Female Entrepreneurship and Professional Networks*

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Abstract

Female-owned businesses continue to be smaller and less profitable than male-owned firms. We conduct an RCT in Ghana on a sample of 1,771 growth-oriented female entrepreneurs to investigate the effect of online networking groups on firm performance. We find that access to online networking opportunities leads to greater innovation, better business practices and higher profits by 24%. The increase in profits is concentrated in the upper tail of the distribution. However, three-year follow-up data reveal limited impacts on long-term firm outcomes. Our findings reveal the potential and limitations of low-cost, light-touch interventions in fostering long-term business growth for female entrepreneurs.

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1 Introduction

Despite being the only region in the world where there are more female entrepreneurs than men, the vast majority of female-owned businesses in Sub-Saharan Africa are microenterprises (World Bank Group, 2019). Identifying the growth constraints of female-owned enterprises is vital for poverty reduction and inclusive economic growth.

One potential explanation for the growth constraints of female entrepreneurs is that they tend to have smaller networks and fewer connections to other firms (World Bank Group, 2019; Izumi et al., 2023; Lambon-Quayefio et al., 2025).In many settings, interfirm relationships and access to professional networks have been shown to be key determinants of business success (Kanter, 1994; Cai and Szeidl, 2017; Fafchamps and Quinn, 2016; Hardy and McCasland, 2020; Vega-Redondo et al., 2019). However, women tend to have smaller and less diverse professional networks and be more likely to rely on their friends and family members when doing business (World Bank Group, 2019; Lambon-Quayefio et al., 2025). Can increasing networking opportunities be an effective solution to improve the performance of female-owned businesses? Past studies documented positive impacts of networking interventions, but they have focused mainly on in-person networking with mostly male entrepreneurs. However, it is not clear if these positive effects would generalize to female entrepreneurs who may face greater time and mobility constraints, making in-person networking potentially more costly and less effective. Moreover, beyond networking constraints, other barriers may be more relevant for the growth of their businesses, such as childcare responsibilities and credit constraints, making networking interventions less beneficial.[1] Despite growing interest from policymakers and practitioners (Ubfal, 2024), there exists limited evidence on the effectiveness of networking interventions on the firm performance of female-owned enterprises.

In this paper, we study how access to *online* networking opportunities and legal support can affect interfirm relationships and firm performance of female-owned enterprises in a field experiment in Ghana. We focus on a sample of 1,771 female entrepreneurs who have applied to the COVID-19 Stimulus Fund offered by our partner NGOs that aimed to invest in high-growth and sustainable firms.[2] It is important to note that while most of the firms in our

[1] A substantial literature on female entrepreneurship in developing contexts have examine potential factors including care responsibilities (Herrera et al., 2019; Ho et al., 2025), restricted financial autonomy over business (Jakiela and Ozier, 2016; Bernhardt et al., 2019), credit constraints (Fafchamps et al., 2014), and social norms (Ashraf et al., 2019). See Jayachandran (2020) and Ubfal (2024) for reviews of the literature.

[2] Our partner NGOs are Women's Empowerment & Investment Group (WEIG), Annan Capital Partners

sample are small microenterprises, they are more growth-oriented than the typical small firm due to the application process.[3]

We randomly assigned female entrepreneurs into two treatment arms and a control group. In the first treatment arm, women are assigned into online networking groups of 8 entrepreneurs on the WhatsApp platform in two rounds. Each week, each member is assigned to meet virtually with another group member. The aim of this treatment is to expand the business networks of participants and increase their opportunities for business collaborations. Importantly, online networking through the use of WhatsApp may provide a more flexible, accessible, and cost-effective way for female entrepreneurs to connect with peers and potential business partners without the need for extensive travel. In the second treatment arm, we enrich the online networking groups with legal support. The goal of the additional legal support is to reduce contracting frictions, potentially increasing business collaborations between entrepreneurs who meet on the platform. The legal support entails weekly video lessons by a local corporate lawyer that discusses risks of collaborations and ways of mitigating these risks through the use of written agreements and effective communication. Entrepreneurs can also consult the lawyer individually during the four-month intervention period.

We find that access to online networking groups have significant positive impacts on firm outcomes. First, one year after the intervention, the treatment groups increased business innovation by 33 to 35%, as measured by likelihood of introducing changes to their businesses, such as new products or new ways of marketing. Second, we also document an improvement in business practices, driven by a positive effect on marketing and financial planning practices. For example, we find increases in firms' use of advertisement and special offers, as well as in their likelihood to review financial performance and set sales targets. Third, one year after the intervention, the treatment groups also experience a 24% increase in business profits. Similar to previous work on business training (Dalton et al., 2021), there is a null effect on sales, suggesting that the intervention led to efficiency gains through a reduction in costs and improvements in business practices. Quantile estimates show that the effects are not homogeneous across businesses. Instead, a significant increase in profits emerges above the 60th percentile in profits for both treatment groups, suggesting that firms in the upper tail of the distribution benefited more from the intervention. This result is similar to evidence found for microfinance (Breza and Kinnan, 2021). The results on business performance are not significantly different between the two treatment arms, suggesting that the reduction

(ACP), and GUBA Foundation.

[3]Over 30% of the women in our sample hold college degrees and 80% of the firms are registered.

in networking constraints drives our results and that legal support does not appear to have additional influence on business outcomes.

We then investigate which components of our intervention had the greatest impact on the observed findings. A mediation analysis suggests that the positive impact on business outcomes can be fully explained by those who had contacted a WhatsApp group member, suggesting that access to the WhatsApp groups and the one-on-one chats are the key drivers of these effects, rather than the use of the business directory. Using a supervised machine learning approach to analyze the text messages of the WhatsApp group chats, we find that although marketing and advice-sharing occurred infrequently in the main WhatsApp group platforms, the WhatsApp groups played a crucial role in the coordination and scheduling of the one-on-one call between group members. This suggests that much of the effect on business outcomes results from the one-on-one virtual interactions. Nonetheless, the WhatsApp groups are critical for providing both the accountability and the structure to facilitate these interactions.

In the next part of the paper, we investigate the potential mechanisms that can explain why access to online networking groups can lead to an improvement in business outcomes. We show that the results cannot be explained by changes in business ambitions, entrepreneurial self-efficacy, get-ahead attitudes, or female empowerment. Instead, we show that the results can be explained by two important channels. First, we find evidence that the intervention changed the composition of business collaborations. We observe a decline in collaborations with friends and family members and an increase in collaborations with business network members in our sample. We show that this shift in collaborators comes from a change in beliefs about the quality of potential collaborators. In particular, those in the treatment group perceive a higher return to collaborating with someone external to their friends and family network. Consistent with the change in beliefs, the treatment group also exerted greater search effort and are more likely to contact and meet firms external to their existing friends and family network. However, we do not observe a change in the likelihood of collaborating.

Second, we show that information sharing and knowledge transfers between peers play a key role in explaining our effects. Female entrepreneurs randomly assigned into WhatsApp groups with more entrepreneurs that are college-educated, have better baseline business practices, and higher baseline sales and profits are more likely to innovate, improve business practices, and have higher profits. We also find that businesses of entrepreneurs in groups with entrepreneurs from different industries than their own, or with a more diverse

industry mix, are more likely to improve. This suggests that networking with high-quality entrepreneurs with diverse experiences can lead to better firm performance and innovation. To provide further evidence on knowledge sharing as a key channel, we show those assigned to groups with entrepreneurs who are more complementary to their baseline business needs are more likely to innovate.

Finally, in the last part of the paper, we investigate the persistence of these effects using data from the long-run follow-up survey. Three years after the intervention, we find limited long-run positive impacts on firm innovation, business practices, or profitability. We also do not find any impacts on firm survival or collaborations. In fact, after three years, the shift in the business network of treated entrepreneurs towards people outside their immediate circle of friends and relatives does not persist and only 2.5% of the treated entrepreneurs are still in touch with entrepreneurs they have met through the intervention. Together, these results suggest that while a light-touch intervention can be effective, without sustained support or ongoing engagement, the benefits of the intervention may not persist and entrepreneurs revert to relying on their pre-existing networks, which may be less conducive to new business ideas or practices.

Our results highlight that networking constraints are an important barrier for the growth of female-owned enterprises. We find that expanding networking opportunities to female entrepreneurs can lead to greater innovation, better business practices and higher profits. Our study provides key novel evidence that a low-cost, light-touch online intervention can effectively improve firm outcomes. A back-of-the-envelope calculation shows that the one-year improvement in profits implies a cost-benefit ratio of 13.4, underscoring the cost-effectiveness of an online networking intervention. However, the long-run results show that these positive benefits do not necessarily translate into persistent business growth if the support is not sustained, an important result that policymakers should take into account when designing future interventions.

This paper contributes to the literature in four ways. First, our research builds on a growing literature on the role of interfirm relationships and business collaborations for firm outcomes (Iacovone et al., 2022; Fafchamps and Quinn, 2016; Cai and Szeidl, 2017; Eesley and Wang, 2017; Quinn and Woodruff, 2019; Dimitriadis and Koning, 2022). In a closely-related paper, Cai and Szeidl (2017) shows that monthly meetings between owner-managers of Chinese manufacturing firms in small groups has a substantial impact on business practices and performance. Our study contributes to this body of work in various ways. Relative to prior studies, which focus mostly on male-owned enterprises, we are the first to document

that networking intervention can have positive impact on women's businesses, in terms of innovation, business practices, and profits. Additionally, our intervention was conducted virtually rather than in-person, highlighting the cost-effectiveness of online networking as a scalable and affordable alternative to traditional approaches. Moreover, we provide novel evidence on the long-term effects of networking interventions by measuring outcomes three years after the intervention. The limited persistence we observe sheds light on the challenges of sustaining impacts over time.

Second, our paper contributes to the large literature on the constraints to growth of microenterprises and potential interventions (see McKenzie and Woodruff (2014) for a review). This literature found mixed results on the effectiveness of training programs (McKenzie, 2021). Especially relevant for our study are training interventions that focused on mentorship (Brooks et al., 2018; McKenzie and Puerto, 2020; Valdivia, 2015), and those conducted with friends (Field et al., 2016) or village peers (Vasilaky and Leonard, 2016). However, these interventions often bundle networking with business training, making it difficult to identify the sole effect of peer support. We contribute to this literature by isolating the effect of WhatsApp networking groups. Moreover, thanks to its online nature, our intervention represents a cost-effective approach to connect entrepreneurs from different regions and backgrounds. Finally, while most of these interventions focus on mentoring, our intervention investigates the role of peers.

Third, our research contributes to the growing literature on the role of social media and digital technology as mobile broadband internet and mobile adoption rises in developing countries (Manacorda and Tesei, 2020; Campante et al., 2022). We extend this work by exploring how social media can be leveraged to connect peer entrepreneurs and facilitate networking. In doing so, we also contribute to a newer strand of research, much of which emerged during the COVID-19 pandemic, that utilizes digital technology and remote tools for knowledge dissemination, such as online training for entrepreneurs (Davies et al., 2024) and online tutoring for students (Angrist et al., 2023; Carlana and La Ferrara, 2024). However, instead of a top-down approach, such as mentors-mentees or teachers-students, we focus on peer interactions. One closely-related paper is (Vega-Redondo et al., 2019), which evaluates an online business training program, combined with in-person and virtual interactions between peer entrepreneurs across different African countries on innovation, as measured by business plan submissions. Relative to this literature, we provide the first evidence that *online* networking can lead to positive impacts on firm performance. Importantly, our experimental design highlights the importance of peer group composition, showing that exposure to

high-quality and diverse peers drive the positive impacts. Furthermore, our study highlights one crucial way for engaging entrepreneurs: *structured*, *one-on-one* interactions—facilitated through "coffee chats" within the WhatsApp groups.

Finally, our research contributes to to the growing literature on the gender gap in entrepreneurship and barriers for female-owned businesses (Jayachandran, 2020; Ubfal, 2024). In particular, in developing countries, interventions that aimed to alleviate growth constraints for female microentrepreneurs have found limited positive effects of loans and business training (Jayachandran, 2020; de Mel et al., 2009, 2014). We contribute to this literature by investigating the effect of providing female entrepreneurs with access to online professional networks. Moreover, while the literature has focused primarily on informal, subsistence microenterprises, our sample consists of more growth-oriented female-owned enterprises. We show that expanding professional networks for potential high-growth firms can be effective in improving business outcomes such as innovation, business practices, and profits.

The paper is organized in the following way. Section 2 describes the experimental design. Section 3 presents the empirical strategy and the outcomes of the analysis. We then describe our results on firm outcomes (Section 4) and labor supply (Section 5). Section 6 investigates which components of the intervention drive the results. In Section 7, we investigate potential underlying mechanisms driving our results. Section 8 presents the long-run results. Section 9 conducts a cost-benefit analysis of the intervention. Finally, Section 10 concludes.

2 Experimental Design

In this study, we explore whether providing online networking can improve business outcomes and increase firm collaborations. Specifically, we provide the following two treatments. Their effect is compared to the status of a control group receiving no support:

Treatment 1 – Online Networking Groups

The entrepreneurs in this treatment arm are assigned to WhatsApp groups of 8 entrepreneurs which are matched by preferences for collaboration type and sector. After an initial multi-way introductory phone call, all women are invited to participate in weekly virtual "coffee chats", i.e. one-on-one meetings between group members. After everyone in the group has met each other ($\approx$ 8 weeks, 1 for the group introduction and 7 for the one-on-one meetings), they are re-assigned into a second group and the same process repeated, for a

total of approximately 16 weeks. Additionally, the treatment group also receives access to an online directory of businesses in the respective treatment group and can submit specific requests for collaboration partners to the enumerators who can help connect them to another firm in the sample.

Treatment 2 – Online Networking Groups + Legal Support

In addition to the support described in Treatment 1, entrepreneurs in this group also receive legal support. The goal of this additional treatment is to reduce potential contracting frictions for interfirm collaborations. Specifically, they receive weekly video lessons by a Ghanaian corporate lawyer. These lessons focus on the risks of collaborations and ways to mitigate these risks. In Appendix B, we present the course syllabus. The entrepreneurs also receive free private consultations with the lawyer who is available for phone calls during weekly "office hours" throughout the four-month intervention period.

Finally, given that our treatments are explicitly aiming at increasing interfirm relationships, part of our effect may be driven by a differential effect of salience between treated and control groups. In order to mitigate this concern, the entire sample of participants including the control group is provided with a video illustrating the benefits of business collaboration.

2.1 Sampling Frame

Our sample comes from the applicant pool of the COVID-19 Stimulus Fund, offered by our partners Women's Empowerment & Investment Group (WEIG), Annan Capital Partners (ACP), and GUBA Foundation. Specifically, the COVID-19 Stimulus Fund offered funding of $2,000-$5,000 to female-owned businesses. In order to apply, entrepreneurs must fill out an online application form that asks questions such as "what problem does your business solve" and "how does your business positively impact the Ghanaian economy." The goal of these questions is to identify sustainable firms with high-growth potential.

The total 3,931 applicant firms form the main sampling frame for the study. The 10 firms that were selected to receive funding were dropped from the research study. We randomly selected 2,326 firms from the pool of applicants who provided their email addresses and phone numbers, and answered all application questions to be included as part of the baseline survey. We then applied an eligibility filter to determine who can be part of the survey: firms with at least one female owner, at least 18 years old, have started business operations at the time of the survey, have at least one business, can speak English or Twi, and provided information

on the firm industry and region. Baseline survey was conducted between October 2020 and December 2020 for 2,000 firms. In December 2020, enumerators conducted a short phone survey to elicit interest in the WhatsApp groups and preferences for collaborations. Out of the 2,000 firms, 1,488 (74%) indicated interest and had WhatsApp capability to participate in the study. In January 2021, we contacted an additional 326 entrepreneurs, among whom 283 were interested in the online networking groups. We also conducted the baseline survey for this additional sample. This resulted in a final sample of 1,771.

2.1.1 Stratified Random Assignment

These individuals were randomly assigned into the two treatment groups and one control group:

- Treatment 1: Networking 40% ($N = 704$)
- Treatment 2: Networking and Legal Support 35% ($N = 608$)
- Control 25% ($N = 436$)

We stratify the randomization based on above and below median of the predicted collaboration index, 4 broad sectors ("Crop and animal", "Manufacturing", "Trade", and "Services"), and 5 broad regions ("Ashanti", "Eastern", "Northern", "Volta", and "Western"). The predicted collaboration index is constructed by predicting the likelihood of having at least one collaboration in the past 6 months using random forest. In Table D.1, we present the fifteen most important predictors of collaborations selected by the random forest.[4] The reason why we stratify over the predicted collaboration index as opposed to the baseline value of collaboration is because we only collected collaboration information for a subsample of 904 firms.[5]

[4]More details on the machine learning prediction are provided in Appendix Section D.

[5]Note that the collaboration definition we used during the baseline survey ultimately differs from the final definition we adopted in the one-year follow-up survey. This is because we learned some entrepreneurs included one-off, spot market transactions. To standardize the definition of collaboration across individuals, during the one-year follow-up survey, enumerators explicitly state that some form of verbal or written agreement must have taken place prior to the collaboration activity. As a result, we observe 30% of firms with any collaboration during the baseline survey as opposed to 13% for the control group during the one-year follow-up survey.

2.1.2 Assignment to WhatsApp Groups

As part of the intervention, we assign individuals into WhatsApp groups of eight based on their preferences over business collaborations. We elicited preferences over their top three choices for collaboration types, preferred industry of the potential collaborator, and preferred location of the potential collaborator. We then use a two-stage procedure to assign individuals into networking groups. First, within treatment status and language (English or Twi), we assign individuals into one of 25 group types based on their preferences over 5 collaboration types (creation of new products with collaboration, joint marketing, joint production, finding suppliers/clients, and mixed types[6]) and five broad sector group (crop and animal, manufacturing, trade, services, and mixed sector).[7] Then, in the second stage of the assignment, individuals are randomly selected to be placed into groups of 8 within their group type, or to the control group. To help identify the importance of group composition, we randomly select half of the sample to be placed in a group with individuals with the same education background (either college-educated or not) and the other half are placed into mixed education groups. The purpose is to generate variation along the education dimension across groups to help us identify key mechanisms.

2.2 Sample Characteristics

2.2.1 Summary Statistics

In Table 1, we report the summary statistics for our full sample at baseline. The average entrepreneur in our sample is aged 37. 56% of the sample is married and 67% have at least one child under the age of 18.

Because of the application process described in Section 2.1, the resulting sample of firms is positively selected compared to the typical female-owned firm in Ghana. For example, 39% of entrepreneurs have a college degree. This stands in contrast to the national female college completion rate in Ghana of 6%.[8] The average firm has been in operation for 7.46 years with 3.54 employees. Monthly sales is $848.41 with monthly profits $219.25.[9] Average

[6]The mixed group comprise of any remaining individuals for whom we could not group based on their collaboration preference.

[7]Due to the limited sample size, we decided not to account for preferences over location in our group assignment. Additional details on the assignment process for the group types are provided in Appendix C.

[8]`https://www.statista.com/statistics/1131775/school-completion-rate-in-ghana-by-gender/`

[9]We used a $1 USD to 5 GHS exchange rate.

monthly sales is over two times higher than the average female-owned firm in Ghana.[10] 80% of the sample has registered their business.

Majority of firms are in the manufacturing sector, followed by retail trade. Figure A.1 plots the distribution of firms across different industries at a finer level. Firms are well-represented across many different industries including Forestry, IT and Computer Services, and wholesale trade. The most frequent industries are tailoring, clothing manufacturing, retail for food and groceries, and hair care and beauty.

2.2.2 Balance Checks

In Table A.1, we provide evidence that our treatment groups are balanced across a series of baseline characteristics. Specifically, Columns (1) to (3) report the average value of a series of baseline variables for the control group, the networking only group and the networking and legal group, respectively. Column (4) displays the difference between the control and the networking groups, while Column (5) shows the difference between the networking and the networking plus legal groups. We do not find significant differences across owner characteristics such as owner's age, probability of being married, number of children, and probability of having a child below 18 years old. Moreover, there is no significant difference across firm characteristics such as firm age, probability of being a firm entirely owned by women, probability of having a collaboration with another firm, average number of employees, average monthly sales and profits, and operating sector.

2.3 Data Collection

Our baseline survey took place between October and December 2020. We collected information on key firm and owner characteristics. For a subsample of around 900 firms we also collected detailed information on collaboration. In December 2020, we conducted a short phone survey to collect information on interest in the matching program and collaboration preferences in terms of collaboration type, sector, and location of the potential partner. The midline survey was conducted between August and October 2021, around three months after the end of the intervention.. The response rate was 88.0% (86.8% for treatment 1, 88.8% for

[10]The average annual revenue of female-owned non-farm enterprises is 9,333.56 GHS in 2013. USD/GHS exchange rate in December 2013 is 2.35. This implies an average monthly revenue of $331. Source: Ghana Panel Survey, Wave II report, Table 10-23.

treatment 2, and 88.7% for control). In Table A.2, we show balance across the treatment groups along baseline characteristics for those that remain in the sample at midline survey.

One year after the end of the intervention, between April and July 2022, we conducted the one-year follow-up survey. We reached 85.7% of the sample (87.6% for treatment 1, 85.1% for treatment 2 and 84% for control). We also document balance across the groups for those we reached in the one-year follow-up survey (Table A.3).

Finally, three years after the end of the intervention, between July and August 2024, we conducted an in-person three-year follow-up survey. We reached 76.2% of the sample (75.1% for treatment 1, 77.5% for treatment 2 and 76.9% for control). We also observe balance among the respondents (Table A.4).

2.4 Program Take-Up

Table A.5 reports the statistics on the take-up of the intervention. Of the entrepreneurs assigned to the online networking groups, 82% (84% in the networking treatment and 80% in networking and legal treatment) were successfully added to the WhatsApp groups.[11] Among those assigned to a WhatsApp group, the take-up rate of the virtual coffee chat was high; 60% of entrepreneurs contacted another WhatsApp group member. On average, participants contacted 1.66 group members with the modal contact frequency of once per week. Entrepreneurs also took advantage of the business directory and around 10% contacted another business owner through the directory. 20% also asked for assistance from one of our enumerators to help them identify potential collaborators. We find higher participation rates for those in the networking only treatment arm. Entrepreneurs in this group contacted more WhatsApp members and more frequently. For the entrepreneurs assigned to the networking and legal arm, they on average watched 30%, or 4 of the 12 videos we distributed.

In Table A.6, we present the summary statistics from the WhatsApp chats. We obtained chat logs for 242 out of 334 groups.[12] The participation rate on the WhatsApp groups is also high, around 50%. On average, there are four unique senders (out of each group of eight), with around 20 messages sent during the active eight-week period. Average number of media messages sent was five. These media messages include videos, voice recordings, or photos that participants would submit to showcase their products.

[11] Primary reasons for not being able to be added are lack of WhatsApp capabilities, wrong number or changed mind about participating.

[12] The missing chats are due to accidental errors in the data collection such as when the enumerator exited the group without first exporting the chats.

Table A.5 shows that connections formed during the intervention have persisted at least for one year. At midline, which corresponds to three to four months after the conclusion of the intervention, around 24% of treated entrepreneurs were still in touch with WhatsApp group members. These numbers remain similar in magnitude one year after the intervention at 16%. However, we observe that for the networking and legal arm, there is significantly lower probability of staying in touch with their group. Three years after the intervention, we observe a large drop-off, with only 3% of all treated entrepreneurs still in touch with their WhatsApp group members.

3 Empirical Strategy

3.1 Estimation Methodology

To investigate the effects of our treatments on our outcomes of interest, we will estimate:

$$Y_{i,t=1} = \beta_0 + \beta_1 T1_i + \beta_2 T2_i + \pi Y_{i,t=0} + \delta M_{i,t=0} + S_i'\gamma + \epsilon_{i,t=1} \quad (1)$$

where β_1 represents the effect of online networking only and β_2 represents the effect of online networking and legal support. $T1_i$ and $T2_i$ are indicators for treatment 1 and 2 , respectively. S_i is the vector of randomization strata dummies. $Y_{i,t=0}$ is the baseline value of the outcome Y. $M_{i,t=0}$ is an indicator if the baseline outcome value was missing at baseline. For collaboration-related outcomes as pre-specified, we also control for $\hat{f}(X)$, machine learning index that predicts likelihood of collaboration from controls (Ludwig et al., 2019; Wager et al., 2016; Bloniarz et al., 2016; Wu and Gagnon-Bartsch, 2018).[13] Because in our study we consider multiple primary outcomes, we adjust for multiple hypothesis testing to minimize the false non-discovery rate (FNR) following Benjamini and Hochberg (1995) and Anderson (2008). Sharpened q-values are added to results tables.

3.2 Outcomes

In this section we present an overview of the outcomes in our study. See Appendix E for the full list of outcomes and additional details on how they were measured.

[13] More details on the machine learning prediction are provided in Appendix Section D.

The key outcomes of interest are firm innovation, business practices, and firm performance.[14] We measure firm innovation in two ways. First, following McKenzie (2017), we use a pre-specified business innovation index, which is a standardized index of twelve variables aiming to capture changes in the production process, such as the introduction of new or improved products and processes, as well as new marketing and pricing methods.[15] Second, we use a dummy version of this outcome, where we asked the respondent whether they implemented any changes in the business in the past six months. Specifically, we ask an open-ended question on whether the entrepreneur made any changes to the business and had the respondent describe the change to the enumerator.

To capture business practices and firm performance, we use two pre-specified indices, as in McKenzie (2017). The business practice index consists in the proportion of adopted practices out of a list of twenty-two which range from marketing to record-keeping, from buying and stock control to financial planning used by the firm. Firm performance is measured by a sales and profits index comprising nine metrics, including various measures of sales, profits, and the number of customers.

We also analyze the impact on pre-specified collaboration outcomes: (i) number of collaborations, (ii) steps towards collaboration index, and (iii) joint application to the business innovation competition. We measure the total number of collaborations based on the total number of times a firm has engaged in one of the following activities: *i.* work with another firm to promote/market each others' businesses; *ii.* build a new ongoing working relationship with suppliers or business clients; *iii.* purchase inputs or stocks wholesale with another firm; *iv.* share tools, inputs, equipment or employees with another firm; *v.* work with another firm to fill a large order; *vi.* start operating business together/sharing of profits with another firm; and *vii.* other forms of collaborations.

It is important to note that our definition of collaboration is quite restrictive. To ensure we were not capturing one-off, spot transactions, enumerators specified to the respondents that collaborations are relationships where a verbal or written agreement took place prior

[14]Note that in our pre-analysis plan, we pre-registered collaboration outcomes as our primary outcomes and firm outcomes as secondary outcomes. While the order of the presentation of the results is switched, we report all the outcomes we pre-specified and unless otherwise denoted, all outcomes and analyses reported are pre-registered.

[15]All indices in our analysis are constructed in four steps. First, we re-code all contributing outcomes so that higher values correspond to treatment effects in the same direction (improvements in the outcomes). Second, we generate z-scores for each variable entering the index using the baseline mean and standard deviation for that outcome. Third, we generate means of these z-scores. Fourth, we create the index by generating the z-score for the means of these z-scores.

to the activity. Entrepreneurs were also asked directly whether they participated in one of the activities listed above. This differs from the definition applied by Ashraf et al. (2019) which includes asking and receiving advice from other businesses. Because we refined this definition of collaboration over the course of the research study, we do not have data on collaborations using this definition at baseline. As a result, in the following section when we present descriptive evidence on collaborations, we will utilize data from the control group.

As part of the intervention design, we host a business innovation competition. The competition seeks to fund an innovative business project and allows for joint applications with one other firm. The winning firm is awarded 6,000 GHS while joint applications are awarded 12,000 GHS to be split between the two firms. This competition is open to all firms in the sample, including the controls. We measure joint applications as an outcome variable for firm collaborations.

In addition to these outcomes, we also analyze outcomes such as quality of collaborations, business ambition, attitudes, entrepreneurial self-efficacy, and female empowerment. Unless otherwise denoted, we will focus on results from our one-year follow-up survey.[16]

4 Effects on Firm Outcomes

In this section, we investigate the effect of our intervention on firm innovation, business practices, and performance.

4.1 Effects on Firm Innovation

Table 2 shows that business innovation significantly increased for both treatment groups. In Column (1), we report the results for our indicator of whether the respondent introduced any changes to the business in the last six months. In Column (2), we display the results for the pre-specified business innovation index.

Online networking groups led to an increase in the likelihood of introducing changes to their businesses by 35% (=.101/.286) for Treatment 1 and 33% (=.0934/.286) for Treatment 2.[17] We find that innovation increased across nearly all areas, both when measured using

[16]The results for the midline, three-month follow-up survey are presented and discussed in Appendix Section J.

[17]Q-values from multiple hypothesis testing are displayed in Table 2.

open-ended responses coded by enumerators (Figure A.2) and when using the pre-specified yes/no business innovation index component questions (Figure A.3). The treated firms were more likely to have introduced new or improved products and processes, as well as new ways of marketing and new pricing methods. They are also more likely to enter new markets. Finally, they are more likely to mention changes in professional relationships, namely (i) changes in the ways they hire and motivate workers; (ii) changes in their relationships with suppliers and (iii) likelihood to build connections with other entrepreneurs. Interestingly, we find that they are able to source inputs at lower costs and at higher quality. The effect sizes are similar in magnitude across the two treatment arms, suggesting that experimentally increasing the online networks of entrepreneurs can have meaningful impacts on firm innovation. Providing legal support does not appear to have additional benefits for this outcome. These findings align with responses to the question on changes implemented as a result of the treatment (Figure A.4).

4.2 Effects on Business Practices

Column (3) of Table 2 reports the effects of the intervention on the overall business practice index. We find that the overall business practice index increased by .1 to .2 standard deviations for the two treatment arms relative to the control group (although results are not statistically significant for treatment 1). The difference between the two groups is not statistically significant. In Figure A.5, we decompose the individual indices into their individual components. We find that the results are driven by an improvement in marketing and financial planning practices. More specifically on marketing practices, the intervention increased firms' use of advertisement and special offers. There is also suggestive evidence that entrepreneurs are more likely to ask customers for feedback on desired new products and reasons why they stopped buying. Regarding the financial planning component, we also find that firms are more likely to review financial performance, set sales targets, compare sales to their target and have a budget for the next year.

4.3 Effects on Firm Performance

Next, we explore how the intervention affected sales and profits. In Table 2 Column (4), we find null effects in the overall sales and profits index. However, when we decompose the index to its sales (Table 3) and profits (Table 4) components, we find overall positive, but

imprecisely estimated effects on sales, and positive and significant impacts on profits for the treated firms. Monthly profits increased by almost 321 cedis, or 24% (=321/1322.919) for treatment 1 and 24% (=315/1322.919) for treatment 2. Similar results hold for winsorized monthly profits and the inverse hyperbolic sine of profits (although not significant for treatment 1). Across all the profit measures, the difference between the two groups is not statistically significant. The positive increase in profits is comparable to other studies in developing contexts that had a positive impact on profits. For example, Cai and Szeidl (2017) finds a 35% increase in profits after 144 hours of meetings between owner-managers. Lafortune et al. (2018) finds a 31% increase after 49 to 63 hours of role model training and providing curated local knowledge led to a 35% increase in profits in Dalton et al. (2021). In contrast to these studies, our intervention took place virtually and had around 16 hours of one-on-one meetings.

To examine the distributional effects of the reform, Figure 1 plots the kernel density plots for monthly profits at baseline and one-year post-intervention for each of the treatment groups. As expected, the densities are nearly identical at baseline, given the randomization. Instead, one year after the intervention, we find a rightward shift in the monthly profits distribution for the two treatment arms. More firms now have monthly profits that are higher than 2000 GHS. We quantify the distribution shift in Figure 2, which plots the coefficients from estimating quantile regressions. The figures show a significant increase in profits above the 60th percentile for both treatment groups. Finally, to explore these distributional effects, we test for heterogeneity along several pre-specified dimensions, namely the baseline networking index (Figure A.6a), baseline business practice index (Figure A.6b), risk aversion (Figure A.6c), business formalization (Figure A.6d), or legal knowledge (Figure A.6e), and education (Figure A.6f). However, we do not find any evidence of heterogeneous effects across these dimensions with the key exception of education. Those with higher education benefited more from the intervention.

What explains this increase in profits? As we show in Table 3, we do not find a significant impact on monthly revenues. However, this masks substantial heterogeneity across firms. Figure A.7 presents the quantile effects on monthly revenues. While the estimates are imprecisely estimated, we see a suggestive positive increase in revenues at the top of the distribution, especially for those in the networking and legal arm. This increase in sales for the top of the distribution can partially explain the positive impacts in profits we observe.

Additionally, the positive impacts on innovation and business practices may have led to efficiency gains through a reduction in cost. For example, the treated entrepreneurs are

more likely to have improved sourcing of inputs at a lower cost or with higher quality. These changes can reduce costs to running the business. Moreover, we showed in Section 4.2 that the positive effect on business practices is driven by an improvement in financial planning. Better financial planning may also reduce expenses by improving business efficiency.

4.4 Effects on Other Business Outcomes

Having established the improvements in firm innovation, business practices, and profits, we next explore whether online networking groups improve other business outcomes. Table A.7 shows limited effects on the overall business financing index and its components. The treated entrepreneurs are not more likely to have received a loan, have larger loans or have a business bank account. Similarly, we also do not find an effect on capital and labor usage in Table A.8. We also do not find a differential effect for firm survival (Table A.9).

5 Effects on Labor Supply

We next explore whether the intervention also affected the labor supply of the entrepreneurs. The effect on labor supply may be driven by different factors. For example, as a result of the interaction with peers, female entrepreneurs may increase the effort they devote to their business because of social pressure (Mas and Moretti, 2009; Falk and Ichino, 2006). Alternatively, if our intervention induces some knowledge exchange, we may think that learning new business practices and introducing business changes may require extra time. Table A.10 shows that women in the treated groups increased their working hours on their businesses by 2 to 3 hours, relative to the control mean of 45 hours, with limited effects on hours spent on other jobs or childcare. This suggests that as a result of the intervention, female entrepreneurs are now putting greater effort in their business, which can explain the improvements in business performance we observe.

6 WhatsApp Groups, Virtual Coffee Chats, or Business Directory?

In this section, we investigate which components of our intervention had the greatest impact on the observed findings. Recall our treatment is a bundle of interventions: those in the

treatment were given access to two WhatsApp Groups, weekly assignment to virtual one-on-one "coffee chats," a business directory of all entrepreneurs in their treatment group, as well as a "matching" service where participants can directly contact their enumerators to find a potential collaborator. While the intervention is not designed for us to disentangle the individual impact of each of these intervention components, in this section, we present suggestive evidence that the positive impacts we observe come largely from the combination of having a WhatsApp group and the one-on-one interactions via the virtual coffee chats.

First, we conduct a mediation analysis to provide suggestive evidence of the role played by the WhatsApp groups versus the access to the business directory and the option to ask the enumerators for a "match." Specifically, we estimate our main specification as in Section 3 and control for whether the participant i) contacted a WhatsApp group member, ii) contacted another participant through the business directory, or iii) contacted an enumerator to receive a "match." Table A.11 shows the results of the mediation analysis for our innovation outcome. Column (1) reports the results for the baseline specification. Column (2) shows that, when we control for whether a participant contacted a WhatsApp group member, the effect of the treatment loses significance, while the coefficient for the new control is positive and significant. Instead, when we control for whether the participant contacted another participant through the business directory (Column 3) or contacted an enumerator for a "match" (Column 4), the additional controls are not significant and the effect of the treatment holds. Column (5) shows that the same conclusions can be drawn when we control for these three additional variables at the same time. Overall, these results suggest that the access to WhatsApp groups plays a larger role in explaining our results. Similar results hold when this mediation analysis is conducted using the business practice index (Table A.12) and profits (Table A.13) as main outcomes (although for profits, results are noisier).

Second, to understand the importance of the WhatsApp groups, we analyze the chats we have collected using a supervised machine learning approach that relies on manual annotations. We first remove all messages sent by the enumerator, message notifications related to people leaving or joining the group, any deleted messages, text messages with two or fewer words, and all messages with media attachments (e.g. photos, files) as we cannot observe these attachments. This leaves us with around 2000 individual messages. Then, we manually coded up 400 messages into one of the following categories that we identified as most frequent themes: 1) marketing or self-promotion (e.g. introductions, sharing of products, websites), 2) providing or seeking business advice and information, 3) coordination of the one-on-one chats, 4) comments/responses related to the legal videos, 5) comments/responses

related to the business competition, 6) greetings or thank yous, and 7) all other messages. We used this labeled dataset as a training dataset to a random forest classification model.

To prepare the text data for machine learning classification, we applied several preprocessing steps. First, we remove punctuation and filter out common English stopwords. We then converted the text data into numerical features using the TF-IDF (Term Frequency-Inverse Document Frequency) vectorizer, limiting the feature space to reduce dimensionality. Next, we split the labeled data into training and validation sets (80% and 20%, respectively). We train a random forest classifier on the training set and evaluate its performance on the validation set.[18] Our model achieves a validation accuracy of 70%, with stronger performance in the categories for "coordination" and "greetings." We then used this trained model to predict categories for the remaining unlabeled messages, allowing us to extend the categorization across the entire dataset.

Table A.15 shows the frequencies of each category across the coded WhatsApp messages. We find that WhatsApp groups are an important device for coordination between group members to schedule one-on-one calls, with nearly 24% of all messages. We find less evidence that the WhatsApp chats were used for marketing purposes or for seeking or providing business advice. This suggests that much of the positive effect on business outcomes is likely the result of the one-on-one virtual coffee chats, but the WhatsApp groups likely also provided both accountability and structure to facilitate these interactions.

7 Mechanisms

Our results thus far show that the intervention led to a meaningful improvement in business profits as well as business practices. The results are similar across the two treatment arms, suggesting that a primary driver of our results come from the networking component of the treatment. In this section, we explore the potential mechanisms that can explain why participating in WhatsApp networking groups can improve business outcomes.

7.1 Business Collaborations

One potential explanation for the positive impacts on business performance is changes in business network composition induced by the treatment. To measure whether network com-

[18] See Table A.14 for the performance metrics of our model.

position changed, we study the impact on business collaborations, which has been shown by Cai and Szeidl (2017) as a key channel for the positive impacts of networks on firm outcomes.

7.1.1 Formation of Collaborations

We first investigate whether the treatment affected the formation of interfirm collaborations in Table A.16. The results reveal that the online networking groups significantly increased intermediate steps towards collaborations by .2 to .3 SD relative to the control group. In Figure A.8, we present the results for the individual components of the index and find that the increase comes from greater search efforts rather than a greater interest in collaboration. For example, we do not find an effect for considering or identifying an area of improvement for collaboration.

However, while the intervention increased efforts towards collaboration, we find an overall null effect in the likelihood of collaboration for the networking arm and a significant negative impact for the legal arm. The difference between the two treatments is significant at the 1% level. The legal arm reduced the probability of having at least one collaboration by 52% (=-0.0695/0.134) and the number of collaborations by 68% (=-.533/.781). We do not find effects for joint application to the business competition, but given the relatively low application rate to the competition (15%), we are unlikely to be powered to detect an effect for this outcome variable.

What drives the decline in collaborations for the legal support group? One potential explanation is that entrepreneurs with a greater understanding of the legal risks are now more wary of entering into contractual relationships. However, it does not appear that entrepreneurs in this group are less interested in collaborations. As shown above, both treatment arms were similarly likely to have taken additional steps towards collaborations. Moreover, in Table G.1, we also do not find a change in beliefs about the perceived benefits and risks of collaborations among the treated entrepreneurs. Instead, the reduction in realized collaborations for the legal arm may be driven by entrepreneurs becoming more selective or careful with whom they are starting collaborations.

7.1.2 Collaborator Types

In Table A.17, we show that the overall effect in collaborations masks a shift in *types* of collaborators. We present the results for probability of collaborating with a friend or relative in Column (1), collaborating with someone met through their business network outside of

the University of Ghana (UG) intervention network in Column (2), and collaborating with someone met through the intervention in Column (3).

For both treatment arms, we find a decline in collaborations with friends and family members. The decline is significantly larger for the legal arm. Moreover, while there is a null effect for collaborations with business network members outside of the UG network for treatment 1, we document a decline in these collaborations for treatment 2. However, for both treatment groups, the declines in collaborations are (at least partially) offset by an increase in collaborations with business network members in our intervention. These results suggest that the introduction of new networking opportunities may weaken existing business relationships, shifting collaborations from friends and family to the external networking group members. In Table A.18, we conduct a mediation analysis to show that the change in collaborators fully explains the overall effect on collaborations.[19]

To understand this shift in collaborators, we explore changes in beliefs about the quality of potential collaborators. Specifically, we ask entrepreneurs in both treatment and control groups to rate the best collaborator they would be able to find among their friends and relatives, as well as those in their broader business network on a scale of one to ten, where ten is ideal. Table A.19 shows that while the intervention did not influence the perception of quality among friends and relatives, it led to a positive increase in perceptions about potential collaborators among business networks. The gap between the two types of collaborators also increased, suggesting that those in the treatment group perceive a higher return to collaborating with someone external to their friends and family network. This complements our earlier findings that our intervention increased search efforts for potential collaborators in the treatment groups.

7.2 Learning from Peers

We next explore the role of peers in explaining our results. In particular, we will focus on two group dimensions: quality and sectoral composition. First, interactions with higher-quality entrepreneurs may lead to information transmission and knowledge transfers that can improve business outcomes. Second, the sectoral composition of groups may affect the type of shared information. For example, business-owners working in the same sector may exchange more sector-specific information. However, competition may limit how openly

[19]In Appendix Section F, we explore whether quality of collaboration improved as a result of the shift in collaborators. However, due to the small number of collaborations, these results are noisy and imprecise.

entrepreneurs share knowledge. In contrast, business-owners working in different sectors may exchange useful cross-sector information (e.g., what are good financial practices, how to hire new employees) without the fear of aiding direct competitors. In this case, a greater diversity of industry representation among the peers may be important.

To study the role of peer effects, we estimate the following linear-in-means model for individuals in the treated groups only, pooling the two treatment groups:

$$Y_{i,t=1} = \alpha_0 + \alpha_1 \overline{X}_{-i,t=0} + \pi Y_{i,t=0} + \delta M_{i,t=0} + S_i'\gamma + \tau \hat{f}(X) + K_i'\phi + \epsilon_{i,t=1} \tag{2}$$

where $\overline{X}_{-i,t=0}$ is the average characteristic of the peers of i.[20] In addition to the controls in the main specification, we will additionally control for K_i, a vector of variables used in the group assignment. This includes indicators for treatment status, top collaboration choices, collaboration language preference, interest in collaborating with the same or different sector, firm sector, and their interactions.[21] Because the assignment to WhatsApp groups is random conditional on these preferences, α_1 identifies the causal impact of peer composition on our outcome variable.[22] We measure peer quality using three baseline characteristics: share of peers with a college degree, average business practice index of peers, and average baseline sales and profits index of peers. To capture sectoral composition, we use the share of peers from the same sector, as well as an industry diversity index, based on the Herfindahl-based index, following the literature on ethnic diversity (Alesina and La Ferrara, 2005).[23] In particular, we define the industry diversity index as $1 - HHI$. HHI is the Herfindahl-Hirschman index, measured as the $\sum_k s_k^2$, where s_k is the industry share for each industry k, including the focal participant. According to this index, homogeneous groups have a diversity index of 0 and balanced groups have a diversity index of 1.

We use equation (2) to investigate how group composition across the key outcomes: innovation (Figure 3a), business practices index (Figure 3b), sales and profits index (Figure 3c), and monthly profits (Figure 3d. Focusing on measures of peer quality, we show that having a greater share of high-educated peers, peers with better business practices, and peers

[20]Note we include all peers from the two rounds of WhatsApp groups.

[21]See group assignment details in Section 2.1.2.

[22]In our pre-analysis plan, we had pre-specified that we will allow for the peer effects to differ across the two treatment arms by interacting the peer characteristics with a treatment two dummy. Since in Section 4, we find limited evidence for a differential effect by treatment, for brevity, we pool together the two arms for these regressions. Results by treatment are presented in Appendix Section H.

[23]In our pre-analysis plan, we also pre-specified that we will examine peer effects based on the baseline predicted collaboration index. We present these results in Appendix Section H.

with higher sales and profits at baseline have a largely positive and significant impact across all outcomes of interest.[24] These results highlight high-quality peers are an important driver of our results.

Turning to sectoral composition, we observe that a greater share of peers from the same industry has a significant *negative* impact, while higher industry diversity index is *positively* correlated for firm outcomes. This suggests that a greater diversity of industries facilitate knowledge-sharing. To examine whether the negative effects of having more peers from the same industry are driven by competition, Table A.20 distinguishes peers based on industry and region, under the assumption that those from the same industry and region would experience the highest competition. We find that having more peers from the same industry, regardless of location, negatively impacts outcomes, while peers from the same industry and region do not have a disproportionately larger negative effect. This suggests that while competition may still play a role, the findings more strongly suggest that industry diversity fosters new ideas and enhances knowledge exchange.

7.2.1 Complementarities

Our findings from the peer effects analysis suggest that information sharing and learning from group members are key mechanisms for our results. If the underlying mechanism is learning, we would expect entrepreneurs to benefit more from being in groups with peers with greater expertise in an area of business that they find most pressing for their businesses. To provide further evidence on this channel, we implement a skill-complementarity analysis by creating a measure that captures the number of potential complementarity connections based on the assigned WhatsApp groups, following Dimitriadis and Koning (2022). Using the baseline data we collected on the potential topics the focal participant was most interested in discussing in their networking meetings, we construct a dyadic-measure of skill-complementarity based on whether the focal participant is connected to someone with expertise in that area.[25] For example, if a participant is very or extremely interested in discussing "Hiring and retaining employees," they will have a complementarity connection if she is placed in a WhatsApp group with someone in the top 25% of the firm size distribution. In Appendix Section I, we present the criteria for each different complementarity definition. We then create an

[24]Peers' average baseline sales and profits index, however, is not as predictive of sales and profits post-intervention.

[25](The potential topics are Hiring and retaining employees, Finding or negotiating with suppliers, Relationships with clients, Pricing strategy, Exports, Financing, Marketing, Innovation, and Business law.

individual-level measure by summing the total number of complementarities.

Table A.21 presents the regression estimates from regressing one of the key business outcomes on the number of complementarities for those in the treatment groups. Since those in groups with entrepreneurs with higher baseline business practice indices are more likely to have complementarities, we also include it as an additional control. We find that entrepreneurs are more likely to innovate and improve their business practices if they have more complements in their WhatsApp groups, though the impact on sales and profits is more limited. These results provide supporting evidence that information sharing and knowledge transfers are key mechanisms.

Together our results suggest that exposure to higher-quality peers and peers from diverse sectors play a key role in explaining the positive impacts on firm outcomes we observe. Importantly, the creation of online networking groups can be a low-cost intervention to expand entrepreneurs' networks and help them connect with business owners of different backgrounds.

7.3 Alternative Mechanisms

In this section, we discuss alternative mechanisms that are unlikely to drive our results.

7.3.1 Ambitions, Business Self-Efficacy, and Female Empowerment

In Table A.22, we investigate how access to online networking groups affected business ambitions, business entrepreneurial self-efficacy, get-ahead attitudes (McKenzie and Puerto, 2020), and female empowerment.[26]

One potential explanation for how online networking groups can lead to improvements in business outcomes is through increasing female entrepreneurs' ambitions and self-confidence. Recent literature has shown that female peers and personal networks can increase women's entrepreneurial activities through raising confidence and ambitions (Field et al., 2016). We measure business ambitions by asking a series of questions that captures expected business outcomes such as expected number of workers and monthly sales in five years. Table A.22 Column (1) shows limited evidence that business ambitions changed as a result of the intervention. Next, we capture entrepreneurial self-efficacy by asking a series of 10 questions

[26]These metrics are standardized indices of the sets of variables listed in Appendix Section E.5.

related to their confidence in coming up with a new idea for a business product, valuing costs of a new business venture, or persuading a bank to lend them money. In Column (2), we find no effects on this outcome.

Then, we test whether there is a change in "get-ahead" attitudes that aim to capture positive and optimistic business attitudes following (McKenzie and Puerto, 2020). This outcome is measured via a set of 11 questions such as whether the respondent agrees with the statement "when I face a difficult problem, I can usually find some solution". We find null effects for this outcome in Column (3), suggesting that the improvements in business outcomes are unlikely to be associated with changes in business attitudes.

However, instead of being driven by changes in business attitudes, the improvement in business outcomes may come from an increase in female empowerment. Given that a large fraction of women in our sample comes from a relatively well-educated background, women in our treatment groups may become empowered in their households from interacting with this new network of women. We capture female empowerment by asking a series of 10 questions related to access and control over their business money as well as whether they have to ask for someone's permission to engage in a series of activities, such as traveling for work or working later than usual hours. We find no significant effect on this index, suggesting that this is not the main driver of our results.

7.3.2 Measurement Concerns

Role of Record-Keeping

One potential explanation for the positive effect on business performance is an improvement in record keeping practices. However, in the decomposition of the business practice index, Figure A.5, we find limited evidence of an effect on record-keeping. Instead, other key business practices seem to drive our results. In particular, treated entrepreneurs improve financial planning and marketing practices, for example, by introducing new special offers and advertisements. Overall, this improvement in business practices suggests gains in efficiency as a key mechanism for the increase in profits. This efficiency mechanism is also consistent with a reduction in expenses which can explain the positive effect on profits without an equivalent increase in sales.

Self-Reporting Bias

One potential concern is that our effects are driven by social desirability bias or exper-

imenter demand effects. To test this, we follow Dhar et al. (2022) and collected measures of social desirability using an adapted version of the Marlowe-Crowne social desirability scale (Crowne and Marlowe, 1960) during the one-year follow-up. In Table A.23, we investigate heterogeneity based on the social desirability index. We find no evidence that higher social desirability affects responses to making any changes to the business or business practices. However, we see that those with higher social desirability are more likely to have reported higher sales and profits in the treated group. This makes sense given that individuals with higher social desirability that participated in the WhatsApp groups may have felt obliged to overstate the performance of their business to enumerators from our research team. Nonetheless, even controlling for social desirability, we see a robust impact on firm performance outcomes for those in the treated group.

7.3.3 Spillovers to the Control Group

The improvements we observed for the treatment firms may come at the expense of control firms that did not receive any additional support. We argue this is unlikely to occur given that the intervention took place at a national level across different regions. First, in Figure A.9, we compare average monthly profits at baseline and one-year after the intervention by treatment group. We find no evidence that profits for the control group declined, suggesting that the increase in profits for the treatment group is unlikely to be at the expense of the control group.

Second, adapting the analysis in Miguel and Kremer (2004) and Dalton et al. (2021), we investigate potential geographic spillovers in our sample. During our three-year in-person follow-up, we collected GPS measurements of the firms in our sample. We use GPS data to measure the distance from each control firm to its nearest firm in both the treatment and control group. We would expect a decline in firm performance for control firms that are closest to a treated firm. We present the estimates from regressing firm outcomes on distance to the nearest treated firm for the control firms in Table A.24. Note we follow Dalton et al. (2021) and additionally control for distance to the nearest control firm to control for market density. The coefficients are all small and insignificant in support of our hypothesis that the improvements in business outcomes for the treated businesses are not at the expense of the control businesses.

8 Long-Run Effects

In this section, we investigate the persistence of the effects using data from the three-year long-run follow-up survey. Table 5 show that there is limited evidence of an effect on firm outcomes after three years on the treated groups. We find null effects for innovation, sales and profits index, business practice index, business financing index, and capital and labor index. We also do not find an effect on firm survival. Table A.25 also shows null effects for business collaborations. In Table A.26, we also do not document the shift in collaboration towards business network members as we did in the one-year post-intervention results (Table A.17).

Notably, only 3% of the treated entrepreneurs remain in contact with members of their WhatsApp group three years later (Table A.5). This suggests that while the intervention initially expanded networking opportunities, these connections largely dissipated over time, potentially contributing to the absence of long-term effects. This finding is especially significant because previous studies, such as Cai and Szeidl (2017), mainly focus on effects in the first year. In contrast, our analysis shows despite the large positive impacts documented in the first year, these benefits may not necessarily persist.

The limited persistence of the effects of social connections stands in contrast to previous literature in other settings, such as academic peer groups (e.g., Shue, 2013; Anelli and Peri, 2017; Cools et al., 2022; Hampole et al., 2024; Baggesgaard Mertz et al., 2024) or mentorship programs (Blau et al., 2010). They also differ from expert predictions we collected through an anonymous survey administered by the Social Science Prediction Platform.[27] Among the 50 experts who have no prior knowledge of the study, the average prediction is positive across the key outcomes after three years (Table A.27). One potential reason for why the connections may be less persistent in our setting is that the mode of interaction occurred virtually, rather than in person. In fact, only 2% of the treated entrepreneurs ever met with someone from their WhatsApp group in person. Moreover, this lack of sustained results is consistent with other online training programs. For example, Davies et al. (2024) show that Zoom training sessions to microentrepreneurs in Mexico and Guatemala improve business practices and performance over 2 months, but these impacts dissipate within 6 months.

[27] See `https://socialscienceprediction.org/purpose/?`.

9 Discussion: Cost-Benefit Analysis

In this section, we evaluate the cost-effectiveness of our intervention by comparing the benefits and costs per participant. On the benefits side, treated entrepreneurs experienced an average one-year profit increase of 3780 GHS (= 315GHS × 12), or \$630.[28] We assume that the profit increase persists only for one year, given the limited effects we observed in the three-year follow-up results.

On the cost side, the intervention includes expenditures for treated entrepreneurs' airtime to participate in the WhatsApp chats and one-on-one calls (20 GHS per participant) and the participation certificate award of 10 GHS per participant.[29] Each WhatsApp group was also managed by an enumerator who maintained the groups and disseminated information about the coffee chats at a cost of 185GHS per participant over the four-month period. Finally, there is the recruitment cost of identifying the sample of entrepreneurs who participated in our study. Specifically, the recruited entrepreneurs all originally applied to a grant competition with a total grant value of 90,000GHS. Assuming an additional administrative overhead of 50% for administering these grants, this leads to a 68GHS recruitment cost per participant.[30] This totals 283GHS, or \$47 in expenditures per participant.

The resulting cost-benefit ratio is 13.4, indicating that every dollar spent generated 13.40 dollars in profits for female entrepreneurs. Even though the positive impacts did not persist past the first year, these calculations highlight the substantial cost-effectiveness and high return of our low-cost, light-touch networking intervention.

10 Conclusion

In this paper, we implement a field experiment in Ghana to identify potential policies that can support the growth of female-owned enterprises. We investigate the effects of an exogenous expansion of female professional networks on the performance of female-owned businesses.

We show that the intervention had important impacts on innovation, business practices and profits. One year after the treatment, treated female entrepreneurs are 33 to 35% more likely to have introduced new changes to their businesses and improve their business practices. Firm profits increased significantly by 24%. The structure of the intervention

[28] 6GHS = \$1 USD in 2021

[29] Total distribution and printing cost of the certificates was 13,230 for the 1335 treated entrepreneurs.

[30] Note, we initially recruited 2000 entrepreneurs in our sample.

plays an important role in generating these results. A mediation analysis indicates that the benefits are largely driven by participants who engaged with WhatsApp group members, highlighting the importance of the WhatsApp groups and one-on-one chats. A supervised machine learning analysis of the WhatsApp group messages shows that, although marketing and advice-sharing were limited, the groups were essential for coordinating and scheduling the one-on-one calls. This suggests that the primary impact on business outcomes stems from these one-on-one virtual interactions, with the WhatsApp groups providing accountability and structure to facilitate them.

We find evidence for two important mechanisms. First, the treatment shifted business collaborations away from friends and family members to business owners met through our intervention. This suggests the treatment led to changes in the composition of business networks. Second, peer effects are important mediators for our results. Female entrepreneurs benefit more from being in WhatsApp groups with entrepreneurs that are college-educated, have better baseline business practices, higher baseline sales and profits, and from different industries.

However, our three-year follow-up reveals that these short-term gains do not necessarily translate into long-term business growth without sustained support. Three years after the intervention, we find limited evidence of persistent impacts on key business outcomes such as innovation, profitability, or business practices. The initial expansion of business networks largely dissipated over time, with only 3% of treated entrepreneurs still in contact with their WhatsApp group members.

Together, our results highlight the large benefits of providing networking opportunities for growth-oriented female-owned enterprises. Importantly, our findings demonstrate that even a low-cost, light-touch online intervention can yield substantial improvements in firm outcomes. A cost-benefit analysis reveals that the intervention generated a return of over 13 times in profits for the treated entrepreneurs, suggesting that online networking programs can be an cost-effective policy tool to promote business growth among female entrepreneurs. However, as our long-run results suggest, the persistence of these benefits over time may depend on sustained engagement or additional support, a factor that should be considered in designing future interventions.

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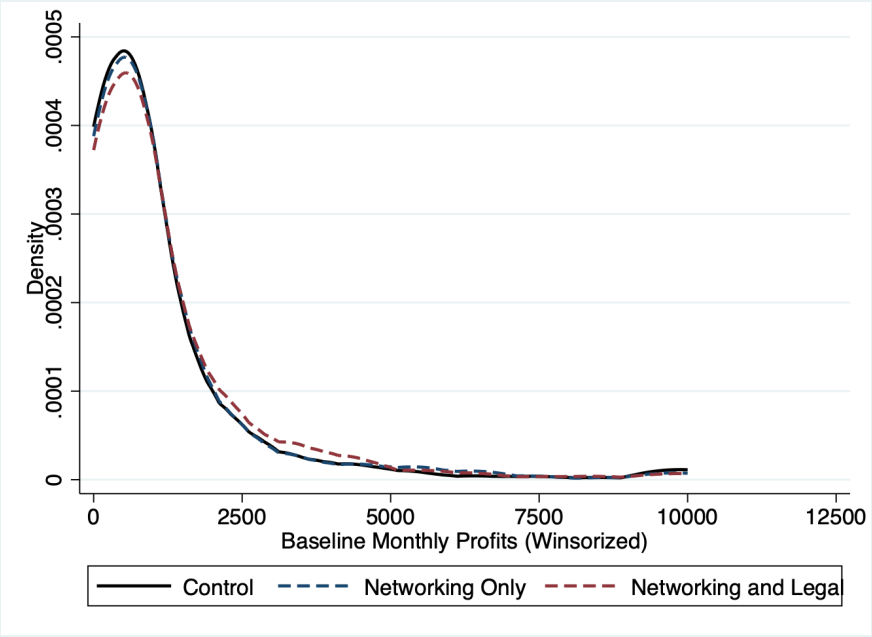
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Figures

Figure 1: Kernel Density of Winsorized Monthly Profits

(a) Baseline



(b) One-Year Post-Intervention

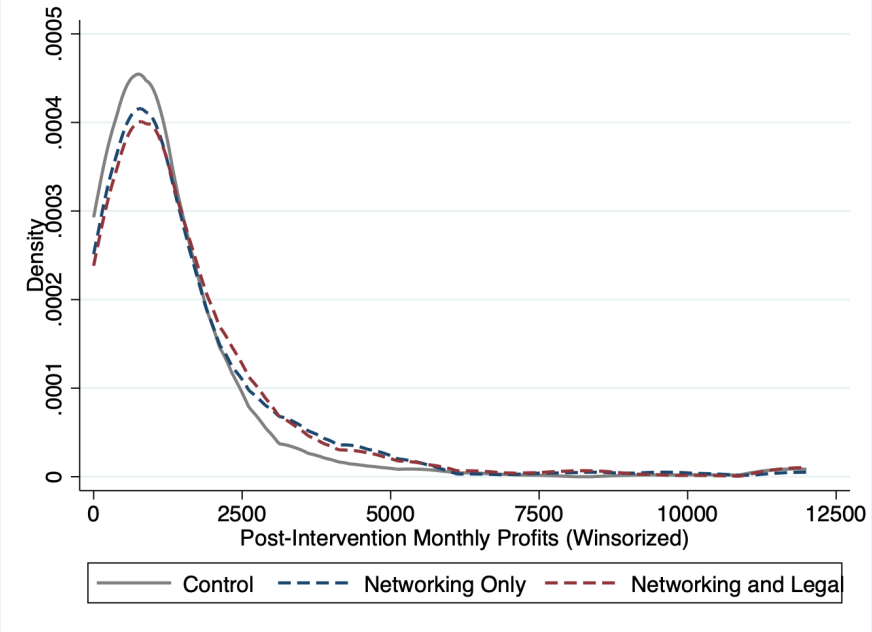


Figure 2: Quantile Effects on Monthly Profits (Winsorized)

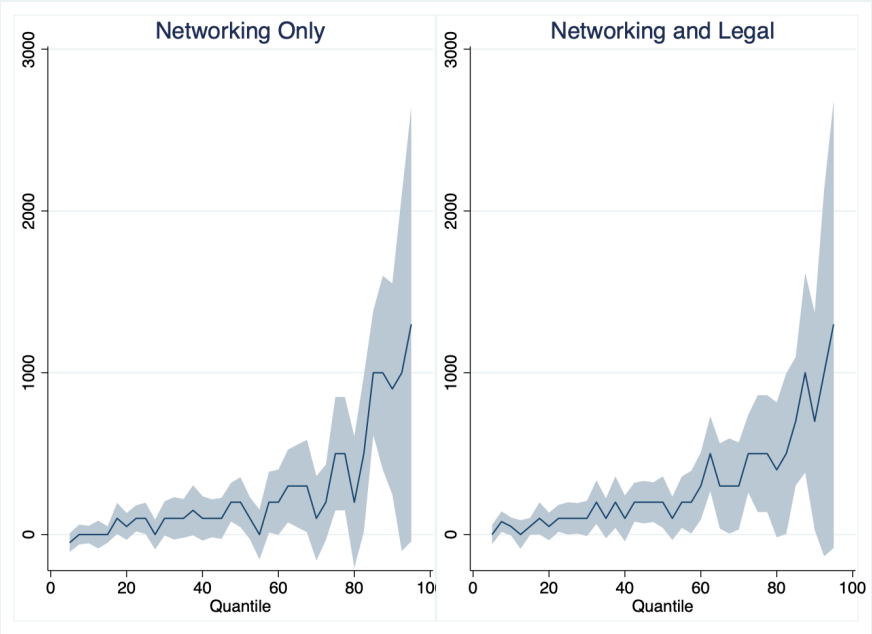
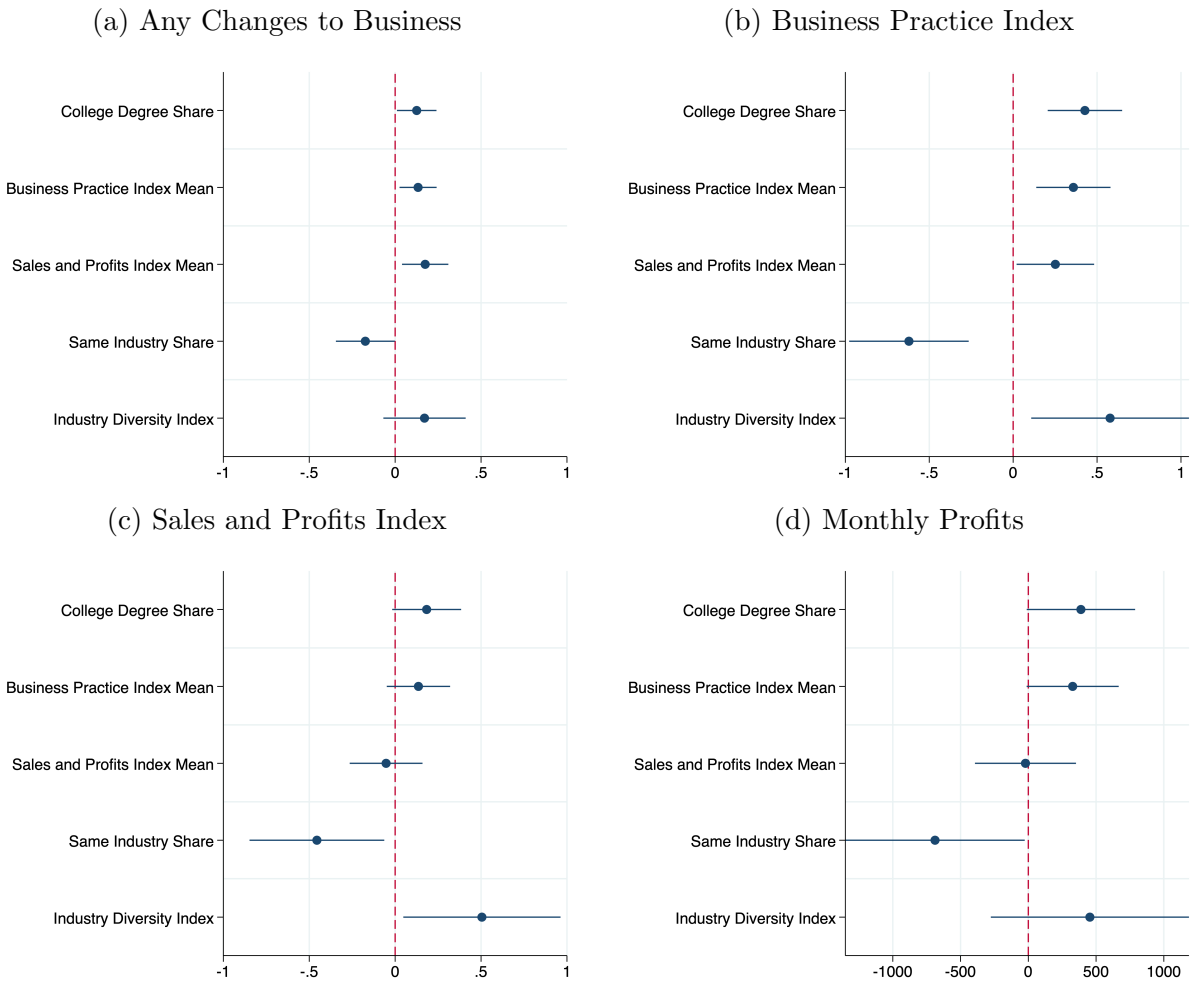


Figure 3: Peer Effects on Business Outcomes



Note: Each plotted coefficient comes from a separate regression of (2). The outcome variable in (a) is a dummy for having implemented any new changes to the business in the last six months, (b) is the standardized business practice index, (c) is the standardized sales and profits index, and (d) is winsorized monthly profits. All specifications control for baseline outcome, missing indicator for baseline outcome, and strata fixed effects. We also include as controls, top collaboration choices, collaboration language preference, interest in collaborating with the same or different sector, and firm sector, as well as all the pairwise interactions. Clustered standard errors at the WhatsApp group level. Sample restricted to only treated firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Tables

Table 1: Summary Statistics

	Mean	SD	Observations
Owner's Age	36.77	(9.30)	1771
Firm Age	7.46	(6.89)	1771
Education			
Less than JHS	0.07	(0.41)	1771
JHS Degree	0.30	(0.56)	1771
HS Degree	0.20	(0.51)	1771
College Degree	0.39	(0.58)	1771
Married	0.56	(0.50)	1771
Women-Only Firm	0.94	(0.24)	1771
Number of Children	2.10	(1.76)	1771
Any Child Under 18?	0.67	(0.47)	1771
Registered Business	0.80	(0.40)	1771
Total Employees	3.54	(6.18)	1771
Monthly Sales (USD)	848.41	(1666.12)	1734
Monthly Profits (USD)	219.25	(322.32)	1716
Sector			
Agriculture	0.08	(0.27)	1771
Manufacturing	0.35	(0.48)	1771
Wholesale Trade	0.05	(0.22)	1771
Retail Trade	0.30	(0.46)	1771
Services	0.17	(0.38)	1771
Professional Services	0.04	(0.20)	1771
Other	0.01	(0.10)	1771

Table 2: Effect of Online Networking Groups on Firm Innovation, Business Practices, and Performance

	(1) Any Changes to Business (Past 6 Months)	(2) Business Innovation Index	(3) Business Practice Index	(4) Sales and Profits Index
Networking	0.101***	0.192***	0.0850	0.0348
	(0.0323)	(0.0736)	(0.0716)	(0.0649)
Networking and Legal	0.0934***	0.192**	0.187**	0.0942
	(0.0333)	(0.0783)	(0.0744)	(0.0678)
Control Mean	0.286	0.000	-0.000	0.000
T1 = T2 (p-value)	0.806	0.993	0.141	0.368
Q-value (T1)	0.015	0.023	0.269	0.592
Q-value (T2)	0.020	0.023	0.023	0.219
R^2	0.036	0.051	0.070	0.152
N	1386	1386	1386	1516

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, and strata fixed effects. Robust standard errors reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 3: Effect of Online Networking Groups on Sales

	(1)	(2)	(3)	(4)
	Monthly Sales	Monthly Sales Winsorized	Inverse Hyperbolic Sine of Monthly Sales	Weekly Customers
Networking	-39.45	37.94	0.0470	-7.171**
	(543.6)	(333.2)	(0.102)	(2.893)
Networking and Legal	338.9	561.4	0.167*	-4.458
	(655.8)	(378.7)	(0.0973)	(3.039)
Control Mean	3893.979	3488.951	8.280	25.992
T1 = T2 (p-value)	0.501	0.136	0.182	0.187
Q-value (T1)	0.942	0.942	0.858	0.106
Q-value (T2)	0.858	0.285	0.285	0.285
R^2	0.186	0.092	0.105	0.066
N	1453	1453	1323	1516

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, and strata fixed effects. Robust standard errors reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 4: Effect of Online Networking Groups on Profits

	(1)	(2)	(3)	(4)	(5)
	Monthly Profits	Monthly Profits Winsorized	Inverse Hyperbolic Sine of Monthly Profits	Monthly Profits in the Best Month	Monthly Profits in the Best Month Winsorized
Networking	320.6**	209.1*	0.0698	351.0	158.0
	(155.4)	(113.7)	(0.0908)	(271.5)	(192.8)
Networking and Legal	315.0**	309.6**	0.183**	370.2	443.6**
	(150.3)	(120.5)	(0.0850)	(255.6)	(212.3)
Control Mean	1322.919	1295.973	7.352	2479.732	2426.767
T1 = T2 (p-value)	0.975	0.373	0.186	0.949	0.146
Q-value (T1)	0.079	0.110	0.442	0.245	0.442
Q-value (T2)	0.079	0.079	0.079	0.211	0.079
R^2	0.197	0.137	0.101	0.202	0.123
N	1325	1325	1325	1297	1297

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, and strata fixed effects. Robust standard errors reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 5: Effect of Online Networking Groups on Firm Outcomes (3-Year Post Intervention)

	(1) Any Changes to Business (Past 6 Months)	(2) Business Innovation Index	(3) Sales and Profits Index	(4) Monthly Profits Winsorized	(5) Business Practice Index	(6) Business Financing Index	(7) Capital and Labor Index	(8) In Operation
Networking	0.0199	0.0509	0.0155	0.0814	-126.0	0.110	-0.0734	-0.0207
	(0.0347)	(0.0798)	(0.0731)	(0.0912)	(208.9)	(0.137)	(0.0662)	(0.0267)
Networking and Legal	0.0629*	0.0401	-0.0118	-0.0220	-184.0	0.0352	-0.115*	-0.0266
	(0.0368)	(0.0824)	(0.0752)	(0.0822)	(209.6)	(0.0879)	(0.0684)	(0.0278)
Control Mean	0.251	0.000	0.000	0.000	2179.980	0.000	-0.000	0.829
T1 = T2 (p-value)	0.185	0.884	0.665	0.295	0.775	0.537	0.482	0.811
Q-value (T1)	0.824	0.824	0.876	0.824	0.824	0.824	0.824	0.824
Q-value (T2)	0.743	0.836	0.876	0.876	0.824	0.848	0.743	0.824
R^2	0.058	0.089	0.113	0.093	0.097	0.101	0.159	0.074
N	1070	1070	1070	1276	1022	1070	1276	1277

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, and strata fixed effects. Robust standard errors reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Appendix

A Additional Figures and Tables

Additional Figures

Figure A.1: Industry Distribution

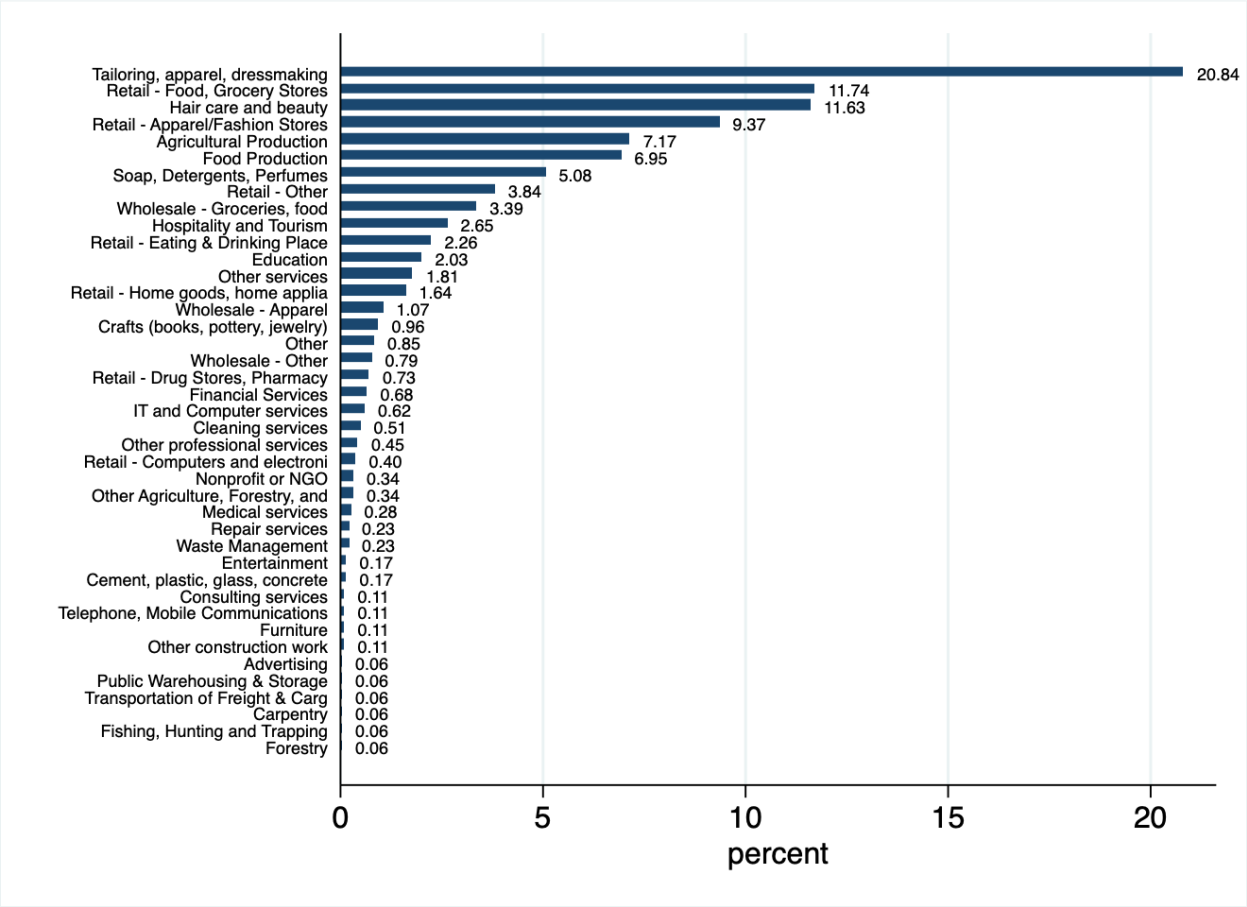


Figure A.2: Effect of Online Networking on Changes to Business in the Past Six Months (Open-Ended Questions)

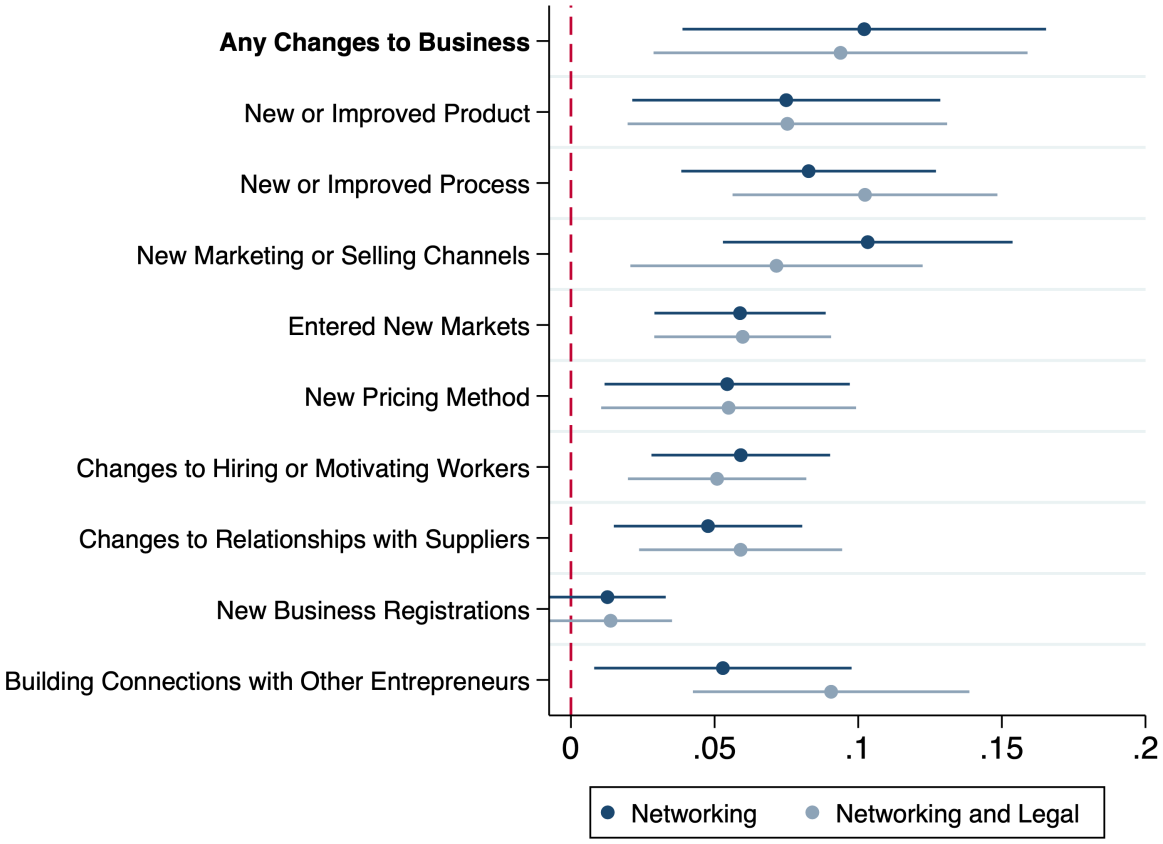


Figure A.3: Effect of Online Networking on Business Innovation Index Components

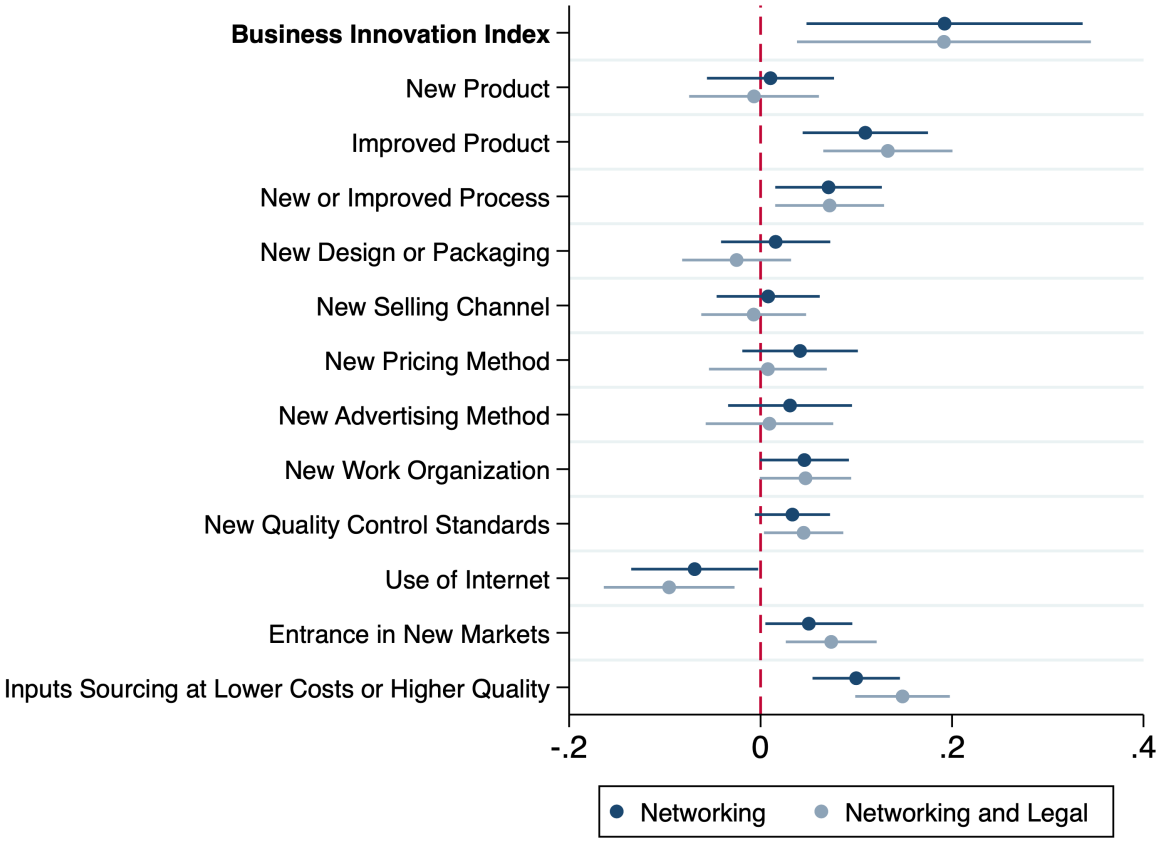


Figure A.4: Changes to Business as Result of Treatment

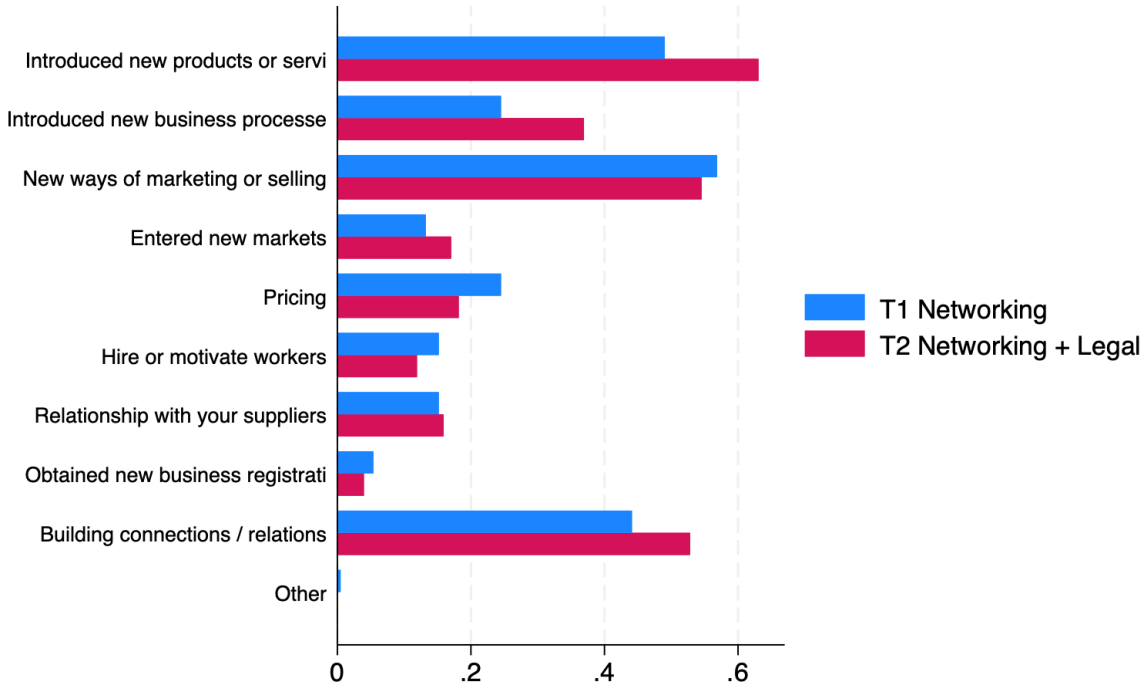


Figure A.5: Effect of Online Networking on Business Practice Index Decomposition

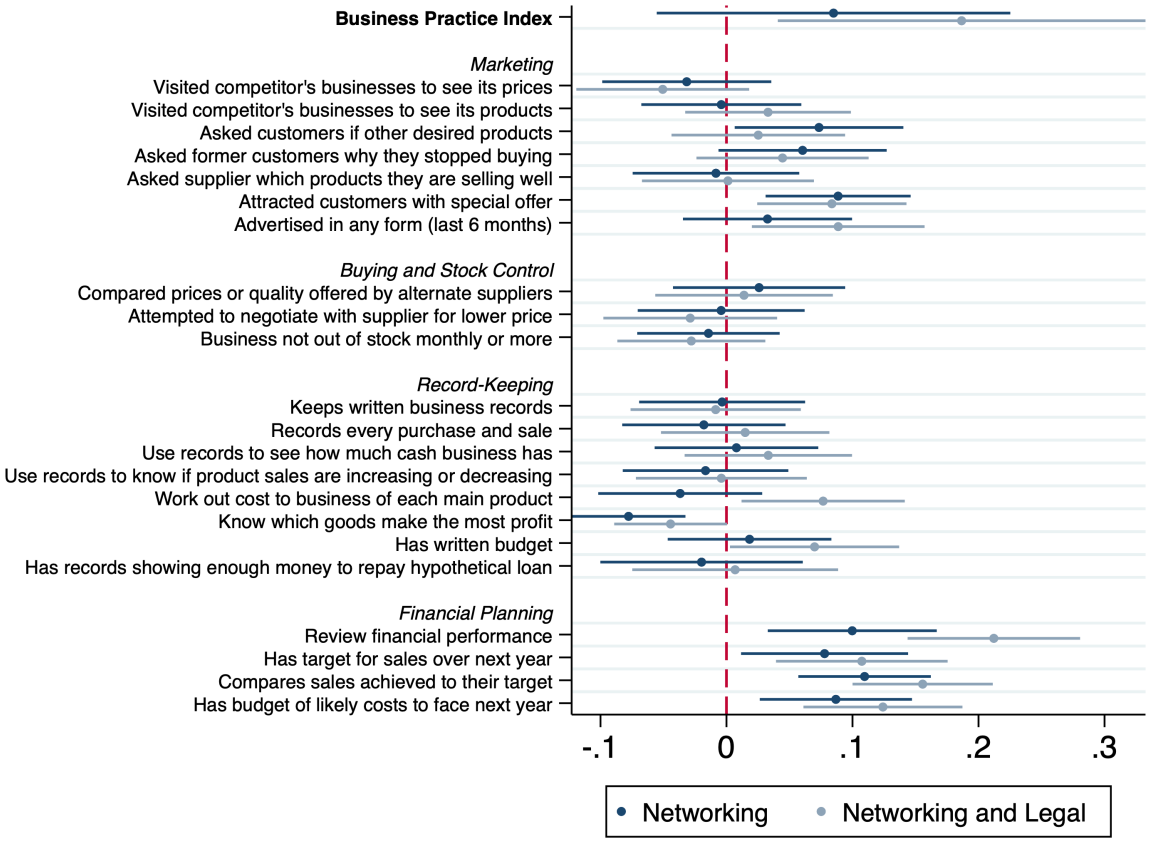
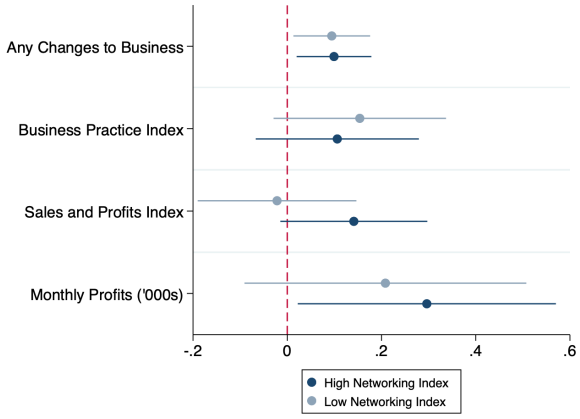
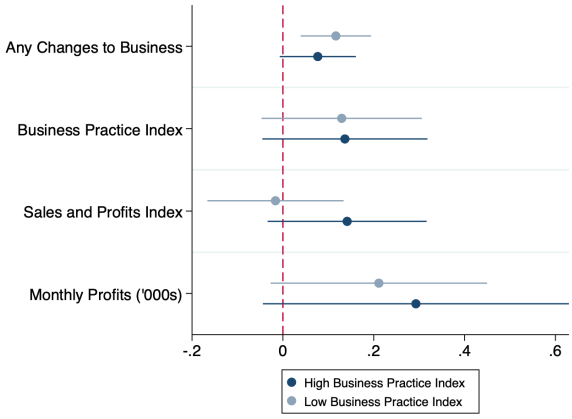


Figure A.6: Effect of Online Networking Groups by Baseline Characteristics

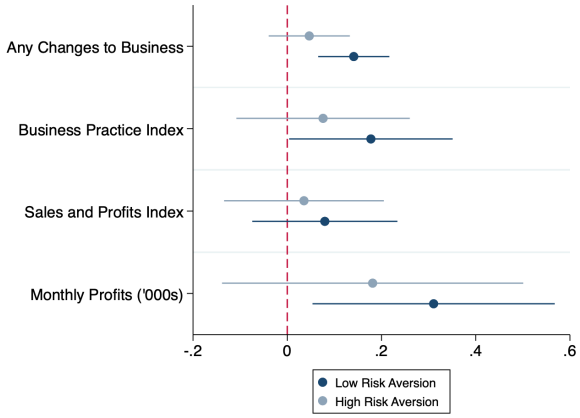
(a) Business Networking Index



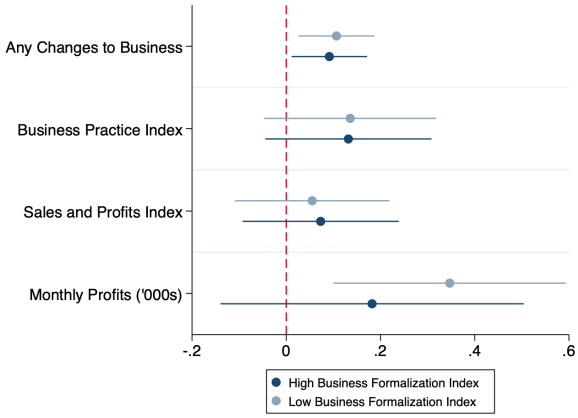
(b) Business Practice Index



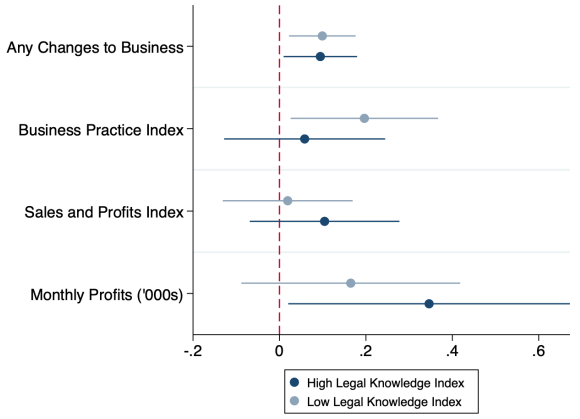
(c) Risk Aversion Index



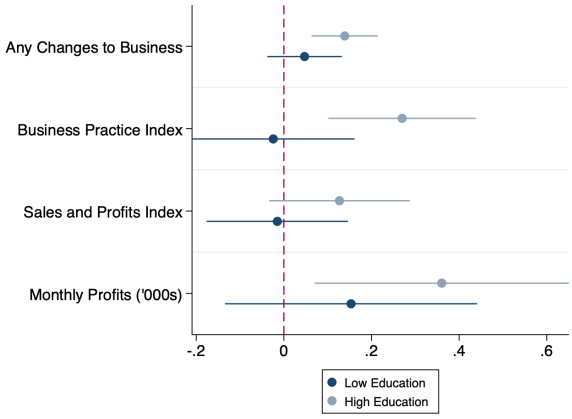
(d) Business Formalization Index



(e) Legal Knowledge Index



(f) Years of Education



Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. Robust standard errors.

Figure A.7: Quantile Effects on Monthly Revenues (Winsorized)

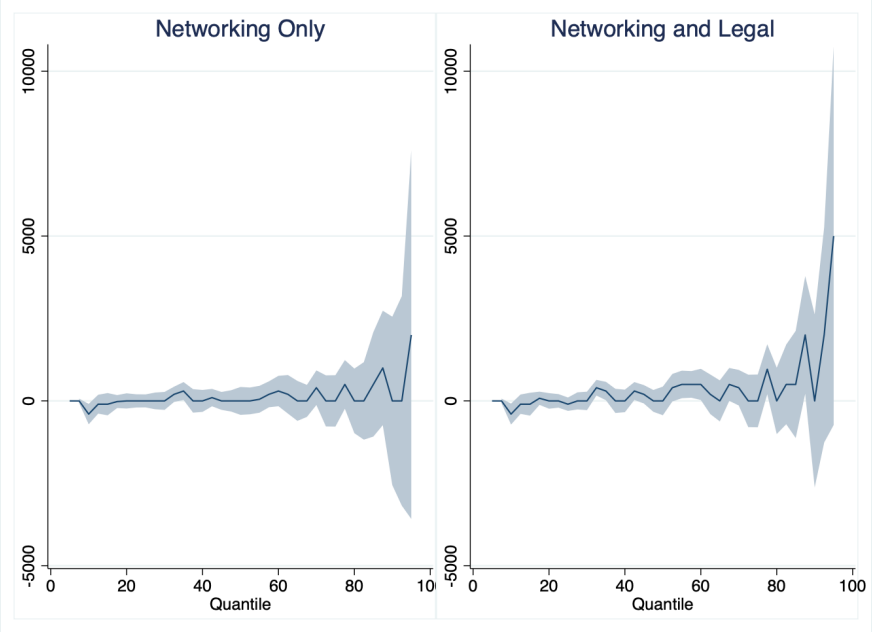


Figure A.8: Effect of Online Networking on Step Towards Collaboration Index and Its Components

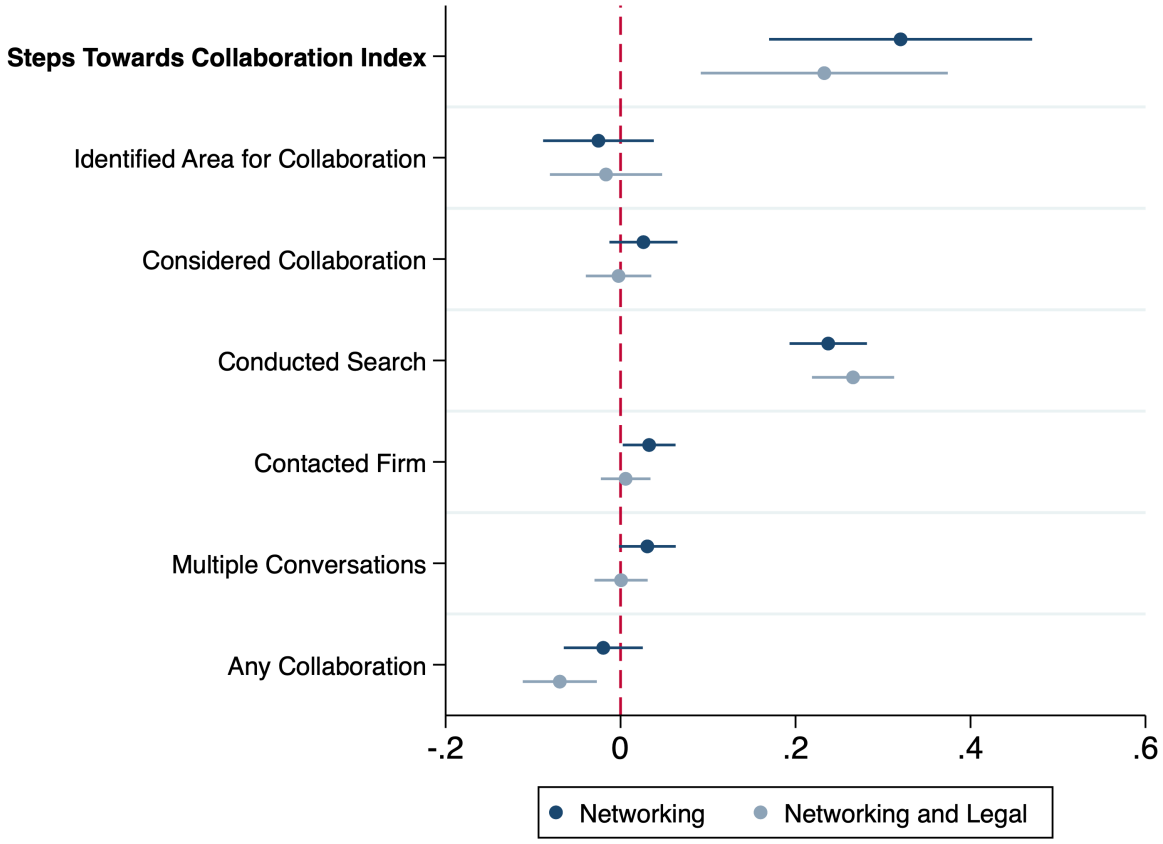
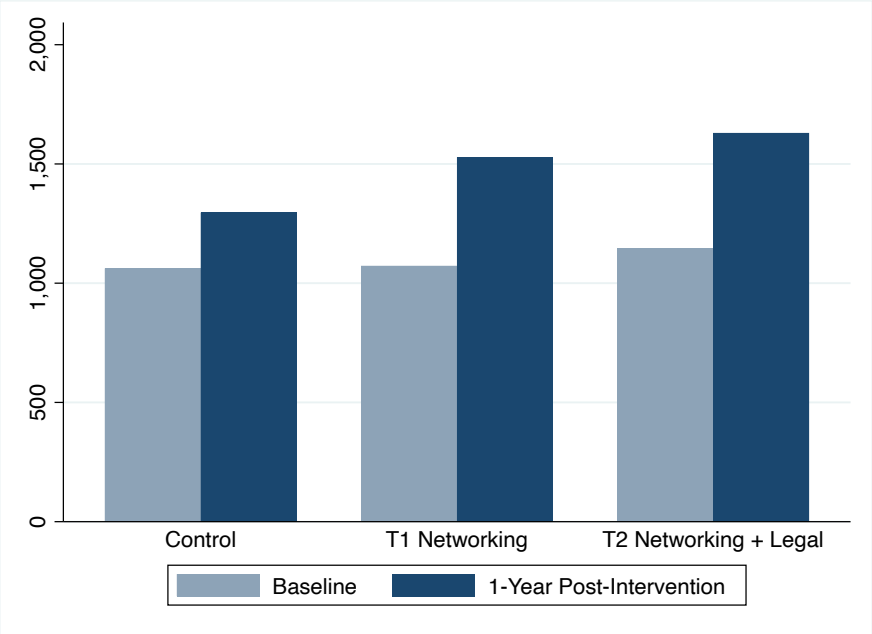


Figure A.9: Monthly Profits (Winsorized) by Treatment Group



Additional Tables

Table A.1: Balance Checks

	Controls	Treatment 1	Treatment 2	C - T1	T1 - T2
Owner's Age	36.60	36.62	37.01	-0.39	0.41
	(9.23)	(9.37)	(9.32)	(0.49)	(0.42)
Firm Age	7.40	7.19	7.67	-0.49	0.27
	(6.74)	(6.59)	(7.19)	(0.25)	(0.48)
Less than JHS	0.07	0.07	0.08	-0.01	0.01
	(0.46)	(0.26)	(0.45)	(0.81)	(0.83)
JHS Degree	0.32	0.29	0.28	0.01	-0.04
	(0.60)	(0.46)	(0.58)	(0.74)	(0.25)
HS Degree	0.19	0.23	0.18	0.05	-0.00
	(0.54)	(0.42)	(0.53)	(0.11)	(0.94)
College Degree	0.36	0.40	0.40	-0.00	0.04
	(0.61)	(0.49)	(0.61)	(0.97)	(0.23)
Married	0.56	0.55	0.57	-0.02	0.01
	(0.50)	(0.50)	(0.50)	(0.52)	(0.67)
Women-Only Firm	0.94	0.93	0.94	-0.01	0.01
	(0.25)	(0.25)	(0.23)	(0.51)	(0.53)
Number of Children	2.12	2.06	2.11	-0.05	-0.01
	(1.86)	(1.76)	(1.67)	(0.60)	(0.92)
Any Child Under 18?	0.68	0.64	0.66	-0.02	-0.02
	(0.47)	(0.48)	(0.47)	(0.48)	(0.56)
Any Collaboration	0.36	0.38	0.33	0.05	-0.03
	(0.48)	(0.49)	(0.47)	(0.22)	(0.49)
Total Employees	3.26	3.83	3.63	0.20	0.37
	(4.42)	(8.08)	(6.18)	(0.64)	(0.21)
Monthly Sales (USD)	847.37	894.46	820.45	74.01	-26.92
	(1541.18)	(1869.85)	(1640.01)	(0.49)	(0.76)
Monthly Profits (USD)	229.36	212.35	214.59	-2.24	-14.77
	(319.29)	(332.28)	(318.86)	(0.91)	(0.41)
Sector					
Agriculture	0.07	0.08	0.08	0.00	0.00
	(0.26)	(0.27)	(0.27)	(0.83)	(0.79)
Manufacturing	0.34	0.35	0.36	-0.01	0.02
	(0.47)	(0.48)	(0.48)	(0.69)	(0.55)
Wholesale Trade	0.06	0.05	0.05	0.00	-0.01
	(0.23)	(0.22)	(0.21)	(0.74)	(0.47)
Retail Trade	0.30	0.30	0.30	-0.00	0.00
	(0.46)	(0.46)	(0.46)	(0.92)	(0.95)
Services	0.17	0.16	0.17	-0.02	-0.00
	(0.38)	(0.37)	(0.38)	(0.51)	(0.96)
Professional Services	0.05	0.05	0.03	0.01	-0.01
	(0.21)	(0.21)	(0.18)	(0.24)	(0.21)
Other	0.01	0.02	0.01	0.01	0.00
	(0.08)	(0.13)	(0.09)	(0.24)	(0.64)
Observations	631	436	704	1140	1335

Table A.2: Balance on Baseline Characteristics at Midline Survey

	Controls	Treatment 1	Treatment 2	C - T1	T1 - T2
Owner's Age	36.68	36.31	37.11	-0.80	0.43
	(9.12)	(9.16)	(9.25)	(0.18)	(0.42)
Firm Age	7.58	7.09	7.65	-0.56	0.07
	(6.83)	(6.43)	(7.14)	(0.21)	(0.86)
Less than JHS	0.07	0.07	0.08	-0.00	0.00
	(0.48)	(0.26)	(0.47)	(0.99)	(0.89)
JHS Degree	0.34	0.30	0.31	-0.00	-0.03
	(0.62)	(0.46)	(0.60)	(0.94)	(0.43)
HS Degree	0.18	0.24	0.17	0.07*	-0.01
	(0.56)	(0.43)	(0.54)	(0.03)	(0.71)
College Degree	0.34	0.38	0.39	-0.01	0.04
	(0.62)	(0.49)	(0.62)	(0.86)	(0.25)
Married	0.56	0.55	0.57	-0.02	0.01
	(0.50)	(0.50)	(0.50)	(0.61)	(0.86)
Women-Only Firm	0.94	0.94	0.95	-0.01	0.01
	(0.24)	(0.24)	(0.22)	(0.63)	(0.46)
Number of Children	2.14	2.07	2.15	-0.08	0.00
	(1.89)	(1.74)	(1.69)	(0.49)	(0.98)
Any Child Under 18?	0.68	0.65	0.67	-0.02	-0.01
	(0.47)	(0.48)	(0.47)	(0.61)	(0.60)
Any Collaboration	0.32	0.37	0.32	0.05	-0.01
	(0.47)	(0.48)	(0.47)	(0.22)	(0.88)
Total Employees	3.14	3.58	3.43	0.15	0.30
	(3.91)	(7.14)	(6.04)	(0.73)	(0.32)
Monthly Sales (USD)	855.23	887.32	712.41	174.91	-142.83
	(1575.31)	(1881.46)	(1432.07)	(0.10)	(0.11)
Monthly Profits (USD)	228.26	210.22	188.92	21.30	-39.34*
	(319.35)	(328.79)	(269.46)	(0.27)	(0.03)
Sector					
Agriculture	0.07	0.07	0.07	0.00	0.00
	(0.26)	(0.26)	(0.26)	(0.94)	(0.98)
Manufacturing	0.34	0.35	0.37	-0.02	0.03
	(0.47)	(0.48)	(0.48)	(0.52)	(0.28)
Wholesale Trade	0.06	0.05	0.05	0.00	-0.01
	(0.24)	(0.23)	(0.22)	(0.90)	(0.62)
Retail Trade	0.30	0.30	0.29	0.01	-0.02
	(0.46)	(0.46)	(0.45)	(0.63)	(0.56)
Services	0.17	0.16	0.17	-0.02	-0.00
	(0.38)	(0.36)	(0.38)	(0.45)	(0.95)
Professional Services	0.04	0.05	0.03	0.02	-0.01
	(0.20)	(0.21)	(0.17)	(0.21)	(0.36)
Other	0.01	0.02	0.01	0.01	0.00
	(0.08)	(0.12)	(0.10)	(0.42)	(0.62)
Observations	560	387	611	998	1171

Table A.3: Balance on Baseline Characteristics at One Year Post-Intervention

	Controls	Treatment 1	Treatment 2	C - T1	T1 - T2
Owner's Age	36.44	36.01	37.04	-1.03*	0.60
	(8.97)	(9.01)	(9.25)	(0.09)	(0.27)
Firm Age	7.63	7.07	7.74	-0.68	0.11
	(6.91)	(6.45)	(7.25)	(0.14)	(0.78)
Less than JHS	0.07	0.08	0.08	0.00	0.01
	(0.48)	(0.27)	(0.47)	(0.96)	(0.70)
JHS Degree	0.34	0.31	0.30	0.01	-0.04
	(0.63)	(0.46)	(0.60)	(0.79)	(0.28)
HS Degree	0.19	0.23	0.18	0.06*	-0.01
	(0.57)	(0.42)	(0.54)	(0.09)	(0.76)
College Degree	0.34	0.38	0.39	-0.01	0.05
	(0.63)	(0.49)	(0.62)	(0.85)	(0.20)
Married	0.57	0.55	0.58	-0.03	0.00
	(0.50)	(0.50)	(0.49)	(0.40)	(0.90)
Women-Only Firm	0.95	0.94	0.94	-0.01	-0.00
	(0.23)	(0.24)	(0.23)	(0.62)	(0.93)
Number of Children	2.11	2.01	2.11	-0.10	0.00
	(1.85)	(1.72)	(1.63)	(0.36)	(1.00)
Any Child Under 18?	0.68	0.66	0.67	-0.01	-0.01
	(0.47)	(0.48)	(0.47)	(0.65)	(0.65)
Any Collaboration	0.35	0.38	0.32	0.06	-0.03
	(0.48)	(0.49)	(0.47)	(0.17)	(0.45)
Total Employees	3.15	3.09	3.34	-0.25	0.18
	(4.21)	(5.19)	(5.64)	(0.49)	(0.53)
Monthly Sales (USD)	811.65	777.23	768.52	8.71	-43.13
	(1501.13)	(1622.15)	(1596.15)	(0.93)	(0.64)
Monthly Profits (USD)	220.68	189.54	196.02	-6.48	-24.66
	(302.50)	(272.09)	(293.68)	(0.73)	(0.17)
Sector					
Agriculture	0.07	0.08	0.06	0.01	-0.01
	(0.25)	(0.27)	(0.24)	(0.37)	(0.62)
Manufacturing	0.36	0.35	0.37	-0.02	0.01
	(0.48)	(0.48)	(0.48)	(0.49)	(0.76)
Wholesale Trade	0.05	0.06	0.05	0.01	0.00
	(0.21)	(0.23)	(0.22)	(0.56)	(0.99)
Retail Trade	0.29	0.29	0.30	-0.01	0.01
	(0.45)	(0.46)	(0.46)	(0.85)	(0.73)
Services	0.19	0.17	0.18	-0.01	-0.00
	(0.39)	(0.38)	(0.39)	(0.57)	(0.89)
Professional Services	0.04	0.04	0.03	0.01	-0.01
	(0.20)	(0.20)	(0.17)	(0.40)	(0.35)
Other	0.01	0.02	0.01	0.01	0.00
	(0.07)	(0.13)	(0.09)	(0.23)	(0.61)
Observations	537	367	617	984	1154

Table A.4: Balance on Baseline Characteristics at Three Years Post-Intervention

	Controls	Treatment 1	Treatment 2	C - T1	T1 - T2
Owner's Age	36.88	36.51	37.46	-0.96	0.59
	(9.12)	(9.14)	(9.11)	(0.14)	(0.30)
Firm Age	7.78	7.38	8.14	-0.76	0.36
	(6.91)	(6.58)	(7.28)	(0.12)	(0.42)
Less than JHS	0.06	0.08	0.08	0.00	0.01
	(0.49)	(0.27)	(0.49)	(0.92)	(0.69)
JHS Degree	0.34	0.33	0.32	0.01	-0.03
	(0.64)	(0.47)	(0.62)	(0.73)	(0.48)
HS Degree	0.18	0.24	0.18	0.06	0.00
	(0.58)	(0.43)	(0.56)	(0.12)	(0.96)
College Degree	0.34	0.36	0.36	-0.00	0.02
	(0.64)	(0.48)	(0.63)	(0.95)	(0.62)
Married	0.63	0.62	0.63	-0.01	0.00
	(0.48)	(0.49)	(0.48)	(0.76)	(0.94)
Women-Only Firm	0.94	0.94	0.95	-0.00	0.01
	(0.24)	(0.23)	(0.22)	(0.78)	(0.48)
Number of Children	2.24	2.16	2.18	-0.02	-0.05
	(1.92)	(1.82)	(1.67)	(0.87)	(0.63)
Any Child Under 18?	0.70	0.66	0.67	-0.01	-0.03
	(0.46)	(0.47)	(0.47)	(0.76)	(0.33)
Any Collaboration	0.34	0.36	0.29	0.06	-0.05
	(0.48)	(0.48)	(0.46)	(0.16)	(0.23)
Total Employees	3.37	3.68	3.34	0.33	-0.03
	(4.67)	(8.62)	(6.24)	(0.51)	(0.94)
Monthly Sales (USD)	280.50	255.45	241.85	13.59	-38.64
	(500.23)	(547.59)	(490.82)	(0.71)	(0.22)
Monthly Profits (USD)	75.25	62.21	65.75	-3.54	-9.50
	(102.25)	(96.83)	(100.07)	(0.61)	(0.14)
Sector					
Agriculture	0.07	0.07	0.08	-0.01	0.01
	(0.25)	(0.25)	(0.27)	(0.66)	(0.63)
Manufacturing	0.36	0.37	0.38	-0.01	0.02
	(0.48)	(0.48)	(0.49)	(0.74)	(0.43)
Wholesale Trade	0.05	0.05	0.04	0.01	-0.01
	(0.22)	(0.23)	(0.20)	(0.47)	(0.57)
Retail Trade	0.28	0.28	0.29	-0.01	0.01
	(0.45)	(0.45)	(0.46)	(0.70)	(0.65)
Services	0.19	0.16	0.17	-0.01	-0.02
	(0.39)	(0.37)	(0.38)	(0.79)	(0.41)
Professional Services	0.04	0.05	0.03	0.02	-0.01
	(0.21)	(0.22)	(0.17)	(0.12)	(0.22)
Other	0.01	0.01	0.01	0.01	-0.00
	(0.09)	(0.11)	(0.08)	(0.31)	(0.63)
Observations	489	331	529	860	1018

Table A.5: Intervention Take-Up

	All Treated	Treatment 1	Treatment 2	T1 - T2
Added to WhatsApp Group	0.82	0.84	0.80	0.04*
Contacted WhatsApp Group Member	0.60	0.62	0.57	0.04
Number of WhatsApp Group Members Contacted	1.66	1.78	1.54	0.24*
Contact Frequency				
Daily	0.01	0.01	0.00	0.01*
Once a Week	0.32	0.36	0.29	0.07*
Every Other Week	0.15	0.15	0.16	-0.00
Once a Month	0.15	0.14	0.15	-0.02
Never	0.37	0.34	0.40	-0.06*
Contacted Using Business Directory	0.10	0.12	0.07	0.05**
Contacted Through Enumerators	0.20	0.27	0.13	0.14**
Applied to Business Competition	0.16	0.17	0.15	0.01
T2 Only - Share of Videos Watched	0.30	0.00	0.30	-0.30
Still in Touch with WhatsApp Group Members (Midline)	0.24	0.25	0.22	0.03
Still in Touch with WhatsApp Group Members (1-Year)	0.16	0.20	0.12	0.08**
Still in Touch with WhatsApp Group Members (3-Year)	0.03	0.04	0.01	0.02*

Table A.6: Summary Statistics on WhatsApp Chats

	Mean	Min	p25	p50	p75	Max
Unique Senders	4.08	1.00	3.00	4.00	5.00	8.00
Total Messages	20.74	0.00	5.00	14.00	26.00	189.00
Avg Word Count	6.11	1.00	2.76	4.26	7.00	40.33
Unique Message Days	8.69	1.00	4.00	7.50	12.00	33.00
Total Media Sent	5.05	0.00	0.00	1.00	5.00	123.00
Total Left Group	1.01	0.00	0.00	1.00	2.00	5.00

Note: This table presents summary statistics on the WhatsApp chats at the group level during the 8-week period while the enumerator was active. The sample is restricted to the groups we were able to obtain the chat log. Messages from the enumerator are dropped before the calculations. Avg word count refers to the average word count of individual messages. Total media includes videos, voice recordings, or photos.

Table A.7: Effect on Business Financing Index and Its Components

	(1) Business Financing Index	(2) Received any loan from any source	(3) Total amount loans received (past six months)	(4) Has business bank account
Networking	-0.0988	-0.0315	-54.87	-0.0293
	(0.0683)	(0.0213)	(285.9)	(0.0314)
Networking and Legal	0.0218	-0.00780	318.2	0.0107
	(0.0760)	(0.0222)	(372.7)	(0.0330)
Control Mean	-0.000	0.120	683.363	0.315
T1 = T2 (p-value)	0.084	0.199	0.359	0.164
R^2	0.055	0.040	0.052	0.046
N	1386	1383	1380	1386

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. Robust standard errors reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.8: Effect on Capital and Labor Index and Its Components

	(1) Capital and Labor Index	(2) Number of paid workers	(3) Value of inventories	(4) Capital stock	(5) Value of capital purchases in endline
Networking	-0.0919	-0.190	-286.3	-387.5	-0.0320
	(0.0632)	(0.240)	(688.9)	(711.2)	(0.0217)
Networking and Legal	-0.0865	-0.415*	97.81	225.1	-0.0241
	(0.0662)	(0.243)	(721.8)	(757.1)	(0.0224)
Control Mean	-0.000	2.943	4579.498	5012.105	0.125
T1 = T2 (p-value)	0.921	0.260	0.511	0.334	0.677
R^2	0.100	0.149	0.064	0.069	0.042
N	1516	1516	1324	1386	1383

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. Robust standard errors reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.9: Effect on Firm Survival

	(1) In Operation
Networking	-0.0245
	(0.0189)
Networking and Legal	-0.0296
	(0.0195)
Control Mean	0.918
T1 = T2 (p-value)	0.776
R^2	0.034
N	1521

Note: The specification controls for ML predicted probability for collaboration, and strata fixed effects. Robust standard errors reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.10: Effect of Online Networking Groups on Labor Supply and Time Use

	(1) Hours Worked on Business	(2) Hours Worked Other Job	(3) Hours Spent on Childcare
Networking	2.186*	0.395	0.497
	(1.138)	(0.666)	(1.041)
Networking and Legal	2.808**	0.144	-0.292
	(1.163)	(0.671)	(1.096)
Control Mean	44.921	2.778	22.332
T1 = T2 (p-value)	0.566	0.671	0.418
Q-value (T1)	0.165	0.830	0.830
Q-value (T2)	0.095	0.830	0.830
R^2	0.076	0.048	0.066
N	1389	1389	1389

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, and strata fixed effects. Robust standard errors reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.11: Mediation Analysis - Innovation

	(1) Any Changes to Business (Past 6 Months)	(2) Any Changes to Business Mediation (Contacts) (Past 6 Months)	(3) Any Changes to Business Mediation (Directory) (Past 6 Months)	(4) Any Changes to Business Mediation (Enumerators) (Past 6 Months)	(5) Any Changes to Business Mediation (Full Controls) (Past 6 Months)
Networking	0.101***	0.0359	0.0894***	0.0920***	0.0395
	(0.0323)	(0.0382)	(0.0337)	(0.0350)	(0.0384)
Networking and Legal	0.0934***	0.0355	0.0852**	0.0869**	0.0327
	(0.0333)	(0.0380)	(0.0340)	(0.0341)	(0.0383)
Contacted WhatsApp Group Member		0.0915***			0.105***
		(0.0323)			(0.0360)
Contacted Using Business Directory			0.0339		0.0269
			(0.0536)		(0.0626)
Contacted Through Enumerators				0.00686	-0.0547
				(0.0408)	(0.0506)
Control Mean	0.286		0.286	0.286	0.286
T1 = T2 (p-value)	0.806		0.896	0.875	0.833
R^2	0.036	0.041	0.035	0.035	0.042
N	1386	1295	1295	1295	1295

Table A.12: Mediation Analysis - Business Practice

	(1) Business Practice Index	(2) Business Practice Index Mediation (Contacts)	(3) Business Practice Index Mediation (Directory)	(4) Business Practice Index Mediation (Enumerators)	(5) Business Practice Index Mediation (Full Controls)
Networking	0.100	-0.0526	0.0556	0.0517	-0.0479
	(0.0713)	(0.0862)	(0.0741)	(0.0768)	(0.0863)
Networking and Legal	0.200***	0.107	0.206***	0.205***	0.103
	(0.0741)	(0.0872)	(0.0763)	(0.0764)	(0.0877)
Contacted WhatsApp Group Member		0.180**			0.199**
		(0.0740)			(0.0819)
Contacted Using Business Directory			0.0497		0.00842
			(0.118)		(0.136)
Contacted Through Enumerators				0.0365	-0.0634
				(0.0903)	(0.113)
Control Mean	-0.000		-0.000	-0.000	-0.000
T1 = T2 (p-value)	0.150		0.036	0.036	0.039
R^2	0.074	0.077	0.073	0.073	0.077
N	1386	1295	1295	1295	1295

Table A.13: Mediation Analysis - Profits

	(1) Monthly Profits (Winsorized)	(2) Monthly Profits (Winsorized) Mediation (Contacts)	(3) Monthly Profits (Winsorized) Mediation (Directory)	(4) Monthly Profits (Winsorized) Mediation (Enumerators)	(5) Monthly Profits (Winsorized) Mediation (Full Controls)
Networking	209.1*	97.99	219.7*	292.1**	134.1
	(113.7)	(132.2)	(121.6)	(127.5)	(132.9)
Networking and Legal	309.6**	170.7	274.8**	303.8**	144.4
	(120.5)	(130.5)	(121.5)	(123.0)	(131.4)
Contacted WhatsApp Group Member		175.1			305.2**
		(114.4)			(135.5)
Contacted Using Business Directory			-60.74		134.7
			(188.5)		(229.9)
Contacted Through Enumerators				-276.3**	-474.8***
				(130.5)	(183.2)
Control Mean	1295.973		1295.973	1295.973	1295.973
T1 = T2 (p-value)	0.373		0.640	0.922	0.931
R^2	0.137	0.157	0.155	0.158	0.162
N	1325	1244	1244	1244	1244

Table A.14: WhatsApp Chat Categorization Performance Metrics

Category	Precision	Recall	F1-Score	Support
Advice	0.00	0.00	0.00	3
Business Competition	1.00	0.25	0.40	4
Coordination	0.70	0.73	0.71	22
Greetings	0.65	0.97	0.78	31
Marketing	1.00	0.50	0.67	10
Other	0.80	0.40	0.53	10
Overall Accuracy		0.70		
Macro Average	0.69	0.47	0.52	80
Weighted Average	0.72	0.70	0.67	80

Note: Classification performance metrics for each category. Advice: Messages seeking or providing business advice. Business Competition: Messages about the competition. Coordination: Messages coordinating chats or activities. Greetings: Messages with greetings or expressions of thanks. Marketing: Messages promoting products or services. Other: Miscellaneous messages not fitting other categories. Support: Number of messages in each category in the validation set.

Table A.15: WhatsApp Chats Categories

Category	Percent of Messages
Marketing	5.46%
Advice	1.21%
Coordination	23.66%
Legal Support	0.73%
Business Competition	1.05%
Greetings	54.09%
Other	13.80%

Table A.16: Effect of Online Networking Groups on Collaborations

	(1) Steps Towards Collaboration Index	(2) Any Collaboration	(3) Number of Collaborations	(4) Joint Application
Networking	0.320***	-0.0198	-0.172	0.00367
	(0.0767)	(0.0230)	(0.274)	(0.00647)
Networking and Legal	0.233***	-0.0695***	-0.533**	0.00276
	(0.0720)	(0.0216)	(0.210)	(0.00696)
Control Mean	0.000	0.134	0.781	0.011
T1 = T2 (p-value)	0.220	0.004	0.070	0.888
Q-value (T1)	0.000	0.626	0.652	0.652
Q-value (T2)	0.004	0.004	0.022	0.692
R^2	0.043	0.042	0.026	0.027
N	1389	1388	1388	1771

Note: Joint Application refers to jointly applying to the business competition. All specifications control for baseline collaboration, missing indicator for baseline collaboration, ML predicted probability for collaboration, and strata fixed effects. Robust standard errors reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.17: Effect of Online Networking Groups on Collaborations by Collaborator Type

	(1) Collaboration with Friends or Relatives	(2) Collaboration with Business Network Members (Non-UG)	(3) Collaboration with Business Network Members (UG)
Networking	-0.0369*	-0.00948	0.0131***
	(0.0210)	(0.0136)	(0.00480)
Networking and Legal	-0.0708***	-0.0266**	0.00604
	(0.0197)	(0.0127)	(0.00369)
Control Mean	0.117	0.044	0.000
T1 = T2 (p-value)	0.021	0.079	0.168
Q-value (T1)	0.118	0.487	0.019
Q-value (T2)	0.002	0.073	0.122
R^2	0.043	0.028	0.050
N	1388	1388	1388

Note: All specifications control for baseline collaboration, missing indicator for baseline collaboration, ML predicted probability for collaboration, and strata fixed effects. Robust standard errors reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.18: Effect of Online Networking Groups on Collaborations (Mediation Analysis)

	(1) Any Collaboration	(2) Any Collaboration
Networking	-0.0198	0.0119
	(0.0230)	(0.0117)
Networking and Legal	-0.0695***	-0.00826
	(0.0216)	(0.0109)
Collaboration with Friends		0.900***
		(0.0162)
Collaboration with Relatives		0.569***
		(0.0865)
Control Mean	0.134	0.134
T1 = T2 (p-value)	0.004	0.055
R^2	0.042	0.704
N	1388	1388

Note: All specifications control for baseline collaboration, missing indicator for baseline collaboration, ML predicted probability for collaboration, and strata fixed effects. Robust standard errors reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.19: Effect on Perception of Quality of Potential Collaborators

	(1) Quality of Potental Collaborator Among Friends and Relatives (1-10 Ideal)	(2) Quality of Potental Collaborator Among Business Network (1-10 Ideal)	(3) Network - Personal Difference
Networking	0.0720	0.317***	0.245**
	(0.120)	(0.113)	(0.112)
Networking and Legal	-0.0471	0.180	0.227*
	(0.123)	(0.120)	(0.122)
Control Mean	5.601	5.726	0.125
T1 = T2 (p-value)	0.252	0.163	0.862
R^2	0.055	0.043	0.039
N	1389	1389	1389

Table A.20: Peer Effects by Industry and Region

	(1) Any Collaborations	(2) Any Changes to Business (Past 6 Months)	(3) Business Practice Index	(4) Sales and Profits Index
Share Different Industry, Same Region	0.397*	0.258	0.786*	787.4
	(0.211)	(0.463)	(0.472)	(765.8)
Share Same Industry, Different Region	-0.163	-0.896***	-0.341	-503.7
	(0.129)	(0.263)	(0.248)	(406.8)
Share Same Industry, Same Region	-0.172	-0.356	-0.350	-923.4
	(0.140)	(0.268)	(0.363)	(640.4)
Control Mean	0.286	-0.000	0.000	1295.973
R^2	0.086	0.164	0.237	0.210
N	1043	1043	1150	991

Note: The independent variable for each column is denoted in the column name. All specifications control for baseline outcome, missing indicator for baseline outcome, and strata fixed effects. We also include as controls, top collaboration choices, collaboration language preference, interest in collaborating with the same or different sector, and firm sector, as well as all the pairwise interactions. Clustered standard errors at the WhatsApp group level. Sample restricted to only treated firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.21: Complementarities

	(1) Any Innovation	(2) Any Innovation	(3) Business Practice Index	(4) Business Practice Index	(5) Sales and Profits Index	(6) Sales and Profits Index	(7) Monthly Profits (Winsorized)	(8) Monthly Profits (Winsorized)
# Complementarities	0.00801***	0.00672***	0.0119***	0.00262	0.00177	-0.00202	8.971	-1.158
	(0.00224)	(0.00248)	(0.00411)	(0.00453)	(0.00532)	(0.00631)	(10.05)	(11.87)
Peers' Business Practice Control?	No	Yes	No	Yes	No	Yes	No	Yes
Control Mean	0.286	0.286	-0.000	-0.000	0.000	0.000	1295.973	1295.973
R^2	0.064	0.065	0.096	0.114	0.102	0.105	0.125	0.133
N	842	842	842	842	926	926	805	805

Note: The independent variable for each column is denoted in the column name. All specifications control for baseline outcome, missing indicator for baseline outcome, and strata fixed effects. Clustered standard errors at the WhatsApp group level for the treated firms. Sample is restricted to treated entrepreneurs only. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.22: Effect of Online Networking Groups on Attitudes

	(1) Business Expectations Index	(2) Entrepreneurial Self-Efficacy Index	(3) Get-Ahead Attitude Index	(4) Female Empowerment Index
Networking	0.575	0.0531	-0.0208	-0.0309
	(0.604)	(0.0717)	(0.0659)	(0.0686)
Networking and Legal	-0.122	0.0402	0.0326	0.0192
	(0.171)	(0.0746)	(0.0658)	(0.0682)
Control Mean	-0.000	0.000	-0.000	0.000
T1 = T2 (p-value)	0.192	0.850	0.317	0.403
Q-value (T1)	0.778	0.778	0.778	0.778
Q-value (T2)	0.778	0.778	0.778	0.778
R^2	0.056	0.029	0.038	0.070
N	1388	1389	1389	1389

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. Robust standard errors reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.23: Effect of Online Networking Groups by Social Desirability Index

	(1) Any Changes to Business (Past 6 Months)	(2) Business Practice Index	(3) Sales and Profits Index	(4) Monthly Profits Winsorized
Treated	0.0948***	0.118*	0.0941	258.8**
	(0.0289)	(0.0606)	(0.0602)	(102.7)
Social Desirability Index	-0.0259	-0.360***	-0.110**	-174.8**
	(0.0246)	(0.0499)	(0.0559)	(75.06)
Treated × Social Desirability Index	-0.0264	0.0924	0.162***	262.2***
	(0.0287)	(0.0613)	(0.0627)	(87.19)
Control Mean	0.286	-0.000	0.000	1295.973
R^2	0.046	0.141	0.164	0.141
N	1386	1386	1389	1325

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. Social desirability index is constructed based on responses to: "I sometimes feel resentful when I don't get my way (no)", "I'm always willing to admit it when I make a mistake (yes)", "I am always courteous, even to people who are disagreeable (yes)", "I am sometimes irritated by people who ask favors of me (no)." This was measured at the one-year follow-up. Robust standard errors reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.24: Distance Analysis

	(1) Sales and Profits Index	(2) Monthly Profits Winsorized
Distance to nearest treatment business (kms)	0.00333	3.913
	(0.0117)	(18.09)
Distance to nearest control business (kms)	0.00386	6.092
	(0.00544)	(10.96)
Control Mean	0.000	1295.973
R^2	0.241	0.214
N	291	268

Note: This table follows the analysis in Dalton et al. (2021) to capture potential spillover effects among the control group by regressing sales and profits index (column 1) and profits (column 2) on the distance to the nearest treated entrepreneur. Regressions also control for distance to the nearest control entrepreneur. All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. Outcome variables are measured at the one-year follow-up. GPS measurements are recorded during the three-year follow-up. The sample is restricted to the control group. Robust standard errors reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.25: Effect of Online Networking Groups on Business Collaboration (3-Year Post Intervention)

	(1) Steps Towards Collaboration Index	(2) Any Collaboration	(3) Number of Collaborations
Networking	0.0369	0.00300	-0.410
	(0.0773)	(0.0354)	(0.398)
Networking and Legal	0.0435	0.00843	-0.104
	(0.0816)	(0.0369)	(0.426)
Control Mean	-0.000	0.303	2.052
T1 = T2 (p-value)	0.927	0.862	0.350
Q-value (T1)	0.932	0.932	0.932
Q-value (T2)	0.932	0.932	0.932
R^2	0.073	0.105	0.122
N	1072	1070	1070

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted collaboration index, and strata fixed effects. Robust standard errors reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.26: Effect of Online Networking Groups on Collaborations by Collaborator Type (3-Year Post Intervention)

	(1) Collaboration with Friends or Relatives	(2) Collaboration with Business Network Members (Non-UG)	(3) Collaboration with Business Network Members (UG)
Networking	-0.0231	0.00244	-0.0107
	(0.0237)	(0.0177)	(0.00789)
Networking and Legal	-0.00845	0.0149	-0.00999
	(0.0249)	(0.0190)	(0.00774)
Control Mean	0.109	0.056	0.015
T1 = T2 (p-value)	0.488	0.464	0.888
R^2	0.056	0.101	0.111
N	1070	1070	1070

Note: All specifications control for baseline collaboration, missing indicator for baseline collaboration, ML predicted probability for collaboration, and strata fixed effects. Robust standard errors reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.27: Expert Predictions for Long-Run Results

	Treatment 1	Treatment 2
Number of Collaborations (%)	10.86	10.94
	(14.26)	(18.96)
Business Innovation Index (SD)	0.13	0.15
	(0.09)	(0.14)
Business Practices Index (SD)	0.14	0.18
	(0.10)	(0.12)
Monthly Sales (%)	9.93	12.44
	(9.02)	(11.65)
Monthly Profits (%)	8.70	11.44
	(8.22)	(11.06)
Observations	50	50

Note: Means and standard deviations of the expert predictions collected through an anonymous survey administered by the Social Science Prediction Platform in September 2024. The values reflect either expected percentage difference or standard deviations relative to the control group three years after the intervention. Sample restricted to the 50 experts who did not have prior knowledge of the study.

B Legal Training Syllabus

1. Benefits of Collaboration (Provided to all treatment and control groups)
    - To explain and discuss what collaboration means and its benefits
2. Types of Collaborations
    - To help participants identify some types of collaboration and identify which type they find feasible for their business
3. Effective Collaborative Activities
    - Information sharing, joint relationship effort, dedicated investment
    - Use of communication as a tool to monitor and prevent risks in collaboration

4. Preparing to collaborate or partner with other firms
    - This will focus on preparatory steps and process for choosing a partner
    - Questions to ask:
        - How does the partnership fit into your bigger strategic picture?
        - How well do you really know your partner?
        - How well have you defined key performance indicators (KPIs) for the partnership?
        - How much analysis and evaluation need to be done keeping your brand and values in mind?
        - Which regulatory matters may affect the negotiations or collaboration and what are the levels of compliance by the intending partners?
5. Protecting your interest prior to collaboration
    - This will cover the processes for securing business interests prior to collaboration
        - Conduct a pre-transaction due diligence (legal, financial operational)
        - Signing a non-disclosure agreement
        - Trademark and intellectual property registration
        - Letter of intent or memorandum of understanding
        - Business registration or incorporation
6. Identifying risks in collaboration
    - To assist participants to identify risk factors for collaboration
    - What risks are associated with collaboration?
        - Performance risk
        - Relational risk
        - Clash of cultures
        - Lack of commitments among management teams
        - Lack of trust
    - Identifying risks by asking the following questions:

  - What risks might be involved in setting up and starting the collaborative partnership?
  - What risks might be involved in organizing the partnership?
  - What risks might be involved in meeting the timelines for the collaboration?
  - What risks might be involved in meeting the objectives of the collaboration?
  - What risks might be involved in not having all the resources/funding needed to manage the partnership?

7. Identifying other common issues with collaboration

   - To identify and discuss other issues that commonly affect the success of any collaboration
     - Inability to reconcile competing interests to attain a union of purpose
     - business entity principle – separating business finances from the individual owner
     - governance and decision-making process
     - share of profits and costs
     - rights, obligations and limitations of the powers of the partners
     - sourcing finance and insurance

8. Documentation and agreements for collaboration

   - To discuss the relevant documentations and agreements for collaboration and reasons for written agreements as a risk control mechanism

9. Dispute resolution

   - To discuss how disputes arise in collaborations and why the process for resolving disputes must be clarified

10. Termination of the collaboration and rights upon termination

    - To discuss the processes and conditions for termination of the collaboration and rights upon termination

11. Promoting Trust in collaborations

- To identify and discuss ways of promoting trust in collaborations
  - What is the value of trust in a collaboration?
  - Why is there a lack of trust?
    - Lack of operationalization of processes across boundaries
    - Misalignment in goals KPIs
    - Lack of visibility predictability in pipeline and revenue
  - How to achieve trust in a collaboration?
    - Open and effective communication
    - Confidence and predictability
    - New opportunities and exponential gains

C Assignment to WhatsApp Groups

To assign individuals into one of the 25 group types (5 collaboration types $\times$ 5 sector types), we conduct the following procedure:

1. First, we assign everyone to their first choice for collaboration type and sector type. Because we have an excess of firms looking for clients compared to firms looking for suppliers by nearly six times, we randomly allocate 60% of the firms looking for clients to be assigned to their second collaboration choice. Individuals who preferred partners in the same broad sector as theirs are assigned to their specific broad sector group. For those who were interested in partners in another broad sector, we assigned them to the mixed sector group.

2. Once the initial assignment is completed, we create groups of 8 within each group type and treatment status.

   - For supplier and client groups, we create groups of 8 with 4 suppliers and 4 clients, matched on sector preference. Any suppliers or clients that cannot be matched are reassigned to their next preferred collaboration type.

3. For any remaining unmatched individuals, we match on only their collaboration type preference by re-assigning them to the mixed sector groups. We then form groups of 8 within their group type and treatment status.

4. Finally, we assign the remaining unmatched individuals to the "Mixed" collaboration type and form all remaining groups.

In sum, we construct the groups using the following variables: top three choices of collaboration type, interest in collaborating with the same or different sector, and firm sector.

D Machine Learning Predictions

Our machine learning predictions are constructed using random forest. Specifically, we fit a random forest on our outcomes of interest to obtain the predicted value as well as the most important predictors for all outcome variables. To perform this analysis, we used the R package "h2o". We provided the h2o.randomforest function with the following arguments: the training data frame, the predictor variables (see the full list below), the response variable,[31], the number of trees and maximum tree depth (both chosen with cross-validation).

The list of predictors is the following: any collaboration, sales and profits index, financing index, capital and labor index, business practices index, innovation index, self efficacy index, empowerment index, networking index, formalization index, legal knowledge index, ambitions index, get ahead attitude index, COVID impact index, risk index, trust index, firm's age, age, years of education, married indicator, number of children, an indicator for having a child below 18, an indicator for being a only-women owned firm. We list the ten most important predictors in Table D.1.

We replaced missing observations with the value 99 and, for each predictor, we added to the previous list one indicator for whether the predictor is missing.

[31]Note that in some of the predictor variables are also outcome variables. When they enter as predictor variables in our model, they are removed from the list of outcome variables.

Table D.1: Predictors of Any Collaborations in the Last Six Months using Random Forest

Ten Most Important Predictors
1. Get Ahead Attitude Index
2. Business Practice Index
3. Networking Index
4. Trust Index
5. Innovation Index
6. Business Formalization Index
7. Risk Aversion Index
8. Ambition Index
9. Owner's Age
10. Legal Knowledge Index
11. Self-Efficacy Index
12. Covid-Impact Index
13. Empowerment Index
14. Sales and Profits Index
15. Firm's age

E Outcome Measures

E.1 Business Performance Outcomes

Business Innovation Index

We construct this index using the measures listed below following the definition described in McKenzie (2017):

- Introduced new products or service
- Significantly improved an existing product or service previously sold by the firm
- Introduced new or improved business processes (examples might include a new production method, a new quality control system, a new accounting system, or a new delivery system).

- Implemented new design or packaging to give a product a new or significantly changed look, or significantly changed the way you display merchandise.
- Introduced a new channel for selling your goods and services, such as licensing to others, selling in a new type of place, etc.
- Introduced a new method of pricing your goods or services, such as a new type of special offer, or a new way of varying the price according to demand.
- Introduced a new way of promoting or advertising your products or services.
- Changed the way work is organized in your firm, by changing the number of levels in your hierarchy, or the way workers work together, or giving more control over certain processes to other workers in your firm.
- Introduced new quality control standards for suppliers or subcontractors
- Licensed a new technology in the last six months
- (Not pre-specified) Entered new markets
- (Not pre-specified) Implemented new ways of sourcing inputs at lower costs or higher quality

The following variables are dropped from the index at midline due to lack of variation as mentioned in **??**:

- Introduced new quality control standards for suppliers or subcontractors
- Licensed a new technology in the last six months

Business Practice Index

Following McKenzie (2017), this measure consists in the proportion of adopted practices out of a list of 22 which range from marketing to record-keeping, from buying and stock control to financial planning used by the firm. This measure is restricted only to firms that are surviving at the time of the survey. The listed business practices are the following:

- Visited at least one of its competitor's businesses to see what prices its competitors are charging

- Visited at least one of its competitor's businesses to see what products its competitors have available for sale
- Asked existing customers whether there are any other products the customers would like the business to sell or produce
- Talked with at least one former customer to find out why former customers have stopped buying from this business
- Asked a supplier about which products are selling well in this business' industry
- Attracted customers with a special offer
- Advertised in any form (in the last 6 months)
- Attempted to negotiate with a supplier for a lower price on raw material
- Compared the prices or quality offered by alternate suppliers or sources of raw materials to the business' current suppliers or sources of raw material
- The business does not run out of stock monthly or more (coded as one if the business has no stock)
- Keeps written business records
- Records every purchase and sale made by the business
- Able to use records to see how much cash the business has on hand at any point in time
- Uses records regularly to know whether sales of a particular product are increasing or decreasing from one month to another
- Works out the cost to the business of each main product it sells
- Knows which goods you make the most profit per item selling
- Has a written budget, which states how much is owed each month for rent, electricity, equipment maintenance, transport, advertising, and other indirect costs to business

- Has records documenting that there exists enough money each month after paying business expenses to repay a loan in the hypothetical situation that this business wants a bank loan
- Review the financial performance of their business and analyze where there are areas for improvement at least monthly
- Has a target set for sales over the next year
- Compares their sales achieved to their target at least monthly
- Has a budget of the likely costs their business will have to face over the next year

No variables are dropped from the index at midline due to lack of variation as mentioned in ??.

Sales and Profits Index

We construct this index using the measures listed below following the definition described in McKenzie (2017):

- Monthly sales: Sales in the last month, 0 if not in business
- Monthly sales (Winsorized): Sales in the last month, 0 if not in business. It is winsorized at the 99th percentile.
- Inverse hyperbolic sine of monthly sales: Sales in the last month, transformed
- Profits: total profits of the business in the last month
- Profits (Winsorized): total profits of the business in the last month, winsorized at the 1st and 99th percentile
- Inverse hyperbolic sine of profits: Transformation of profits to allow for zero and negative values of profits
- Profits in the best month: total profits of the business in the best month of the past 12 months
- Profits in the best month (Winsorized): total profits of the business in the best month of the past 12 months, winsorized at the 1st and 99th percentile

- Weekly customers: number of customers the firm has in the past week, winsorized at the 99th percentile. It is zero for firms that are not operating

No variables are dropped from the index at midline due to lack of variation as mentioned in **??**.

Business Financing Index

We construct this index using the measures listed below following the definition described in McKenzie and Puerto (2020):

- Received at least 1 loan from any source in the past six months
- Received a loan from a bank, microfinance organization, or NGO in the past six months
- Total amount of loans received from all sources in the last six months. 0 if no loans received
- Received a new investment in the form of equity in the past six months
- Has a business bank account that is separate from personal bank account

The following variables are dropped from the index at midline due to lack of variation as mentioned in **??**:

- Received a loan from a bank, microfinance organization, or NGO in the past six months
- Received a new investment in the form of equity in the past six months

Capital and Labor Index

We construct this index using the measures listed below following the definition described in McKenzie (2017):

- Total employment: the number of paid workers in the firm, including the owner. Unpaid workers are not included. Coded as zero if the business does not exist
- Value of inventories: current value reported of inventories and raw materials, top-coded at the 99th percentile
- Capital stock: current value of inventories plus the sum of the value of capital purchases made in midline and endline, truncated at the 99th percentile

- Made a large capital purchase: reports making a capital purchase of more than 2000 GHS in the past six months

No variables are dropped from the index at midline due to lack of variation as mentioned in ??.

E.2 Collaboration-Related Outcomes

Number of Collaborations

We measure total number of collaborations based on the total number of times a firm has engaged in one of the following activities:

- Work with another firm to promote/market each others' businesses or products
- Build a new ongoing working relationship with suppliers or business clients
- Purchase inputs or stocks wholesale with another firm
- Share tools, inputs, equipment or employees with another firm
- Work with another firm to fill a large order
- Start operating business together/sharing of profits with another firm
- Other forms of collaboration

Steps towards Collaboration Index

The index is constructed based on the following measures:

- Identified an area of improvement for your business that may benefit from collaboration with another business
- Considered a collaboration
- Conducted a search process (e.g. asking business network, personal connections) to identify potential collaborators
  - For the treatment group, this includes speaking with enumerators with specific requests for collaborators
- Contacted a specific firm with a proposal to collaborate

- Having multiple conversations oriented towards a collaboration
- Started a collaboration

The following variables are dropped from the index at midline due to lack of variation as mentioned in **??**:

- Contacted a specific firm with a proposal to collaborate
- Having multiple conversations oriented towards a collaboration

Joint Application for Business Innovation Competition

As part of the intervention design, we will host a business innovation competition. The competition seeks to fund an innovative business project. The winning firm will be awarded 6,000 GHS. The competition allows for joint applications with one other firm. Joint applications will be awarded 12,000 GHS. This competition will be open to all firms in the sample, including the controls and it will be announced at the beginning of the intervention. We will measure joint applications as a key outcome variable for firm collaborations.

Quality of Collaborations Index

We construct this index using the following measures. For firms without any collaborations, we impute 0 to each of the measure before constructing the index.

- Quality of the competition project (1-5 scale)
- Average of the responses for each collaborator in the last six months (1-5 scale for strongly disagree to strongly agree). These measures are adapted from Nyaga et al. (2010).
  - We expect this relationship to continue for a long time.
  - The firm is satisfied with:
    - coordination of activities
    - participation in decision making
    - level of commitment
    - level of information sharing
    - management of activities
  - My firm is satisfied with the collaborative relationship in terms of profitability and sales growth.

- (1-5 strongly disagree to strongly agree) I would recommend this collaborator to other firms looking for business collaborations.
- Number of times the firm has referred the collaborator

No variables are dropped from the index at midline due to lack of variation as mentioned in ??.

E.3 Business Networking

We construct this index using the measures listed below:

- Has a Mentor: The firm reports have a business mentor in response to a direct question.
- Number in Business Network: number of other business owners the individual discusses business matters with, truncated at the 99th percentile.
- Number of Referrals Received: Number of referrals received in the last six months, truncated at the 99th percentile. Coded as 0 if don't know.
- Member of a Business Association: The firm reports being a member of a business association

No variables are dropped from the index at midline due to lack of variation as mentioned in ??.

E.4 Outcomes Related to Access to Legal Support

Business Formalization Index

- Registration documents
- % wage/salaried employees with written contracts
- % employees above the minimum wage (did not collect this information)
- % suppliers with written contracts
- % clients with written contracts

- Ever registering a trademark/patent/copyright

The following variables are dropped from the index at midline due to lack of variation as mentioned in **??**:

- Ever registering a trademark/patent/copyright

Trust in Contracts

We measure trust in contracts through a trust game modified from a similar survey question used in Cai and Szeidl (2017). Specifically, respondents will be asked the following question:

"Suppose that you are given GHS 10,000. Out of this, you can choose to give as much as you want for a business project which is controlled by another business owner. This project is very successful and triples the money you give. All the proceeds go to the other business owner. The business owner ***[says/agrees in writing that]*** *he will give you 50% of the proceeds. How much (between 0 and GHS 10,000) do you give to this business owner?"* To measure trust in contracts, we randomly vary whether the agreement is verbal or written with equal probability during the survey.

Trust in the Legal System

Respondent answers "agree" or "strongly agree" to the statement "You have high confidence in the legal system".

E.5 Ambition and Attitudes

Business Ambitions Index

An average of standardized z-scores for

- number of workers in five years (0 if believe no longer will own business)
- truncated number of workers in five years
- highest monthly sales in five years (0 if believe no longer will own business)
- truncated monthly sales in five years
- expect an increase in sales outside of current market in five years
- expect to export in five years

No variables are dropped from the index at midline due to lack of variation as mentioned in **??**.

Get Ahead Attitudes

This index is adapted from McKenzie and Puerto (2020) and is constructed from 11 questions designed to measure positive and optimistic business attitudes. These are scored 1 through 5, where 1=strongly disagree, 5 = strongly agree. Questions will be coded so that higher scores indicate better entrepreneurial attitudes. It include:

- "Even when my business is going well, I keep my eyes open in case I find a way to improve it"
- "When I face a difficult problem, I can usually find some solution"
- "Sometimes I agree to something but then I realize I can't provide it in full or on time, so the customer just has to wait" (negatively coded)
- "I will not try something new unless I am 100% certain it will succeed" (negatively coded)
- "Sometimes to make money you have to risk losing some"
- "I don't worry about where my business will be in the future – I just plan week to week based on what comes up" (negatively coded)
- "If I want to do something, I just do it – I don't need to think about it a lot or discuss with others"
- "I can usually get people to see my point of view, even if they may not understand at first"
- "I am always talking to people and trying to meet new people – you never know when someone will be able to help you later"
- "My business provides about the same as others/is doing about the same as others, so there's no need to make it better" (negatively coded)
- "Even if I am not sure I will succeed in an endeavor, I like to try anyway"

No variables are dropped from the index at midline due to lack of variation as mentioned in ??.

Entrepreneurial Self-Efficacy

We construct an index out of the following 10 business activities that the owner rates themselves as "very confident" in their ability to do. This measure is based on the definition used in McKenzie (2017).

- Come up with an idea for a new business product or service
- Estimate accurately the costs of a new business venture
- Estimate customer demand for a new product or service
- Sell a product or service to a customer you are meeting for the first time
- Identify good employees who can help a business grow
- Inspire, encourage, and motivate employees
- Find suppliers who will sell you raw materials at the best price
- Persuade a bank to lend you money to finance a business venture
- Correctly value a business if you were to buy an existing business from someone else

No variables are dropped from the index at midline due to lack of variation as mentioned in ??.

Female Empowerment Index

We construct this index using the measures listed below following the definition described in McKenzie and Puerto (2020):

- Compelled to spend money on husband or family (coded 1 if they answer no)
- Not the only person with access to their firms' money (coded as 1 if only they have access)
- Has some money which they have sole control over and can spend how they like
- Do not need anyone's permission:
  - to visit a friend

- to travel to sell a business asset
- to travel to a new location to work
- to stay overnight in a different town
- to work later than usual hours
- to take out a loan
- to spend money on an investment for their business.

No variables are dropped from the index at midline due to lack of variation as mentioned in ??.

E.6 Collaboration Trust Index

This index is constructed using the following measures from Seppänen et al. (2007) and Panayides and Venus Lun (2009). Each measure is coded from 1 to 5 for strongly disagree to strongly agree.

- We trust that our collaborator will keep the promises it makes to our firm
- We believe the information that this collaborator provides us
- We trust this collaborator keeps our best interests in mind
- We find it necessary to be cautious with this collaborator (Negatively coded)

No variables are dropped from the index at midline due to lack of variation as mentioned in ??.

E.7 Collaboration Formalization Index

We construct index using the measures described below. These measures are adapted from the scale items designed to measure level of formalization in business collaborations in Daugherty et al. (2006).

- Communication between our company and our collaborator takes place frequently.
- The basic terms of our relationship have been explicitly verbalized and discussed.

- We share proprietary information with each other.
- We include each other in formal business planning meetings.
- We have a written agreement.

No variables are dropped from the index at midline due to lack of variation as mentioned in ??.

E.8 Collaboration Knowledge Index

We construct index using the measures described below. These measures are adapted from the scale items designed to measure level of knowledge in business collaborations. Note this index was not pre-specified.

- Agree or strongly agree:
  - I can terminate a collaboration at any time
  - Sharing business information with the other firm makes collaboration more effective.
  - A party to a business collaboration must be prudent to conduct due diligence on the partners and business
  - You must protect your trademarks and business interests before collaborating with others.

No variables are dropped from the index at midline due to lack of variation as mentioned in ??.

Table E.1: Effect on Step Towards Collaboration Index and Its Components

	(1) Contacted Firm	(2) Multiple Conversations	(3) Any Collaboration
Networking	0.0327**	0.0306*	-0.0198
	(0.0154)	(0.0166)	(0.0230)
Networking and Legal	0.00580	0.000576	-0.0695***
	(0.0145)	(0.0155)	(0.0216)
Control Mean	0.041	0.050	0.134
T1 = T2 (p-value)	0.061	0.045	0.004
R^2	0.038	0.035	0.042
N	1388	1388	1388

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. Robust standard errors reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

F Quality of Collaborations

Given that the intervention shifted the types of collaborations taking place, we next explore whether quality of collaboration may have improved. To investigate effects on quality, we look at three outcomes: (i) quality of collaboration index that captures measures such as satisfaction with coordination of activities and level of commitment of collaborator, (ii) collaboration trust index that captures trust in promises or information collaborator provides to the firm, and (iii) formalization of collaboration index which measures the use of formal agreements and whether terms of relationships have been discussed and verbalized. [32] Table F.1 shows limited evidence that quality improved. We also do not observe an increase in the formalization of collaborations.

[32]Full description of these indices can be found in Appendix E.

Table F.1: Effect of Online Networking Groups on Quality, Trust and Formalization of Collaborations

	(1) Quality of Collaboration Index	(2) Collaboration Trust Index	(3) Collaboration Formalization Index
Networking	-0.0376	0.177	-0.382*
	(0.0684)	(0.201)	(0.209)
Networking and Legal	-0.198***	0.165	0.155
	(0.0633)	(0.253)	(0.286)
Control Mean	-0.000	-0.000	-0.000
T1 = T2 (p-value)	0.002	0.958	0.057
R^2	0.042	0.242	0.254
N	1388	140	140

Note: All specifications control for baseline collaboration, missing indicator for baseline collaboration, ML predicted probability for collaboration, and strata fixed effects. Robust standard errors reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

G Perceptions Related to Collaborations

Table G.1: Effect of Online Networking Groups on Perceptions Related to Collaborations

	(1) Likelihood of Collaborating Next 6 Months (1-10 Most Likely)	(2) Usefulness of Collaborations (1-10 Most Useful)	(3) Riskiness of Collaborations (1-10 Most Risky)	(4) Collaborations More Risky Compared to 6 Months Ago
Networking	0.213	0.190	0.0456	0.0204
	(0.148)	(0.162)	(0.135)	(0.0342)
Networking and Legal	-0.0696	0.000595	-0.0142	0.00255
	(0.151)	(0.163)	(0.139)	(0.0351)
Control Mean	4.146	5.044	6.050	0.394
T1 = T2 (p-value)	0.033	0.177	0.634	0.559
R^2	0.040	0.043	0.043	0.034
N	1389	1389	1389	1389

Note: All specifications control for baseline collaboration, missing indicator for baseline collaboration, ML predicted probability for collaboration, and strata fixed effects. Robust standard errors reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

H Peer Effects Estimation (Pre-Specified Results)

This section presents the result from estimating our pre-specified linear-in-means estimation, which allows for differential effects across treatment groups:

$$\begin{aligned} Y_{i,t=1} = \alpha_0 + \alpha_1 T2 + \alpha_2 \overline{X}_{-i,t=0} + \alpha_3 \overline{X}_{-i,t=0} \times T2 \\ + \pi Y_{i,t=0} + \delta M_{i,t=0} + S_i'\gamma + \tau \hat{f}(X) + K_i'\phi + \epsilon_{i,t=1} \end{aligned} \tag{A1}$$

where $\overline{X}_{-i,t=0}$ is the average characteristic of the peers of i.[33] In addition to the controls in the main specification, we will additionally control for K_i, a vector of variables used in the group assignment. This includes indicators for treatment status, top collaboration choices, collaboration language preference, interest in collaborating with the same or different sector, firm sector, and their interactions.[34] Because the assignment to WhatsApp groups is random conditional on these preferences, α_2 identifies the causal impact of peer composition on our outcome variable and α_3 identifies any difference in peer effects across the two treatment arms.

Additionally, we had pre-specified that we would look at peers' predicted collaboration index. These results are presented in Table H.5.

[33]Note we include all peers from the two rounds of WhatsApp groups.

[34]See group assignment details in Section 2.1.2.

Table H.1: Peer Effects on Innovation (Allowing for Differential Effects Across Treatments)

	(1) Share of Peers with College Degrees	(2) Peers' Average Baseline Business Practice Index	(3) Peers' Average Baseline Sales and Profits Index	(4) Share of Peers from Same Industry	(5) Industry Diversity Index
Networking and Legal	-0.00590	-0.0164	-0.00586	-0.0748*	0.149*
	(0.0434)	(0.0333)	(0.0325)	(0.0429)	(0.0778)
Peer Characteristics	0.119*	0.182***	0.143**	-0.279***	0.254**
	(0.0611)	(0.0553)	(0.0696)	(0.0848)	(0.116)
Peer Characteristics × Networking and Legal	0.0151	-0.126	0.137	0.256***	-0.228**
	(0.0842)	(0.0992)	(0.133)	(0.0879)	(0.113)
Control Mean	0.286	0.286	0.286	0.286	0.286
R^2	0.085	0.087	0.088	0.088	0.083
N	1041	1043	1043	1043	1043

Note: The outcome variable in all specifications is any changes to business in the past six months. The independent variable for each column is denoted in the column name. All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. We also include as controls, top collaboration choices, collaboration language preference, interest in collaborating with the same or different sector, and firm sector, as well as all the pairwise interactions. Clustered standard errors at the WhatsApp group level. Sample restricted to only treated firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table H.2: Peer Effects on Business Practice Index (Allowing for Differential Effects Across Treatments)

	(1) Share of Peers with College Degrees	(2) Peers' Average Baseline Business Practice Index	(3) Peers' Average Baseline Sales and Profits Index	(4) Share of Peers from Same Industry	(5) Industry Diversity Index
Networking and Legal	0.112	0.0732	0.0887	-0.0224	0.457***
	(0.0687)	(0.0593)	(0.0586)	(0.0838)	(0.114)
Peer Characteristics	0.436***	0.399***	0.285**	-0.779***	0.742***
	(0.126)	(0.119)	(0.133)	(0.183)	(0.226)
Peer Characteristics × Networking and Legal	0.0133	-0.132	-0.145	0.413**	-0.534***
	(0.150)	(0.164)	(0.242)	(0.174)	(0.182)
Control Mean	-0.000	-0.000	-0.000	-0.000	-0.000
R^2	0.167	0.163	0.157	0.165	0.160
N	1041	1043	1043	1043	1043

Note: The outcome variable in all specifications is the business practices index. The independent variable for each column is denoted in the column name. All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. We also include as controls, top collaboration choices, collaboration language preference, interest in collaborating with the same or different sector, and firm sector, as well as all the pairwise interactions. Clustered standard errors at the WhatsApp group level. Sample restricted to only treated firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table H.3: Peer Effects on Sales and Profits Index (Allowing for Differential Effects Across Treatments)

	(1) Share of Peers with College Degrees	(2) Peers' Average Baseline Business Practice Index	(3) Peers' Average Baseline Sales and Profits Index	(4) Share of Peers from Same Industry	(5) Industry Diversity Index
Networking and Legal	0.112	0.0732	0.0887	-0.0224	0.457***
	(0.0687)	(0.0593)	(0.0586)	(0.0838)	(0.114)
Peer Characteristics	0.436***	0.399***	0.285**	-0.779***	0.742***
	(0.126)	(0.119)	(0.133)	(0.183)	(0.226)
Peer Characteristics × Networking and Legal	0.0133	-0.132	-0.145	0.413**	-0.534***
	(0.150)	(0.164)	(0.242)	(0.174)	(0.182)
Control Mean	-0.000	-0.000	-0.000	-0.000	-0.000
R^2	0.167	0.163	0.157	0.165	0.160
N	1041	1043	1043	1043	1043

Note: The outcome variable in all specifications is the sales and profits index. The independent variable for each column is denoted in the column name. All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. We also include as controls, top collaboration choices, collaboration language preference, interest in collaborating with the same or different sector, and firm sector, as well as all the pairwise interactions. Clustered standard errors at the WhatsApp group level. Sample restricted to only treated firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table H.4: Peer Effects on Monthly Profits (Allowing for Differential Effects Across Treatments)

	(1) Share of Peers with College Degrees	(2) Peers' Average Baseline Business Practice Index	(3) Peers' Average Baseline Sales and Profits Index	(4) Share of Peers from Same Industry	(5) Industry Diversity Index
Networking and Legal	108.5	93.35	110.7	197.7	-58.85
	(142.6)	(114.4)	(115.8)	(156.6)	(273.7)
Peer Characteristics	379.6*	352.1*	-44.68	-504.7	341.8
	(193.7)	(180.8)	(192.0)	(327.1)	(392.3)
Peer Characteristics × Networking and Legal	51.03	-99.21	89.88	-417.2	226.4
	(287.0)	(371.6)	(439.0)	(296.1)	(402.3)
Control Mean	1295.973	1295.973	1295.973	1295.973	1295.973
R^2	0.210	0.209	0.206	0.211	0.207
N	989	991	991	991	991

Note: The outcome variable in all specifications is winsorized monthly profits. The independent variable for each column is denoted in the column name. All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. We also include as controls, top collaboration choices, collaboration language preference, interest in collaborating with the same or different sector, and firm sector, as well as all the pairwise interactions. Clustered standard errors at the WhatsApp group level. Sample restricted to only treated firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table H.5: Peer Effects by Baseline Predicted Collaboration Index

	(1) Any Collaborations	(2) Any Changes to Business (Past 6 Months)	(3) Business Practice Index	(4) Sales and Profits Index	(5) Monthly Profits Winsorized
Networking and Legal	-0.0167	0.0732	0.243	-0.233	-449.3
	(0.0606)	(0.131)	(0.223)	(0.209)	(357.9)
Average Predicted Collaboration Index of Peers	0.0745	0.191	0.777*	0.226	475.3
	(0.122)	(0.209)	(0.465)	(0.438)	(630.1)
Networking and Legal × Average Predicted Collaboration Index of Peers	-0.0871	-0.221	-0.423	0.775	1476.3
	(0.157)	(0.344)	(0.600)	(0.580)	(996.8)
Control Mean	0.134	0.286	-0.000	0.000	1295.973
R^2	0.098	0.079	0.156	0.235	0.211
N	1045	1043	1043	1150	991

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. We include as controls: top collaboration choices, collaboration language preference, interest in collaborating with the same or different sector, and firm sector, as well as all the pairwise interactions. Clustered standard errors at the WhatsApp group level. Sample restricted to only treated firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

I Complementarities Analysis

We implement a skill-complementarity analysis by creating a measure that captures the number of potential complementarity connections based on the assigned WhatsApp groups, following Dimitriadis and Koning (2022). During the baseline survey, we asked participants which potential topics they would be most interested in discussing in their networking meetings. Using this information, we construct a dyadic measure of skill complementarity, which indicates whether a focal participant is connected to someone with expertise in their area of interest. To define complementary matches, we classify participants as "experts" in specific topics if they rank in the top 25th percentile in relevant baseline measures. For each topic, the criteria for expertise are defined as follows:

- **Hiring and retaining employees:** Participants in the top 25th percentile by the number of employees at baseline.
- **Finding/negotiating with suppliers:** Participants in the top 25th percentile of the baseline buying and stock control business practice index.
- **Relationships with clients:** Participants in the top 25th percentile by the baseline number of business clients.
- **Pricing strategy:** Participants in the top 25th percentile of the baseline marketing index.
- **Exports:** Participants who were already exporting at baseline.
- **Financing:** Participants in the top 25th percentile of the business financing index.
- **Marketing:** Participants in the top 25th percentile of the baseline marketing index.
- **Innovation:** Participants in the top 25th percentile of the baseline innovation index.
- **Business law-related topics (e.g., government policies, taxation, registration):** Participants in the top 25th percentile of the business formalization index.

J Midline Results

In this section, we present the results for the midline survey, conducted approximately three-month after the end of the intervention. We find evidence that in the very short-term, there was a decline in business innovation, business financing, and capital and labor usage—potentially due to greater time and attention spent on networking activities during the intervention. There are limited impacts on sales and profits, business practices, and the likelihood of the business to be in operation. There is a decline in collaboration but the networking arm appears to have increased steps towards collaboration.

Table J.1: Effect of Online Networking Groups on Firm Performance (3-Months Post Intervention)

	(1) Business Innovation Index	(2) Sales and Profits Index
Networking	-0.360***	-0.105
	(0.0573)	(0.0638)
Networking and Legal	-0.370***	-0.0575
	(0.0579)	(0.0588)
Control Mean	-0.000	0.000
T1 = T2 (p-value)	0.824	0.398
R^2	0.134	0.107
N	1520	1557

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. Robust standard errors reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table J.2: Effect of Online Networking Groups on Additional Firm Outcomes (3-Month Post Intervention)

	(1) Business Practice Index	(2) Business Financing Index	(3) Capital and Labor Index	(4) In Operation
Networking	-0.0313	-0.195***	-0.181***	-0.0156
	(0.0590)	(0.0655)	(0.0556)	(0.00991)
Networking and Legal	0.0259	-0.273***	-0.197***	-0.0164
	(0.0597)	(0.0562)	(0.0552)	(0.0104)
Control Mean	-0.000	-0.000	0.000	0.982
T1 = T2 (p-value)	0.261	0.074	0.699	0.942
R^2	0.171	0.104	0.153	0.040
N	1520	1520	1558	1558

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. Robust standard errors reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table J.3: Effect of Online Networking Groups on Business Collaboration (3-Month Post Intervention)

	(1) Any Collaboration	(2) Number of Collaborations	(3) Steps Towards Collaboration Index
Networking	-0.0512**	-0.240**	0.224***
	(0.0211)	(0.117)	(0.0653)
Networking and Legal	-0.0703***	-0.371***	-0.0423
	(0.0210)	(0.111)	(0.0659)
Control Mean	0.144	0.596	-0.000
T1 = T2 (p-value)	0.245	0.087	0.000
R^2	0.071	0.056	0.071
N	1506	1506	1506

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. Robust standard errors reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.