongly agree). We used statements from (Liñán and Chen, 2009):

"I am ready to do anything to be an entrepreneur"

"I will make every effort to start my own firm"

"I am determined to create a firm in the future"

"I have very seriously thought of starting a firm"

We also draw on validated approaches to measure social entrepreneurial intentions (SEI) described in Hockerts (2017), drawing on Mair and Noboa's (2006) framework of the antecedents to social entrepreneurial intentions. Respondents rated their level of agreement with four statements that assess their aspirations to pursue socially-oriented entrepreneurship, where scales again ranged from 1(strongly disagree) to 7 (strongly agree):

"It is important to me to have the opportunity to use my abilities to reach others"

"I expect that at some point in the future I will be involved in launching an organization that aims to solve social problems"

"I have a preliminary idea for a social enterprise on which I plan to act in the future"

"It is important to me for my product/service to reach a diverse customer base".

We compared gender differences in participants' responses to individual items as well as combined indices of items that were internally consistent and captured a common construct using Cronbach's alpha. For each individual item, we included in the analysis only individuals who completed the question, and for the indices, we only included respondents who completed the entire survey. Given the small sample size, this analysis is intended to provide preliminary motivating evidence about differences in the social vs. commercial motivations of men and women I-Corps participants, before turning to the larger datasets in the remainder of the paper.

3.2. Project descriptions from the national I-Corps team program

For the national data, we use publicly available information from 1267 NSF I-Corps projects funded nationwide from 2011 to 2019. The project includes the name of the Principal Investigator (PI) of each project and a project summary (abstract) of their funded grant. Our goal was to code the degree to which social impact and commercial impact of each project was emphasized in the project summaries and compare whether women and men PIs' projects showed systematic differences in how they then framed their I-Corps projects.

Four coders read 1267 NSF I-Corps funded abstracts (blind to the name of the PI). First, they assigned each project a social impact rating and a commercial impact rating on a 3-point scale anchored by low (1), medium (2), and high (3). Each abstract was evaluated by two coders who provided good interrater reliability ($\alpha = 0.749$ for social framing and $\alpha = 0.705$ for commercial framing). Any discrepancies between the two coders were resolved by the first author. Second, the coders identified phrases from each project summary that captured the project's social impact goals and commercial goals. These phrases were aggregated to create a count of the number of times social impact and commercial impact were mentioned.

Examples of social phrases include:

"animal and human health globally"

"have a large societal impact"

"decrease patient suffering"

"to improve the quality of the health-based recommendations"

Examples of business phrases include:

"low capital cost"

"target the cosmetic industry"

"Improve a restaurant operator's bottom line"

To assign the likely gender of each PI based on their name, we used the genderize.io prediction tool. This tool predicts the likely gender of a person based on their first name (Strømgren, 2015). The database for genderize.io consists of public profiles and gender data from major social network profiles. It provides the predicted gender "male" "female" or "none" with two confidence parameters, count and probability. Count indicates how many social network profiles in the database have the same first name as the target name. Probability gives the proportion of social media profiles with the same first name and predicted gender as the target name. The database processes 15,0000 to 20,0000 social network profiles per day (Wais, 2016). We used a Gender Prediction Threshold (GPT) of 85 %. In cases where the automated tool was unable to assign a gender or did not meet the probability GPT threshold, we assessed the PI's gender based on photographs from their university website (Belz et al., 2022; West et al., 2013). We find that 21 % of the PIs in our sample are women, which is very similar to the share reported by the NSF of 20 % for the cumulative share of female participants in the I-Corps program since its inception (National Science Foundation, 2023). Appendix Table A4 shows further summary statistics about the sample and our key variables.

We also collected information about each PI by doing manual web searches, usually based on faculty webpages, to identify their primary discipline based on their university department affiliation and their PhD year. We used the NSF Classification of Fields of Study table on broad fields of study to categorize each PI's department into one of these broad fields.[3]

For our analysis, we ran a series of ordinary least squares (OLS) regressions to estimate whether women PIs' NSF-funded I-Corps projects emphasized social motivations or commercial motivations compared to men PIs. The key outcomes in our regressions were (1) the social framing rating of the project summaries, (2) number of social phrases in those

[3] For more information, see the NSF Classification of Fields of Study on broad fields of study: https://ncsesdata.nsf.gov/sere/2018/html/sere18-dt-taba001.html.

summaries, (3) the commercial framing rating and (4) the number of commercial phrases. We also ran linear probability models with outcome variables being a high social frame score (social framing of 3) and high commercial frame score (business framing of 3). Our main coefficient of interest is on the female dummy variable, which indicates the extent to which women's projects are framed as social vs. commercial. We present the results after controlling for PI's discipline, department, career age (year of PhD), award year/cohort dummies (to control for year-to-year differences in composition), and abstract length (word count).

3.3. Email experiment at local I-Corps site

At the same local I-Corps site described earlier, we also conducted a randomized experiment systematically varying the content of recruitment messages to see whether framing the I-Corps program as either (1) an opportunity to use STEM to tackle a social problem or (2) the usual framing of the opportunity to translate STEM research into commercial ventures, would differentially attract women compared to men's interest. The commercial version of the email was the control condition, usually used in I-Corps materials. It emphasized turning an idea into a business and had the subject line "Learn to Translate Your Research to Create a Breakthrough Product."[4] The social version of the email emphasized social impact and had the subject line "Learn to Translate Your Research to Address a Societal Challenge."

We used emails of all graduate students, faculty and postdocs in all STEM-related departments (7921 graduate students and 1745 faculty members) and randomly assigned them to receive one of two message framings of the I-Corps program (social vs. commercial) after stratifying the sample by department, gender and, for faculty only, rank.[5] The email invited them to join a mailing list to receive more information about I-Corps and to complete an Expression of Interest (EOI) form requesting contact information and more details about their interest in the program. We distributed the emails for 3 cycles of the I-Corps program, which took place in November 2018, February 2019, and June 2019. Once an individual was randomly assigned to the social or business version of the email, they were always in that condition. Summary statistics for the full sample of individuals sent an email message are in Appendix Table A5 and balance for treatment and control groups is in Appendix Table A6.

We ran OLS regressions with measures of interest in the program as the dependent variable and whether someone was in the social vs. commercial condition as the main coefficient of interest. Our main dependent measures of interest were (a) whether participants opened the email,[6] (b) clicked on active links in the email, and (c) completed EOI. To test for gender differences, we tested the interaction between the social condition indicator variable and the female indicator variable.

4. Results

We first present results from the survey of seven I-Corps participant cohorts from one large I-Corps university site. Fig. 1 shows participants' average entrepreneurial intentions and social entrepreneurial intentions by participant gender. While the sample is small, comparing the averages by gender shows that women appear to express higher social entrepreneurial intentions compared to general entrepreneurial intentions. Men appear to express both types of entrepreneurial intentions to an equal degree. When comparing across genders, we find that women express significantly higher social entrepreneurial intentions than men, but there are no significant gender differences in general entrepreneurial intentions. These findings emerge for individual items as well as the aggregated index of items (see Appendix Tables A2 and A3). These findings, while based on a small sample, provide preliminary evidence showing that women appear to be more interested in entrepreneurship when it is oriented toward social impact.

To test the generalizability of these preliminary findings in a nationwide dataset of a large sample of STEM researchers, we next turn to data from the national I-Corps program. As shown in Fig. 2a, in this larger and national dataset, we find that although PIs of both genders were equally likely to describe their projects in terms of its commercial benefits, women PIs were significantly more likely to describe their projects in terms of their social impacts compared to men PIs. Fig. 2b shows gender differences in the number of commercial or social phrases used in the NSF funded abstracts. This shows again that women used significantly more social phrases to describe their projects compared to men; but again, there was no gender difference in use of commercial phrases. For phrases unlike the ratings, the number of commercial phrases used in the abstracts is higher than the number of social phrases for both women and men.

Tables 1 and 2 test these differences using OLS regressions and including control variables. Table 1, Panel A shows that project summaries of women PIs had social impact ratings that were 0.18 units higher on average than that of men PIs. This represents approximately a 10 % higher social impact rating for projects led by women PIs compared to those led by men. Moreover, women PIs were 8.5 % more likely than men to receive the highest social impact rating of 3 on a scale of 1 to 3 (see Column 5). Prior literature has pointed to the representation of women across scientific fields as a factor explaining gender differences in commercialization activities (Koffi and Marx, 2022) and the likelihood of applying for specific grant opportunities (Mancuso et al., 2023). If women and men PIs differ in seniority, this could also explain differences in the ratings, for example if interest in social impact varies by level of career. To account for these factors, we include controls for discipline, as well as career age. Once we include these controls in columns 3 and 4, we see that the gender difference is reduced, but it is still significantly different from zero.

Meanwhile, Panel B shows that women had commercial framing ratings that were, on average, 9.6 units lower than those of men, or approximately 4 % lower. However, this difference is not statistically significant after including controls in Columns 2 to 4. Yet, women PIs were still 7.4 % less likely to get the highest commercial framing rating of three, and this difference is significant after including controls (column 5). We also estimated an ordered logit model and the results were very similar to the linear regression analysis: women were more likely to have higher social impact scores.

In Panel A of Table 2, we see that women use about 0.25 more social phrases on average in their project abstracts compared to men (with an

[4] We used the "breakthrough" language for the control condition since this is what the I-Corps Site program would have used in their emails regardless of our intervention. Most I-Corp Hubs and local programs use language like this to describe the program (e.g. "provides entrepreneurial training, mentoring, and resources to enable researchers to form startup companies that translate laboratory discoveries into breakthrough products and services" or "to help advance new technologies and incubate emergent companies that can move breakthrough discoveries from the lab to the marketplace")

[5] This included departments in the following broad disciplinary fields: engineering, computer sciences, natural sciences, nursing, social sciences, management, public health, and linguistics.

[6] An email open means that someone received the email in their inbox and clicked on it to view the content. In email marking, the open rate is known as a good indication of general engagement, and many use it to prove the effectiveness of their subject line tests. (http://help. e2ma.net/article/understanding-your-mailing-response-numbers/)

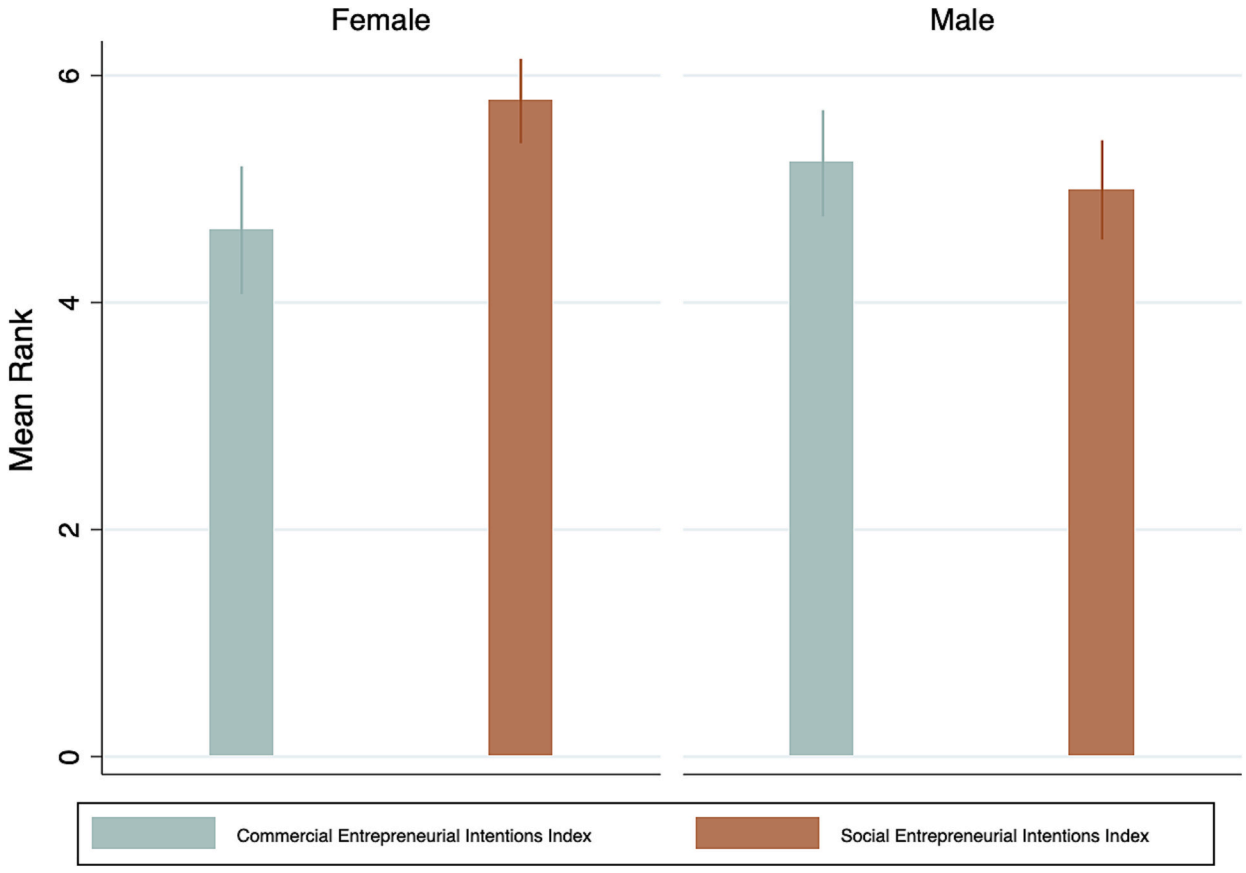

Fig. 1. Commercial and Social Entrepreneurial Intentions by Gender.
Note. Respondents were asked to rate their level of agreement with each statement listed. We calculated the difference in the means of entrepreneurial intentions index by gender. The indices are created using Cronbach's alpha. The sample used in the analysis ($N = 52$, Female = 20, Male = 32) included all individuals who completed the entire survey and who self-reported their gender. Participants that did not complete the entire survey or did not self-identify their gender were excluded from the sample.

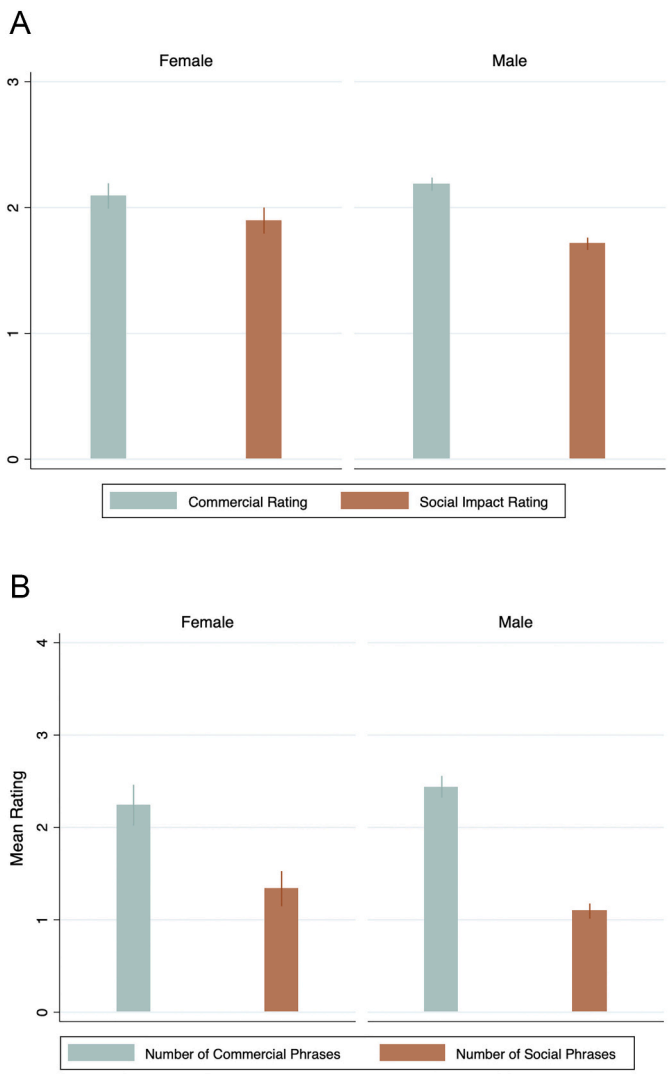

Fig. 2. Social Impact vs. Commercial Impact Framing in National I-Corps Project Abstracts Led by Male and Female Principal Investigators.
a. Commercial vs. Social Impact Rating of National I-Corps Project Abstracts.
Note. Four coders reviewed 1267 NSF I-Corps funded abstracts (blind to the name of the PI). The coders assigned social and commercial framing scores on a scale of 1 (low) to 3 (high). Each abstract was evaluated by two coders who provided good interrater reliability ($\alpha = 0.749$ for social framing and $\alpha = 0.705$ for commercial framing). The figure shows the mean social and commercial rating scores in national I-Corps project abstracts from 2012 to 2019, by gender.
b. Number of Commercial and Social Phrases in National I-Corps Project Abstracts.
Note. Four coders reviewed 1267 NSF I-Corps funded abstracts (blind to the name of the PI). The coders identified social phrases and commercial phrases within each project summary. The figure shows the mean number of social and commercial phrases in national I-Corps project abstracts from 2012 to 2019, by gender. There the highest number of phrases for each category was 6.

average of approximately 1.2 social phrases per abstract). However, once we include discipline and career age controls, the gender difference is no longer significantly different from zero. In Panel B, we show that women use 0.22 fewer commercial phrases on average, with a mean of 2.42. These differences are only significant after we include controls for discipline and year of PhD and cohort controls (column 5). As a robustness check, we also cluster our standard errors by institution to account for differences across institutions (see Appendix Table A7), and the estimates are very similar for both social and commercial ratings.

While we control for discipline in these regressions, given that some fields have a higher share of women, such as life sciences disciplines, we probed the results by excluding life sciences (Biological, Agricultural, and Environmental Sciences) to see if this impacts the estimates or whether there are interaction effects for women in the life sciences. However, we find that the results are very similar when excluding life sciences and there are no significant interaction effects (see Appendix Tables A8 and A9). This indicates that women in the life sciences in our sample are not more oriented toward social impact than women in other fields. We also note that as evident in Table A4, life sciences are a relatively small share of the national I-Corps PI sample (11 %), as the majority of I-Corps participants come from engineering fields (62 %). We also see in Table A6 that main effect of the discipline dummy for life sciences is significant and of a similar magnitude as the female coefficient, suggesting that there are also likely important differences by discipline in terms of the social impact vs. commercial impact motives among researchers, which is an interesting avenue for future research.

So far, our findings suggest that women involved in the early phases of the commercialization process have stronger social impact motivations and tend to work on more socially oriented projects when pursuing the commercialization of their research. Prior research suggests that this pattern may be attributed to differing individual motivations, with women generally being more prosocial (Guzman et al., 2020), and/or to the entrepreneurship evaluation process, which tends to favor women-led ventures that align with stereotypical gender norms of helping society, while penalizing those that deviate from these expectations (Lee and Huang, 2018). However, our findings so far from the survey data and framing of National I-Corps projects show no difference in the commercial framing of male and female participants, and no gender differences in general entrepreneurial intentions. Since the I-Corps selection criteria discussed in Section 2 focuses on the commercial potential of I-Corps teams' projects and clearly addressing a need in the marketplace, our findings of no gender differences in commercial intentions/framing suggest that gender differences in the selection process is likely not playing a role. However, the higher social intentions/framing we see could still be due to women being selected on having *both* commercial and social motivations.

To further probe whether motivation of individual women is the causal factor that drives gender differences we documented so far, we next examine whether social impact framing plays a role in who comes in the door to pursue entrepreneurship activities using our recruitment email experiment.

The main results of the email experiment are presented in Fig. 3 and Table 3. Fig. 3 shows that women were more likely to open the social impact version of the email compared to the business impact version email. For men, however, there was no difference in the share who

Table 1
Social and commercial framing score regressions for national I-Corps project abstracts.

Panel A. Social Impact Framing Ratings

	Social Impact Rating (1)	Social Impact Rating (2)	Social Impact Rating (3)	Social Impact Rating (4)	High Social Impact Rating (5)
Female	0.180***	0.145**	0.137**	0.139**	0.085***
	(0.058)	(0.058)	(0.060)	(0.059)	(0.032)
Discipline Dummies	No	Yes	Yes	Yes	Yes
Year PhD Awarded	No	No	Yes	Yes	Yes
Year Fixed Effects	No	No	No	Yes	Yes
N	1267	1267	1267	1267	1267
Mean of Dep. Var.	1.749	1.749	1.749	1.749	0.232
r2	0.008	0.025	0.063	0.083	0.098

Note. Estimation is by OLS with robust standard errors. Dependent variable is the social impact rating of the national I-Corps program abstract. (1 = low social impact, 2 = medium social impact, 3 = high social impact). Controls include program cohort, discipline, and year PhD awarded. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Panel B. Commercial Framing Ratings

	Commercial Framing Rating (1)	Commercial Framing Rating (2)	Commercial Framing Rating (3)	Commercial Framing Rating (4)	High Commercial Framing Rating (5)
Female	−0.096*	−0.086	−0.099	−0.090	−0.074**
	(0.058)	(0.058)	(0.060)	(0.058)	(0.035)
Discipline Dummies	No	Yes	Yes	Yes	Yes
Year PhD Awarded	No	No	Yes	Yes	Yes
Year Fixed Effects	No	No	No	Yes	Yes
N	1267	1267	1267	1267	1267
Mean of Dep. Var.	2.169	2.169	2.169	2.169	0.455
r2	0.002	0.008	0.048	0.104	0.090

Note. Estimation is by OLS with robust standard errors. Dependent variables is the commercial framing rating of the national I-Corps program abstract. (1 = low commercial impact, 2 = medium commercial impact, 3 = high commercial impact). Controls include program cohort, discipline, and year PhD awarded.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

opened each version of the email. Table 3 shows the statistical significance of these effects in using an OLS regression. The main result for the likelihood of opening the email is in Column 1 and shows that women were 4.1 % more likely than men to open the social impact version of the email. Columns 2–4 show that there are no significant differences in the effect of the social impact version of the email by researcher gender on other measures of interest (clicks on active links in the email and completing the survey to show interest in participating in I-Corps). These results are quite similar to research suggesting that women engage more with social impact messages than with business messages by Guzman et al. (2020).

We also tested whether there were gender differences in how quickly individuals responded to a specific version of the email message. For this analysis, we estimated differences in engagement with the email (opens and clicks) by which round of the email experiment it was. We found no differences by gender in which round of the experiment individuals it took for individuals to engage with the email.

5. Conclusions

In this paper, we have tested the extent to which women academic researchers (compared to their male colleagues) are more motivated by social impact motivations as they consider converting their fundamental science and engineering research to commercial products and services, and whether emphasizing the social impact of commercialization can increase women's representation in these activities. Our results suggest that women researchers appear more interested and active in pursuing science-based commercialization and entrepreneurship activities when they are framed as tackling a societal problem. We investigated this in both a local I-Corps site as well as in a nationwide program. Future research should examine these processes in other settings, including non-academic ones, to understand how social impact framing can most

Table 2
Number of social and commercial phrases regressions in national I-Corps project abstracts.

Panel A. Number of Social Impact Phrases.

	No. of Social Phrases (1)	No. of Social Phrases (2)	No. of Social Phrases (3)	No. of Social Phrases (4)
Female	0.245**	0.179*	0.145	0.130
	(0.105)	(0.102)	(0.104)	(0.102)
Discipline Dummies	No	Yes	Yes	Yes
Year PhD Awarded	No	No	Yes	Yes
Award Year Fixed Effects	No	No	No	Yes
N	1267	1267	1267	1267
Mean of Dep. Var.	1.144	1.144	1.144	1.144
r2	0.005	0.032	0.072	0.098

Note. Estimation is by OLS with robust standard errors. Dependent variable is the number of social phrases in each of the national I-Corps program abstract. Controls include program cohort, discipline, and year PhD awarded.
* p < 0.10, ** p < 0.05, *** p < 0.01

Panel B. Number of Commercial Phrases.

	Number of Commercial Phrases (1)	Number of Commercial Phrases (2)	Number of Commercial Phrases (3)	Number of Commercial Phrases (4)
Female	−0.197	−0.185	−0.212	−0.220*
	(0.128)	(0.130)	(0.137)	(0.124)
Discipline Dummies	No	Yes	Yes	Yes
Year PhD Awarded	No	No	Yes	Yes
Year Fixed Effects	No	No	No	Yes
N	1267	1267	1267	1267
Mean of Dep. Var.	2.403	2.403	2.403	2.403
r2	0.002	0.013	0.052	0.206

Note. Estimation is by OLS with robust standard errors. Dependent variables is the number of commercial phrases in each of the national I-Corps program abstract. Controls include program cohort, discipline, and year PhD awarded.
* p < 0.10, ** p < 0.05, *** p < 0.01.

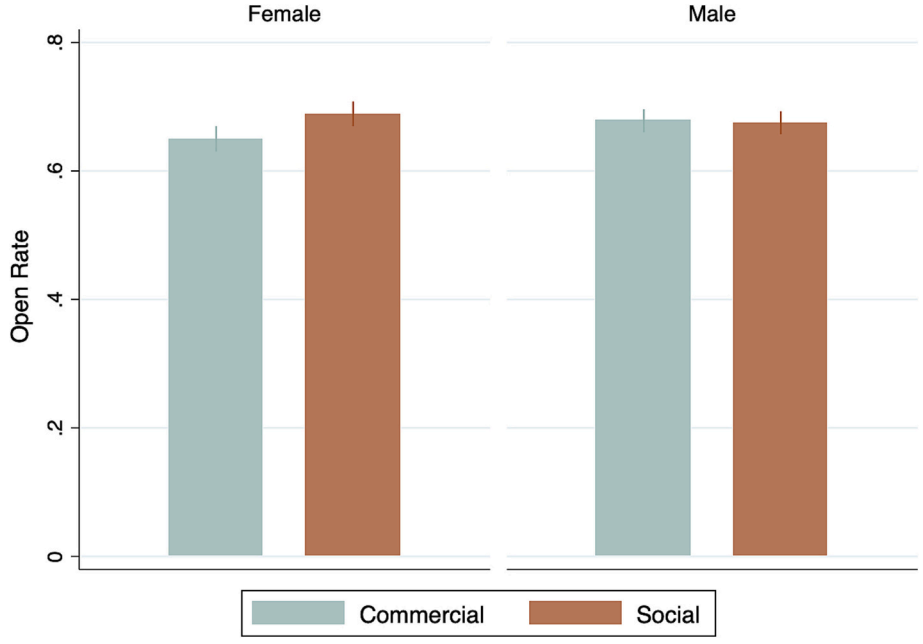

Fig. 3. Email Opens By Framing Type and Gender.
Note. Estimation using Ordinary Least Squares (OLS) with robust standard errors. The binary outcome variable is a value of one if the individual showed interest by opening the email. The social category indicates if the individual randomly received the social impact version of the email, while the commercial email is the control group.

Table 3
Email experiment: impact of social version of email on interest in I-Corps

	Opened	Clicked	Total clicks	Survey	Clicked if opened	Survey if clicked
	(1)	(2)	(3)	(4)	(5)	(6)
Female x Social Treatment	0.041**	−0.001	−0.010	0.000	−0.001	−0.002
	(0.018)	(0.005)	(0.009)	(0.003)	(0.008)	(0.169)
Social Treatment	−0.004	0.003	0.012*	−0.002	0.005	−0.149
	(0.013)	(0.004)	(0.006)	(0.002)	(0.005)	(0.105)
Female	−0.025	−0.010	−0.012	−0.004	−0.010	0.015
	(0.023)	(0.007)	(0.012)	(0.004)	(0.010)	(0.207)
Nb. of Observations	9664	9664	9664	9664	6512	174
Mean of dependent variable	0.67	0.02	0.02	0.01	0.03	0.37

Note. Estimation is by OLS with robust standard errors. Dependent variables are binary indicators except for column 3.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

effectively increase the interest of women in academic entrepreneurship and commercialization opportunities. Our findings suggest that low-costs interventions like framing the opportunities in terms of social impact appear to be a promising avenue to boost gender diversity in these activities.

For I-Corps in particular, our findings along with those of Epstein et al. (2022), which show less positive experiences for woman participants in I-Corps, suggest that more attention to the experiences and preferences of women and underrepresented groups in the program design could lead to greater participation. Other aspects of the program such as the gender composition of mentors and involvement of women in curriculum design could also be explored in future work.

In addition to the specific findings related to gender differences in social and commercial entrepreneurial motives within the NSF I-Corps program, the implications of this research extend beyond commercialization activities and into broader fields of engineering and STEM disciplines. For instance, while women represent 40 % of biomedical engineering majors, they account for only about 10 % in electrical engineering. This disparity underscores a larger issue within STEM fields: the underrepresentation of women, particularly in technical and engineering disciplines. Emphasizing the social impact of entrepreneurial activities could help attract a more diverse pool of talent to fields traditionally dominated by men, contributing to efforts aimed at closing gaps in the STEM pipeline.

This reframing has the potential to influence not only entrepreneurship but also the way engineering disciplines are perceived. Incorporating the social value of engineering work could resonate with women and other underrepresented groups, who may be more inclined to pursue fields where societal contributions are made explicit (Burbano et al., 2024). The broader impact of this study could thus extend to shaping policies and educational approaches that encourage diversity in STEM, particularly in areas where women remain significantly underrepresented, thereby broadening the scope and impact of engineering disciplines.

CRediT authorship contribution statement

April Burrage: Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Data curation. **Nilanjana Dasgupta:** Writing – review & editing, Writing – original draft, Supervision, Methodology, Conceptualization. **Ina Ganguli:** Writing – review & editing, Writing – original draft, Supervision, Project administration, Methodology, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Appendix tables

Table A1
Summary statistics, survey sample.

	All Survey Participants	Female Survey Participants	Male Survey Participants
Male	0.68		
	(0.468)		
Faculty	0.21	0.15	0.24
	(0.410)	(0.364)	(0.430)
Graduate Student	0.28	0.39	0.23
	(0.451)	(0.496)	(0.421)
Social Entrepreneurial Intentions			
Social Entrepreneurial Intentions Index	5.57	5.89	5.41
	(1.153)	(0.872) *N = 20*	(1.247) *N = 32*
I expect in the future to launch a social org	5.22	5.76	4.87
	(1.650)	(1.422) *N = 25*	(1.711) *N = 38*
I have a preliminary idea for a social enterprise	4.57	4.90	4.40
	(1.945)	(1.539) *N = 30*	(2.120) *N = 57*
It is important for my product to reach a diverse base	5.68	6.10	5.48
	(1.444)	(1.221) *N = 31*	(1.512) *N = 61*
It is important for me to have the ability to benefit others	6.47	6.73	6.33
	(0.889)	(0.521) *N = 30*	(1.003) *N = 60*
Commercial Entrepreneurial Intentions			
Commercial Entrepreneurial Intentions Index	5.23	4.70	5.49
	(1.370)	(1.231) *N = 20*	(1.368) *N = 32*

(*continued on next page*)

Table A1 (*continued*)

	All Survey Participants	Female Survey Participants	Male Survey Participants
I will do anything to be an entrepreneur	5.21	4.93	5.38
	(1.106)	(1.016) *N = 28*	(1.134) *N = 47*
I will make every effort to start my firm	5.20	4.57	5.52
	(1.501)	(1.406) *N = 30*	(1.455) *N = 60*
I am determined to create a firm in the future	5.14	4.48	5.48
	(1.614)	(1.458) *N = 30*	(1.598) *N = 61*
I have seriously thought of starting a firm	5.34	4.90	5.56
	(1.815)	(1.647) *N = 30*	(1.867) *N = 61*

Note. Standard deviations in parentheses. Respondents were asked to rate their level of agreement with each statement listed. This table includes means for the sample of individuals who answered each question, while Tables A2 and A3 only includes individuals who answered all intentions questions ($N = 52$).

Table A2
Commercial and social entrepreneurial intentions.*,**

	Women			Men		
	Social Index	Commercial Index	Difference	Social Index	Commercial Index	Difference
Social or Commercial Index	5.775	4.638	1.137***	4.992	5.227	−0.234
Observations	20			32		

Note. The indexes are created using Cronbach's alpha based on the survey items discussed in Section 3.1.The stars in the difference column is based on *t*-tests of differences in means for the relevant entrepreneurial intentions index measure.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A3
Survey of local I-Corps site participants, summary statistics.

	All Survey Participants	Female Survey Participants	Male Survey Participants
Female	0.38		
	(0.491)		
Male	0.62		
	(0.491)		
Faculty	0.21	0.10	0.28
	(0.412)	(0.308)	(0.457)
Graduate Student	0.31	0.45	0.22
	(0.466)	(0.510)	(0.420)
Social Entrepreneurial Intentions			
Social Entrepreneurial Index	5.29	5.78	4.99
	(1.130)	(0.794)	(1.212)
I expect in the future to launch a social org	5.35	5.70	5.12
	(1.570)	(1.380)	(1.661)
I have a preliminary idea for a social enterprise	4.13	4.70	3.78
	(1.889)	(1.689)	(1.947)
It is important for my product to reach a diverse base	5.48	6.10	5.09
	(1.502)	(1.210)	(1.553)
It is important for me to have the ability to benefit others	6.21	6.60	5.97
	(0.997)	(0.598)	(1.121)
Commercial Entrepreneurial Intentions			
Commercial Entrepreneurial Intentions	5.00	4.64	5.23
	(1.281)	(1.202)	(1.296)
I will do anything to be an entrepreneur	5.15	4.90	5.31
	(1.109)	(1.071)	(1.120)
I will make every effort to start my firm	4.98	4.60	5.22
	(1.379)	(1.429)	(1.313)
I am determined to create a firm in the future	4.87	4.40	5.16
	(1.495)	(1.314)	(1.547)
I have seriously thought of starting a firm	5.00	4.65	5.22
	(1.868)	(1.725)	(1.947)
N	52	20	32

Note. Standard deviations in parentheses. Respondents were asked to rate their level of agreement with each statement listed. The sample used in the analysis (N = 52, Female = 20, Male = 32) included all individuals who completed the entire survey and who self-reported their gender. Participants that did not complete the entire survey or did not self-identify their gender were excluded from the sample.

Table A4
Summary statistics for national NSF I-Corps projects, 2012–2019.

	All Principal Investigators	Female Principal Investigators	Male Principal Investigators
Male	0.79		
	(0.404)		
Female	0.21		
	(0.404)		
Year PhD Awarded	1999.39	2000.61	1999.07
	(10.14)	(9.765)	(10.21)
Mean Social Impact Framing Score	1.75	1.89	1.71
	(0.808)	(0.850)	(0.793)
Mean Business Framing Score	2.17	2.09	2.19
	(0.845)	(0.829)	(0.848)
Low Social Impact (=1) Framing Score	0.48	0.42	0.50
	(0.500)	(0.494)	(0.500)
Mid Social Impact (=2) Framing Score	0.28	0.27	0.29
	(0.452)	(0.444)	(0.454)
High Social Impact (=3) Framing Score	0.23	0.31	0.21
	(0.422)	(0.464)	(0.409)
Mean Social Phrases	1.14	1.34	1.09
	(1.375)	(1.560)	(1.319)
Low Commercial Impact Framing Score	0.29	0.30	0.28
	(0.452)	(0.459)	(0.451)
Mid Commercial Impact Framing Score	0.26	0.31	0.25
	(0.438)	(0.462)	(0.430)
High Commercial Impact Framing Score	0.46	0.39	0.47
	(0.498)	(0.489)	(0.499)
Mean Business Phrases	2.40	2.25	2.44
	(1.893)	(1.814)	(1.911)
Mean Abstract Character Count	2107.37	2142.53	2098.29
	(516.9)	(500.9)	(520.8)
Biological, Agricultural, Environmental Sciences	0.11	0.13	0.11
	(0.314)	(0.334)	(0.308)
Computer Science	0.08	0.08	0.08
	(0.272)	(0.267)	(0.274)
Engineering	0.62	0.53	0.64
	(0.487)	(0.500)	(0.481)
Physical and Mathematical Sciences	0.12	0.14	0.11
	(0.321)	(0.346)	(0.315)
Management	0.02	0.02	0.02
	(0.144)	(0.138)	(0.146)
Social, Behavioral, and Humanities	0.03	0.08	0.02
	(0.181)	(0.273)	(0.146)
Other or Missing	0.02	0.03	0.02
	(0.144)	(0.173)	(0.136)
N	1267	260	1007

Note. Standard deviations in parentheses. This table present the shares or means by gender for each variable listed for the sample of the National I-Corps PIs.

Table A5
Summary statistics, email experiment.

	All	Female	Male
Male	0.54		
	(0.499)		
Female	0.46		
	(0.499)		
Social Treatment	0.50	0.50	0.50
	(0.500)	(0.500)	(0.500)
Graduate student	0.82	0.81	0.83
	(0.386)	(0.396)	(0.373)
Faculty	0.18	0.19	0.17
	(0.384)	(0.395)	(0.371)
Professor	0.22	0.28	0.14
	(0.415)	(0.451)	(0.342)
Assoc. Professor	0.03	0.02	0.03
	(0.157)	(0.156)	(0.159)
Asst. Professor	0.03	0.03	0.03
	(0.171)	(0.167)	(0.175)
Other Faculty Type	0.08	0.08	0.08
	(0.275)	(0.274)	(0.276)
Engineering	0.12	0.16	0.07
	(0.322)	(0.366)	(0.251)
Biological, Agricultural, and Environmental Sciences	0.19	0.13	0.25
	(0.392)	(0.339)	(0.436)

(*continued on next page*)

Table A5 (*continued*)

	All	Female	Male
Computer Science	0.10	0.14	0.05
	(0.298)	(0.346)	(0.221)
Physical and Mathematical Sciences	0.09	0.11	0.07
	(0.288)	(0.308)	(0.263)
Management	0.27	0.31	0.22
	(0.444)	(0.464)	(0.414)
Social and Behavioral Sciences and Humanities	0.22	0.15	0.31
	(0.416)	(0.357)	(0.461)
N	9680	5203	4477

Note. Standard deviations in parentheses. Table shows summary statistics (shares) for the sample of individuals in the email experiment analysis by gender.

Table A6
Balance table, email experiment.

	All	Treatment Group	Control Group
Male	0.54	0.54	0.54
	(0.499)	(0.499)	(0.499)
Female	0.46	0.46	0.46
	(0.499)	(0.499)	(0.499)
Graduate student	0.82	0.82	0.82
	(0.386)	(0.386)	(0.386)
Faculty	0.18	0.18	0.18
	(0.384)	(0.384)	(0.384)
Professor	0.22	0.22	0.22
	(0.415)	(0.413)	(0.416)
Assoc. Professor	0.03	0.03	0.02
	(0.157)	(0.159)	(0.156)
Asst. Professor	0.03	0.03	0.03
	(0.171)	(0.170)	(0.172)
Other Faculty Type	0.08	0.08	0.08
	(0.275)	(0.273)	(0.277)
N	9680	4843	4837

Note. Standard deviations in parentheses. Table shows share in treatment and control groups for each covariate listed.

Table A7
Social and commercial framing score regressions for national I-Corps project abstracts, clustering standard errors by institution.

Panel A. Social Impact Framing Ratings

	Social Impact Rating (1)	Social Impact Rating (2)	Social Impact Rating (3)	Social Impact Rating (4)	High Social Impact Rating (5)
Female	0.181***	0.145**	0.137**	0.139**	0.084***
	(0.057)	(0.056)	(0.058)	(0.056)	(0.031)
Discipline Dummies	No	Yes	Yes	Yes	Yes
Year PhD Awarded	No	No	Yes	Yes	Yes
Cohort Year Dummies	No	No	No	Yes	Yes
N	1267	1267	1267	1267	1267
ymean	1.749	1.749	1.749	1.749	0.232
r2	0.008	0.025	0.063	0.083	0.099

Panel B. Commercial Framing Ratings

	Commercial Framing Rating (1)	Commercial Framing Rating (2)	Commercial Framing Rating (3)	Commercial Framing Rating (4)	High Commercial Framing Rating (5)
Female	−0.097* (0.054)	−0.086 (0.055)	−0.099* (0.058)	−0.090 (0.056)	−0.075** (0.036)
Discipline Dummies	No	Yes	Yes	Yes	Yes
Year PhD Awarded	No	No	Yes	Yes	Yes
Cohort Year Dummies	No	No	No	Yes	Yes
N	1266.000	1266.000	1266.000	1266.000	1266.000
ymean	2.169	2.169	2.169	2.169	0.456
r2	0.002	0.008	0.048	0.104	0.089

Note. Estimation is by OLS with robust standard errors. Standard errors are clustered at the institutional level.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A8
Social and commercial framing score regressions for national I-Corps project abstracts, excluding life sciences (biological, agricultural, and environmental).

Panel A. Social Impact Framing Ratings					
	Social Impact Rating (1)	Social Impact Rating (2)	Social Impact Rating (3)	Social Impact Rating (4)	High Social Impact Rating (5)
Female	0.187***	0.151**	0.150**	0.151**	0.090***
	(0.062)	(0.062)	(0.064)	(0.064)	(0.034)
Discipline Dummies	No	Yes	Yes	Yes	Yes
Year PhD Awarded	No	No	Yes	Yes	Yes
Cohort Year Dummies	No	No	No	Yes	Yes
N	1127	1127	1127	1127	1127
Mean of Dep. Var.	1.728	1.728	1.728	1.728	0.224
r2	0.009	0.022	0.062	0.083	0.101

Panel B. Commercial Impact Framing Ratings					
	Commercial Framing Rating (1)	Commercial Framing Rating (2)	Commercial Framing Rating (3)	Commercial Framing Rating (4)	High Commercial Framing Rating (5)
Female	−0.112* (0.062)	−0.103* (0.062)	−0.124* (0.065)	−0.107* (0.063)	−0.083** (0.038)
Discipline Dummies	No	Yes	Yes	Yes	Yes
Year PhD Awarded	No	No	Yes	Yes	Yes
Cohort Year Dummies	No	No	No	Yes	Yes
N	1127	1127	1127	1127	1127
Mean of Dep. Var.	2.182	2.182	2.182	2.182	0.463
r2	0.003	0.007	0.050	0.106	0.094

Note. Estimation is by OLS with robust standard errors. Standard errors in parentheses.
* p < 0.10, ** p < 0.05, *** p < 0.01.

Table A9
Social and commercial framing score regressions for national I-Corps project abstracts, female and life science interaction.

Panel A. Social Impact Framing				
	Social Impact Rating (1)	Social Impact Rating (2)	Social Impact Rating (3)	High Social Impact Rating (4)
Female	0.187***	0.180***	0.183***	0.109***
	(0.062)	(0.064)	(0.064)	(0.034)
Biological, Agricultural, and Environmental	0.207**	0.196**	0.198**	0.090*
	(0.084)	(0.087)	(0.087)	(0.046)
Female x Biological, Agricultural, and Environmental	−0.084	−0.103	−0.086	−0.062
	(0.175)	(0.176)	(0.173)	(0.096)
Year PhD Awarded	No	Yes	Yes	Yes
Cohort Year Dummies	No	No	Yes	Yes
N	1267	1267	1267	1267
Mean of Dep. Var.	1.749	1.749	1.749	0.232
r2	0.014	0.053	0.071	0.087

Panel B Commercial Impact				
	Commercial Framing Rating (1)	Commercial Framing Rating (2)	Commercial Framing Rating (3)	High Commercial Framing Rating (4)
Female	−0.112* (0.062)	−0.127** (0.064)	−0.111* (0.062)	−0.085** (0.037)
Biological, Agricultural, and Environmental	−0.148* (0.087)	−0.134 (0.091)	−0.119 (0.088)	−0.067 (0.052)
Female x Biological, Agricultural, and Environmental	0.147 (0.178)	0.165 (0.177)	0.085 (0.170)	0.048 (0.102)
Year PhD Awarded	No	Yes	Yes	Yes
Cohort Year Dummies	No	No	Yes	Yes
N	1267	1267	1267	1267
Mean of Dep. Var.	2.169	2.169	2.169	0.455
r2	0.004	0.044	0.101	0.088

Note. Estimation is by OLS with robust standard errors.
* p < 0.10, ** p < 0.05, *** p < 0.01.

Data availability

The data that has been used is confidential.

References

Abreu, M., Grinevich, V., 2017. Gender patterns in academic entrepreneurship. J. Technol. Transf. 42 (4), 763–794.
Belz, A.P., Graddy-Reed, A., Hanewicz, I., Terrile, J., R., 2022. Gender differences in peer review of innovation. Strateg. Entrep. J. 16 (2), 255–280.
Burbano, Vanessa, Padilla, Nicolas, Meier, Stephan, 2024. Gender differences in preferences for meaning at work. Am. Econ. J. Econ. Pol. 16 (3), 61–94.

Burrage, A., Ciemiecki, J., Couch, S., Ganguli, I., 2024. Inclusive pathways to invention: Racial and ethnic diversity among collegiate student inventors in a national prize competition. Technology & Innovation.
Ceci, S.J., Ginther, D.K., Kahn, S., Williams, W.M., 2014. Women in academic science: a changing landscape. Psychol. Sci. Public Interest 15 (3), 75–141.
Cohen, W.M., Sauermann, H., Stephan, P., 2020. Not in the job description: the commercial activities of academic scientists and engineers. Manag. Sci. 66 (9), 4108–4117.
Cook, L.D., Kongcharoen, C., 2010. The Idea Gap in Pink and Black (No. w16331). National Bureau of Economic Research.
Cook, L.D., Gerson, J., Kuan, J., 2022. Closing the innovation gap in pink and black. Entrepreneurship and Innovation Policy and the Economy 1 (NBER Working Paper 29354.).
Criado-Perez, C., 2019. Invisible Women: Data bias in a World Designed for Men. Abrams Press, New York.
Ding, W.W., Murray, F., Stuart, T.E., 2006. Gender differences in patenting in the academic life sciences. Science 313, 665–667.
Einio, Elias, Feng, Josh, Jaravel, Xavier, 2022. Social push and the direction of innovation. In: CEP Discussion Papers dp1861. Centre for Economic Performance, LSE.
Epstein, A., Duval-Couetil, N., Huang-Saad, A., 2022. Gender differences in academic entrepreneurship: experience, attitudes and outcomes among NSF I-CORPS participants. Int. J. Gend. Entrepreneurship 14 (1), 117–141.
Ganguli, I., Huysentruyt, M., Le Coq, C., 2021. How Do Nascent Social Entrepreneurs Respond to Rewards? A Field Experiment on Motivations in a Grant Competition. Management Science.
Gompers, P.A., Wang, S.Q., 2017. Diversity in innovation (No. w23082). National Bureau of Economic Research.
Guzman, J., Oh, J.J., Sen, A., 2020. What motivates innovative entrepreneurs? Evidence from a global field experiment. Management Science 66 (10), 4808–4819.
Hockerts, K., 2017. Determinants of social entrepreneurial intentions. Entrep. Theory Pract. 41 (1), 105–130.
Hsieh, C.-T., Hurst, E., Jones, C.I., Klenow, P.J., 2019. The allocation of talent and U.S. Economic Growth. Econometrica 87, 1439–1474. https://doi.org/10.3982/ECTA11427.
Koffi, M., Marx, M., 2022. Cassats in the Attic. University of Toronto Working Paper.
Koning, R., Samila, S., Ferguson, J.P., 2021. Who do we invent for? Patents by women focus more on women's health, but few women get to invent. Science 372 (6548), 1345–1348.
Leatherbee, M., Katila, R., 2020. The lean startup method: early-stage teams and hypothesis-based probing of business ideas. Strategic Entrepreneurship Journal 14 (4), 570–593.
Lee, M., Huang, L., 2018. Gender bias, social impact framing, and evaluation of entrepreneurial ventures. Organ. Sci. 29 (1), 1–16.
Liñán, F., Chen, Y.W., 2009. Development and cross-cultural application of a specific instrument to measure entrepreneurial intentions Entrep. Theory Pract. 33, 593–617.
Mair, J., Marti, I., 2006. Social entrepreneurship research: A source of explanation, prediction, and delight. J. World Bus. 41 (1), 36–44.
Mair, J., Noboa, E., 2006. Social entrepreneurship: How intentions to create a social venture are formed. In: Social Entrepreneurship. Palgrave Macmillan UK, London, pp. 121–135.
Mancuso, R., Rossi-Lamastra, C., Franzoni, C., 2023. Topic choice, gendered language, and the under-funding of female scholars in mission-oriented research. Res. Policy 52 (6), 104758.
Meoli, Azzurra, Fini, Riccardo, Sobrero, Maurizio, Wiklund, Johan, 2020. How entrepreneurial intentions influence entrepreneurial career choices: the moderating influence of social context. In: Journal of Business Venturing, 35(3). Elsevier.
Muir, J., Aanstoos, M., Barrett, T., Campbell, A., Ghahramani, F., Gottwald, J., Leute, K., Mercier, N., Shockro, J., 2022. Engaging More Women In Academic Innovation: Findings And Recommendations. Technology & Innovation, 2022.
National Science Foundation, 2023. SFS biennial report. https://www.nsf.gov/edu/Pubs/2023SFSBiennialReport.pdf.
Schultz, I., Blaho, J.A., Becker, K.H., 2022. The impact of the National Science Foundation's innovation corps (I-corps) on academic innovation and entrepreneurship. The European Physical Journal D 76 (12), 1–18.
Strømgren, C., 2015. Genderize.io. http://genderize.io.
Wais, K., 2016. Gender prediction methods based on first names with genderizer. The R Journal 8 (1), 17. https://doi.org/10.32614/rj-2016-002.
West, J.D., Jacquet, J., King, M.M., Correll, S.J., Bergstrom, C.T., 2013. The role of gender in scholarly authorship. PloS One 8 (7), e66212.
Whittington, K.B., Smith-Doerr, L., 2008. Women inventors in context: disparities in patenting across academia and industry. Gend. Soc. 22 (2), 194–218. https://doi.org/10.1177/0891243207313928.
Yang, Y., Tian, T.Y., Woodruff, T.K., Jones, B.F., Uzzi, B., 2022. Gender-diverse teams produce more novel and higher-impact scientific ideas. Proc. Natl. Acad. Sci. 119 (36), e2200841119.