

Gender Discrimination in Access to Capital: A Field Experiment in Ethiopia¹

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We test whether loan officers discriminate against female business owners in capital decisions affecting real businesses in an Ethiopian business plan competition. Randomizing owner gender across 3,696 evaluations, by 84 loan officers, for 916 businesses, we find no effect on prize scores or consideration for a loan. Incentivized beliefs about future performance did not differ by gender, ruling out statistical and taste-based discrimination. Machine learning predictions of future business performance show that loan officers beliefs were accurate. Gender does not meaningfully improve predictions, implying no trade-off between gender equity and effective capital allocation.

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1 Introduction

Female business owners in many low-income countries have less access to formal credit and earn lower profits than men.² Observable differences between male and female entrepreneurs explain only a small portion of the profit gap, suggesting that gender discrimination may be an important factor (Campos et al., 2019). Financial providers, such as loan officers, may discriminate against female business owners due to prejudice or because they use gender as a proxy for business performance. On the other hand, financial providers are experts in their field, face real stakes in portfolio performance, and have rich information about businesses seeking capital, all of which reduce the likelihood of discrimination.

Beyond equity considerations, the response to gender in capital allocation has implications for profit maximization. If gender predicts business performance, discrimination may be profit-maximizing for loan officers targeting high-performing businesses.³ Indeed, standard theories predict that discrimination only persists when it is profit-maximizing.⁴ However, empirical studies have documented discrimination from prejudice and inaccurate beliefs, even when it reduces profits (Guryan and Charles, 2013).

²See, for example, Blattman, Fiala and Martinez (2014); Buehren et al. (2019); Hardy and Kagy (2020). In Ethiopia, male managers borrow more often and in larger amounts than female managers (Buehren et al., 2019). In 2015, 49.1% of female-led firms with five or more employees cited access to finance as a major constraint, versus 18.8% of male-led firms (World Bank, 2015).

³High-performing (i.e., profitable) businesses increase the likelihood of repayment and the returns to capital. Interviews with loan officers confirm that profitability is a key factor in loan appraisal.

⁴Taste-based discrimination models imply that discriminatory providers only remain in the market if discrimination is profit-maximizing (Becker, 1957). Statistical discrimination demonstrates that it can indeed be profit-maximizing if beliefs about gender and business performance are accurate (Phelps, 1972; Arrow, 1974; Aigner and Cain, 1977; Bohren, Imas and Rosenberg, 2019).

These equity and profit-maximization implications depend both on *whether* loan officers discriminate and on the *source* of discrimination: preferences (taste-based discrimination (Becker, 1957)) or differing beliefs about female-owned versus male-owned businesses (belief-based or statistical discrimination (Phelps, 1972; Arrow, 1974; Aigner and Cain, 1977)). Each source of discrimination, as well as the accuracy of the loan officers' beliefs, has distinct welfare and policy implications (Bohren et al., 2025). Our study addresses each of these questions in turn: whether loan officers discriminate in making capital allocation decisions, the extent of each source of discrimination, and whether the beliefs held by loan officers are accurate.

We embed a field experiment in a large business plan competition in Ethiopia by randomly assigning business-owner gender in the evaluation of the competition. Business owners throughout Ethiopia completed an application form designed to mimic an initial loan application.⁵ We recruited 84 loan officers from 13 financial institutions to evaluate 916 real businesses that applied to the competition. For each business, the loan officers provided a score used to determine the competition grants and prizes, decided whether to forward the application to their own lending institution to be considered for a loan, and predicted future business performance, with and without additional capital. Without this belief elicitation, the response to gender in the capital allocation decisions could be consistent with a continuum of belief-based and taste-based discrimination (Bohren et al., 2025). The belief elicitation, which was incentivized for accuracy, reveals the extent of each source of discrimination. Each business application was evaluated multiple times, and each loan officer evaluated multiple businesses, yielding 3,696 evaluations and allowing for business and loan officer fixed effects.

To assess the accuracy of the loan officers' beliefs, we surveyed the businesses 18 months after the competition. We compare the loan officers' subjective beliefs with actual survival, profits, and assets. We also use machine learning to evaluate whether a business owner's gender is an important

⁵The application form was designed based on interviews with loan officers at both microfinance institutions and commercial banks. It provided no more information than what would be available in a typical loan application at an Ethiopian financial institution.

predictor of business profitability. The three components of our research design—loan officers’ capital allocation decisions, their subjective beliefs, and business outcomes measured in the follow-up survey—allow us to identify the overall extent of discrimination (i.e., gender equity), separate taste-based from belief-based discrimination, and assess implications for profit-maximization (i.e., targeting capital towards high-performing businesses).

We find no evidence that loan officers discriminated against female-owned businesses. Randomly assigned business-owner gender did not affect loan officers’ competition scores or their decisions to forward the business to their own financial institution for consideration for a loan. The point estimates are small for both decisions: less than .03 standard deviations in the competition and less than .16 percentage points in loan consideration. We find no evidence for discrimination in any subset of the sample (e.g., based on characteristics of the business owner, business, or loan officers), and our standard errors rule out meaningful gender differences in these capital allocation decisions.

Consistent with this lack of gender discrimination, loan officers expected similar future business performance, returns to capital, and loan repayment likelihood for both genders. Coupled with the capital allocation decisions, this rules out both preference-based and belief-based discrimination. The alignment between capital allocation decisions and expectations of business performance is consistent with a model of decision-making based on beliefs: loan officers do not believe that business-owner gender predicts business performance, and so do not respond to gender in capital allocation.

We then turn to the accuracy of beliefs. Loan officers’ beliefs about gender differences in business performance align with actual gender differences we observe in our follow-up survey. Furthermore, just like the loan officers, standard machine learning algorithms do not prioritize gender among the optimal predictors of business profits. Rather, both loan officers and algorithms rely on other business information to target high-performing businesses. These results imply that loan officers have accurate beliefs and there is no meaningful trade-off between gender equity and allocating capital to the highest-performing businesses. This is consistent with theory: if loan officers’ beliefs are accurate and gender is *not* predictive of business performance, then discrimination would *not* be

profit-maximizing.

We provide a number of checks to confirm the validity and robustness of our results. We assess generalizability, particularly to initial loan applications, using the SANS framework (List, 2020).

Our primary contribution is to provide a well-identified test of gender discrimination in real-world capital allocation decisions. Recent papers have used well-designed lab-in-the-field experiments to study gender discrimination in hypothetical business capital allocation decisions, framed as being for research or training purposes, in low- and middle-income countries (Alibhai et al., 2019; Brock and De Haas, 2023; Bartös et al., 2024; Buehren and Papineni, 2025).⁶ In some cases, financial providers received small bonuses for allocating hypothetical capital to businesses that performed well in the real world. These lab-in-the-field experiments have found evidence for gender discrimination on some margins, concentrated among loan officers with biased gender attitudes and with less experience. An earlier observational literature estimates residual gender differences in credit access after controlling for observable characteristics. These studies have found mixed results, with no consensus on the

⁶Brock and De Haas (2023) conducted a clever lab-in-the-field experiment where Turkish loan officers made hypothetical lending decisions for previous real loan applications, in which business-owner gender was randomized. Loan officers received a bonus for approving loans that had performed well in the real world. They find no evidence for gender discrimination in the decision to approve a loan or beliefs about loan repayment, consistent with our findings. They do find women receive stricter conditions on credit offers. Alibhai et al. (2019) similarly find support for intensive-margin gender discrimination by Turkish loan officers evaluating fictional loan applications. In Uganda, Bartös et al. (2024) also find that loan officers discriminate against individual female entrepreneurs, but not female teams, on the intensive margin for start-up businesses. In contrast, Buehren and Papineni (2025) find no average gender discrimination in an Ethiopian start-up context, but document sector-specific patterns: women face lower investment amounts in male-dominated sectors and men face lower investment probabilities in female-dominated sectors.

existence of gender discrimination in business capital decisions.^{7, 8}

We build on this literature by identifying gender discrimination in business finance using experimental variation in a large-scale, high-stakes natural context. Our experimental approach improves upon observational studies where financial providers' incentives are strong, but gender discrimination is not well identified. Our high-stakes setting improves upon lab-in-the-field studies that yield convincing identification but often lack the strong incentives that loan officers face in the real world. We do not find discrimination in these real decisions, which contrasts with evidence of gender discrimination in hypothetical contexts.⁹ To the best of our knowledge, our paper represents one of the first experimental estimates of gender discrimination in a real-world capital allocation decision that influences outcomes for businesses. Together with the literature, our results suggest that discrimination will not be a driving factor in information-rich settings where it is not profit maximizing.

An additional contribution is to elicit financial providers' beliefs and link their decisions to theoretical frameworks of discrimination. Previous research typically has not observed underlying beliefs, making our study one of the first to measure and estimate the accuracy of these beliefs

⁷For example, Muravyev, Talavera and Schäfer (2007) find that female-managed firms are less likely to obtain a bank loan across 34 countries, primarily in Central and Eastern Europe. In contrast, Aterido, Beck and Iacovone (2013) find that the gender gap in formal bank credit and rejection rates in Sub-Saharan Africa disappears after controlling for firm characteristics. Beck and Cull (2014) find some evidence that female-owned firms are more likely to have bank loans in Africa, likely reflecting survival bias. See Klapper and Parker (2011) for a more thorough review.

⁸A related literature explores credit decisions when clients and loan officers share traits, which suggests that discrimination may be an underlying phenomenon (Fisman, Paravisini and Vig, 2017; Beck, Behr and Madestam, 2018).

⁹One exception is Montoya et al. (2025), who find gender discrimination using well-identified experimental variation in gender in a large field experiment in consumer credit.

across our entire sample. Belief accuracy is the critical component to identifying whether gender discrimination is a profit-maximizing strategy that can persist in equilibrium. We use a novel approach in which we benchmark beliefs against machine learning algorithms (i.e., a “synthetic” judge for the competition). This comprehensive approach enables a deeper understanding of the interplay between beliefs, decision-making, and the implications of gender discrimination in the realm of business finance.

2 Context and Experimental Design

2.1 Ethiopian context

Ethiopia performs poorly on global indicators of gender equality. The World Economic Forum’s 2016 Global Gender Gap Report ranked Ethiopia 109 of 144 overall, 106 on economic participation and opportunity, and 132 on educational attainment. These stark gaps motivate examining whether discrimination (both belief-based and mechanisms such as social norms or prejudice) shapes economic outcomes in Ethiopia.

Outside of agriculture, entrepreneurship is the most common form of female labor force participation in Ethiopia and Sub-Saharan Africa. Yet, the Ethiopia Socioeconomic Survey shows that male business managers are 3.7% more likely to borrow and borrow approximately 50% more than their female counterparts (Buehren et al., 2019). Increasing recognition of these gender gaps has driven policy responses: Ethiopia has a financial inclusion policy that targets gender gaps, and many lending institutions are encouraged to lend to women.

2.2 The Business Plan Competition

In 2019, the Entrepreneurship Development Institute (EDI) launched a business plan competition, EthioSpur, to provide capital and other awards to promising businesses.¹⁰ Business plan competitions are an increasingly common method to stimulate entrepreneurial growth in developing countries.

¹⁰The Entrepreneurship Development Institute, formerly Entrepreneurship Development Center, is an agency tasked by the Ethiopian government to promote entrepreneurship and economic growth, with a particular focus on women entrepreneurs. A key element of EDI’s mission is to improve

For example, during the time of our own competition, we were aware of two other business plan competitions in Ethiopia itself.

The top three businesses received 300,000 ETB (9,375 USD), 220,000 ETB (6,875 USD), and 140,000 ETB (4,375 USD).¹¹ In addition, the top 20 businesses received media and marketing coverage, and the top 100 received a “fast track to credit,” as described in Section 2.5. EDI promoted the competition nationally via social media, SMS, and targeted outreach.

To participate in the competition, applicants had to be the majority owner in a business that had operated for at least four months, have a business license, and complete the application form.¹² Any business seeking capital (including loans) from a formal financial institution would meet these minimal requirements (discussed in Section 3.5).

We partnered with EDI to study whether loan officers recruited to judge the competition discriminated against female-owned businesses. In an approach similar to an audit study, we gave recruited loan officers a packet of applications in which the gender of the applicant had been randomly assigned.

We designed the application form to mirror the information loan officers use to make initial decisions on loan requests in their financial institutions. We interviewed financial providers from nine different financial institutions on their loan criteria and used their standard loan application forms as a template for the competition application. The application form collected information on current business characteristics (e.g., industry, profits, years of operation), a business expansion plan (e.g., how awarded funds would be used, expected revenue), and information on the business owner (e.g., marital status, age, gender).¹³ As in a loan application, the information was self-reported. To

access to finance.

¹¹These amounts are comparable to a typical small business loan: in a dataset of 357 female entrepreneurs seeking credit from Wasasa MFI in Ethiopia, the median loan request was 200,000 ETB (Alibhai et al., 2021).

¹²Businesses did not need a license at the time of the application, but were informed that they would be required to get a business license to receive any prizes.

¹³The complete application form can be found in Appendix A.

ensure that applicants were truthful, they were informed that winning businesses would be audited and any false or misleading information would result in disqualification from the competition and all future EDI initiatives. The application was available in multiple languages and could be submitted online, in hard copy, or via email.

2.3 Applicants

The competition attracted 916 businesses. Table 1, Panel A, provides summary statistics on the median business performance of the applicants. The median applicant has 5 years of industry experience for both male and female businesses, 15,000 ETB (500 USD) in profit for the previous month, 3 employees, 240,000 ETB in assets, and 4,000 ETB in liabilities. This profile reflects the type of business that we expect to apply for capital. For example, our sample is similar to that in a previous study of female loan applicants at Wasasa Microfinance Institution: their median monthly business profit was 15,000 ETB, median number of employees was 1, median business age was 4 years, and the median value of reported assets was 150,000 ETB (Alibhai et al., 2021).¹⁴ Below the median, we report the mean and standard deviation. Means substantially exceed medians, highlighting a significant right tail of larger businesses. Relative to male businesses, female-owned businesses report lower profits, have fewer employees, and have fewer assets and liabilities. Only the profit gap is statistically significant. Section 3.4 discusses the relevance of this gender gap in more detail.

Table 1, Panel A, illustrates that applicant businesses are relatively small, but more successful and larger than the median Ethiopian business. Note that gender gaps in credit are evident even among larger businesses in Ethiopia (World Bank, 2015). In our sample, female-owned businesses were equally likely to apply for loans in the past year (32.5%), but were 6 percentage points less likely to receive them, conditional on key business characteristics.

Table 1, Panel B, provides summary statistics for the business owners. 44% of applicants were

¹⁴We are not aware of a more representative sample of Ethiopian loan applicants to which we can compare our sample. The similarity in our sample and that of the study at Wasasa MFI provides support that our sample overlaps well with our population of interest: businesses requesting capital.

female-owned businesses. The sample is highly educated: nearly 50% have a bachelor’s degree or higher, with male owners more likely to have completed tertiary education. Female owners have more children (1.95 vs 1.62), though gender differences in marital status are smaller (54% are married or cohabitating). Most applicants are household heads (86%) and have high self-reported risk preference (8.64).¹⁵ Female applicants are slightly older on average.

2.4 Loan Officers as Judges

The competition was judged by loan officers recruited from banks and microfinance institutions across Addis Ababa. Institutions were asked to provide experts who: (i) reviewed loan applications, with specific attention to urban clients, capital for business purposes, and individual applicants or enterprises;¹⁶ (ii) served as a loan officer or a member of the loan approval committee; and (iii) had worked for at least one year at the institution.¹⁷ These criteria ensured that those recruited were from the relevant population for reviewing requests for capital.

The recruited loan officers spanned 13 different lending institutions. 14% were female and 65% were recruited from microfinance institutions. On average, the loan officers had been at their respective institution for five years, and in finance for 11 years.

Due to COVID-19, loan officers received a phone orientation and reviewed applications and completed evaluations remotely. The orientation covered all questions in the evaluation form, signing a contract, and a “comprehension check” that explicitly asked how each section of the evaluation form would be used.¹⁸ This ensured that the loan officers understood the definitions and objectives

¹⁵This includes sharing the status of the household head with a spouse.

¹⁶In contrast to “social collateral” loans with joint liability in groups, commonly found in microfinance.

¹⁷In the results, we find no heterogeneity by loan officer’s years of experience at their own institution, suggesting that our results would generalize to first-year loan officers.

¹⁸The contract committed judges “to perform the services with the highest standards of professional and ethical competence and integrity” and specified the expertise requirements, remuneration (including the bonus based on the accuracy of beliefs described in Section 2.5), and non-monetary

Table 1: Applicant Characteristics

	(1) Total	(2) Male	(3) Female	(4) Diff	(5) N
<i>Panel A: Business Mean, Median, and Standard Deviation</i>					
Years in Industry	5 6.00 (4.46)	5 5.88 (4.61)	5 6.16 (4.27)	-0.28	812
Profits (thousands birr)	15 107.23 (471.01)	17 157.64 (608.74)	12 44.16 (170.53)	113.49***	824
Employees	3 5.75 (11.13)	3 5.93 (11.37)	2 5.51 (10.82)	0.43	884
Assets (thousands birr)	240 1,038.84 (3,153.68)	248 1,097.52 (3,242.70)	221 964.20 (3,039.09)	133.32	911
Liabilities (thousands birr)	4 203.85 (740.99)	4.5 239.75 (808.09)	3 158.77 (645.15)	80.98	882
<i>Panel B: Owner Mean and Standard Deviation</i>					
Female	0.44 (0.50)	0.00 (0.00)	1.00 (0.00)	-1.00	911
Bachelors Degree or Higher	0.49 (0.50)	0.56 (0.50)	0.39 (0.49)	0.17***	892
Married/Cohabiting	0.53 (0.50)	0.54 (0.50)	0.53 (0.50)	0.00	890
Number of Children	1.76 (1.70)	1.62 (1.80)	1.95 (1.56)	-0.33**	757
Household Head	0.86 (0.35)	0.85 (0.36)	0.87 (0.33)	-0.02	888
Self-Reported Risk Preference	8.64 (2.15)	8.60 (2.16)	8.69 (2.14)	-0.09	866
Age	37.27 (9.09)	36.32 (9.08)	38.40 (8.98)	-2.09**	655

Panel A reports median, mean, and standard deviation (s.d.) in parentheses. Panel B reports mean and s.d. in parentheses. Column 4 shows mean difference by gender and stars indicate significance in a t-test. Column 5 reports the number of observations, which vary due to missing data. Profits refer to the previous month. Profits, Assets, and Liabilities are shown in thousands of ETB. All variables in Panel A are winsorized at the 1st and 99th percentiles. Self-reported risk preference is the answer to the question “How do you see yourself: are you generally a person who is fully prepared to take risks, or do you try to avoid taking risks?” where the answer ranges from 0 to 10, increasing in risk tolerance.

of each question. The comprehension check also confirmed confidentiality and a commitment not to discuss applications or evaluations with anyone else.

To avoid social desirability bias, the loan officers were not told ahead of time that they were participating in an experiment or that their evaluations would be used in a study on gender and finance. All communication with the loan officers during the evaluation of the competition was conducted by an EDI staff member blinded to the key question of interest and the randomized gender assignment. The loan officers were compensated 2,500 ETB (approximately 75 USD) upon satisfactory completion of their evaluations within two weeks, though extensions were granted.

The loan officers had several incentives to conduct a thorough and thoughtful review, beyond payment contingent on quality. They had been handpicked by their institutions to serve as judges, in some cases based on formal Memorandums of Understanding (MoUs) between EDI and their institutions. EDI is a highly respected agency in Ethiopia with a key focus on maintaining relationships with the financial institutions that provided the judges. Thus, there would be a reputational consequence both within their institution and in the broader financial sector for poor performance. Section 3.3 reports evidence on the quality of their evaluations.

2.5 Evaluation Form: Treatment Salience and Outcomes

Treatment Salience: Loan officers reviewed digitized application forms translated into English and shown in a standard format.¹⁹ Appendix Figure A1 shows an example of an application form. Applicant demographics, including gender, appeared at the top of the form. The remainder showed information about the business and business plan.

The evaluation form had four sections (see Appendix Figure A2). Section A was designed to ensure the salience of the randomly assigned gender without revealing the research question. This section asked the loan officer to confirm the demographics of the applicant: ID, age, gender, total years of experience, and whether they were also employed outside of the business. The loan officers benefits (recognition on both EDI's website and at the awarding event for the competition).

¹⁹We did not translate detailed business plan narratives submitted in Amharic, as all loan officers were fluent in Amharic.

were informed that this section was used to verify that they were reviewing the correct application. This ensured salience of the randomly assigned business-owner gender and serves as an attention check. 98.5% of evaluations noted the gender correctly.

To confirm that gender was not revealed in other parts of the application, our local survey firm reviewed the digitized application materials and verified that no other field in the form would reveal applicant gender. In addition, in the sample of applicants, both genders are represented across all twenty industry categories included in the application form, suggesting that the industry alone would not reveal the gender of the applicant (see Appendix Table A1). Similarly, EDI was not concerned that businesses were gendered to the extent that the business details would reveal the true gender of the business owner, or cast doubt on the credibility of the randomly assigned gender. Any observed gender discrimination is therefore unlikely to be due to the business owners' gender being revealed or surprising.

Beliefs on Future Performance: Section B asked the loan officers to predict the business' performance in January 2021, exactly one year after the submission of applications. The majority of the evaluations were completed only a few months prior to January 2021.²⁰ The loan officers were therefore well aware of the shocks in the economy, including the COVID-19 pandemic, when forming predictions. They predicted the likelihood of survival, monthly profit, assets, and number of paid employees if the business did or did not win the 300,000 ETB top competition prize.

Our interviews with loan officers indicated that future business profitability is a key metric for determining capital allocation at their institution, since repayment probability and returns to capital are increasing in business performance. In an exit survey of 43 loan officers who served as judges, 86% reported that "growth potential (i.e., future profits)" was important or very important in determining whether to approve a loan.²¹

²⁰The competition closed on January 20, 2020, and evaluations were conducted from September 2020 to December 2020, with a handful of loan officers still returning packets after the December deadline.

²¹Loan officers who completed the exit survey were more likely to work at a microfinance institu-

While future profitability is a key metric of concern, repayment is ultimately most important for lending institutions. To directly capture this consideration, we also asked loan officers to evaluate the likelihood of repayment for a three-year loan of 100,000 ETB. They selected whether the applicant was more likely to repay the loan, strategically default (i.e., choose not to repay despite having the resources), or default because of an inability to repay.

This section on beliefs was incentivized for accuracy. The loan officers were informed that the person with the most accurate evaluations for Section B would receive 15,000 ETB (500 USD).²²

We elicit the beliefs of loan officers on future business performance and loan repayment to determine the extent of each source of discrimination. Common methods used to determine the source of discrimination that do not incorporate such belief elicitation are generally limited and require strong assumptions. For example, Bohren et al. (2025) highlight that any response to gender in the capital allocation decisions will be consistent with a continuum of belief-based discrimination and taste-based discrimination. In addition, the common method of comparing loan officers' decisions to the true distribution of business success cannot disentangle inaccurate beliefs from preferences, and estimating how discrimination changes as a function of the information provided can only partially identify the source of discrimination. Thus, elicitation of loan officers' beliefs is a necessary measure to effectively determine sources of discrimination.

Capital Allocation Decisions: Section D was the loan officers' overall score that determined the competition's prizes. The loan officers scored the business on overall impression, value proposition, and entrepreneurial credibility with a range of 1 to 10 each. This was then aggregated into a final score: $\text{Final Score} = \text{Overall Impression} + 0.5 \times (\text{Value Proposition} + \text{Entrepreneurial Credibility})$. We informed the loan officers that this was the *only* measure determining the competition's winners.

Grant decisions and loan decisions can differ in important ways, such as consideration of repayment. In recognition of this, following Section D, we asked the loan officers whether they wanted
tion, but were otherwise similar to non-responders (see Appendix Table A2).

²²Additional details on the belief elicitation and related experimental literature are provided in Appendix A.1.1.

to forward the applicant's information to their own institution for consideration for a loan. This question proxies for an initial loan-screening decision at the loan officer's own institution.

Identifying promising businesses as potential borrowers was a key part of discussions with lending institutions when forming partnerships for the competition, beginning with the initial recruitment of loan officers from lending institutions to serve as judges. Several institutions signed MoUs that explicitly committed to fast-track loan reviews for applicants forwarded by their loan officers.²³ In the orientation, loan officers were informed that EDI would "let your institution know you recommend this person to be reviewed for a loan and forward this information to your institution if the applicant is interested in a loan." Hence, the decision to forward the applicant to their own lending institution was a meaningful proxy for that institution reviewing the applicant as a potential borrower.

Our main outcomes of interest for capital decisions are 1) the loan officer's final score from Section D, and 2) whether they requested the applicant's information be sent to their own institution for consideration for a loan.

Additional components in the evaluation form: Section C collected information about the loan officers' beliefs about the business owner. They evaluated the business owner's managerial skills, sources and amount of capital for the business, market demand, and whether the business was the primary source of income for the household. This section was not incentivized. It was designed to shed light on beliefs that may not affect business performance, but could be influenced by gender and affect an evaluation of a business.

²³Though MoUs are not easily legally enforceable, they are meaningful: it took time and negotiation to reach these agreements, and institutions varied in their willingness to commit and in the specific terms negotiated. Ultimately, because of the disruptions caused by COVID-19 and judging delays, EDI did not track what happened to forwarded applicants. However, loan officers and lending institutions would have considered their decisions consequential when they were making them, since they did not know EDI would not follow up.

2.6 Loan Officer Incentives

Interpreting the evaluation outcomes requires understanding the private incentives loan officers faced in each section. Overall, as described above in Section 2.4, loan officers were well incentivized to provide careful and complete evaluations.

Our primary outcomes are loan officer beliefs (Section B) and the two capital allocation decisions: the final score (Section D) and loan consideration (the last question). For beliefs, loan officers were explicitly incentivized for prediction accuracy. They were also informed that their responses in this section would have no bearing on the awarding of the capital from the competition.²⁴ This separation was intentional: because we study beliefs as a mechanism underlying capital allocation decisions, we wanted to ensure that the loan officers had no incentive to manipulate stated beliefs to influence capital allocation outcomes.²⁵

The final score determined the competition prizes. The loan officers' objective was thus to provide the highest scores to the applicants that they most wanted to win a prize. This scoring task

²⁴In the orientation, the loan officers were told that “this information is collected to understand what characteristics determine business success. We are collecting information from experts, such as yourself, since you are best equipped and knowledgeable to predict a business's success.” Comprehension checks reinforced this distinction, including a question on which parts of the evaluation would be used to determine the final competition scores.

²⁵Our incentive structure ensured that the loan officers did not face any external incentive to align their stated beliefs with their capital allocation preferences. However, we would not expect the outcomes themselves to be independent. If a loan officer perceives a business as more likely to succeed, they may prefer to allocate capital to it, particularly for loans. Judges might have also felt internally compelled to ensure consistency between their detailed assessments and their final capital allocation decisions. However, since comparable appraisal forms and documents are standard in loan reviews, such internal consistency effects would closely mirror real-world lending decisions.

was intentionally designed to allow for subjectivity in loan officers' decisions. Unlike the specific and quantifiable prediction tasks in Section B, Section D allowed loan officers to weigh subjective priorities. For example, loan officers could personally value gender equity or other social objectives and therefore direct capital towards particular businesses by scoring them higher. On the other hand, they could express preference-based discrimination by scoring female-owned businesses lower. Such internalized preferences may influence decisions in their lending institutions, even without explicit institutional mandates. Discussions with six lending institutions confirmed that although credit reviews include formal financial analysis, loan officer judgment is central, and this analysis itself requires subjective interpretation. By allowing for subjective evaluations in the final score, we capture this element of judgment that characterizes routine lending practice outside the experimental setting.

Finally, the loan consideration decision was designed to be a more natural proxy for the incentives loan officers face in initial loan appraisal at their institution. This addresses the concern that decisions for a grant given by an external institution may not reflect lending decisions. We framed the question as logistical coordination, making it clear that the decision was not part of the competition or any EDI evaluation.²⁶ However, loan officers were informed that EDI would notify their institution of their recommendation and would forward the applicant's information, though it is not clear whether the forwarded applicant would be assigned to the referring loan officer's portfolio.²⁷ Thus, loan officers' incentive was to forward applicants likely to successfully receive a loan from their institution. This loan consideration decision was thus designed to proxy for how loan officers evaluate an applicant in the initial loan screening at their institution, though we recognize that the competition setting itself differs from a routine lending environment.

²⁶The decision was described in the orientation guide as being for "internal purposes only" and as being asked for "internal coordination purposes only between EDC and your institution."

²⁷In conversations with lending institutions, we found variation in how clients are recruited and assigned to loan officers. Some loan officers do recruit to their own loan portfolios. Other institutions have dedicated departments for client recruitment, which assign applicants to the loan officers.

2.7 Random Assignment

We duplicated each application so it would be shown at least once as male-owned, and at least once as female-owned.²⁸ We then randomly assigned each duplicate to be shown as either male or female to loan officers, in a random order. Each loan officer received 48 or 49 application forms (referred to as their “application packet”).^{29,30} The median number of reviews per business was 4, and the median number of evaluations completed by a loan officer was 48 (Appendix Figure A3). Randomly assigned gender is uncorrelated with loan officer characteristics (Appendix Table A3).

2.8 Estimating Equations: Identification of Gender Discrimination

We estimate the effect of randomly assigning the business owner to be shown as male on capital allocation decisions:

$$Y_{ij} = \beta_1 * RandomlyAssignedMale_{ij} + \alpha_i + \alpha_j + \epsilon_{ij} \quad (1)$$

where *RandomlyAssignedMale* indicates that applicant *i* assigned to loan officer *j* was shown as male. The specification includes applicant and loan officer fixed effects and uses robust standard errors.³¹ We study two pre-specified capital allocation outcomes. The first is the overall final score, which determined the winners of the business plan competition. The second is an indicator of whether the loan officer selected the business to be forwarded to their institution for loan consideration.

We next estimate Eq. 1 on three pre-specified loan officer predictions of future business performance: survival, profits, and assets. We estimate beliefs both with and without additional capital.

²⁸Each application is duplicated two to eight times. The number of times they were duplicated was randomly determined.

²⁹If an applicant was assigned to the same loan officer twice, we dropped one of the duplicates from the loan officer’s packet.

³⁰We discuss ethical considerations related to this design in Appendix A.1.2.

³¹Since randomization is at the evaluation level, we do not cluster at the loan officer level (Abadie et al., 2023).

The differences in these predictions capture the loan officers' expectations on the return to capital by gender. We also estimate Eq. 1 on loan officers' beliefs about repayment, which was not pre-specified.

We limit our primary analysis sample to evaluations in which the loan officers completed all pre-specified outcomes. We impose this restriction to ensure a consistent analysis sample across all outcomes and avoid changes in sample composition that could confound comparisons. Results are robust to removing this restriction: completion rates do not differ by randomized gender, and the main findings remain unchanged (see Appendix Tables A4 and A5). Our primary analysis sample consists of 3,696 completed evaluations of 916 businesses by 84 loan officers. In this sample, 910 businesses were evaluated by multiple (2 to 8) financial providers, and 83 loan officers reviewed multiple applicants (2 to 79). 82 of these loan officers reviewed applications with variation in randomly assigned gender.³²

3 Results

3.1 Identifying Discrimination: Capital Allocation Decisions

The randomly assigned gender of the business owner did not affect loan officers' capital allocation decisions, either for the capital prize in the competition or for consideration for a loan at their own institution. Table 2, Panel A, Column 1 shows that the final score, which determined the competition prizes, is not statistically different whether the applicant was shown as male or female. In fact, when applicants were shown as male, they received slightly lower scores. The point estimate for the difference is -0.105 points (on a scale from 2 to 20), which amounts to a difference of less than .03 standard deviations (sd). These results indicate that loan officers did not discriminate by

³²Assuming 80% power and a 5% significance level, our sample size implies a minimum detectable effect of 0.09 standard deviations in a simple two-mean comparison without fixed effects. Because our main specifications include application and loan officer fixed effects, this threshold is a conservative upper bound on the MDE. Consistent with this, our confidence intervals are sufficiently narrow to rule out effects of any meaningful size.

applicant gender in the allocation of capital in the business plan competition. Columns 2 through 4 document differences in each component of the final score (each ranging from 1 to 10), and we find no meaningful differences by randomly assigned business-owner gender.

Randomly assigned business-owner gender similarly did not affect the loan officers' decision to send the applicant's information to their own institution for loan consideration, which is our closest proxy for standard credit screening (Table 2, Panel A, Column 5). The point estimate is a less than .16 percentage point (pp) difference in the probability of forwarding an applicant.

The standard errors for both estimates are very small, allowing us to rule out meaningful differences by randomly assigned gender in either decision. For the final score, which determined the competition prizes, the 95% confidence interval is narrow (-.337 to .127), a range of merely -.07 to .03 sd.³³ For loan consideration, the 95% confidence interval rules out effects larger than a 2.9 pp advantage for men.³⁴ The consistency of the null result across both outcomes suggests that the absence of discrimination is not specific to either the grant or the lending context. However, it is worth noting that the point estimates for loan consideration favored men, but did not for the final score.

This lack of discrimination is consistent across the distribution of final scores (Appendix Figure A4). Throughout the distribution of business quality, randomly assigned gender had no meaningful effect on the evaluation of the business. A Kolmogorov-Smirnov test finds no statistical difference

³³Even at the upper bound of the confidence interval (a 0.127-point difference), such a change would not have altered the identity of the top five capital prize winners. A gain of this magnitude would, on average, increase an applicant's rank by about 5% in the overall distribution of unique scores.

³⁴This corresponds to an upper bound of men being 5.7% more likely than women to be forwarded to be considered for a loan. This is considerably smaller than the percent effects documented in other experimental studies that do find evidence of gender discrimination (Alibhai et al., 2019; Brock and De Haas, 2023; Bartös et al., 2024).

Table 2: Gender, Capital Allocation, and Business Performance Beliefs

Panel A: Causal Effect of Gender on Capital Allocation Decisions								
	(1) Score	(2) Overall	(3) Value Prop	(4) Entrepren	(5) Loan			
Male	-0.105 (0.116)	-0.0478 (0.0611)	-0.0550 (0.0626)	-0.0596 (0.0650)	0.00159 (0.0140)			
Observations	3696	3696	3696	3696	3696			
Female Mean	12.06	5.990	6.079	6.069	0.495			
Panel B: Effect of Gender on Business Performance Beliefs								
	(1) Surv. w/o Cap	(2) Surv. w/ Cap	(3) W. Profit w/o Cap	(4) W. Profit w/ Cap	(5) W. Assets w/o Cap	(6) W. Assets w/ Cap	(7) Repay	
Male	-0.0944 (0.636)	-0.0339 (0.666)	1.665 (4.208)	-8.534 (7.895)	60.09 (46.85)	52.75 (65.42)	-0.00574 (0.0143)	
Observations	3696	3696	3696	3696	3696	3696	3584	
Female Mean	50.47	60.08	42.41	84.57	778.4	1089.4	0.663	
Panel C: Final Score Correlates with Business Performance Beliefs								
	(1) Surv.	(2) Surv.	(3) W. Profit	(4) W. Profit	(5) W. Assets	(6) W. Assets	(7) Repay	(8) Repay
Score	2.579*** (0.100)		7.733*** (0.946)		99.40*** (15.13)		0.0625*** (0.00160)	
Loan		15.53*** (0.830)		53.45*** (8.251)		499.9*** (88.49)		0.521*** (0.0159)
Observations	3696	3696	3696	3696	3696	3696	3584	3584

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. In Panel A, Score is the final score in the business plan competition, determined by Overall Impression (Overall) + .5* Value Proposition (Value Prop) + .5*Entrepreneurial Credibility (Entrepren). Each of these subscores is on an increasing scale of 1 to 10. Loan indicates whether the application was forwarded by the loan officer to their own institution for loan consideration. In Panel B, Survival, Profits, and Assets are loan officer expectations with and without additional capital. In Panel C, they are the loan officer expectations without additional capital. Profit and Assets are in thousands of ETB. Survival is the probability of survival, from 0 to 100; W. specifications winsorize the variables at the 1st and 99th percentiles. Repay is an indicator for whether the loan officer reported that they believed the applicant would repay a 3-year 100,000 ETB loan. Panels A and B include loan officer and application fixed effects, with robust standard errors in parentheses. Panel C includes loan officer fixed effects, with standard errors clustered at the application level.

between these two distributions, with a p-value of 0.639. Similarly, we find no differences in the variance of final scores by gender.³⁵

We also find no evidence of gender discrimination across pre-specified dimensions of heterogeneity in business owner, business, and loan officer characteristics. Estimated gender differences are small and statistically insignificant by marital status, education, number of children, and operation in a male-dominated industry (Appendix Tables A6 and A7). Non-pre-specified exploratory analyses of heterogeneity by applicant age, baseline profits, number of employees, and business age similarly find no evidence of discrimination.³⁶ We also examine heterogeneity by loan officer characteristics, including institutional environment, loan officer gender, years of experience, and portfolio gender composition. We find no evidence of discrimination, with one exception: loan officers with less industry experience favor women in their final scores, and this favoritism declines with greater experience (Appendix Table A8). At the mean level of industry experience, we find no evidence of discrimination toward either gender. Overall, the 95% confidence intervals indicate that even if gender discrimination exists within specific subgroups, its magnitude is small. Additional discussion of the heterogeneity analyses and confidence interval magnitudes is provided in Appendix A.2.

We do find evidence that the gender of the first application reviewed affects how loan officers calibrate their evaluations. Loan officers whose first evaluation was randomly assigned to be male awarded higher competition scores and were more likely to forward that application for loan consideration than loan officers whose first evaluation was female (Appendix Table A9, Col 1-2). First applications differ somewhat on observable characteristics, but controlling for these characteristics does not eliminate the gender difference. This pattern does not, however, manifest as differential treatment of male and female applicants within evaluation packets.³⁷ Instead, loan officers who

³⁵We test for differences in variance using the Stata command `sdtest` and `robvar`, which implement the proposed tests by Levene (1960) and Brown and Forsythe (1974) respectively.

³⁶Though heterogeneity by widowhood is statistically significant in loan consideration decisions, this result is based on only 91 evaluations.

³⁷The anchoring pattern does not change our main results even when we limit the sample to early

happened to first receive a male application assigned higher scores and forwarded applications at higher rates for all subsequent businesses, regardless of applicant gender, and this difference remains even when excluding the first application (Appendix Table A9, Col 3-4).

These results are consistent with gender influencing the calibration of loan officers' evaluation scales rather than generating discrimination within loan officers. One interpretation is that the first application served as an anchor for loan officers' internal benchmark of business quality, and beginning with a male applicant shifted the perceived center of the quality distribution and led to more lenient evaluations overall. From a broader perspective, this finding suggests that in new or unfamiliar evaluation contexts, such as novel financial products or borrower populations, the initial gender composition of cases can shape evaluators' reference points and thereby affect the overall level of assessments. However, because this anchoring effect altered the overall scoring level rather than the relative treatment of male and female applicants, it does not generate gender discrimination in capital allocation decisions either within loan officers or in the aggregate. Thus, while we find evidence of an anchoring effect in how loan officers calibrated their evaluations, this does not change our main finding that loan officers did not treat male and female applicants differently within evaluation packets.

3.2 Identifying Discrimination: Beliefs

Consistent with a lack of belief-based discrimination, loan officers predicted similar future business performance for applicants shown as male or female. As described in Section 2.4, the loan officers predicted both business performance one year after the application submission and the likelihood that the applicant would repay a three-year loan. Table 2, Panel B, shows no difference in expectations of survival likelihood (Columns 1 and 2), profit (Columns 3 and 4), or assets (Columns 5 and 6) by observations (Appendix Table A10). We also find no evidence that the anchoring pattern restarts. We originally planned to send loan officers multiple rounds of applications, allowing us to test whether the first application in each round exhibits gender discrimination (Appendix Table A9, Column 5 and 6). However, in most cases, the rounds were sent at the same time due to the pandemic.

applicant gender. This null holds for predictions both with and without additional capital.³⁸ Column 7 shows that loan officers did not expect gender differences in loan repayment likelihood, suggesting that even when evaluating the outcome of direct interest to financial institutions, they did not perceive female applicants as riskier borrowers.

These results on future business performance extend to the full distributions: comparing the CDF of expected profits and assets by gender, we find similar results (Appendix Figure A5). In each scenario and outcome, Kolmogorov-Smirnov tests fail to reject equality across the two distributions. We also find no gender differences in variance, except that the variance in expected profits with additional capital is slightly higher among female-owned businesses.³⁹ Taken as a whole, the loan officers did not expect gender differences in business growth potential, even after receiving a capital infusion.

To further examine whether this lack of belief-based discrimination masks heterogeneity across judges, we estimate individual-level “discrimination coefficients” for each belief outcome. These coefficients capture, for each loan officer, the difference in predicted performance between male- and female-assigned applications. The distribution of these coefficients is centered at zero, with the highest density at zero. The overall null is therefore not driven by offsetting biases, where some loan officers favor male applicants and others favor female applicants.

These results indicate that loan officers exhibit no belief-based discrimination by business owner gender. Combined with the lack of discrimination in capital allocation decisions, this rules out both statistical and taste-based discrimination.

An additional battery of pre-specified robustness tests confirms the lack of discrimination: weighting evaluations so that each loan officer has equal weight (Tables A13 and A14); controlling for the order in which evaluations were assigned (Tables A15 and A16); using the gender as reported by the loan officer (Table A17); excluding 5% of loan officers with the least amount of variation

³⁸Appendix Table A11 shows no differences in beliefs about return to capital by business owner gender. Appendix Table A12 includes beliefs on employment, an additional prespecified variable.

³⁹This difference in variance is not robust to winsorizing profit expectations.

in their final score (Table A18); limiting the sample to the first five applications given to the loan officer (Table A10); and removing loan officer fixed effects (Table A19). We also confirm robustness to limiting the sample to loan officers who passed various attention and internal consistency checks: correctly answering 75% and 100% of the verification questions (Tables A20 and A21), application information predicted the final score with a p-value of less than .15 (Table A22), and predictions of profits and firm survival with capital were higher than predictions without capital (Table A23).⁴⁰ Finally, we assess robustness to the composition of judges by bootstrapping the set of judges and re-estimating the main specification across 1,000 replications, finding that in 84.4% of cases, the gender effect remains statistically insignificant at the 5 percent level. The main finding of no discrimination in the evaluation of businesses is remarkably robust.

3.3 Validity of Evaluations

Several pieces of evidence indicate that the loan officers were attentive and thorough when evaluating businesses. First, though gender did not affect evaluations, other business characteristics did. Table 3 shows that businesses with higher profits, greater assets, and business plans that projected more employees and greater revenue received higher competition scores and were more likely to be forwarded to the lending institution.⁴¹

Second, the loan officers completed the verification section of the evaluation form with high accuracy. As described in Section 2.5, the loan officers verified the applicant's gender and other demographic characteristics before completing the evaluation. They correctly recorded the applicant's gender in 98.5% of evaluations, the age in 97% of evaluations, experience in 96% of evaluations, and employment status in 95% of evaluations.

Third, evaluations were internally consistent. The loan officers predicted businesses would perform better with capital than without in most evaluations. In 92% of evaluations, loan officers

⁴⁰Some robustness checks are not expected to hold for every application or evaluation. For example, loan officers may reasonably believe that additional capital could reduce performance for some businesses. However, we expect these patterns to hold on average.

⁴¹Column 1 was pre-specified in our analysis plan.

Table 3: Baseline Business Characteristics Predictive of Capital Allocation Decisions

	(1) Score	(2) Loan
Profits (IHS)	0.136*** (0.0201)	0.0104*** (0.00173)
Employees	0.000141 (0.000359)	0.0000563** (0.0000269)
Assets (IHS)	0.254*** (0.0258)	0.0190*** (0.00255)
Liabilities (IHS)	-0.0108 (0.0116)	-0.000353 (0.00135)
Initial Yr	0.0197* (0.0114)	0.00125 (0.00101)
Projected Employees	0.00313** (0.00143)	-0.0000309 (0.000104)
Projected Revenue (IHS)	0.224*** (0.0290)	0.0137*** (0.00300)
Industry Exp.	0.0136 (0.0155)	0.00239 (0.00187)
Observations	3696	3696
F	40.59	28.18
pvalue	4.41e-57	7.79e-35

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Each independent variable is interacted with an indicator for the variable being missing, which is not shown. All independent variables are information reported by the applicant and viewed by the loan officer. Specifications include loan officer fixed effects, and standard errors are clustered by application.

predicted the business would be at least as likely to be operational in a year with additional capital as without. Evaluations are similarly consistent with and without capital for the projected number of employees (93%), assets (93%), and profits (84%).

Fourth, capital-allocation decisions tracked loan officers' beliefs about future business performance. Loan officers gave higher final scores and were more likely to forward businesses that they expected to survive, generate higher profits, have greater assets, and to repay a loan (Table 2, Panel C). The endline survey also confirms that both the final score and loan consideration decision were predictive of firm survival and profits 18 months after the competition (Table A24).

Finally, evaluations showed substantial within-officer variation, suggesting that loan officers engaged thoughtfully with each application. The average range of scores used by a loan officer is 13.8 out of a possible 18, with an average within-officer standard deviation of 3.6. Loan officers recommended 50% of their businesses for loan consideration, on average, and all but five forwarded at least one application. None forwarded all the businesses they reviewed.⁴²

3.4 Implications for capital targeting and accuracy of beliefs

A key contribution of our paper is to compare loan officers' decisions and beliefs with actual gender gaps in business performance. This comparison answers two questions: whether the absence of discrimination involves a trade-off between gender equity and profit maximization, and whether loan officers' beliefs about gender are accurate.⁴³

⁴²These statistics are based on 83 loan officers that are in our main sample and had more than 1 evaluation.

⁴³Some of the analysis in this section deviates from our original pre-analysis plan. The original pre-analysis plan considered only statistical significance, as opposed to meaningful differences in the theoretical context of discrimination or differences across estimations. We report main outcomes from the original pre-analysis plan in Appendix Table A24 and A25, and explain the limitations of the original pre-specified analysis plans where relevant. The analysis put forth in this section still maintains the purpose of the original plan. We did not conduct simulations on policies to reduce

In models of accurate statistical discrimination, considering gender can improve predictions about the future performance of businesses. If financial providers accurately believe that female-owned businesses perform differently, conditional on all other observable information, belief-based discrimination can be profit-maximizing. In our case, loan officers' beliefs do not differ by business-owner gender. If those beliefs are accurate, the absence of discrimination is consistent with targeting capital toward the highest-performing businesses. However, if they are inaccurate, and business-owner gender does predict performance, the lack of gender discrimination instead comes at a cost of selecting lower-performing businesses. We assess this by linking the loan officers' beliefs to real endline business performance, measured 18 months after the competition.⁴⁴

An effective test of belief accuracy is to compare beliefs to outcome data (Bohren et al., 2025; Manski, 2004). We compare loan officers' beliefs about gender differences in future business performance to the actual differences measured in our follow-up survey. Conditional on loan officers' final score, male-owned businesses were 2.69% more likely to still be operational and earned 4539.4 ETB more profit at endline (Appendix Table A24).⁴⁵ While the endline gender differences are statistically significant, the real mean gender difference is within the 95% confidence interval of the loan officers' beliefs (Table 2, Panel B).^{46,47} Thus, the direct comparison of subjective mean beliefs with mean outcomes fails to reject that loan officers' beliefs are accurate.

Belief accuracy matters because discrimination could be justified if it improves targeting of discrimination, as we did not find discrimination.

⁴⁴Appendix Table A26 confirms that our main results on discrimination in capital allocation are robust to the sample we successfully surveyed at endline.

⁴⁵Consistent with the belief measures, these outcomes are also winsorized to ensure that both variables are treated in the same way and results are not driven by outliers.

⁴⁶The same is true when conditioning on the loan consideration decision, and when conditioning on business characteristics presented in the competition application (shown in Table 3).

⁴⁷Appendix Table A25 estimates differences in gender on additional measures of business performance prespecified in the study's pre-analysis plan.

capital toward higher-performing businesses. While beliefs were not statistically different from actual gender differences in business performance, male-owned businesses earned significantly more profit than female-owned businesses. We therefore ask whether the actual gender gap in business performance is large enough to justify discrimination. If it is not, we can conclude that the loan officers' beliefs were "accurate enough," in the sense that incorporating gender would not have changed the capital allocation a profit-maximizing lender would choose, consistent with what a model of accurate statistical discrimination would predict.

A statistically significant gender gap in profits does not automatically imply that gender is an effective proxy for targeting profitable businesses. This is because using gender as a predictor may lead to overfitting, where gender appears predictive in sample data but does not reliably indicate higher profitability across different groups or future cases. Combined with cognitive limitations, the effectiveness of gender as a proxy depends on whether it provides stronger predictive value than other characteristics of the business.

We assess whether the gender gap is large enough to justify discrimination by asking whether gender is an important variable in an optimal prediction of business outcomes. A natural starting point is an OLS regression of business outcomes on all information shown to loan officers. A crude measure of the predictivity of this regression is the R^2 .⁴⁸ We quantify the predictive value of gender by comparing the R^2 in a regression with and without gender. Using a regression of winsorized endline profits on all quantifiable information shown to loan officers, including gender increases the R^2 by only 1.9% (0.2447 versus 0.2401).⁴⁹ This is consistent with the loan officers' beliefs

⁴⁸Note that statistical significance is different from predictivity (Lo et al., 2015). Because the R^2 is a measure of the distance between the values predicted by OLS and the true values in the sample, it is one possible measure of the predictivity of the model.

⁴⁹In contrast, the inclusion of profits alone increases the R^2 by 2.9% (0.2447 v. 0.2379). The contribution of revenues is 2.5% (0.2447 v. 0.2386) and the contribution of assets is over 10% (0.2447 v. 0.2223).

being accurate: accounting for gender did not meaningfully improve model predictivity. However, a major concern with this naive linear regression is overfitting, where the model captures noise and random fluctuations in the data rather than the underlying relationship between the predictors and the outcome.

Machine learning methods aim to construct prediction models that reduce overfitting and thus minimize out-of-sample prediction error. A more robust way of quantifying the importance of gender is to use a machine learning algorithm to select optimal predictors of endline business profits.⁵⁰ We assess whether such algorithms will select gender as an important predictor from the same set of application variables used in the OLS regression above.

There are numerous potential algorithms for selecting optimal predictors of profits in this setting.⁵¹ We provide results from three common methods (Athey and Imbens, 2019). We first use the least absolute shrinkage and selection operator (LASSO), which has been widely used for variable selection in linear regression models in the economics literature (Baylis, Heckeleei and Storm, 2021). The LASSO introduces a penalty that shrinks coefficients in the regression model toward zero, producing a small set of predictors with non-zero coefficients. The penalty prevents overfitting, reduces the risk of multicollinearity, and enhances predictive accuracy with a simplified model. The magnitude of this penalty influences the number of variables selected (i.e., models with larger penalties select fewer variables). We use 10-fold cross-validation to optimally select this penalty, a process that relies on randomly splitting the data into 10 subsamples and selecting the penalty parameter that minimizes out-of-sample prediction error.⁵² This randomness implies that

⁵⁰These methods also reduce researcher degrees of freedom in a similar way to pre-specification.

We use the default settings for all methods.

⁵¹We use profits winsorized at 99% as the target variable for all methods.

⁵²For each fold, the algorithm fits a linear regression on the remaining nine folds, then calculates the prediction error on the tenth fold. This is done for each fold, creating a mean prediction error across the ten folds for each penalty parameter λ_k . The algorithm then selects the λ_k that minimizes this prediction error.

the variables selected may be slightly different each time the algorithm is implemented. Therefore, to assess the importance of gender as a predictor, we conduct 1,000 trials of the LASSO and record how often each of the 94 application variables is selected.

A drawback of the LASSO and other penalized linear regression methods is that variable selection can be unstable when the predictors are highly correlated, which is true in our setting (Zhao and Yu, 2006). Tree-based methods provide a more robust alternative (Athey and Imbens, 2019). These approaches recursively split the data into subsets based on values of the predictors (e.g., male versus female or above versus below a certain threshold), then estimate predictions in each subset. Each split aims to minimize the sum of in-sample squared errors across all subsets, and the average squared error reduces with each subsequent split. The subsets are called leaves, and the entire sequence of splits and subsets is called a tree. We provide results from two tree-based algorithms. The random forest averages over a large number of trees, where each tree is based on a bootstrap sample, and the splits at each stage are based on a random subset of the covariates that change every split (Athey and Imbens, 2019). Extreme gradient boosting (XGBoost) similarly averages over a large number of trees, but each sequential tree is designed to reduce the prediction error of the previous tree (Chen and Guestrin, 2016). Tree-based methods do not perform variable selection explicitly. However, it is possible to measure the contribution of each variable to prediction accuracy by calculating the reduction in the variance of the target variable (a proxy for prediction accuracy) when that variable is used in a tree split. This measure, known as feature importance, can be used to rank the variables.⁵³

The results from the machine learning exercise show that gender is not among the most important predictors of business outcomes (Table 4). Panel A shows the variables most frequently selected by LASSO. LASSO tends to drop highly correlated predictors; the mean number of variables selected is 2.49, and only two variables are selected in over 50% of the 1,000 simulations. Gender is selected in just 5% of simulations. Panel B shows the top 5 variables in terms of feature importance in the random forest and XGBoost, as well as the importance and rank for gender. Gender ranks 52 in

⁵³Tree-based methods tend to perform well “out of the box” (Athey and Imbens, 2019). Therefore, we use the default tuning parameters for random forest in Stata and XGBoost in R.

importance (out of 94 variables) in the random forest and 67 in importance in XGBoost.

These results confirm that loan officers' beliefs about gender are accurate enough: considering gender would not meaningfully improve their ability to target the most profitable businesses.⁵⁴ There is no meaningful trade-off between gender equity and the targeting of successful businesses.

The machine learning exercise serves as a clear benchmark for loan officers' optimal capital allocation decisions. By design, the algorithm and the loan officers share the same objective: to predict the business's future performance. Furthermore, the machine learning algorithms use only the quantifiable information from the application, a subset of what loan officers observed. Since the additional information observed by the loan officers is independent of gender by design, gender is at least as informative for the algorithm as for the loan officers. Lastly, a large literature highlights that humans have limited cognitive resources when making decisions (i.e., limited attention).⁵⁵ These cognitive constraints force loan officers to rely on a limited set of criteria, while the algorithms face no such limit.

Comparing the machine learning predictions to loan officers' predictions demonstrates why loan

⁵⁴Another way that loan officers might consider gender is by evaluating male and female applicants differently (Chioda et al., 2024). When running the machine learning algorithms separately, we find that although there are some differences in the variables identified as most important for male and female applicants, profits, assets, and other business characteristics appear as the most important predictors of business success.

⁵⁵Limited attention has been the subject of a large theoretical and empirical literature in economics; see for example, Sims (2003) and reviews by Wiederholt et al. (2010), Gabaix (2019) and Maćkowiak, Matějka and Wiederholt (2023). Lieder and Griffiths (2020) discuss how these models fit into the broader psychological literature on human cognitive limitations. Bartoš et al. (2016) discuss endogenous allocation of attention as an aspect of discrimination; we do not find evidence for this type of effect given that we document an absence of discrimination.

Table 4: Optimal Predictors of Business Profits

Panel A: LASSO		
Variable	Share Included	Rank
Projected Revenue from Second Highest Source	0.746	1
Tax Liabilities	0.746	2
Projected Administrative Expenses	0.170	3
No Business License	0.126	4
Profit Missing	0.126	5
Female	0.050	12
Panel B: Tree-based methods		
Variable	Importance	Rank
<i>Random Forest</i>		
Total Assets	1.000	1
Profit	0.926	2
Total Expenditure	0.920	3
Fixed Assets	0.888	4
Current Revenue from Second Highest Source	0.861	5
Female	0.209	52
<i>XGBoost</i>		
Profit	0.176	1
Work Experience	0.060	2
Fixed Assets	0.054	3
Age	0.054	4
Salary Expenditures	0.032	5
Female	0.001	67

officers did not discriminate despite the unconditional gender gap in profits. The importance of gender in predicting business performance is dwarfed by the other information in the application (and in a typical loan application more generally), even with a statistically significant gender difference in business performance. Relative to the machine learning benchmark, loan officers' beliefs were not different enough from reality to affect how capital should be awarded.

Together, these results show that the loan officers' decisions are consistent with a model of decision-making based on accurate beliefs. Loan officers do not believe that gender predicts business performance, and in accordance with these beliefs, they do not discriminate. The machine learning results confirm that the predictive value of gender is not large enough to justify statistical discrimination. Loan officers' beliefs are therefore accurate enough to respond to gender in a manner consistent with profit maximization, and there is no meaningful trade-off between gender equity and targeting capital towards successful businesses.

3.5 External validity: generalizability to the financial sector

We next discuss the generalizability of this study using the SANS (Selection, Attrition, Naturalness, Scaling) framework (List, 2020), focusing on Selection (comparability to the population of interest) and Naturalness (similarity of the choice task to the natural setting). We evaluate the extent to which our results are informative about gender discrimination in capital grants and initial applications for loans in capital markets in Ethiopia. A more detailed discussion can be found in Appendix A.3.

Selection: EthioSpur recruited businesses actively seeking capital, similar to those served by formal financial institutions. Applicants' business characteristics also closely resemble those in the only other dataset of potential borrowers in Ethiopia (Section 2.3; Alibhai et al., 2021). Participation is self-selected and applicants are likely positively selected on factors such as education or business performance. However, we find no heterogeneity in gender discrimination by baseline profits or number of employees, suggesting that greater business success does not attenuate discriminatory patterns. Additional evidence from a subsequent competition year also shows substantial overlap in observables between competition applicants and loan applicants, implying that selection into a grant competition versus a loan is unlikely to meaningfully affect loan officers' responses (Manian and

Sheth, 2025). Taken together, these patterns suggest that our sample overlaps with the population of entrepreneurs that loan officers evaluate and that participate in formal credit markets. We provide more details on these factors in Appendix Section A.3.2.

We next assess the selection of loan officers. The loan officers who judged the competition were real decision-makers from microfinance institutions and commercial banks in Addis Ababa. The primary concern is whether participation as a judge was correlated with loan officers' underlying propensity to discriminate by gender. There is no indication of this. Competition materials made no reference to women or inclusive finance, and we find little evidence that discrimination varies with loan officer characteristics associated with gender bias (Appendix Table A8). The one exception is that loan officers with less experience in the financial industry favored women when allocating competition grants, though not in the loan-forwarding decision. Our sample has 11 years in finance on average. If our sample were more experienced than the population of loan officers, our results would understate the degree of favoritism toward women, at least in grant decisions. Appendix Section A.3.3 provides additional discussion.

Naturalness: A key concern for naturalness is whether behavior is affected by experimenter demand (motivation to please the researcher) or social desirability bias (motivation to please the competition host, EDI). Our results are unlikely to be influenced by either. Experimenter demand is unlikely because loan officers were unaware of their participation in an experiment, and all communication occurred through a project manager blinded to the research question and the randomized gender assignment.

Several features of the setting reduce concerns about social desirability bias. First, competition materials and the loan officer orientation emphasized identifying promising businesses and allocating limited funding effectively, without mentioning gender or inclusive growth.⁵⁶ Second, loan officers were given explicit objectives for each evaluation question, none of which mentioned gender. Third,

⁵⁶For example, loan officers were instructed to identify those who would contribute to “the country’s economic growth and employment opportunities” and decide “where limited funding for entrepreneurs is put to the best use.”

other than the loan recommendations, the completed evaluation forms were confidential and de-identified to all EDI staff and researchers, except for the project manager. Fourth, we find no evidence of favoritism toward younger entrepreneurs, another under-resourced group referenced in EDI's mission. Finally, each outcome was incentivized differently, yet our results are consistent across all three measures: monetary prize (beliefs), capital awarded by EDI (final score), and loans from one's own institution (loan consideration). Appendix A.3.1 provides additional detail on experimenter demand and social desirability. Appendix A.3.5 further discusses the naturalness of the setting and the similarity of the decision environment to a loan application.

The absence of messaging on women, explicit evaluation criteria, anonymity in evaluations, and consistency of results across different objectives together make social desirability biases an unlikely explanation for our findings. That said, we acknowledge that we cannot completely rule out the possibility that loan officers inferred an implicit objective to advance women-owned businesses beyond what is typical in the financial sector.

Priming and the Evaluation Form: A potential concern is that asking judges to predict future business success before making capital allocation decisions primed them to focus on financial information and suppressed bias that might otherwise have emerged. While we cannot rule this out, interviews with key personnel from six financial institutions indicate that it mirrors standard credit evaluation processes in Ethiopia, where officers use structured processes that prompt similar consideration of financial information. We discuss this potential priming effect in more detail in Appendix Section A.3.6. Omitting Section B would therefore have reduced, rather than enhanced, the external validity of our findings on capital allocation decisions.

Nevertheless, our design necessarily abstracts away from more complex, institution-specific processes. In particular, the sequencing of information and the use of a continuous competition score rather than a binary screening decision may differ from some lenders' typical practice and could affect how bias manifests. These considerations should be kept in mind when interpreting our results, though the core evaluative elements in Section B reflect dimensions that loan officers routinely assess using discretionary judgment across lending institutions.

Section C of the evaluation form, which focuses on managerial ability, alternative sources of finance, household income reliance, and market demand, may raise similar concerns. However, Section C aimed explicitly to probe mechanisms commonly cited as sources of discrimination against women-owned businesses, and thus would, if anything, prime judges toward gender bias.

Boundaries of Generalizability: Our context is most similar to the early stages of a loan review process, though capital requests often involve subsequent steps where gender discrimination may arise. Theory provides guidance on the relevance of our findings for these later stages. It predicts that discrimination should become less likely as additional interactions increase information and reduce reliance on gender as a signal. Backward induction further limits the scope for preference-based discrimination at these stages (Aigner and Cain, 1977; Guryan and Charles, 2013). However, discrimination may arise in later stages if the process becomes less structured. For example, Goldstein et al. (2023) demonstrate that in the absence of a formal process, the questions asked to prospective borrowers vary by gender, leading to lower approval rates for female applicants. Whether these predictions hold in practice remains an open question for future research.

3.6 Lessons from the literature

A growing experimental literature on gender discrimination by loan officers in low- and middle-income countries has found discrimination in some contexts and margins of business credit. We discuss three factors that help reconcile our findings with this literature—information, stakes, and contextual differences in gender norms—and what they imply about when discrimination is likely to arise.

We focus on three closely related experiments that found gender discrimination in low- and middle-income countries. Alibhai et al. (2019) presented Turkish loan officers with four fictional loan applications and found they allocated less hypothetical money to female-owned businesses. Also in Türkiye, Brock and De Haas (2023) had loan officers review real loan applications previously processed by their bank, with gender randomized. They made two hypothetical decisions: loan approval (incentivized based on the loan’s real-world performance) and guarantor request (not incentivized). They found no gender discrimination in incentivized loan approval but did find it

in guarantor requests. Bartös et al. (2024) in Uganda had loan officers evaluate real start-up pitch decks, the gender of the founder and CEO randomized. Loan officers received a small endowment to “invest” in the start-ups, with returns based on the businesses’ real performance two years later. They invested less in single-owner female-owned start-ups and were less likely to select them as the best business.

Statistical discrimination models predict that gender discrimination is less likely in contexts with more information, and evidence in the four experiments is consistent with this prediction. Although we lack random variation in missing information, we find evidence of discrimination when *all* key pieces of information were missing: loan officers were 13.7 pp more likely to recommend male-owned businesses for a loan, a result statistically significant at the 5% level.⁵⁷ This is the pattern predicted by statistical discrimination: given that male-owned businesses in our follow-up survey were more likely to survive and had higher profits, we should expect gender to affect decisions when loan officers observe gender but lack additional business information. Brock and De Haas (2023) provided a similar level of information to our experiment and found no gender discrimination in the incentivized measure of loan approval. In contrast, Alibhai et al. (2019) used less detailed fictional applications, and Bartös et al. (2024) evaluated start-up pitches with no business track record. This suggests gender discrimination may matter more for start-up capital, where there is mechanically less information about a business’s success, and less for existing businesses seeking growth capital. Since existing businesses represent the majority of credit demand, the information mechanism suggests that we may not expect widespread discrimination in credit markets. A key policy implication is that sufficient and salient business information should be provided alongside information about gender at all points of decision-making, including early stages of a longer sequence of credit decisions.

Another key factor is the stakes faced by loan officers. Standard models predict that taste-based discrimination, including norm-driven biases, decreases as costs increase and can disappear when

⁵⁷The key pieces of information are profits, employees, assets, liabilities, business age, years in industry, projected revenues, and projected employees. These data were missing not due to applicant omission, but because of an implementation error during transcription for a subset of 30 applications.

the stakes are high enough (Becker, 1957). The studies discussed above used small or no payouts. Brock and De Haas (2023) only found discrimination on a margin that they did not incentivize. Our experiment, in contrast, was embedded in a real business plan competition with substantial capital at stake. The high stakes and natural context may help explain the lack of gender discrimination we observe. This highlights the value of mirroring high-stakes, real-world capital allocation decisions when studying discrimination.

A third explanation for our differing results is that preferences, gender norms, and inferences that drive gender discrimination vary across contexts. Both Brock and De Haas (2023) and Bartös et al. (2024) find discrimination concentrated among loan officers with more biased gender attitudes, suggesting preferences play a role. The female labor force participation rate is also markedly lower in Türkiye (35.8%) than in Ethiopia (57.6%) (World Bank, 2015), suggesting that discrimination may be more likely in areas with differing norms around women’s work.

4 Conclusion

This paper investigates gender discrimination in capital allocation through a large-scale field experiment in an Ethiopian business plan competition. We obtain clean identification of gender discrimination by randomizing the gender of applicants in the evaluation of the competition. We then evaluate the potential trade-off between gender equity and targeting capital to the highest-performing businesses. We find no evidence of gender discrimination by capital providers in our setting. Across 84 loan officers from 13 financial institutions, the gender of the business owner did not influence capital allocation decisions, in either the competition or loan consideration. These results are consistent across business owner, business, and loan officer characteristics.

The absence of gender discrimination did not hinder targeting the highest-performing businesses. Using endline data collected 18 months after the competition and several machine learning algorithms, we find that gender is not among the important predictors of future business performance. This indicates no meaningful trade-off between gender equity and targeting successful businesses. It further suggests that loan officers’ beliefs were accurate enough to make decisions aligned with profit maximization, showing no belief-based (statistical) or preference-based (taste-based) discrimination.

Our findings are consistent with the theory that discrimination does not persist where it is not profit-maximizing.

Our results caution against assuming that gender discrimination patterns align with gender disparities. In Ethiopia, as in many low-income countries, gender gaps in access to finance persist, contributing to high gender inequality (Klapper and Parker, 2011). A common assumption is that unequal gender norms generate discrimination and capital misallocation between equally productive men and women. Our findings show this is not necessarily the case. Indeed, empirical evidence indicates that in developing countries with high gender inequality, discrimination can sometimes favor women of high ability (Delavande and Zafar, 2019; Ayalew, Manian and Sheth, 2021).

Finally, our results point to settings in which gender discrimination is more likely to arise. Our exploratory analyses identified two cases in which gender affected evaluations: when key business information was missing, and in the first evaluation each loan officer completed. These patterns suggest that gender may matter most when decision makers have limited information or are forming benchmarks in a new evaluation environment. Although both results are exploratory, they are consistent with a broader implication of the paper: structured, salient business information can reduce reliance on gender as a proxy, while novel or information-poor settings leave more scope for discrimination. Future work could directly test how the amount, salience, and sequencing of information shape gender discrimination in capital allocation.

Our results suggest that gender discrimination is unlikely in structured, information-rich evaluation of existing businesses, such as loan appraisal. This emphasizes the need for further research on other factors that contribute to gender gaps in access to capital. One promising direction is gender differences in capital demand. The decision to apply for capital may drive the gender gap and explain the lack of discrimination among applicants. In our sample, the gender gap in business performance appears to be smaller than population-level estimates, suggesting that applying for capital may itself signal business success. Additionally, if the decision to apply for a loan is a household decision, applying could signal household support for the female-owned business and responsibility for the loan (Bernhardt et al., 2019). Therefore, we see exploring gender differences in the demand for

capital as a promising avenue for future research.

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Online Appendix

Gender Discrimination in Access to Capital: A Field Experiment in Ethiopia

A Appendix Sections

A.1 Context and Experimental Design Details

A.1.1 Beliefs on Future Performance: Details on Incentive Compatible Elicitation

We intentionally did not provide details on how accuracy is determined for the bonus, consistent with Danz, Vesterlund and Wilson (2022), who find that false reports of beliefs are *lower* when subjects are simply told that the payment rule is designed to maximize their payment when they are truthful, rather than being given additional information of the details of the incentive-compatible payment calculation.⁵⁸ We similarly chose to have one large bonus, following the guidance from Charness, Gneezy and Halladay (2016) that randomly paying a large amount to one subject is as effective as paying a smaller amount to every subject. A conservative interpretation of our approach is that the loan officers' perception of our belief elicitation is equivalent to simply asking them for their best prediction. Charness, Gneezy and Rasocha (2021)'s review of the literature finds that such introspective belief elicitation performs equally well as "state-of-the-art" complex belief elicitation methods (e.g., quadratic scoring rule). This is particularly true with respect to accuracy, the extent to which elicited beliefs match the objective probabilities of an event, which is the purpose of our belief elicitation (Trautmann and van de Kuilen, 2014). Charness, Gneezy and Rasocha (2021) conjecture

⁵⁸Danz, Vesterlund and Wilson (2022) compare false reports of subjects' beliefs when they are told "the payment rule is designed so that you can secure the largest chance of winning the prize by reporting your most accurate guess," to a treatment arm in which in addition to the statement, they were also given details on how the binarized scoring rule, a state-of-the-art elicitation, is calculated. Similarly, Charness, Gneezy and Rasocha (2021)'s review of the literature highlights that in most cases where complex scoring rules that are incentive-compatible to truth-telling are used, subjects are also explicitly told by the researchers that telling the truth will maximize their payment. This further suggests that the effectiveness of incentive-compatible structures may be driven by respondents responding to the researchers' claim that truth-telling maximizes payment.

that increasing simplicity is an important dimension for improving belief elicitation.⁵⁹

A.1.2 Ethical Considerations

As in all audit study designs, our methodology uses deception by randomizing the gender depicted in the application that a loan officer reviews. The justification for using deception in audit studies is that no alternative method exists to rigorously identify discrimination, as was the case in our setting. Given the scarcity of studies identifying gender discrimination in business finance and low-income country settings, we argue that the benefits of the research justified the design. The study was approved by the IRB at UC Merced. It was also approved by the Entrepreneurship Development Institute, the local organization with whom we collaborated. EDI is a highly respected institution in Ethiopia and had a reputational stake in the study. All the loan officers who served as judges were debriefed and informed after the completion of the study that demographic information was manipulated for research purposes in the applications they were reviewing.

Another ethical concern with audit studies is the time experts spend reviewing fake materials. In our case, experts were evaluating real businesses for a real business plan competition, and they were compensated for their time.⁶⁰

A.2 Results: Heterogeneity in Capital Allocation Decisions

We generally find no evidence of gender discrimination along several pre-specified dimensions of heterogeneity. Across most marital status, education, and number of children, the estimated gender differences are small and statistically insignificant (see Table A6). The upper bounds of the 95 percent

⁵⁹In general, there are two primary concerns with non-incentivized introspection: resorting to defaults or random responses, or explicit bias in reporting due to factors such as experimenter demand effects (Charness, Gneezy and Rasocha, 2021). In terms of the former, we show in Section 3.3 that elicited beliefs are both predictive of future performance and responsive to baseline information, confirming that the loan officers did not respond randomly. Section 3.3 provides evidence for the loan officers being thoughtful and attentive in their evaluations. In addressing the latter concern, Section 3.5 details the limited role of experimenter demand and social desirability biases in our context.

⁶⁰An additional ethical concern is the scores given to the applicants for the business plan competition. If we had observed discrimination, there were two possible ways we would have proceeded: using only real gender or using only one gender when determining scores to award the competition prizes. However, since we did not observe gender discrimination, EDI chose to use all evaluations in determining the prizes.

confidence intervals show that we can rule out substantively meaningful levels of discrimination: differences larger than .07 sd in competition scores or 5 pp in loan forwarding among married and separated applicants; larger than .02 sd or 2 pp at the mean education level; and larger than .04 sd or 4 pp at the mean number of children. These intervals indicate that, even if discrimination existed within these subgroups, its magnitude would be small and unlikely to meaningfully explain the gender gap in access to capital.

We do observe gender discrimination against female widows, particularly for loan consideration. The lower bound of the 95 percent confidence interval allows us to rule out differences smaller than 2 pp in favor of men. The upper bound includes effects as large as a 38 pp higher likelihood of male widows being forwarded for a loan. Although not statistically significant, we also observe larger differences in competition scores for this subgroup, with the upper bound of the confidence interval including up to .36 sd higher scores for male widows. Only 91 evaluations (2.2% of the sample) include widows, leading to large standard errors. Nevertheless, these effects are consistent with female widowhood signaling unique vulnerability and access to fewer resources.

We also find no evidence for discrimination conditional on business characteristics. First, we explore discrimination based on whether the business industry is male-dominated, a pre-specified characteristic. If female business owners face discrimination in male-dominated industries, which tend to be more profitable, this could be an important driver of the gender profit gap. We asked our local survey firm to have two employees review the products and services described in the application and categorize the business as belonging to an industry dominated by women, men, or neither.⁶¹ We confirm that these classifications meaningfully capture industry gender composition by comparing them to the actual gender of the business owners: businesses coded as male-dominated are

⁶¹For each application, employees were requested to answer the following two questions with Yes, No, or Unsure: In your opinion, are over 90 percent of businesses that supply the main product described [in the application] run by women [men] (i.e., are over 90 percent of the business owners of such businesses female [male])? In practice, the employees appear to have categorized businesses as being dominated by a particular gender using a threshold lower than 90 percent. We use this question to define indicators for male or female industries for the businesses marked affirmative for each of these questions. 28 percent of applications were coded as female-dominated, 38 percent as male-dominated, 30 percent as unsure, and 3 percent as missing.

significantly more likely to be male-owned, and those coded as female-dominated are significantly more likely to be female-owned.

Second, we present exploratory analyses based on business performance, as measured by profits, size, and business age. Even if there is no gender discrimination on average, if high-performing female business owners face discrimination, this could explain why they cannot grow further. We do not find support for discrimination within gendered industries using our survey firm's categorization of industries as female-dominated or male-dominated, nor as a function of business baseline profits, the number of employees, or business age (see Table A7).

The upper bounds of the 95 percent confidence intervals similarly indicate that any potential gender differences are small: they rule out differences larger than .08 sd and .06 sd in competition scores or 4 pp and 3 pp in loan forwarding among businesses in male-dominated and female-dominated industries; larger than .03 sd or 3 pp at the mean level of business profit; larger than .3 sd or 3 pp at the mean number of employees; and larger than .05 sd or 2 pp at the mean business age. These bounds suggest that heterogeneity of discrimination by business characteristics is insufficient to meaningfully contribute to observed gender disparities.

We next test for heterogeneity by characteristics of the judging loan officers, drawing on existing literature that identifies several factors that may influence or mitigate gender discrimination in credit allocation: characteristics of their institutional environment (such as employment at a microfinance institution, which often serves more female clients or operates with a social mission), the gender of the loan officer, their years of experience, and the share of female clients in the loan officer's existing portfolio. We find no evidence of discrimination across these subgroups, with one exception: loan officers with less industry experience are more likely to favor women in their competition scores, and this favoritism declines with greater experience (Table A8). At the mean level of industry experience, we continue to find no evidence of discrimination toward businesses owned by either gender. Similarly, we find no evidence of discrimination for any subgroup (for continuous characteristics, evaluated at the mean). In addition, the 95 percent confidence intervals are narrow and rule out substantively meaningful magnitudes of discrimination. For competition scores, we can rule out differences larger

than approximately 0.08 sd in favor of men and 0.22 sd in favor of women. For forwarding applicants for loan consideration, we can rule out differences larger than about 8 pp in either direction, with most subgroups being in the range of 2 to 4 pp. Though MFIs often prioritize female clients, none of the MFIs that participated in the judging serve women exclusively. In our exit survey of loan officers ($N = 43$), no loan officer reported having a portfolio of borrowers of only one gender. The highest share of female borrowers in a loan officer’s portfolio was 82.5 percent.^{62,63}

A.3 External validity: Generalizability to the broader financial sector

We next discuss the generalizability of this study using the SANS framework (List, 2020). We evaluate the extent to which our results are informative about gender discrimination in capital markets in Ethiopia and generalizable to decisions about capital grants and initial applications for loans. We also consider the relevance of our findings to gender discrimination in low-income countries and business finance. The SANS framework offers a structured method for defining generalizability; as List (2020) points out, “all results are externally valid to some setting, and no result will be externally valid to all settings.” The framework assesses generalizability through four factors: Selection, Attrition, Naturalness, and Scaling. If preferences, constraints, and beliefs in the research study align with those in the context of interest, then the findings can be generalized to that context. We focus on Selection and Naturalness. We have no Attrition by design: since applications were randomly assigned to loan officers, the randomized gender is necessarily orthogonal to loan officer attrition. Scaling is not applicable.

Selection refers to the study group’s comparability to the population of interest, and Naturalness refers to the naturalness of the choice task, setting, and timeframe—that is, the extent to which “the

⁶²We pre-specified additional loan officer characteristics for heterogeneity tests based on information collected in an exit survey. However, our response rate on the exit survey was only 63 percent (43 loan officers); thus, we do not report these additional tests.

⁶³MFIs disproportionately target women globally, and are widespread in settings with substantial gender gaps in financial access (Zainuddin and Yasin, 2020). For example, MFIs are most common in South Asia, where gender gaps are among the largest in the world (Convergences, 2024; World Economic Forum, 2025). The fact that we do not find heterogeneity in discrimination by loan officers from MFIs versus commercial banks provides suggestive evidence of external validity to settings where loan officers have less exposure to female borrowers.

choice and outcome architecture [are] exchangeable between research and target settings” (List, 2020). Experimenter demand and social desirability bias are key aspects affecting naturalness. We address these two concerns directly, then categorize our study based on the stage of research in the general literature on the topic, which determines the weight of importance of the external validity assessment.

A.3.1 Experimenter Demand and Social Desirability

Our results are unlikely to be influenced by experimenter demand or social desirability bias, defined as motivations to please researchers or the competition host (EDI), respectively.

Experimenter demand is unlikely because loan officers were unaware of their participation in an experiment.⁶⁴ They communicated exclusively with a project manager who was blinded to the research question and randomized gender assignment.⁶⁵ Consequently, there existed no channel to induce experimenter demand.

Several factors suggest social desirability bias is unlikely to affect our results’ generalizability to the broader financial sector. First, EDI’s primary objective is to promote entrepreneurship in all sectors. While their mission includes supporting traditionally under-resourced populations, including women, a large segment of EDI’s clients are male. For example, in a database of participants in EDI training programs spanning the three years prior to the competition, 51 percent were male.⁶⁶ Broader

⁶⁴The loan officers were simply told that “One of EDC’s missions is to improve services and entrepreneurship growth by participating and conducting research. By participating as a judge in the EthioSpur Competition, you are consenting to share your contact information and de-identified responses with research partners who may use it to contact you for additional information and to conduct research.” The loan officers were debriefed on the research after the competition was completed.

⁶⁵The project manager was not informed about the gendered randomization until necessary for debriefing the loan officers.

⁶⁶Note that EDI’s focus on women has expanded since our study. This is because EDI, a new entity after our project, combines WEDP (a female-focused loan program) and EDC (the partner institution for this project at the time of the study). Other programs by EDC at the time of our study highlight their central focus on general entrepreneurship. For example, the Incubation Project, a contemporaneous initiative, was described on their website as follows: “the primary aim of this program is to develop innovative businesses that are being commercialized and be able to create sustainable profit to the owners, and create more jobs to the community.” The only mention of women and youth was a statement saying they were eligible to apply.

messaging and direct communication with lenders focused on identifying promising businesses without mentioning inclusive growth or women.⁶⁷ Individual loan officers did not appear to be familiar with EDI's programs, and none of the loan officers were aware of EthioSpur before their recruitment, indicating that they were unlikely to be influenced by EDI's broader mission. Perhaps most compellingly, EDI's own behavior in awarding the competition winners revealed no preference favoring women: despite 44 percent of applicants being female, only one of the five grant prizes was awarded to a female entrepreneur.

Second, the orientation provided loan officers with EDI's objectives for each evaluation question, none of which mentioned gender.⁶⁸ Prioritizing women or men to please EDI would imply pursuing an unstated objective at the cost of performing well on explicitly requested objectives. That is, if judges were trying to please EDI, they would likely attempt to do what was asked of them—assessing potential—rather than prioritizing women, which was never described to them as an objective. If they prioritized women, it would be at the cost of accurately assessing their potential as asked.

Third, the loan officers' responses in the evaluation forms, except for loan recommendations, were confidential and de-identified to all EDI staff and researchers, except for the project manager, who was an EDI employee, not a member of the research team. Evaluation forms never captured the loan officers' names and were tracked through an ID number. Judges were explicitly informed about both confidentiality and de-identification of evaluation forms in their orientation materials.⁶⁹

⁶⁷This includes promotional materials, recruitment letters, orientation guides, contracts, and memorandums of understanding for the judging loan officers. For example, the partnership request to lending institutions describes EthioSpur as a business plan competition “to promote the entrepreneurial spirit and provide support to promising entrepreneurs with a strong passion to grow their business” and that loan officers are requested because “the expertise in your organization would be extremely valuable in the evaluation of the business plan competition applications...consistent with our existing partnership to promote entrepreneurs with significant potential.” Likewise, judges' orientation materials elaborated on the objective to identify entrepreneurs that would benefit the “country's economic growth and employment opportunities” and “decid[ing] where limited funding for entrepreneurs is put to the best use”.

⁶⁸For example, in the section on future performance beliefs, loan officers were informed that “this information is collected to understand what characteristics determine business success.” Definitions were provided for each sub-category in the final score (e.g., “Value proposition: your overall assessment of the profitability potential of the applicant's business plan.”).

⁶⁹Loan officers were informed their ID would be used to identify them if they won the bonus for

Fourth, if social desirability bias had affected responses, we might expect favoritism towards young entrepreneurs, another under-resourced demographic group mentioned in EDI's mission statement. However, we do not find that loan officers favored younger entrepreneurs in any outcomes of interest.

Finally, each outcome was incentivized differently, yet our results are consistent across all three measures: monetary prize (beliefs), capital awarded by EDI (final score), and loans from one's own institution (loan consideration). If social desirability bias explained our results, it would imply an assumed priority of EDI influenced decisions across multiple domains, even those unrelated to the competition. The complete absence of messaging on women, explicit evaluation criteria, anonymity in evaluations, and consistent results across different objectives suggest social desirability biases are unlikely to explain our findings or affect generalizability.

In addition, EDI's focus on women in its mission statement is common in Ethiopia's financial sector. Lending institutions often emphasize inclusive growth, and during our study, Ethiopia had a national policy to improve women's financial access. Thus, any focus on women aligns with the broader financial sector's goals. And so, if judges are considering EDI preferences, these would be the same preferences that are present in the broader financial sector.

While we have argued that social desirability bias is unlikely to explain our findings, it is not possible to definitively rule out the possibility that loan officers inferred an unspoken diversity objective to support female-owned businesses in the competition and adjusted their evaluations accordingly. Determining this would have required directly eliciting loan officers' beliefs about the goals of the competition. We chose not to include such a question, as its inclusion may have inadvertently signaled a gender-related objective and biased their responses to other questions we had asked. While the absence of discrimination is consistent with the loan officers' observed behaviors and beliefs, we acknowledge that we cannot completely rule out the possibility that loan officers' evaluation accuracy. Even then, individual evaluations would remain anonymous. Their orientation materials explicitly stated that "even staff at EDI will not connect judge id to applicant id." Given this assurance and the other reasons detailed in this paragraph, we argue that even if judges did not fully trust these confidentiality procedures, it is unlikely that potential social desirability effects would have fully suppressed gender bias.

perceived an implicit mandate to advance women-owned businesses beyond what is typical in the financial sector.

A.3.2 Selection of Applicants

EthioSpur recruited businesses seeking capital, similar to those supported by formal financial institutions through loans. The competition’s information collection and eligibility requirements mirrored initial loan applications, ensuring relevant businesses participated. Among our sample, 32 percent had applied for a loan in the past 12 months, and 88 percent were interested in obtaining a loan through the competition, confirming their interest in capital, including loans. This interest highlights their relevance for understanding loan officers’ beliefs and behaviors.⁷⁰ Additionally, the applicants’ business characteristics are similar to those in the only other dataset of potential borrowers in Ethiopia, as discussed in Section 2.3 (Alibhai et al., 2021). The competition’s minimal eligibility requirements mirrored initial loan applications, ensuring no business interested in seeking capital was excluded.⁷¹ In summary, our participation requirements mirrored initial loan requests, making the sampling process similar to typical loan applicants. By focusing on active entrepreneurs, our sample aligns with the core demographic of lending institutions, ensuring relevance to the broader financial sector.

Nevertheless, the businesses participating in the competition—like those applying for loans more generally—constitute a self-selected sample. It is likely that these applicants are positively selected on characteristics such as education or business performance, and discrimination may decline as businesses become more successful or better resourced.⁷² Existing datasets document that gender

⁷⁰No significant gender differences were observed in loan applications in the past 12 months, interest in loans through the competition, or the amount of capital requested. Kolmogorov-Smirnov tests also found no statistical difference in the distributions of the amount requested by gender.

⁷¹This includes the four-month operational history requirement. Sample loan application forms and loan officers emphasized the importance of business history, even for start-ups. For example, in the Wasasa MFI sample, over 80 percent of loan applicants reported using their own or partner’s savings as starting capital, with less than 1 percent reporting a loan from an MFI and none from formal financial institutions. This indicates that businesses seeking capital generally have some operational history (Alibhai et al., 2021).

⁷²A comparison with other samples suggests that our businesses are more successful, on average, than microfinance applicants (e.g., those in Alibhai et al. (2019)), but smaller than the average firm in the World Bank Enterprise Survey. However, our sample includes both large, highly educated businesses and smaller, less-resourced firms. This suggests that while our average applicant may not

gaps in access to capital persist even among more successful businesses in Ethiopia (e.g., World Bank Enterprise Survey 2015), suggesting that testing for discrimination within relatively advantaged subsets of firms remains an important question (World Bank Gender Innovation Lab, 2024). In our own data, we find no heterogeneity in gender discrimination by baseline profits or number of employees, two key indicators of business success (Table A7). While not definitive, this provides some indication that greater business success is not attenuating patterns of discrimination. Although we cannot rule out the possibility that gender discrimination occurs toward businesses that chose not to apply to the competition, the diversity of applicants and the absence of heterogeneous effects offer suggestive evidence for the broader relevance of our findings.

Additional evidence from the following year of the competition provides further insight into how businesses selecting into the competition compare to those applying for loans (Manian and Sheth, 2025). As part of a broader survey, enumerators approached female business owners from central market areas in Addis Ababa and promoted the competition to those who met the eligibility criteria. In this sample, Manian and Sheth (2025) observe both whether a business owner had applied for a loan in the past year and whether they submitted an application to the competition. Although this sample is not directly comparable to the businesses in our study, it provides a useful benchmark for how competition and loan applicants differ on observables. Manian and Sheth (2025) find that prior loan application is a strong predictor of competition entry, implying that the competition attracts entrepreneurs who would otherwise seek capital through standard loan applications. In addition, firms with higher profits are modestly more likely to apply to *both* forms of capital, suggesting positive selection of businesses in credit markets as well. In general, the distributions of profits across loan applicants and competition applicants overlap substantially. These findings imply that businesses pursuing the competition grants were not systematically different from loan applicants in observable ways. Ultimately, while we cannot rule out selection on unobservables or the possibility that loan officers held distinct beliefs about competition applicants, the substantial overlap in business characteristics documented in Manian and Sheth (2025) suggests that differences in selection into a

be directly comparable to other samples, the distribution of firms in our data overlaps with both, allowing for comparisons across a range of business types.

grant competition versus a loan are unlikely to have been an important factor shaping loan officers' responses.

A.3.3 Selection of Loan Officers

The loan officers who judged the competition were real experts from diverse banking institutions in Addis Ababa, including microfinance institutions and commercial banks. There was no indication that selection into the loan officer sample was correlated with gender attitudes. The eligibility requirements ensured the sample was relevant to those making capital decisions in the financial sector. Thus, both the businesses and loan officers were sampled from the key population of interest.

One concern is that the lack of discrimination exhibited by the loan officers who agreed to participate as judges in the competition may not be representative of loan officers generally. However, it is unlikely that loan officers chose to participate specifically because they support women's advancement or because they already did not discriminate against women. None of the recruitment materials, competition descriptions, memoranda of understanding, or orientation materials indicated that the competition aimed to improve women's financial access, suggesting that their decision to participate was unlikely driven by an underlying predisposition to gender equality.

However, we may still be concerned that the factors determining judge participation could be correlated with their beliefs or behaviors related to gender discrimination. But as shown in Table A8, we generally do not find that discrimination varies by loan officer characteristics theorized to affect gender discrimination. This indicates that even if our sample of loan officers is systematically different from the general population of loan officers along these dimensions, such differences would not compromise the external validity of our findings about discrimination. Thus, while various motivations likely influenced loan officers' decisions to participate, these motivations generally appear unrelated to gender-discriminatory attitudes or behaviors, supporting the generalizability of our conclusion that loan officers do not discriminate against women. The one exception is that loan officers who had less experience in the financial industry favored women when allocating competition grants, though not when determining who to forward for consideration of a loan. This implies that if our sample were more experienced in the industry than the broader population of loan

officers, our results would understate the degree of favoritism toward women, at least with respect to grant decisions.

We also provide suggestive evidence that the gender attitudes of the loan officers in the competition did not differ from the broader population of loan officers in Ethiopia. In an exit survey of a non-random subset of judging loan officers (n=43), we asked how important gender was when reviewing and approving loans, on a scale from 1 (not at all important) to 4 (very important). Responses varied: 37 percent indicated gender was not at all important, 30 percent somewhat important, 14 percent important, and 19 percent very important. When asked how important they believed gender was to other loan officers, the distribution of responses was similar.⁷³ This suggests that judging loan officers perceived themselves as considering gender similarly to their broader peer group. Further supporting this view, we anonymously surveyed participants at the “National Conference on Making the Financial Sector Work for Women,” hosted by the National Bank of Ethiopia. This conference targeted professionals and leaders in the Ethiopian financial sector. Respondents (n=45) indicated their agreement with the statement: “On the whole, loan officers are more likely to reject loan applications if they come from a woman rather than a man, even if all other details in the applications are the same.” Despite the context potentially creating social desirability bias toward recognizing gender discrimination, 73 percent of respondents disagreed or strongly disagreed. While acknowledging these measures cannot perfectly detect implicit discrimination or attitudes, the evidence suggests that judging loan officers did not perceive themselves as substantially different from their professional peers regarding gender discrimination.

A.3.4 Experimental Variation of Business Owner Gender

A key consideration is whether altering the gender of business owners changed the distribution of gender-incongruent businesses. For example, female-owned businesses in male-dominated sectors might appear more frequently in our sample than in the population. This could affect the applicability

⁷³We do not consider this question to clearly represent whether loan officers discriminate against women. The way this question is phrased, it does not specify the causal effect of gender (as gender is likely correlated with other key factors) or its importance conditional on observing the other information. It also does not ask whether the consideration is in favor of or against women.

of our findings to real-world scenarios with a stronger correlation between business owner gender and business type. Our results suggest this is unlikely. Reduced generalizability would require loan officers to treat gender-incongruent businesses differently, i.e., evaluating female or male-owned businesses differently in a sector dominated by the opposite gender. Table A7 shows no such heterogeneity. This indicates the experimental manipulation did not inhibit generalizability. Both genders are represented across all 20 industries listed in the application form, and EDI did not believe gender incongruities would impact result interpretation.

A.3.5 Naturalness

We next assess the naturalness of our three key outcomes: beliefs, competition score, and loan consideration. Having addressed social desirability and experimenter demand, we focus on the naturalness of the setting and the similarity of the decision environment to a loan application.

We designed the competition's application form to mirror the criteria used by loan officers for initial capital lending decisions. Like a loan application, the information was self-reported but subject to future verification. This ensured that capital allocation decisions in the competition were based on the same information typically available to loan officers.⁷⁴ Since statistical discrimination models suggest discrimination arises from the informational value of gender, the observed lack of discrimination may be because loan officers had sufficient information about the businesses, reducing the need to rely on gender.⁷⁵ The similar information environment in the research and initial loan applications implies this lack of statistical discrimination is generalizable to credit markets.

One key outcome is beliefs about gender and future business performance, which were independent of all other outcomes and incentivized for accuracy. There was no aspect of the research design that altered loan officers' beliefs about business success. Another key outcome is the competition score. This was the natural decision for the business plan competition, determining the grant awards,

⁷⁴We interviewed financial providers from nine institutions and reviewed their standard loan application forms to design the competition application.

⁷⁵Moreover, in the exit survey, loan officers reported spending an average of 21 minutes reviewing each application. This is shorter than the time typically allocated to standard loan assessments, suggesting that evaluations in our setting may have relied more on heuristics or simplified decision rules, conditions that are associated with a *greater* likelihood of discrimination.

and thus directly generalizable to such decisions. Thus, the research design has no aspects that would change the preferences, constraints, and beliefs about future business performance or who deserves capital grants.

Another consideration for generalizability is whether loan officers make different decisions for loans versus grants or when acting for their employer. The loan forwarding decision addresses this concern and serves as a proxy for the decision to approve an initial loan application. This proxy is generalizable as long as: 1) the two measures are correlated, and 2) the relationship between the two measures does not differ by business owner gender. On the former, the two outcomes are mechanically correlated—to accept an initial loan application from the applicant, the loan officer must have access to their information. On the latter, our results suggest no gender discrimination in deciding to forward to the lending institution.

It is illustrative to consider an example that might raise concerns about the generalizability of the loan forwarding decision. Suppose loan officers have a quality threshold for forwarding an applicant, which is lower than for initial loan approval. If female-owned businesses are closer to this threshold, the conversion from forwarding to approval would be lower for women, limiting generalizability to initial loan decisions. However, we find no support for this. Among forwarded businesses, loan officers' beliefs about future performance and competition scores do not differ by gender, suggesting female-owned businesses are not closer to the threshold. Since perceptions and evaluations are similar by gender, gender should not affect the conversion from forwarding to initial loan approval. Note that the lower threshold for forwarding alone does not reduce generalizability. Thus, the causal effect of business-owner gender on the forwarding decision is a reasonable proxy for initial loan application approval to proceed to the next review step.

A.3.6 Priming and the Evaluation Form

A potential concern is that requiring judges to consider future business success and repayment capability before making their capital allocation decisions may have primed them to focus more heavily on these financial metrics than they otherwise would. This heightened salience could, in theory, suppress bias that might arise from first impressions, heuristics, or assumptions about

differential screening costs for women. While such priming effects cannot be ruled out, they reflect a common feature of formal credit evaluation processes, in which officers work from structured documentation that prompts consideration of similar factors.

Loan review is a multi-step process in which key factors are assessed at different stages, often by multiple individuals. The information elicited in Section B closely mirrors what loan officers evaluate and document over the course of a loan review. Interviews with key personnel from six institutions confirmed that loan reviews consistently include assessments of financial feasibility and repayment capacity, that these assessments are documented, and that they rely on human judgment rather than automated algorithms. Omitting Section B would therefore have reduced, rather than enhanced, the external validity of our findings on capital allocation decisions.

Nevertheless, our design necessarily simplifies these more complex, institution-specific processes. For example, institutions differ in the order in which information is gathered and when specific factors are considered, and our design may have introduced a sequencing that differs from some lenders' typical practice. This could increase the salience of financial information and reduce the scope for bias.⁷⁶ In addition, each stage of the process typically culminates in a binary decision to move forward or not. While our loan forwarding measure directly mimics the binary nature of these loan screening decisions, the competition scoring task is a continuous decision. It is possible that loan officers make decisions differently in binary and continuous settings, which could affect the manifestation of bias.⁷⁷ These possibilities should be kept in mind when interpreting our results. Nonetheless, the core evaluative elements in Section B are those that loan officers are expected to consider, and which are assessed and documented through processes that involve human discretion; this is common across lending institutions.

We may similarly be concerned that Section C of the evaluation form, which asks judges to evaluate factors such as managerial ability, potential alternative sources of finance, household income

⁷⁶Our evaluation form adapted the Women's Entrepreneurship Development Project (WEDP) appraisal tool, which was rolled out to 16 MFIs to use for initial screening, mirroring our process in the experiment.

⁷⁷In conversations with lending institutions, we learned that some stages at some lending institutions do incorporate a score, where a higher score indicates a stronger application.

reliance, and market demand, differs from typical forms used by financial institutions. The inclusion of Section C was intentional, aiming explicitly to probe mechanisms commonly cited in the literature as potential sources of gender discrimination against women-owned businesses. Importantly, the types of information requested in Section C should theoretically prime judges toward bias, rather than against it. Previous research suggests women may be perceived as poorer managers, and there may be a perception that market demand is weaker for female-owned businesses because of gender sorting in industries (OECD, 2023; Hardy and Kagy, 2020). Similarly, women are documented to have fewer alternative sources of finance and are less likely to be the primary source of household income, implying lower urgency or need (Campos et al., 2019). Each of these dimensions aligns closely with common items from gender-attitude surveys known to reflect biases against women (World Values Survey Association, 2024). Thus, if Section C had any priming effect, it would likely encourage rather than suppress bias against female applicants.

A.3.7 Wave Consideration: The Weight of External Validity and Boundaries of Generalizability

The framework in List (2020) highlights that expectations for external validity depend on the stage of the body of research.⁷⁸ We view our results as a Wave 1 insight for gender discrimination in low-income countries, establishing initial causality. Few studies have convincingly isolated causality using randomized gender in low- or middle-income country contexts. For gender discrimination in business finance, we see this study as contributing to Wave 2, understanding underlying mechanisms and exploring boundary conditions. In Wave 1, List (2020) argues that external validity is “extra credit,” while in Wave 2, studies should vary subject populations, stakes, and other theoretically important factors to mirror natural settings.

A useful benchmark is the ideal experiment and its feasibility. To study gender discrimination in credit markets, the ideal experiment would randomize the business owner’s gender in a loan application and follow the evaluation through the entire loan process. This is nearly impossible

⁷⁸List (2020) categorizes research stages into three waves: the first wave is efficacy and proof of concept, the second wave is underlying mechanisms, boundaries, and replications, and the third wave is measurement, mechanisms, and scaling.

in most low-income countries. In Ethiopia, loan processes are conducted in person, and loan files are extensive and not digitized. Only one concurrent study has followed subjects through an entire loan process using a correspondence methodology in a high-income country with entirely digital applications and approval (Montoya et al., 2025). Given these limitations, designing a study in a low-income country closer to a natural context than our approach would be very difficult.

Theory provides guidance on the generalizability of gender discrimination in later stages of a loan review process. Our context is similar to the early stages, but capital requests often involve further steps and interactions where gender discrimination could become a factor. Loan processes typically include multiple visits and communications between a business and the lending institution. However, standard economic models of discrimination, including statistical, taste-based, and gender norm violations, generally suggest discrimination should become less likely at these later stages. Models of statistical discrimination predict that more information reduces reliance on gender as a signal (Aigner and Cain, 1977; Guryan and Charles, 2013). Each interaction increases information, reducing statistical discrimination. Similarly, for taste-based discrimination or gender norm violations, backward induction suggests a loan officer would not start a process likely to fail due to their preferences. Whether this prediction holds true is an open question for future research, both in terms of its existence and reconciling it with the lack of discrimination observed in early stages. One way in which discrimination may arise in later stages is if parts of the process become less structured. For example, Goldstein et al. (2023) demonstrate that in the absence of a formal process, the types of questions asked to prospective borrowers vary by gender, leading to lower approval rates for female applicants.

B Appendix Figures and Tables

Application ID: [REDACTED]

Business Owner's Characteristics

28 years old
Female
9 years of total work experience
Not currently employed outside of proposed business
Vocational training is the highest level of education completed
Never Married
4 total household members, including applicant
0 children

Business Characteristics

Owns 100% of the business
Description of product and/or services: [REDACTED]
[REDACTED]
5 years of experience in the industry
Business cards have been used for advertising
Has a current business license
13 years of operation
Rents primary business location
Yes, had a written financial record keeping system for the previous 4 months

Current Business Performance

25,950 birr PROFIT reported in previous month
84,000 birr total revenue reported in previous month
58,050 birr total expenses reported in previous month
45,000 birr supply purchase expenses
150 birr rental expenses
7,000 birr salary expenses
5,900 birr other expenses
9 paid full-time employee(s)
48 hours per week typically worked by employees
310,000 birr total assets
55,000 birr cash assets
210,000 birr fixed assets
45,000 birr other assets
0 birr total liabilities
0 birr loans payable within one year
0 birr loans with longer than one year duration
0 birr to trade creditors
0 birr in other liabilities

Top Three Customers

1. Name and phone number provided. 320,000 birr in revenue during the past year.
Customer is an Organization.
2. Name and phone number provided. 21,000 birr in revenue during the past year.
Customer is an Organization.
3. Name and phone number provided. 300,000 birr in revenue during the past year.
Customer is an Organization.

Business Plan

[REDACTED]

Figure A1: Application form shown to loan officers

Confidential Evaluation of Applicant

Date of evaluation (DD/MM): _____

Judge ID: _____

Section A: Application Verification (For verification purposes only)

Application ID:
Applicant's age: ☐ 18-25 ☐ 26-35 ☐ 36-45 ☐ 46-55 ☐ above 55 ☐ Information is missing
Applicant's gender: ☐ Male ☐ Female ☐ Information is missing
Applicant's total years of experience: ☐ 0-4 ☐ 5-9 ☐ 10-19 ☐ 20 or more ☐ Information is missing
Applicant employed outside of the proposed business: ☐ Yes ☐ No ☐ Information is missing

Section B: Understanding Business Growth (For determining judge bonus only)

Suppose that the applicant receives **no capital** from the competition:

What is the probability that this business will be operational in January 2021: ☐ 0-10% ☐ 11-20% ☐ 21-30% ☐ 31-40% ☐ 41-50% ☐ 51-60% ☐ 61-70% ☐ 71-80% ☐ 81-90% ☐ 91-100%
Assuming that the business is operational in January 2021, provide your best estimate of: The number of operational hours in January 2021 will be: ☐ Less than in January 2020 ☐ Similar to January 2020 ☐ Greater than January 2020
The value of the business' capital stock in January 2021: _____ Birr
The monthly profits or losses of the business in January 2021 (Only one should be filled). Monthly Profit: _____ Birr Monthly Loss: _____ Birr
The number of paid employees (excluding the owner) in January 2021: _____

Suppose the applicant receives **300,000 ETB** from the competition:

What is the probability that this business will be operational in January 2021: ☐ 0-10% ☐ 11-20% ☐ 21-30% ☐ 31-40% ☐ 41-50% ☐ 51-60% ☐ 61-70% ☐ 71-80% ☐ 81-90% ☐ 91-100%
Assuming that the business is operational in January 2021, provide your best estimate of: The number of operational hours in January 2021 will be: ☐ Less than in January 2020 ☐ Similar to January 2020 ☐ Greater than January 2020
The value of the business' capital stock in January 2021: _____ Birr
The monthly profits or losses of the business in January 2021 (Only one should be filled). Monthly Profit: _____ Birr Monthly Loss: _____ Birr
The number of paid employees (excluding the owner) in January 2021: _____

If the applicant was instead given a **3-year 100,000 ETB loan**, which of the following do you believe is most likely?

☐ Applicant will repay the loan: Applicant will have enough financial resources and will repay.
☐ Applicant will strategically default: Applicant will have enough financial resources, but will still not repay.
☐ Applicant must default: Applicant will not have enough financial resources to repay the loan.

Section C: Reviewing the Applicant

Rate applicant's managerial skills: ☐ very poor ☐ poor ☐ acceptable ☐ good ☐ excellent
Which do you expect that the applicant can access to cover shortfalls in demand? Check all that apply. ☐ Personal savings/assets ☐ Gifts/Loans from family or friends ☐ Business loans from microfinance ☐ Business loans from bank ☐ Government assistance
Estimate the total amount of additional capital the applicant can secure (from all sources): _____ Birr
Applicant's business is most likely the primary source of income for the applicant's household? ☐ Yes ☐ No
Rate market demand of applicant's business: ☐ very low ☐ low ☐ medium ☐ high ☐ very high

Section D: Determination of winner Overall impression will be half the final score, and value proposition and entrepreneurial credibility will be the other half of the final score. **This final score is the only measure that determines the competition winners.**
Final Score = Overall Impression + ½ *Value Proposition + ½ *Entrepreneurial Credibility.

OVERALL IMPRESSION:	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7	☐ 8	☐ 9	☐ 10
VALUE PROPOSITION:	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7	☐ 8	☐ 9	☐ 10
ENTREPRENEURIAL CREDIBILITY:	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7	☐ 8	☐ 9	☐ 10

Internal: Should applicant's information be sent to your institution for loan consideration? ☐ Yes ☐ No

Figure A2: Evaluation Form

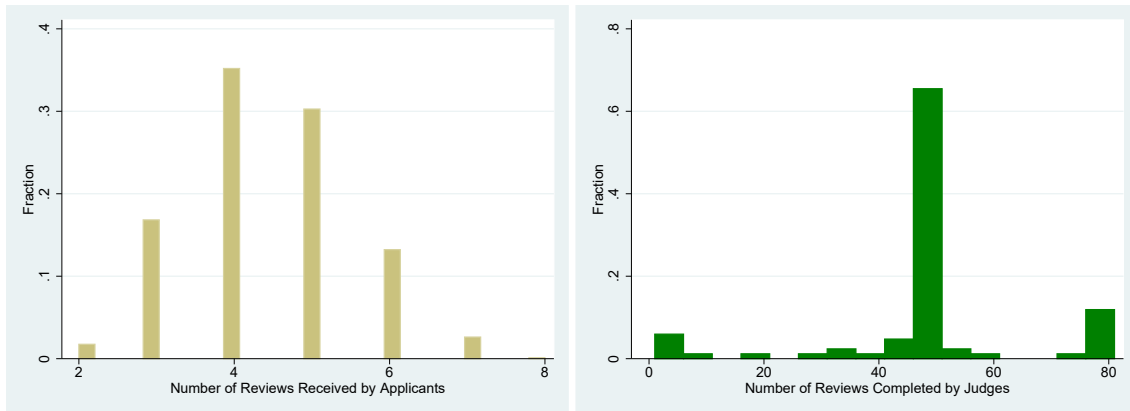


Figure A3: Reviews per Application and Evaluation per Loan Officer

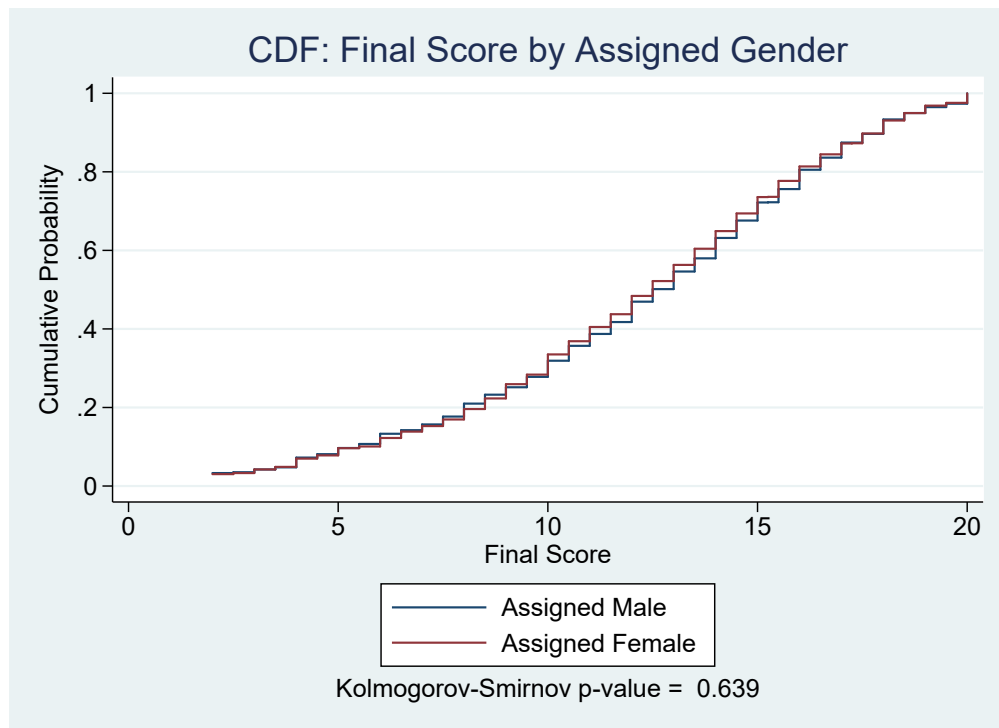


Figure A4: CDF of Final Score by Randomly Assigned Gender

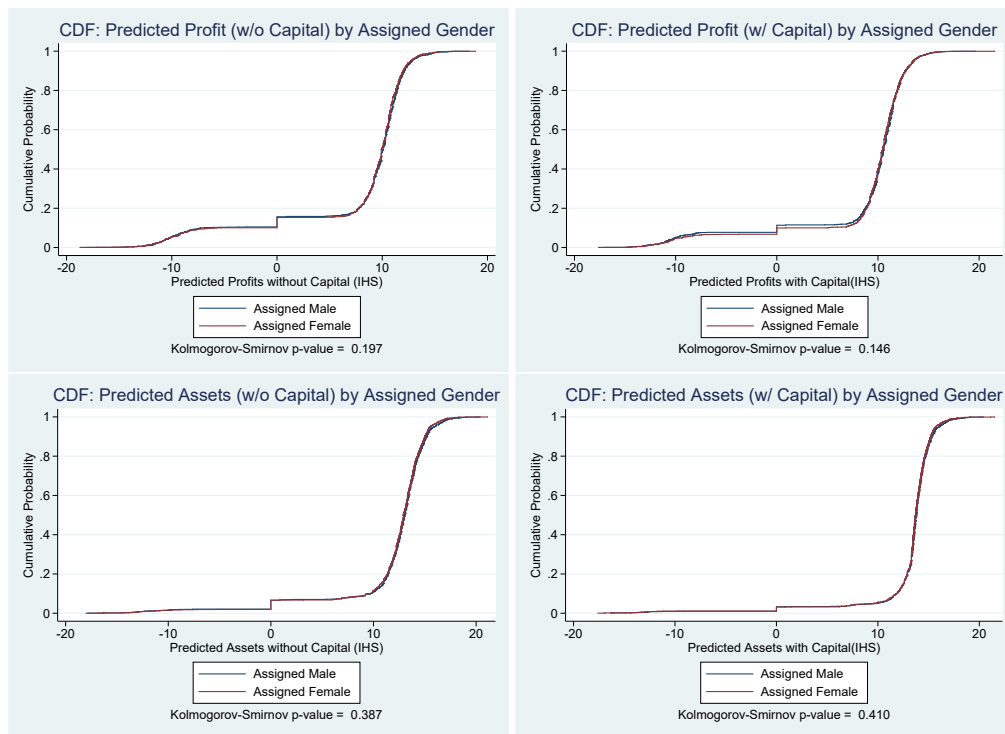


Figure A5: Distribution of Predicted Profits and Assets by Assigned Gender

Table A1: Industry Distribution of Applicants by Gender

	(1) Total	(2) Male	(3) Female
Agribusiness	0.11	0.13	0.08
Business or Personal Services	0.10	0.10	0.11
Chemicals and Pharmaceuticals	0.02	0.03	0.01
Clothing and Textiles	0.10	0.07	0.13
Construction and Infrastructure	0.08	0.11	0.05
Education and Skills Development	0.06	0.06	0.06
Energy and Renewables	0.01	0.01	0.01
Entertainment	0.01	0.01	0.01
Financial Services	0.00	0.01	0.00
Food/Nutrition/Beverages	0.13	0.10	0.17
Health Care	0.01	0.01	0.02
Manufacturing	0.17	0.21	0.13
Media/Marketing/Creative	0.02	0.02	0.01
Resources and Green Economy	0.02	0.02	0.02
Retail and Distribution	0.08	0.08	0.09
Technology	0.05	0.07	0.02
Telecommunications	0.01	0.01	0.02
Tourism and Hospitality	0.01	0.01	0.02
Transport and Logistics	0.02	0.02	0.02
Other	0.10	0.09	0.11
Observations	907	508	399

Table A2: Judge Exit Survey Responders

	(1) Fem Judge	(2) MFI	(3) Exper Instn	(4) Exper Industry
Completed exit survey	0.0378 (0.0778)	0.316*** (0.102)	-0.384 (0.720)	-0.987 (0.870)
Observations	83	83	83	83
Non-responder Mean	0.125	0.475	5.175	11.47

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Fem Judge is an indicator for whether the judge was female. MFI is an indicator for whether the judge was employed at a microfinance institution. Exper Industry and Exper Instn are the years of experience in the financial industry and their own institution, respectively. Robust standard errors in parentheses.

Table A3: Randomization balance on loan officer characteristics

	(1) MFI	(2) Fem Judge	(3) Exper Inst	(4) Exper Industry
Male	-0.0114 (0.0161)	0.0123 (0.0122)	0.0943 (0.113)	-0.174 (0.142)
Observations	3695	3695	3695	3695
Assigned Female Mean	0.699	0.129	4.976	11.12

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. MFI is an indicator for whether the judge was employed at a microfinance institution. Fem Judge is an indicator for whether the judge was female. Exper Industry and Exper Inst are the years of experience in the financial industry and their own institution, respectively. Specifications include application fixed effects. Robust standard errors in parentheses.

Table A4: Main specification robust to unrestricted sample

	(1) Score	(2) Overall Impress	(3) Value Prop	(4) Entrepreneurial	(5) Loan
Male	-0.0367 (0.110)	-0.00260 (0.0580)	-0.0294 (0.0592)	-0.0389 (0.0614)	0.0187 (0.0133)
Observations	4072	4072	4072	4072	4074
Female Mean	11.97	5.940	6.029	6.022	0.478

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Score is the final score in the business plan competition, determined by Overall Impression (Overall Impress) + .5* Value Proposition (Value Prop) + .5*Entrepreneurial Credibility (Entrepreneurial). Each of these subscores is on an increasing scale of 1 to 10. Loan indicates whether the application was forwarded by the judge to their own institution for loan consideration. Specifications include judge and application fixed effects. Robust standard errors in parentheses. Observations are not restricted to evaluations in which the loan officer responded to all prespecified outcomes.

Table A5: Belief specification robust to unrestricted sample

	(1) Surv., w/o Cap	(2) Surv., w/ Cap	(3) Win. Profit, w/o Cap	(4) Win. Profit, w/ Cap	(5) Win. Assets, w/o Cap	(6) Win. Assets, w/ Cap	(7) Repay
Male	0.0545 (0.607)	0.335 (0.633)	2.535 (3.945)	-8.148 (7.766)	38.28 (45.67)	31.61 (62.50)	0.000132 (0.0135)
Observations	4021	4012	4056	4055	4029	4013	3928
Female Mean	49.91	59.33	43.57	89.05	806.1	1110.9	0.653

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Survival, Profits, and Assets are loan officer expectations with and without additional capital. Profit and Assets are in thousands of ETB. Survival is the probability of survival, from 0 to 100; Win. specifications winsorize the variables at the 1st and 99th percentiles. Repay is an indicator for whether the loan officer reported that they believed the applicant would repay a 3-year 100,000 ETB loan. Specifications include loan officer and application fixed effects. Robust standard errors in parentheses. Observations are not restricted to evaluations in which the loan officer responded to all prespecified outcomes.

Table A6: Heterogeneity by applicant characteristics

	(1) Score	(2) Score	(3) Score	(4) Score	(5) Loan	(6) Loan	(7) Loan	(8) Loan
Male	-0.168 (0.191)	-0.313 (0.423)	-0.143 (0.177)	0.511 (0.578)	-0.0144 (0.0227)	-0.0343 (0.0530)	-0.0115 (0.0226)	0.0536 (0.0684)
Assigned Male=1 $\times$ Married=1	0.152 (0.249)				0.0261 (0.0300)			
Assigned Male=1 $\times$ Separated=1	-0.455 (0.511)				-0.0662 (0.0569)			
Assigned Male=1 $\times$ Widowed=1	0.388 (0.749)				0.214** (0.0930)			
Assigned Male=1 $\times$ Highest Education		0.0254 (0.0614)				0.00459 (0.00772)		
Assigned Male=1 $\times$ Number children			0.0482 (0.0736)				0.00981 (0.00962)	
Assigned Male=1 $\times$ Age				-0.0157 (0.0154)				-0.00150 (0.00179)
Observations	3602	3605	3093	2682	3602	3605	3093	2682
M + M $\times$ Char		-0.143	-0.0585	-0.0747		-0.00360	0.00580	-0.00211
P-val		0.218	0.633	0.569		0.800	0.708	0.898
Female Mean	12.06	12.06	12.06	12.06	0.495	0.495	0.495	0.495

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Score is the final score in the business plan competition, ranging from 2 to 20. Loan indicates whether the application was forwarded by the judge to their own institution for loan consideration. M + M $\times$ Char corresponds to Male + Male $\times$ Characteristic of the applicant, in the order presented in the table, evaluated at the mean characteristic for continuous variables and one for indicator variables. All characteristics were pre-specified except applicant age. Specifications include judge and application fixed effects. Robust standard errors in parentheses.

Table A7: Heterogeneity by business characteristics

	(1) Score	(2) Score	(3) Score	(4) Score	(5) Loan	(6) Loan	(7) Loan	(8) Loan
Male	-0.239 (0.215)	-0.0798 (0.117)	-0.120 (0.132)	0.0944 (0.291)	0.0261 (0.0243)	0.00108 (0.0149)	-0.000677 (0.0161)	-0.0221 (0.0362)
Male $\times$ Male-dominated ind.	0.247 (0.285)				-0.0336 (0.0335)			
Male $\times$ Female-dominated ind.	0.137 (0.293)				-0.0407 (0.0350)			
Male $\times$ Baseline profits		0.0431 (0.0594)				0.000548 (0.00791)		
Male $\times$ Number employees			0.00185 (0.00980)				0.000298 (0.00139)	
Male $\times$ Business Age				-0.0113 (0.0246)				0.00126 (0.00302)
Observations	3696	3367	3593	2857	3696	3367	3593	2857
M + M $\times$ Char	0.00819	-0.0727	-0.110	-0.0260	-0.00750	0.00117	0.00103	-0.00872
P-val	0.965	0.532	0.352	0.839	0.745	0.937	0.942	0.586
M + M $\times$ Char	-0.102				-0.0146			
P-val	0.614				0.561			
Female Mean	12.06	12.06	12.06	12.06	0.495	0.495	0.495	0.495

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Score is the final score in the business plan competition, ranging from 2 to 20. Loan indicates whether the application was forwarded by the judge to their own institution for loan consideration. Baseline profits are in units of 1,000,000 Birr. The number of employees is winsorized at the 1st and 99th percentiles, and business age at the 99th percentile. M + M $\times$ Char corresponds to Male + Male $\times$ Characteristic of the applicant, in the order presented in the table, evaluated at the mean characteristic for continuous variables and one for indicator variables. Specifications include judge and application fixed effects. Robust standard errors in parentheses.

Table A8: Heterogeneity by loan officer characteristics

	(1) Score	(2) Score	(3) Score	(4) Score	(5) Score	(6) Loan	(7) Loan	(8) Loan	(9) Loan	(10) Loan
Male	-0.0540 (0.223)	-0.0694 (0.126)	-0.810** (0.370)	-0.245 (0.218)	0.0559 (0.533)	0.0135 (0.0267)	0.00291 (0.0155)	-0.0653 (0.0473)	0.0129 (0.0275)	-0.0673 (0.0588)
Male=1 $\times$ MFI=1	-0.0718 (0.281)					-0.0167 (0.0324)				
Male=1 $\times$ Fem Judge=1		-0.257 (0.374)					-0.00954 (0.0429)			
Male=1 $\times$ Exper Instn			0.0640** (0.0324)					0.00607 (0.00413)		
Male=1 $\times$ Exper Instn				0.0283 (0.0387)					-0.00228 (0.00490)	
Male=1 $\times$ Prop. Fem. Portfolio					-0.00593 (0.0118)					0.00154 (0.00134)

Observations	3695	3695	3695	3695	2091	3695	3695	3695	3695	2091
M + M $\times$ Char	-0.126	-0.326	-0.103	-0.103	-0.185	-0.00320	-0.00663	0.00178	0.00142	-0.00495
P-val	0.391	0.343	0.373	0.374	0.326	0.850	0.864	0.899	0.919	0.819
Female Mean	12.07	12.07	12.07	12.07	11.83	0.495	0.495	0.495	0.495	0.523

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Score is the final score in the business plan competition, ranging from 2 to 20. Loan indicates whether the application was forwarded by the judge to their own institution for loan consideration. MFI is an indicator for whether the judge was employed at a microfinance institution. Fem Judge is an indicator for whether the judge was female. Exper Instn and Exper Instn are the years of experience in the financial industry and their own institution, respectively. Prop. Fem. Portfolio is the proportion of female clients in the loan officer's portfolio (0 to 100) and is only available for loan officers who answered the exit survey ($N = 43$). M + M $\times$ Char corresponds to Male + Male $\times$ Characteristic of the loan officer, evaluated at the mean characteristic for continuous variables and one for indicator variables. Specifications include judge and application fixed effects. Robust standard errors in parentheses.

Table A9: Effect of Gender in First Evaluation

	(1) Score	(2) Loan	(3) Score	(4) Loan	(5) Score	(6) Loan
Male	2.364** (1.014)	0.170 (0.111)	-0.274 (0.239)	0.00656 (0.0279)	-0.674 (0.489)	-0.0782 (0.0571)
First Apl. Male			1.525*** (0.222)	0.0707*** (0.0267)		
Male*First Apl. Male			0.328 (0.313)	-0.000145 (0.0378)		
Observations	82	82	3603	3603	332	332
Female Mean	10.78	0.417	12.09	0.495	11.98	0.524

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Score is the final score in the business plan competition, determined by Overall Impression (Overall Impress) + .5* Value Proposition (Value Prop) + .5*Entrepreneurial Credibility (Entrepreneurial). Each of these subscores is on an increasing scale of 1 to 10. Loan indicates whether the application was forwarded by the loan officer to their own institution for loan consideration. First Apl. Male is an indicator for whether the first application in the loan officer's packet was randomly assigned to be a male business-owner. Column 1 and 2 limit observations to the first application in the loan officer's packet. Column 3 and 4 include loan officer fixed effects and exclude the first applicant in the loan officer's packet. Column 5 and 6 limit observations to the first application in each round and include loan officer fixed effects. Robust standard errors in parentheses.

Table A10: First five evaluations

	(1) Score	(2) Profit, w/o Cap	(3) Win. Profit, w/o Cap	(4) Profit, w/ Cap	(5) Win. Profit, w/ Cap
Male	2.195 (4.520)	-29.66 (63.82)	-29.66 (63.82)	45.13 (66.87)	44.97 (66.69)
Observations	410	410	410	410	410
Female Mean	11.76	62.90	45.10	8.228	93.27

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Score is the final score in the business plan competition, ranging from 2 to 20. Profits are expectations of the loan officers with and without additional capital, and measured in thousands of birr. Win. specifications winsorize the variables at the 1st and 99th percentiles. Observations are limited to the first round of applications given to the loan officer. Specifications include loan officer and application fixed effects. Robust standard errors in parentheses.

Table A11: Effect of gender on return to capital

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Survival	Profit	Win. Profit	Profit (IHS)	Assets	Win. Assets	Assets (IHS)
Male	0.0605 (0.513)	-937.9 (851.3)	-9.446* (5.687)	-0.0932 (0.0906)	-582.6 (710.4)	-1.745 (11.17)	-0.0584 (0.0982)
Observations	3696	3696	3696	3696	3696	3696	3696
Female Mean	9.610	665.9	41.70	1.856	926.3	241.0	4.776

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Survival, Profits, and Assets are the difference in expectations of the loan officers with and without additional capital (i.e., the return to capital). Profit and Assets are in thousands of birr. Survival is the probability of survival, from 0 to 100; Win. specifications winsorize the variables at the 1st and 99th percentiles; and IHS specifications transform the variables using the inverse hyperbolic sine transformation. Specifications include loan officer and application fixed effects. Robust standard errors in parentheses.

Table A12: Pre-specified secondary outcomes

	(1) Surv., w/o Cap	(2) Surv., w/ Cap	(3) Win. Assets, w/o Cap	(4) Win. Assets, w/ Cap	(5) Win. Jobs, w/o Cap	(6) Win. Jobs, w/ Cap	(7) Loan
Male	-0.0944 (0.636)	-0.0339 (0.666)	60.09 (46.85)	52.75 (65.42)	87.85** (43.00)	162.0 (205.3)	0.00159 (0.0140)
Observations	3696	3696	3696	3696	3696	3696	3696
Female Mean	50.47	60.08	778.4	1089.4	219.2	878.0	0.495

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Loan indicates whether the application was forwarded by the loan officer to their own institution for loan consideration. Survival, Assets, and Jobs are expectations of the loan officers with and without additional capital. Assets are in thousands of birr. Survival is the probability of survival, from 0 to 100. Jobs is the number of people employed by the business. Win. specifications winsorize the variables at the 1st and 99th percentiles. Specifications include loan officer and application fixed effects. Robust standard errors in parentheses.

Table A13: Primary outcomes with loan officer weights

	(1) Score	(2) Profit, w/o Cap	(3) Win. Profit, w/o Cap	(4) Profit, w/ Cap	(5) Win. Profit, w/ Cap
Male	-0.0727 (0.116)	-30.13 (77.97)	0.701 (4.197)	-1141.5 (990.2)	-14.20* (8.323)
Observations	3696	3696	3696	3696	3696
Female Mean	11.96	52.98	42.74	713.8	86.19

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Score is the final score in the business plan competition, ranging from 2 to 20. Profits are expectations of the loan officers with and without additional capital, and measured in thousands of birr. Win. specifications winsorize the variables at the 1st and 99th percentiles. Specifications include loan officer and application fixed effects, and weight each loan officer equally. Robust standard errors in parentheses.

Table A14: Secondary outcomes with loan officer weights

	(1) Surv., w/o Cap	(2) Surv., w/ Cap	(3) Win. Assets, w/o Cap	(4) Win. Assets, w/ Cap	(5) Win. Jobs, w/o Cap	(6) Win. Jobs, w/ Cap	(7) Loan
Male	0.276 (0.665)	0.531 (0.703)	57.58 (45.28)	46.95 (66.18)	81.51** (38.63)	93.86 (191.3)	0.00127 (0.0144)
Observations	3696	3696	3696	3696	3696	3696	3696
Female Mean	49.74	58.10	771.5	1105.8	155.3	692.7	0.479

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Loan indicates whether the application was forwarded by the loan officer to their own institution for loan consideration. Survival, Assets, and Jobs are expectations of the loan officers with and without additional capital. Assets are in thousands of birr. Survival is the probability of survival, from 0 to 100. Jobs is the number of people employed by the business. Win. specifications winsorize the variables at the 1st and 99th percentiles. Specifications include loan officer and application fixed effects, and weight each loan officer equally. Robust standard errors in parentheses.

Table A15: Primary outcomes with ordering FE

	(1) Score	(2) Profit, w/o Cap	(3) Win. Profit, w/o Cap	(4) Profit, w/ Cap	(5) Win. Profit, w/ Cap
Male	-0.114 (0.116)	-25.15 (73.46)	1.721 (4.220)	-948.8 (907.6)	-8.159 (7.910)
Observations	3685	3685	3685	3685	3685
Female Mean	12.06	43.26	42.41	709.2	84.57

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Score is the final score in the business plan competition, ranging from 2 to 20. Profits are expectations of the loan officers with and without additional capital, and measured in thousands of birr. Win. specifications winsorize the variables at the 1st and 99th percentiles. Specifications include the order of the application presented to the loan officer, loan officer, and application fixed effects. Robust standard errors in parentheses.

Table A16: Secondary outcomes with ordering FE

	(1) Surv., w/o Cap	(2) Surv., w/ Cap	(3) Win. Assets, w/o Cap	(4) Win. Assets, w/ Cap	(5) Win. Jobs, w/o Cap	(6) Win. Jobs, w/ Cap	(7) Loan
Male	-0.108 (0.639)	-0.0501 (0.670)	57.63 (47.14)	50.45 (65.39)	90.41** (42.93)	160.8 (206.1)	0.00108 (0.0141)
Observations	3685	3685	3685	3685	3685	3685	3685
Female Mean	50.47	60.08	778.4	1089.4	219.2	878.0	0.495

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Loan indicates whether the application was forwarded by the loan officer to their own institution for loan consideration. Survival, Assets, and Jobs are expectations of the loan officers with and without additional capital. Assets are in thousands of birr. Survival is the probability of survival, from 0 to 100. Jobs is the number of people employed by the business. Win. specifications winsorize the variables at the 1st and 99th percentiles. Specifications include the order of the application presented to the loan officer, loan officer, and application fixed effects. Robust standard errors in parentheses.

Table A17: Reported gender

	(1) Score	(2) Profit, w/o Cap	(3) Win. Profit, w/o Cap	(4) Profit, w/ Cap	(5) Win. Profit, w/ Cap
Reported Male	-0.114 (0.117)	-26.87 (76.04)	2.276 (4.273)	-990.6 (937.4)	-7.967 (7.995)
Reported No Gender	-0.0292 (0.451)	-57.08 (93.75)	-2.715 (16.26)	-754.8 (701.2)	-32.09 (31.22)
Observations	3696	3696	3696	3696	3696
Reported Female Mean	12.06	43.18	41.99	717.2	84.32

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Score is the final score in the business plan competition, ranging from 2 to 20. Profits are expectations of the loan officers with and without additional capital, and measured in thousands of birr. Win. specifications winsorize the variables at the 1st and 99th percentiles. Independent variables are those reported by the loan officer. Specifications include loan officer and application fixed effects. Robust standard errors in parentheses.

Table A18: Excludes 5 percent of loan officers with lowest variance of final scores

	(1)	(2)	(3)	(4)	(5)
	Score	Profit, w/o Cap	Win. Profit, w/o Cap	Profit, w/ Cap	Win. Profit, w/ Cap
Male	-0.105 (0.117)	-16.10 (70.96)	1.735 (4.376)	-864.0 (816.5)	-9.143 (8.211)
Observations	3663	3544	3544	3592	3592
Female Mean	12.05	44.77	43.88	731.7	86.86

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Score is the final score in the business plan competition, ranging from 2 to 20. Profits are expectations of the loan officers with and without additional capital, and measured in thousands of birr. Win. specifications winsorize the variables at the 1st and 99th percentiles. Observations limited to loan officers with variation in outcomes at least at the 5th percentile. Specifications include loan officer and application fixed effects. Robust standard errors in parentheses.

Table A19: No loan officers fixed effects

	(1)	(2)	(3)	(4)	(5)
	Score	Profit, w/o Cap	Win. Profit, w/o Cap	Profit, w/ Cap	Win. Profit, w/ Cap
Male	-0.0328 (0.138)	-14.25 (64.67)	4.011 (4.331)	-750.1 (781.4)	-1.344 (8.266)
Observations	3693	3693	3693	3693	3693
Female Mean	12.07	43.19	42.33	710.2	84.55

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Score is the final score in the business plan competition, ranging from 1 to 20. Profits are expectations of the loan officers with and without additional capital, and measured in thousands of birr. Win. specifications winsorize the variables at the 1st and 99th percentiles. Specifications include application fixed effects. Robust standard errors in parentheses.

Table A20: 75 percent correct on verification questions

	(1) Score	(2) Profit, w/o Cap	(3) Win. Profit, w/o Cap	(4) Profit, w/ Cap	(5) Win. Profit, w/ Cap
Male	-0.105 (0.116)	-24.26 (74.49)	1.665 (4.208)	-962.1 (911.4)	-8.534 (7.895)
Observations	3696	3696	3696	3696	3696
Female Mean	12.06	43.26	42.41	709.2	84.57

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Score is the final score in the business plan competition, ranging from 2 to 20. Profits are expectations of the loan officers with and without additional capital, and measured in thousands of birr. Win. specifications winsorize the variables at the 1st and 99th percentiles. Observations limited to loan officers who correctly answered verification questions on at least 75 percent of their evaluations. Specifications include loan officer and application fixed effects. Robust standard errors in parentheses.

Table A21: 100 percent correct on verification questions

	(1)	(2)	(3)	(4)	(5)
	Score	Profit, w/o Cap	Win. Profit, w/o Cap	Profit, w/ Cap	Win. Profit, w/ Cap
Male	1.625 (2.518)	19.06 (22.94)	19.06 (22.94)	36.21 (60.90)	36.21 (60.90)
Observations	329	329	329	329	329
Female Mean	12.00	54.82	41.40	105.4	85.13

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Score is the final score in the business plan competition, ranging from 2 to 20. Profits are expectations of the loan officers with and without additional capital, and measured in thousands of birr. Win. specifications winsorize the variables at the 1st and 99th percentiles. Observations limited to loan officers who correctly answered verification questions on at 100 percent of their evaluations. Specifications include loan officer and application fixed effects. Robust standard errors in parentheses.

Table A22: Loan officers responsive to application information

	(1) Score	(2) Profit, w/o Cap	(3) Win. Profit, w/o Cap	(4) Profit, w/ Cap	(5) Win. Profit, w/ Cap
Male	-0.111 (0.118)	-14.73 (69.24)	2.499 (4.257)	-842.5 (800.8)	-7.358 (8.057)
Observations	3542	3542	3542	3542	3542
Female Mean	12.00	42.41	42.42	736.6	85.32

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Score is the final score in the business plan competition, ranging from 2 to 20. Profits are expectations of the loan officers with and without additional capital, and measured in thousands of birr. Win. specifications winsorize the variables at the 1st and 99th percentiles. Observations limited to loan officers for which application information predicted their final score with a p-value of less than .15. Specifications include loan officer and application fixed effects. Robust standard errors in parentheses.

Table A23: Loan officers responsive to capital

	(1) Score	(2) Profit, w/o Cap	(3) Win. Profit, w/o Cap	(4) Profit, w/ Cap	(5) Win. Profit, w/ Cap
Male	-0.0409 (0.132)	-58.81 (107.1)	1.958 (4.197)	-1324.8 (1394.7)	-3.953 (9.984)
Observations	2973	2973	2973	2973	2973
Female Mean	12.30	34.36	37.14	898.5	102.5

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Score is the final score in the business plan competition, ranging from 2 to 20. Profits are expectations of the loan officers with and without additional capital, and measured in thousands of birr. Win. specifications winsorize the variables at the 1st and 99th percentiles. Observations limited to evaluations in which predictions with capital were greater than predictions without capital. Specifications include loan officer and application fixed effects. Robust standard errors in parentheses.

Table A24: Predicted value of gender for business performance

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Firm Survival	Firm Survival	Profit	Profit	Win. Profit	Win. Profit	Firm Profits (IHS)	Firm Profits (IHS)
Male Owner	0.0269 (0.0245)	0.0284 (0.0245)	13317.3** (6094.1)	13645.5** (6018.3)	4539.4* (2345.1)	4922.0** (2352.2)	0.437 (0.451)	0.484 (0.452)
Mean Final Score	0.00953** (0.00421)		2132.2 (1422.6)		2366.1*** (496.8)		0.292*** (0.0863)	
Mean Loan Consideration		0.0825* (0.0439)		13033.9 (21947.4)		22915.9*** (5487.5)		2.994*** (0.944)
Constant	0.840*** (0.0186)	0.839*** (0.0186)	11827.8*** (3053.6)	11638.3*** (3053.7)	14144.8*** (1524.4)	13991.0*** (1530.4)	6.125*** (0.325)	6.107*** (0.328)
r2	0.00702	0.00527	0.00950	0.00687	0.0379	0.0332	0.0157	0.0152
N	847	847	846	846	846	846	846	846

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Mean final score (loan consideration) is the relative mean for the applicant, in which the score or loan consideration has been demeaned by the loan officer average score or consideration of loan. Male Owner is an indicator for the actual gender of the business owner (not the randomly assigned gender on the application). Robust standard errors in parentheses.

Table A25: Pre-specified endline variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Ttl Bus Prof	Win. Ttl Bus Prof	Ttl Bus Prof (IHS)	Hh Bus Prof	Win. Hh Bus Prof	Hh Bus Prof (IHS)	Pers Income	Win. Pers Income	Pers Income (IHS)
Male Owner	15684.4** (6306.1)	7802.6*** (2699.3)	0.431 (0.437)	11343.0* (6470.7)	3783.3 (3130.4)	-0.0877 (0.416)	15684.4** (6306.1)	7802.7*** (2699.3)	0.442 (0.432)
Mean Final Score	2549.4* (1435.9)	2730.4*** (575.6)	0.248*** (0.0841)	2829.2* (1453.9)	3030.9*** (642.5)	0.184** (0.0800)	2549.4* (1435.9)	2730.4*** (575.6)	0.243*** (0.0831)
Constant	14098.3*** (3293.5)	15829.0*** (1639.1)	6.767*** (0.312)	20606.9*** (3524.6)	22448.2*** (2067.4)	7.701*** (0.291)	14098.7*** (3293.5)	15829.3*** (1639.1)	6.839*** (0.309)
r ²	0.0125	0.0423	0.0124	0.0100	0.0329	0.00671	0.0125	0.0423	0.0123
N	846	846	846	844	844	844	846	846	846

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Mean final score is the relative mean for the applicant, in which the score has been demeaned by the loan officer average score. Male Owner is an indicator for the actual gender of the business owner (not the randomly assigned gender on the application). Columns 1 to 3 reflect total business profits earned by the applicant from all their businesses, Columns 4 to 6 reflect all business profits earned by all members in the applicant's household, and Column 7 to 9 reflect all income earned by the applicant. Robust standard errors in parentheses.

Table A26: Main specification robustness to endline sample

	(1) Score	(2) Overall Impress	(3) Value Prop	(4) Entrepreneurial	(5) Loan
Male	-0.0792 (0.119)	-0.0270 (0.0632)	-0.0561 (0.0644)	-0.0485 (0.0671)	-0.00311 (0.0145)
Observations	3430	3430	3430	3430	3430
Female Mean	12.09	5.999	6.092	6.085	0.496

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Score is the final score in the business plan competition, determined by Overall Impression (Overall Impress) + .5* Value Proposition (Value Prop) + .5*Entrepreneurial Credibility (Entrepreneurial). Each of these subscores is on an increasing scale of 1 to 10. Loan indicates whether the application was forwarded by the loan officer to their own institution for loan consideration. Specifications include loan officer and application fixed effects. Sample is limited to those observed in endline survey. Robust standard errors in parentheses.

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