PEDL Research Papers

This research was partly or entirely supported by funding from the research initiative Private Enterprise Development in Low-Income Countries (PEDL), a Foreign, Commonwealth & Development Office (FCDO) funded programme run by the Centre for Economic Policy Research (CEPR).

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Female Entrepreneurship and Professional Networks *

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April 12, 2023

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 21%. The increase in profits is concentrated in the upper tail of the distribution. The treatment shifts business collaborations from friends and family members to business network members in the intervention. We find the largest effects for those in groups with more-educated, higher-quality, and more diverse entrepreneurs. Our findings reveal that a low-cost, light-touch online intervention that increases networking opportunities can effectively improve outcomes of female-owned firms.

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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 and women's businesses earn 34% lower profits than male-owned ones. Identifying the constraints faced by female entrepreneurs is vital for fostering economic growth. Recent studies have shown that interfirm relationships and access to professional networks can be important determinants of business success (Ashraf et al., 2019; Kanter, 1994; Cai and Szeidl, 2017). Building business networks and forming collaborations can help firms adopt new business practices, expand market reach, innovate, and gain new customers (Kanter, 1994; Cai and Szeidl, 2017). However, because female entrepreneurs tend to have smaller networks and are less connected to other firms (World Bank Group, 2019), they are more likely to rely on their friends and family members and have less access to high-quality entrepreneurs with whom to network. As a result, increasing networking opportunities among female entrepreneurs may help firms grow. However, past interventions that aim at expanding business networks mainly considered male entrepreneurs (Cai and Szeidl, 2017). It remains an open question how creating interfirm relationships can contribute to the growth of female-owned businesses.

In this paper, we study how access to online networking opportunities affect firm performance 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 aim to invest in high-growth and sustainable firms.[1] It is important to note that while most of the firms in our sample are small microenterprises, they are more growth-oriented than the typical small firm due to the application process.[2] Over 30% of the women in our sample hold college degrees and 80% of the firms are registered.

We randomly assigned the 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. We also provide a directory of all entrepreneurs in the treatment group with their contact information. The aim of this treatment is to expand the business networks of participants and increase their opportunities

[1] Our partner NGOs are Women's Empowerment Investment Group (WEIG), Annan Capital Partners (ACP), and GUBA Foundation.

[2] Average number of employees is 3.54 and half of the sample has no employees.

for business collaborations. 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.

The intervention was implemented between February and June of 2021. Post-intervention midline survey was conducted between August and October 2021 and a one-year follow-up survey was conducted between April to July 2022. Qualitative interviews will be conducted in March 2023 to identify mechanisms. A longer-run follow-up survey is planned for April to July 2024.

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 25 to 31%, 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 21% increase in business profits. Similar to previous work on business training (Dalton et al., 2018), 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 in networking constraints drives our results and that legal support does not appear to have additional influence on business outcomes.

In the last 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, or get-ahead attitudes. We also do not find positive impacts on female em-

powerment. 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. While we do not observe a change in the likelihood of collaborating, we find 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.

Second, we show that peer effects 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 a larger share of peers from the same industry are less likely to improve. This suggests that networking with high-quality entrepreneurs with diverse experiences can accelerate firm growth and innovation. In ongoing work, we will conduct qualitative interviews to explore these mechanisms further.

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. Importantly, our findings reveal that a low-cost, light-touch online intervention can effectively improve firm outcomes.

This paper contributes to the literature in three ways. First, our research builds on a growing literature on the role of interfirm relationships and business collaborations for firm outcomes (Cai and Szeidl, 2017; Fafchamps and Quinn, 2016). While a closely related paper by Cai and Szeidl (2017) shows that randomly assigning owner-managers to small-group, *in-person* meetings can improve firm outcomes, we are the first to document that *online* networking can also lead to positive impacts on innovation, business practices, and profits. We provide new evidence that WhatsApp networking groups can be a cost-effective measure to connect entrepreneurs from different regions and backgrounds. In addition, unlike Cai and Szeidl (2017), which focuses on male managers of larger small and medium enterprises, our sample consists of female entrepreneurs of microenterprises. For this population of entrepreneurs, there is very limited evidence on how networks and peer support can support

the growth of their businesses. In particular, the literature has thus far focused on mentorship (Brooks et al., 2018; McKenzie and Puerto, 2020; Valdivia, 2015) or business training 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 a cost-effective online networking intervention which targets high-growth potential female entrepreneurs.

Second, our research contributes to our understanding of the potential barriers faced by female entrepreneurs of potentially high-growth firms in developing countries. Prior 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). However, the literature has focused primarily on informal, subsistence microenterprises. In comparison, our sample consists of a selected group of female-owned enterprises that are more growth-oriented. 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.

Finally, our paper speaks to the literature on the relevance of legal knowledge as well as legal environment and law enforcement on economic activities. Bertrand and Crépon (2021) show that providing information to small and medium firms about topics regarding hiring regulations has a positive effect on average employment levels in South Africa. Ashraf et al. (2019) show that in environments with little rule-of-law and unequal bargaining power, female entrepreneurs collaborate less, learn less from fellow entrepreneurs and earn less. However, these gender differences are mitigated when women have access to adjudicating institutions. We contribute to this literature by exploring how legal knowledge about business collaboration and legal advisory services can affect interfirm collaboration and business outcomes.

The paper is organized in the following way. Section 2 describes the treatment, the sample as well as the data collection process. 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). In Section 6, we investigate potential underlying mechanisms driving our results. Finally, Section 7 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 Q, we present the course syllabus. Finally, 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 "Ser-

vices"), 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 A45, we present the fifteen most important predictors of collaborations selected by the random forest.[3] 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.[4]

2.1.2 Assignment to WhatsApp Groups

As part of the intervention, we assign individuals into WhatsApp groups of 8 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[5]) and five broad sector group (crop and animal, manufacturing, trade, services, and mixed sector).[6] Then, in the second stage of the assignment, individuals are randomly selected to be placed into groups of 8 within their group type. 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.

[3]More details on the machine learning prediction are provided in Appendix Section S.

[4]Note that the collaboration definition we used during the baseline survey ultimately differs from the final definition we adopted in the endline survey. This is because we learned some entrepreneurs included one-off, spot market transactions. To standardize the definition of collaboration across individuals, during the endline 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 endline survey.

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

[6]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 R.

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%.[7] 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.[8] Average monthly sales is over two times higher than the average female-owned firm in Ghana.[9] 80% of the sample has registered their business.

Majority of firms are in the manufacturing sector, followed by retail trade. Figure 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 A1, 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, prob-

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

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

[9] 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.

ability 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. The response rate was 88.0% (86.8% for treatment 1, 88.8% for treatment 2, and 88.7% for control). In Appendix Table A3, 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 endline 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 (Appendix Table A3). In March 2023, we plan to conduct qualitative interviews. Then in April 2023, the long-run three-year follow-up survey will be rolled out.

2.4 Program Take-Up

Table A4 reports the statistics on the take-up of the intervention. Of the entrepreneurs assigned to the online networking groups, 84% in the networking treatment and 80% the in networking and legal treatment were successfully added to the WhatsApp groups.[10] Table A4 shows that there is no significant difference between the two treatment groups in the probability of contacting another WhatsApp group member. However, entrepreneurs in the networking only group contacted more WhatsApp members on average (1.78 versus 1.54) and more frequently. In particular, they are more likely to contact another member of the WhatsApp group daily (1% versus 0%) or once a week (36% versus 29%) and less likely to never contact them (34% versus 40%). Moreover, entrepreneurs in the networking only group

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

are more likely to contact other entrepreneurs in the study using the online business directory (12% versus 7%) and asking for assistance from one of our enumerators (27% versus 13%). For the entrepreneurs assigned to the networking and legal arm, they on average watched 30%, or 4 of the 12 videos we distributed.

We also document that connections formed during the intervention have persisted. At midline, which corresponds to three to four months after the conclusion of the intervention, around 25% of Treatment 1 and 22% of Treatment 2 were still in touch with WhatsApp group members. These numbers remain similar in magnitude one year after the intervention.

3 Empirical Strategy

3.1 Estimation Methodology

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

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

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, and $\hat{f}(X)$ is the ML index that predicts Y from controls (Ludwig et al., 2019; Wager et al., 2016; Bloniarz et al., 2016; Wu and Gagnon-Bartsch, 2018).[11] Standard errors are clustered at the WhatsApp group level. Because each participant in the treatment groups is assigned to two different groups, we use two-way clustering and for the control group, standard errors are clustered at the individual level following the methodology in Cai and Szeidl (2017).

3.2 Outcomes

The key outcomes of interest are firm innovation, business practices, and firm performance. We also analyzed outcomes on (i) number of collaborations, (ii) steps towards collaboration index, and (iii) joint application for business innovation competition. We measure total

[11] More details on the machine learning prediction are provided in Appendix Section S.

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
- 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 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 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.

To measure intermediate steps towards collaboration, we construct the Steps towards Collaboration Index using 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,[12] contacted a specific firm with a proposal to collaborate, having multiple conversations oriented towards a collaboration, or started a collaboration.

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

[12]For the treatment group, this includes speaking with enumerators with specific requests for collaborators

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 practices, business ambition, attitudes, entrepreneurial self-efficacy, and female empowerment. Appendix T presents the full list of outcomes and how they were measured. Unless otherwise denoted, we will focus on results from our endline survey, conducted one year after the intervention.

Multiple Test Correction

Because in our study we consider multiple primary outcomes, we will adjust for multiple hypothesis testing to minimize the false non-discovery rate (FNR) following Benjamini and Hochberg (1995) and Anderson (2008). Sharpened q-values will be presented by each outcome grouping.

3.2.1 Index Construction

For some of our outcome variables, we group several related variables into index variables. We construct the indices 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.

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 3 shows that business innovation significantly increased for both treatment groups. During the midline survey, we noticed potential misreporting of business innovation, because the pre-specified innovation questions were a series of Yes/No questions. To prevent

manipulation, in the endline survey, we asked an open-ended question on whether the business made any changes to the business and had the respondent describe the change to the enumerator (Column 2). We report the results for the pre-specified business innovation index in Column (2) and in Table K and find very similar results.

Online networking groups led to an increase in the likelihood of introducing changes to their businesses by 31% (=.0829/.267) for Treatment 1 and 25% (=.0661/.267) for Treatment 2. Appendix Section J shows that innovation increased across nearly all areas. The treated firms were more likely to have introduced new or improved products, new ways of marketing, as well as building connections with other entrepreneurs. 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.

4.2 Effects on Business Practices

Table 4 reports the effects of the intervention on the overall business practice index as well as indices for the four underlying domains: marketing, buying and stock control, record-keeping, and financial planning. We find that the overall business practice index increased by .1 to .19 standard deviations for the two treatment arms relative to the control group. The difference between the two groups is not statistically significant. This improvement in business practices is driven by positive effects for marketing and financial planning. In Appendix Section L, we decompose the individual indices into their individual components. The intervention improved marketing practices by increasing firms' use of advertisement and special offers. 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 5 Column (1), we find null effects in the overall sales and profits index. However, when we decompose the index to its sales (Table 5) and profits (Table 6) components, we find positive impacts on profits for the treated firms, but null effects on sales. This suggests that the intervention led to efficiency gains through a reduction in costs. Monthly profits increased by around 265 cedis, or 21% (=265/1225.85) for both treatment arms. Similar results hold for winsorized monthly

profits but we do not find an increase in the inverse hyperbolic sine of profits, suggesting that the increase in profits comes from the right-tail of the distribution. 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. (2018). 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 3 plots the kernel density plots for baseline and endline monthly profits 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 4, which plots the coefficients from estimating quantile regressions. The figures show a significant increase in profits above the 60th percentile for both treatment groups.

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 A12 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 A13. We also do not find a differential effect for firm survival (Table A14).

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.

Although understanding the reasons behind a change in labor supply is beyond the scope of this paper, we can provide some evidence of the effect of our interventions on the time allocation of our sample. Table 7 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.

6 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.

6.1 Effects on 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 composition 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.

6.1.1 Formation of Collaborations

We first investigate whether the treatment affected the formation of interfirm collaborations in Table 8. 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 Appendix C, 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 Appendix Table A18, 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. As a result, one year post intervention may not be enough time to observe effects on this outcome. We will explore this possibility in future data collection.

6.1.2 Collaborator Types

In Table 9, 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 Appendix Table A5, we conduct a mediation analysis to show that the change in collaborators fully explains the overall effect on collaborations.[13]

[13]In Appendix Section D, we explore whether quality of collaboration improved as a result of the shift in

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. Appendix Table A6 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.

6.2 Peer Effects

We next explore the role of group composition in explaining our results. In particular, we will focus on two group dimensions: quality and diversity. First, interactions with higher-quality entrepreneurs may lead to information transmission and knowledge transfers that can improve business outcomes. Second, forming connections with a diverse group of entrepreneurs from different backgrounds may expose individuals to new ideas.

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

$$\begin{aligned} Y_{i,t=1} = \alpha_0 + \alpha_1 T2 + \alpha_2 \overline{X}_{-i,t=0} + \alpha_3 \overline{X}_{-i,t=0} \times T2 \\ + \pi Y_{i,t=0} + \delta M_{i,t=0} + S_i'\gamma + \tau \hat{f}(X) + K_i'\phi + \epsilon_{i,t=1} \end{aligned} \tag{2}$$

where $\overline{X}_{-i,t=0}$ is the average characteristic of the peers of i.[14] 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.[15] In the first set of controls, Group Assignment Controls I, we include top collaboration choices, collaboration language preference, interest in collaborating with the same or different sector, and firm sector. In the second set, or Group

collaborators. However, due to the small number of collaborations, these results are noisy and imprecise.

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

[15]See group assignment details in Section 2.1.2.

Assignment Controls II, we also include all pairwise interactions. 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.

First, we use equation 2 to investigate how innovation, business practices, sales and profits depend on the share of high-quality peers. 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. In Tables 10 and 11, we show that having a greater share of high-educated peers improves business practices for those in the treatment group. Moreover, we find in Tables 12 and 13 that having peers with better business practices led to positive impacts on innovation, business practices and monthly profits. Similarly, in Tables 14 and 15, we find more innovation and business practice improvements among those with peers who have higher sales and profits at baseline. Together these results suggest that exposure to higher-quality peers play a key role in explaining the positive impacts on firm outcomes we observe.

Second, we explore how diversity of the network members matters for our outcomes. Specifically, we study how the share of peers from the same industry background affects business outcomes. In ongoing work, we will analyze how these results also depend on the ethnic diversity of the peer groups. Tables 16 and 17 show that female entrepreneurs with more peers from the same industry are less likely to improve their business practices. We also find suggestive negative impacts on innovation and sales and profits. These results highlight that networking with entrepreneurs with diverse industry backgrounds can be critical for business growth. Importantly, 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.

6.3 Alternative Mechanisms: Ambitions, Business Self-Efficacy, and Female Empowerment

In this section, we rule out alternative mechanisms that may drive our results. In Table 18, 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.[16]

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 18 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 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 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

[16]These metrics are standardized indices of the sets of variables listed in Appendix Section T.3.4.

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 25 to 31% more likely to have introduced new changes to their businesses and improve their business practices. Firm profits increased significantly by 21%.

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.

Together, our results highlight that access to networking opportunities can have large benefits for growth-oriented female-owned enterprises. Importantly, our findings reveal that a low-cost, light-touch online intervention can effectively improve firm outcomes.

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8 Figures

Figure 1: Industry Distribution

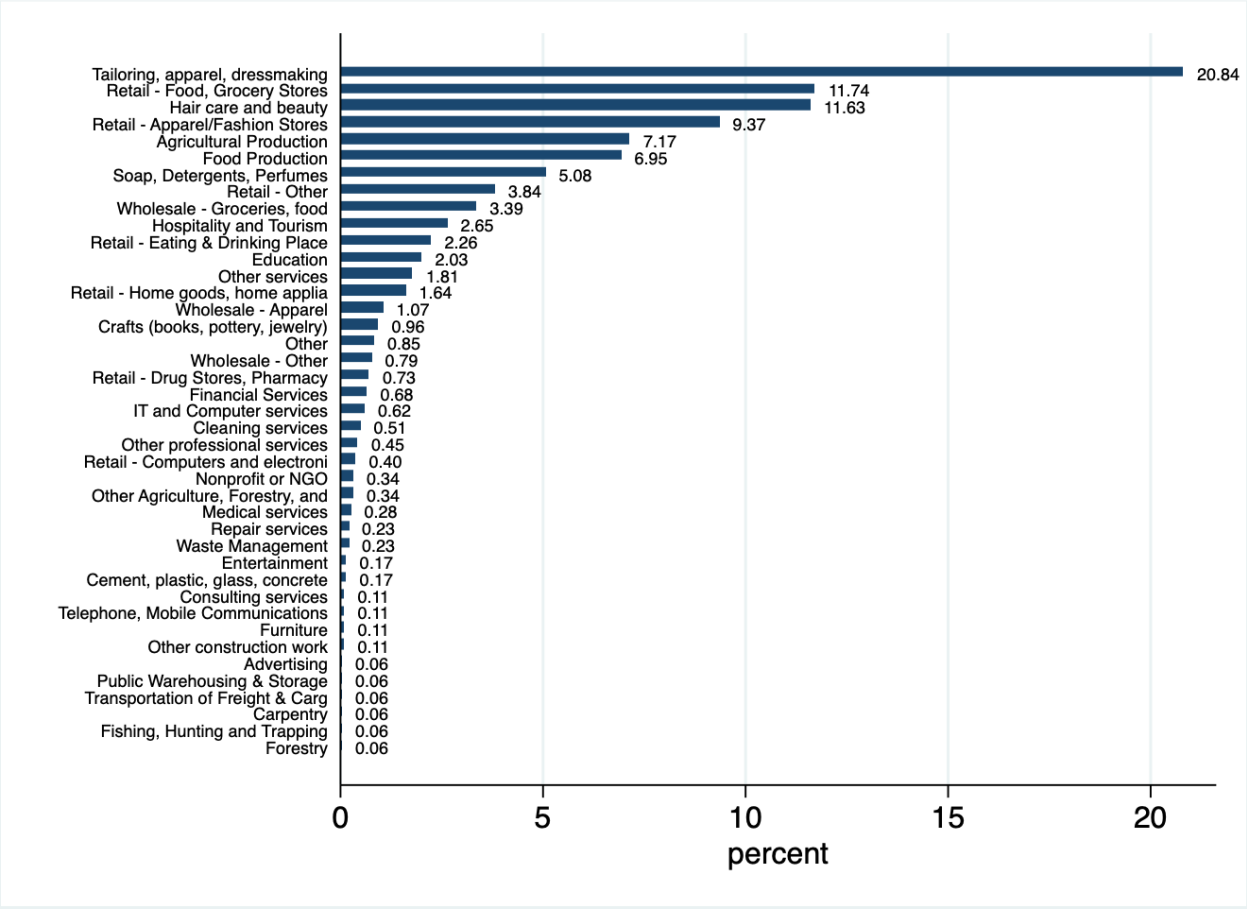


Figure 2: Types of Collaborators (Conditioned on Collaborating)

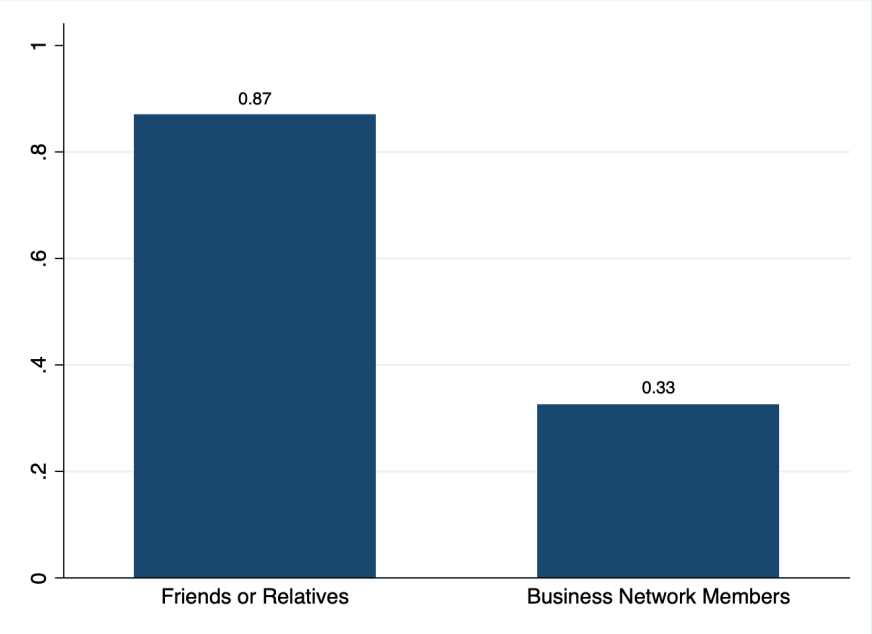
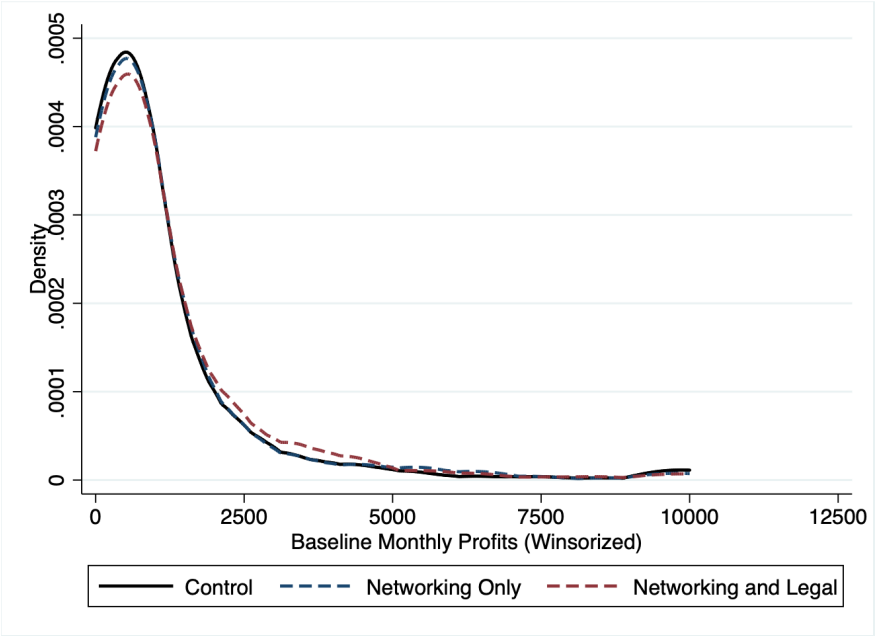


Figure 3: Kernel Density of Winsorized Monthly Profits

(a) Baseline



(b) Endline

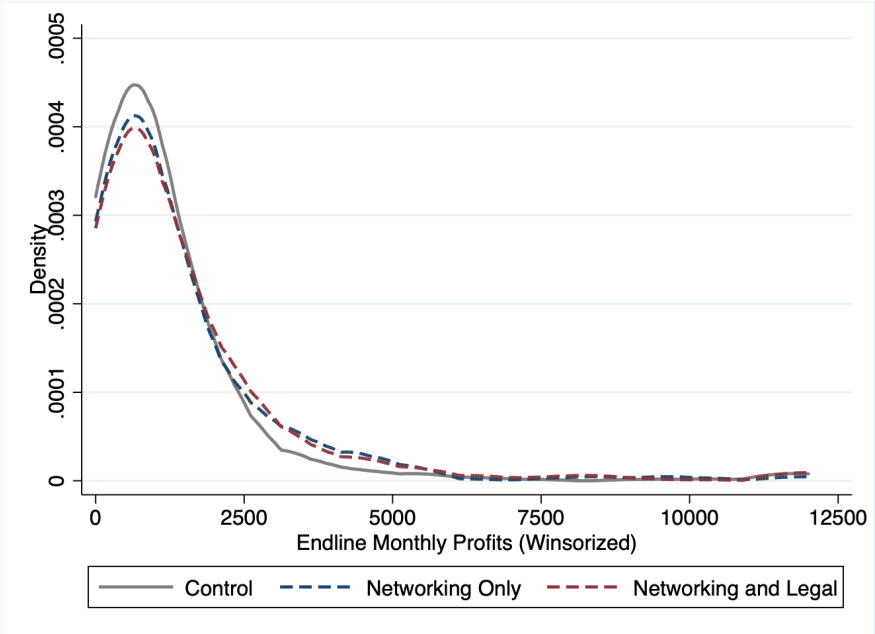
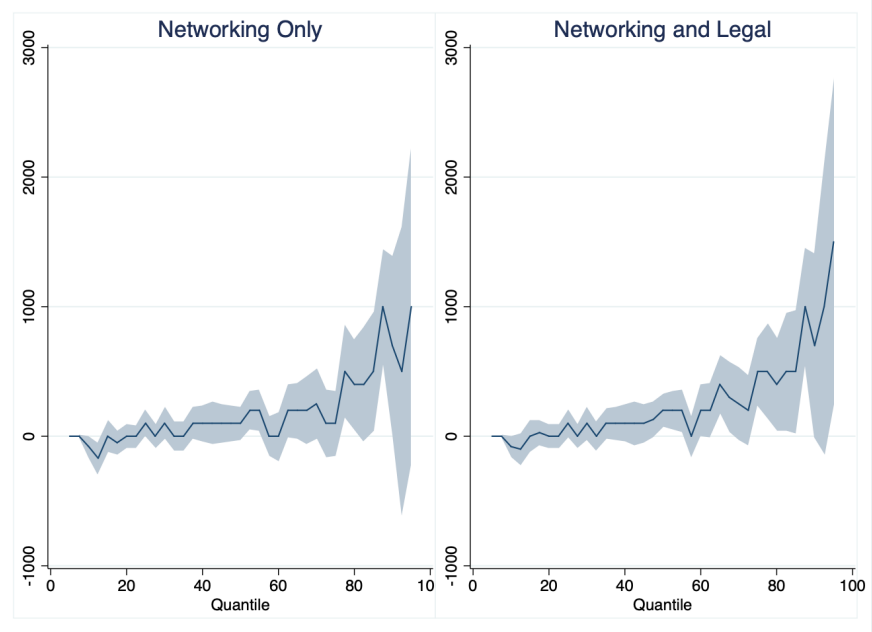


Figure 4: Quantile Effects on Monthly Profits (Winsorized)



9 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: Business Collaborations Summary Statistics

	Mean	SD
Any Collaboration	0.13	(0.34)
Types of Collaborations (if Collaborating):		
Joint Marketing	0.59	(0.50)
Supplier/Client	0.46	(0.50)
Purchase Inputs Together	0.15	(0.36)
Share Tools, Inputs, Equipment, Workers	0.11	(0.31)
Fill Larger Order Together	0.30	(0.47)
Operate Business Together	0.07	(0.25)
Other	0.07	(0.25)
Observations	343	

Table 3: Effect of Online Networking Groups on Firm Innovation

	(1) Any Changes to Business (Past 6 Months)	(2) Business Innovation Index
Networking	0.0829***	0.159**
	(0.0296)	(0.0673)
Networking and Legal	0.0661**	0.145*
	(0.0333)	(0.0795)
Control Mean	0.267	0.000
T1 = T2 (p-value)	0.585	0.849
R^2	0.034	0.045
N	1520	1520

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 4: Effect of Online Networking Groups on Business Practice Index

	(1) Business Practice Index	(2) Marketing Index	(3) Buying and Stock Control Index	(4) Record-Keeping Index	(5) Financial Planning Index
Networking	0.104	0.119*	-0.00221	-0.0477	0.323***
	(0.0769)	(0.0698)	(0.0723)	(0.0742)	(0.0778)
Networking and Legal	0.194***	0.117*	-0.0575	0.0597	0.496***
	(0.0698)	(0.0685)	(0.0668)	(0.0670)	(0.0780)
Control Mean	-0.000	-0.000	0.000	0.000	0.000
T1 = T2 (p-value)	0.193	0.984	0.349	0.102	0.021
R^2	0.076	0.042	0.043	0.082	0.086
N	1371	1371	1371	1370	1370

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 5: Effect of Online Networking Groups on Sales

	(1) Sales and Profits Index	(2) Monthly Sales	(3) Monthly Sales Winsorized	(4) Inverse Hyperbolic Sine of Monthly Sales	(5) Weekly Customers
Networking	0.0162	-55.82	66.56	-0.156	-6.930**
	(0.0668)	(567.4)	(372.2)	(0.186)	(2.937)
Networking and Legal	0.0715	441.2	662.3	-0.108	-4.040
	(0.0722)	(687.8)	(409.4)	(0.198)	(3.200)
Control Mean	0.000	3858.342	3482.297	7.595	25.646
T1 = T2 (p-value)	0.437	0.402	0.139	0.792	0.213
R^2	0.123	0.153	0.088	0.045	0.066
N	1520	1457	1457	1457	1520

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 6: 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	266.1*	162.8	-0.110	272.7	111.0
	(146.6)	(107.7)	(0.163)	(254.3)	(177.6)
Networking and Legal	264.1*	245.4**	-0.0627	299.1	349.2*
	(147.0)	(118.9)	(0.174)	(237.8)	(190.2)
Control Mean	1225.852	1200.712	6.745	2296.877	2214.113
T1 = T2 (p-value)	0.990	0.452	0.768	0.921	0.191
R^2	0.159	0.123	0.048	0.159	0.108
N	1459	1459	1459	1432	1432

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 7: 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	2.275*	0.411	0.377
	(1.165)	(0.786)	(1.007)
Networking and Legal	2.878**	0.157	-0.386
	(1.166)	(0.718)	(1.152)
Control Mean	44.921	2.778	22.332
T1 = T2 (p-value)	0.586	0.730	0.440
R^2	0.077	0.048	0.067
N	1389	1389	1389

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 8: 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
	(0.0769)	(0.0228)	(0.269)	(0.00703)
Networking and Legal	0.233***	-0.0695***	-0.533**	0.00276
	(0.0744)	(0.0212)	(0.210)	(0.00741)
Control Mean	0.000	0.134	0.781	0.011
T1 = T2 (p-value)	0.239	0.002	0.061	0.903
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. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 9: 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***
	(0.0204)	(0.0138)	(0.00466)
Networking and Legal	-0.0708***	-0.0266**	0.00604*
	(0.0198)	(0.0124)	(0.00365)
Control Mean	0.117	0.044	0.000
T1 = T2 (p-value)	0.014	0.073	0.156
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. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 10: Peer Effect on Innovation and Business Practice (by Share of Peers with College Degree)

	Any Changes to Business (Past 6 Months)		Business Practice Index	
	(1) Group Assignment Controls I	(2) Group Assignment Controls II	(3) Group Assignment Controls I	(4) Group Assignment Controls II
Share of Peers with College Degree	0.0743	0.0683	0.399***	0.407***
	(0.0501)	(0.0531)	(0.103)	(0.114)
Control Mean	0.267	0.267	-0.000	-0.000
R^2	0.051	0.079	0.151	0.172
N	1151	1151	1032	1032

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. In Group Assignment Controls I, we include top collaboration choices, collaboration language preference, interest in collaborating with the same or different sector, and firm sector. In Group Assignment Controls II, we also include all the pairwise interactions. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 11: Peer Effect on Sales and Profits (by Share of Peers with College Degree)

	Sales and Profits Index		Monthly Profits Winsorized	
	(1) Group Assignment Controls I	(2) Group Assignment Controls II	(3) Group Assignment Controls I	(4) Group Assignment Controls II
Share of Peers with College Degree	0.0616	0.0181	159.5	82.02
	(0.117)	(0.112)	(193.6)	(187.4)
Control Mean	0.000	0.000	1200.712	1200.712
R^2	0.146	0.205	0.143	0.195
N	1151	1151	1099	1099

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. In Group Assignment Controls I, we include top collaboration choices, collaboration language preference, interest in collaborating with the same or different sector, and firm sector. In Group Assignment Controls II, we also include all the pairwise interactions. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 12: Peer Effect on Innovation and Business Practice (by Average Business Practice Index of Peers)

	Any Changes to Business (Past 6 Months)		Business Practice Index	
	(1) Group Assignment Controls I	(2) Group Assignment Controls II	(3) Group Assignment Controls I	(4) Group Assignment Controls II
Average Business Practice Index of Peers	0.106**	0.117**	0.315***	0.339***
	(0.0459)	(0.0501)	(0.108)	(0.114)
Control Mean	0.267	0.267	-0.000	-0.000
R^2	0.054	0.083	0.146	0.169
N	1153	1153	1034	1034

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. In Group Assignment Controls I, we include top collaboration choices, collaboration language preference, interest in collaborating with the same or different sector, and firm sector. In Group Assignment Controls II, we also include all the pairwise interactions. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 13: Peer Effect on Sales and Profits (by Average Business Practice Index of Peers)

	Sales and Profits Index		Monthly Profits Winsorized	
	(1) Group Assignment Controls I	(2) Group Assignment Controls II	(3) Group Assignment Controls I	(4) Group Assignment Controls II
Average Business Practice Index of Peers	0.0929	0.134	281.5*	311.4**
	(0.0961)	(0.0969)	(151.6)	(156.3)
Control Mean	0.000	0.000	1200.712	1200.712
R^2	0.146	0.206	0.145	0.198
N	1153	1153	1101	1101

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. In Group Assignment Controls I, we include top collaboration choices, collaboration language preference, interest in collaborating with the same or different sector, and firm sector. In Group Assignment Controls II, we also include all the pairwise interactions. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 14: Peer Effect on Innovation and Business Practice (by Average Sales and Profits Index of Peers)

	Any Changes to Business (Past 6 Months)		Business Practice Index	
	(1) Group Assignment Controls I	(2) Group Assignment Controls II	(3) Group Assignment Controls I	(4) Group Assignment Controls II
Average Sales and Profits Index of Peers	0.135**	0.134**	0.249**	0.238**
	(0.0562)	(0.0555)	(0.117)	(0.115)
Control Mean	0.267	0.267	-0.000	-0.000
R^2	0.054	0.082	0.142	0.163
N	1153	1153	1034	1034

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. In Group Assignment Controls I, we include top collaboration choices, collaboration language preference, interest in collaborating with the same or different sector, and firm sector. In Group Assignment Controls II, we also include all the pairwise interactions. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 15: Peer Effect on Sales and Profits (by Average Sales and Profits Index of Peers)

	Sales and Profits Index		Monthly Profits Winsorized	
	(1) Group Assignment Controls I	(2) Group Assignment Controls II	(3) Group Assignment Controls I	(4) Group Assignment Controls II
Average Sales and Profits Index of Peers	-0.0599	-0.0690	-5.098	-42.75
	(0.103)	(0.101)	(172.9)	(168.5)
Control Mean	0.000	0.000	1200.712	1200.712
R^2	0.146	0.205	0.143	0.195
N	1153	1153	1101	1101

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. In Group Assignment Controls I, we include top collaboration choices, collaboration language preference, interest in collaborating with the same or different sector, and firm sector. In Group Assignment Controls II, we also include all the pairwise interactions. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 16: Peer Effect on Innovation Index (by Share of Peers from Same Industry)

	Any Changes to Business (Past 6 Months)		Business Practice Index	
	(1) Group Assignment Controls I	(2) Group Assignment Controls II	(3) Group Assignment Controls I	(4) Group Assignment Controls II
Share of Peers from Same Industry	-0.126**	-0.0991	-0.454***	-0.587***
	(0.0635)	(0.0763)	(0.161)	(0.179)
Control Mean	0.267	0.267	-0.000	-0.000
R^2	0.052	0.078	0.145	0.169
N	1153	1153	1034	1034

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 17: Peer Effect on Sales and Profits Index (by Share of Peers from Same Industry)

	Sales and Profits Index		Monthly Profits Winsorized	
	(1) Group Assignment Controls I	(2) Group Assignment Controls II	(3) Group Assignment Controls I	(4) Group Assignment Controls II
Share of Peers from Same Industry	-0.293*	-0.257	-400.6	-364.6
	(0.160)	(0.199)	(244.1)	(292.5)
Control Mean	0.000	0.000	1200.712	1200.712
R^2	0.148	0.207	0.145	0.196
N	1153	1153	1101	1101

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 18: Effect of Online Networking Groups on Attitudes

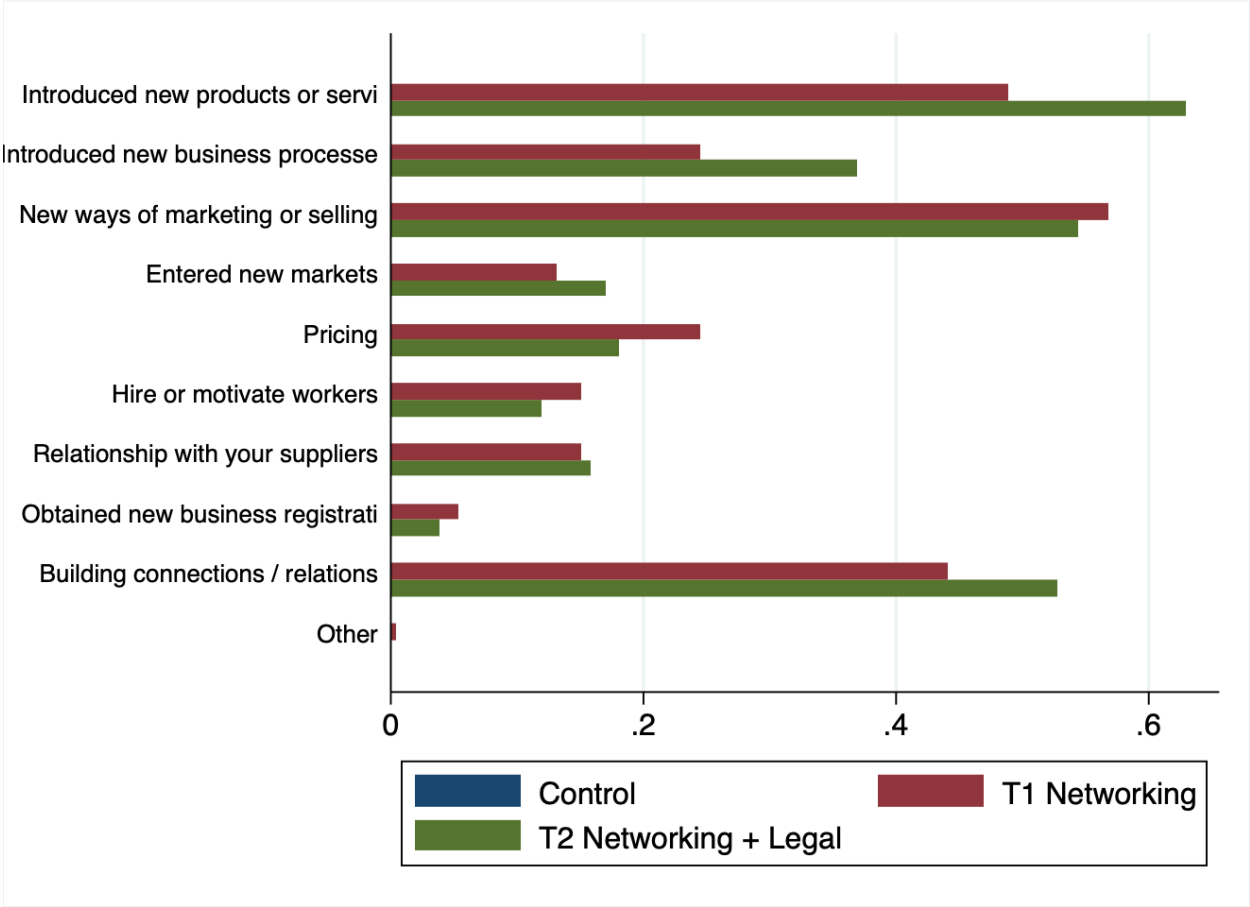
	(1) Business Expectations Index	(2) Entrepreneurial Self-Efficacy Index	(3) Get-Ahead Attitude Index	(4) Female Empowerment Index
Networking	0.552	0.0637	-0.0251	-0.0346
	(0.592)	(0.0723)	(0.0656)	(0.0643)
Networking and Legal	-0.145	0.0488	0.0291	0.0164
	(0.162)	(0.0777)	(0.0651)	(0.0652)
Control Mean	0.000	0.000	-0.000	0.000
T1 = T2 (p-value)	0.192	0.836	0.307	0.317
R^2	0.057	0.032	0.038	0.071
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. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Appendix

A Additional Figures

Figure A1: Changes to Business as Result of Treatment



B Additional Tables

Table A1: Balance Checks

	Controls	Treatment 1	Treatment 2	C - T1	T1 - T2
Owner's Age	36.62	37.01	36.61	-0.39	0.40
	(9.37)	(9.32)	(9.22)	(0.49)	(0.43)
Firm Age	7.19	7.67	7.41	-0.49	0.27
	(6.59)	(7.19)	(6.73)	(0.25)	(0.48)
Education					
Less than JHS	0.07	0.08	0.07	-0.01	0.01
	(0.26)	(0.45)	(0.46)	(0.81)	(0.82)
JHS Degree	0.29	0.28	0.32	0.01	-0.04
	(0.46)	(0.58)	(0.60)	(0.74)	(0.25)
HS Degree	0.23	0.18	0.19	0.05	-0.00
	(0.42)	(0.53)	(0.54)	(0.11)	(0.95)
College Degree	0.40	0.40	0.37	-0.00	0.04
	(0.49)	(0.61)	(0.61)	(0.97)	(0.24)
Married	0.55	0.57	0.56	-0.02	0.01
	(0.50)	(0.50)	(0.50)	(0.52)	(0.69)
Women-Only Firm	0.93	0.94	0.94	-0.01	0.01
	(0.25)	(0.23)	(0.25)	(0.51)	(0.54)
Number of Children	2.06	2.11	2.12	-0.05	-0.01
	(1.76)	(1.67)	(1.86)	(0.60)	(0.91)
Any Child Under 18?	0.64	0.66	0.68	-0.02	-0.02
	(0.48)	(0.47)	(0.47)	(0.48)	(0.54)
Predicted Collaboration	0.40	0.37	0.38	0.03	-0.00
	(0.30)	(0.30)	(0.30)	(0.17)	(0.78)
Total Employees	3.83	3.63	3.25	0.20	0.37
	(8.08)	(6.18)	(4.42)	(0.64)	(0.21)
Monthly Sales (USD)	894.46	820.45	850.53	74.01	-30.08
	(1869.85)	(1640.01)	(1541.93)	(0.49)	(0.73)
Monthly Profits (USD)	212.35	214.59	232.00	-2.24	-17.41
	(332.28)	(318.86)	(325.64)	(0.91)	(0.33)
Sector					
Agriculture	0.08	0.08	0.07	0.00	0.00
	(0.27)	(0.27)	(0.26)	(0.83)	(0.79)
Manufacturing	0.35	0.36	0.34	-0.01	0.01
	(0.48)	(0.48)	(0.48)	(0.69)	(0.58)
Wholesale Trade	0.05	0.05	0.06	0.00	-0.01
	(0.22)	(0.21)	(0.23)	(0.74)	(0.48)
Retail Trade	0.30	0.30	0.30	-0.00	0.00
	(0.46)	(0.46)	(0.46)	(0.92)	(0.93)
Services	0.16	0.17	0.17	-0.02	-0.00
	(0.37)	(0.38)	(0.38)	(0.51)	(0.97)
Professional Services	0.05	0.03	0.05	0.01	-0.01
	(0.21)	(0.18)	(0.21)	(0.24)	(0.22)
Other	0.02	0.01	0.01	0.01	0.00
	(0.13)	(0.09)	(0.08)	(0.24)	(0.64)
Observations	436	704	632	1140	1336

Table A2: Balance on Baseline Characteristics at Midline Survey

	Controls	Treatment 1	Treatment 2	C - T1	T1 - T2
Owner's Age	36.44	36.01	37.04	-0.39	0.41
	(8.97)	(9.01)	(9.25)	(0.49)	(0.42)
Firm Age	7.63	7.07	7.74	-0.49	0.27
	(6.91)	(6.45)	(7.25)	(0.25)	(0.48)
Less than JHS	0.07	0.08	0.08	-0.01	0.01
	(0.48)	(0.27)	(0.47)	(0.81)	(0.83)
JHS Degree	0.34	0.31	0.30	0.01	-0.04
	(0.63)	(0.46)	(0.60)	(0.74)	(0.25)
HS Degree	0.19	0.23	0.18	0.05	-0.00
	(0.57)	(0.42)	(0.54)	(0.11)	(0.94)
College Degree	0.34	0.38	0.39	-0.00	0.04
	(0.63)	(0.49)	(0.62)	(0.97)	(0.23)
Married	0.57	0.55	0.58	-0.02	0.01
	(0.50)	(0.50)	(0.49)	(0.52)	(0.67)
Women-Only Firm	0.95	0.94	0.94	-0.01	0.01
	(0.23)	(0.24)	(0.23)	(0.51)	(0.53)
Number of Children	2.11	2.01	2.11	-0.05	-0.01
	(1.85)	(1.72)	(1.63)	(0.60)	(0.92)
Any Child Under 18?	0.68	0.66	0.67	-0.02	-0.02
	(0.47)	(0.48)	(0.47)	(0.48)	(0.56)
Any Collaboration	0.35	0.38	0.32	0.05	-0.03
	(0.48)	(0.49)	(0.47)	(0.22)	(0.49)
Total Employees	3.15	3.09	3.34	0.20	0.37
	(4.21)	(5.19)	(5.64)	(0.64)	(0.21)
Monthly Sales (USD)	811.65	777.23	768.52	74.01	-26.92
	(1501.13)	(1622.15)	(1596.15)	(0.49)	(0.76)
Monthly Profits (USD)	220.68	189.54	196.02	-2.24	-14.77
	(302.50)	(272.09)	(293.68)	(0.91)	(0.41)
Sector					
Agriculture	0.07	0.08	0.06	0.00	0.00
	(0.25)	(0.27)	(0.24)	(0.83)	(0.79)
Manufacturing	0.36	0.35	0.37	-0.01	0.02
	(0.48)	(0.48)	(0.48)	(0.69)	(0.55)
Wholesale Trade	0.05	0.06	0.05	0.00	-0.01
	(0.21)	(0.23)	(0.22)	(0.74)	(0.47)
Retail Trade	0.29	0.29	0.30	-0.00	0.00
	(0.45)	(0.46)	(0.46)	(0.92)	(0.95)
Services	0.19	0.17	0.18	-0.02	-0.00
	(0.39)	(0.38)	(0.39)	(0.51)	(0.96)
Professional Services	0.04	0.04	0.03	0.01	-0.01
	(0.20)	(0.20)	(0.17)	(0.24)	(0.21)
Other	0.01	0.02	0.01	0.01	0.00
	(0.07)	(0.13)	(0.09)	(0.24)	(0.64)
Observations	537	367	617	1140	1335

Table A3: Balance on Baseline Characteristics at Endline Survey

	Controls	Treatment 1	Treatment 2	C - T1	T1 - T2
Owner's Age	36.44	36.01	37.04	-0.39	0.41
	(8.97)	(9.01)	(9.25)	(0.49)	(0.42)
Firm Age	7.63	7.07	7.74	-0.49	0.27
	(6.91)	(6.45)	(7.25)	(0.25)	(0.48)
Less than JHS	0.07	0.08	0.08	-0.01	0.01
	(0.48)	(0.27)	(0.47)	(0.81)	(0.83)
JHS Degree	0.34	0.31	0.30	0.01	-0.04
	(0.63)	(0.46)	(0.60)	(0.74)	(0.25)
HS Degree	0.19	0.23	0.18	0.05	-0.00
	(0.57)	(0.42)	(0.54)	(0.11)	(0.94)
College Degree	0.34	0.38	0.39	-0.00	0.04
	(0.63)	(0.49)	(0.62)	(0.97)	(0.23)
Married	0.57	0.55	0.58	-0.02	0.01
	(0.50)	(0.50)	(0.49)	(0.52)	(0.67)
Women-Only Firm	0.95	0.94	0.94	-0.01	0.01
	(0.23)	(0.24)	(0.23)	(0.51)	(0.53)
Number of Children	2.11	2.01	2.11	-0.05	-0.01
	(1.85)	(1.72)	(1.63)	(0.60)	(0.92)
Any Child Under 18?	0.68	0.66	0.67	-0.02	-0.02
	(0.47)	(0.48)	(0.47)	(0.48)	(0.56)
Any Collaboration	0.35	0.38	0.32	0.05	-0.03
	(0.48)	(0.49)	(0.47)	(0.22)	(0.49)
Total Employees	3.15	3.09	3.34	0.20	0.37
	(4.21)	(5.19)	(5.64)	(0.64)	(0.21)
Monthly Sales (USD)	811.65	777.23	768.52	74.01	-26.92
	(1501.13)	(1622.15)	(1596.15)	(0.49)	(0.76)
Monthly Profits (USD)	220.68	189.54	196.02	-2.24	-14.77
	(302.50)	(272.09)	(293.68)	(0.91)	(0.41)
Sector					
Agriculture	0.07	0.08	0.06	0.00	0.00
	(0.25)	(0.27)	(0.24)	(0.83)	(0.79)
Manufacturing	0.36	0.35	0.37	-0.01	0.02
	(0.48)	(0.48)	(0.48)	(0.69)	(0.55)
Wholesale Trade	0.05	0.06	0.05	0.00	-0.01
	(0.21)	(0.23)	(0.22)	(0.74)	(0.47)
Retail Trade	0.29	0.29	0.30	-0.00	0.00
	(0.45)	(0.46)	(0.46)	(0.92)	(0.95)
Services	0.19	0.17	0.18	-0.02	-0.00
	(0.39)	(0.38)	(0.39)	(0.51)	(0.96)
Professional Services	0.04	0.04	0.03	0.01	-0.01
	(0.20)	(0.20)	(0.17)	(0.24)	(0.21)
Other	0.01	0.02	0.01	0.01	0.00
	(0.07)	(0.13)	(0.09)	(0.24)	(0.64)
Observations	537	367	617	1140	1335

Table A4: Intervention Take-Up

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

Table A5: Effect of Online Networking Groups on Collaborations (Mediation Analysis)

	(1) Any Collaboration	(2) Any Collaboration
Networking	-0.0198	0.0119
	(0.0228)	(0.0131)
Networking and Legal	-0.0695***	-0.00826
	(0.0212)	(0.0107)
Collaboration with Friends		0.900***
		(0.0162)
Collaboration with Relatives		0.569***
		(0.0868)
Control Mean	0.134	0.134
T1 = T2 (p-value)	0.002	0.090
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. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A6: 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)	(0.112)	(0.116)
Networking and Legal	-0.0471	0.180	0.227*
	(0.119)	(0.113)	(0.120)
Control Mean	5.601	5.726	0.125
T1 = T2 (p-value)	0.237	0.118	0.866
R^2	0.055	0.043	0.039
N	1389	1389	1389

Table A7: Relationship between Monthly Profits and Business Collaborations

	(1)	(2)	(3)	(4)	(5)
Any Collaboration	444.2*				
	(255.4)				
Any Collaboration with Friends or Relatives		186.9	154.7	119.0	-137.1
		(283.3)	(290.2)	(292.5)	(287.9)
Any Collaboration with Business Network		1053.4**	960.3**	896.5*	895.8**
		(440.0)	(453.7)	(458.5)	(447.7)
Business Practice Index			306.6***	289.0***	205.9**
			(87.44)	(89.31)	(88.12)
Business Networking Index				91.46	94.21
				(94.28)	(92.13)
1-4 Employees					282.7
					(183.4)
5+ Employees					1083.3***
					(296.8)
Education	Yes	Yes	Yes	Yes	Yes
Industry Fe	Yes	Yes	Yes	Yes	Yes
Mean	1200.712	1200.712	1200.712	1200.712	1200.712
R^2	0.329	0.340	0.372	0.374	0.428
N	334	334	328	328	318

Note: All specifications use data from the control group at endline survey and control for years of education and industry fixed effects. The outcome variable is monthly profits winsorized at the 1%. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

C Steps Towards Collaboration Index Decomposition

Table A8: Effect on Step Towards Collaboration Index and Its Components

	(1) Steps Towards Collaboration Index	(2) Identified Area for Collaboration	(3) Considered Collaboration	(4) Conducted Search
Networking	0.320***	-0.0253	0.0262	0.237***
	(0.0769)	(0.0349)	(0.0188)	(0.0238)
Networking and Legal	0.233***	-0.0166	-0.00232	0.266***
	(0.0744)	(0.0315)	(0.0201)	(0.0246)
Control Mean	0.000	0.332	0.079	0.044
T1 = T2 (p-value)	0.239	0.775	0.103	0.355
R^2	0.043	0.037	0.031	0.090
N	1389	1388	1388	1389

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A9: 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
	(0.0147)	(0.0164)	(0.0228)
Networking and Legal	0.00580	0.000576	-0.0695***
	(0.0146)	(0.0156)	(0.0212)
Control Mean	0.041	0.050	0.134
T1 = T2 (p-value)	0.049	0.042	0.002
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. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A10: Effect of Online Networking Groups on Business Formalization and Other Legal-Related Outcomes

	(1) Use of Written Agreements	(2) Business Formalization Index	(3) Trust in Legal System
Networking	0.0550*	0.0849	0.178**
	(0.0286)	(0.0698)	(0.0792)
Networking and Legal	0.0356	0.0798	0.321***
	(0.0297)	(0.0831)	(0.0772)
Control Mean	0.202	0.000	3.697
T1 = T2 (p-value)	0.494	0.949	0.023
R^2	0.052	0.126	0.037
N	1520	1389	1389

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. We do no not have baseline data for Collaboration Knowledge Index and Trust in Contracts (Game). Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A11: Effect of Online Networking Groups on Business Networking

	(1) Business Networking Index
Networking	-0.0255
	(0.0626)
Networking and Legal	-0.0794
	(0.0679)
Control Mean	0.000
T1 = T2 (p-value)	0.358
R^2	0.121
N	1388

Table A12: 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	-0.100	-0.0295	-80.05	-0.0312
	(0.0644)	(0.0189)	(261.2)	(0.0308)
Networking and Legal	0.00853	-0.00861	256.3	0.00283
	(0.0747)	(0.0217)	(324.4)	(0.0324)
Control Mean	0.000	0.106	624.891	0.292
T1 = T2 (p-value)	0.106	0.250	0.348	0.247
R^2	0.050	0.038	0.049	0.046
N	1520	1517	1514	1520

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A13: 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	-0.0695	-0.142	-296.6	-412.6	-0.0316
	(0.0640)	(0.261)	(598.1)	(628.6)	(0.0195)
Networking and Legal	-0.0556	-0.363	73.33	139.5	-0.0257
	(0.0693)	(0.255)	(637.2)	(691.6)	(0.0213)
Control Mean	-0.000	2.918	4114.320	4535.019	0.117
T1 = T2 (p-value)	0.816	0.358	0.437	0.323	0.742
R^2	0.099	0.147	0.055	0.058	0.038
N	1520	1520	1458	1520	1517

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A14: Effect on Firm Survival

	(1) In Operation
Networking	-0.0244
	(0.0194)
Networking and Legal	-0.0295
	(0.0207)
Control Mean	0.918
T1 = T2 (p-value)	0.794
R^2	0.034
N	1521

Note: The specification controls for ML predicted probability for collaboration, and strata fixed effects. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

D 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. [17] Table A15 shows limited evidence that quality improved. Results for the corresponding decomposition of the quality index are presented in Appendix Table A16. We also do not observe an

[17] Full description of these indices can be found in Appendix T.

increase in the formalization of collaborations.

Table A15: 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	0.331*	0.177	-0.382*
	(0.177)	(0.197)	(0.212)
Networking and Legal	-0.0927	0.165	0.155
	(0.269)	(0.278)	(0.289)
Control Mean	0.000	-0.000	-0.000
T1 = T2 (p-value)	0.064	0.961	0.060
R^2	0.275	0.242	0.254
N	140	140	140

Note: All specifications control for baseline collaboration, missing indicator for baseline collaboration, ML predicted probability for collaboration, and strata fixed effects. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A16: Effect on Quality of Collaboration Index and Its Components

	(1) Quality of Collaboration Index	(2) Expect relationship to continue	(3) Satisfied with coordination of activities	(4) Satisfied with participation in decision making	(5) Satisfied w participatio level of commi
Networking	0.322*	0.143	0.146	0.318**	0.235
	(0.177)	(0.149)	(0.154)	(0.156)	(0.152)
Networking and Legal	-0.0756	-0.202	-0.210	0.0400	-0.122
	(0.258)	(0.216)	(0.228)	(0.207)	(0.203)
Control Mean	0.000	4.384	4.246	3.873	4.170
T1 = T2 (p-value)	0.069	0.065	0.074	0.123	0.035
R^2	0.273	0.283	0.255	0.273	0.277
N	140	140	140	140	140

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probab collaboration, and strata fixed effects. Clustered standard errors at the WhatsApp group level for the treated firms an individual level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A17: Effect on Quality of Collaboration Index and Its Components – Continued

	(1) Satisfied with level of information sharing	(2) Satisfied with management of activities	(3) Satisfied with profitability and sales growth	(4) Would recommend collaborator to other firms	(5 Numb refer collab
Networking	0.321*	0.133	0.268	0.592**	-0.4
	(0.176)	(0.150)	(0.163)	(0.238)	(1.2
Networking and Legal	0.0618	0.0116	0.182	0.380	-2.9
	(0.244)	(0.186)	(0.204)	(0.276)	(1.2
Control Mean	3.909	4.011	3.938	3.859	4.9
T1 = T2 (p-value)	0.199	0.430	0.633	0.310	0.0
R^2	0.224	0.262	0.256	0.252	0.2
N	140	140	140	140	14

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for
ration, and strata fixed effects. Clustered standard errors at the WhatsApp group level for the treated firms and at the in
level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

E Perceptions Related to Collaborations

Table A18: 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
	(0.146)	(0.160)	(0.134)	(0.0354)
Networking and Legal	-0.0696	0.000595	-0.0142	0.00255
	(0.155)	(0.158)	(0.140)	(0.0354)
Control Mean	4.146	5.044	6.050	0.394
T1 = T2 (p-value)	0.041	0.169	0.627	0.575
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. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

F Collaboration Trust Index Decomposition

Table A19: Effect on Collaboration Trust Index and Its Components

	(1) Collaboration Trust Index	(2) Collaborator will keep promises	(3) Believe information from collaborator	(4) Collaborator has our best interests	(5) Not Nec to be ca with colla
Networking	0.191	0.109	0.0367	0.0921	0.38
	(0.195)	(0.166)	(0.144)	(0.174)	(0.27
Networking and Legal	0.103	-0.0169	-0.0534	0.133	0.32
	(0.275)	(0.217)	(0.206)	(0.223)	(0.34
Control Mean	-0.000	4.141	4.163	4.043	2.81
T1 = T2 (p-value)	0.717	0.497	0.617	0.822	0.82
R^2	0.226	0.191	0.279	0.213	0.25
N	140	140	140	140	140

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability fo ration, and strata fixed effects. Clustered standard errors at the WhatsApp group level for the treated firms and at the level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

G Collaboration Formalization Index Decomposition

Table A20: Effect on Collaboration Formalization Index and Its Components

	(1) Collaboration Formalization Index	(2) Frequent communication between our company our collaborator	(3) Basic terms of relationship explicitly verbalized and discussed
Networking	-0.380*	-0.702**	0.103
	(0.209)	(0.305)	(0.289)
Networking and Legal	0.120	-0.153	0.111
	(0.282)	(0.428)	(0.396)
Control Mean	-0.000	1.761	1.326
T1 = T2 (p-value)	0.072	0.090	0.985
R^2	0.249	0.208	0.239
N	140	140	140

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A21: Effect on Collaboration Formalization Index and Its Components

	(1) Proprietary information shared with each other	(2) Include each other in formal business planning meetings	(3) Written agreement
Networking	-0.986*	-0.984**	0.0573
	(0.524)	(0.488)	(0.384)
Networking and Legal	0.0504	0.0744	0.598
	(0.632)	(0.648)	(0.498)
Control Mean	4.261	3.935	4.913
T1 = T2 (p-value)	0.079	0.093	0.269
R^2	0.248	0.259	0.226
N	140	140	140

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

H Business Formalization Index Decomposition

Table A22: Effect on Business Formalization Index and Its Components

	(1)	(2)	(3)	(4)
	Business Formalization Index	Business Registration with Registrar General	Renewal Business Registration with Registrar General within Past Year	Having Municipal L (Business Op Permit)
Networking	0.0849	-0.0210	-0.0176	0.0697
	(0.0698)	(0.0339)	(0.0306)	(0.0309
Networking and Legal	0.0798	-0.0597*	-0.0269	0.0540
	(0.0831)	(0.0358)	(0.0330)	(0.0325
Control Mean	0.000	0.542	0.267	0.633
T1 = T2 (p-value)	0.949	0.227	0.748	0.567
R^2	0.126	0.101	0.049	0.082
N	1389	1388	1373	1388

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability fo fixed effects. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for t ** $p < 0.05$, *** $p < 0.01$.

Table A23: Effect on Business Formalization Index and Its Components

	(1) Social Security Registration	(2) Percent Salaried Employees with Written Contracts	(3) Percent Suppliers with Written Contracts	(4) Percer Client with Written
Networking	-0.0130	0.000823	0.0396*	0.025
	(0.0298)	(0.0508)	(0.0215)	(0.011
Networking and Legal	-0.0362	0.0532	0.0718***	0.046
	(0.0305)	(0.0588)	(0.0242)	(0.013
Control Mean	0.236	0.254	0.083	0.029
T1 = T2 (p-value)	0.398	0.310	0.185	0.116
R^2	0.052	0.126	0.056	0.066
N	1388	482	1389	1389

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability f tion, and strata fixed effects. Clustered standard errors at the WhatsApp group level for the treated firms and at the ind for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

I Business Networking Index Decomposition

Table A24: Effect on Business Networking Index and Its Components

	(1) Business Networking Index	(2) Has a Mentor	(3) Number in Business Network	(4) Number of Referrals Received	(5) Member of Business Associations
Networking	-0.0255	-0.0460	0.355	0.247	-0.00148
	(0.0626)	(0.0325)	(1.041)	(0.608)	(0.0320)
Networking and Legal	-0.0794	-0.0254	-0.106	-0.862	-0.0255
	(0.0679)	(0.0351)	(1.096)	(0.554)	(0.0311)
Control Mean	0.000	0.402	6.496	5.176	0.440
T1 = T2 (p-value)	0.358	0.488	0.664	0.024	0.429
R^2	0.121	0.044	0.055	0.038	0.261
N	1388	1388	1386	1370	1388

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

J Innovation Types

Table A25: Effect on Innovation Types

	(1) Any Changes to Business (Past 6 Months)	(2) New or Improved Product (Past 6 Months)	(3) New or Improved Process (Past 6 Months)	(4) New Marketing or Selling Channels (Past 6 Months)	(5) Entered New Markets (Past 6 Months)
Networking	0.0843***	0.0617**	0.0744***	0.0917***	0.0544***
	(0.0298)	(0.0241)	(0.0224)	(0.0234)	(0.0142)
Networking and Legal	0.0667**	0.0536**	0.0860***	0.0578**	0.0537***
	(0.0332)	(0.0256)	(0.0227)	(0.0254)	(0.0158)
Control Mean	0.267	0.153	0.082	0.120	0.027
T1 = T2 (p-value)	0.567	0.724	0.640	0.182	0.971
R^2	0.033	0.030	0.045	0.036	0.042
N	1520	1520	1520	1520	1520

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A26: Effect on Innovation Types

	(1) New Pricing Method (Past 6 Months)	(2) Changes to Hiring or Motivating Workers (Past 6 Months)	(3) Changes to Relationships with Suppliers (Past 6 Months)	(4) New Business Registrations (Past 6 Months)	(5) Building Connections with Other Entrepreneurs (Past 6 Months)
Networking	0.0491**	0.0517***	0.0438***	0.0103	0.0456**
	(0.0198)	(0.0143)	(0.0149)	(0.00954)	(0.0210)
Networking and Legal	0.0472**	0.0444***	0.0523***	0.0110	0.0768***
	(0.0209)	(0.0156)	(0.0182)	(0.0106)	(0.0242)
Control Mean	0.087	0.030	0.041	0.016	0.095
T1 = T2 (p-value)	0.928	0.658	0.642	0.946	0.183
R^2	0.033	0.039	0.029	0.028	0.036
N	1520	1520	1520	1520	1520

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

K Alternative Business Innovation Index and Decomposition

Table A27: Effect on Alternative Innovation Index and Its Components

	(1) Business Innovation Index	(2) New Product (Past 6 Months)	(3) Improved Product (Past 6 Months)	(4) New or Improved Process (Past 6 Months)	(New or Pac (Past 6
Networking	0.159**	0.00608	0.0905***	0.0665**	0.0
	(0.0673)	(0.0321)	(0.0292)	(0.0276)	(0.0
Networking and Legal	0.145*	-0.0180	0.102***	0.0633**	-0.0
	(0.0795)	(0.0355)	(0.0325)	(0.0278)	(0.0
Control Mean	0.000	0.360	0.313	0.166	0.2
T1 = T2 (p-value)	0.849	0.452	0.676	0.909	0.0
R^2	0.045	0.030	0.035	0.032	0.0
N	1520	1520	1520	1520	15

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability f
effects. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for the co
*** $p < 0.01$.

Table A28: Effect on Innovation Index and Its Components

	(1) New Pricing Method (Past 6 Months)	(2) New Advertising Method (Past 6 Months)	(3) New Work Organization (Past 6 Months)	(4) New Quality Control Standards (Past 6 Months)
Networking	0.0333	0.0272	0.0375*	0.0283*
	(0.0285)	(0.0304)	(0.0208)	(0.0172)
Networking and Legal	0.000807	0.00559	0.0366	0.0373**
	(0.0292)	(0.0312)	(0.0225)	(0.0189)
Control Mean	0.245	0.324	0.112	0.074
T1 = T2 (p-value)	0.210	0.431	0.961	0.581
R^2	0.030	0.048	0.036	0.041
N	1520	1520	1520	1520

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A29: Effect on Innovation Index and Its Components

	(1) Use of Internet	(2) Entrance in New Markets	(3) Inputs Sourcing at Lower Costs or Higher Quality
Networking	-0.0698**	0.0434**	0.0860***
	(0.0317)	(0.0219)	(0.0214)
Networking and Legal	-0.0936***	0.0626**	0.130***
	(0.0319)	(0.0243)	(0.0252)
Control Mean	0.401	0.101	0.090
T1 = T2 (p-value)	0.374	0.431	0.080
R^2	0.050	0.044	0.046
N	1520	1520	1520

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

L Business Practice Index Decomposition

Table A30: Effect on Business Practice - Marketing Index and Its Components

	(1) Marketing Index	(2) Visited competitor's businesses to see its prices	(3) Visited competitor's businesses to see its products	(4) Asked customers if other desired products
Networking	0.119*	-0.0297	-0.000847	0.0783**
	(0.0698)	(0.0320)	(0.0321)	(0.0344)
Networking and Legal	0.117*	-0.0449	0.0391	0.0222
	(0.0685)	(0.0340)	(0.0314)	(0.0344)
Control Mean	-0.000	0.430	0.318	0.412
T1 = T2 (p-value)	0.984	0.543	0.121	0.059
R^2	0.042	0.027	0.030	0.038
N	1371	1371	1371	1371

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A31: Effect on Business Practice - Marketing Index and Its Components – Continued

	(1) Asked former customers why they stopped buying	(2) Asked supplier which products are selling well	(3) Attracted customers with special offer	(4) Advertised in any form (last 6 months)
Networking	0.0598*	-0.00150	0.0936***	0.0392
	(0.0328)	(0.0343)	(0.0321)	(0.0323)
Networking and Legal	0.0389	0.00331	0.0834***	0.0956***
	(0.0332)	(0.0324)	(0.0281)	(0.0368)
Control Mean	0.380	0.389	0.208	0.499
T1 = T2 (p-value)	0.456	0.858	0.720	0.067
R^2	0.027	0.037	0.046	0.055
N	1371	1371	1370	1371

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A32: Effect on Business Practice - Buying and Stock Control Index and Its Components

	(1) Buying and Stock Control Index	(2) Compared prices or quality offered by alternate suppliers	(3) Attempted to negotiate with supplier for lower price	(4) Business not out of stock monthly or more
Networking	-0.00221	0.0285	-0.00639	-0.0202
	(0.0723)	(0.0374)	(0.0364)	(0.0294)
Networking and Legal	-0.0575	0.0148	-0.0347	-0.0299
	(0.0668)	(0.0336)	(0.0348)	(0.0287)
Control Mean	0.000	0.500	0.608	0.777
T1 = T2 (p-value)	0.349	0.657	0.387	0.702
R^2	0.043	0.041	0.046	0.041
N	1371	1369	1370	1368

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A33: Effect on Business Practice - Record-Keeping Index and Its Components

	(1) Record-Keeping Index	(2) Keeps written business records	(3) Records every purchase and sale	(4) Use records to see how much cash the business has	(5) Use records to know if product sales are increasing or decreasing
Networking	-0.0477	0.00568	-0.00337	0.0229	-0.00641
	(0.0742)	(0.0339)	(0.0344)	(0.0343)	(0.0357)
Networking and Legal	0.0597	-0.00494	0.0236	0.0423	0.000913
	(0.0670)	(0.0349)	(0.0335)	(0.0326)	(0.0350)
Control Mean	0.000	0.605	0.604	0.607	0.598
T1 = T2 (p-value)	0.102	0.730	0.378	0.504	0.821
R^2	0.082	0.057	0.068	0.067	0.064
N	1370	1370	1368	1368	1368

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A34: Effect on Business Practice - Record-Keeping Index and Its Components – Continued

	(1) Work out cost to business of each main product	(2) Know which goods make the most profit	(3) Has written budget which states every indirect costs to business	(4) Has records showing enough money after business expenses to repay a hypothetical loan
Networking	-0.0272	-0.0778***	0.0235	-0.0242
	(0.0345)	(0.0259)	(0.0332)	(0.0414)
Networking and Legal	0.0808**	-0.0436**	0.0734**	0.00556
	(0.0322)	(0.0214)	(0.0372)	(0.0407)
Control Mean	0.647	0.899	0.415	0.628
T1 = T2 (p-value)	0.000	0.147	0.142	0.397
R^2	0.060	0.063	0.077	0.064
N	1369	1368	1368	941

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A35: Effect on Business Practice - Financial Planning Index and Its Components – Continued

	(1) Financial Planning Index	(2) Review financial performance and analyze areas for improvement	(3) Has target for sales over next year	(4) Compares sales achieved to their target	(5) Has budget of likely costs to face next year
Networking	0.323***	0.102***	0.0805**	0.114***	0.0889***
	(0.0778)	(0.0349)	(0.0369)	(0.0261)	(0.0306)
Networking and Legal	0.496***	0.211***	0.107***	0.158***	0.123***
	(0.0780)	(0.0329)	(0.0359)	(0.0291)	(0.0321)
Control Mean	0.000	0.378	0.384	0.143	0.261
T1 = T2 (p-value)	0.021	0.000	0.439	0.100	0.209
R^2	0.086	0.054	0.065	0.064	0.067
N	1370	1364	1367	1365	1370

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

M Business Ambitions Index Decomposition

Table A36: Effect on Business Ambitions Index and Its Components

	(1)	(2)	(3)	(4)	(5)	
	Business Expectations Index	Number of workers in 5 Years	Number of workers in 5 Years (truncated)	Highest Monthly Sales in 5 Years	Highest Monthly Sales in 5 Years (truncated)	in S of Cu i
Networking	0.552	37.58	-1.343**	-16649.0	1943.8	
	(0.592)	(38.81)	(0.651)	(22923.8)	(2346.4)	
Networking and Legal	-0.145	-0.864	-2.090***	-19502.8	-294.9	
	(0.162)	(9.582)	(0.625)	(22265.5)	(2239.3)	
Control Mean	0.000	11.120	9.775	41124.599	17732.787	
T1 = T2 (p-value)	0.192	0.283	0.130	0.574	0.290	
R^2	0.057	0.057	0.076	0.024	0.037	
N	1388	1350	1350	1350	1350	

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability fo effects. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for t $p < 0.05$, *** $p < 0.01$.

N Get-Ahead Attitude Index Decomposition

Table A37: Effect on Get-Ahead Attitude Index and Its Components

	(1) Get-Ahead Attitude Index	(2) Always Looking to Improve Business	(3) Usually Can Find Solution	(4) Customer Shoud Not Wait
Networking	-0.0251	0.0195	0.0818	-0.0853
	(0.0656)	(0.0451)	(0.0514)	(0.0644)
Networking and Legal	0.0291	-0.00561	0.0166	-0.119*
	(0.0651)	(0.0478)	(0.0508)	(0.0679)
Control Mean	-0.000	4.648	4.374	2.275
T1 = T2 (p-value)	0.307	0.517	0.135	0.557
R^2	0.038	0.029	0.034	0.025
N	1389	1384	1388	1387

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A38: Effect on Get-Ahead Attitude Index and Its Components

	(1) Will Try Unless 100% Success	(2) Need to Risk Money to Make Money	(3) Not Plan Week-to-Week	(4) Just Do It
Networking	-0.341***	0.129**	-0.313***	0.249***
	(0.0860)	(0.0629)	(0.0927)	(0.0902)
Networking and Legal	-0.239***	0.146**	-0.444***	0.360***
	(0.0911)	(0.0614)	(0.0969)	(0.102)
Control Mean	2.886	3.968	3.440	2.655
T1 = T2 (p-value)	0.154	0.710	0.135	0.188
R^2	0.037	0.036	0.049	0.047
N	1381	1379	1388	1386

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A39: Effect on Get-Ahead Attitude Index and Its Components

	(1) Can Convince Others	(2) Always Try to Meet New People	(3) Need to Make Business Better	(4) Will Try Even if Not Succeed
Networking	0.114*	0.158**	-0.287***	-0.0275
	(0.0590)	(0.0702)	(0.0907)	(0.0735)
Networking and Legal	0.159***	0.244***	-0.296***	0.202***
	(0.0612)	(0.0673)	(0.0962)	(0.0732)
Control Mean	3.850	3.929	3.907	3.927
T1 = T2 (p-value)	0.329	0.122	0.923	0.000
R^2	0.033	0.041	0.050	0.040
N	1384	1382	1386	1384

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

O Self-Efficacy Index Decomposition

Table A40: Effect on Self-Efficacy Index and Its Components

	(1) Entrepreneurial Self-Efficacy Index	(2) Idea for New Product	(3) Accurately Estimate Costs of New Business Venture	(4) Estimate Customer Demand for New Product	Se
Networking	0.0637	-0.0567	0.0251	0.0231	
	(0.0723)	(0.0355)	(0.0317)	(0.0348)	
Networking and Legal	0.0488	-0.0113	0.0315	-0.0116	
	(0.0777)	(0.0387)	(0.0329)	(0.0333)	
Control Mean	0.000	0.461	0.300	0.338	
T1 = T2 (p-value)	0.836	0.202	0.826	0.254	
R^2	0.032	0.035	0.037	0.031	
N	1389	1389	1389	1389	

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability
and strata fixed effects. Clustered standard errors at the WhatsApp group level for the treated firms and at the indivi
control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A41: Effect on Self-Efficacy Index and Its Components

	(1) Identify Good Employees	(2) Inspire, Encourage, and Motivate Employees	(3) Find Suppliers Who Sell at Best Price	(4) Persuade Bank to Lend Money for Business Venture	Corr Exist
Networking	0.0568*	0.0248	0.0183	0.0268	
	(0.0310)	(0.0329)	(0.0307)	(0.0291)	(
Networking and Legal	0.0408	-0.0203	0.00808	0.0439	
	(0.0336)	(0.0349)	(0.0331)	(0.0309)	(
Control Mean	0.268	0.394	0.294	0.213	
T1 = T2 (p-value)	0.589	0.127	0.723	0.542	
R^2	0.026	0.033	0.033	0.034	
N	1389	1389	1389	1389	

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability fo and strata fixed effects. Clustered standard errors at the WhatsApp group level for the treated firms and at the individ control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

P Empowerment Index Decomposition

Table A42: Effect on Empowerment Index and Its Components

	(1) Female Empowerment Index	(2) Free to Spend Money on Husband or Family	(3) Only Person with Access to Firm Money	(4) Sole Control on Some Money
Networking	-0.0346	-0.0786**	0.00805	0.00771
	(0.0643)	(0.0339)	(0.0222)	(0.00906)
Networking and Legal	0.0164	-0.0808**	0.0305	0.0162**
	(0.0652)	(0.0342)	(0.0210)	(0.00788)
Control Mean	0.000	0.515	0.854	0.983
T1 = T2 (p-value)	0.317	0.942	0.162	0.079
R^2	0.071	0.047	0.067	0.061
N	1389	1382	1389	1389

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A43: Effect on Empowerment Index and Its Components

	(1) No Need Permission to Visit Friend	(2) No Need Permission to Sell Business Asset	(3) No Need Permission to Travel to Work	(4) No Need Per to Stay Ov in Differen
Networking	-0.0213	-0.0117	0.0615*	0.017
	(0.0292)	(0.0294)	(0.0337)	(0.031
Networking and Legal	-0.0107	-0.00249	0.0196	0.029
	(0.0300)	(0.0315)	(0.0340)	(0.035
Control Mean	0.738	0.738	0.513	0.469
T1 = T2 (p-value)	0.674	0.735	0.147	0.669
R^2	0.060	0.046	0.053	0.068
N	1389	1386	1388	1386

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability fo
ration, and strata fixed effects. Clustered standard errors at the WhatsApp group level for the treated firms and at the
level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A44: Effect on Empowerment Index and Its Components

	(1) No Need Permission to Work Later than Usual Hours	(2) No Need Permission to Take Out a Loan	(3) No Need Permission to Spend Money on Investment for Business
Networking	-0.100***	0.0231	-0.0196
	(0.0292)	(0.0336)	(0.0253)
Networking and Legal	-0.0498*	0.0281	0.0107
	(0.0300)	(0.0364)	(0.0261)
Control Mean	0.763	0.603	0.816
T1 = T2 (p-value)	0.050	0.872	0.148
R^2	0.042	0.034	0.046
N	1388	1386	1389

Note: All specifications control for baseline outcome, missing indicator for baseline outcome, ML predicted probability for collaboration, and strata fixed effects. Clustered standard errors at the WhatsApp group level for the treated firms and at the individual level for the control firms. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Q 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

R 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.

S 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,[18], 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 A45.

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.

[18]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 A45: 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

T Outcome Measures

T.1 Primary 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 3.2.1:

- 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.

T.2 Secondary 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 3.2.1:

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

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 3.2.1.

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 3.2.1.

T.3 Intermediate Outcomes

T.3.1 Additional Business Outcomes

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 3.2.1.

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 3.2.1:

- 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 3.2.1.

T.3.2 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 3.2.1.

T.3.3 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 3.2.1:

- 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".

T.3.4 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 3.2.1.

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 3.2.1.

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 3.2.1.

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 3.2.1.

T.3.5 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 3.2.1.

T.3.6 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 3.2.1.

T.3.7 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 3.2.1.