

# THE IMPACT OF PRIVATE SECTOR PROJECTS IN AFRICA

Studies from the EIB-GDN Programme

Cycle 2





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## **The impact of private sector projects in Africa: Studies from the EIB-GDN Programme, Cycle 2**

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**This is a joint publication of the EIB Economics Department and the Global Development Network (GDN).**

The mission of the EIB's Economics Department is to provide economic analyses and studies to support the Bank in its operations and in its positioning, strategy and policy. The department, a team of 40, is headed by Debora Revoltella, Director of Economics.

GDN is a public international organisation dedicated to supporting high-quality, policy-oriented research in developing and transition countries. It is headquartered in New Delhi, India and works in close cooperation with national and international development partners.

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### **Acknowledgements**

The authors would like to express their gratitude to the EIB clients who cooperated with them on the production of these studies. They also wish to thank the expert advisors and the EIB team for their advice, feedback and inputs throughout the project, and to GDN for their support.

### **Disclaimer**

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Published by the European Investment Bank.  
Printed on FSC Paper.

pdf:

QH-04-20-615-EN-N

ISBN 978-92-861-4843-9

DOI 10.2867/751564

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# Foreword

**The European Investment Bank works beyond the European Union to improve lives, support the economy, protect the environment and fight climate change.** The Bank measures the development impacts of the projects we support so that we can be accountable to our stakeholders, and to inform our decisions on where, when and how to invest for maximum development effectiveness.

**The studies in this publication bring new insights into the potential of innovative impact investments to improve lives and livelihoods in Africa, while aiming for financial sustainability.** The studies in this report deepen our understanding of how these projects have made a difference on the ground. The findings will help us to:

- **To be accountable to our stakeholders.** As the EU Bank, we are accountable to our shareholders, the EU Member States, to the European Commission, and ultimately to all EU citizens. We must demonstrate that we improve lives. This publication provides a high level of detail on how selected investments are changing lives on the ground, based on primary evidence of those impacts. This complements the information that the Bank publishes each year on results of projects beyond the European Union. Top global experts in the fields of impact evaluation and impact assessment were engaged from the start, ensuring that the studies were carried out with maximum academic rigour and using state-of-the-art methods. Their stamp of approval ensures that the results form part of a reliable evidence base for our stakeholders.
- **To inform our decisions on where and when to invest.** We need information on impacts to assess how a project fits the objectives of our mandates and the expectations of our stakeholders. The projects discussed in this report were supported under the Impact Financing Envelope for Africa, the Caribbean and the Pacific. With impact finance, the Bank aims to generate superior development impact by focusing on private sector projects which could not be otherwise pursued, due to the relatively high level of risk. Impact finance is an area of business that the EIB and other partners are expanding, so it was particularly important to learn how these investments worked in practice and which aspects might be replicable in other contexts.
- **To improve our effectiveness.** The Bank wants to learn about the needs of its clients and beneficiaries to improve and fine-tune the support it provides, to enhance our positive impacts over time. We assess our results and impact to understand what is working and what is not so we can get better at what we do. A number of studies under the EIB-GDN programme gave us and our partners pointers as to where we can reach further and do better to boost impact.

**The EIB-GDN programme is also enhancing capacity for impact assessment and research in developing countries.** This is a highly innovative feature of the programme. The talented young researchers from African and Caribbean countries who produced the studies in this volume have brought new perspectives to the understanding of the EIB’s development impact and found the experience highly rewarding.

**Measuring impact remains a priority for the EIB as we seek to build back better in the wake of the COVID-19 crisis.** Given the financing constraints faced by many of our private and public sector partners, it is more important than ever to ensure that support the investments that can make the biggest difference. Demonstrating our impact is even more a must at a time when the expectations of European citizens and partners are higher than ever.

**We are looking forward to continuing studying our impact, building on the lessons we have learned under the EIB-GDN programme.** Data on the needs and experiences of our final beneficiaries remain at the heart of this work – we need to keep talking to people and firms on the ground. New data sources – including “big data” – and the use of new techniques such as machine learning will also open up new opportunities to understand our impacts, particularly in regions such as Africa where secondary data remain limited. We are looking forward to exploring these possibilities in the coming years and leveraging the knowledge we generate to boost our accountability, our decision making and our overall development effectiveness.

**Ambroise Fayolle**  
Vice-President  
European Investment Bank

# Introduction

**Authors:** Nina Fenton and Claudio Cali

**Impact measurement is central to the European Investment Bank’s business.** The European Investment Bank tracks the development results of every investment. This helps the Bank to understand what works and how we can further [enhance our impact](#).

**The EIB has been piloting a programme of micro impact studies of private sector impact investments, partnering with the [Global Development Network](#).** The studies deepen our understanding of the impacts of these projects, going beyond the detailed [results measurement framework](#) the European Investment Bank uses for every project by collecting data directly from the people who benefit on the ground. This requires local resources, so the programme has mobilised 30 [talented researchers from developing countries](#) to carry out impact studies of [impact investment projects in Africa, the Caribbean and the Pacific](#).

**The EIB is pleased to present five studies completed in the second cycle of this programme.** The results of the first wave of studies, including the full reports and a number of blogs highlighting the findings, are available [here](#).

**The programme shows that academically rigorous research can drive impact.** The programme partners have brought in globally renowned [experts](#) as advisors. These experts ensure that the studies are carried out with maximum rigour and using state-of-the-art methods. Their stamp of approval ensures that the results are a reliable basis for decision-making to enhance development impacts by the European Investment Bank and our clients. The EAs, recruited by GDN, are five top-level academics and policymakers from institutions including Paris School of Economics, the World Bank and the International Initiative on Impact Evaluation (3ie).

**The micro impact studies under the EIB-GDN programme used a variety of econometric techniques, tailored to a diverse set of investments and to the developing country context.** In some case the researchers, drawing on the technical advice of the experts, used experimental or quasi-experimental techniques to identify a causal relationship between EIB investment and impacts on the ground. Some of the emerging findings are as follows:

- **The stamp of approval from the experts ensures that the results are a reliable basis for decision-making to enhance development impacts by the EIB and its clients.** For example, a study of Baobab, a microfinance institution serving around 22,000 female clients in rural northern Ghana showed that Baobab is successfully reaching out to poor women – the proportion of Baobab’s clients who fall below the poverty line is higher than the local average in three of the five districts where Baobab was active. The finance provided is helping women to invest in existing businesses – most had already established a business prior to receiving a loan. The use of the loans to start a new business, on the other hand, was uncommon. To gain

insights into the causal impact of Baobab, 541 women who did who had never borrowed from a formal institution were interviewed, including in two districts with no Baobab branch. The two groups were compared, using propensity score matching to control for observable differences between the groups. The evidence suggested that Baobab has indeed succeeded in reducing poverty amongst its clients, even when controlling for differences between Baobab clients and the comparison group. Extreme poverty rates were also higher among respondents who had never borrowed than among those who had taken 1, 2-3 or 4+ loans from Baobab. The study also examined various measures of how women control their lives and resources evidence and found that Baobab's support may have increased economic empowerment among the women served. The results suggest that investing in microfinance has the potential to improve lives among the poorest communities, and to support women in particular, although the benefits are very context-specific.

- **Investing in academic rigour can pay off commercially.** Impact evaluation is not purely an academic discipline: private sector firms frequently use impact evaluation techniques, such as experimentation. The EIB-GDN programme has given smaller and early-stage firms the chance to try these techniques – most of these firms had not explored quantitative impact evaluation techniques in the past, due to time as well as budget constraints. The firms are finding that these techniques have the potential to pay off commercially. As an example, a study of a small enterprise providing maternal and child health services in Senegal looked at the impact of the company and also examined ways of boosting uptake of a midwife-led service offered by the firm. Midwife-led care for low-risk pregnancies and uncomplicated deliveries is more affordable than doctor-led options, while offering the same quality. Increasing uptake of this service could attract new clients and have a positive social impact by expanding access. However, negative perceptions of midwife-led services have made the promotion of the midwife-led care package challenging. The analysis carried out showed that using short stories and scenarios could be a cost-effective way to deliver accurate information about midwife-led care services to counteract negative perceptions. The randomly selected women who participated in the visualization proved more likely to be willing to consider the midwife-led service than their peers who received the same information in a more “traditional” format. NEST will now consider whether and how it can make more use of the techniques investigated to promote this package.
- **Even where a causal impact cannot be conclusively established, micro impact studies provide useful insights into the profile of the people the EIB's investments benefit and demonstrate how their lives change as our projects are implemented.** For example, a study analysed the profile and living conditions of artisans working in one of the largest urban slums in Sub-Saharan Africa, Kibera, some of whom who work with an ethical jewellery brand, SOKO. SOKO's innovation is to provide a platform to link artisans to global value chains, by leveraging on the opportunities provided by new technologies and social media platforms. The study found that SOKO is providing opportunities to young artisans, many of whom have limited formal education, although women appear to have difficulty accessing opportunities in the handicraft sector, including with SOKO. The study, comparing the artisans who worked with SOKO with others who were not connected, suggests that SOKO has boosted livelihoods. The artisans who SOKO links to international markets earn approximately 37% more than artisans not working

for SOKO every month – a statistically significant difference. However, a more advanced analysis indicated that the difference may be caused by differences between the artisans who work with SOKO and their peers, and further investigation would be needed to conclusively pin down the role of SOKO in raising incomes. SOKO also contributed to sustainability by improving the artisans’ knowledge of environmental and occupational risk practices and by enhancing the ability of artisans to generate revenues outside of their relationship with SOKO. On average, SOKO artisans generated around \$240 yearly from other markets.

**The partnership will also produce a publication discussing some of the challenges and the successes of the programme.** This will highlight learnings about how to carry out impact studies of private sector investments in developing country contexts. This aims to further enhance and widen the capacity building impact of the EIB-GDN partnership.

**EIB is progressively developing a strong evidence base of micro-level impact studies through the EIB-GDN programme and other initiatives.**<sup>1</sup> The micro impact study workstream is a crucial component of the Bank’s approach to impact measurement.<sup>2</sup> The EIB is discussing options to continue work on in-depth impact studies after the conclusion of this pilot programme in 2020.

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<sup>1</sup> Other initiatives include studies using EIB’s own databases combined with secondary data, such as an assessment of the impact of lending to Small and Medium Enterprises in Central and South Eastern Europe.

<sup>2</sup> The first workstream is a results framework, which is applied to all projects. The Bank’s results framework – AIM – measures the direct effects of all EIB projects and links them, logically, to broader impact objectives. The other workstream consists of macro-level modelling, capturing indirect effects of operations on factors such as GDP and jobs. The Bank has developed a spatial computable general equilibrium model, RHOMOLO, to assess macro-level impacts of EIB operations within the EU, and is in discussion with the European Commission and other European Development Finance Institutions about how to apply modelling outside the EU.



# Understanding the sustained impact of SOKO on artisans in Kenya: Empirical evidence from Kibera, Kenya

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**Expert advisors:** **Prof. Shahrokh Fardoust** (College of William and Mary) and **Prof. Alexandros Sarris** (University of Athens).

**JEL Classification:** E24, F61, H32, I26, M53, P46

**Keywords:** SOKO, worker, artisans, matching, livelihood

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## Summary

### Research focus

African artisans can produce jewellery with international appeal, but reaching those markets is often impossible for them. Ethically-sourced fashion company SOKO aims to bridge this gap by tapping ethically-conscious consumer markets and passing on most of the benefits to African producers. Our study shows the difference this makes.

Founded in 2012, [SOKO](#)<sup>3</sup> designs jewellery and fashion accessories and supports a growing network of low-income artisans in Kenya to produce these products using ethically and sustainably-sourced materials. Finished products are sold worldwide through shops and online channels. SOKO has received finance from [Novastar Ventures](#), a venture capital fund that is supported under the EIB's [Impact Finance Envelope](#) for Africa, the Caribbean and Pacific.

Under the [EIB-GDN programme](#), Soazic Elise Wang Sonne and Timothy Kinoti surveyed artisans working in one of the largest urban slums in Sub-Saharan Africa, Kibera, in Nairobi, Kenya. To gain insights into how SOKO is helping to improve the skills and livelihoods of the artisans that work with them, the researchers compared the responses of the artisans working with SOKO with those of a group of artisans not currently affiliated with the network<sup>4</sup>. Altogether, 192 artisans were interviewed. The analysis has brought interesting insights into the way SOKO is influencing its workers – and on the potential impacts of working in Kenya's handicraft sector<sup>5</sup>.

### Research findings

#### Who are the artisans?

**The artisan industry provides young people with livelihoods.** Roughly 75% of SOKO artisans are below the age of 36. The age distribution of the non-SOKO artisans was similar, with an important exception: SOKO does not work with artisans below the age of 18, whereas there were a few respondents below this cut-off working outside of the SOKO network.

**Few women become professional artisans.** 95% of artisans interviewed are male, including around 90% of those in SOKO's network.

**Education.** Roughly 60% of artisans have reached at least an upper primary school educational level but only 10% went on to vocational college or higher education level.

#### What is different for SOKO artisans?

**Linkage to a global supply chain may be paying off.** The artisans who SOKO links to international markets earn approximately 37% more than artisans not working for SOKO every month – a statistically

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<sup>3</sup> Meaning 'Market place' in Kiswahili.

<sup>4</sup> The comparison group were made up of potential workshop leads and workers with the same ability and skills to those who are currently working with SOKO and their selection was made thanks to the help of a chairperson most knowledgeable of the Kibera area and the handicraft sector.

<sup>5</sup> Although the sample is not representative of the whole handicraft sector in Kenya, meaning that the results cannot be too widely generalized.



significant difference. The wage gap between SOKO and non-SOKO artisans is particularly large for women. However, a more advanced analysis indicated that the difference may be caused by differences between the artisans who work with SOKO and their peers. Further investigation would be needed to conclusively pin down the role of SOKO in raising incomes.

**Vulnerability to poverty.** Both the workshop leaders and the other artisans working with SOKO tend to be slightly better off than non-SOKO artisans, even when statistical methods are used to control for differences between the two groups. However, the difference in the probability of falling below the national poverty line was only statistically significant for the workshop leaders. Given the small size of the sample, the results should be interpreted with caution. We also found that female worker artisans in both SOKO and non-SOKO workshops are more vulnerable to poverty than male worker artisans.

**Some evidence suggests that SOKO may be enabling artisans to invest in their children's future.** SOKO artisans spend more on their children's healthcare than non-SOKO artisans, and the difference is statistically significant. On the other hand, the difference between levels of spending on education was not significant once statistical matching techniques were used to control for differences between the groups.

**SOKO's trainings seem to be benefitting the artisans attending and some of their peers.** Almost all artisans mentioned having acquired specific skills from SOKO. Among the 85 SOKO artisans who mentioned they have acquired new skills; the majority were lead artisans (66%). This group benefits from direct training from SOKO. In addition, 15% of artisans affiliated with SOKO mentioned they have received training through other satellite SOKO workshops ("friends") indicating that information on skills flow well between SOKO workshops.

**SOKO aims to boost sustainability by enhancing the ability of artisans to generate revenues outside of their relationship with SOKO.** This way, SOKO's impact "footprint" exceeds the revenues earned from the company and becomes long-lasting. Most of the SOKO artisans preferred to sell their products to SOKO, which they report offers a better price. However, they also attempted to penetrate other markets- which SOKO encourages. On average, SOKO artisans generated around \$240 yearly from other markets. However, key informant interviews revealed that limitations in marketing skills make it difficult to penetrate new markets. The high cost of holding product exhibitions or running formal marketing events also makes it hard for them to "go it alone".

**Innovative uses of technology can promote sustainability.** SOKO's innovation was to provide a platform to link artisans to global value chains, by leveraging on the opportunities provided by new technologies and social media platforms. The study showed that this has boosted their livelihoods and contributed to sustainability.

## Abstract

Founded in 2012, SOKO designs jewellery and fashion accessories and supports a growing network of artisans working in low-income areas of Kenya to produce these products using ethically and sustainably-sourced materials. Finished products are sold worldwide through shops and online channels. SOKO has received finance from Novastar Ventures, a venture capital fund that is supported under the EIB's Impact Finance Envelope for Africa, the Caribbean and Pacific.

We studied the socioeconomic impacts of SOKO on lead and worker artisans in Kibera, Nairobi<sup>6</sup>, which represents one of the largest urban slums in Sub-Saharan Africa. We used mixed empirical methods combining quasi-experimental impact evaluation with key informant interviews to investigate the impact of SOKO on the socioeconomic wellbeing of its affiliated lead and worker artisans. A variety of outcome indicators, including asset ownership, children's education and health expenses, poverty likelihood, access to new markets, and compliance with the environmental, social, and governance (ESG) safety measures, were assessed. Our findings show that SOKO has a positive impact on artisans. Using ordinary least square regressions and propensity score matching techniques to compare SOKO artisans to artisans with similar socio-demographic characteristics but no SOKO affiliation, the study revealed several positive social impacts of SOKO affiliation on the livelihood of both worker and lead artisans. Our results also shed light on how artisans can use the skills they acquired through SOKO training programs to access new markets. Finally, our study highlighted the motivating factors for women to work in the traditionally male-dominated handicraft industry, and the additional challenges they face. Our findings are robust to various propensity score matching specifications.

*We would like to acknowledge the financial support of the EIB in the successful completion of this research. We would also like to thank our expert advisors Shahrokh Fardoust and Alexandros Sarris for their invaluable advice and suggestions. We are solely responsible for any remaining errors.*

*“Fashion is about dreaming and making other people dream.”*

Donatella Versace, fashion designer

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<sup>6</sup> Kibera is in the Southern part of Nairobi, Kenya.

## 1. Introduction

SOKO<sup>7</sup> is a lifestyle/jewellery brand that is dedicated to designing jewellery and fashion accessories<sup>8</sup> and supporting a growing network<sup>9</sup> of jewellery artisans in low-income areas of Kenya to produce these products using ethically and sustainably sourced materials. Founded in 2012 and registered in Nairobi by one Kenyan and two American social entrepreneurs, SOKO has rapidly expanded from the Silicon Savannah to the Silicon Valley, establishing its headquarters in San Francisco in 2015. Today, SOKO sells its fashion products to consumers globally via hundreds of fashion boutiques and large established retail chains, and directly to clients through online channels (websites). The artisans receive payment for the jewellery they produce (*asking price*<sup>10</sup>) via the popular national mobile money transfer and payment service, M-PESA.

SOKO's central innovation is its variable-cost '*virtual factory*' of remotely working artisans combined with the use of a proprietary mobile technology platform to manage the "factory". SOKO artisans typically become affiliated with the company via formal recruitment at a traditional marketplace or through a personal recommendation from already-affiliated experienced artisans ('mentors'). An innovative component of the approach to the supply chain is that SOKO then relies on smartphones<sup>11</sup> to connect the company directly with its independent artisans, manage production flows and quality control. Thus, through SOKO, a small-scale artisan in Kenya can have his/her products sold by international department stores, fashion boutiques, and online retailers. The overall aim of SOKO is to position itself on the international scene as both a technology company and a social enterprise, by expanding the market reach of craft producers in Kenya through its mobile-to-web platform<sup>12</sup> while achieving a positive change<sup>13</sup> in the livelihoods of its artisans. Small-scale craft artisans in sub-Saharan Africa face several hurdles in exercising their profession, including health hazards, high product transportation costs, unreliability of income, and several forms of exploitation by their mentors. SOKO intends to help artisans overcome such challenges by offering access to international markets to circumvent the pitfalls of the traditional market avenues.

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<sup>7</sup> Meaning 'marketplace' in Kiswahili.

<sup>8</sup> SOKO's jewellery and fashion accessories are predominantly made of brass, horn, and bone.

<sup>9</sup> As of 2018, SOKO had 60 full-time employees and 2300 artisans on contract, with an average annual growth compound rate of 92% between 2014 and 2017. SOKO's revenue has been doubling each year since 2014. (Waldman-Brown & Calter, 2018).

<sup>10</sup> SOKO's selling prices include charges for shipping and a 35% commission fee on top of the artisans' asking price.

<sup>11</sup> According to the latest statistics of the Communications Authority of Kenya (CAK) (2018), 95.1% of Kenyans have access to smartphones with an Internet penetration rate of 89.4% (2017).

<sup>12</sup> <https://shopsoko.com>

<sup>13</sup> Waldman-Brown and Calter (2018) reported that, as of 2018, SOKO's artisanal suppliers received an approximate fivefold increase in their annual income after joining the company. Moreover, one of the three SOKO co-founders mentioned in an interview with Waldman-Brown and Calter in 2018 that SOKO has contributed to social mobility by lifting most of its artisans out of poverty, moving them out of slums and improving their overall livelihoods: "They are paying their dowries for the first time, paying the school fees for their boys and girls, and putting three meals on the table every day. This is a huge point of pride."

SOKO primarily works directly with lead artisans who own their workshops. The lead artisans are responsible for overseeing all their workshop's activities and the recruitment of workers – “worker artisans”. SOKO offers various forms of support to its lead artisans, including the following programs:

- i)* Regular on-the-job training program for skills<sup>14</sup> development in using different types of machines<sup>15</sup> for higher overall jewellery quality;
- ii)* On-the-job training program in environmental, social, and governance (ESG) risks<sup>16</sup>;
- iii)* Asset financing to support artisans' needs for increased production capacity, and;
- iv)* Product delivery coordination: SOKO uses its artisan mobile application and its proprietary virtual resource planner to coordinate with the artisans in its network on all aspects of production.

It should be noted that SOKO purchases only up to 50% of the total artisans' sales. For the remaining 50%, the lead artisans sell their handicraft products by their own means, including through traditional channels.

The workshop owners are expected to transmit the knowledge and skills that they have acquired through SOKO to their worker artisans through on-site capacity building and training. Figure 1 summarizes the development of the SOKO business model over time.

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<sup>14</sup> SOKO hires field workers to train artisans in additional skills such as metalworking techniques and how to use horn and bone as jewellery materials.

<sup>15</sup> SOKO provides artisans with various sophisticated machines to ensure that the quality of their jewellery products is of the highest standard. These include quality electric drills and drill bits, tools for precision craftsmanship, precise and small soldering torches, and better measuring tools such as new rulers. The machines are loaned through asset financing by SOKO to the artisans, and payments done by deducting 25% of the artisans purchase order.

<sup>16</sup> The environmental, social, and governance (ESG) training is mainly aimed at reducing the health and safety hazards faced by artisans when undertaking their craft activities.

**Figure 1: Overview of the SOKO business model history**

Sources: Adapted from Brown and Campbell (2018) using case writers with images from Sip Dada (2011), Accompany US (2012), and Soko (2013–2018).

There is a small body of empirical evidence documenting whether the SOKO business and training model improves the skills, knowledge, market access, and overall social wellbeing of artisans, especially for worker artisans.

Using focus group discussions and key informant interviews with a sample of 28 SOKO and 22 non-SOKO artisans, Ford and Cooper (2016) found that SOKO artisans tend to have higher incomes than non-SOKO artisans. Several of the SOKO artisans mentioned using the income they had earned through SOKO to support their children's education, allowing them to remain in school. Using a similar qualitative approach based on interviews with SOKO co-founders, Waldman-Brown and Calter (2018) found that since joining the company, some SOKO artisans had moved out of the slums where they were living with their families. The SOKO co-founders also reported that some male artisans had paid their wife's dowry for the first time, sent their children back to school by paying their education fees, and provided more food to their household (with three meals on the table every day), ultimately moving the entire family out of poverty.

However, these studies relied on qualitative approaches with limited samples, which makes it difficult to draw any robust conclusions on the causal social effects of SOKO on its artisans. In addition, both studies relied on a limited number of outcome indicators as a proxy for the social changes induced by SOKO on artisans. Moreover, the two studies did not investigate the observance of environmental and social performance standards among artisans. Finally, none of the studies provided a disaggregated assessment of the social impact of SOKO on lead and worker artisans, even though it seems likely that the impacts vary significantly, given their differing respective roles in the value chain.

Therefore, in this study, we intended to fill the existing gap in the literature by taking a mixed methodological approach, combining quantitative econometric models with key informant interviews to empirically assess the causal impact of SOKO on the socioeconomic wellbeing of its artisans, with a focus on the worker artisans. Moreover, we used a diverse set of outcome indicators as a proxy for the artisans' socioeconomic wellbeing, including the Poverty Probability Index (PPI), asset ownership, and household consumption.

The findings of the study should be of broader interest because SMEs in Kenya tend to grow rapidly and have the potential to provide employment opportunities to a large share of the Kenyan adult population, including women entrepreneurs. However, to date, few empirical studies have focused on the status of women in the handicraft industry in Kenya or on the key factors hindering their full participation in this sector. Hence, in this study, we also explored potential gender differences in the impact of SOKO on artisans. Gaining new insights into gender inequalities could help the sector reach a more equitable income distribution between male and female artisans and reduce poverty incidence among women. Overall, by focusing on SOKO as a case study, our work aimed to inform the wider national (Kenyan) and sub-regional (East African) communities that are currently investing in social entrepreneurship and development impact about how the potential of these initiatives to generate social and economic returns for small-scale artisans.

## 2. Background and theoretical framework

### 2.1 The craft sector in Kenya

According to a USAID market assessment for handicrafts, the artisanal craft industry represents the second largest sector of rural employment after agriculture<sup>17</sup> in many regions of the world, with the vast majority of handicraft SMEs operating in the informal economy<sup>18</sup>. In Kenya, the informal sector employs 13.3 million people and accounts for 83% of employment (KNBS<sup>19</sup> 2016). Like most other workers in the informal economy, the socioeconomic conditions in which jewellery artisans live and work in Kenya are generally poor. In addition, artisans in Kenya face many hurdles in making a living from their craft, including a lack of appropriate skills, finance, technology, information, and access to markets as well as an unfavourable policy and regulatory environment and administrative barriers.

Information and communication technologies (ICTs), which are often identified as drivers of economic growth, present enormous opportunities in Kenya for SMEs in the handicraft sector to improve their access to markets. ICTs could help SMEs in their communication with local and international customers<sup>20</sup>, competitive positioning, acquisition and production of quality products, generation of market information, reduction of logistics costs, access to global markets, networking, market transactions, and market identification (Kiveu and Ofafa 2013). However, few SMEs in the Kenyan craft sector are harnessing the available e-commerce platforms to reach out to new customers, and the majority of leading e-commerce platforms are owned by foreigners.

The SOKO business model taps into the potential of ICTs to overcome the challenges faced by SMEs in the handicraft sector by ensuring the coordination of product delivery from the local to international markets through an innovative mobile technology-based platform.

### 2.2 Women in the handicraft sector

Women are under-represented across SME owners, and the handicraft sector is no exception. According to a 2016 KNBS survey, licensed SMEs in Kenya are predominantly owned by men (47.9%), with only 32.2% owned by women. A lack of access to productive assets such as land and credit (World Bank 2014) as well as to training opportunities (Lock and Lawton Smith 2015) are cited as the factors behind the lower participation of women in SME ownership across various sectors. Berniell and Sánchez-Páramo (2011) also identified time constraints related to women doing a disproportionately high share of household chores as a key barrier to the participation of women in business. A few other studies have documented the main challenges impeding women in developing countries from fully participating in the handicraft sector. Based on a sample of 60 female survey respondents in rural India, Datta et al. (2017) identified several major barriers facing women entrepreneurs in the handicraft industry, including inadequate training, insufficient access to information, lack of awareness about

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<sup>17</sup> USAID Global Market Assessment for Handicrafts, 2006.

<sup>18</sup> Informal SMEs are often characterized by i) the absence of official legal registration and ii) general avoidance of business taxes.

<sup>19</sup> KNBS, Kenya National Bureau of Statistics.

<sup>20</sup> In 2017, Kenya had the third highest number of online shoppers in African countries, with Nigeria and South Africa leading with 2.6 and 3.3 million online shoppers, respectively.

government support programs, work-family conflicts, legal barriers and administrative procedures, gender-based violence and women's safety.

Traditionally, women in many countries in sub-Saharan Africa have also been engaged in a broad range of small scale handicraft activities, including textile manufacturing, crocheting, embroidery, felt making, knitting, quilting, tapestry, weaving, woodcraft, paper craft, pottery, lace making, and jewellery. However, women often face barriers to scaling up their handicraft production with professionalism, with most of what they produce being used at home or locally in small scale.

In Kenya, the professional artisanal fabrication of brass and horn jewellery has primarily been a male-dominated activity. One of the main goals of SOKO's co-founders has been to bring in more women into its growing network of artisans. In 2017, a SOKO initiative that targeted and supported women with additional training opportunities resulted in the share of women-owned workshops within the network rising from 2% to 16%. While the company is still a long way off from reaching gender equity among its affiliated artisans, the share of women artisans in the SOKO network reached 26% in 2018.

During 2002-05, the United Nations Educational, Scientific, and Cultural Organization (UNESCO) ran a pilot project called "*Handicrafts as a socioeconomic and cultural development factor*" that aimed to harness the handicraft sector for empowering disadvantaged social groups, and women in particular, thereby contributing to poverty eradication. The published project outcomes by Richard (2007) highlighted the existence of gender inequalities and additional barriers holding back women entrepreneurs in the handicraft sector, limiting their potential for professional development in different parts of the world. The UNESCO report also identified a widespread lack of knowledge and awareness among national and local support institutions about the specific constraints faced by women entrepreneurs in the handicraft sector, limiting their ability to provide adequate support. The study sought to bring fresh evidence to help SOKO support its women entrepreneurs more effectively.

### **2.3 On-the-job training and earnings**

In theory, providing on-the-job training to workers can enhance their productivity (Becker, 1994), profitability (Pedro and Almeida 2006), and competitiveness so that specific organizational and personal goals can be met. The empirical evidence supports this theoretical prediction. In his seminal work on the nexus between returns from human capital investments, earnings, and productivity, Becker (1994) found that the more knowledgeable and skilled the workers are, the higher their productivity. His results indicated that on-the-job training can increase employee productivity by 9.5 to 16%. Similarly, Mincer (1962) estimated the rate of return on investment from job training in three occupations with apprenticeship programs, namely the metal, printing, and building industries. The return varied between 9 and 13%. Pedro and Almeida (2006) used panel data of 1500 large manufacturing Portuguese firms between 1995-1999 to estimate the rate of return on firms' investments formal job training. They found that the return on investment for firms that provided their workers with on-the-job training averaged 24%, compared with -7% among firms that do not provide on-the-job training<sup>21</sup>.

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<sup>21</sup> <https://openknowledge.worldbank.org/handle/10986/8742>



For workers, the expected returns from on-the-job training mainly consist in higher future earnings or incomes but also increased job satisfaction. To understand the link between earnings and on-the-job training, Becker and Chiswick (1966) suggested the dynamic economic model given below:

$$(1) E_{ij} = E_{i0} + \sum_{j=1}^n r_{ij} C_{ij} = E_{i0} + \sum_{j=1}^n r_{ij} k_{ij} E_{i,j-1}$$

where  $E_{ij}$  is the earnings of a person  $i$  in year  $j$ .  $E_{i0}$  represents the level of earnings of a person  $i$  when there was no on-the-job training investment made.  $\sum_{j=1}^n r_{ij} C_{ij}$  is the sum of annual returns from past human capital investments where  $C_{ij}$  represents the  $i^{th}$  person's rate of return from their on-the-job training investment in the  $j^{th}$  period and  $r_{ij}$  is the rate of return on this investment.

$k_j = \frac{C_j}{E_{j-1}}$  is the level of investment in year  $j$  compared to what the level of earnings would have been had there been no on-the-job training investment in that same year.

Assuming  $r_{ij} k_{ij}$  is small, Equation (1) could be approximately rewritten as follows:

$$(2) E_{ij} = E_{i0} \prod_{j=1}^n (1 + r_{ij} k_{ij})$$

which is equivalent to:

$$(3) \ln(E_{ij}) = \ln(E_{i0}) + \ln\left(\prod_{j=1}^n (1 + r_{ij} k_{ij})\right) = \ln(E_{i0}) + \sum_{j=1}^n \ln(1 + r_{ij} k_{ij})$$

Again, assuming  $r_{ij} k_{ij}$  is small,

$$(4) \ln(E_{ij}) \cong \ln(E_{i0}) + \sum_{j=1}^n r_{ij}$$

where  $r$  is the adjusted rate of return, as per the work of Becker and Chiswick (1966).

Assuming that  $r$  is constant and that the amount of investment in a given year relative to what would have been the case under no investment is constant, Equation (4) could be rewritten as follows:

$$(5) \ln(E_{ij}) = \ln(E_0) + r' n_i + U_i$$

where  $U_i$  is the idiosyncratic error term encompassing variables such as unobserved artisan abilities or any other omitted variables that might influence earnings.  $n$  is the number of investment periods.

In his seminal 1967 paper, Chiswick disentangled the impact of human capital investments between schooling (S), on-the-job training (J), and other forms of human capital. Hence, assuming the additivity of all types of human capital, Equation (5) could be rewritten as follows:

$$(6) \ln(E_{ij}) = \ln(E_0) + \sum_{s=1}^S r'_{i,s} + \sum_{s=1}^J r'_{i,j} + U_i = \ln(E_0) + \sum_{s=1}^S r_s k_s + \sum_{j=1}^J r_j k_j + U_i$$

Mincer (1974) later showed that assuming  $k_t = k_0 - \frac{k_0}{T^*} T_t$ , with  $k_t$  representing the investment ratio in the year  $T$  of on-the-job training, then the earning equation could be rewritten as follows:

$$(7) \ln(E_{it}) = \ln(E_{i0}) + r_s k_s S_i + (r_j k_0) T_i - \left(\frac{r_j k_0}{2T^*}\right) T_i^2$$

where  $S_i$  is the length of schooling for artisan  $i$ ,  $T_i$  is the length of on-the-job training, and  $r_j$  is the rate of return from on-the-job training.

Several studies have estimated the Mincer earning functions above and found that formal education and on-the-job training explain the observed variations in wages. For example, in an empirical investigation conducted in Sweden, Regner (2002) found a statistically significant positive relationship between on-the-job training and wages, with larger effects being observed for general training compared to specific training. In a similar study, Blundell et al. (1996) found that personal returns from vocational training are significant, with trained workers reporting a salary that was on average 5% higher than that of workers that did not undertake training.

Overall, On-the-job training provides employees with the opportunity to develop new knowledge and skills and keep up with the latest technological innovations in their niche or sector and here as well, women may be at a disadvantage. In another study, as noted previously, employers were found to be more reluctant for female than for male employees to invest in training tailored to the needs of the firm (Ehrenberg and Smith 1994). There is strong evidence that women are offered less on-the-job training than men, even though, in recent years, this gap may have been narrowing.

### 3. The theory of change

We built a theory of change to capture the impact of SOKO on the socioeconomic conditions of its affiliated artisans, by adapting the SOKO impact value chain proposed by Ford and Cooper (2016) and Brown and Campbell (2018). As illustrated in Table 1, we described, under specific assumptions, the channels through which the SOKO business model and the various forms of support that the company offers to its affiliated artisans (inputs) can yield positive individual social changes (impacts).

**Table 1: Theory of change for SOKO's business**

<b>Inputs</b>	<b>Outputs</b>	<b>Outcomes</b>	<b>Final outcomes (Impacts)</b>
SOKO mobile platform SOKO technical support team (including field officers) SOKO working capital for purchasing equipment, reaching up to 50% of the artisans' capital SOKO training in Environmental, Social, and Governance (ESG) safety measures and product development for lead artisans, with the subsequent on-the-job-training of workers under the supervision of lead artisans SOKO provision of sophisticated craft machines through asset financing (e.g., quality electric drill and bits, tools for precision craftsmanship, precise soldering torches, better measuring tools, etc.) SOKO San Francisco-style product design	Artisans' access to markets, locally and internationally Production of standardized, high-quality jewellery by artisans Improved artisans' skills and abilities Reduction of workplace injuries/incidents	Increased revenues and profits for artisans Increased revenues and profits for SOKO	Improved quality of life/wellbeing for SOKO's direct (lead and worker artisans) and indirect beneficiaries (the artisans' families) using the PPI or asset ownership as a proxy, hence contributing to Sustainable Development Goal (SDG) 1 Enhanced food security and increased health and education expenditures in the artisans' households, including for children, hence contributing to SDGs 2, 3, and 4
<b>Implementation (Supply side)</b>			<b>Results (Supply + Demand side)</b>

#### **Assumptions:**

Artisans will use the machines supplied by SOKO to produce jewellery.

The SOKO technical team will be available to support artisans on quality standards.

Artisans will use the technical skills provided by SOKO to develop quality products.

There will be consistent demand for the artisans' products over time.

The artisans will be able to deliver products based on the designs approved by SOKO.

### **3.1. Inputs**

SOKO provides its artisans with up-to-date and sophisticated machines to ensure that the quality of their jewellery is of the highest standard. These pieces of equipment include quality power tools, such as the electric drill and bits, soldering stations, tools for precision and measuring (Vernier callipers and ring sizers). SOKO also provides artisans with technical support and working capital reaching up to 50% of the total order value. Lead artisans affiliated with SOKO are also offered training on ESG standards and product development. In turn, SOKO lead artisans supervise<sup>22</sup> and provide on-the-job training to worker artisans. Finally, SOKO provides lead artisans with product designs made in San Francisco and a mobile platform to manage production flows and quality control.

### **3.2. Outputs**

With these technical and human capital inputs received from SOKO, workshop owners are able to access international markets and produce standardized, high-quality jewellery. In turn, most importantly, through the supervision and on-the-job training that they receive from lead artisans, worker artisans can build up their skills and enhance their technical capacity.

### **3.3. Outcomes**

The greater ability of SOKO lead artisans, and indirectly worker artisans, to access international markets and sell their standardized high-quality jewellery results in an increase in their incomes and profits. In 2018, the annual income of SOKO artisans increased by five times after joining the company (Waldman-Brown & Calter 2018).

### **3.4. Final outcomes or impacts**

In the short and medium terms, the improvement of artisans' incomes will help to lift them out of poverty by allowing them to raise their expenditure to meet basic household needs. It will also boost in health and education.

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<sup>22</sup> Most lead artisans in their respective workshops have on average three to five worker artisans working either full-time or part-time, with a maximum of 10 workers in the largest micro factories.

## 4. Research questions

In close collaboration with SOKO<sup>23</sup>, we defined a set of research questions aimed at rigorously assessing the impact of the SOKO business model on artisans. SOKO was particularly keen to understand how its work contributes to sustainability. For SOKO, sustainability means developing artisans' capacity so that, over time, they depend less on the company and become better able to earn money outside of their working relationship. Hence, SOKO believes that in the long term, its impact on affiliated artisans will exceed the revenues they generate from selling their handicraft via SOKO. Overall, SOKO strongly believes that it is important to avoid making artisans dependent on their custom for revenues.

SOKO also expressed an interest in gaining a better understanding of how the different activities of the company could be improved, especially in terms of the artisans' perceptions of the SOKO business model. Finally, SOKO was keen to know whether artisans are aware of the value of observing ESG safety requirements.

### 4.1. Primary research questions

Our primary research questions focused on sustainability, with the aim of understanding the following aspects:

- (i) For artisans, what are the main impacts of SOKO affiliation on income, skills, access to healthcare and education, and ultimately, poverty status?
- (ii) Which additional options are available to artisans for diversifying their income?
- (iii) What are the motivating factors and challenges for women to participate in the handicraft (jewellery) sector, and is there a differentiated impact of SOKO by gender?

### 4.2. Secondary research questions

Our secondary research questions focused on environmental and safety measures, as follows:

- (i) Do artisans value the ESG safety policies promoted by SOKO, and do these perceptions differ between the lead and the worker artisans?
- (ii) How often do SOKO artisans observe ESG safety practices, and how does this observance differ from that of artisans not affiliated with SOKO?

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<sup>23</sup> The research team met on several occasions with SOKO to plan the research questions that should receive priority attention. This was a necessary undertaking to ensure the research was useful and informative to SOKO.

## 5. Data

### 5.1. Data collection

To empirically assess the causal impacts of SOKO on artisans, we used a mixed method approach.<sup>24</sup> First, we performed a quantitative assessment, in which we used a field survey and an “*as if random*” impact evaluation framework to estimate the impact of SOKO on a range of indicators capturing socioeconomic outcomes for artisans. This approach involved building a sample of lead and worker artisans to serve as a counterfactual or control group for SOKO artisans. We used a convenience and snowballing sampling technique to identify SOKO artisans for interviewing. We focused our study on the geographical area known in Kenya as the biggest<sup>25</sup> and main hub for artisans, whether affiliated or not with SOKO: the Kibera artisan market. In close collaboration with SOKO and the Kibera market chairperson<sup>26</sup>, who was knowledgeable about the handicraft sector in Kibera, we were able to locate all the SOKO artisans working in the Kibera market, as well as the non-SOKO artisans that engaged in similar crafts and had similar entrepreneurial skills<sup>27</sup> to those of the SOKO-affiliated artisans. Through several follow-up attempts, including by phone, to reach out to the artisans who were not physically present in the market at the time of the survey, we succeeded in surveying all SOKO and non-SOKO artisans working in the Kibera artisan market. Altogether, we collected data on all 192 artisans operating in the handicraft sector in the Kibera neighbourhood. The majority of interviewees were affiliated with SOKO (101 artisans, representing 53% of the survey sample), versus 47% of non-SOKO artisans (91). The collected data covered a range of socioeconomic outcomes, including basic demographic information on the artisans and their household, educational level, access to food, technology, and healthcare, skill development, and observance frequency of ESG safety standards. The quantitative data collection was done over 3 weeks during spring 2019 (March-April) in Kibera. This was the most suitable season identified by the SOKO team to mobilize artisans and guarantee a high response rate to our survey. We hired the services of a survey firm in Nairobi that was familiar with the local area and workshops. In doing so, we overcame one of the limitations pointed out by Ford and Cooper (2016) in their study: their survey was conducted by a female lead researcher who was not from Kenya and could have been perceived as an outsider, which could have affected the data quality.

In our study, data were recorded digitally using KOBO Toolbox, a free open-source tool for mobile data collection providing a computer-assisted personal interface with mobile phones and tablets. Due to language barriers, most of the questions were translated into Kiswahili, the predominant local language in Nairobi. Standardized translations were used to ensure consistency in the data collection and recording of responses. Prior to data collection, the survey enumerators were guided through the questionnaire and a piloting of the tool during a two-day training program. The training was offered jointly by the research team, the survey firm, and the SOKO team, with the latter also providing enumerators with context information on the company operations. During the training phase, each enumerator was allocated several artisan workshops within the Kibera area for data collection. All the

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<sup>24</sup> Evaluations that integrate quantitative and qualitative analysis are defined as mixed (Bamberger, Rao, and Woolcock 2010).

<sup>25</sup> Also, one of the biggest in terms of SOKO operations.

<sup>26</sup> The Kibera market chairperson is the representative leader of all the artisans in the market. He is also known as the artisans’ coordinator.

<sup>27</sup> Based on Ford and Cooper (2016) descriptive findings of SOKO artisans, we made sure that non-SOKO artisans knew how to work with glass beads and metals (brass and aluminium), ceramic beads, bone, and other organic materials.

enumerators' allocated tasks were validated by a team leader, who checked the overall accuracy and consistency of the collected data before submitting it to the survey firm's lead data analyst. We used the quantitative software STATA<sup>28</sup> to perform the data cleaning and analysis. During the data collection phase, we noted that most workshops did not actually employ any workers. In other cases, the lead artisans did not want their workers to be interviewed. To overcome these challenges and minimize the rate of refusal and missing data, the field enumerators paid repeated visits to the workshops. Additionally, the reluctance of lead artisans to cooperate with the enumerators was overcome thanks to a small-scale sensitization campaign run by the SOKO management team on the importance of the survey.

As the second component of our mixed-method approach, we hired the services of the same Nairobi-based survey firm to undertake, over the summer (July-August 2019), a qualitative survey consisting of one-on-one key informant interviews. We used a convenient/purposive sampling approach to identify a sub-sample of SOKO and non-SOKO artisans that we considered to be key informants. Altogether, 26 male and 6 female SOKO and non-SOKO artisans were interviewed. Like for the quantitative data collection, enumerators were taken through a two-day training program that included the pre-testing of qualitative tools. The survey firm extracted the qualitative data from the transcribed interview notes and the research team analysed them thematically.

## 5.2. Descriptive statistics

In our quantitative survey, we interviewed all 192 artisans working in the handicraft sector in the Kibera market. Of them, 101 artisans were affiliated with SOKO, with the remaining 91 having no SOKO affiliation. In both the SOKO and non-SOKO workshops, the majority of artisans were lead artisans, with a total of 61 lead artisans and 40 workers in the SOKO group and 58 lead artisans and 33 workers in the non-SOKO group. Table 2 compares the distribution of various socio-demographic and professional characteristics between SOKO and non-SOKO artisans by their status in their respective workshop (worker or lead).

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<sup>28</sup> STATA is a general-purpose statistical software package that was created in 1985 by StataCorp. STATA is best suited for analysing data from surveys of small and large households or firms.

**Table 2: Distribution of artisans by socio-demographic and economic characteristics**

Variables (characteristics)	IN SOKO WORKSHOPS			IN NON-SOKO WORKSHOPS			ENTIRE SAMPLE
	Lead artisans Total number Percentage of lead artisans with characteristic / share of artisans with characteristic that have lead status	Worker artisans Total number Percentage of worker artisans with characteristic / share of artisans with characteristic that have worker status	All Total number Percentage of artisans with characteristic / share of artisans with characteristic that are in SOKO workshops	Lead artisans Total number Percentage of lead artisans with characteristic / share of artisans with characteristic that have lead status	Worker artisans Total number Percentage of worker artisans with characteristic / share of artisans with characteristic that have worker status	All Total number Percentage of artisans with characteristic / share of artisans with characteristic that are in non-SOKO workshops	Total number Total percentage of artisans
Artisan is female==Yes	3 4.91% / 60%	2 5% / 40%	5 4.95% / 35.71%	6 10.34% / 66.67%	3 9.09% / 33.3%	9 9.89% / 64.28%	14 7.29%
Artisan is married==Yes	53 86.89% / 69.74%	23 57.50% / 30.26%	76 75.21% / 52.41%	51 87.93% / 73.91%	18 54.55% / 26.09%	69 75.82% / 47.59%	145 75.52%
Artisan lives with their family==1	52 98.11% / 72.22%	20 86.96% / 27.78%	72 94.74% / 52.33%	52 98.11% / 82.54%	11 61.11% / 17.46%	63 88.73% / 46.67%	135 91.84%
Average number of children	2.92	1.73	2.57	3.66	2.27	3.3	2.93
Artisan has at least one child ==Yes	51 96.23% / 71.83%	20 90.91% / 28.17%	71 94.67% / 51.45%	52 98.11% / 77.62%	15 83.33% / 22.38%	67 94.37% / 48.55%	138 94.52%
Number of years with their main company >1 year==Yes	57 93.44% / 65.51%	30 75% / 34.48%	87 86.14% / 53.70%	54 93.10% / 72%	21 63.64% / 28%	75 82.42% / 46.30%	162 84.38%
Artisan has a vocational or higher education level ==Yes	12 19.67% / 92.31%	1 2.50% / 7.69%	13 12.87% / 65%	4 6.90% / 57.14%	3 9.09% / 42.86%	7 7.69% / 35%	20 10.42%
Artisan has a secondary or post-primary education level ==Yes	7 11.48% / 46.67%	8 20% / 53.33%	15 14.85% / 42.86%	10 17.24% / 50%	10 30.30% / 50%	20 21.98% / 57.14%	35 18.23%
Artisan has a primary 8 or higher education level ==Yes	34 55.74% / 54.84%	28 70% / 45.16%	62 61.39% / 53.91%	36 62.07% / 67.93%	17 51.52% / 32.07%	53 58.24% / 46.09%	115 59.90%
Artisan has an education level below primary 8 ==Yes	8 13.11% / 72.73%	3 7.50% / 27.27%	11 10.89% / 50%	8 13.79% / 72.73%	3 9.09% / 27.27%	11 12.09% / 50%	22 11.46%

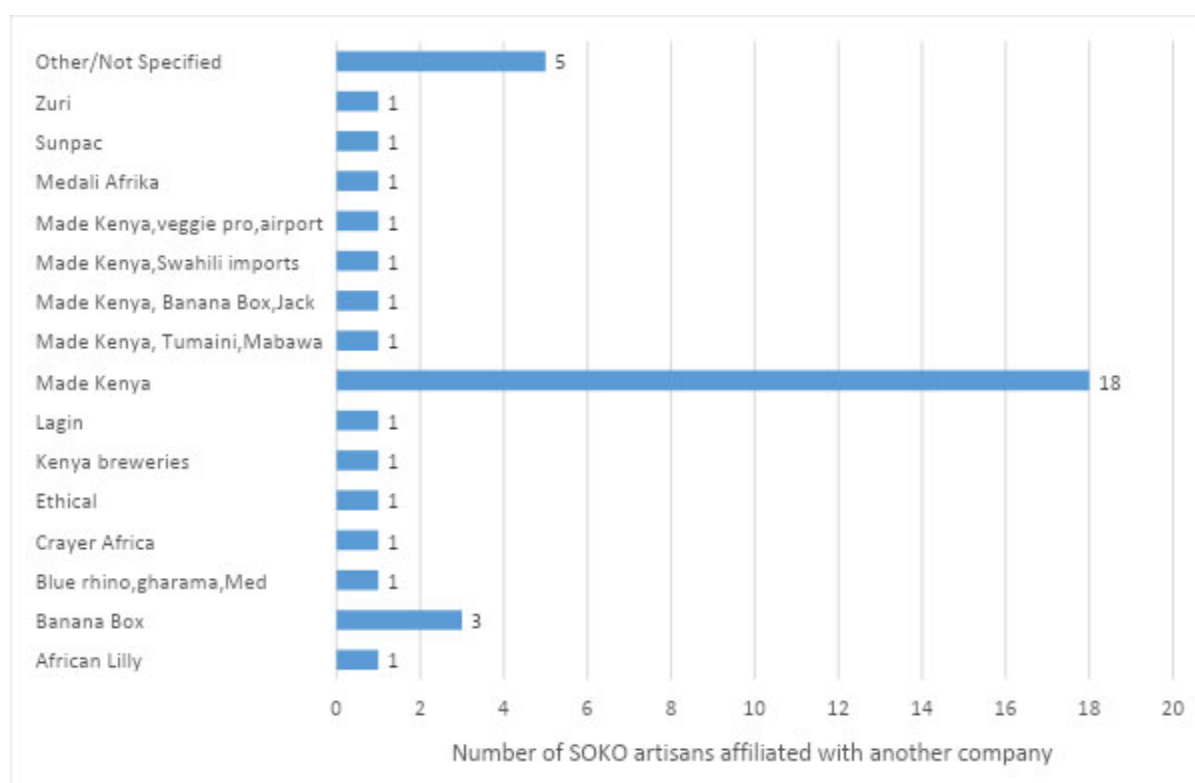


As shown in Table 2, only 14 artisans (7.29%) across both SOKO and non-SOKO workshops were female. This finding corroborates established knowledge that the professional handicraft sector is male-dominated. However, we do observe more female artisans are working in the non-SOKO workshops (10%), compared to the SOKO workshop that has only 5% of artisans as female. On the level of education, majority of the artisans (60%) have only attained a primary 8 (upper primary school) level of education and 10.42% of the artisans having reached vocational college or higher education level.

The majority (over 70%) of the artisans from SOKO affiliated workshops and non-SOKO workshops live within close proximity of their work place. Thus, the majority of them can access their workshops, which are within 2km from their residence by foot. (Table A1 in Annex).

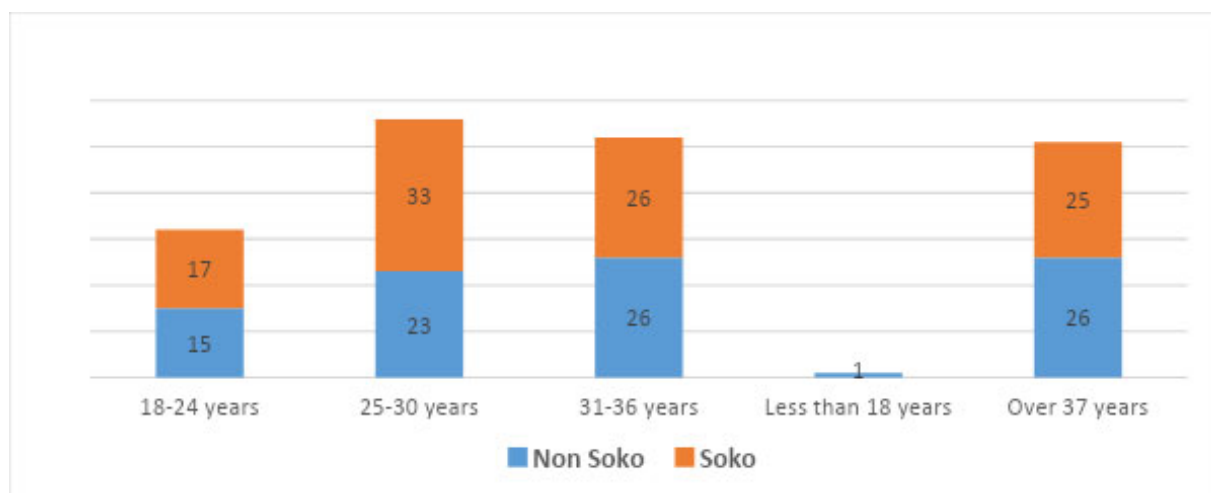
Among SOKO artisans, 38.61% mentioned having worked for companies other than SOKO. Top of the list of these other companies was *Made Kenya*, which was by far the most commonly reported former employer of SOKO artisans (Figure 2).

**Figure 2: Number of SOKO artisans reporting they have ever worked for another company apart from SOKO**



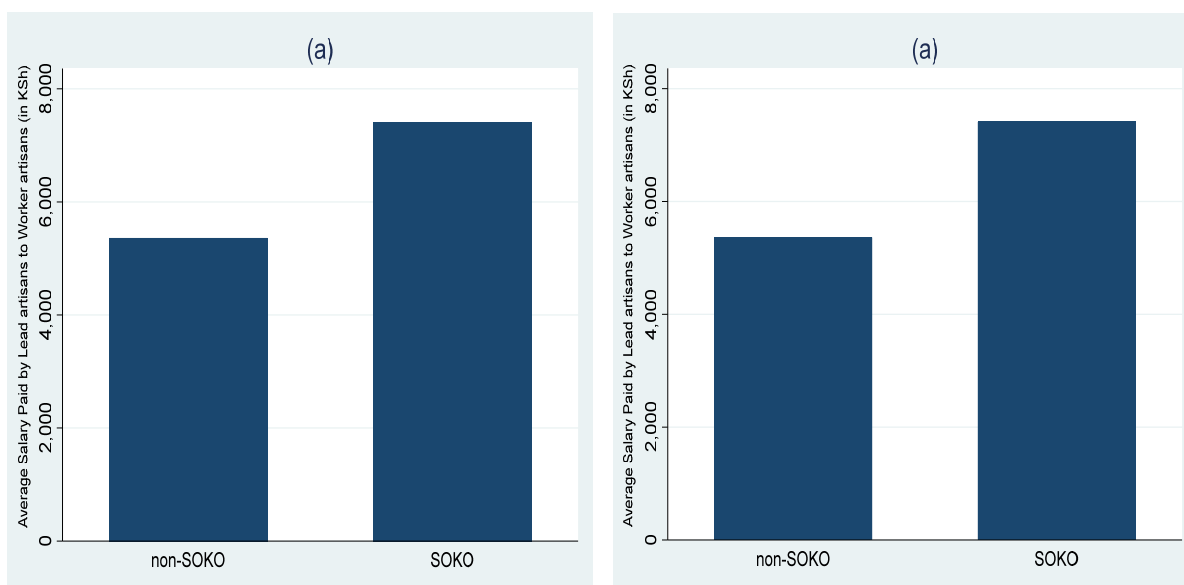
Altogether, 73.44% of artisans were aged 37 or younger (Figure 3), with lead artisans having an older age distribution than worker artisans.

**Figure 3: Age distribution, by SOKO affiliation**



The lead artisans that belonged to the SOKO network reported paying a higher salary to their workers, on average, than non-SOKO lead artisans (Figure 4). The average monthly income was 7411 Kenyan shillings (KSh) (almost \$74) per month and 5362 KSh (almost \$54) per month for SOKO workers and non-SOKO workers, respectively. This represented a monthly wage difference of almost 2048 KSh (about \$20.5), which was statistically significant at the 10% threshold. The wage gap<sup>29</sup> between SOKO and non-SOKO artisans was wider among female workers than among male workers. On average, SOKO female workers were receiving up to 4500 KSh (about \$45) more than their non-SOKO female counterparts, whereas SOKO male workers were only receiving up to 2089 KSh (about \$21) more than their non-SOKO male counterparts. However, the differences were not statistically significant (reflecting the small sample size).

**Figure 4: Average monthly salary received by worker artisans in Kenyan shilling (KSh), by SOKO affiliation (a) and by gender (b)**



<sup>29</sup> Defined as the difference in average monthly salary between the two groups.

## 6. Impact of SOKO on artisans' wellbeing

### 6.1. Empirical strategy

We studied the impact of SOKO on the socioeconomic wellbeing of artisans, with a focus on the artisans that had less experience and worked under the mentorship of lead artisans—the workers. We used a three-step empirical strategy. First, we used a simple statistical t-test of difference in means of two populations to compare artisan outcomes in the SOKO and non-SOKO groups. Second, drawing from our theoretical framework on returns of investment on employees' training described above, we used a multivariate econometric regression controlling for various covariates that were likely to affect artisans' wellbeing<sup>30</sup>. The regression was as follows:

$$Y_i = \beta_0 + \beta_1 \cdot Soko_i + \beta_2 \cdot Worker_i + \beta_3 \cdot Worker_i * Soko_i + \beta_3 X_i + \varepsilon_i$$

where  $\beta_1$  represents the impact of SOKO on artisans, *ceteris paribus*.  $Y_i$  measures any of the socioeconomic outcome indicators (e.g., poverty likelihood ratio, expenses on food, housing, and transportation, asset ownership, and children's health and education expenditures) for the artisan  $i$ . These variables are either continuous or discrete/dichotomous.  $Soko_i$  is a binary variable that takes the value 1 if the artisan  $i$  belongs to the SOKO network, and 0 if otherwise.  $Worker_i$  is a binary variable that takes the value 1 if the artisan  $i$  is a worker operating under the supervision of a lead artisan in either a SOKO or non-SOKO workshop, and 0 if otherwise.  $Worker_i * Soko_i$  is an interaction term to measure the differentiated impact of SOKO on worker artisans.  $X_i$  is a set of household-level covariates including gender, age, level of education, marital status, the number of children, and whether or not the artisans live with their family.  $\varepsilon_i$  is the idiosyncratic error term encompassing measurement errors due to factors such as the type of survey instrument used for data collection or potential memory recall biases.

We also used a quasi-experimental impact evaluation method, namely propensity score matching with three main specifications to carry out robustness checks and sensitivity analysis. The three main specifications were *i*) nearest neighbour matching, *ii*) stratification matching, and *iii*) radius matching. The intention was to estimate a causal impact of SOKO on artisan well-being.

While propensity score matching could be seen as one type of multivariate regression, the main advantage of using it in our study was that it put more weight on those artisans within the non-SOKO comparison group that are most similar to the SOKO-affiliated (treatment) artisans based on observable characteristics ( $X_i$ ).

Because we matched SOKO and non-SOKO participants located within the same geographical area (Kibera), we were not concerned about the possibility that there could have been any shock affecting the group of SOKO artisans and not the comparison group of non-SOKO artisans. Hence, we assumed that our matching variables were good enough to explain the differences between the two groups of artisans, with chance being the only remaining factor. In addition, it is also quite unlikely that non-SOKO artisans differed from SOKO artisans on many unobservable characteristics such as motivation,

<sup>30</sup> Income; food, housing, and transport expenses as well as the Poverty Probability Index (PPI) were used as proxies for to artisans' socioeconomic wellbeing.

attitudes, and expectations that would be correlated with our different outcomes of interest even after controlling for observables in  $X_i$ .

Thus, we estimated the probability  $p$  of being affiliated or not with SOKO as a function of observable characteristics  $X_i$  using a logit discrete choice model, as follows:

$$p(X_i) = Pr(Soko_i/X_i) = \beta_0 + \beta_1 \cdot X_i + \varepsilon_i$$

We used the estimated coefficients to generate the predicted value  $\hat{p}(X_i)$  called the propensity score for each artisan  $i$  belonging to SOKO or not. Overall, the matching consisted in finding, for each artisan  $i$  affiliated with SOKO, another artisan  $j$  not affiliated with SOKO with the closest value (preferably not differing by more than 1/1000) on the propensity score, that is  $\hat{p}(X_i) \cong \hat{p}(X_j)$ . We then restricted the sample to ensure a common support<sup>31</sup> (Figure A1 in Annex) by only keeping the range of values for the propensity score including both SOKO and non-SOKO artisans. Hence, after matching, we were confident enough that the difference in any of our socioeconomic outcome indicators of interest between each SOKO artisan and his/her match was the estimated gain or loss attributable to his/her affiliation with SOKO. Furthermore, the mean of these individual gains or losses was the causal average treatment effect of SOKO on SOKO artisans (or the so-called average treatment effect on the treated (ATT), as it does not tell us the impact on non-SOKO artisans that do not sufficiently resemble SOKO artisans).

For robustness check purposes, we used nearest neighbour matching, stratification matching, and radius matching by also estimating bootstrapped<sup>32</sup> standard errors with 100 repetitions and by restricting our analysis sample to the common support. This allowed us to check the sensitivity of our estimates and to ascertain the overall accuracy of our results. For each of the econometric regressions, our matching covariates were similar to those in  $X_i$ .

### 6.1.1. Nearest neighbour matching

Nearest neighbour matching allowed us to match or pair an artisan in the SOKO treatment group with another, 'closest' artisan in the non-SOKO group. Let us assume  $p_i$  and  $p_j$  are propensity scores respectively for an artisan  $i$  in the SOKO treatment group and an artisan  $j$  in the non-SOKO group, with  $i$  belonging to  $I_1$  (the set of SOKO artisans) and  $j$  belonging to  $I_0$  (the set of non-SOKO artisans). We defined a neighbourhood  $C(P_i)$  which contained a non-SOKO artisan  $j$  ( $j \in I_0$ ) as a match for a SOKO artisan  $i$  ( $i \in I_1$ ) if the absolute difference of propensity scores was the smallest among all possible pairs of propensity scores between  $i$  and  $j$  such as:

$$C(P_i) = \{j \in I_0 \mid \|p_i - p_j\| \leq \|p_i - p_k\|, \forall k \in I_0\}$$

Once an artisan  $j$  in the non-SOKO group was found to match an artisan  $i$  in the SOKO group, that artisan  $j$  was removed from  $I_0$  without replacement. In the event that for each artisan  $i$  in the SOKO group there was only a single artisan  $j$  from the non-SOKO group which was found to fall into  $C(P_i)$ , then the nearest neighbour matching would be called a pair, or one-to-one, matching. Otherwise, if

<sup>31</sup> Altogether, we had 70% (135 artisans) of observations on the common support.

<sup>32</sup> Bootstrap is a statistical resampling method, which refers to any test or metric that uses random sampling with replacement of observations to assign measures of accuracy (confidence intervals, standard error, etc.) to sample estimates.

for each artisan  $i$  in the SOKO group, we found  $n$  non-SOKO artisans falling into  $C(P_i)$  as matches, then the nearest neighbour matching would be said to be a one-to-many matching. In practical terms, using the statistical software STATA, we implemented the nearest neighbour algorithm of Becker and Ichino (2005). Nearest neighbours are not identified by comparing each SOKO artisan to every single non-SOKO artisan, but rather by first sorting all observations (artisans) by the estimated propensity score and then searching forward and backward for the closest non-SOKO artisan(s) in the control group. If for an artisan  $i$  in the SOKO treatment group, forward and backward matches happened to be equally good, then the algorithm randomly drew either the forward or backward matches.

### 6.1.2. Radius matching

In the previous definition of matching, we did not assign or impose any restrictions on the distance between  $p_i$  and  $p_j$ . This implies that even if  $\|p_i - p_j\|$  was large or, in other words, a non-SOKO artisan  $j$  was very different on the estimated propensity score to a SOKO artisan  $i$ , the non-SOKO artisan  $j$  was still considered a good match to the SOKO artisan  $i$ . Therefore, to overcome bias that might arise from wrongly identifying the suitable non-SOKO artisan  $j$  in the control group, we selected the SOKO artisan  $i$  as a match for the non-SOKO artisan  $j$  only if the absolute distance of propensity scores between the group of SOKO and non-SOKO artisans complied with the following condition:

$$\|p_i - p_j\| < \epsilon$$

Where  $\epsilon$  is a pre-specified tolerance for matching, also known as caliper.<sup>33</sup>

Radius matching is a variant of caliper matching that was developed by Dehejia and Wahba (2002). The rationale behind radius matching is to use not only the nearest neighbour within each tolerance level or caliper, but rather all of the comparison non-SOKO artisans within the caliper. Radius matching therefore made it possible to use more (or fewer) artisans when good matches were (or were not) available and avoided the risk of bad matches between artisans. We computed the ATT using the algorithm from Becker and Ichino (2005) implemented in STATA. The algorithm allowed us to restrict the analysis to those SOKO artisans matched to “control”<sup>34</sup> non-SOKO artisans that lay within a defined radius.<sup>35</sup>

### 6.1.3. Stratification matching

Stratification matching, which is also known as interval, blocking, or sub-classification matching, consists in partitioning the common support of the propensity score into different sets of intervals, or strata, and taking the mean difference in outcomes between the treated and control observations within each interval. Determining the optimal number of subclasses or strata to use has often been a challenge for the proper implementation of stratification matching. However, Cochrane and Chambers (1965) have shown that five subclasses are usually enough to remove 95% of the bias associated with one single covariate. In this study, we followed Aakvik (2001) and determined our choice of strata number by checking the balance of the propensity score within each stratum.

<sup>33</sup> Rosembaum and Rubin (1985) recommended using 0.25xstandard deviation of the estimated propensity score of the analysis sample as the caliper size.

<sup>34</sup> In the event of multiple best controls, the average outcome of those controls was used.

<sup>35</sup> We followed Becker and Ichino (2005) and used 0.1 as a predefined radius.

## 6.2. Main findings

The findings section is organized based on the primary and secondary research questions. Sections 6.2.1 to 6.2.3 focuses on the primary research question: the impact of SOKO affiliation on income, skills, access to healthcare and education, and ultimately, poverty status; diversification of income by the artisans and then lastly the motivating factors and challenges for women to participate in the handicraft sector. Sections 6.2.4 to 6.2.7 focus on the secondary research questions: the value of ESG safety policies promoted by SOKO, and how the perceptions differ between the lead and the worker artisans. The findings detail how frequently SOKO artisans observe ESG safety practices, and this observance differs from that of artisans not affiliated with SOKO.

### 6.2.1 Impact of SOKO affiliation

This section discusses the impact of SOKO on the artisan's livelihoods, addressing the first primary research question 'impacts of SOKO affiliation on income, skills, access to healthcare and education, and ultimately, poverty status'. In summary, the findings show that:

1. SOKO and non-SOKO artisans were similar in terms of their spending priorities. They focus on basic needs such as food, clothing, housing, school fees, medical service and support dependents. However, artisans affiliated with SOKO spend more on housing than their peers, and this difference was statistically significant. Based on regression analysis, we found that worker artisans affiliated with SOKO spend an average of 609 KSh more on housing than non-SOKO workers or around 689 KSh based on radius matching. There was no statistically significant difference between SOKO and non-SOKO lead artisans (see section 6.2.1.2 for detailed analysis).
2. SOKO lead artisans are less likely to be poor than their peers who do not work for SOKO. The findings are robust to controlling for differences in the characteristics of these groups using linear regression and propensity score matching. However, for the worker artisans, the evidence is more mixed. There is clear evidence that they are less likely to fall into extreme poverty than workers not affiliated with SOKO, but when we control for differences between the groups there is no statistical difference between SOKO and non-SOKO among the worker artisans (see section 6.2.1.1 below for detailed findings).
3. SOKO lead artisans spend more on their children's education and on healthcare than lead artisans who are not affiliated with SOKO. The findings were similar even after applying propensity matching by restricting the sample of analysis to the common support and bootstrapping (see section 6.2.1.3 for detailed analysis).

#### 6.2.1.1 Impact of SOKO on artisans' vulnerability to poverty

To understand the impact of SOKO on poverty status, we proxied the poverty status of artisans using the PPI<sup>36</sup> at different thresholds, namely the national, food, less than \$ 1.90, and less than \$5.50 poverty lines. We used a simple T-test to compare the average poverty likelihood ratio between SOKO and non-SOKO lead artisans using different poverty lines (Table 3). On average, non-SOKO lead artisans

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<sup>36</sup> Poverty Probability Index (PPI) is based on a statistical model calibrated using the most recent national consumption survey data of a given country. The responses correspond to a pre-defined score ranging from 0 to 10 depending on the response (Figure A3 in Annex).

had a higher likelihood of their household's expenditure level falling below the national, the food, \$1.90 a day, and \$5.50 a day poverty lines than SOKO lead artisans. This difference was statistically significant across all poverty lines.

**Table 3: Difference in means of PPI between SOKO and non-SOKO lead artisans**

Poverty Line	Non-SOKO lead artisans	SOKO lead artisans	Overall	Non-SOKO lead artisans vs. SOKO lead artisans	p-value
PPI, national poverty line	13.779 (1.684)	9.351 (0.792)	11.509 (0.934)	4.428** (1.861)	0.019
PPI, food poverty line	1.171 (0.289)	0.523 (0.088)	0.839 (0.151)	0.648** (0.303)	0.034
PPI, \$1.90 poverty line per day	6.259 (1.152)	3.762 (0.472)	4.979 (0.619)	2.496** (1.245)	0.047
PPI, \$5.50 poverty line per day	55.100 (2.635)	47.995 (2.162)	51.458 (1.720)	7.105** (3.408)	0.039
N	58	61	119	119	

Notes: These results are based on a simple T-test. Standard errors are in parentheses; \* p-value < 0.1, \*\* p-value < 0.05, \*\*\* p-value < 0.001.

There are no statistically significant differences found between SOKO and non-SOKO workers in the likelihood of their household's expenditure level falling below the different poverty lines, even though the average poverty likelihood ratio was higher for non-SOKO worker artisans than for SOKO worker artisans (Table 4). Regardless of SOKO affiliation, worker artisans generally had a higher poverty likelihood ratio than lead artisans.

**Table 4: Difference in means of PPI with different poverty line between SOKO and non-SOKO worker artisans**

Poverty Line	Non-SOKO worker artisan	SOKO worker artisan	Overall	Non-SOKO worker artisans vs. SOKO worker artisans	p-value
PPI, national poverty line	16.891 (2.522)	14.915 (1.892)	15.808 (1.534)	1.976 (3.151)	0.533
PPI, food poverty line	2.021 (0.721)	1.615 (0.493)	1.799 (0.421)	0.406 (0.873)	0.643
PPI, \$1.90/Day 2011 PPP <sup>a</sup>	8.882 (2.026)	7.730 (1.539)	8.251 (1.238)	1.152 (2.543)	0.652
PPI, \$5.50/Day 2011 PPP	58.003 (3.748)	56.845 (2.948)	57.368 (2.325)	1.158 (4.766)	0.809
N	33	40	73	73	

Notes: These results are based on a simple T-test. Standard errors are in parentheses; \*p-value < 0.1, \*\* p-value < 0.05, \*\*\* p-value < 0.001; <sup>a</sup>PPP, purchasing power parity.

We used a multiple linear regression model to control for gender, age, marital status, educational level, number of children, and whether the artisans lived with their family (Table A3 in Annex). Controlling for these factors, worker artisans not affiliated with SOKO had a food poverty likelihood ratio that was 1.51 higher than that of SOKO worker artisans, a difference that was statistically significant at the 10% threshold. The point estimates for the other poverty lines (national, \$1.90/ day, \$5.50/day) corroborated our main findings, suggesting a higher poverty likelihood ratio for non-SOKO workers than for SOKO workers, but the differences between the two groups were not statistically significant for these poverty lines. When applying different propensity score matching specifications to the overall sample of artisans, we found that across all poverty lines and across different matching specifications, SOKO artisans had a lower poverty likelihood ratio than non-SOKO artisans (Table 5). These differences were consistently significant at the 5% significance threshold.



**Table 5: Average treatment effect on the treated (ATT) of SOKO affiliation on the PPI Poverty Likelihood Ratio for all artisans**

Poverty line	Nearest neighbour matching	Stratification matching	Radius matching
PPI, national poverty line	-8.779** (3.568)	-5.962** (2.003)	-3.751** (1.661)
PPI, food poverty line	-1.621** (0.727)	-1.134** (0.548)	-0.610** (0.296)
PPI, \$\$1.90/Day 2011 PPP <sup>a</sup>	-5.960** (2.461)	-3.899** (1.563)	-2.291** (1.163)
PPI, \$\$5.50/Day 2011 PPP	-11.000** (4.669)	-7.601** (3.182)	-5.674** (2.931)

Notes: <sup>a</sup>PPP, purchasing power parity. These results are based on propensity score matching. Standard errors are in parentheses; \*p-value < 0.1, \*\* p-value < 0.05, \*\*\* p-value < 0.001.

When restricting our analysis to the sample of worker artisans, we found a null effect but when restricting the sample our analysis to lead artisans, we found from Table 6 below that across all propensity score matching specifications and all poverty lines, SOKO lead artisans always had a lower poverty likelihood ratio than non-SOKO lead artisans with these differences being consistently statistically significant at all statistical conventional thresholds.

**Table 6: Average treatment effect on the Treated (ATT) of SOKO affiliation on the PPI Poverty Likelihood Ratio for lead artisans**

Poverty line	Nearest neighbour matching	Stratification matching	Radius matching
PPI National Poverty Line	-10.482** (4.078)	-5.543*** (2.009)	-3.966** (1.798)
PPI Food Poverty Line	-1.834** (0.754)	-0.848** (0.399)	-0.533* (0.292)
PPI using the \$\$1.90/Day 2011 PPP	-6.874** (3.141)	-3.298** (1.624)	-2.212 * (1.309)
PPI using the \$\$5.50/Day 2011 PPP	-13.330** (5.831)	-8.174** (3.549)	-7.108** (3.289)

Notes: <sup>a</sup>PPP, purchasing power parity. These results are based on propensity score matching. Standard errors are in parentheses; \*p-value < 0.1, \*\* p-value < 0.05, \*\*\* p-value < 0.001.

### 6.2.1.2 Impact of SOKO affiliation on food, housing, and transport expenses

Based on our qualitative interviews, we found that SOKO and non-SOKO artisans had similar spending priorities. Spending was mostly focused on meeting basic needs such as food (30% of spending on average), clothing, housing (20%), school fees (30%), transport, basic medical services and support to dependents (some respondents dedicated 10% of funds to dependents other than children) and utility bills (5%). Savings were rarely mentioned and accounted for 5% of total spending on average. Meeting

health care needs, especially through medical services, was cited as the main source of worries by SOKO artisans.

The quantitative survey results (Table 7 and Table 8) are consistent with the findings of the qualitative interviews: the largest chunk of the budget was devoted to food, followed by rent and then transport. Artisans affiliated with SOKO tend to spend more than their peers who are not affiliated with SOKO on transport and rent, but a statistically significant difference was found only for rent expenditures. This difference held for lead and worker artisans.

**Table 7: Difference in means between food, transport, and rent spending between SOKO and non-SOKO lead artisans.**

	Non-SOKO lead	SOKO lead	Overall	Non-SOKO lead vs SOKO lead	p-value
Monthly spending on food (0-4)	3.086 (0.124)	2.918 (0.133)	3.000 (0.091)	0.168 (0.182)	0.356
Monthly spending on transport (0-4)	0.948 (0.158)	0.951 (0.127)	0.950 (0.100)	-0.003 (0.203)	0.990
Monthly spending on housing/rent (0-4)	2.017 (0.106)	2.361 (0.117)	2.193 (0.080)	-0.343** (0.158)	0.031
N	58	61	119	119	

Notes: These findings are based on a simple T-test. Standard errors are in parentheses; \*p-value < 0.1, \*\* p-value < 0.05, \*\*\* p-value < 0.001. The categories 0 to 4 correspond to the following: 0, below 1000 KSh; 1, 1001-2500 KSh; 2, 2501-5000 KSh; 3, 5001-10,000 KSh; 4, above 10,000 KSh.

**Table 8: Difference in means between food, transport and rent spending between SOKO and non-SOKO worker artisans.**

	Non-SOKO worker	SOKO worker	Overall	Non-SOKO worker vs SOKO worker	p-value
Monthly spending on food (0-4)	2.576 (0.163)	2.250 (0.174)	2.397 (0.121)	0.326 (0.239)	0.177
Monthly spending on transport (0-4)	0.364 (0.136)	0.575 (0.138)	0.479 (0.098)	-0.211 (0.194)	0.280
Monthly spending on housing/rent (0-4)	1.394 (0.115)	1.925 (0.115)	1.685 (0.087)	-0.531*** (0.163)	0.002
N	33	40	73	73	

Notes: These findings are based on a simple T-test. Standard errors are in parentheses; \*p-value < 0.1, \*\* p-value < 0.05, \*\*\* p-value < 0.001. The categories 0 to 4 correspond to the following: 0, below 1000 KSh; 1, 1001-2500 KSh; 2, 2501-5000 KSh; 3, 5001-10,000 KSh; 4, above 10,000 KSh.

We used multiple linear regression and propensity score matching (Table A2 in Annex) to test whether the simple T-Test findings are robust to controlling for age, educational level, marital status, number of children, and whether the artisans lived with their family. With these controls, we found that worker

artisans affiliated with SOKO spend an average of 609 KSh more on housing than non-SOKO workers based on the regression analysis (statistically significant at the 10% threshold) or around 689 KSh more (statistically significant at the 1% threshold) based on radius matching (Table 9). However, we found no statistically significant difference between SOKO and non-SOKO lead artisans.

**Table 9: Average treatment effect on the treated (ATT) of SOKO affiliation on the consumption and ownership of basic household goods for worker artisans**

	Nearest neighbour matching	Stratification matching	Radius matching
Monthly spending on food (0-4)	-0.970** (0.401)	-0.481 (0.338)	-0.492 (0.336)
Monthly spending on transport (0-4)	-0.985 (0.664)	-0.097 (0.390)	-0.235 (0.422)
Monthly spending on housing/rent (0-4)	0.333 (0.326)	0.734*** (0.236)	0.689*** (0.254)

Notes: These results are based on propensity score matching. Standard errors are in parentheses; \*p-value < 0.1, \*\* p-value < 0.05, \*\*\* p-value < 0.001. The matching was done on the following variables: gender, age, marital status, education, number of children, and whether or not the artisans lived with their family. The categories 0 to 4 correspond to the following: 0, below 1000 KSh; 1, 1001-2500 KSh; 2, 2501-5000 KSh; 3, 5001-10,000 KSh; 4, above 10,000 KSh.

### 6.2.1.3 Impact of SOKO affiliation on children’s healthcare and education expenses

SOKO artisans reported spending an approximate per term average of 8165 KSh (\$82) on their children’s education before joining SOKO (Table 10). The highest reported expenses reached 60,000 KSh (about \$600), with a standard variation across the sample of 11460 KSh / \$115. After joining SOKO, the artisans reported spending a monthly average of 16,662 KSh on their children’s education (about \$167), with the highest expenses reaching 100,000 KSh (about \$1000). Although the worker artisans reported spending more on children’s education after they joined SOKO, these remained inferior to the expenses of lead artisans. On average, male artisans spent slightly more on education than female artisans, but the difference was not statistically significant.

**Table 10: Differences in means of average spending on children’s education before and after joining SOKO**

	Spending on children’s education before joining SOKO	Spending on children’s education after joining SOKO
Worker artisan	4 026.32	4 657.90
Lead artisan	9 873.91	21 514.89
Overall (Mean)	8 164.61	16 662.12
Overall (Max)	60 000	100 000

Note: The currency is Kenyan Shillings.

Artisans affiliated with SOKO spent more on children’s healthcare than their non-SOKO counterparts (Table 11), although the difference was statistically significant (at the 10% threshold) only for lead artisans.

**Table 11: Difference in average spending on children’s healthcare, by SOKO affiliation and status in the workshop**

	Non-SOKO worker	SOKO worker	Overall	Non-SOKO worker vs SOKO worker	p-value
Monthly spending on children’s healthcare	1 139.286 (231.466)	1 786.842 (489.478)	1 512.121 (300.048)	-647.556 (605.754)	0.293
N	33	40	73	73	
	Non-SOKO lead	SOKO lead	Overall	Non-SOKO lead vs SOKO lead	p-value
Monthly spending on children’s healthcare	1 086.085 (217.696)	2 240.625 (621.513)	1 669.432 (0.091)	-1 154.540* (0.182)	0.085
N	58	61	119	119	

Notes: These findings are based on a simple T-test. Standard errors are in parentheses; \*p-value < 0.1, \*\* p-value < 0.05, \*\*\* p-value < 0.001.

Applying propensity matching by restricting the sample of analysis to the common support and bootstrapping the standard errors with 100 repetitions led to similar results (Table 12).

**Table 12: Average treatment effect of SOKO affiliation on monthly children’s healthcare expenses**

	Nearest neighbour matching	Stratification matching
Monthly spending on children’s healthcare (all artisans)	1 220.740** (607.218)	1 005.872** (508.369)
Monthly spending on children’s healthcare (worker artisans)	-296.825 (924.708)	779.545 (698.015)
Monthly spending on children’s healthcare (lead artisans)	1 371.011* (799.098)	1 124.061* (637.176)

Notes: These results are based on propensity score matching. Standard errors are in parentheses; \*p-value < 0.1, \*\* p-value < 0.05, \*\*\* p-value < 0.001.

### 6.2.2 Artisan diversification of income

This section answers the second primary research question ‘Which additional options are available to artisans for diversifying their income.’ In summary, the findings show that the lead artisans saved more than their workers. However, we do observe that the SOKO lead artisans and their workers saved more than their peers with no SOKO affiliation, but this was not statistically significant. Most of the artisans interviewed said that they believe their current work would help them move up the socioeconomic ladder, but this varies with several livelihood and wellbeing factors which are income, market stability, access to additional markets, investment benefits, reinvestments from income diversification, and the nature of their needs. Financial investments were identified as a means to diversify the artisan’s activities, although their interest varied depending on their knowledge and beliefs about the prospective returns. The qualitative interviews revealed that both the lead and the worker artisans

aspired to expand their networks, move out of poverty, and ensure their children’s future. There was no difference in aspirations between SOKO and non-SOKO artisans, or between male and female artisans (see section 6.2.2.1 for detailed findings).

### 6.2.2.1. Impact of SOKO on savings, investments and aspirations for the future

The artisans surveyed saved an average of 1000 to 2500 KSh per month, with lead artisans saving more than their workers. On average, SOKO lead artisans and workers in SOKO-affiliated workshops saved more than their peers with no SOKO affiliation, but this difference was not statistically significant based on a simple T-test. The difference identified was robust to applying a multiple linear regression and propensity score matching specifications (nearest neighbour, stratification, and radius matching), but again the result lacked statistical significance.

The qualitative interviews suggested that the degree to which their work helped them exit or avoid poverty varied with several livelihood and wellbeing factors. Among the factors that artisans considered important for their socioeconomic status to improve were income, market stability, access to additional markets, investment benefits, reinvestments from income diversification, and the nature of their needs. Most artisans believed that their current work would help them move up the socioeconomic ladder and ultimately lift them out of poverty, provided they worked hard and diversified their incomes through access to stable and expanding markets. All the artisans interviewed cited lack of money as a challenge to meet their daily financial needs. Some saw the relationship between their financial difficulties and issues such as unpredictable cash flows, inflation, poor budgeting and financial planning skills, increasing needs, and unexpected emergencies. It emerged clearly that a minor shock on their spending needs could easily threaten their economic stability, particularly given low savings.

The interviewed artisans saw financial investments as a means to diversify their activities, although their interest varied depending on their knowledge and beliefs about the prospective returns. The investment plans mentioned by artisans ranged from launching a restaurant to engaging in agriculture, agroforestry, livestock, or transport activities to selling beauty products and cosmetics and buying real estate. A significant number of artisans were investing in informal financial plans through participation in unregulated savings clubs, *chamas*<sup>37</sup>. The artisans saw taking part in a chama as an opportunity to save resources that they may later access under the form of loans to finance emergencies or development needs such as the acquisition of real assets. This was consistent with earlier results from Ford and Cooper (2016).

*“(...) I save KSH 1500 in a women’s SACCO<sup>38</sup> every month. We also contribute KSH 400, on the second Sunday of every month, to a [fund held by a] group of women in my church.”*

Female SOKO artisan, 2019

*“I have invested in building structures at home. I have a “side hustle shop” near our estate. I do agriculture; keep livestock at home. We have our own chama [a small savings*

<sup>37</sup> *Chamas* are unregulated savings clubs provide small-scale loans to their members, with the proceeds (loan interests) being shared back among all group members. This financial model has been booming in Kenya where it has strengthened financial inclusion despite the lack of strong controls for deposit protection and the weak enforcement mechanisms.

<sup>38</sup> SACCO: Savings and Credit Cooperatives Society.

*fund] in the workshop, everyone contributes KSH 500 weekly.”*

Male SOKO artisan, 2019

The artisans agreed on the need to diversify income between investments in tangible and financial assets. Most of the lead artisans noted they would like to expand their business through increased investments to create more job opportunities for workers. Future investments were seen as providing a safety net, all the more so that the artisans perceived their future relationship with SOKO as uncertain.

The qualitative interviews revealed that both the lead and the worker artisans aspired to expand their networks, move out of poverty, and ensure their children’s future. There was no difference in aspirations between SOKO and non-SOKO artisans, or between male and female artisans.

*“I have children who need to go to school, I don't want to leave everything to my husband. I have always seen this [work as an artisan] as a tool of empowerment because at least you can earn some good money when seasons are good.”*

Female artisan, 2019

*“[I am motivated by] the idea that one might die anytime and then [my family would] need help, especially financial help. I also do this [to give myself] a retirement age benefit. (...) Age motivates me to invest for the future, saving towards the education of my children.”*

Female artisan, 2019

Artisans were asked how much time they estimated it would take to improve their socioeconomic status at the household level. Both the worker and the lead artisans expected to start making profits and see returns on their workshop’s affiliation within the next two to five years, with a majority of them indicating five years. However, many artisans noted that this timing was subject to other work-related factors, such as the ability to make products quickly based on customer demands, work hard, and design new products.

*“A duration of two to five years will be okay because I am thinking of diversifying my business, so that I do not only rely on SOKO alone. By that time, I will be collecting a large amount of revenue from my business.”*

Female SOKO artisan, 2019

SOKO-affiliated lead artisans strongly believed that their business activities had positively affected the socioeconomic wellbeing of their workers. They cited the ability of their workers to meet their basic household needs. Moreover, several lead artisans felt that SOKO had financially empowered their workers by helping them develop new handicraft and financial management skills so that in the long term, they may diversify their income and open their own workshops.

*“I have empowered them (workers) to be financially stable through employment, which makes them busy thus keeping them away from any negative peer pressure. (...) most (workers) have gained almost all skills that are offered by SOKO. I took them from home (in the countryside) when they had nothing but now most of them can afford [to meet their] basic needs and are also saving some money.”*

Male SOKO lead artisan, 2019

*“After selling the products, we normally share the profits based on the level of work everyone has done. I have also taught them (workers) most of the skills relate to [producing all] product designs, and sometimes when am not around they do produce them [by themselves].”*

Female SOKO lead artisan, 2019

### 6.2.3. The impact of SOKO on female artisans

This section shows findings on the third primary research question ‘what are the motivating factors and challenges for women to participate in the handicraft (jewellery) sector, and is there a differentiated impact of SOKO by gender.’ In summary, the artisan women took up work in the sector due to a lack of other job options. It was clear that the sector is viewed as male-dominated and those women who were in it received a lot of support from their male counterparts. Using the multiple linear regression to study the differentiated impacts of SOKO on artisans by gender indicated that female worker artisans had a higher poverty likelihood ratio (across all the different poverty lines) than male worker artisans, regardless of their SOKO affiliation. However, the female worker artisans affiliated with SOKO had a lower poverty likelihood ratio (a statistically significant difference) than non-SOKO female worker artisans.

#### 6.2.3.1. Motivations and challenges for SOKO female artisans

One of the aims of our qualitative interviews was to understand the motivations for women to join the handicraft sector. The main reported factor was the lack of jobs, which motivated women to explore new ways of making a living, as illustrated in the quotes below:

*“[I was motivate to seek work in the handicraft sector as a result of] lack of employment opportunities in other areas. I wanted to meet personal needs in the face of limited opportunities.”*

SOKO female artisan

*“One, my husband has no good job. So, the money I get after selling the products caters for my basic needs. Two, I understand the kind of ornaments women want, so I feel like I am filling a gap by making beauty products for women.”*

SOKO female artisan

The few women in the trade had learned their craft by observing others. They also reported receiving support from male friends and relatives, which further fuelled their interest in the handicraft sector. Some of the women we interviewed said that being a female artisan in such a male-dominated field had given them an edge by helping them gain increased trust from customers. There was the shared perception among our key informants that professional artisan work was still viewed by outsiders as an occupation reserved to men. Nonetheless, even within the sector, artisans still viewed operating jewellery-making materials and equipment as better suited to men, with many stereotypes still commonly held, as indicated by a male artisan:

*“Women mostly work on beauty issues. They think that working as artisans may damage their looks. In fact, there are also many body injuries [among handicraft artisans] and the work is always dirty. Finally, socially, people think women artisans do not earn satisfactory amounts”.*

In Figure A4 in Annex, we performed a sentiment analysis and plotted a word cloud to capture the challenges faced by women in their day-to-day work as artisans in the sector. The overall score of women artisans towards words portraying a negative sentiment was higher than that of words conveying a positive sentiment, confirming the serious challenges faced by women in the sector.

### **6.2.3.2 Socio-economic impacts of SOKO on women’s vulnerability to poverty**

We added an interaction term to our main multiple linear regression to study the differentiated impacts of SOKO on artisans by gender. After controlling for age, marital status, educational level, number of children, and whether the artisans lived with their family, female worker artisans had a higher poverty likelihood ratio (across all the different poverty lines) than male worker artisans, regardless of their SOKO affiliation (Table 13). There was an up to 22.10 point-higher likelihood for female than for male artisans to see their household expenditures fall below the national poverty line and the threshold of \$1.90/ day, which was statistically significant at the 5 and 1% threshold, respectively. These findings support the results of our qualitative interviews highlighting the different challenges faced by female artisans. Female worker artisans affiliated with SOKO had a lower poverty likelihood ratio than non-SOKO female worker artisans<sup>39</sup>.

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<sup>39</sup> This is statistically significant for two poverty lines (1.90 USD and Food). Look at the significance on row (female\*Worker\*Affiliation SOKO) on table 18 above.



**Table 13: Gender-differentiated impact of SOKO on artisans' vulnerability to poverty**

	PPI, national poverty line	PPI, food poverty line	PPI, \$1.90/ day poverty line	PPI, \$5.50/ day poverty line
Affiliation with SOKO (==Yes)	-3.764* (-1.76)	-0.512 (-1.23)	-2.013 (-1.36)	-5.677 (-1.64)
Worker artisan (==Yes)	5.618* (1.68)	0.890 (1.37)	3.554 (1.54)	9.841* (1.82)
Affiliation SOKO*Worker	-1.332 (-0.32)	-0.443 (-0.54)	-1.412 (-0.49)	0.920 (0.14)
Artisan is female (==Yes)	3.204 (0.68)	1.177 (1.29)	3.469 (1.06)	-5.132 (-0.67)
female*Affiliation with SOKO	-8.344 (-0.72)	-1.689 (-0.75)	-6.324 (-0.79)	-13.31 (-0.71)
female*Worker	22.10** (2.38)	9.684*** (5.37)	22.10*** (3.44)	13.46 (0.90)
female*Worker*Affiliation SOKO	-24.95 (-1.56)	-9.958*** (-3.21)	-23.55** (-2.13)	-20.46 (-0.79)
Married ==Yes	8.188 (1.05)	1.570 (1.04)	5.956 (1.11)	8.113 (0.64)
Age category	2.004* (1.83)	0.251 (1.18)	1.216 (1.60)	3.189* (1.80)
Education category	-2.650** (-2.29)	-0.289 (-1.29)	-1.456* (-1.82)	-6.742*** (-3.60)
Number of children	-0.0351 (-0.07)	0.0172 (0.17)	-0.00815 (-0.02)	0.430 (0.50)
Artisan Live with family==yes	6.218* (1.69)	1.759** (2.46)	5.373** (2.10)	4.561 (0.76)
Controls	Yes	Yes	Yes	Yes
N	146	146	146	146

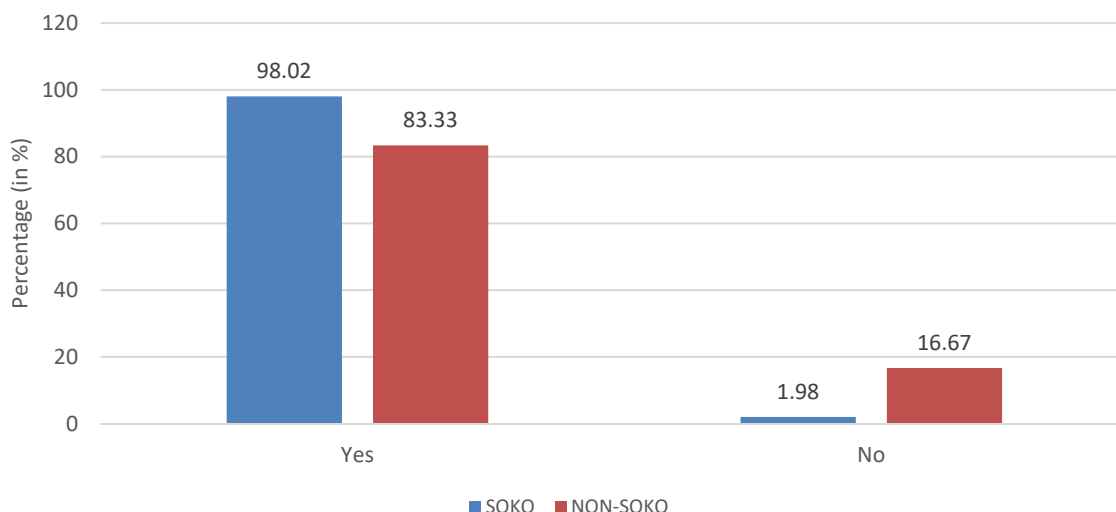
Note: T statistics are in parentheses; \*p-value < 0.1, \*\* p-value < 0.05, \*\*\* p-value < 0.001.

## 6.2.4 Impact of SOKO affiliation on artisans' environmental, social, and governance (ESG) safety compliance, skills, views on product design, and access to markets

### 6.2.4.1. Compliance with ESG standards

91% of all the surveyed artisans said they were aware of environmental, social, and governance (ESG) safety measures that have to be observed at the workshop level (Figure 5). However, almost 17% of non-SOKO artisans (including both lead and worker artisans) reported being unaware of any required safety measures. This was the case for only two SOKO-affiliated artisans (one worker, one lead).

**Figure 5: Artisans’ awareness of environmental, social, and governance (ESG) safety measures, by SOKO affiliation**



Most artisans reported that they observed ESG measures only “sometimes”. Artisans affiliated with SOKO reported slightly more frequent observance, but the difference was not statistically significant (Table 14). Worker artisans were on average more likely to report frequent observance of safety measures than lead artisans.

**Table 14: Artisans’ observance of environmental, social, and governance (ESG) safety guidelines**

Artisan affiliation and status		Mean <sup>a</sup>	Standard deviation
SOKO		1.16	0.62
Non-SOKO		1.12	0.67
Lead	SOKO	1.11	0.64
	Non-SOKO	1.06	0.66
Worker	SOKO	1.23	0.58
	Non-SOKO	1.23	0.71

Note: <sup>a</sup>The following response scale was used: 0, “Never”; 1, “Sometimes”; and 2, “Always”.

Almost 19% of artisans, including 10 working in non SOKO workshops, reported having learned about health and safety measures directly through SOKO, indicating that SOKO’s trainings were benefiting their own workers and spilling over to other workshops, while 11% cited another company (Table 15). However, it was more common for the artisans to learn by observing others (29%), or from friends, supervisors or colleagues (20.5%). Almost 40% did not specify a source of their knowledge.

**Table 15: Artisans’ sources of knowledge on health and safety measures at work**

	<b>SOKO workshop</b>	<b>Non-SOKO workshop</b>	<b>Total</b>
SOKO	23 (23.23%)	10 (13.33%)	33 (18.97%)
My colleague	4 (4.04%)	5 (6.67%)	5 (5.17%)
My supervisor	10 (10.10%)	11 (14.67%)	21 (12.07%)
My friend	0 (0%)	6 (8%)	6 (3.45%)
Other company	14 (14.14%)	5 (6.67%)	19 (10.92%)
From observing others	31 (31.31%)	20 (26.67%)	51(29.31%)
Other	35 (35.35%)	30 (40%)	65 (37.36%)
<b>Lead artisans</b>			
SOKO	21 (35%)	6 (12.24%)	27 (24.77%)
My colleague	1 (1.67%)	4 (8.16%)	5 (4.59%)
My supervisor	1 (1.67%)	4 (8.16%)	5 (4.59%)
My friend	0 (0%)	4 (8.16%)	4 (3.67%)
Other company	10 (16.67%)	5 (10.20%)	15 (13.76%)
From observing others	18 (30%)	15 (30.61%)	33 (30.28%)
Other	22 (36.67%)	19 (38.78%)	41 (37.61%)
<b>Worker artisans</b>			
SOKO	2 (5.13%)	4 (15.38%)	6 (9.23%)
My colleague	3(7.69%)	1 (3.85%)	4 (6.15%)
My supervisor	9 (23.08%)	7 (26.92%)	16 (24.62%)
My friend	0 (0%)	2 (7.69%)	2 (3.08%)
Other company	4(10.26%)	0 (0%)	4 (6.15%)
From observing others	13 (33.33%)	5 (19.23%)	18 (27.69%)
Other	13 (33.33%)	11(42.31%)	24 (36.92%)

Note: Percentage of relevant group in brackets.

The qualitative interviews corroborated these findings. Most artisans were aware of the ESG standards, with SOKO lead artisans displaying better knowledge than their non-SOKO peers. Most artisans valued ESG measures: there was a common perception among artisans that wearing gloves, dustcoats, masks, and sunglasses offered some useful protection. Other ESG standards that were broadly accepted as important and useful related to the safe disposal of waste and remains from raw materials. In contrast to our quantitative results in Table 14 above, we noted that in SOKO workshops, lead artisans tended to observe safety measures slightly more often than worker artisans. In the artisans’ own words:

*“I have enough knowledge of how to use them [ESG measures] because I have gone through the trainings. And I normally observe them. The ESG [guidelines] give conditions on use of horn because breaking horns and smashing horn materials may*

*cause pollution and health-related issues when [the dust is] inhaled.”*

SOKO Male artisan

*“SOKO also trains [the artisans in its network] and has always emphasized observing the ESG measures while working. I know most of the measures to be followed while working, and all workers who work in my workshops have to observe them.”*

SOKO Female artisan

*“We use masks to prevent us from inhaling fumes, and dustcoats to prevent dust getting on our clothes. We do observe proper waste disposal to avoid negative health issues in the workplace.”*

SOKO Female artisan

Moreover, consistently with our quantitative results, the majority of interviewed artisans noted that their compliance with ESG standards was not uniform during their work. More than half of SOKO (lead and worker) artisans reported that they observed safety measures in the workplace only “sometimes.” Compliance also varied according to the type of tasks and the expected level of production, but most importantly depended on the enforcement rules in place in the workshop.

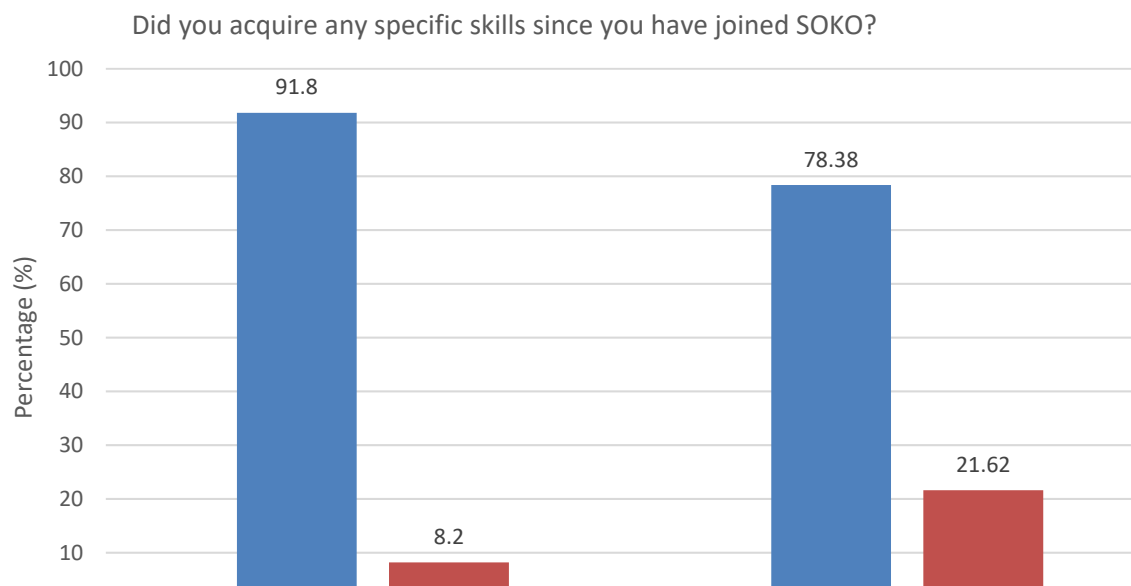
Convenience, reluctance to change, a lack of perceived benefits, and insufficient enforcement frameworks were all barriers to compliance with ESG standards. The workshops that insisted on the need to observe standards had high compliance rates. Some of the key reasons for non-compliance included aesthetic aspects such as the use of white coats that make dust more visible to clients, uncomfortable protective glasses or masks, the cost of protective gear and, in some cases, a concern that the protective gear actually makes it difficult to carry out the work.

*“The policy requires adherence to environmental and health care [standard] but sometimes the products we produce are too tiny - you just have to use bare hands to use them.”*

SOKO male artisan

#### **6.2.5. Skill levels**

SOKO offers continuous training to affiliated lead artisans. In the quantitative survey, about 87% of respondents indicated that they had gained specific new skills since joining SOKO. Lead artisans are the main target of skills training and, as such, were most likely to report upskilling - 92% of all lead artisans affiliated with SOKO reported having acquired a specific skill since joining the company (Figure 6) compared to 78% of worker artisans.

**Figure 6: Artisans' skills acquired through SOKO, by status**

As expected, SOKO lead artisans had predominantly gained their skills through direct participation in a training program offered by SOKO (Table 16), while most SOKO worker artisans who reported upskilling had been taught by the lead artisans through on-the-job training (66%), with 24% reporting receiving direct training from SOKO. 15.3% of artisans affiliated with SOKO reported receiving indirect training from other SOKO workshops (“friends”), offering evidence of knowledge exchange between SOKO workshops. Almost a quarter (22.35%) of SOKO artisans, predominantly lead artisans, reported acquiring their skills from training offered by other, non-SOKO sources.

**Table 16: Sources of the skills acquired by SOKO artisans, by status**

Source of the skills	Lead artisans	Worker artisans	Total
Direct training from SOKO==Yes	36 (64.29%)	7 (24.14%)	43 (50.59%)
Training from my SOKO friends==Yes	10 (17.86%)	3 (10.34%)	13 (15.29%)
Training by lead artisans in the SOKO workshop==Yes	4 (7.14%)	19(65.52%)	23 (27.06 %)
Training from others==Yes	16 (28.57%)	3 (10.34%)	19 (22.35%)

*Notes: Based on our qualitative analysis, the skills encompassed specific technical skills such as soldering, making brass wire and brass sheet, and making earrings out of bones and horns; standard technical skills such as balancing, polishing, measuring, and perfectly copying design; and interpersonal skills such as communication.*

Both SOKO and non-SOKO artisans believed that the artisans trained by SOKO could be a useful source of technical skills for others. Non-SOKO artisans mentioned an interest in gaining production skills, especially for the design reproduction, finishing, and polishing of high-quality, expensive products from their peers working with SOKO. SOKO artisans believed they would be able to share skills such as efficiency, preciseness, casting, moulding, burning, soldering, silver-plating skills, social skills, and knowledge of ESG standards.

*“I have acquired skills like: soldering, how to make brass wire and brass sheet, and making earrings out of bone and horn. I have learnt interpersonal skills like communication, (...) [and] technical skills such as balancing, polishing, measurement and design. I have learnt how to use different types of materials.”*

Male SOKO artisan

In numerous instances, the qualitative interviews confirmed the transmission of skills between SOKO lead artisans and their workers. Such know-how, which encompassed both technical and soft skills, was reported by the lead artisans to help workers produce high-quality products.

*“I always teach them all the skills SOKO has taught me, like; soldering, polishing, mixing all these materials, and even observing environmental concerns. [I also teach them:] the skill of fixing wire to a bone and metals, design skills, how to make samples to be taken to SOKO. This all helps them to make better products.”*

Male SOKO lead artisan

SOKO artisans wished to continue improving their skills, and expressed a hope that SOKO could provide trainings in, for example, business management skills and how to operate specific production tools.

*“[I need] business and management skills to be able run a business and manage it and [I need to learn] how to market my products online. (...) [I would like to gain] management and leadership skills how to lead my team and organize the work.”*

Male SOKO artisan

Our results are consistent with the Ford and Cooper (2016) study, in which SOKO was found to act as a hub for skills development.

### **6.2.6. Product design**

Initially, SOKO only used local designs and styles, with a limited international dimension. Since 2014, SOKO has embarked on quality improvement and design aesthetic, which has entailed training artisans on product quality and standards. However, SOKO needs to keep responding to ever-changing market trends while maintaining quality. Among the initiatives being explored are:

- i)* the use of Nile perch skin;
- ii)* the inclusion of ceramic materials to increase the involvement of women artisans in the workshops;
- iii)* *iii)* beadwork scaling to increase the involvement of women artisans in the value chain.

The qualitative survey revealed that some artisans preferred using the designs provided by SOKO rather than their own because they were already defined and did not require a lot of thinking. Some of the non-SOKO artisans were envious of the SOKO designs and thought they were superior to what they were producing.

*“SOKO's design(s), their standards, are too high. They are of very high standard and at times, it gets a bit complicated and a lot of time is required. Designs are drawn using a computer so at times they [the finished products] may differ [from the original design] but I always try my best to do as expected.”*

Male SOKO artisan

*“I can use my own design, but when working for SOKO it is faster because they make thinking easier.”*

Male SOKO artisan

*“I do produce both SOKO products and my own designs. SOKO normally bring their own designs with procedures to follow and I have had good experience with their products. I produce different designs (of) my own and sell to my customers.”*

Female lead SOKO artisan

*“SOKO designs are unique and there are conditions on their making. SOKO designs make one concentrate; it takes time, some products take two hours, others take as long as a whole day.”*

Female lead SOKO artisan

*“I am okay with the material I am using but I admire most of all the materials that SOKO people use to produce their products. The designs are unique and admirable.”*

Female non-SOKO lead artisan

Several artisans, including some affiliated with SOKO, felt unsure of their ability to make products based on the specifications and allocated time indicated by the company. Similarly, they believed that a broader variety of raw materials and machines should be made available by SOKO to fabricate the products.

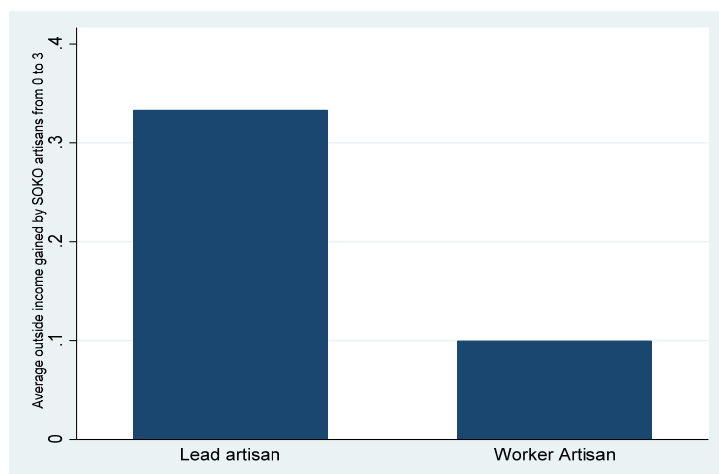
*“SOKO products are hard, hence take a lot of time. When SOKO gives different samples to make products, they should be giving enough time to perfect products. (...) there is a need for enough raw materials and machines to produce the high-quality products [expected by SOKO].”*

Female SOKO artisan

### 6.2.7 Access to external markets

Most of the SOKO artisans we interviewed preferred to sell their products to SOKO, but they also attempted to penetrate other markets, in particular in order to ensure they had an outlet for their production at times when the SOKO market was going low. On average, SOKO lead artisans generated 33,333 KSh a year (\$333) in income from other markets (Figure 7 below), while worker artisans earned around 10,000 KSh (a statistically significant difference at the 5% threshold, based on a t-test).

**Figure 7: SOKO artisans’ income gained outside of SOKO**



Note: The income is divided into different categories given by: 1 000 001-2 000 000 Ksh==3; 500 001-1 000 000 KSh ==2; 100 001- 500 000 KSh ==1; Below 100 000 KSh ==0

Artisans noted that SOKO had more competitive prices, so they would prefer to sell to SOKO where possible. Working for other markets also came with several additional hurdles.

*“The SOKO prices are much higher than in other markets; for these earrings, SOKO gave me a deposit of KSh 3000 to make six pairs, but in other markets I sell at sh.150 a pair. This is a big difference in pricing. We realized that selling to outside market is making a big loss. (...).”*

Male SOKO artisan

*“It is difficult to get new customers to purchase your products. The outside market has lower prices than SOKO and demands lower quality products.”*

Male SOKO artisan

*“We face payment delays and variations in price ranges due to negotiations. We also face challenges [meeting] market product preference since each market has own product preference.”*

Female SOKO artisan

*“Capital; the amount of money to buy the raw materials so that you make products for other markets. Time; you have to create time and look for labour to make products for other markets and SOKO.”*

Male SOKO artisan



Artisans' efforts to reach out to other markets included using traditional marketing strategies such as customer referrals, repeat clients, exhibitions, and large merchandising through wholesale trading to attract new customers. Other strategies included adopting technology-assisted marketing or using the Internet and social media (WhatsApp groups, Twitter accounts, etc.). Overall, however, penetration in other markets remained low. While social media may be attractive to some groups of customers with access to technology, the amount of sales the artisans were able to make through innovative marketing strategies was limited.

*“We have a WhatsApp group where we share pictures of products from other markets. Customers send photos of designs they would like. (...) We normally also get information from our friends when meet in social places like in church, since they know that I deal with artwork.”*

Female SOKO lead artisan

*“[I find business] through Internet, word of mouth from friends and through intermediaries as well as referrals from past clients.”*

Male SOKO artisan

A range of factors affecting SOKO artisans' ability to expand their business to other markets. These included the fluctuating costs of raw materials (especially horn during some seasons), the difficulty of securing trust from new customers, and the low selling prices (sometimes half the prices offered by SOKO). In most cases, SOKO artisans faced stiff competition from other artisans who did not have an alternative market, and they lacked sufficient marketing skills for efficient market penetration. Finally, SOKO artisans felt that the external market was volatile with unreliable customers who sometimes failed to pay, resulting in conflicts and low demand. Consistent with our findings, Ford and Cooper (2016) found that, on average, SOKO artisans only sell their products through two avenues in addition to SOKO.

## 7. Conclusions

This research work aimed to assess the impact of SOKO on the livelihood of artisans, looking not only at the workshop leads but also at the artisans working under them, at the bottom of the value chain. We used multiple linear econometric regression and quasi-experimental impact evaluation methods, namely propensity score matching by nearest neighbour, stratification matching, and radius matching to empirically assess the socioeconomic impacts of the SOKO business model (including initiatives to offer training and raise awareness of ESG safety measures) on worker and lead artisans. We considered a range of basic assets and goods consumption and ownership, savings, and the PPI as our main outcome indicator. We also studied whether SOKO-affiliated artisans were more likely to comply with ESG safety measures than non-SOKO artisans. We complemented our quantitative impact assessment with qualitative in-depth interviews to further understand the expectations of SOKO artisans and their level of observance of ESG safety measures.

We found that, on average and across our different socioeconomic outcome indicators, worker artisans affiliated with SOKO fared better than their non-SOKO counterparts, but were nonetheless worse off than SOKO lead artisans. We also found, both in SOKO and non-SOKO workshops, that female worker artisans were more vulnerable to poverty than male worker artisans. The qualitative interviews further strengthened our quantitative findings by highlighting the challenges facing women in the professional handicraft sector, which to this day remains a male-dominated field. Most of our findings were consistent with previous work conducted on SOKO by Ford and Cooper (2016) and Waldman-Brown and Calter (2018).

Overall, our main findings support the hypothesis that SOKO affiliation has a range of positive impacts on the livelihood of worker as well as lead artisans.

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## Annex A: Additional Tables, Figures and Explanations

Figure A1: Propensity score matching (PSM) common support

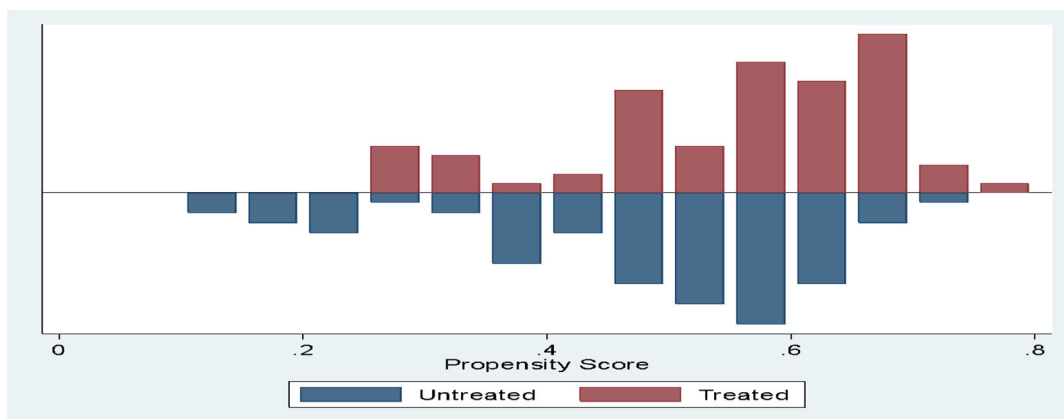
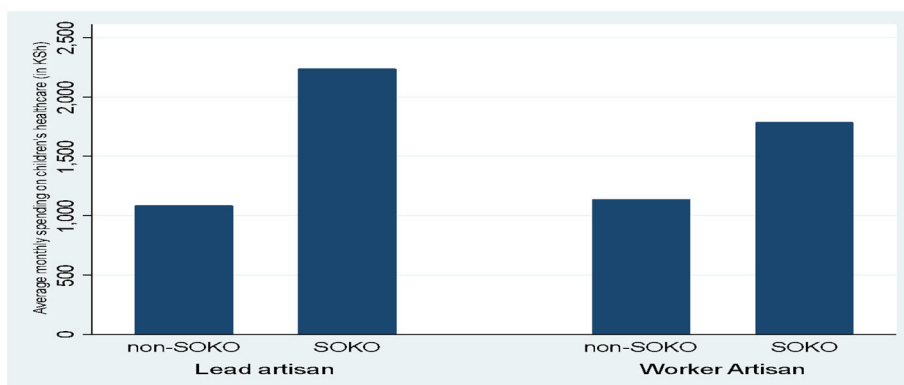


Figure A2: Differences in means on average spending on children's healthcare, by status in the workshop



### PPI Scorecard

PPI is based on a statistical model calibrated using the most recent national consumption survey data of a given country. PPI is based on a multiple-choice questionnaire with ten questions about ownership or consumption of common household goods or products. The responses correspond to a pre-defined score ranging from 0 to 10 depending on the response (see Figure A3 below). The total PPI score (0-100) is then compared against different scorecards corresponding to pre-established poverty lines (e.g., the national, food, \$1.90, and \$5.50 poverty lines) to generate the poverty likelihood ratio, the probability (between 0 and 1) that an individual or household's expenditure level falls below the poverty line in question. This is done for each PPI score between 0 to 100 obtained and for each poverty line. A poverty likelihood of 30% when using the national poverty line thus reflects a three-in-ten chance that an individual or household is poor and falls below the national poverty line. Hence, the closer to 100% (or 1) of the poverty likelihood, the higher the likelihood that a household's expenditure level falls below a specific poverty line.

Figure A3: PPI Scorecard, Kenya 2015

National Poverty Line – Scorecard Kenya 2015 PPI®		
Important: Convert each household's PPI score into a poverty likelihood using the PPI Look-up Table. Then average individual household poverty likelihoods to obtain the poverty rate of a group of households. DO NOT average their PPI scores directly.		
Indicators	Responses	Points (National Poverty Line)
1. In which county does the household reside?		(Select county)
2. What is the highest educational level that the female household head/spouse reached?	A. Pre-primary, none, or other	0
	B. Primary	7
	C. Secondary or post-primary, vocational	10
	D. College level or higher	15
	E. There is no female household head/spouse	16
3. What is the highest educational level that any member of the household reached?	A. Pre-primary, none, or other	0
	B. Primary	3
	C. Secondary or post-primary, vocational	1
	D. College level or higher	5
4. Over the past 7 days, did the household either purchase/consume/acquire any bread?	A. Yes	10
	B. No	0
5. Over the past 7 days, did the household either purchase/consume/acquire any meat or fish?	A. Yes	12
	B. No	0
6. Over the past 7 days, did the household either purchase/consume/acquire any ripe bananas?	A. Yes	9
	B. No	0
7. Does your household own any towels?	A. Yes	10
	B. No	0
8. Does your household own any thermos flasks?	A. Yes	9
	B. No	0
9. What is the predominant wall material of the main dwelling unit?	A. Finished walls (cement, stone with lime/cement, bricks, cement blocks, covered adobe, or wood planks/shingles)	8
	B. Uncovered adobe, plywood, cardboard, reused wood, or corrugated iron sheets	6
	C. Natural walls (cane/palm/trunks, grass/reeds, or mud/cow dung), no walls, bamboo with mud, stone with mud, or other	0
10. What is the predominant floor material of the main dwelling unit?	A. Natural floor (earth/sand or dung) or palm/bamboo	0
	B. Other (including wood planks/shingles, parquet or polished wood, vinyl or asphalt strips, ceramic tiles, cement, or carpet)	7
<b>PPI Score:</b>		



## National Poverty Line – Look-up Table Kenya 2015 PPI®

Use this table to convert PPI scores to poverty likelihoods (%) below the **National Poverty Line**.

PPI Score	Poverty Likelihood (%)	PPI Score	Poverty Likelihood (%)	PPI Score	Poverty Likelihood (%)
0	88.0%	34	51.7%	68	13.5%
1	87.4%	35	50.3%	69	12.9%
2	86.7%	36	48.9%	70	12.3%
3	86.1%	37	47.4%	71	11.7%
4	85.4%	38	46.0%	72	11.1%
5	84.7%	39	44.6%	73	10.5%
6	83.9%	40	43.2%	74	10.0%
7	83.1%	41	41.9%	75	9.5%
8	82.3%	42	40.5%	76	9.0%
9	81.5%	43	39.1%	77	8.6%
10	80.6%	44	37.8%	78	8.2%
11	79.7%	45	36.5%	79	7.7%
12	78.8%	46	35.2%	80	7.3%
13	77.8%	47	33.9%	81	7.0%
14	76.8%	48	32.6%	82	6.6%
15	75.8%	49	31.4%	83	6.3%
16	74.8%	50	30.2%	84	5.9%
17	73.7%	51	29.0%	85	5.6%
18	72.6%	52	27.9%	86	5.3%
19	71.4%	53	26.8%	87	5.1%
20	70.2%	54	25.7%	88	4.8%
21	69.1%	55	24.6%	89	4.6%
22	67.8%	56	23.6%	90	4.3%
23	66.6%	57	22.6%	91	4.1%
24	65.3%	58	21.6%	92	3.9%
25	64.0%	59	20.6%	93	3.7%
26	62.7%	60	19.7%	94	3.5%
27	61.4%	61	18.9%	95	3.3%
28	60.0%	62	18.0%	96	3.1%
29	58.7%	63	17.2%	97	2.9%
30	57.3%	64	16.4%	98	2.8%
31	55.9%	65	15.6%	99	2.6%
32	54.5%	66	14.9%	100	2.5%
33	53.1%	67	14.2%		

Source: Innovation for Poverty Action (IPA), 2015 PPI for Kenya.

Figure A4: Qualitative analysis of female artisans' participation in the professional handicraft sector: Word Cloud and sentiment analysis

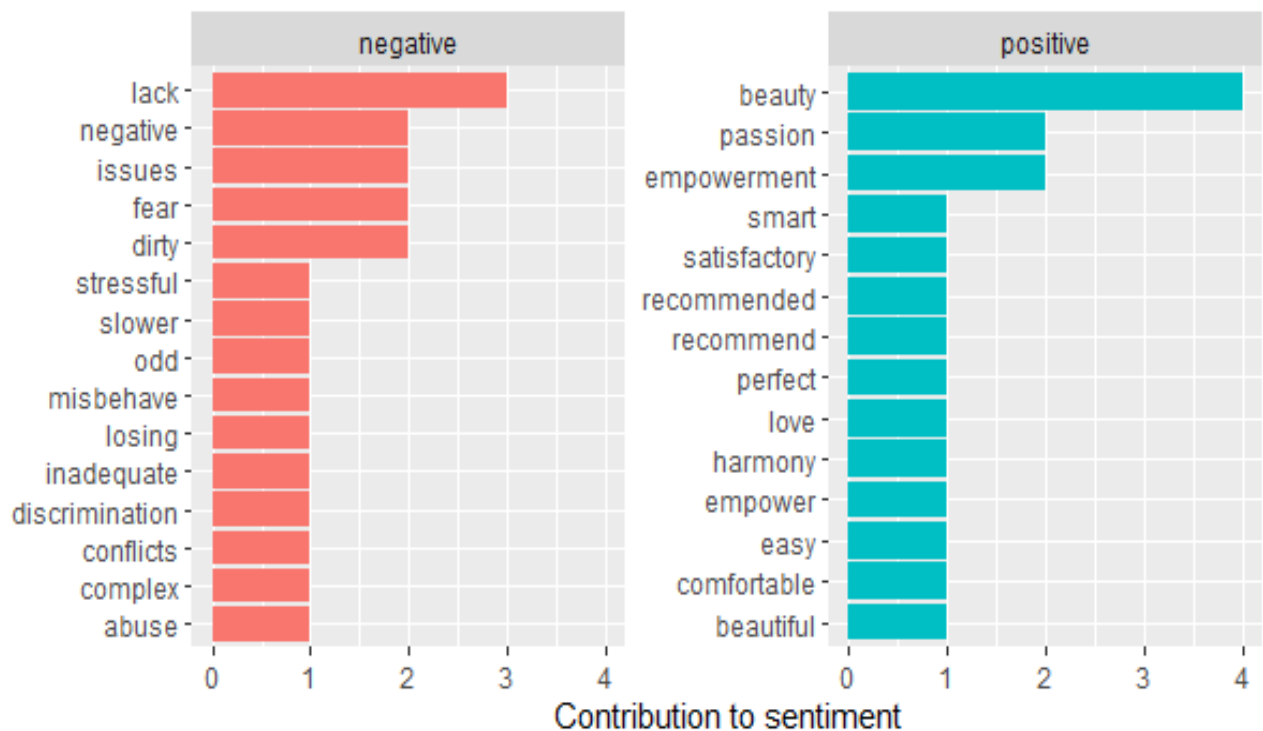
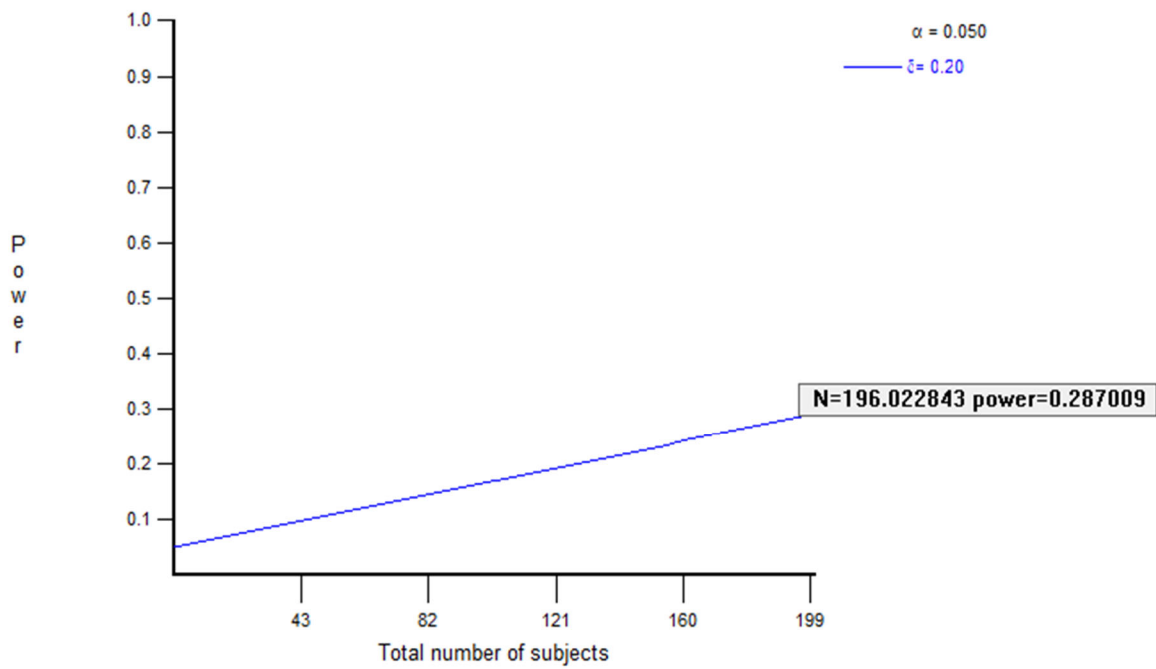
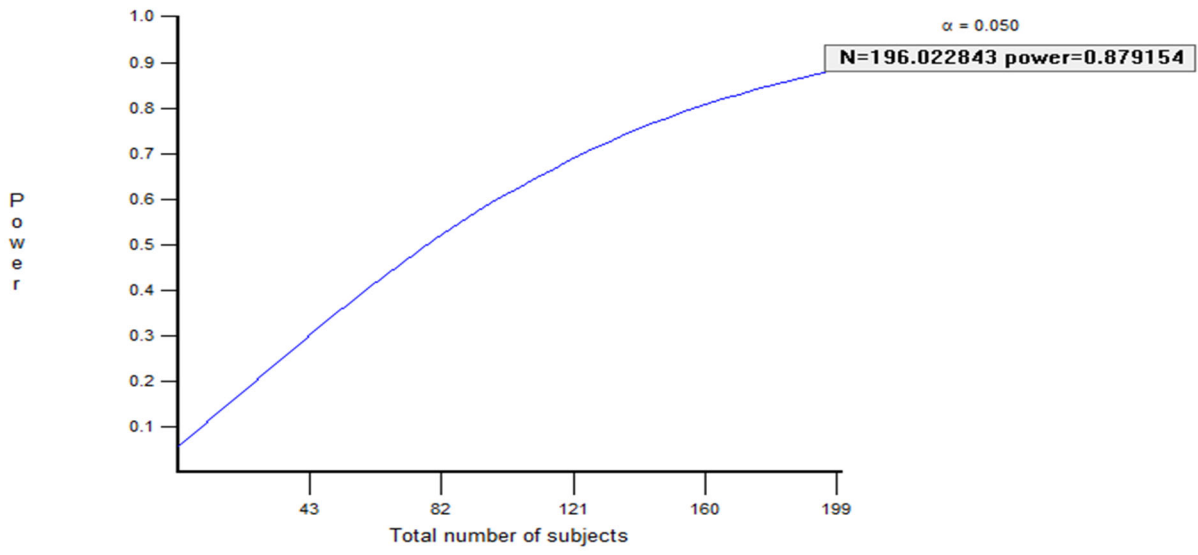


Figure A5: Statistical power achieved with a Minimum Detectable Effect Size (MDES) on household spending of 45%



Note: The statistical software Optimal Design was used to generate these data.

**Table A1: Distance to work for SOKO and non-SOKO artisans**

How far do you travel to work (in km)	Lead artisan	Worker artisan	Total
0	3	0	3
1	65	49	114
2	22	13	35
3	4	6	10
4	5	1	6
5	7	0	7
6	1	2	3
7	1	0	1
8	5	2	7
10	3	0	3
20	2	0	2
50	1	0	1

**Table A2: Impact of SOKO on food, transport, and housing spending**

	<b>Food</b>	<b>Transport</b>	<b>Housing</b>
Affiliation with SOKO (==Yes)	-0.143 (0.192)	-0.0200 (0.211)	0.188 (0.164)
Worker artisan (==Yes)	-0.0232 (0.297)	-0.371 (0.327)	-0.868*** (0.255)
Affiliation SOKO*Worker	-0.102 (0.371)	-0.0377 (0.410)	0.609* (0.319)
Artisan is female (==Yes)	-0.571* (0.309)	-0.111 (0.341)	0.397 (0.265)
Artisan is married (==Yes)	1.982*** (0.704)	0.794 (0.777)	1.053* (0.604)
Age category <sup>a</sup>	-0.0402 (0.0990)	0.00287 (0.109)	-0.153* (0.0850)
Education category <sup>b</sup>	-0.216** (0.103)	0.180 (0.114)	0.117 (0.0886)
Number of children	0.190*** (0.0481)	-0.0322 (0.0531)	0.00938 (0.0413)
Artisan lives with family==1	0.403 (0.336)	0.178 (0.370)	0.148 (0.288)
N	146	146	146

<sup>a</sup> The age categories were the following: 0, less than 18 years old; 1, 18-24 years; 2, 25-30 years; 3, 31-36 Years; 4, Over 37 Years.

<sup>b</sup> The educational categories were the following: 1, primary below 8; 2, primary 8 or higher; 3, secondary or post-primary; 4, vocational college level or higher.

Note: t statistics are in parentheses; \*p-value < 0.1, \*\* p-value < 0.05, \*\*\* p-value < 0.001.

**Table A3: Impact of SOKO on the Poverty Likelihood Ratio using different poverty lines**

	PPI, national poverty line	PPI, food poverty line	PPI, \$1.90/ day poverty line	PPI, \$5.50/ day poverty line
Affiliation with SOKO (==Yes)	-4.027* (-1.87)	-0.525 (-1.15)	-2.165 (-1.42)	-6.283* (-1.85)
Worker artisan (==Yes)	7.432** (2.23)	1.697** (2.40)	5.383** (2.27)	10.89** (2.07)
Affiliation SOKO*Worker	-4.133 (-0.99)	-1.509* (-1.70)	-4.016 (-1.35)	-1.553 (-0.24)
Artisan is female (==Yes)	4.574 (1.32)	2.527*** (3.43)	5.686** (2.30)	-7.658 (-1.40)
Artisan is married (==Yes)	8.320 (1.05)	1.911 (1.14)	6.408 (1.14)	6.925 (0.55)
Age category <sup>a</sup>	1.940* (1.74)	0.195 (0.83)	1.123 (1.42)	3.269* (1.86)
Education category <sup>b</sup>	-2.030* (-1.75)	-0.0325 (-0.13)	-0.850 (-1.03)	-6.305*** (-3.44)
Number of children	-0.0930 (-0.17)	-0.0000619 (-0.00)	-0.0570 (-0.15)	0.359 (0.42)
Artisan lives with their family (==Yes)	5.123 (1.36)	1.348* (1.68)	4.356 (1.62)	3.585 (0.60)
N	146	146	146	146

<sup>a</sup> The age categories were the following: 0, less than 18 years old; 1, 18-24 years; 2, 25-30 years; 3, 31-36 Years; 4, Over 37 Years.

<sup>b</sup> The educational categories were the following: 1, primary below 8; 2, primary 8 or higher; 3, secondary or post-primary; 4, vocational college level or higher.

Notes: t statistics in parentheses; \*p-value < 0.01, \*\* p-value < 0.05, \*\*\* p-value < 0.001.

**Table A4: Impact of SOKO on household acquisition of basic goods**

	<b>Towels</b>	<b>Bread</b>	<b>Fish</b>	<b>Bananas</b>	<b>Thermoflask</b>
Affiliation with SOKO (==Yes)	0.0833 (1.57)	0.123* (1.68)	0.0976 (1.51)	0.125 (1.62)	0.102* (1.67)
Worker artisan (==Yes)	-0.107 (-1.30)	-0.209* (-1.84)	-0.0494 (-0.49)	0.0584 (0.48)	-0.259*** (-2.75)
Affiliation SOKO*Worker	-0.0254 (-0.25)	0.149 (1.05)	0.00249 (0.02)	-0.112 (-0.73)	0.210* (1.77)
Artisan is female (==Yes)	-0.0848 (-0.99)	0.118 (1.01)	-0.157 (-1.50)	-0.114 (-0.92)	-0.0441 (-0.45)
Artisan is married (==Yes)	-0.172 (-0.88)	-0.258 (-0.97)	-0.315 (-1.33)	0.692** (2.47)	-0.169 (-0.76)
Age category <sup>a</sup>	-0.0195 (-0.71)	-0.0610 (-1.62)	-0.0666** (-1.99)	-0.0207 (-0.52)	-0.00586 (-0.19)
Education category <sup>b</sup>	0.0313 (1.09)	0.0624 (1.59)	0.0207 (0.60)	-0.0134 (-0.32)	0.0265 (0.79)
Number of children	0.00405 (0.30)	0.0248 (1.34)	0.00780 (0.48)	-0.00845 (-0.44)	0.0178 (1.15)
Artisan lives with their family (==Yes)	-0.0766 (-0.82)	-0.109 (-0.83)	-0.0781 (-0.69)	-0.172 (-1.17)	-0.0162 (-0.15)
N	146	144	145	142	144

<sup>a</sup> The age categories were the following: 0, less than 18 years old; 1, 18-24 years; 2, 25-30 years; 3, 31-36 Years; 4, Over 37 Years.

<sup>b</sup> The educational categories were the following: 1, primary below 8; 2, primary 8 or higher; 3, secondary or post-primary; 4, vocational college level or higher.

Notes: t statistics in parentheses; \*p-value < 0.01, \*\* p-value < 0.05, \*\*\* p-value < 0.001.

**Table A5: Impact of SOKO on ownership of basic household assets**

	Television	Computer	Smartphone	Refrigerator	Car
Affiliation with SOKO (==Yes)	0.0689 (1.09)	0.0167 (0.27)	0.103 (1.36)	0.0279 (0.53)	0.00611 (0.21)
Worker artisan (==Yes)	-0.0814 (-0.83)	-0.0860 (-0.89)	-0.0745 (-0.63)	-0.104 (-1.27)	-0.0349 (-0.77)
Affiliation SOKO*Worker	-0.100 (-0.82)	-0.0542 (-0.45)	-0.0152 (-0.10)	-0.0234 (-0.23)	-0.00630 (-0.11)
Artisan is female (==Yes)	0.0780 (0.76)	-0.0613 (-0.61)	-0.00972 (-0.08)	-0.0298 (-0.35)	-0.00272 (-0.06)
Artisan is married (==Yes)	-0.0252 (-0.11)	-0.0202 (-0.09)	-0.318 (-1.14)	0.0144 (0.07)	0.00477 (0.04)
Age category <sup>a</sup>	0.0780** (2.39)	-0.0355 (-1.10)	-0.0172 (-0.44)	-0.0173 (-0.63)	-0.00382 (-0.25)
Education category <sup>b</sup>	0.0423 (1.24)	0.147*** (4.39)	0.115*** (2.80)	0.0660** (2.32)	0.0242 (1.54)
Number of children	0.00169 (0.11)	0.0184 (1.17)	-0.0315 (-1.65)	-0.00463 (-0.35)	-0.00645 (-0.88)
Artisan lives with their family (==Yes)	0.154 (1.39)	0.0380 (0.35)	0.208 (1.56)	0.00506 (0.05)	-0.000130 (-0.00)
N	146	146	146	146	146

<sup>a</sup> The age categories were the following: 0, less than 18 years old; 1, 18-24 years; 2, 25-30 years; 3, 31-36 Years; 4, Over 37 Years.

<sup>b</sup> The educational categories were the following: 1, primary below 8; 2, primary 8 or higher; 3, secondary or post-primary; 4, vocational college level or higher.

Notes: t statistics in parentheses; \*p-value < 0.01, \*\* p-value < 0.05, \*\*\* p-value < 0.001.



### Study limitations

We faced several challenges in conducting our study and identified several shortcomings and future research directions that would be useful for SOKO and others to address.

### Reliable database

As is the case with most of the SMEs in the region, there are challenges in accessing reliable databases of employee contacts. This is mostly due to insufficient SME knowledge in creating and maintaining exhaustive and up-to-date employee databases. The lack of a comprehensive database of SOKO-affiliated artisans meant that we had to switch our approach to convenient methods (e.g. snowballing) in order to identify artisans to participate in our survey. This led to delays in the data collection process, challenges in achieving sample representativeness beyond Kibera, and difficulties in reaching the expected statistical power (Figure A5 in Annex). Hence, readers should be cautious about extrapolating our findings to all artisans operating in the SOKO network beyond the Kibera slum.

### Business process disruption

The livelihood of most of the businesses we surveyed relied on the amount of time the artisans could dedicate to crafting a product and selling it to the market, limiting their time to participate in the survey. We worked closely with SOKO to engage artisans, but in some cases, there were objections from lead artisans to us talking to more than one employee. To overcome this unforeseen difficulty, we devised creative ways of collecting information, especially for qualitative data. Some of the strategies we used were callbacks to leave workers sufficient time to carry out their tasks on the day of the interview or carrying out the interview in the early morning or evening.

### Risk of biased responses

Most self-reported studies suffer from response bias. Being aware of this pitfall during the design phase, we employed statistical and triangulation techniques to address potential bias in our analysis as much as possible. In particular, the qualitative in-depth interviews gave us a better picture of the artisans' observance of ESG standards in their day-to-day practice and proved to be a great strategy for addressing the anticipated social desirability bias<sup>40</sup> in our survey responses. For instance, in the quantitative analysis, we expected some form of social desirability bias in the responses to behavioural questions related to compliance with ESG safety measures. In fact, the qualitative interviews revealed that it was difficult for most of the respondents to know for sure whether they acted in conformity with the ESG safety norms and rules.

### Language barriers and translations

At the start of the research, we were aware of the different challenges surrounding the use of Kiswahili as the most widely spoken language among the lead and worker artisans. Hence, our main survey instruments were translated from English to Kiswahili and back. However, although the enumerators were trained, these additional translation stages could have introduced errors in the data collection.

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<sup>40</sup> In the social sciences, social desirability bias refers to a specific type of response bias where survey respondents tend to answer questions in such a way that they will appear favourably to others and the society. This could lead to the over-reporting of what is seen as "good behaviour" or under-reporting of what is considered as "bad" or undesirable behaviour from the perspective of the society.

To address this issue, we triangulated the information in multiple ways to check for data consistency, which led to lengthy interview tools that took more than 30 minutes to administer in some cases. Spot checks were regularly conducted during data collection to ensure that uniform translation was employed throughout.

### **Use of the PPI**

In our quantitative impact assessment, we used a poverty scorecard, namely the PPI<sup>41</sup>, as the main outcome of interest and proxy for the artisans' living conditions. However, this aggregate indicator is not exempt from imperfections, for numerous reasons. According to Pape<sup>42</sup> (2019), two main shortcomings are associated with the use of PPI as a proxy for poverty conditions in developing countries, especially in the case of Kenya. First, Pape argued that answers to some of the PPI scorecard questions are highly dependent on the location or timing of the interview rather than on whether the household can be classified as poor. By taking the example of Question 6 in the PPI scorecard measuring a household's banana consumption over the seven days preceding the survey, Pape made the obvious case that the consumption of bananas varies considerably across the country independently of the poverty status. Thus, Mombasa and Narok, for example, are two districts with a comparable level of poverty but very different rates of household banana consumption (75% of households in Mombasa as compared to less than 40% in Narok). Pape (2019) further argued that the determination of the PPI score relies on a structural model that does not factor in the macroeconomic shocks that might occur at any point in time. Pape (2019) took the example of an export shock, which might increase the price of bananas in Kenya. Hence, Kenyan households who might want to consume fewer bananas by substituting them with another product will be classified by the PPI as poorer than they really are.

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<sup>41</sup> The Poverty Probability Index (PPI) was designed by the Grameen Foundation in India (GFI) and the non-profit development institution Innovation for Poverty Action (IPA).

<sup>42</sup> World Bank Senior Economist, Kenya Country Office.

# Provision of Quality and Affordable Maternal Health Care in Developing Countries: A Case Study of Nest in Senegal

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**JEL Classification:** I11, D12, O55

**Keywords:** Maternal and child health, willingness to use (WTU), willingness to pay (WTP), midwife-led care services, visualization, Senegal

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## Summary

### Research focus

**Senegal has only around 3.1 nurses and midwives per 10,000 people, which makes it one of the countries least covered with qualified maternal care in the world (162th out of 187 countries).** Not surprisingly, outcomes for maternal and child health are poor. Where public hospitals are struggling to provide quality service, private clinics have sprung up, but most charge fees that only wealthier patients can afford. The private clinics have only been able to cover about 20% of the demand.

**NEST is a small enterprise aiming to bridge the gap between the private and the public sectors by reaching out beyond the wealthiest segment of the population.** NEST's maternal and child health clinics in Dakar offer services at prices around 40% lower than private clinics by using a number of innovations to cut costs without compromising on quality. For example, NEST minimizes the duration of hospitalization for uncomplicated deliveries and works with doctors that are willing to discount their fees for less well-off clients. NEST received funding from [I&P Afrique Entrepreneurs 1](#), an impact fund designed to support small and medium enterprises in which the European Investment Bank invested [€7 million](#).

**To understand better the impact of this impact investment, the research team surveyed 90 of NEST's clients.** The researchers wanted the impact study to also provide NEST with practical insights into how to further enhance the company's impact. Together with NEST's management, they decided to focus on how to encourage more women to use NEST's midwife-led service. Midwife-led care is more affordable than the doctor-led options with the same quality, so increasing reliance on midwives for low-risk pregnancies and uncomplicated deliveries is an important pillar of NEST's strategy to bring down costs of quality maternity care, allowing them to expand access to more women.

**However, negative perceptions of midwife-led services have made the promotion of the midwife-led care package challenging.** Many Senegalese women believe that midwives are only able to deliver basic care. Some of the negative perceptions are based on negative experiences with midwives, particularly those working in the public sector. Many of these midwives work in challenging conditions, in a difficult working environment and under time pressure. This means that they may have limited time available for consultations. Some women even report that midwives display "bad attitudes" towards patients.

**NEST was interested in understanding whether an innovative information campaign could help to counteract these negative perceptions and boost the willingness of women to consider the service.** Hence, in collaboration with NEST, the researchers developed and tested an information session where the benefits of midwives in maternal care are shared in the form of short stories and scenarios. This kind of information session is commonly known as a visualization session. There is evidence that such simple intervention can be useful in motivating good behaviour. In the visualization session, a presenter (e.g. skilled NEST staff) outlines issues that women could face during their pregnancies and how a midwife could provide support and advice. Participants are encouraged to think deeper about how a qualified and highly-skilled midwife could support them.

**To test whether such an innovative approach could change the demand for the midwife-led service, the researchers used a randomization approach.** They compared outcomes after a basic information

session with outcomes after a visualization session. They selected a group of women to participate in the visualization session, and compared their willingness to consider the midwife-led service with that of another group of women, who attended just the basic information session on midwife-led care. To rule out the possibility that differences in willingness were caused by other differences between the groups, not by the way the information was delivered, the women were allocated between the two groups by random selection. This was in line with international best practice for impact evaluation. This approach was chosen to ensure that the results of the study would be a reliable guide for NEST on the benefits of the innovative approach.

### Summary findings

**NEST is successfully reaching out to middle class women and those working in the informal sector, although few of its clients are among the extreme poor.** Around 4% of the clients surveyed would likely fall below the national poverty line, which is the case for 17% of Dakar residents. Less wealthy women are accessing the service – 30% of respondents are estimated to live on less than \$5.5 a day (a reality for 52% of residents of Dakar). Furthermore, NEST’s services are accessible to women without health insurance coverage – they account for 42% of respondents. This includes women working in the informal sector (about 27% of the economically active survey respondents).

**Visualization emerged as a potentially cost-effective way to deliver information about midwife-led care services, especially if this can be achieved in larger information campaigns via social media.** The women who participated in the visualization proved more likely to be willing to consider the midwife-led service than their peers who received the same information in a more “traditional” format. NEST will now consider whether and how it can make more use of visualization techniques to promote this package.

## Abstract

NEST is an affordable healthcare enterprise that is trying to bridge the market gap between private clinics and public hospitals in Senegal. In this study, we collaborated with NEST to investigate: (i) of the profile of clients NEST is currently serving; and (ii) whether information on midwife-led care can catalyse the demand for this service. We conducted a survey and a field experiment. Additional focus group discussions were performed to complement the quantitative results. The survey collected data from 90 NEST patients using midwife- or/and doctor-led care services. The results indicate that NEST is reaching out to middle-class women, although only a few of their clients are among the extremely poor; about 4% of respondents fall below the national poverty line, compared to about 17% of the Dakar population. Furthermore, NEST services are accessible to women without health insurance coverage (42% of respondents), including women working in the informal sector. The field experiment involved 52 pregnant women and evaluated the impact of visualization on the willingness to use (WTU) and to pay (WTP) for midwife-led care services. The results show that providing information via visualization raises WTP and WTU more effectively than providing basic information. Visualization could be a cost-effective way for NEST to promote midwife-led care services, especially in larger information campaigns via social media.

## Acknowledgements

We would like to thank the Global Development Network (GDN) and the European Investment Bank (EIB) for launching the EIB-GDN Fellowship Program in Applied Development Finance, under which this research was conducted. The advice and the technical and financial support that both GDN and EIB kindly offered to us have been invaluable during this project. We also wish to thank the NEST clinic in Dakar for agreeing to serve as one of the case studies for the EIB Deep Dive projects on impact investments, and also for demonstrating their support and openness to this project by sharing their research needs and resources. Furthermore, our thanks and appreciation go to the Expert Advisors (Emmanuel Jimenez and Arianna Legovini) for their overall guidance and valuable comments on the technical aspects of the project, which have contributed immensely to improving this work. Finally, special thanks go to all the other people who have contributed to making this work a success, namely Abhay Gupta from GDN, Nina Fenton and Claudio Cali from EIB, Matt Ripley from The Good Economy, Samuel Monteiro and Fatou Cisse of Investisseurs & Partenaires (I&P), and Khadidiatou Nakoulima and Khadi Touré from NEST. The authors take full responsibility for any errors or omissions in the report.

## Executive Summary

In developing countries, access to affordable and quality services remains a bottleneck in maternal and child health care. With only around 3.1 nurses and midwives per 10,000 people, Senegal ranks 162<sup>nd</sup> out of 187 countries for qualified maternal health care coverage (WHO 2016). The public sector is the main provider of maternal health care, and costs are lower. However, unmet demand has prompted the private sector to enter the field of maternal and child health care. Many patients prefer to use private services, where care is perceived to be of better quality. However, health care services offered by private sector providers are often not affordable to the majority of the population, including low- and middle-income individuals.

NEST is a small enterprise in Senegal with the mission of addressing this market gap between the private and public sector providers of maternal and child health care. Today, NEST runs several maternal and child health clinics in Dakar. By implementing a number of cost-cutting innovative approaches and without compromising on service quality, Nest offers its services at a fee that is around 40% lower than private clinics. For instance, NEST minimizes the duration of hospitalization for uncomplicated deliveries and works with doctors that are willing to discount their fees for clients from underprivileged socioeconomic backgrounds.

In this study, we collaborated with the company to explore two main research questions: (i) what is the profile of Nest’s patients? and (ii) how does the use of short stories (visualization) affect uptake of the midwife-led care service. The study is based on a survey questionnaire and a field experiment, complemented by the results of focus group discussions. The quantitative survey collected data from 90 NEST patients. These patients were using either or both of the midwife- or the doctor-led care service packages. The field experiment evaluated the impact of informing pregnant women about midwife care on the likelihood of them adopting or using midwife-led care services. The experiment tested whether an innovative information sharing mechanism (the sharing of information via storytelling, or “visualization”) can boost the adoption and use of midwife-led care services. This new way of disseminating information about midwife-led care services was compared to a more traditional information campaign, which had been run by NEST to date. A sample of 52 pregnant women recruited via social media participated in the experiment. The women were randomly divided into two groups. One group participated in an information session only and the other group in both the information and an additional visualization session.

The results show that around 4% of survey respondents would likely fall below the national poverty line, as compared to 17% of Dakar residents. Nonetheless, non-wealthy women are able to access NEST services. Around 30% of respondents were estimated to live on less than \$ 5.5 a day (a reality for 52% of Dakar residents). Women without health insurance coverage accounted for 42% of survey respondents, indicating that the service is accessible to this group. The clients also include women working in the informal sector, who represented about 27% of the economically active survey respondents. The results from the field experiment indicate that the likelihood of participants adopting and using midwife-led care services was higher after the visualization than after the basic information session.<sup>43</sup> Visualization emerged as a potentially cost-effective way to deliver information about midwife-led care services, especially if this can be achieved in larger information campaigns via social

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<sup>43</sup> Regardless of how the information was conveyed, participants had a higher willingness to pay for delivery care services than for pregnancy monitoring services.



media. Therefore, the delivery of information via visualization could help encourage women to take up maternal care services, which could positively impact maternal and child health.

The study was also an opportunity for Nest to collect precious feedback from their clients. For example, participants were overall satisfied with the services offered but highlighted some improvements that could be made, such as increasing the size of shared hospital rooms, increasing the availability of parking space near the clinics, and compensating for the perceived inconvenience of the clinic locations. Finally, the NEST clients we interviewed emphasized that the company should do more to exploit social media platforms for fostering customer relations, for example by providing online access to a health professional that may respond to customer questions and concerns around the clock.

## Abbreviations and Acronyms

ANSD:	National Agency of Statistics and Demography
DHS:	Demographic and Health Survey
FGD:	Focus Group Discussion
IMR:	Infant Mortality Rate
MCH:	Maternal and Child Health
NMR:	Neonatal Mortality Rate
NPS:	Net Promoter Score
PNDSS:	National Health and Social Development Plan
SSA:	Sub-Saharan Africa
UNICEF:	United Nations International Children's Emergency Fund
WHO:	World Health Organisation
WTP:	Willingness to Pay
WTU:	Willingness to Use

## 1 Introduction

### 1.1 Access to Affordable and Quality Maternal and Child Health Care in Developing Countries

Access to affordable and quality maternal and child health (MCH) care remains a challenge in developing countries, where infant and maternal mortality rates are much higher than in developed countries. It is estimated that more than half of the deaths of children under age 5 occur in sub-Saharan Africa (SSA) and that more children aged 5-14 die in Africa than in any part of the world (UNICEF 2019). According to the World Health Organization (WHO), in 2017 SSA together accounted for about 66% (196,000) of the global maternal death. According to Hug et al. (2019), in 2017, SSA and South Asia also accounted for 79% of the global neonatal mortality rate (NMR)<sup>44</sup>. According to the WHO, most maternal deaths occur during or soon after childbirth and are mostly due to preventable causes, including high blood pressure, infections, excessive bleeding and other delivery complications, and unsafe abortion.

Poor quality of facility-based care for women and newborns is one of the major factors behind these elevated figures (WHO 2004, Bullough et al. 2005, Austin et al. 2014, Goyet, Broch-Alvarez, and Becker 2019). Only a low proportion of women in developing countries are attended by a skilled practitioner during pregnancy and childbirth. Consequently, each year, many women and children die in developing countries from causes that could be prevented through access to affordable and quality MCH care (De Brouwere et al. 1998, WHO 2004, Khan et al. 2006). In developing countries, there are huge disparities in access to quality MCH care between the poor and the rich (Peters et al. 2008). In a study of economic inequalities in MCH care in 45 developing countries, Houweling et al. (2007) reported that births without professional assistance during delivery (from obstetricians, nurses, or midwives) were more widespread among the poor due to affordability issues.

Expanding access to quality and affordable MCH care has been defined as an aim in the 2030 Agenda for Sustainable Development. In particular, increasing access to quality MCH care has been highlighted under Sustainable Development Goal 3 (SDG3) towards ensuring a healthy life and promoting wellbeing for all, and at all ages. SDG 3.1 states that all countries should aim to “reduce the global maternal mortality ratio to less than 70 per 100,000 live births.” SDG 3.2 adds that countries should also strive to “end, by 2030, preventable deaths of newborns and children under 5 years of age, with all countries aiming to reduce neonatal mortality to 12 or below per 1,000 live births and under-5 mortality to 25 or below per 1,000 live births.”

Increasing skilled birth attendance (SBA) can reduce maternal and child deaths. A global commitment to increasing SBA has been in place since the 1990s, with the Millennium Development Goals (MDGs) setting the target of increasing SBA to 90% of live births in poor countries by 2015. However, access to SBA remains a challenge in some developing countries even though significant progress was made under the MDGs. Several studies also showed that increasing access to quality prenatal care can improve SBA, which in turn reduces maternal and infant mortality. A study by Barber (2006) in Mexico revealed that access to quality prenatal care increases access to SBA, which decreases both maternal

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<sup>44</sup> The NMR corresponds to the probability expressed as a rate per 1 000 live births that a child born in a specific period will die during the first 28 days of life, when subjected to the age-specific mortality rates of that period (WHO and UNICEF 2015).

and child mortality. Also, Adjiwanou and LeGrand (2013) found evidence in four African countries that SBA and antenatal care (ANC) are positively related. Furthermore, Jacobs et al. (2017) found in Zambia that receiving ANC at least once during pregnancy is a significant determinant of receiving SBA and postnatal care (PNC) within two days after birth. Therefore, promoting access to quality ANC is crucial for SBA and PNC in SSA. Moreover, Lawn et al. (2005) indicated that the quality of PNC received by a mother significantly impacts a newborn's ability to survive and thrive.

The utilization of primary health care depends to a large degree on affordability (Shaikh and Hatcher 2005, McPake et al. 2013). In Rwanda, Dhillon et al. (2012) reported that removing financial barriers such as co-payment has a positive effect on the utilization of primary health care facilities by the poor. Johnson et al. (2012) showed that the elimination of user fees (a form of subsidy for co-payments) increases access to primary health care in Mali. However, affordability can come at the cost of reduced quality of services, and the quality of public hospitals is often low, or is perceived to be low by women. It is recognized in a number of contexts that private health care providers in developing countries provide more efficient and higher-quality care than public health care providers (Griffin 1989, Berman and Rose 1996). Private health care providers that are capable of providing these quality services at affordable prices have a huge potential to improve the choice and quality available to women in developing countries.

## 1.2. The Senegal Context

Senegal is a West African country sharing borders with Mauritania, Mali, Guinea, Guinea-Bissau, and Gambia. According to the Senegal National Agency of Statistics and Demography (ANSD), the total population of Senegal was approximately 15.3 million in 2018 (ranking 30th in the world), with an annual population growth rate of about 2.5%. The largest share of the Senegalese population is young (with 54% of Senegalese people under 20). Women represent half of the population, and the majority of Senegalese people live in rural areas (ANSD 2018). Senegal is divided into 14 regions with marked variations in population density. With about a quarter of the national population in only 0.3% of the country's total land area, Dakar is the most densely populated region, with about 5,000 inhabitants per km square compared to a national average of about 82. The average life expectancy in Senegal is around 60 years, which positions Senegal among the 30 worst performing countries in the world on this indicator (WHO 2019).

Given that the right to quality health care is guaranteed by the Senegalese Constitution, improving healthcare for men, women, and children is a top priority for the Senegalese government. This mandate has shaped a range of government blueprints on health including the National Health and Social Development Plan (PNDSS)<sup>45</sup> for the 2019-2028 period. This plan is focused on providing universal health coverage to Senegalese people as a roadmap towards achieving SDG3 (PNDSS 2019). Establishing programs that ensure that every woman and every child have access to quality health care is pivotal to reaching the government's health objectives. In addition to the PNDSS, and in collaboration with the World Bank Group, the Senegalese government has been running a reproductive, maternal, neonatal, child, and adolescent health (RMNCAH) program aiming to improve the utilization of essential RMNCAH services, with quality standards. The RMNCAH aims to achieve the following by 2020: (i) reduce maternal mortality to 285 per 100,000 live births; (ii) reduce neonatal mortality to 17

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<sup>45</sup> *Plan National de Développement Sanitaire et Social*, in French.

per 1,000 live births; (iii) reduce under-five mortality rate to 42 per 1,000 live births; and (iv) improve youth and adolescent health.

However, as reported by the World Bank<sup>46</sup>, maternal mortality was estimated to be 31.5 per 1,000 live births in 2017. Neonatal mortality was estimated to be 20.6 per 1,000 live births in 2018 with an under-five mortality rate of 45 per 1,000 live births in 2017. Furthermore, the last Demographic and Health Survey (DHS) in Senegal estimated the infant mortality rate (IMR)<sup>47</sup> to be 42 per 1,000 live births and the neonatal mortality rate to be 28 per 1,000 live births (WHO and UNICEF 2015). Both the IMR and the NMR are thus significantly above the estimated global averages of 29 and 18 per 1,000 live births in 2017, respectively. Access to maternal and child health care remains a major bottleneck to achieving the government goals for reducing IMR and NMR. For example, only 54% of pregnant women in Senegal received the four ANC monitoring visits recommended by the WHO in 2016 (ANSD and ICF International 2018a).

Access to quality MCH care cannot be improved if the supply of skilled healthcare personnel is limited. In developing countries, due to the shortage of obstetricians and paediatricians, nurses and midwives play an important role in the delivery of MCH care. Hence, the hiring of nurses and midwives is crucial for increasing access to ANC and PNC. In Senegal, the number of nurses and midwives per 10,000 of the population was 3.129 in 2016, which was among the lowest rates in the world (ranking 162 out of 187 countries) (WHO 2016). Even though the number of midwives is on the rise—from 681 in 2004 to 2,002 in 2016—it remains insufficient in a population where about a third of the women (about 4.7 million) are aged between 20 and 24 and about third got married before 18 (ANSD and ICF International 2018b). The average fertility rate in Senegal was estimated in 2017 to be 4.6 children per woman and the median age at first delivery to be 21.8 years (WHO 2019). Public hospitals have been receiving overwhelming large and rising demand for maternal care, which they do not have the capacity to meet. Private clinics in Senegal serve about 20% of the women needing maternal care services. NEST aims to bridge the gap in the delivery of MCH care between the private and public sectors.

### 1.3. About NEST and Their Mission

NEST is a medical network that was set up in 2012 to offer private sector solutions for quality MCH care access in Senegal. Realizing that the middle class finds the costs of the private health care services too high (e.g., delivery care in private hospitals costs about USD800) and the quality of the public health care services too low, the company initially chose to target the middle-class population. NEST has since been working to replicate the Lifespring Hospital model in Hyderabad India, Senegal by creating a chain of small-size clinics with the aim of providing standard maternal and paediatric childcare services at a low cost. NEST mainly targets middle-class and poor families.

NEST launched and developed its pilot program for maternal and paediatric care services in the region of Dakar and its suburbs. The company hopes to extend its services to other communities in Senegal and to neighbouring countries like Gambia and Guinea Bissau. NEST aims to offer high-quality and round-the-clock health services for women and children at reasonable prices. Such services include prenatal and postnatal care as well as care for children up to 15 years of age. NEST services include

<sup>46</sup> <https://data.worldbank.org/indicator/SH.STA.MMRT?locations=SN>.

<sup>47</sup> The IMR corresponds to the probability expressed as a rate per 1,000 live births that a child born in a specific period will die before reaching the age of 1 year, when subjected to the age-specific mortality rates of that period (United Nations 2014).

family planning, gynaecological and obstetric consultation with a midwife or a doctor, echography, surgery (such as myomectomy and cystectomy), physiotherapy, pregnancy monitoring, childbirth services with labour and delivery care (including caesarean delivery), prenatal and postnatal health care, vaccination, and paediatric care. All the NEST MCH services are provided under the leadership of either a midwife or a doctor, or both.

To provide quality MCH at affordable prices the company has adopted a series of cost-reduction strategies. These include shortening the duration of hospitalization after delivery (in the absence of complications), working with doctors who are willing to discount their fees, and using more midwives than nurses or doctors for pregnancy, childbirth, and postpartum care. NEST offers a midwife-led care service package where doctors are only called upon in cases of medical emergency. NEST targets this service particularly at meeting the needs of low- and middle-income families. The prices for labour and delivery care services at NEST are as follows: CFA 250,000 (about \$435 or € 381) for the “social” (also called “my midwife”<sup>48</sup>) package; CFA 470,000 (about \$818 or € 716) for normal delivery with doctor-led monitoring; between CFA 592,000 (about \$1030 or € 902) and CFA 880,000 (about \$1531 or € 1341) for caesarean delivery. According to Nest, its prices for labour and delivery care services are almost 40% lower than at other private clinics in Senegal.

Nest aims to fill a gap between private clinics and hospitals. Public hospitals offer cheaper labour and delivery care services than private clinics, even taking into account the lower prices at NEST facilities. However, infrastructure and staff at public hospitals are often inadequate to cope with the high demand they face. Some of the issues reported by women involved in this study include lack of patient privacy and comfort and lack of fully qualified staff to provide care. Women who can afford to seek what they perceive to be better quality care at private facilities often do so. By keeping its prices below those of most other private clinics, NEST aims to make private care an option for women who could not otherwise afford it.

In addition to lowering their prices, NEST offers families flexibility via the possibility to choose between different payment plans. This is an innovative and unique approach as other private clinics in Dakar require upfront payment for all fees, which can be difficult for less wealthy households who may be credit constrained.

#### **1.4. NEST’s Midwife-Led Care Package**

One of the services that NEST is currently trying to promote is the “My Midwife” package, under which monitoring and delivery care services are led by a midwife. The midwife-led care package may be especially attractive to low-income households, as it gives access to ANC at reduced prices. NEST offers midwife-led care package clients ANC service at an affordable price of CFA 90,000 (about USD157 or €137). The total cost for ANC and delivery care services under the midwife-led package is CFA 340,000 (about USD195 or €223) which is low compared to the cost for doctor-led service (CFA 590,000 that is about USD338 or €387).

Prenatal consultation under the midwife-led package is based on personalized relationships with the patients. A dedicated midwife follows the patient from the beginning of the pregnancy. The package includes the following services: six prenatal consultations with a personal midwife; three ultrasound

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<sup>48</sup> The “My midwife” package includes both pregnancy monitoring and delivery care services.

baby scans; preventive treatment against malaria and tetanus; a follow-up record of pregnancy monitoring; and one childbirth preparation course. A gynaecologist is consulted only if the midwife identifies risk factors during the prenatal consultations. In such cases, the patient has to pay separately for the service of the doctor.

However, the “My Midwife” package has so far suffered from low patient demand. NEST believes that negative perceptions of the quality of the service provided by midwives, which are common in Senegal, are a major factor behind lack of take-up of a service they believe is of high quality and suitable for a large number of women (those at low risk of complications during pregnancy).

According to NEST, they work to ensure that their midwives perform better than midwives in the public sector, in order to counteract negative perceptions. After being recruited, NEST claims that midwives undergo clinical training to ensure the care they provide meets international standards; they are offered continuous training on a range of interpersonal skills including client reception, professional attitudes towards patients, empathy and kindness, and communication; they are better paid than are midwives in the public sector and receive incentives for doing a good job; and they work in a good environment.

More recently, the company has embarked on an information campaign to educate the public on the abilities of qualified midwives and the advantages of using their services.

### **1.5. Goals of the Study and Research Questions**

NEST expressed its interest in better understanding the profile of their existing clients so they could develop more targeted services and packages. Therefore, this study tried to shed light on the profile of NEST patients and how NEST could increase the uptake of its midwife-led care services in the future.

This study also attempted to fill existing gaps in the literature by providing novel evidence on the take-up of health services offered by clinics like NEST in developing countries.

Therefore, our research questions were the following:

1. What is the profile of NEST patients?
2. How willing are NEST patients to pay for and to use midwife-led monitoring and delivery care services?
3. What determines the willingness to pay and the willingness to use the NEST midwife-led care service package?
4. Does the provision of information via short stories (i.e. visualization) influence patient demand for midwife-led care services better than basic information?

First, a survey was conducted to gather data on the profile of existing NEST clients. Second, the demand for midwife-led care services was explored among potential new clients through an experiment in which the willingness to pay was elicited in a uniform price auction.

## 2. Literature Review

### 2.1. Midwives and Health care Delivery

The role played by midwives in MCH care varies by countries. In developed countries more than two-thirds of births are attended by midwives, but their role is usually restricted to supervising uncomplicated pregnancies and births, with major interventions performed by doctors (Larsson, Aldegarmann, and Aarts 2009). In some cases, midwives may also offer preparation classes for childbirth and parenthood or provide care to mothers and children following delivery or even accompany women throughout their lives by ensuring gynaecological preventive monitoring and prescribing contraception. In some contexts, they play a larger role. In South Africa, for instance, midwives can perform a comprehensive scope of practices that include: contributing to health assessment through patient screening and referrals; engaging in therapeutic activities such as prescribing and administering authorized medicines; delivering emergency treatment such as fluid and electrolyte perfusion; using forceps and suction during delivery; and offering education, counselling, and family-planning services (Abrahams, Jewkes, and Mvo 2001). The correct balance between midwife- and doctor-led services is likely to be highly context specific, and, possibly as a result, studies investigating the optimal set of roles and responsibilities have yielded mixed results (Wiegers 2003, Homer et al. 2009, Larsson, Aldegarmann, and Aarts 2009).

However, it is clear that the health care services offered by midwives can offer a pivotal contribution to quality MCH by supporting pregnant women as they deal with a broad range of antenatal and postnatal care issues affecting both themselves and their unborn infant (WHO 2002, George et al. 2011, Renfrew et al. 2014, Friedman, Liang, and Banks 2015, WHO 2015). Frawley et al. (2020) described midwives as the greatest players in the antenatal care models today in vigour in most parts of the world, acting as a trusted source of information for parents, especially for the provision of maternal immunization. Similarly, Williamson and Thomson (1996) found that midwives are significantly more likely than physicians to confidently advise parents about maternal and childhood immunizations. In terms of care during pregnancy and childbirth, women who are attended by midwives tend to have lower rates of invasive medical interventions such as epidural anaesthesia, caesarean section, and labour induction. In addition, women tend to report fewer birth complications, perineal lacerations, and infant abrasions (Wilson and Sirois 2010). A systematic review by Sandall et al. (2016) showed that among the main benefits of midwife-led care is a reduction in the use of regional analgesia, episiotomies, and instrumental births together with an increase in vaginal births and a greater likelihood of breastfeeding. Also, midwife-led care can have a significant impact on maternal and infant mortality as well as morbidity. Therefore, ongoing efforts towards better MCH should also identify and address the systemic, cultural, and individual constraints leading to the hindrance of quality midwifery (Hoope-Bender et al. 2014).

Furthermore, Wagner (2001) argued that placing primary maternity care into the hands of midwives is a central strategy in the “humanization of birth,” for four reasons. First, the existing evidence supports that for low-risk pregnant women, the primary care provided by midwives is as safe as that provided by physicians. Second, compared to physician-attended low-risk births, midwife-attended births show significantly lower rates of unnecessary invasive interventions. Third, midwifery care is cost saving. Lastly, midwifery care in developed countries has been found to be satisfying to both the women and their families. Such humanization of birth reinforces the need for midwives to be trustworthy, as



pregnant women rely on their expertise for their planning decisions during the antenatal and postnatal phases (Cook and Loomis 2012, Luyben and Fleming 2005). Moreover, it appears that midwife-led care also affects fathers' experience of birth. Hildingsson, Cederlöf, and Widén (2011) found that midwifery actions in the form of support, presence, and provision of accurate information on the progress of labor are important factors in giving fathers a positive experience in the labour room.

Given all the potential benefits, it is becoming increasingly important for developing countries, where the lack of adequate pre- and postnatal services is the leading cause of the high maternal and child mortality rates, to develop midwifery programs that embrace the diversity of cultural values, beliefs, and attitudes so midwives can successfully influence healthy behaviours. In particular, midwife-led care can reduce non-skilled birth attendance among pregnant women in the lower socioeconomic groups (Williamson and Thomson 1996). While midwife-led care has a quality equivalent at best to doctor-led care, it should be cheaper and easier to scale up in the context of developing countries, where qualified doctors are usually scarce. Therefore, midwife-led care could offer an effective strategy for expanding access to skilled birth attendance, which suggests that promoting midwife-led care should become a major target for health policy makers. There is, however, evidence of a lack of information among pregnant women regarding the health care services offered by midwives and a prevalence of negative perceptions of the role of midwives. In addition, there is evidence that some key aspects of midwifery practice such as being patient-centred, providing safe and supportive care, and working in collaboration with other professionals, have been neglected in developing countries (Homer et al. 2009). This is due to a range of barriers that have hindered midwives from achieving their full potential, including the lack of opportunities to practice across the full spectrum of maternity care; the invisibility of midwifery in national regulations and clinical practice; the professional domination of physicians; workforce shortages; the institutional system of maternity care; and the lack of a clear understanding of what midwifery is within society (Garel et al. 2007).

## **2.2. Willingness to Pay**

### **Willingness to pay elicitation**

The willingness to pay (WTP) represents an estimation of the maximum price that a consumer is willing to pay for a good, product, or service (Kalish and Nelson 1991, Voelckner 2006, Miller et al. 2011, Andersson, Levivier, and Lindberg 2019). In the health care sector, WTP is the amount of money that a patient is willing to pay to receive a certain medical treatment or intervention (Bala, Mauskopf, and Wood 1999, Olsen and Smith 2001, Lew et al. 2020). WTP thus represents a reliable and valid measurement of the health utility of the treatment or intervention (O'Brien and Viramontes 1994, Moghaddam, Mazyaki, and Razaghi 2019, Noor, Saperi, and Aljunid 2019). WTP estimation is crucial for estimating the demand for new products or services (Kalish and Nelson 1991) and designing optimal pricing policies (Grunert et al. 2009).

There are two main approaches for measuring WTP, which are based on the dichotomy between “real WTP” and “hypothetical WTP.” These two methods differ mainly in whether they necessitate a real economic commitment from respondents or not (Voelckner 2006). Thus, in contrast to real WTP methods, hypothetical WTP methods use not only a fictitious economic commitment but also a non-marketed product or service.

The most popular method for measuring hypothetical WTP is contingent valuation (CV). In the CV approach, respondents are asked—both directly and indirectly—about the maximum amount of money they are willing to pay for a particular product or service (Diener, O'Brien, and Gafni 1998, Klose 1999, Mitchell and Carson 2013, Moghaddam, Mazyaki, and Razaghi 2019). In other words, the CV approach requires that people express their preferences for some non-market goods or services by answering questions about hypothetical choices they would make. In contrast to the revealed preference models (such as the travel cost, hedonic price, and value for safety models), which are popular for the monetary evaluation of non-market goods and services, the CV approach is based on a stated preference model (Green and Gerard 2009, Pavel, Chakrabarty, and Gow 2015). Moreover, CV can be used to value goods and services even when no established market already exists (Abdullah and Jeanty 2011, Donfouet, Mahieu, and Malin 2013, Donfouet, Jeanty, and Mahieu 2014). The CV approach has been used extensively in economics studies for WTP elicitation of environmental goods and transport services. However, this approach has also recently received great attention in health care sector studies.

However, the hypothetical WTP measuring approach is subject to hypothetical bias. Due to the lack of real economic commitment during a study, consumers usually tend to declare a higher WTP than their true WTP (Hoffman et al. 1993). In contrast to hypothetical WTP, real WTP methods require that respondents do pay the stated price and rely on revealed preference data. Such an approach has been used to study simulated test market data (Ben-Akiva et al. 1994), lotteries through the so-called BDM procedure as first established by Becker, DeGroot, and Marschak (1964), Wertenbroch and Skiera (2002), and auctions (Vickrey 1961), among others. The revealed preference approach uses observations on actual choices made by the individual to measure preferences. To that end, actual purchase data are necessary, as well as individual/household demographics and attitudinal characteristics. These factors may significantly affect choice behaviour and can then be used as control variables in WTP calculation. The main advantage of this approach is its reliance on actual choices, which avoids potential problems associated with hypothetical responses such as the failure to properly take into account behavioural constraints or strategic responses. However, is that this analysis relies on having data on relevant characteristics of the subjects, which are not always available.

Auctions are a specific experimental setup that has been intensively used to study consumer demand and is now increasingly applied in the study of WTP for new products (Umberger and Feuz 2004, Breidert, Hahsler, and Reutterer 2006, Breidert 2007). The most popular auction mechanism for eliciting WTP is the so-called Vickrey auctions, which are also known as “second-price sealed-bid auctions.” All participants are requested to provide sealed bids simultaneously, with the highest-price bidder later having to buy the product/service at a price equal to the second highest bid. This method has the advantage of providing a strong incentive for participants to reveal their true WTP, since they must buy the product or service should they win the auction, at a purchase price lower than the winning bid (Vickrey 1961). Another popular auction mechanism used in WTP elicitation is the uniform price auction. Here, the winners are the high bidders (those participants who bid a higher price than the market price), and they only have to pay the market price.

Given that estimating the demand or designing optimal price policies for a new product or service requires a valid procedure for measuring WTP (Kalish and Nelson 1991, Breidert 2007), this study used the uniform price auction method for the WTP elicitation of midwife-led pregnancy monitoring and delivery care services. As noted by Breidert (2007), running an auction can offer insight into participant

valuation of a product or service that can later be used to inform pricing decisions. Furthermore, when combined with the BDM approach (as discussed in section 2.2.2), the uniform price auction method imposes a cost for inaccurate value revelation while providing incentives for participants to reveal their true valuation.

A large number of empirical research studies have been conducted to assess consumer preference for health care services in the developing world through WTP (O'Brien and Viramontes 1994, Asenso-Okyere et al. 1997, Diener, O'Brien, and Gafni 1998, Asgary et al. 2004, Onwujekwe et al. 2009, Aizuddin et al. 2011, Donfouet et al. 2011, Donfouet, Mahieu, and Malin 2013, Shafie and Hassali 2013, Donfouet, Jeanty, and Mahieu 2014, Jain et al. 2014, Ahmed et al. 2016, Yahya and Pumpaibool 2017, Moghaddam, Mazyaki, and Razaghi 2019, Noor, Saperi, and Aljunid 2019). However, to date, these studies have mostly focused on health insurance (Asgary et al. 2004, Tundui and Macha 2014, Delavallade 2017), with only a few of them looking at maternal, neonatal, and paediatric services (Ternent et al. 2010, Kanya et al. 2015, Yahya and Pumpaibool 2017). Recently, using a sample population of 750 women, Yahya and Pumpaibool (2017) analyzed the factors affecting women's WTP for antenatal, delivery, and postnatal care services in North Eastern Nigeria (Gombe State)—a region with some of the highest maternal and newborn death rates globally. The study found that the major factors influencing the WTP for ANC and delivery care are: proximity to a health facility, membership of a community savings and loans group, educational level, marital status, and income. The number of previous visits to the health facility and the mother's professional occupation also significantly affect the WTP for maternal care services. Kanya et al. (2015) examined the WTP for a broad range of reproductive health services (ANC, delivery, PNC, and family planning) in Kenya among voucher and non-voucher clients. They found that women are generally willing to pay a significant amount of money to access reproductive health. In addition, voucher clients are less likely than non-voucher clients to express WTP for ANC and delivery services. In another study, Ternent et al. (2010) analyzed gender differences in WTP for maternal health care in Burkina Faso. Male heads of households and their spouses were asked their WTP for a reduction in the number of maternal deaths in their area. The results revealed that, while men are willing to pay a higher price than women in absolute terms, but that women are willing to sacrifice a greater share of their income to reduce maternal mortality.

To the best of our knowledge, there are no studies looking specifically at the WTP for midwife-led ANC, delivery, and PNC services in developing countries. Therefore, this work aims to fill the gap by bringing evidence on how provision of information on the midwife-led service may impact their WTP for midwife-led care services and how that impact may be enhanced by coupling the information provision with a specific type of psychological intervention.

### **Challenges in WTP Elicitation**

Generally, regardless of the method used, WTP elicitation may suffer from two main shortcomings: incentive compatibility and hypothetical bias. For instance, elicitation of WTP using a self-stated method (e.g. contingent valuation or unitary price auction) brings the problem of incentive compatibility, which arises when consumers have an incentive to lie about their true valuation because buying the good is not mandatory (Rao 2009). The elicitation of WTP using the contingent valuation method can suffer from both incentive compatibility and hypothetical bias. Hypothetical bias arises when the value reported in a hypothetical context (e.g., a survey) varies from the value reported in a real context (e.g., the market) (Harrison and Rutström 2008). Although the evidence on the existence

of such a bias is mixed, many of the papers that have examined this phenomenon concluded that it does exist (Harrison and Rutström 2008), especially in the valuation of environmental goods (List and Shogren 1998).

One way of solving the issue of incentive compatibility is to use an auction mechanism for eliciting WTP. One such mechanism is the BDM approach, which requires that each respondent directly declares the maximum price at which they are willing to buy a product or service (Becker, DeGroot, and Marschak 1964). Subsequently, the purchase price is randomly determined by lottery. If the randomly-drawn price is lower than or equal to the respondent's price, they are required to buy the product or service at the drawn price. The respondents will not have to buy the product or service should the drawn price exceed their offer. Given that bidding a low price increases a participant's chance of not winning the product, this approach creates an incentive for respondents to reveal their true valuation (Wertenbroch and Skiera 2002). Previous studies (e.g., Ding, Grewal, and Liechty 2005) have shown that, when combined with the BDM approach, self-stated WTP can address the incentive compatibility problem.

As for the problem of hypothetical bias, one of the ways it is commonly dealt with in the literature is through the use of "cheap talk", as pioneered by Cummings and Taylor (1999). During cheap talk, researchers engage with respondents in order to encourage them to reveal their true valuations of the product by bringing the problem of hypothetical bias to their attention (Özdemir, Johnson, and Hauber 2009). However, to date, the evidence on whether this approach is effective remains inconclusive. Therefore, the potential for bias remains. Given that the approach used in our WTP elicitation experiment addressed the incentive compatibility problem at least to some extent, and that the problem of hypothetical bias did not apply as we did not compare hypothetical scenarios or prices, there were no major concerns in our study regarding the potential over-evaluation of WTP.

### **2.3. Impact of Providing Information on Consumer Demand**

Economics and psychology studies have shown that providing information about a product or service and running psychological interventions can influence consumer behaviour, including in their economic and health-related decisions. For instance, receiving information on the benefits and returns of education can increase parents' investment in their children's education (Hastings and Weinstein 2008, Nguyen 2008, Jensen 2010, Bettinger et al. 2012, Mizala and Urquiola 2013, Dinkelman and Martínez 2014). Dinkelman and Martínez (2014) also revealed that access to relevant information on financial aid has a significant impact on schooling outcomes (e.g., primary school attendance and college preparatory school enrolment) in Chile. Offering this information to both parents and children is more effective in improving school outcomes than providing the information to the children alone. Similar results were found by Bettinger et al. (2012) showing the impact of receiving information and assistance in completing the Free Application for Federal Student Aid (FAFSA) in the United States on schooling outcomes (likelihood of college attendance, student persistence, and receiving aid). Furthermore, Jensen (2010) found that, in the Dominican Republic, where awareness of the benefits of education tends to be low, providing information on quantitative returns of education increases schooling attainment. This latter study was especially important, as it documented that providing information, rather than a monetary incentive for attendance, can stimulate the demand for schooling. Jensen's study also corroborated the findings of Nguyen (2008) in the context of Madagascar.

In a field experiment carried out in a suburb of Delhi in India, Jalan and Somanathan (2008) showed that providing relevant information can impact the demand for environmental quality, as measured by household water quality, through greater awareness and expenditures on disease prevention. Madajewicz et al. (2007) found similar results in Bangladesh about the impact of information on household awareness of arsenic concentration in well water. Specifically, when receiving information about the amount of arsenic originating from their wells, most of the households with unsafe levels changed their water source.

Providing information and psychological interventions about drinking water can also change consumer behaviour (Madajewicz et al. 2007, Jalan and Somanathan 2008, Haushofer, John, and Orkin 2019 ). In particular, Haushofer, John, and Orkin (2019) tested in field experiments whether a “visualization” or a “planning” intervention could increase the take-up of drinking water chlorination by young women in rural Kenya. In the visualization arm, the young women took part in a session where they were asked to visualize a range of alternative future scenarios that were conditioned by their present behaviour. In contrast, in the planning arm, participants had a session where they received guidance to make specific and concrete plans, anticipate potential problems, and establish successful routines for carrying out the tasks. The authors found that both interventions can increase chlorination of drinking water and that the provision of more information can change beliefs about the effectiveness of chlorination.

In the health sector, providing information and psychological interventions have also been found to affect patient behaviour. For instance, through a randomized field experiment in Kenya, Dupas (2011) documented that risky sexual behaviour among girls is affected by the provision of age-disaggregated information on human immunodeficiency virus (HIV) risk. Therefore, by providing both risk avoidance and risk reduction information, HIV education campaigns can achieve a wider health impact. Haushofer, John, and Orkin (2019) also documented that visualization and planning interventions can both reduce the number of diarrhoea episodes in children, showing that addressing psychological barriers can significantly improve the use of preventive health products. However, in another study in Kenya, Duflo, Dupas, and Kremer (2015) found mixed results on the impact of providing information and psychological interventions on health outcomes. Thus, while education subsidies combined with abstinence-until-marriage courses significantly reduced the rate of early pregnancy and sexually transmitted infections in adolescents, the combined intervention did not increase educational attainment as much as the education subsidies alone.

Our work builds upon these earlier studies of the impact of information on health-related outcomes. More precisely, we provide evidence on whether the provision of information through storytelling to better help participants visualize potential benefits can improve their WTP for midwife-led care services in Senegal.

### 3. Methodology

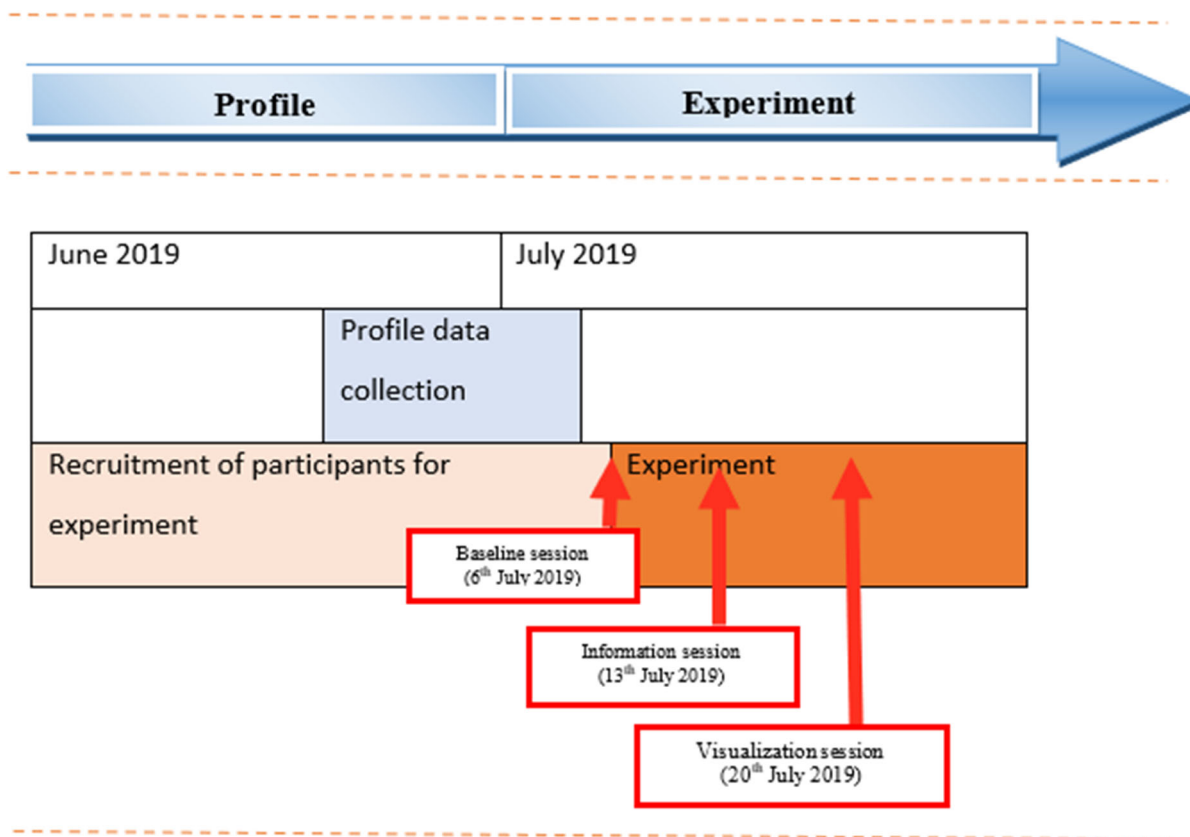
#### 3.1. Overall Study Design

This study used both quantitative and qualitative methods to answer our research questions. First, a survey was conducted to collect quantitative information on the profile of NEST clients. Quantitative data were then also collected in a field experiment to evaluate the impact of a new variant of information campaign (i.e., visualization) on the willingness of potential clients to use (WTU) and to pay (WTP) for NEST-type midwife-led care services. Finally, focus group discussions (FGDs) were held to complement our quantitative results with qualitative insights.

#### 3.2. Study Timeline

The data collection was carried out between June and July 2019. All participants resided in the Dakar region, in the cities of Dakar, Guédiawaye, Pikine, and Rufisque. All the enumerators who carried out the survey received training in preparation for the data collection, which started on June 21 and ended on July 3. For the field experiment, participant recruitment was initiated on June 6 via social media (Facebook) and ended on July 5. In total, three information sessions were delivered, namely a baseline session to all field experiment participants, on July 6; an information session to all participants, on July 13; and a visualization session to the treatment group only, on July 20. The timeline is depicted in Figure 1.

Figure 1: Timeline for field data collection



### 3.3. Profiling Survey of Existing NEST Clients

At the time of the study, NEST had a list of 400 clients, which the company had started collecting in late 2018. The list included both the clients that used the midwife-led care package (40) and the clients that used the doctor-led care package (360). From this list, 101 were selected—all the clients that were using the midwife-led service package plus another 61 clients randomly selected from the doctor-led service package.<sup>49</sup> 11 clients in the midwife-led package were, at the time of the survey, unavailable for an interview, but all of the clients using the doctor-led package were successfully surveyed. The sample drew only from the clients that shared their contact details with the company starting in late 2018. It is impossible to tell how the profile of these clients may differ from the profile of clients who registered earlier.

The data were collected during face-to-face interviews with a structured survey questionnaire consisting of three modules. The first module collected information on the respondents' socioeconomic and demographic characteristics; the second module served to evaluate their ownership of durable assets and their household dwelling conditions, allowing us to estimate the likelihood that they are poor; and the third module explored client satisfaction with NEST services. Seven enumerators were enrolled, all of them women, due to the potential sensitivity of some questions. The enumerators were trained on the questionnaire and a pilot survey was carried out. No major issues emerged from this preliminary phase and all the minor issues were addressed before the start of the survey. The importance of incentives for responding to the survey was also studied, and while the results were mixed, incentives did not generally affect the quality of survey responses (see Annex). In addition, a focus group discussion was held with 5 clients to complement the survey results.

### 3.4 Theory of Change in Field Experiment

To study the impact of a new approach for providing information on the valuation and demand for midwife-led care services, a willingness-to-pay (WTP) and willingness-to-use (WTU) field experiment based on the theory of change was carried out with potential clients.

Causal chain analysis is used to study the potential mechanisms underlying how an intervention can impact outcomes. In our work, causal chain analysis was used to understand how an information session (in particular, the visualization session) could affect the decision whether or not to request midwifery care services. At least in principle, by increasing their knowledge about midwifery services, providing information on the abilities and qualifications of midwives could influence how much pregnant women are willing to pay for such services. Furthermore, given that prejudices can lead to suboptimal decision-making, the provision of information (especially in a form that allows participants to visualize potential benefits) could help overcome psychological barriers to the use of midwife care services. In our study, this could lead to the realization that midwives are fully capable of delivering quality services, prompting participants to increase their WTP and WTU.

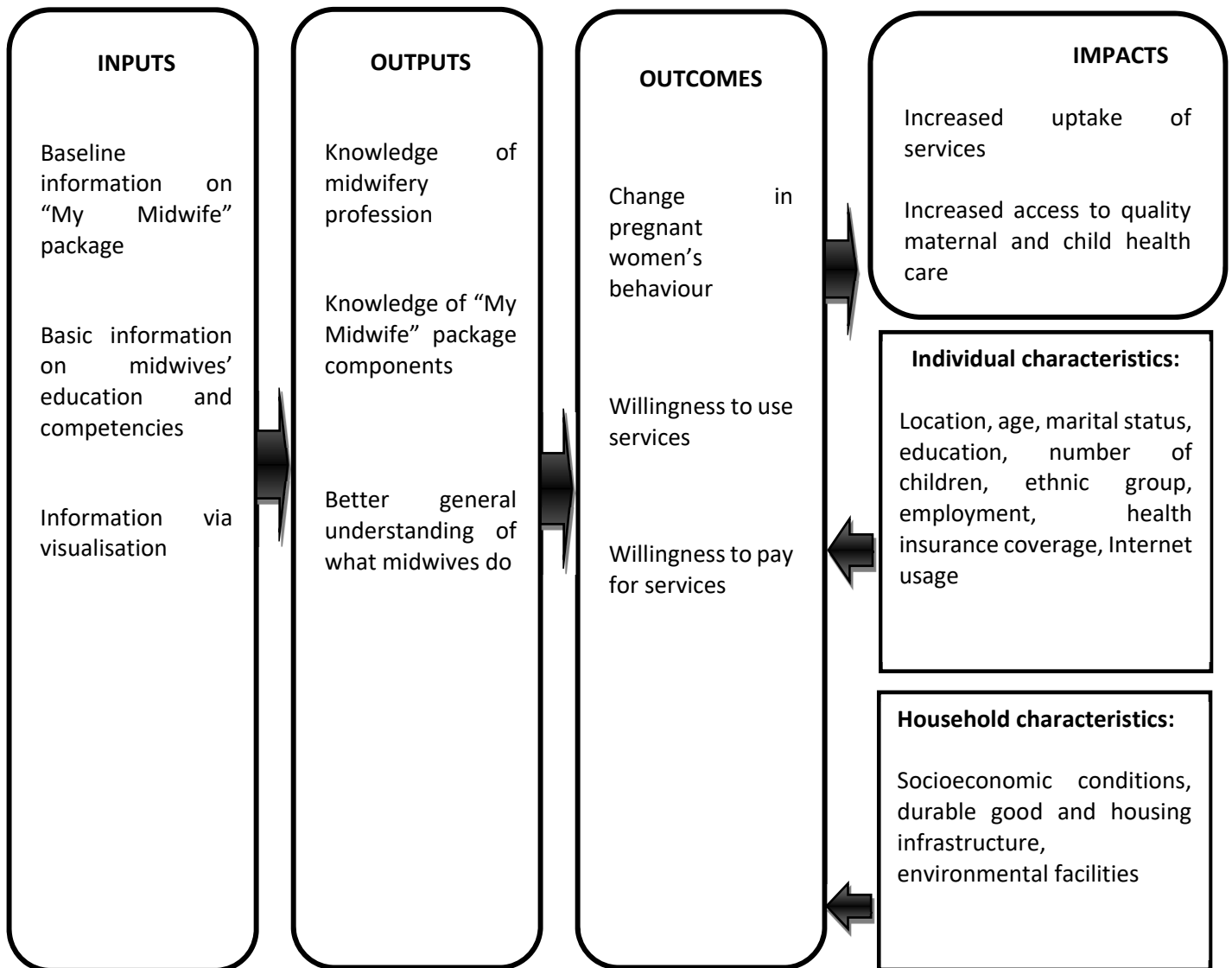
Therefore, our key hypothesis is that a lack of information on the training and professional competencies of midwives, as well as negative perceptions, possibly based on previous bad experiences in public hospitals, are major barriers to WTP and WTU for midwife-led care services. We expected that informing women in their first or second trimester of pregnancy on the existence of

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<sup>49</sup> Clients in the NEST midwife-led care package were oversampled to ensure a good number of such clients in the sample.

better-qualified midwives in the private sector would change both their perceptions and their demand for midwife-led care. We expected that visualization would have a positive effect on WTP and WTU for midwife-led pregnancy monitoring and delivery care services. Ultimately, increased uptake of quality midwifery services (i.e., skilled birth attendance) should lead to increased access to quality MCH care and lower maternal mortality rates. The assumed causal chain is summarized in Figure 2.

**Figure 2: Theory of change for visualization experiment**





### 3.5. Recruitment of Participants for Field Experiment

Given that most pregnant women decide in their first or second trimester, or are on the verge of deciding, which type of maternal and delivery care they wish to receive, they represented the natural target group for our field experiment.

Social norms in Senegal do not allow women to discuss personal health care issues, including access to and usage of maternal care services, with unknown individuals (and in particular, non-medical staff). Moreover, the topic under investigation (the behaviour of pregnant women) is a sensitive subject in many African countries. Therefore, to recruit participants, we decided to turn to social media channels (e.g., Facebook). Because they allow women to anonymously and openly discuss issues about pregnancy and maternal health care, social media channels seemed an effective way to identify women willing to participate in our study. In a first phase, a recruitment message was circulated on the most popular Facebook pages for women in Senegal, namely “*Entre yaays*”<sup>50</sup>, “*Maternita*”<sup>51</sup>, “*Ma Sage Femme, mon bien-être*”<sup>52</sup>, and the Facebook page of Dr Diop<sup>53</sup>. The recruitment message specified that the field experiment was targeted at pregnant women in their first or second trimester. A link to a Google form embedded in the ad invited interested participants to sign up for the study by providing personal information, including their pregnancy status, place of residence, telephone number, and possession of a nurse pregnancy certificate. This preliminary information was used to identify eligible participants. As shown in Figure 3, a total of 190 eligible women signed up for the experiment, after which all of them were called back to confirm participation<sup>54</sup>. Altogether, 107 women confirmed their availability to participate.

### 3.6. Field Experiment for WTP and WTU Measurement

The field experiment consisted in providing pregnant women with information about midwives over three sessions, namely a baseline session, an information session, and a visualization session. All sessions were delivered by a NEST midwife based on the instructions of the research team. To avoid biases arising from personal and professional differences between midwives, the same NEST midwife was used for all three sessions. Information on participant characteristics was collected during the baseline session, while WTP and WTU data were collected during all three sessions.

In the baseline session, general information about the NEST midwife-led care package (e.g., what the midwife-led care package consists in, and how it can be accessed) was shared with participants. In the information session, participants were given insights into the qualifications of midwives, their skills and abilities, the further training that they gain in private clinics like those run by NEST, how it makes them different from their public-sector counterparts, and the benefits of having a dedicated midwife during pregnancy. This session is similar to an information session currently run by NEST as part of its marketing campaign.

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<sup>50</sup> A group of 10,000 members created for mothers in Senegal to share information and tips about women’s role in child care.

<sup>51</sup> A company with more than 80,000 “likes” that sells clothes for pregnant women as well as clothes, shoes, and toys for children.

<sup>52</sup> A group of 136,000 members where midwives answer questions about reproductive health.

<sup>53</sup> Professional gynaecologist and obstetrician with more than 17,000 “likes”.

<sup>54</sup> Challenges in recruitment and how these were resolved are discussed in the Annex.

In the visualization session, storytelling is used to inform women about the health issues they could face during their pregnancy and how a midwife could provide support and advice. Participants were encouraged to think more deeply about how a qualified and skilled midwife could help them through their pregnancy. Terms such as “imagine”, “think more deeply,” and “reflect thoroughly on what you are being told” were used to ensure that participants digested the received information in a thoughtful way (see Annex). Such encouragement distinguished the visualization session from the information session.

In all sessions, WTP was elicited via a uniform price auction. Thus, at the end of each session, participants were asked to indicate in a sealed envelope the maximum amount that they would pay for midwife-led care services for pregnancy monitoring and delivery care<sup>55</sup>. To make the auction incentive compatible, respondents were told that those whose WTP was higher than the NEST price would be voluntarily enrolled on the program, and this at only the NEST price. The other respondents would not be offered enrolment, which introduced an element of BDM to motivate participants to reveal their true WTP. Information on participants’ willingness to use (WTU) the midwife-led care services was also collected at the end of each session. Participants who responded that they were not willing to use midwife-led care packages were asked to elaborate on their reasons for the decision.

As shown in Figure 3, 107 women with confirmed participation were invited to attend the first session imparting baseline information. Due to the low attendance, however, the 58 women who participated in this first session were all invited to come to the following session. Altogether, 52 women attended the information session, after which pairwise randomization was employed to select participants for the third session. Twenty-six women were allocated to the treatment group for participation in the third, visualization session.

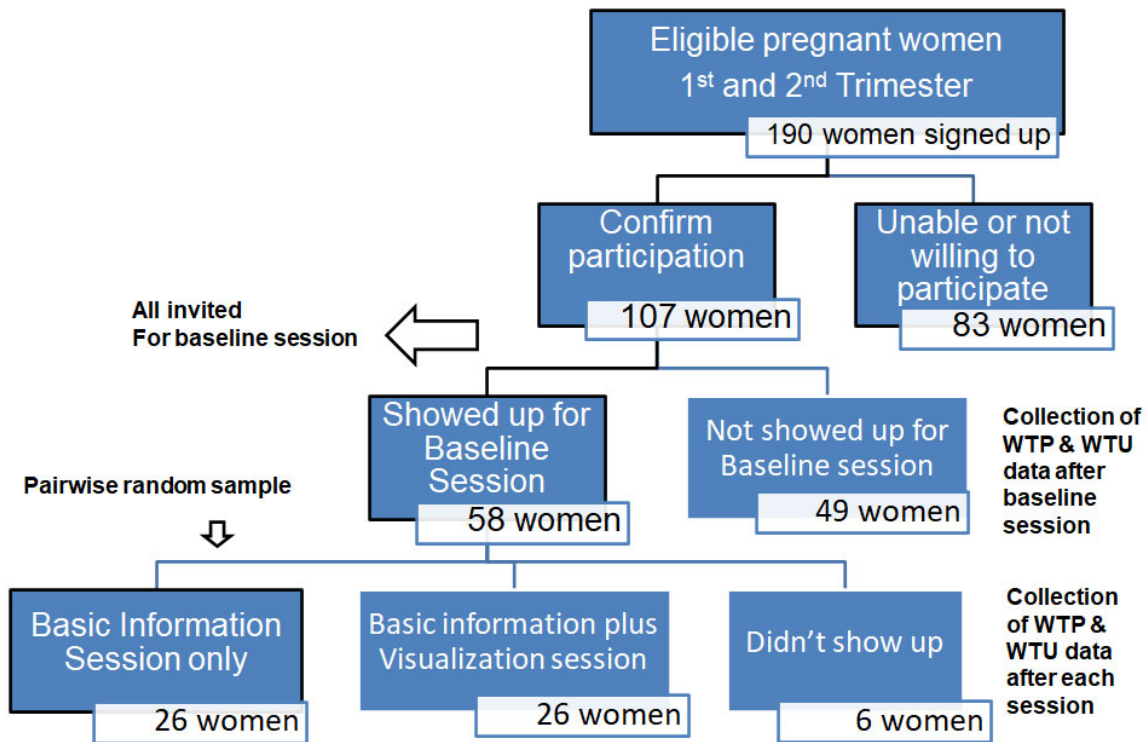
All the sessions were held in a rented hall in the centre of Dakar. To foster attendance, participants were paid show-up fees for each session, which was communicated to all participants beforehand. Additionally, after each session, several maternity suitcases were handed out as a prize in a random draw. To encourage everyone to arrive on time at the third session, an additional gift was promised to all punctual participants, which proved to be a very effective strategy.<sup>56</sup>

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<sup>55</sup> For details on how this aspect was captured in the questionnaire, see note 3 in the Annex.

<sup>56</sup> This adds to the existing experimental evidence that incentives can successfully encourage positive behaviour in subjects.

Figure 3: Evaluation design for willingness-to-pay and willingness-to-use field experiment



### 3.7. Estimation Model for Treatment Effects in Field Experiment

The experimental treatment consisted of attendance of the visualization session following the baseline and information sessions. To estimate treatment effects, we assumed that participants in the treatment group (all the women who attended the three sessions, including visualization) and the control group (all the women who attended the baseline and information sessions only) showed similar individual characteristics. The use of randomization to assign participants to one of the two groups ensured this was the case and that any differences in participant demand behaviour between the treatment and the control group could be interpreted as the impact of participation in the visualization session. The following mathematical model was used to estimate the overall treatment effects:

$$(1) \quad y_i = \alpha_0 + \alpha_1 T_i + \delta' X_i + \varepsilon_i$$

Where  $y_i$  is the outcome variable of interest at the end line for the individual  $i$ , that is, either WTP or WTU.  $T_i$  is a treatment status indicator that indicates whether an  $i$ th respondent is in the control or the treatment group.  $X_i$  captures the individual participant characteristics that were imbalanced at baseline and serve as a measure of wellbeing (which affects WTP). Given that the assignment of participants was randomized using a pairwise process, the error  $\varepsilon_i$  is uncorrelated with treatment status. Therefore, the parameter in the treatment status variable provides an estimate of the causal effect of the additional visualization session. In light of the small sample size, pairwise randomization was used to increase precision, and standard errors were clustered at the pairwise group level to infer conclusions. To estimate the determinants of the willingness to pay and the willingness to use the

services, A Poisson and a logistic regression were respectively used to study the determinants of the willingness to pay and the willingness to use the services.

### **3.8. Ethical Issues**

Our research aims were clearly explained to all the participants of the questionnaire survey, field experiment, and focus group discussions in both French and Wolof before data collection. All participants gave their written consent prior to the beginning of the first session of the field experiment. Research participation was based on un-coerced, informed, and documented consent. The collected data were anonymized to ensure confidentiality of the information provided by the participants. Furthermore, the field experiment did not deprive any women from the opportunity of subscribing to a service that they would otherwise have taken up. Furthermore, all participants were given a show-up fee and option to win prizes conditional on their participation in the sessions. Participants in both groups received helpful information about midwife-led services; in fact, non-treated participants were receiving more information than they would have possibly received had they not been participants in this experiment.

### **3.9. Software Tools for Data Collection and Quality Control**

Quantitative data were collected during the questionnaire survey and field experiment using tablets and the free Survey Solutions software developed by the Data Group of the World Bank. Data were collected offline and completed interviews were uploaded daily by the enumerators to a central server provided by Survey Solution administrators, which was made accessible only to the researchers (who were also the field supervisors).

Several measures were implemented to ensure data quality, including but not limited to the following: i) quality control was provided by the Survey Solutions software; ii) each filled interview form was systematically reviewed by field supervisors for validation and approval; iii) a final round of checks and quality controls was performed during the data cleaning process, which took about three weeks (from the end of July to mid-August).

### **3.10 Qualitative Data Collection and Analysis**

To complement the results obtained from the questionnaire survey and the field experiment, focus group discussions (FGDs) were held with a subset of the existing NEST clients who participated in the survey and potential clients who participated in the field experiment. For the FGDs, five to ten individuals were randomly selected from the participant pool. The aim of the FGDs was to gather more contextualized and nuanced information to help us understand the quantitative results. The qualitative data collection from the existing NEST clients aimed to gather additional information on their individual profiles, with a special focus on understanding how satisfied they were with NEST services and what improvements they would like to see. The qualitative data collection with the experimental participants aimed to allow a more in-depth analysis of the factors influencing WTU and WTP for midwife-led ANC and PNC services. The FGDs lasted between 20 and 40 minutes each, and all the discussions were recorded, transcribed, and translated into English. During their analysis, recurring similarities, patterns, and differences in the experiences and expectations of participants were identified.

## 4. Results and Discussion

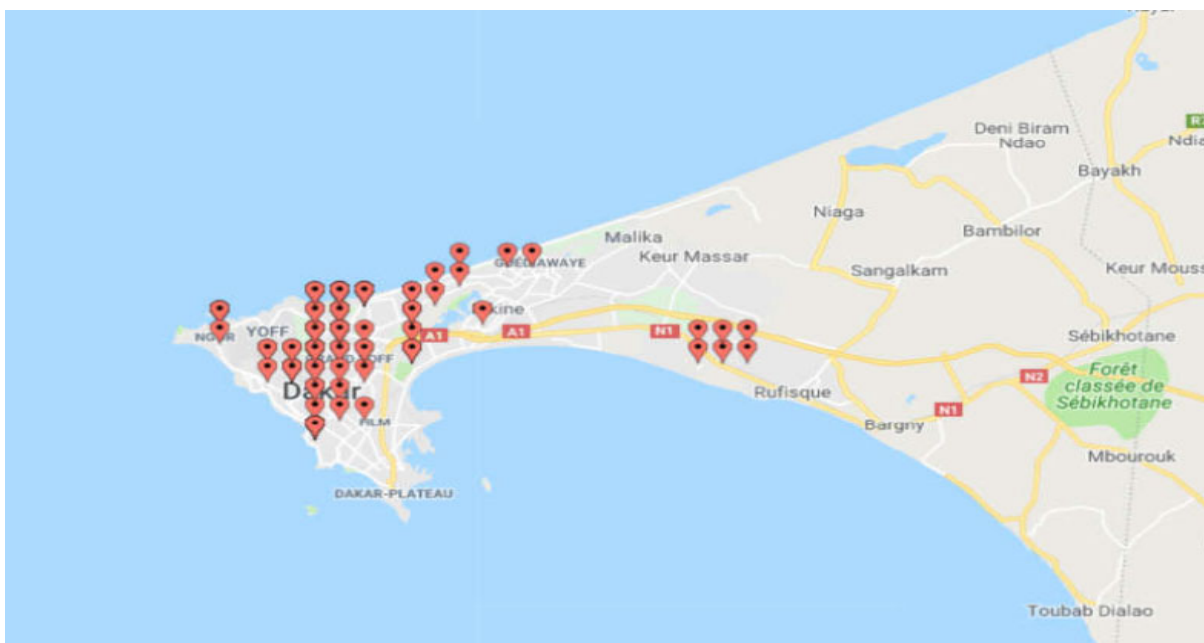
### 4.1. Profile of Existing NEST Clients

This section reports on the key socioeconomic, demographic, and behavioural indicators that characterized the existing NEST clients who participated in the questionnaire survey. The responses on client satisfaction with NEST services were analysed using the Net Promoter Score (NPS). At the time of the survey, one third of the respondents had used the midwife-led care package, with the remaining two-thirds having used the doctor-led care package. A subset of the respondents in the doctor-led care group had also used the midwife-led pregnancy monitoring service, and were thus analysed as a separate, ‘gynecologist plus midwife’ category.

#### Geographical Distribution of Clients

Figure 4 provides a map of the geographical distribution of the NEST clients surveyed. The majority of respondents (about 83%) lived in the city of Dakar and its suburbs, followed by Rufisque, Guédiawaye, and Pikine.

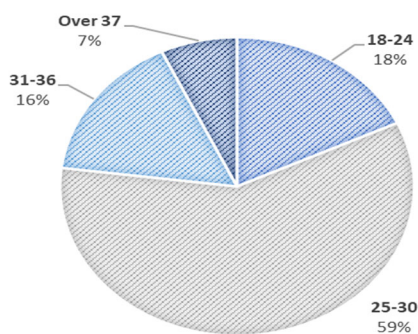
**Figure 4: Location of survey respondents in the region of Dakar for NEST client profiling**



#### Age of Respondents

The majority of respondents (59%) were aged between 25 and 30 years (Figure 5). This pattern broadly reflects the typical profile of Senegalese pregnant women. In Senegal, about 70% of women give birth for the first time before the age of 25, with a median age at first pregnancy of 22 years (ANSD and ICF International, 2018b). Within urban areas, the median age at first pregnancy is about 24, which is higher than in rural areas (20), where early marriage is more common.

**Figure 5: Age distribution of respondents, by years**



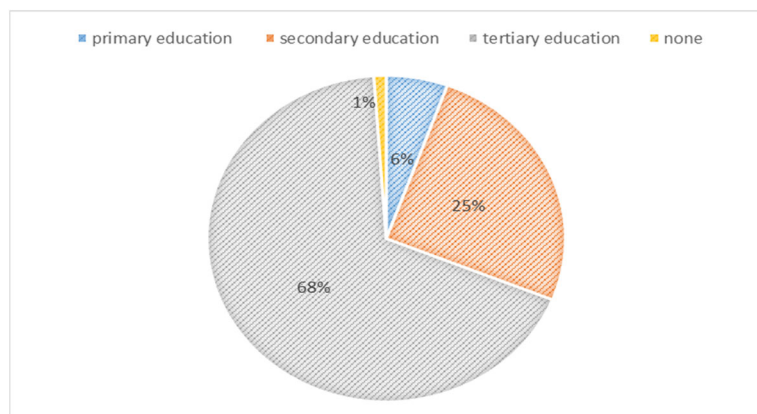
Age demographics can be helpful when designing information campaigns aimed at reaching different target groups. For example, digital marketing<sup>57</sup>, which is less expensive than traditional advertising means such as television ads, can be more efficient in reaching out to younger women, who are digital natives. Such insight can be particularly relevant in the Senegalese context, where the number of Internet users is continuously growing.

Furthermore, a significant relationship was found between respondent age and the type of NEST services used (Table A1 in Annex). While the gynaecologist-led care services were mostly used by older women, the midwife-led care services were mostly used by younger women.

**Level of Education**

The vast majority of the respondents (about 93%) had completed secondary or tertiary education (Figure 6). Given that educational level typically correlates with earning power, one may expect that more educated women would opt for the more expensive doctor-led care services. The results (Figure A1 in Annex) indicate that this was indeed the case.

**Figure 6: Educational level of respondents**

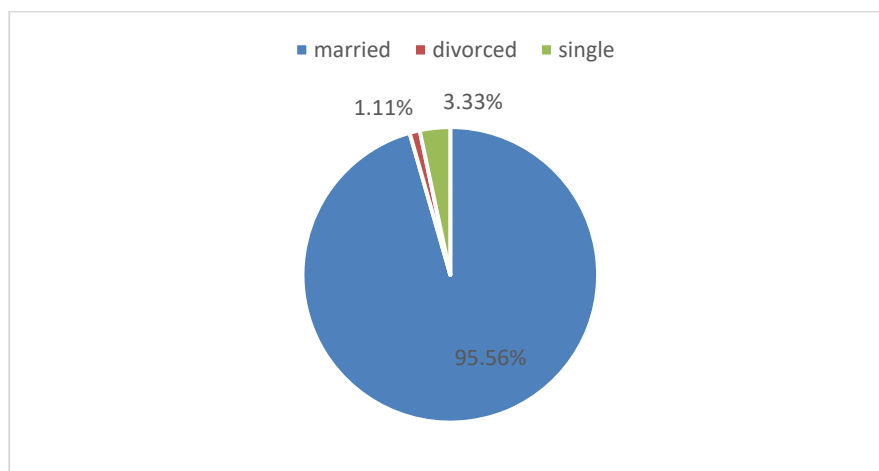


<sup>57</sup> Digital marketing can be defined as “an adaptive, technology-enabled process by which firms collaborate with customers and partners to jointly create, communicate, deliver, and sustain value for all stakeholders” (Kannan 2017).

## Marital Status

Almost all respondents were married (Figure 7). This is to be expected in Senegal, where a lot of women of reproductive age (about 65% of them, according to the latest DHS) are married, and reproductive health issues are thus usually approached within the context of marriage. NEST may thus wish to consider designing its services in such a way that they are not only attractive to women but also to their spouses, for example by offering counselling to men on their role during the prenatal period. Moreover, including men in birth preparation courses could make delivery care packages more attractive to couples. Moreover, NEST outreach programs could be designed to inform men as well as women about their services, as most antenatal care choices are jointly made by couples.

**Figure 7: Marital status of respondents**



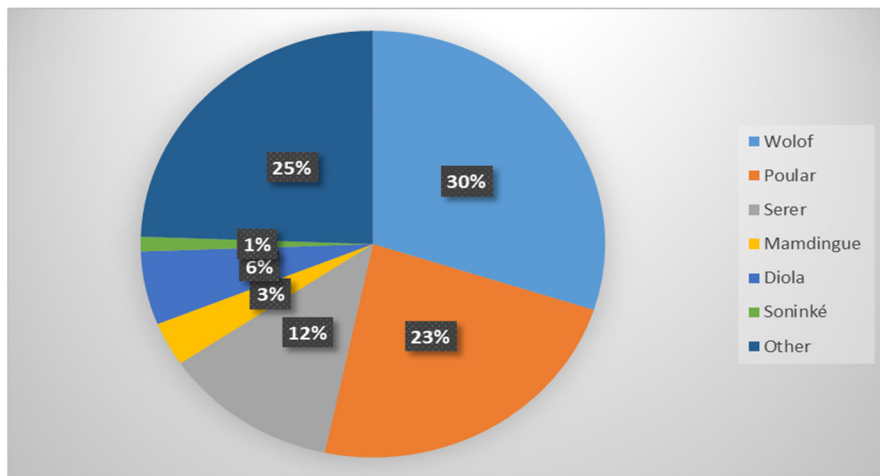
## Number of Children

The results indicate that about 60% of respondents had at least a child, and most of those (85%) had up to three children (see Table A2 in Annex). There was a statistically significant correlation between the number of children and the type of services used. Specifically, women who were expecting their first child, or who only had one other child, were more likely to use the doctor-led monitoring services. This could be explained by several reasons. First, women in their first pregnancy may feel more anxious and may thus want to be followed by a physician, who they may think offers the best option in terms of competencies and professionalism. Second, the lack of information on the training and professional competencies of midwives, together with their negative reputation in Senegal, could explain why midwife-led care was less popular among respondents expecting their first child, whereas women who already have children may have had positive or neutral experiences with midwives, counteracting the negative perception. In the subsequent FGD with existing NEST clients, some of the participants mentioned that they knew relatives who had had bad experiences with midwives in the past (not referring to NEST midwives).

## Ethnic Group

While the respondents came from very diverse ethnic groups, two ethnicities dominated, namely the Wolof (30%) and the Poular (23%). These ethnic groups are also dominant in the general population in Senegal; according to the last DHS, about 37% of the national population are from the Wolof and 26% from the Poular ethnic group.

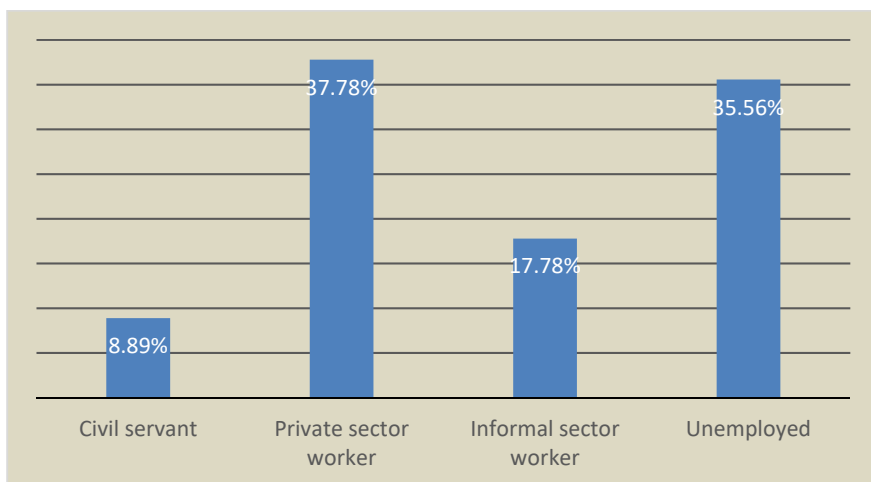
**Figure 8: Distribution of respondents, by ethnic group**



### Professional Occupation

Respondents (about 38%) were predominantly employed in the private sector (Figure 9). Almost 20% were also employed in the informal sector. A significant number of respondents (about 36%) were unemployed.

**Figure 9: Distribution of respondents, by type of work**



### Poverty Status

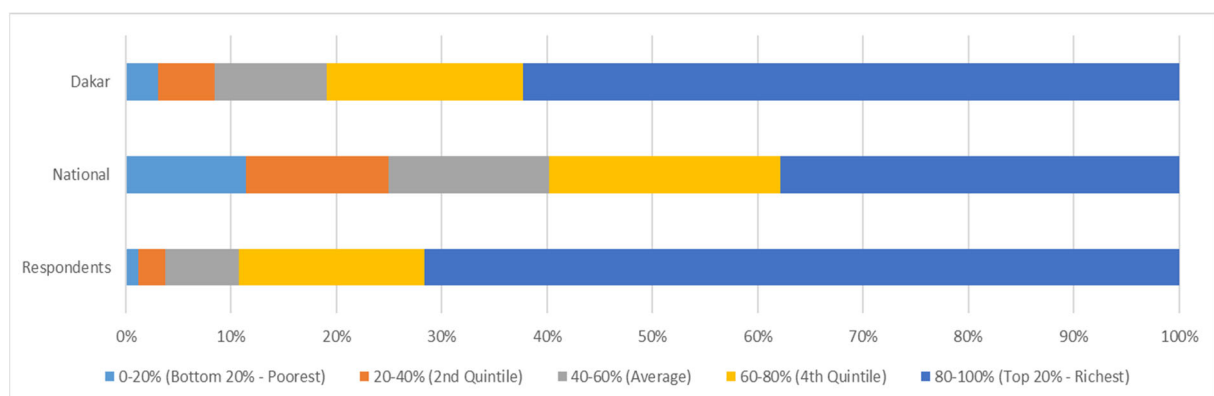
The PPI is a simple poverty measurement tool based on ten questions aimed at assessing household characteristics and asset ownership. PPI estimates the likelihood that a household is living below a set poverty line (more details in Annex). Table 1 indicates that the overall probability of NEST clients living in a poor household was about 3.8% when taking the national poverty line as reference. Almost none of the respondents appeared as poor when the food poverty line was used as reference. Although a substantial proportion of respondents lived below the \$USD5.5-per-day poverty line, the prevalence of this level of poverty was far lower among NEST respondents than in the Dakar or national population.



**Table 1: PPI for respondents, compared to households in Dakar and nationally**

Poverty Line	Respondents' poverty rate	Dakar benchmark	National benchmark
National Poverty Line	3.8%	17.1%	35.6%
Food Poverty Line	0.5%	1.5%	10.8%
USD1.00/day 2011	0.3%	2.2%	5.1%
USD1.90/day 2011	1.5%	8.2%	24.5%
USD3.20/day 2011	9.3%	32.6%	56.0%
USD5.50/day 2011	31.3%	62.2%	81.4%

Figure 10 presents the poverty distribution of respondents according to quintiles, in comparison to the poverty distribution in Dakar and nationally. We see that about 89% of respondents likely had consumption lying between the 60<sup>th</sup> and 100<sup>th</sup> percentiles of the consumption distribution in Senegal. While this share was far higher than the national average of about 60%, it was consistent with the Dakar average of about 81%.

**Figure 10: PPI for respondents and households in Dakar, by quintile**

**Note:** The length of the bars represents the wealth class distribution according to the PPI of the considered population. For instance, the orange bar captures the proportion of households under the food poverty line based on the PPI of (from top to bottom) the Dakar and the national population and NEST survey respondents.

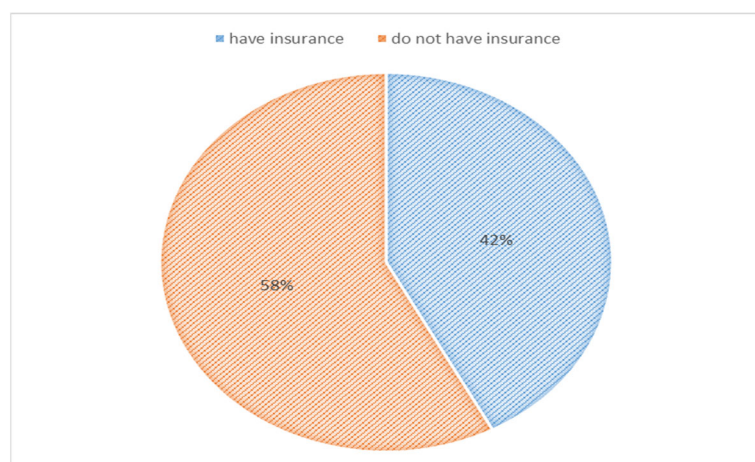
Table 2 presents the results of a test of differences in mean PPI at different poverty lines between the respondents in the midwife-led and the doctor-led care packages. For each of the poverty lines, the difference in mean PPI between the respondents in the two NEST care packages was not significant at the conventional significance level of 5%. However, the mean PPI (for all poverty lines) was lower for respondents in the doctor-led care package than for respondents in the midwife-led care package. Thus, it is possible that there is a meaningful positive relationship between PPI and the choice of care package, but this cannot be proven given the small sample size.

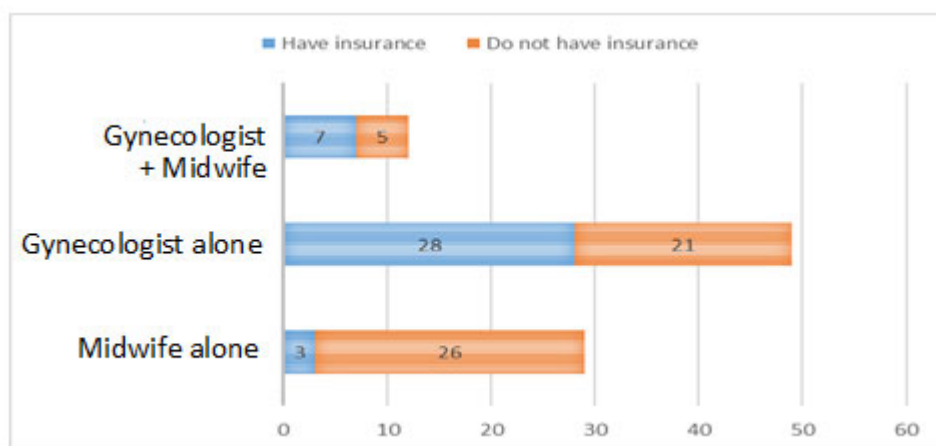
**Table 2: Differences in PPI between respondents in the midwife- and the doctor-led care packages, by poverty line**

PPI	Mean, Midwife-led care	Mean, Gynaecologist-led care	Difference	Standard Error	t-value	P-value
National Poverty Line	4.321	3.534	0.786	0.712	1.1	0.272
Food Poverty Line	0.558	0.451	0.108	0.086	1.25	0.214
USD1.90/day 2011	1.673	1.29	0.382	0.302	1.25	0.21
USD5.50/day 2011	33.842	29.859	3.982	4.344	0.9	0.362

### Health Insurance Coverage

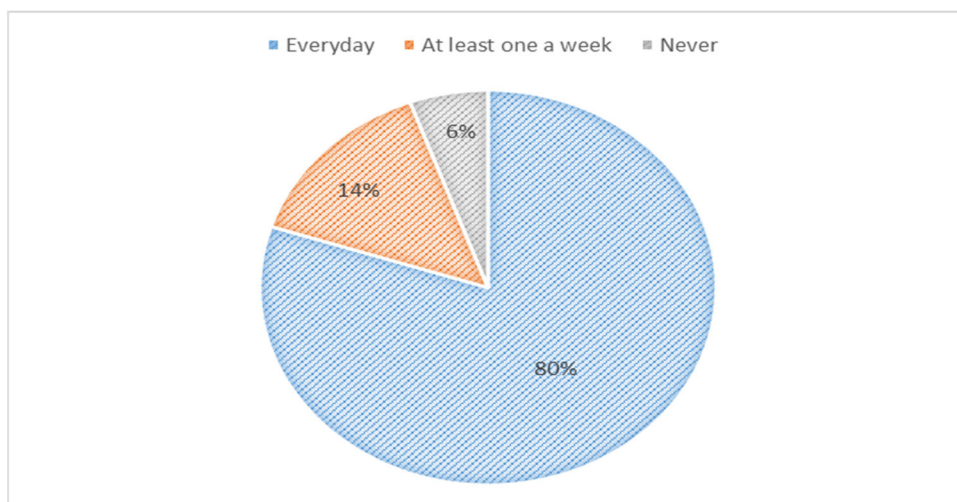
As many as 42% of respondents reported having health insurance (Figure 11). Clients with insurance predominantly chose doctor-led care services (about 57%), while almost all clients (about 90%) without insurance chose midwife-led care services (Figure 12). As became apparent during the FGD, some of the respondents had insurance that did not cover all services at NEST, encouraging them to seek the services of other health care providers where the costs would be reimbursed. This finding highlighted the need for NEST to consider how it could accommodate clients whose insurance companies do not cover the full portfolio of NEST services.

**Figure 11: Possession of health insurance by NEST clients**

**Figure 12: Possession of health insurance, by chosen NEST pregnancy monitoring professional**

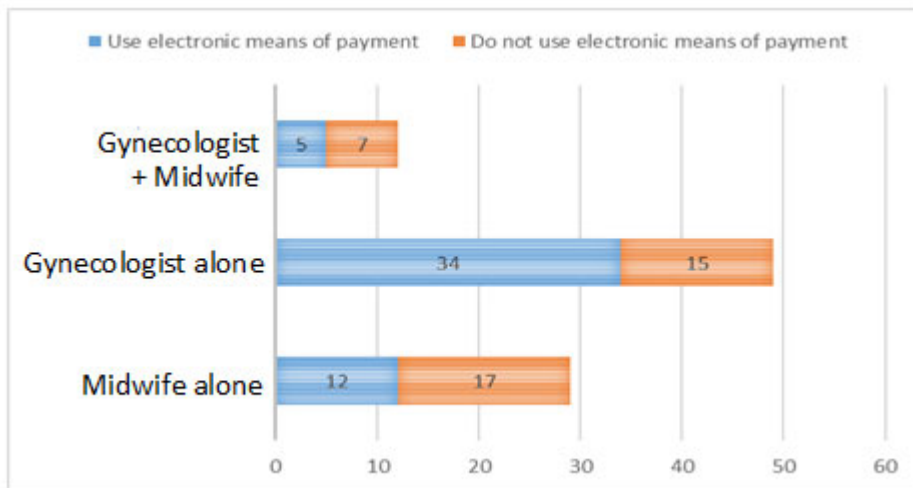
### Electronic Means of Payment

Altogether, 96% of respondents reported connecting to the Internet every day. About 94% of respondents reported using Facebook, the majority (about 80%) of them every day. Only 6% of the clients did not use Facebook (Figure 13).

**Figure 13: Frequency of Facebook use by NEST clients**

About 43% of respondents use electronic means of payment. Electronic payment was more common among the NEST clients that used doctor-led care services than among the clients that used midwife-led care services. About 59% of clients on the midwife-led care package reported not using any form of electronic payment.

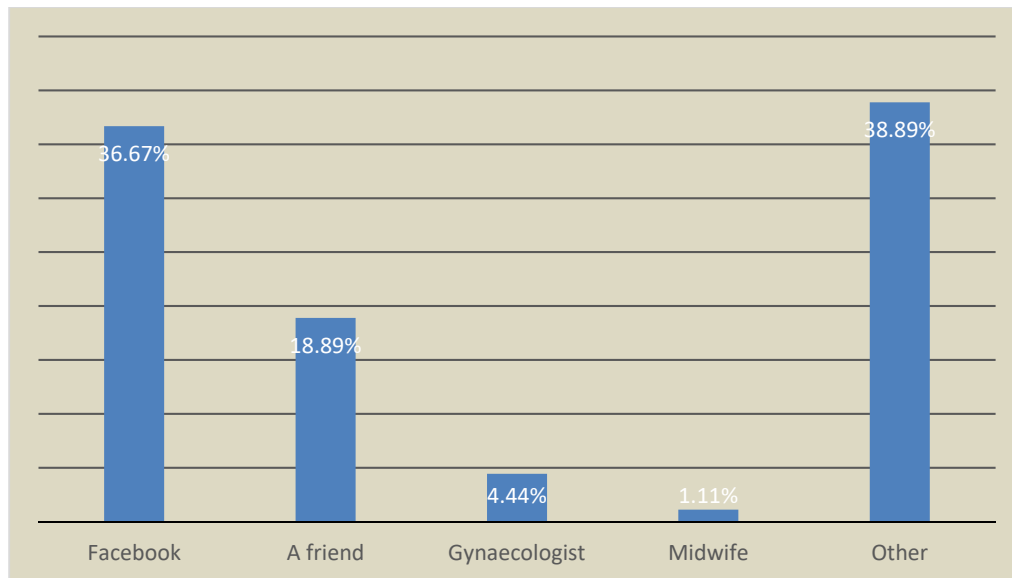
**Figure 14: Use of electronic payments by NEST clients**



### Client Acquisition

A little more than a third of respondents (37%) first heard about NEST and its services through Facebook (Figure 15). The second largest share of respondents (about 19%) learned about NEST through a friend’s recommendation. The proportion of clients that were advised by a doctor or midwife to seek NEST services was very low, even though the number of reported doctor referrals was higher than that of midwife referrals.

**Figure 15: How clients first heard about NEST**



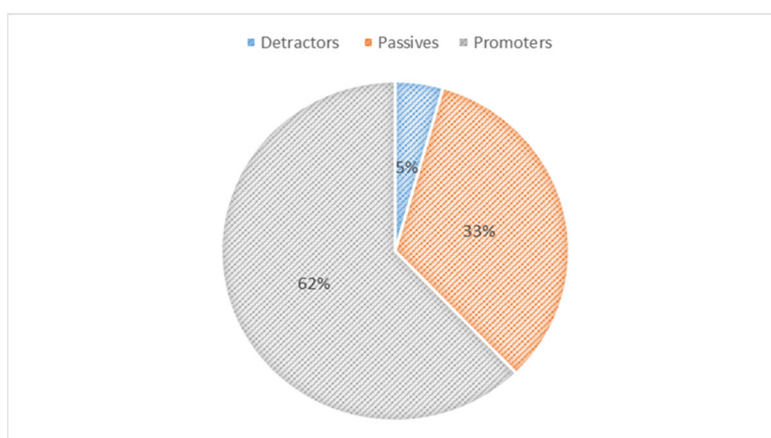
## Client Satisfaction

We used the Net Promoter Score (NPS) as a proxy for overall client satisfaction and loyalty. NPS is a widely-used index ranging from -100 to 100 that measures the willingness of clients to recommend a company's service or product to others through a range of survey questions. Using a 0-to-10 scale, clients can be classified as promoters (with a score ranging from 9 to 10), passives (with a score ranging from 7 to 8), or detractors (with a score ranging from 0 to 6). The NPS is computed using the following equation:

$$(2) \text{ NPS} = \% \text{ promoters} - \% \text{ detractors}$$

The NPS classification of our survey sample respondents is summarized in Figure 16.

**Figure 16: Satisfaction score among NEST clients**



The NPS calculated for the entire sample was 58 (Table 3). This score indicated that NEST had significantly more clients that were promoters (loyal or satisfied) than clients that were detractors (dissatisfied).

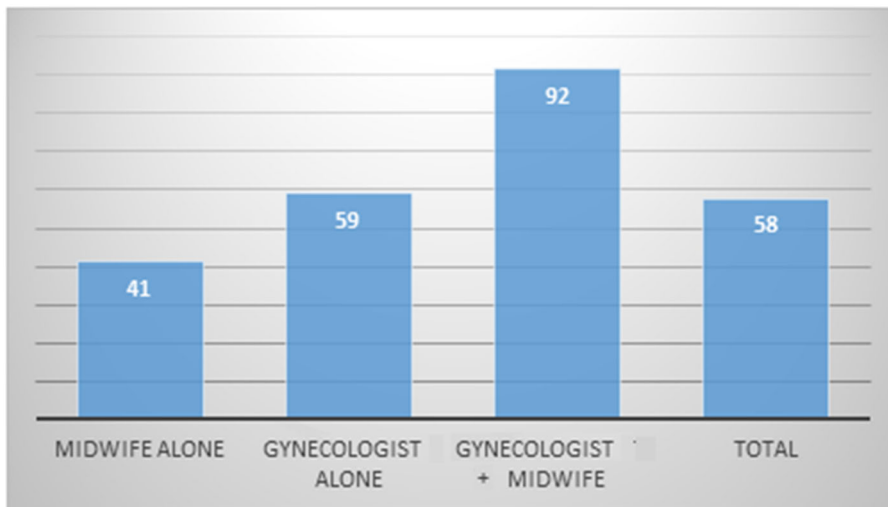
**Table 3: Client satisfaction, by chosen NEST pregnancy monitoring professional**

	Midwife alone	Gynaecologist alone	Gynaecologist + Midwife	Total
Detractors	2	2	0	4
Passives	13	16	1	30
Promoters	14	31	11	56
NPS <sup>a</sup> (promoters minus detractors)	41	59	92	58

<sup>a</sup> NPS, Net Promoter Score

Clients tended to report greater satisfaction when some elements of the NEST services were carried out by a doctor. Our results on the satisfaction scores were supported by the qualitative evidence we gathered during the FGD, where clients reported that NEST doctors had a very good reputation.

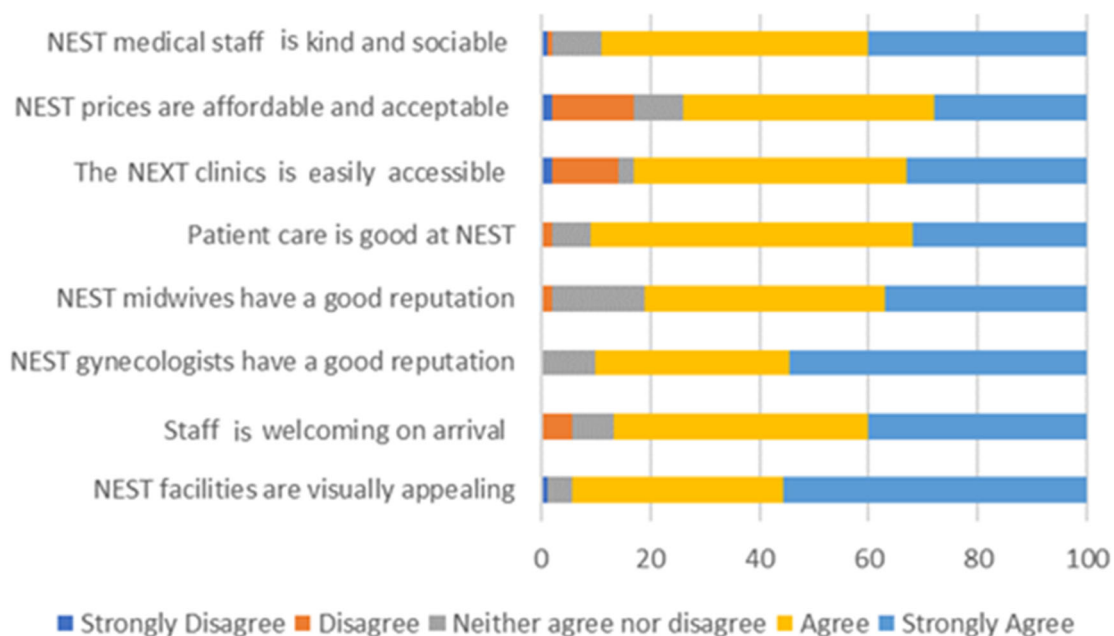
**Figure 17: Net Promoter Score, by chosen NEST pregnancy monitoring professional**



### Determinants of Customer Satisfaction

In the survey, clients were asked how strongly they agreed or disagreed with statements related to various aspects of the NEST services. Figure 18 shows that respondents were least satisfied with the pricing of the services and the physical accessibility of the clinics. On the other hand, respondents most strongly agreed that NEST gynaecologists have a good reputation. In fact, many existing clients had gone to NEST clinics in the first place for the reputation of their doctors. Almost all of the clients agreed or strongly agreed that the midwives of NEST also enjoy a good reputation.

**Figure 18: Customer perceptions of NEST services**



We performed a correlation analysis on the level of client satisfaction through the NPS score to determine which factors might be driving overall client loyalty. Statistically significant relationships were only found for two aspects of NEST services. A first association was identified between the overall

client satisfaction score and the perception that NEST clinics are visually appealing<sup>58</sup>. It was not possible to distinguish, however, whether the clinics looked appealing to clients as a result of their overall satisfaction with NEST, or whether the appealing appearance of the clinics led the clients to feel satisfied. Second, the reputation of NEST gynaecologists was significantly associated with client satisfaction, consistent with insights gathered during the FGDs. Specifically, FGD participants reported that the reputation of certain gynaecologists at NEST was impressive, and that this had been an important factor in their decision to choose NEST for prenatal health care services.

In addition, respondents who had already used NEST prenatal care services in the past (about 44% of respondents) showed a greater degree of satisfaction than did new clients, which means that they were also more willing to recommend NEST services to others. This result is consistent with the fact that about 20% of survey respondents declared that NEST had been recommended to them by a friend.

NEST could consider including NPS questions into their current client satisfaction survey questionnaire. The advantage of NPS over NEST's satisfaction survey is that it gives a granular quantification of client satisfaction. Thus, analysing the evolution of NPS over time could help NEST to more effectively track progress in client satisfaction and thus further establish its reputation. Moreover, a breakdown of NPS according to client characteristics could help NEST identify those groups whose experience could be improved. Asking individual clients to justify their score would also allow tracking more effectively the factors that impact client satisfaction. Implementing NPS as an add-on to NEST's client satisfaction survey could be done using tablets to lower the cost of data collection and reduce the time for data analysis. However, NPS should be used as a feedback mechanism rather than as an absolute score reflecting professional performance. Thus, clinical staff should understand that NPS is a tool designed to help them gain a better understanding of the experiences of some specific client groups rather than to evaluate their own professional and personal performance.

During the FGD NEST clients recommended some improvements which could make Nest clinics more attractive, ranging from allocating more parking slots to increasing the size of shared hospitalization rooms and improving the privacy of consultations. Respondents also noted that they find the location of NEST clinics inconvenient, and that they could be better signposted.

#### **4.2. Impact of Access to Information on the Willingness to Pay and the Willingness to Use Midwife-led Care Services**

To study how greater access to information affects the demand for midwife-led care services, we ran a field experiment in which we offered information sessions about NEST services to pregnant women in their first or second trimester. We then studied the impact of the sessions on the participants' willingness to pay (WTP) for and to use (WTU) midwife-led care services. WTP values were calculated based on the participants' answers to the question of how much they were willing to pay for each type of midwife-led care services (i.e. pregnancy monitoring or delivery care). Participant responses were collected at the end of each information session.

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<sup>58</sup> Visual appeal refers to whether facilities were generally perceived to be clean and tidy as well as whether the structures were physically in good shape.

Overall, the results show that greater access to information increased both WTP and WTU among participants. Furthermore, using a visualization exercise to convey the potential benefits of midwife services affected WTP and WTU more strongly than merely giving information on midwife-led care packages. When looking for specific determinants of WTP and WTU, we did not find any significant relationships between WTP or WTU and participant perceptions of the roles and abilities of midwives. In fact, in most of the cases, the results pointed to a negative relationship between a positive perception of midwives and WTP. This surprising result may be explained at least in part by the small size of our sample. In our regression analyses we used more than 10 variables for only 26 observations each for the treatment and control groups. This could affect the reliability of the estimation of the parameters in the model of the determinants, even though care was taken to use pairwise randomization to increase precision, with standard errors accounting for clustering at the pairwise group level.

### Balance Test of Observed Characteristics

In the field experiment, participants were randomly assigned to the treatment (attendance of the visualization session following the baseline and information sessions) or control group (attendance of the baseline and information sessions only). If our randomization succeeded in balancing covariates between the treatment and control groups at baseline, any changes observed following treatment can be attributed to our intervention. The results are reported in Table 4.

**Table 4: Balance test of observed characteristics between the treatment and control groups at baseline**

	(1) Control Mean [SE] <sup>a</sup>	(2) Treatment Mean [SE]	(3) Total Mean [SE]	(4) Difference (2) - (1)
Age (years)	28.091 [0.895]	29.667 [0.898]	28.860 [0.607]	1.576
Educational level	2.682 [0.121]	2.762 [0.118]	2.721 [0.077]	0.080
Married	1.000 [0.000]	0.810 [0.148]	0.907 [0.072]	-0.190
Spouse educational level	2.636 [0.124]	2.474 [0.160]	2.561 [0.102]	-0.163
Household size	6.409 [1.186]	4.048 [0.450]	5.256 [0.685]	-2.361*
Number of children	1.364 [0.370]	1.400 [0.245]	1.381 [0.224]	0.036
Children under 6	1.462 [0.268]	0.800 [0.262]	1.107 [0.173]	-0.662
Religion	0.864 [0.075]	0.952 [0.048]	0.907 [0.044]	0.089
Ethnicity	2.863 [0.443]	2.048 [0.312]	2.465 [0.298]	-0.816



Work type	2.227 [0.197]	2.143 [0.186]	2.186 [0.149]	-0.084
Work sector	0.308 [0.092]	0.423 [0.099]	0.365 [0.071]	0.115
Has medical insurance	0.364 [0.105]	0.238 [0.095]	0.302 [0.066]	-0.126
Uses e-pay	0.500 [0.109]	0.524 [0.112]	0.512 [0.091]	0.024
House floor material	5.000 [0.000]	5.048 [0.048]	5.023 [0.023]	0.048
Exterior wall material	0.692 [0.092]	0.654 [0.095]	0.673 [0.062]	-0.038
Energy (electricity)	1.000 [0.000]	1.000 [0.000]	1.000 [0.000]	0
Energy used for cooking	2.000 [0.000]	2.000 [0.000]	2.000 [0.000]	0
Separate room for cooking	1.000 [0.000]	0.905 [0.066]	0.953 [0.032]	-0.095
Purchased gasoline	0.455 [0.109]	0.333 [0.105]	0.395 [0.085]	-0.121
Uses e-money	0.909 [0.063]	0.810 [0.088]	0.860 [0.049]	-0.100
Uses Internet	1.000 [0.000]	1.000 [0.000]	1.000 [0.000]	0
Frequency of Internet use	0.909 [0.063]	1.000 [0.000]	0.953 [0.032]	0.091
Uses Facebook	1.000 [0.000]	0.952 [0.048]	0.977 [0.023]	0.048
Dwelling type	0.346 [0.095]	0.231 [0.084]	0.288 [0.069]	0.115
PPI <sup>b</sup> at national poverty line	7.235 [3.457]	16.056 [5.916]	11.829 [3.453]	8.821
N (women)	26	26	52	
Clusters	26	26	26	
F-test of joint significance (F-stat)				56.311***

Note: The values displayed for t-tests are the differences in the means across the treatment and control [1] groups. The values displayed for F-tests are the F-statistics. Standard errors (in square brackets) are clustered at the pairwise randomized level. All missing values in balance variables were treated as zero. <sup>a</sup> SE, standard errors. <sup>b</sup> PPI, Poverty Probability Index. \*\*\* Significant at the 1 percent level. \*\* Significant at the 5 percent level. \* Significant at the 10 percent level.

All the observed characteristics, except for household size, were balanced between the control and the treatment group. On average, participants in the treatment group were living in smaller households.

Column 3 in the balance table indicates the means of the observed characteristics for the entire (treatment and control) sample. The average age of women who participated in the field experiment was 29 years. Most participating women reported having attained at least tertiary education. About 91% of women were married. Most participants had one child, most often aged six or above. Even though the number of children was higher for participants in the control arm than in the treatment arm, the difference was not statistically significant at the 5% level. Furthermore, while the poverty likelihood of participants measured at the national poverty line was higher in the control group than in the treatment group, the difference was not statistically significant. The PPI for the entire sample was about 11.83%, which was lower than the average PPI for both the Dakar and the national population. Finally, the average household size in the total sample was five members.

We also tested for orthogonality of covariates between participants in the field experiment and NEST clients in the survey. The results are reported in Table 5. Overall, the two groups had similar observable characteristics. With the exception of four covariates (religion, spouse educational level, purchased gasoline, and poverty probability index), all observed characteristics were balanced between the two groups. The PPI at the national poverty line was higher for experiment participants than for NEST clients. In particular, experiment participants were on average poorer than NEST clients, even though their rate is lower than both the Dakar and national benchmark (see Table 2).

**Table 5: Balance test of observed characteristics (Survey respondents vs experiment participants)**

Observed characteristic	(1) Survey Respondents Mean [SE] <sup>a</sup>	(2) Experiment Participants Mean [SE]	(3) Total Mean [SE]	(4) Difference (1) - (2)
Age (years)	27.854 [0.416]	28.860 [0.638]	28.182 [0.350]	-1.007
Educational level	2.656 [0.067]	2.721 [0.084]	2.677 [0.053]	-0.065
Married	0.889 [0.058]	0.907 [0.073]	0.895 [0.046]	0.018
Spouse educational level	2.860 [0.076]	2.561 [0.099]	2.764 [0.062]	0.299**
Household size	4.567 [0.320]	5.256 [0.663]	4.789 [0.305]	-0.689
Number of children	1.178 [0.144]	1.381 [0.223]	1.242 [0.121]	-0.203
Children under 6	1.173 [0.105]	1.107 [0.195]	1.150 [0.096]	0.066
Religion	0.756 [0.046]	0.907 [0.045]	0.805 [0.035]	-0.151**

Ethnicity	25.811 [4.414]	17.605 [5.540]	23.158 [3.487]	8.206
Work type	5.156 [1.850]	2.186 [0.134]	4.195 [1.256]	2.970
Formal employment	0.467 [0.053]	0.365 [0.067]	0.430 [0.042]	0.101
Has medical insurance	0.427 [0.053]	0.302 [0.071]	0.386 [0.043]	0.125
Uses e-pay	0.567 [0.053]	0.512 [0.077]	0.549 [0.043]	0.055
House floor material	5.033 [0.019]	5.023 [0.023]	5.030 [0.015]	0.010
Exterior wall material	0.789 [0.043]	0.673 [0.066]	0.746 [0.037]	0.116
Energy (electricity)	1.000 [0.000]	1.000 [0.000]	1.000 [0.000]	0
Energy used for cooking	3.044 [1.078]	2.000 [0.000]	2.707 [0.730]	1.044
Separate room for cooking	0.967 [0.019]	0.953 [0.032]	0.962 [0.017]	0.013
Purchased gasoline	0.644 [0.051]	0.395 [0.075]	0.564 [0.043]	0.249***
Uses e-money	0.867 [0.036]	0.860 [0.053]	0.865 [0.030]	0.006
Uses Internet	0.967 [0.019]	1.000 [0.000]	0.977 [0.013]	-0.033
Frequency of Internet use	0.989 [0.011]	0.953 [0.032]	0.977 [0.013]	0.035
Uses Facebook	0.977 [0.016]	1.023 [0.023]	0.992 [0.013]	-0.046
Dwelling type	0.356 [0.051]	0.288 [0.063]	0.331 [0.040]	0.067
PPI <sup>b</sup> at national poverty line	4.323 [0.386]	11.829 [3.522]	6.968 [1.279]	-7.454***
N	90	52	142	
F-test of joint significance (F-stat)				1.635*

Note: The values displayed for t-tests are the differences in the means across the NEST clients surveyed (profile) and the participants of the experiment (experiment). The values displayed for F-tests are the F-statistics. Standard errors (in square brackets) are clustered at the pairwise randomized level. All missing values in balance variables were treated as zero. <sup>a</sup> SE, standard errors. <sup>b</sup> PPI, Poverty Probability Index. \*\*\* Significant at the 1 percent level. \*\* Significant at the 5 percent level. \* Significant at the 10 percent level.

## Willingness to Pay

The average WTP, which was measured following the baseline, information, and visualization sessions, is reported in Table 6. As expected, participants were willing to pay more for delivery care services than for pregnancy monitoring services. The average willingness to pay for monitoring services following the baseline session was about CFA 126,000 (\$213), compared to about CFA 200,000 (\$340) for normal delivery care services. The same trend was found following the information and visualization sessions. Following the baseline session, very few participants proposed a WTP above the NEST price. Thus, across the entire sample, only about 17% of participants were willing to pay more than the established NEST price for midwife-led monitoring services. The proportion of participants bidding above the NEST price was higher following the visualization session, further suggesting that visualization led to greater WTP.

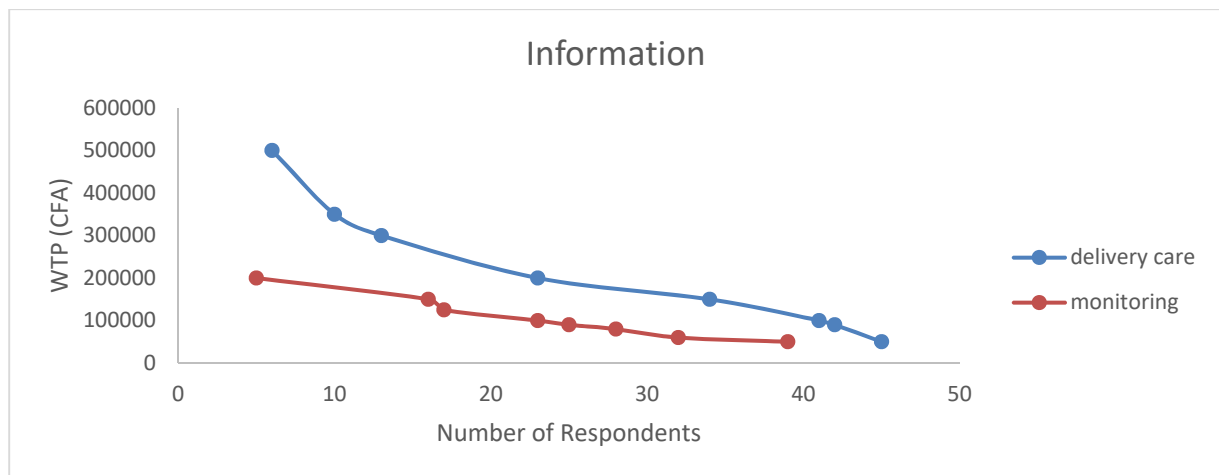
**Table 6: Summary statistics on willingness to pay for midwife-led care services**

Variable (midwife services, following sessions)	(1) Control Mean [SE] <sup>a</sup>	(2) Treatment Mean [SE]	(3) Total Mean [SE]
Monitoring (Baseline)	143.65 [17.70]	107.50 [11.65]	125.58 [12.79]
Normal delivery (Baseline)	232.31 [3.072]	166.92 [16.97]	199.62 [17.52]
Monitoring (Information)	129.04 [15.68]	114.81 [1.192]	121.92 [11.75]
Normal delivery (Information)	237.69 [29.48]	216.92 [22.54]	227.31 [19.76]
Monitoring (Visualization)		160.58 [18.96]	152.12 [13.77]
Normal delivery (Visualization)		292.31 [24.76]	262.31 [16.64]
N	26	26	52

Note: All values are expressed in CFA 1 000. The standard errors (in square brackets) for information and visualization sessions are at the pairwise group level. <sup>a</sup> SE, standard errors.

Figure 19 and Figure 20 present the WTP for monitoring and delivery care services by session type. Following the information session (which all participants attended), in general, the WTP for delivery care services was higher than that for monitoring services (Figure 19). Thus, the curve representing the WTP for delivery care services lies above that of the WTP for monitoring services. While the maximum WTP for monitoring was CFA 200,000, the maximum WTP for delivery was CFA 500,000. However, the gap in WTP between the monitoring and delivery care services narrowed as the WTP values decreased.

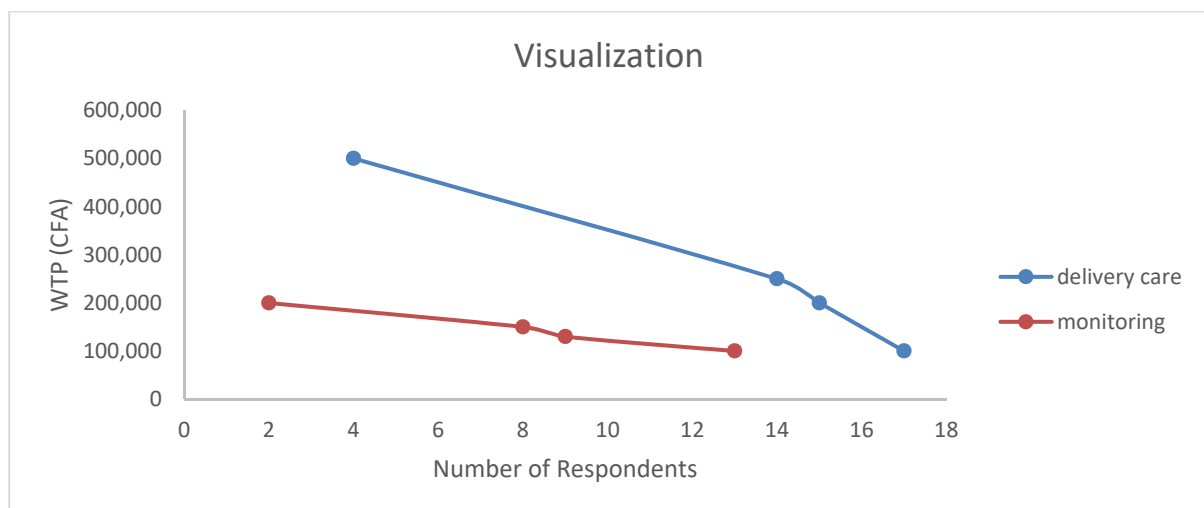
**Figure 19: Willingness to pay, monitoring vs delivery care services (information session)**



*Note: The cumulative numbers of respondents are used for the WTP corresponding to each of the services.*

Following the visualization session, the WTP for delivery care services was also higher than the WTP for monitoring services (Figure 20), with the gap narrowing as WTP values decreased. However, the gap between the WTP for the two types of services was wider after the visualization than after the information session. This result indicates that visualization increased the WTP for delivery care services more strongly than the WTP for pregnancy monitoring services.

**Figure 20: Willingness to pay, monitoring vs delivery care services (visualization session)**



*Note: Cumulative numbers of respondents are used for the WTP corresponding to each of the services.*

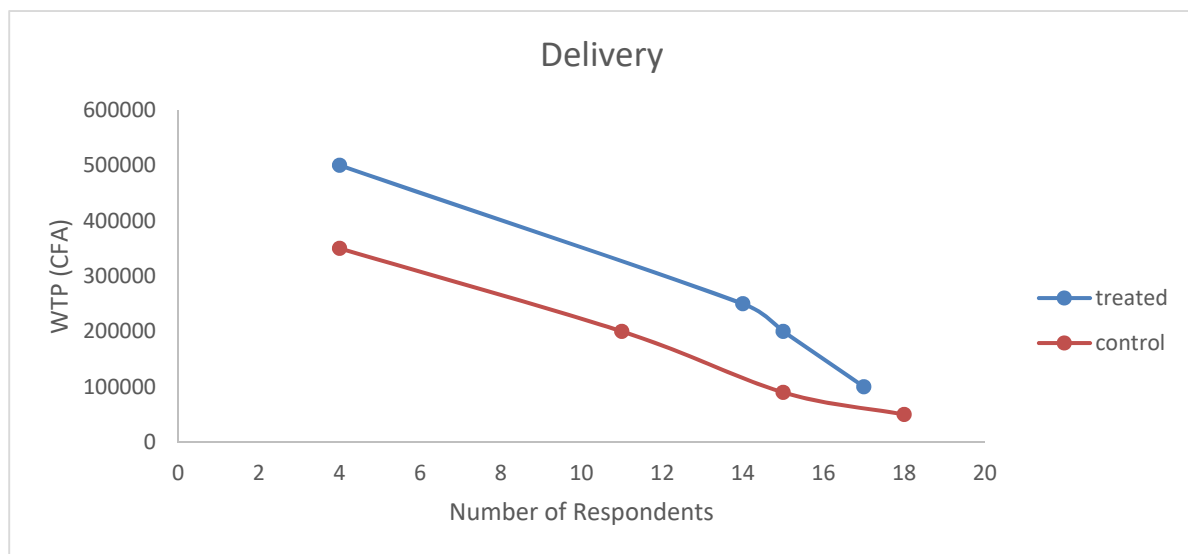
Figure 21 and Figure 22 show the difference in WTP between the visualization group (treated) and the information group (control) by type of NEST service. For both monitoring (Figure 21) and delivery care services (Figure 22), the WTP in the group that attended the visualization session was higher than that of the group that only took part in the information session. In particular, both the maximum and minimum WTP values were higher following the visualization session than following the information session only. Thus, the visualization session led to an upward shift in the demand for both monitoring and delivery care services, with a higher WTP for delivery care than for monitoring services.

**Figure 21: Willingness to pay for pregnancy monitoring services (information vs visualization)**



Note: Cumulative numbers of respondents are used for the WTP corresponding to each group.

**Figure 22: Willingness to pay for delivery care services (information vs visualization)**



Note: Cumulative numbers of respondents are used for the WTP corresponding to each group.

### Willingness to Pay for Midwife-led Care Services versus NEST Prices

At NEST, the cost for pregnancy monitoring services is about CFA 90,000 (\$157) for the midwife-led care package and CFA 250,000 (\$435) for the doctor-led care package. For the delivery care services, the prices are CFA 250,000 (\$435) and CFA 592,000 (\$1030), respectively. Table 7 shows the proportion of participants that offered a WTP higher than the corresponding NEST price. For pregnancy monitoring services, about 27% and 7% of the participants in the control and in the treatment group, respectively, were willing to pay an amount that was at least equal to the NEST price following the baseline session. Following the information session, the proportion of participants that bid above the NEST price for monitoring services increased significantly in the treatment group. Following the visualization session, the proportion of participants that bid above the NEST price increased further to reach about 39%. This confirmed our previous findings that visualization led to a greater number of participants bidding above the NEST price for monitoring services. The bidding for normal delivery care services followed a similar pattern. Furthermore, the results indicate that more participants bid at the NEST price for delivery care services than for pregnancy monitoring services, suggesting that participants saw more value in delivery care than in monitoring services.

**Table 7: Participant Willingness to pay (WTP) for midwife-led care services above NEST prices, by information session**

Variable	(1) Control Mean [SE] <sup>a</sup>	(2) Treatment Mean [SE]	(3) Total Mean [SE]
Monitoring (Baseline)	0.269 [0.089]	0.077 [0.053]	0.173 [0.048]
Monitoring (Information)	0.269 [0.089]	0.231 [0.084]	0.250 [0.064]
Monitoring (Visualization)		0.385 [0.097]	0.327 [0.055]
WTP normal delivery (Baseline)	0.692 [0.092]	0.538 [0.100]	0.615 [0.080]
WTP normal delivery (Information)	0.577	0.577 [0.099]	0.577 [0.077]
WTP normal delivery (Visualization)		0.769 [0.084]	0.731 [0.057]
N	26	26	52
Clusters	26	26	26

<sup>a</sup> SE, standard errors.

### Willingness to Use Midwife-led Care Services

The willingness to use midwife-led monitoring and delivery care services was also higher following the visualization session than following the basic information session (Table 8). Specifically, about 75% of treated participants declared their willingness to use midwife-led services following the information session, compared to nearly 100% following the visualization session. Thus, the visualization session was associated with both a higher willingness to pay and a higher willingness to use midwife-led care services.

**Table 8: Willingness to use (WTU) midwife-led care package, by information session**

Variable	Control Mean [SE] <sup>a</sup>	Treatment Mean [SE]	Total Mean [SE]
WTU midwife-led monitoring and delivery care services (Baseline )	1.154 [0.072]	1.192 [0.079]	1.173 [0.068]
WTU midwife-led monitoring and delivery care services (Information)	1.269 [0.089]	1.231 [0.084]	1.250 [0.064]
WTU midwife-led care monitoring and delivery care services (Visualization)	0.000 [0.000]	1.000 [0.055]	0.500 [0.028]
N	26	26	52

<sup>a</sup> SE, standard errors.

### Treatment Effects on WTP and WTU for Midwife-led Care Services

Treatment effects on the WTP and WTU for midwife-led care services were estimated based on Equation 1 using a linear regression and a logistic model, respectively. In our treatment effects estimation, we controlled for differences in observed characteristics between the two groups at baseline. To control for our use of pairwise randomization to assign participants to the visualization group we clustered the standard errors at the pairwise group level.

Presented in Table 9 are the results from the estimation of average treatment effects controlling for the fact that household size was not balanced at baseline.<sup>59</sup> At baseline, the WTP for both pregnancy monitoring and normal delivery care services was lower for participants in the treatment group than in the control group, with both effects significant at the 10 percent statistical significance level. Furthermore, the WTP for both pregnancy monitoring and normal delivery care services was lower in the treatment than in the control group after the (basic) information session. However, the difference at endline was not statistically significant. This result shows that, before the visualization session, the participants in the control group (who participated in the baseline and information sessions only) had a higher WTP for midwife-led pregnancy monitoring and normal delivery care services than the participants in the treatment group (who participated in all three sessions). Given that observed covariates were balanced at baseline, this difference in outcome between the two groups must have occurred by chance. Finally, participation in the visualization session increased the WTP of women for pregnancy monitoring and normal delivery care services. Specifically, the WTP for monitoring and

<sup>59</sup> Note that estimates presented for the baseline session are the same as those reported in Table 5.



delivery care services increased by about CFA 28,840 (\$50) and CFA 52,290 (\$89), respectively. Even though these effects were not statistically significant, perhaps due to the small sample size, they were important at the economic level. Interestingly, while the information session did not increase WTP, the visualization session did, and substantially so for normal delivery care.

**Table 9: Treatment effects on willingness to pay (WTP) for midwife-led care services**

	Baseline		Information		Visualization	
	(1) Monitoring	(2) Normal delivery	(3) Monitoring	(4) Normal delivery	(5) Monitoring	(6) Normal delivery
Control (levels)	143.65*** (14.98)	232.31*** (24.82)	121.11*** (16.96)	217.05*** (37.04)	125.68*** (16.27)	234.98*** (31.50)
Treatment vs. control	-36.15* (21.19)	-81.86* (35.10)	-21.05 (16.24)	-38.52 (33.83)	28.84 (30.45)	52.29 (50.86)
Household size			2.22 (2.08)	5.77 (4.58)	0.94 (3.23)	0.76 (4.21)
Observations	52	52	52	52	52	52

Note: Standard errors in parentheses; \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ ; for information and visualization, the standard errors are clustered at the pairwise randomization level.

The impact of our intervention on the WTU for combined midwife-led monitoring and delivery care services is reported in Table 10. Given that the magnitude of the coefficients from a logit model are not easy to interpret when more than one response variable is considered, we report the partial effects of the variables at the mean of all the variables. The difference in predicted margins between the WTU of participants in the information and the visualization session was about 15% in favour of the latter, a finding that was statistically significant.

**Table 10: Treatment effects on the willingness to use (WTU) midwife-led care services**

	<b>(1) Baseline</b>	<b>(2) Information</b>	<b>(3) Visualization</b>
Control (levels)	0.846** (0.60)	0.731** (0.58)	0.854** (0.64)
Treatment	-0.033 (1.00)	0.030 (0.115)	0.146** (0.91)
Household size		0.003 (0.016)	0.020* (0.011)
Observations	52	52	52

*Note: Standard errors in parentheses and for information and visualization are clustered at the pairwise randomization level;  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$*

### Determinants of WTP and WTU for midwife-led care services

We also analysed determinants of participant willingness to pay for and to use midwife-led care services, using Poisson and logistic regressions respectively. We investigated whether participant perception of the roles and qualities of midwives could affect WTP and WTU. Respondents were asked to indicate (using a yes/no answer) whether they thought that midwives in Senegal can be regarded as capable of screening patients, monitoring fetal growth, and evaluating risk in pregnancy. The same approach was used to gauge the impact of the perceptions surrounding the professional qualities of midwives (e.g., whether midwives can be regarded as professionals, trustworthy, and skilled.) Table 11 shows that many of the professional abilities and qualities of midwives (although not all) had a positive effect on participant WTP and WTU. Thus, quality attributes like professionalism were positively related to both WTP and WTU, with a 5% level statistical significance for WTU. Further insights from our FGDs corroborated this finding. For instance, in the FGD that was held following the visualization session, participants shared the perceptions that midwives in public hospitals generally lack professionalism and polite manners with clients and mostly use traditional methods of examination. Several participants expressed their dislike of vaginal examination and preferred techniques such as echography, which they perceived to be more modern and that it is more comfortable.

**Table 11: Determinants of willingness to pay (WTP) and willingness to use (WTU) for midwife-led care services**

Perceived midwife quality attributes and professional abilities	(1) WTP (Monitoring)	(2) WTP (Normal delivery)	(3) WTU (Monitoring & delivery)
Trustworthy	0.302 (0.19)	1.995 (0.46)	0.293 (0.55)
Professional	1.554 (0.87)	3.936 (1.05)	1.405* (2.26)
Skilled	0.842 (0.67)	0.642 (0.34)	0.139 (0.34)
Screening	-2.594 (-0.53)	7.055 (0.82)	3.055* (2.42)
Fetal monitoring	1.302 (0.25)	-17.03 (-1.27)	17.48*** (18.22)
Risk identification	-3.470 (-0.84)	2.833 (-0.38)	15.45*** (-12.90)
Constant	17.63 (0.65)	35.81 (0.66)	11.80* (2.35)
Observations	42	42	42

Note: *t* statistics in parentheses. Standard errors are clustered at the pairwise group level. In all regressions, patient individual characteristics are controlled for, but not reported. \*\*\* Significant at the 1 percent level. \*\* Significant at the 5 percent level. \* Significant at the 10 percent level.

Surprisingly, an important professional ability like risk identification was negatively associated with the WTP for midwife-led monitoring services. However, this variable was positively associated with the

WTP for delivery care services. Risk identification was also positively and highly significantly associated with WTU. Participant perception of midwives as being skilled positively affected both WTP and WTU, even though these results did not reach the 5% statistical significance level. The further insights provided by the FGDs supported these findings. In particular, almost all FGDs participants reported preferring doctor-led care services because doctors are more skilful due to their higher level of qualifications. As illustrated by one of the FGDs participants, “Why should I choose to meet a priest when I have the chance to meet a bishop?” For most pregnant women, qualifications are what matters most.

During the FGDs, women were also asked why they thought midwives in public hospitals exhibited negative behaviour. Participants pointed out that midwives in public hospitals may be channelling their frustrations to patients at the lack of incentives such as remuneration, which is usually higher in the private than in the public sector. Another reason suggested by participants was that public hospitals usually see a very large number of patients, leading midwives to feel overworked and to engage in bad manners. These perceptions corroborated other findings in Senegal and elsewhere that public sector midwives experience high levels of stress, low remuneration satisfaction, and emotional exhaustion. For example, in Uganda, Nabirye et al. (2014) reported that about 80% of midwives in public hospitals experienced job stress and that only 17% were satisfied with their job.

### **Cost-Effectiveness Analysis**

In our field experiment, the visualization session was associated with higher participant WTP and WTU for midwife-led care services than was the information session, even though these associations were statistically significant for WTU only. For comparison with the existing information campaign by NEST, it is important to analyse whether the visualization method is in fact more cost-effective.

Currently, NEST information sessions each gather about 40 women of reproductive age in Dakar at the cost of about CFA 10,000 (about USD17) for the company. In order to inform 10,000 young women about its services in the coming years, NEST would need to run 250 sessions, at the total cost of about CFA 2.5 million (about \$4239). At an assumed rate of two information sessions per month, it would take a 10-year outreach campaign to meet the 10,000 women targeted. An information campaign based on face-to-face visualization sessions similar to those piloted in this study would cost NEST approximately the same amount of money as its current information sessions. The midwives who run the visualization sessions should also be compensated for their time preparing their storytelling with an additional small sum of money—for example, about CFA 2,000 (about USD3) more per session. In such a scenario, using visualization would increase the cost of NEST information sessions by about 20%. However, as indicated by our WTP results, running visualization sessions would increase NEST estimated earned benefits for its midwife-led care services by at least 22% (i.e., the difference in impact between the information and visualization sessions), and thus be more cost-effective.

An outreach campaign based on visualization could be even more cost effective if it included a video that could be shared online via social media platforms like Facebook.

According to NEST estimations, producing a campaign video would cost around CFA 500,000 (about \$848). Hiring a celebrity, which would likely make the video more effective, would cost an additional CFA 200,000 (about \$339). Should the video be posted on a platform such as Facebook as an ad, the cost would be further increased by an estimated \$112 (about CFA 66,400). Altogether, producing a

visualization video with a celebrity for posting on Facebook with a target audience of 10,000 women would cost NEST an estimated CFA 766,400 (about USD1300). Hence, the video option would increase cost substantially in the short run for small campaigns, even without including the cost the viewer will incur in streaming the video. On the other hand, posting a video on Facebook would make it possible to reach 10,000 women in just a few months, as compared to several years when using face-to-face sessions. Thus, when targeting a large number of women, particularly middle-class women (who usually have a social media account), the visualization video would be more cost-effective in targeting a large number of clients, and thus a better option in the long run, if NEST believes that the number of clients is likely to rise over time.

Unlike face-to-face sessions, a video campaign has very low marginal costs. In fact, the breakeven between running face-to-face information sessions and a visualization video campaign would occur at the 3066<sup>th</sup><sup>60</sup> women. Hence, in the case the company plans to reach out to fewer than 3066 women, then the face-to-face information sessions would be cheaper. But if the objective is to reach out to more than 3066 women, then a visualization video that can be posted on a social media platform like Facebook would be less costly. Of note, however, our visualization experiment only used face-to-face interactions, and thus did not test whether a video session would be more effective than a face-to-face session.

Hence, the question of which option would cost less to the company depends on its outreach campaign objectives. Furthermore, it is important to highlight that if the objective is to reach out to poor women, then face-to-face sessions would be more practical, as a large part of the poor population does not have access to social media platforms. Consequently, with the aim of targeting different groups, a mixed approach targeting some women via face-to-face visualization sessions and others via a social media platform could be optimal.

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<sup>60</sup> The calculation was made as follows:  $40 \times 766400 / 1000 = 3065.5$ .

## 5. Conclusion and Key Insights

The aim of this study was twofold: to profile Nest clients, and to provide evidence on whether simple psychological interventions may increase demand for affordable services offered by private firms like NEST.

Most of the NEST clients surveyed were young. Most had access to the Internet and used it frequently. Most were from the two biggest tribes in Dakar. Majority (about 38 percent) of them worked in the private sector. The majority of NEST clients had medical insurance coverage, even though several respondents reported that their insurance company did not reimburse all of the services offered by NEST.

Compared with the average population in Senegal, NEST clients came from fairly privileged socioeconomic backgrounds, with a poverty probability as low as 3.8% when using the PPI at the national poverty line. The ownership of mobile money accounts was widespread. Almost all the NEST clients interviewed used social media (Facebook) on a daily basis, which is a useful insight for NEST. Indeed, while the company already uses Facebook to communicate with clients as well as to advertise services, there is room for NEST to continue harnessing social media in its marketing strategy. In fact, during our FGD, several existing NEST clients highlighted that it could be interesting for NEST to have a Facebook chatting platform so clients have online access to a health professional to answer their queries around the clock.

The results of our net promoter score analysis revealed that most of the existing clients were loyalists to NEST, rather than detractors. One of the major insights that emerged from the FGDs were that most clients came to NEST because of the good reputation of its doctors. Generally, clients were happy with the NEST business model, although they highlighted room to improvement in the allocation of parking spaces, the location of NEST clinics, the size of shared admission rooms and the privacy afforded during consultations. NEST services are mostly benefiting middle-income families, which may also help explain why many clients preferentially choose the doctor-led services even though they are more expensive. More needs to be done for NEST to extend its services to the poor, which remains a primary remit of the company.

In our field experiment, we tested the impact of delivering information about midwife-led care services on participant willingness to pay for such services using two session variants: 1. the model currently used by NEST, which delivers basic information about its services in a face-to-face session; and 2. a face-to-face session harnessing the visualization of potential benefits through midwife stories to make the information more vivid. We found that the visualization session had a greater impact on the willingness to pay than did the standard information session used by NEST. Visualization was also associated with a greater likelihood that participants were willing to use midwife-led care services. However, the impact of visualization on WTP was not significant, and the impact on WTU was only significant at the 10 percent level. Moreover, less than 40% of participants offered a payment bid that corresponded to the current NEST price. In fact, in the visualization session, where the highest bids were observed, only 39% of participants bid above the NEST price. Overall, our results show that information campaigns that use visualization and storytelling are more effective than basic information sessions. Our results are consistent with previous literature showing that simple psychological intervention can influence behaviour. Of note, the sample size in our field experiment was low due to

a lower-than-expected participant show-up rate, and our results should thus be interpreted with caution. Notwithstanding this caveat, the results imply that, if NEST could embed storytelling on the positive aspects of being attended by a midwife into its current information campaign, it could positively influence demand for midwife services. Contrary to expectations, not all of the professional abilities and quality attributes of midwives were observed to be associated with WTP and WTU. This may be due to the low sample size. Nonetheless, reported perceptions of unprofessionalism did have a negative effect on WTP and WTU, which was corroborated by qualitative insights from the FGD.

Three general issues surrounding midwives emerged from the FGDs with field experiment participants. First, many participants reported a negative perception of midwives. Many believed that midwives generally lacked professionalism and polite manners. Second, many participants believed that midwives used vaginal examination too frequently and that they should adopt more modern pregnancy monitoring techniques like echography. Third, many participants believed that a lot should be done to improve the professionalism and attitudes of midwives, including attributes like courtesy and pleasantness, empathy towards patient questions and worries, hygiene, and physical appearance. Therefore, companies like NEST should put more emphasis on the professionalism and attitudes of their midwives, as these are aspects of greater concern to most women. They must also convince women that their midwives indeed have these traits. Furthermore, the women we spoke to highlight that access to midwives by phone or through social media are service dimensions that can make a difference.

Our cost-effectiveness analysis indicated that visualization sessions can be cost effective, especially if run to reach a large number of potential clients. Bringing the campaign online and using an information video could be cost effective. However, given that most of the poor do not use social media, face-to-face visualization sessions would still be the most cost-effective option to reach out to these groups. In this regard, a mixed visualization information campaign where some potential clients are targeted via online platforms and others via face-to-face sessions would likely yield greater dividends.

This study has several limitations. First, the sampling for our survey of existing NEST clients was based on a list of patients that registered with the company only six months before this work was commissioned. Given that there is a good number of patients that registered in previous years, the list that we used as our sampling frame falls short of containing all existing NEST clients. Second, even though participation in the experiment was incentivized, the show-up rate remained low. As a result, the estimation of the treatment effects of the information sessions on WTP or WTU and the determinants of WTP or WTU relied on a small sample size. Although we used pairwise randomization to increase precision, the sample size is still relatively low for detecting statistically meaningful effects.

The study highlights several issues of potential interest for further research. First, our study focused on urban populations. This was because, until now, NEST clinics have mostly been available in urban areas in Senegal (Dakar). Therefore, studies that focus on rural populations in developing countries could add value to the evidence. Second, we found that like most private sector firms, NEST mainly serves middle-class families even though its primary remit is to serve the poor. As a result, their services are pricier than what the public system offers. This might explain why the public health care system finds it difficult to outsource some of these services to private providers like NEST even though public hospitals are overcrowded. Third, in this study, we only considered the lack of information as a potential barrier to the acceptance and use of midwife services in Senegal. However, considering other

barriers such as social and professional factors could also be insightful. Further research is also warranted into how gender-related norms or beliefs in developing countries affect the promotion of midwife-led care services.



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## Annex A: Additional Tables, Figures and Explanations

**Table A1: Test of independence between respondent age and choice of pregnancy monitoring professional**

Respondent age	Midwife alone	Gynecologist alone	Gynecologist + Midwife	Total
18-24 years	11	4	1	16
25-30 years	15	31	7	53
31-36 years	2	11	2	15
Over 37 years	1	3	2	6
<b>Total</b>	<b>29</b>	<b>49</b>	<b>12</b>	<b>90</b>

*Pearson  $\chi^2(6) = 15.10$  P-value = 0.019*

**Table A2: Test of independence between the number of children and choice of pregnancy monitoring professional**

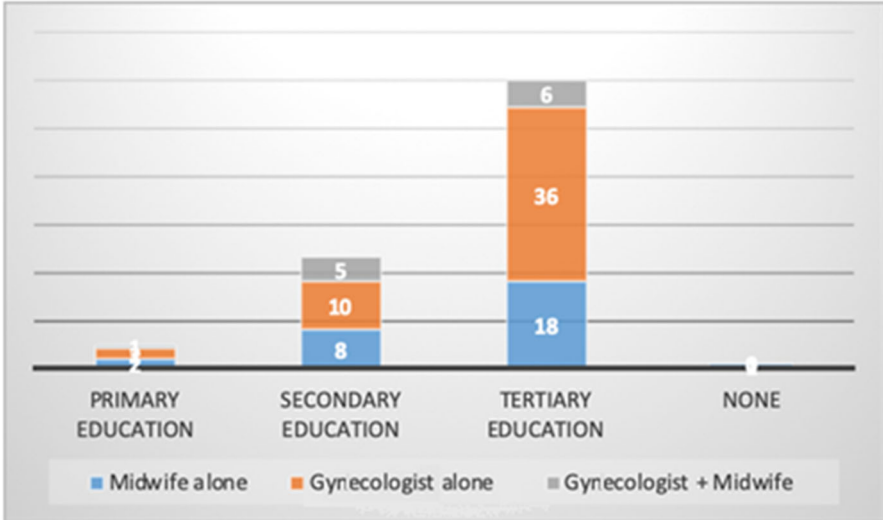
Number of children	Midwife alone	Gynecologist alone	Gynecologist + Midwife	Total
0	10	25	3	38
1	8	13	2	23
2	5	5	5	15
3	5	1	0	6
4	0	5	0	5
5	1	0	2	3
<b>Total</b>	<b>29</b>	<b>49</b>	<b>12</b>	<b>90</b>

*Pearson  $\chi^2(10) = 27.78$  P-value = 0.002*

**Table A3: PPI quintiles for respondents compared to households in Dakar and nationally**

Quintiles for Population Consumption Distribution Across Individuals	Respondents	National benchmark	Dakar benchmark
0-20% (Bottom 20% - Poorest)	1.1%	11.4%	3.1%
20-40% (2nd Quintile)	2.6%	13.5%	5.3%
40-60% (Average)	7.0%	15.3%	10.7%
60-80% (4th Quintile)	17.7%	21.9%	18.6%
80-100% (Top 20% - Richest)	71.6%	37.9%	62.3%

Figure A1: Educational level of respondents, by pregnancy monitoring professional



**Note 1: Pilot survey**

No major issue was identified during the pilot field survey, except that some questions, including those about income and use of mobile money, were seen as sensitive by respondents. As a result, these questions were dropped in the final version of the questionnaire. Furthermore, free airtime incentives were offered to all survey participants. For a subset of respondents, we randomly decided whether they would be told about the incentives before or after the interview. Based on the reports from enumerators, offering incentives before the interview did not seem to have much effect on response quality, as compared to giving incentives once the interview was over, even though there were some notable exceptions. In some cases, respondents spontaneously declined the incentive as they felt there was no need for their time to be compensated. Thus, incentives may have mixed effects on participant willingness and response quality, and this warrants further investigation.

**Note 2: Detailed description of visualization session**

In the visualization session, participants were asked to imagine how access to cheaper MCH services that would be led by a professional midwife could affect their prenatal care experience. Thus, participants were invited to “think more deeply” about how having regular appointments with a midwife that monitors how well their baby is developing and provides them with updates at every stage of the pregnancy could be beneficial. Additionally, the attention of the pregnant women was drawn to how a midwife could take her time to ensure that every checkup is performed thoroughly and that any potential issue is communicated early enough to reduce the chances of complications.

The women were also asked to “think through” how a midwife could support them during childbirth, by making sure that they receive the best delivery care and calming encouragement in the labor room, in particular. Participants were also reassured that, in case of complications, the midwife would offer the woman the opportunity to consult a gynecologist. Furthermore, during the visualization exercise, participants were asked to close their eyes, envision having the opportunity to take on a midwife-led care package, and think about how valuable this service would be to them. Several phrases were used to guide participants, like, “Imagine that you are on such a midwife package and all the benefits it will accrue to you. How much will you be willing to pay for such a package?” or, “Suppose your future self can talk to you now, how would she feel that you are paying this much for such a package? What will she advise you to do?” Therefore, in the visualization session, information about midwife-led care services was delivered in such a way that participants could absorb it in a more vivid manner than in the sessions currently run by NEST, which merely offer a basic description of the services.

**Note 3: WTP and WTU questions in field experiment****1. Section 1: Willingness to use midwife-led care service**

- (1) Based on your experience and the information provided, are you willing to use midwife-led services for monitoring and delivery? (a) yes (b) no (if no go to 30)
- (2) Based on your experience and the information provided, on a scale of zero to ten, how likely are you to be willing to use midwife-led services for monitoring and delivery?
- (3) What explains your choice?

- (4) Which of the following features mattered for your choice? (a) price (b) medical staff (c) medical staff attitude (d) medical staff-patient relationship (e) others specify

## **2. Section 2: Willingness to pay for midwife-led care service**

Based on the information you've heard about the midwife monitory and delivery care package, what is the maximum amount you can pay for this service? Please indicate this on your sheet of paper. Place the sheet into the envelope, seal it, and hand it over to the experimenter(s) in the room. Depending on your bid, you can either be enrolled or fail to be enrolled in the program. You will be enrolled if your bid is higher the market price of the service, otherwise you will not be enrolled. Therefore, it is very important for you to state your true valuation of the services.

Thank you very much for your participation in this study. Your answers will be extremely useful for our research. Again, I assure you that all the answers you have provided in this survey will be kept strictly confidential and will never be used for any purpose other than research.

### **Note 4: Challenges in participant recruitment for field experiment**

During the first two weeks of recruitment, we realized it would be difficult to find enough women to sign up for our field experiment. Therefore, to increase participant interest, several approaches were implemented. Specifically, we recruited more Facebook influencers, including a local celebrity (an actress), which was costly but more successful than any of our other recruitment interventions. In fact, by posting a one-minute video recruitment message on her page, the celebrity convinced about 100 women to register in just one day (which occurred just three days before we started running our information sessions). However, ultimately, only 58 of all registered participants came to attend the baseline session (see Figure 1 for details).

### **Note 5: PPI calculation**

The Poverty Probability Index (PPI) is a statistically robust country-specific poverty measurement tool utilizing ten questions on participant household characteristics and asset ownership (IPA, 2018). The index, which is computed from scored responses to the ten PPI questions, captures the likelihood that a household is living below a given poverty line. By using PPI, organizations can identify those customers who are most likely to be vulnerable to poverty.

PPI uses an algorithm that processes data previously collected in nationally representative household surveys to determine both the set of questions that is the most informative for a given country and the points or weight attached to each response. For Senegal, the latest PPI is based on data from the country's 2011 Poverty Monitoring Household Survey conducted by the National Agency of Statistics and Demography (ANSD).

A household may be considered poor with reference to one of 15 pre-established poverty lines:

- the national poverty line (NPL), the food poverty line, and the poverty line corresponding to 150% and 200% of NPL;
- three 2005 (at purchasing power parity) international poverty lines (USD1.25, USD2.50, and USD5.00)

- four 2011 (at purchasing power parity) international poverty lines ((USD1.00, USD1.90, USD3.20, USD5.50), and
- four poverty lines corresponding to the 20th, 40th, 60th, and 80th percentiles of the population.

The reference poverty line is chosen according to its relevance to the population and the research purpose of the study.

The computation of PPI requires two essential components, namely a scorecard and a look-up table. The PPI scorecard itself comprises two elements: the ten questions with well-defined response options, and the points allocated to each response. The ten questions are established based on how they can predict the probability for a household or an individual's consumption to be below or above the national poverty line. In the most recent version of the PPI for Senegal, the questions are:

1. In what region does this household reside?
2. How many members does the household have?
3. How many children aged 0 to 6 are household members?
4. Has the household head attended school?
5. What is the main roofing material in your house?
6. Does your household have a fan?
7. Does your household have a table?
8. In the last 30 days, did the household purchase gas?
9. In the last 30 days, did the household purchase clothing?
10. In the last 12 months, has your household raised cattle (oxen, cows)?

The PPI score for the household is then computed as the sum of the points allocated to each response. The household's PPI score also depends on the reference poverty line, as it influences the points allocated for each question.

The final step is the conversion of a household's PPI score to its poverty likelihood. The look-up table is used to match a household's PPI score to the probability that a household's consumption is below a chosen poverty line. A household's PPI score is inversely related to its poverty likelihood.

Please refer to [www.povertyindex.org](http://www.povertyindex.org) for more information about PPI.



# Microfinance Loans, Women’s Economic Empowerment, and Poverty: A Case Study of Baobab Microfinance Company

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**JEL Codes:** C21, G21, I32, I38, J16, O15

**Keywords:** Microfinance, Poverty, Women’s Empowerment, Impact Analysis

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## Summary

### Research focus

Baobab Microfinance Company (Baobab) has five branches in the Northern and Savannah Regions of Ghana providing financial services targeting low-income women who earn their livings in the informal sector. Baobab provides enterprises with microcredit, training and support. The company's mission is to reduce the level of poverty among their clients. It is a portfolio company of The Luxembourg Microfinance and Development Fund (LMDF), which has received funding under the IFE.

The impact study investigates Baobab's impact on female clients and provides guidance on how the company can further its impact and business model sustainability. Baobab currently has 22,200 clients, 98% of which are women. The study explores women's economic empowerment through the lenses of 'power and agency' (ability to control and direct life and resources) and 'economic advancement' (increase in her economic prosperity).

The primary research questions include:

- Has Baobab been reaching the poorest women in its operations areas?
- Has microcredit impacted women's economic empowerment in the five districts of Baobab operations?
- Has there been a reduction in the poverty level of Baobab female clients?

Data were collected in June and July 2019. A total of 411 Baobab clients were interviewed (the 'treatment' group): Two women were randomly selected per solidarity loan group within each district where Baobab had an existing branch. To gain insights into the causal impact of Baobab, a further 541 women in Baobab operation district were interviewed who had never borrowed from a formal institution, including in two districts with no Baobab branch (the 'control' groups).

### Summary findings

#### Impact on low-income and vulnerable clients

**Baobab is successfully reaching out to poor women.** The proportion of Baobab client's who fall below the poverty line is higher than the local average in three of the five districts where Baobab was active.

**Baobab is helping women to invest in existing businesses.** Most women had already established their business prior to receiving a loan – the use of the loans to start a new business was uncommon.

**There is evidence that Baobab has succeeded in reducing poverty amongst its clients, even when controlling for differences between Baobab clients and a comparison group.** Table 1 shows that there is a significant difference in poverty rates between Baobab clients and those without loans.<sup>61</sup> Extreme poverty rates were also higher among respondents who had never borrowed than among those who had taken 1, 2-3 or 4+ loans from Baobab.

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<sup>61</sup> This finding holds true using either a measure of poverty based on an index (the PPI) developed to estimate poverty levels and using household consumption reported by the women.



**Table 1: Average treatment effect for poverty outcomes**

	<b>1 Loan vs No Loan</b>	<b>2-3 Loans vs 1 Loan</b>	<b>4+ vs 2-3 Loans</b>
PPI-extreme poverty	-11.34*	6.15**	-6.63***
<i>Z-statistic</i>	-1.82	1.99	-2.68
PPI-poverty	-11.33*	7.90*	-9.61**
<i>Z-statistic</i>	-1.74	1.91	-2.28
Adjusted consumption (logs)	0.37**	-0.07	0.22*
<i>Z-statistic</i>	2.03	-0.55	1.66

Notes: The reported Z values are based on standard errors clustered by district. N = 952 for poverty estimates and N = 951 for consumption estimates. Explanatory variables: household size (3 levels), education (=1 if completed some education), age (5 levels), married (=1 if married), religion (=1 if Muslim), household head (= 1 if household head). \*p < 0.1; \*\*p < 0.05; \*\*\*p < 0.01.

### Economic empowerment

**The evidence also suggests that Baobab’s support may have increased economic empowerment among the women served.** Economic empowerment was measured based on nine dimensions, shown in Table 2, below. These reflect women’s power and agency, access to resources and ability to adapt to technology<sup>62</sup>. Six out of the nine indicators of women’s economic empowerment were significantly higher for women with loans, even controlling for observable characteristics. Baobab clients made most of the key decisions in running their business, relying less on their husband or other male figures in their life than did their peers. Their personal autonomy in decision-making at home was also higher, and they seemed to engage in more networking and group meetings than the control respondents, indicating a higher level of social capital. The single-loan clients also experienced a higher share in household spending relative to the control group.

<sup>62</sup> Lombardini, S., K. Bowman and R. Garwood (2017). A ‘How to’ Guide to Measuring Women’s Empowerment: Sharing Experience from Oxfam’s Impact Evaluations. The ability of women to use a mobile phone for making and receiving calls from clients and suppliers—and using mobile money for business related transactions—serves as a proxy for the adoption of simple technology as well as the autonomy of women in making business related decisions. Personal time spent on household chores, taking care of the family and business activities, self-confidence and personal autonomy indicates the woman’s role in society, her economic role and her confidence in going about her activities.

**Table 2: Average treatment effect (ATE) for women’s economic empowerment outcomes**

	<b>1 Loan vs No Loan</b>	<b>2-3 Loans vs 1 Loan</b>	<b>4+ vs 2-3 Loans</b>
Business practice	0.45***	0.81***	-0.16
<i>Z-statistic</i>	2.90	5.00	-0.82
Decision-making role in business	2.38**	2.63***	-0.16
<i>Z-statistic</i>	2.08	9.72	-0.14
Use of phone and technology in business	0.70	0.55	-0.22***
<i>Z-statistic</i>	1.61	1.62	-3.20
Agency/decision-making at home	1.96***	0.69*	-0.68
<i>Z-statistic</i>	6.02	1.87	-0.75
Self-confidence	-0.04	0.16*	0.13***
<i>Z-statistic</i>	-0.54	1.71	3.57
Personal autonomy	0.25**	-0.13***	-0.02
<i>Z-statistic</i>	2.02	-4.05	-0.77
Social capital/group participation	2.34***	-0.27	0.11
<i>Z-statistic</i>	9.91	-1.54	0.86
Time allocation and workload	0.09	-0.12	0.01
<i>Z-statistic</i>	1.38	-1.27	0.12
Share of household spending	0.37***	-0.29***	-0.07
<i>Z-statistic</i>	5.96	-3.73	-1.39

Notes: The reported Z values are based on standard errors clustered by district. Business-related outcomes are based on comparing the self-employed respondents only (N = 571). All other household-related outcomes were based on the full sample of 952 respondents. Explanatory variables: household size (3 levels), education (=1 if completed some education), age (5 levels), married (=1 if married), religion (=1 if Muslim), household head (= 1 if household head). \*p < 0.1, \*\*p < 0.05, and \*\*\*p < 0.01.

**Focus groups supported the findings above and added new insights.** Women reported that Baobab’s services benefited them via a number of different channels and in a number of different ways. For some households, increased capacity to consume was the greatest impact. For instance, an older woman explained that being part of the Baobab loan solidarity group provided her with easy access to loans for emergencies. Many women reported that economic empowerment from loans reduced the potential for financial disagreements at home. Loans reduced the financial burden on men, creating more peace and reducing violence. Most participants agreed that home responsibilities limited their ability to effectively run their businesses, however. In some cases, the size of households directly affected the ability of clients to reinvest the profits back into their businesses. The loans were important in improving their livelihoods and the profitability of their businesses. In large households, however, the increased profits had a high tendency to support household consumption rather than increasing the women’s businesses.

**Five narratives obtained from our focus group discussion consistent with our quantitative results are as follows:**

1. Baobab clients feel economically empowered
2. Access to loans reduces violence at home for Baobab clients
3. Responsibilities at home negatively affect running a business
4. Larger households spend profits and loans on consumption
5. Borrowing from family and friends only meets basic needs.

## Abstract

Baobab Microfinance Company (BMC) in the Northern and Savannah regions of Ghana has offered group lending opportunities to the poor for a decade. This study analysed the impact of BMC loans on the welfare and economic empowerment of female clients. Based on a sample of 411 BMC clients and 541 control respondents, the results indicate that, in three out of five of the districts where it operates, BMC reaches a share of poor and extremely poor women that is below the district poverty level. Female BMC clients showed more decision-making power in their business and at home than respondents without loans. The data suggests that BMC clients experienced lower poverty relative to the no loan group as a result of the loan, with loans increasing consumption by up to 32.5% for consumption per capita and reducing the probability that a recipient is in extreme poverty or poverty by 43.3% and 19.6% respectively. The results were consistent with focus group discussions with control respondents and BMC clients. Altogether, our results showed that BMC is actively engaged in achieving its mission statement of reducing poverty.

## Acknowledgements

We are grateful to the Founder and Managing Director of Baobab Microfinance Company (BMC), Mr. Alhaji Amadu Montia, for giving us access to the company's clients and data. We also warmly thank BMC General Manager Mr. Mahadi Tahiru, Research Manager Mr. Patrick Yenteeb, and Human Resources Manager Mr. Adam Mikdad, who repeatedly met with us to respond to our queries. We are especially grateful to Mr. Yenteeb for accompanying us to solidarity loan group meetings during the project's pilot phase as well as offering us his assistance during the subsequent focus group discussions. Mr. Yenteeb was also helpful on many other occasions by providing data, clarifications, and answers to our questions on the solidarity groups. Furthermore, we thank all department heads and other BMC representatives for attending our first project meeting and the final presentation of our results. We thank the BMC credit officers that assisted our field enumerators in identifying the solidarity group meeting locations and other BMC employees who helped us in a myriad ways. We are also grateful to our field supervisor Mr. Abdulai Iddrisu and team of 11 enumerators (Ms. Fauzia Iddrisu, Ms. Musah Mariam, Ms. Nathalia Konkuri, Ms. Braimah Sherifa, Ms. A-isha Adamu Dufailu, Ms. Masona Mustapha, Ms. Fati Haruna, Ms. Fali Mustapha, Mr. Amos Nunifant, Mr. Abu M. Bomzaa, and Ms. Hawa Abubakari) that collected data from BMC clients. Mr. Abdulai Iddrisu, Mr. Amos Nunifant, and Mr. Abu Bomzaa also assisted us in our focus group discussions. We thank the team from Dataplas for the assistance provided in terms of programming the questionnaire on the tablets and data management (in particular, Mr. Martin Agbodzi). Finally, we cannot forget the EIB for all the support they offered to our project through funding and helpful comments and suggestions. Moreover, our expert advisors Prof. François Bourguignon (Paris School of Economics) and Dr. Emmanuel Jimenez (International Initiative for Impact Evaluation) have been amazing in all the great support and advice they gave us to improve our work. Finally, the support team at GDN has been no less amazing (Anindya, Abhay, Aarti, Mansoor, Dominic, and others). GDN staff members not only in the EIB-GDN team but also in other units have provided us with invaluable help in solving some of the teething problems we faced in our project. We cannot conclude our appreciation without mentioning the support of the EIB team (Nina, Claudio, Matt, and the rest of the team). Any potential caveats or errors are those of the authors.

## 1. Introduction

Widespread poverty and a low level of women’s empowerment are common challenges in developing countries. In an effort towards achieving the Sustainable Development Goals (SDGs) 1 (i.e. no poverty) and 5 (i.e. gender equality), stakeholders have recommended several measures for reducing poverty and empowering women<sup>63</sup>, including expanding access to microfinance. Globally, microfinance has been documented as an effective means to broaden access to formal financial opportunities (Ahlin and Suandi 2019). Microfinance institutions provide a range of financial products (i.e., micro-credits and savings) to low and middle income individuals who are otherwise often excluded from the formal financial system. Most microfinance institutions complement their financial products with services such as financial literacy training, advice, and economic empowerment. Some support health costs incurred by clients or provide micro-insurance. Over the last three decades, the microfinance sector has experienced an exceptional growth that expanded its client base to about 140 million individuals globally as at the year 2018, according to the Microfinance Barometer 2019 report<sup>64</sup>.

Empirical studies of the impact of microfinance on development outcomes (e.g., poverty and women’s empowerment) have shown mixed results. Among others, Li et al. (2011) found that microcredit tends to wealthier individuals, with no significant impact observed on the income or welfare of the poor. Banerjee et al. (2015) found no statistically significant impact of microcredit on poverty and women’s empowerment. On the contrary, Barnes and Keogh (1999) and Hietalahti and Linden (2006) have found that microcredit is positively associated with poverty and women’s empowerment. A systematic review by Van Rooyen et al. (2012) showed that the impact of microfinance on development outcomes is dependent on the context of the study and method used.

This study aimed to investigate the impact of Baobab Microfinance Company (BMC)’s activities on the livelihood of its female clients and their broader communities in the Northern and Savannah regions of Ghana.

The aim of this study was two-fold: 1. to assess the impact of Baobab Microfinance Company on its female clients; and 2. to inform the company on ways to strengthen its impact in the future. BMC aims to ensure the sustainability of its business model and to gather social data to better understand its role in poverty reduction. In this regard, we explored the following research questions:

1. Has BMC been reaching the poorest women in its areas of operation?
2. Has microcredit impacted women’s economic empowerment in the five districts of BMC operations?
3. Has there been a reduction in the poverty level of BMC’s female clients?

The results of this study provide evidence about the current and potential impact of BMC on poverty among its female clients in the Northern region of Ghana. Such information could be used by stakeholders towards meeting the two Sustainable Development Goals of poverty alleviation and women’s empowerment. This study also adds to the literature on the impact of microcredit on both

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<sup>63</sup> According to Golla (2011), “A woman is economically empowered when she has both the ability to succeed and advance economically and the power to make and act on economic decisions.”

<sup>64</sup> [http://www.convergences.org/wp-content/uploads/2019/09/Microfinance-Barometer-2019\\_web-1.pdf](http://www.convergences.org/wp-content/uploads/2019/09/Microfinance-Barometer-2019_web-1.pdf).

poverty and women's economic empowerment. Compared to previous work on women's economic empowerment in Ghana, this study used both qualitative and quantitative methods to analyze the impact of microcredit on poverty and women's economic empowerment, considering power, agency and economic advancement measures.

## 2. Overview of the Ghanaian Economy, Microfinance Sector, and Baobab Microfinance Company

### 2.1. Ghanaian Economy and Poverty Trends

Ghana is a country in the Western region of Africa with an estimated population of about 30 million people, 51% of whom are female (Ghana Statistical Service (GSS) 2019)<sup>65</sup>. The country is known for its political stability, good governance, and relatively well-developed political institutions.

Over the last three decades, Ghana has brought the national poverty headcount rate down from around 50% in 1990 to 24.2% in 2013—thereby achieving the first United Nations (UN) Millennium Development Goal of halving poverty (Cooke et al. 2016). Over the same period, the poverty gap was also halved (Cooke et al. 2016). The proportion of the population living below the national poverty line<sup>66</sup> further declined to 23.4% in 2017 (GSS 2018).

BMC is headquartered in the Northern region, where 1.8 million poor people were estimated to live in 2017 (GSS 2018). The Northern region also has the largest number of extremely poor people (households that cannot afford the minimum amount of calories of food required per day for sustenance), representing approximately a third of the national extremely poor population in Ghana (GSS 2018).

Today, the Northern<sup>67</sup>, Upper West, and Upper East regions remain the poorest regions of Ghana, with regional poverty headcount rates ranging from 54.8% in the Upper East to 70.9% in the Upper West (GSS 2018).

### 2.2 Microfinance in Ghana

Financial institutions are regulated by the Bank of Ghana (BoG) in accordance to the BoG Act 2002 (Act 612). The Act mandates the Bank of Ghana to protect the interests of all depositors and ensure stability in the financial system. The Bank of Ghana categorizes deposit-taking institutions into four tiers according to their minimum capital requirement, degree of risk, and licensing or registration type (BoG Notice No. BG/GOV/SEC/2011/04)<sup>68</sup>. The classification is as follows: Tier 1, commercial banks, rural and community banks, and savings and loan companies; Tier 2, credit unions and microfinance companies; Tier 3, financial non-governmental organizations (NGOs) and money-lending companies; and Tier 4, informal groups engaging in collective savings (Susu Collectors) or individual money lenders. MFIs, fall under Tiers 2 to 4 and are regulated under the Banking Act 2004 (Act 673). The Bank of Ghana has authorized all institutions that deliver microfinance services and meet the capital requirement of microfinance companies to add the word “microfinance” to their name. Such institutions belong to an authorized umbrella body known as the Ghana Association of Microfinance Companies (GAMC).

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<sup>65</sup> <http://www.statsghana.gov.gh/index.php?id=MjYzOTE0MjAuMzc2NQ==/webstats/4238n0op4p>.

<sup>66</sup> The poverty line is defined as GH¢ 1,760.80 (USUSD 404.78) per adult equivalent per year for 2016/17, which is equivalent to GH¢ 1,314.00 (USUSD 673.85) in 2012/13 prices. The extreme or food poverty line is defined as GH¢ 982.2 (USUSD 225.79) per adult equivalent per year for 2016/17, which is equivalent to GH¢ 792.2 (USUSD 406.26) in 2012/13 prices. The exchange rates used were USD1 = GH¢ 11.95 for 2013 and USD1 = GH¢ 4.35 for 2017 (Source: International Monetary Fund).

<sup>67</sup> In the year 2019 the Northern region was divided into three different administrative regions.

<sup>68</sup> <https://dfsobservatory.com/sites/default/files/Bank%20of%20Ghana%20-%20Notice%20No.%20BG-GOV-SEC-2011-04%20-%20Operating%20Rules%20and%20Guidelines%20for%20Microfinance%20Institutions.pdf>.



There are 137 deposit-taking microfinance institutions following the revocation of the licenses of 347 microfinance institutions<sup>69</sup> in 2019.

### 2.3 Overview of Baobab Microfinance Company

Baobab Microfinance Company (BMC) Ltd was incorporated as a limited liability company and obtained its operating license from the Bank of Ghana on April 23 2008. BMC started business in the Tamale metropolis of the Northern Region of Ghana, and today has five branches located in the Northern (4 branches) and Savannah (1 branch) regions<sup>70</sup>. The latter branch in the Sawla-Tuna-Kalba district was established in 2019. BMC is currently funded by both local and international sources. BMC is a portfolio company of the Luxembourg Microfinance and Development Fund (LMDF), which has received funding from the European Investment Bank (EIB) under its Impact Financing Envelope for Africa, the Caribbean, and the Pacific<sup>71</sup>.

The objective of BMC is to provide financial services to poor households and micro- and small-scale businesses, with a focus on women entrepreneurs, in the Northern, North Eastern, and Savannah regions of Ghana. In 2018, the total number of BMC clients<sup>72</sup> reached over 22,200. About 98% of BMC clients were female micro-entrepreneurs. Individual loans typically range from GH¢ 200 to 2,000 (\$43.57 to 435.73)<sup>73</sup>. BMC provides its clients with financial literacy training, business advisory services, and technical assistance. It also supports health screening and pays health insurance premia for its female clients.

BMC focuses on solidarity group lending<sup>74</sup>. Solidarity groups can be as large as 56 women when initially formed, but in practice, they tend to reduce over time to an average of 15 women per group. The group lending modality makes it possible for BMC to lend without requiring collateral, as group members act as guarantors for each other. The group loan model is convenient for BMC because it reduces its transaction costs in terms of credit screening and background checks. This ultimately reduces the principal-agent problem<sup>75</sup> and the adverse selection of providing loans to high-risk clients, hence reducing default rates.

<sup>69</sup> BoG press release, <https://www.bog.gov.gh/notice/notice-of-revocation-of-license-of-insolvent-microcredit-companies-and-appointment-of-receiver/> and <https://www.bog.gov.gh/supervision-regulation/all-institutions/>.

<sup>70</sup> More specifically, the five BMC branches are located in the East Gonja, Nanumba North, Yendi Municipal, Tamale Metropolis, and Sawla-Tuna-Kalba districts.

<sup>71</sup> The EIB Impact Financing Envelope is a dedicated window of the Africa, Caribbean, and Pacific Investment Facility which targets projects with a higher development impact, but also higher risks, than traditional EIB activities in these regions.

<sup>72</sup> We drew upon information provided by the BMC website as of January 2019.

<sup>73</sup> The exchange rate used was USD1 = GH¢ 4.59 for 2018 (Source: International Monetary Fund).

<sup>74</sup> Solidarity group lending is a lending practice where small groups borrow collectively from a financial institution. The group members encourage each other to repay, with other members within the group being liable for the defaulting members.

<sup>75</sup> As noted in the economics literature, the principal-agent problem is one of the conflicts that may occur between two parties in a contractual arrangement. One party, the principal, hires another party (the agent) to execute a project on the principal's behalf. The relationship creates a tension between the two parties in that the agent acts in their own interest to improve their gains from the project rather than to pursue benefits for the principal. In most cases, since the agent and the principal have different objectives, this creates a conflict of interest.

### 3. Literature Review

Studies on the impact of microfinance on poverty and women's economic empowerment have yielded mixed results. Some of these studies have shown that microfinance improves both financial (such as savings and assets accumulation) and non-financial (such as health, nutrition, food security, education, and women's empowerment) outcomes (Barnes & Keogh, 1999, Beck, Demirguc-Kunt, & Levine 2004, Hietalahti & Linden 2006). However, other studies (Kondo et al. 2008, Li et al. 2011) found that microfinance had increased poverty outcomes, and Nanor (2008) reported mixed results in four districts of the Eastern region of Ghana. One key factor in these discrepancies has been the difficulty in establishing the counterfactual (i.e., a comparable group to the microfinance beneficiaries). Essentially, people that receive a loan may be quite different from people without a loan (Cintina and Love 2017), in part due to personal characteristics such as entrepreneurial ability that could create unobserved differences between the two groups (Cintina and Love 2017).

The measured impact of microfinance depends on the context or scope of the study and the extent to which statistical biases have been addressed. Only rarely is it possible to determine a counterfactual in such a study and thus compare borrowers with non-borrowers. This raises two key statistical bias issues in the analysis of the impact of microfinance, namely self-selection of program participants and endogenous program placement. Self-selection occurs when individuals who join microfinance institutions possess unobserved attributes (such as entrepreneurial ability) that differentiate them from people who do not join microfinance institutions. Such attributes are correlated with the outcomes of interest (Coleman, 1999, Chowdhury 2009). For example, in the case of our study, if those joining BMC are more entrepreneurial than those who do not join a microfinance institution, then the measure of the impact of microfinance on outcomes such as income or poverty would be misleading.

In the case of endogenous program placement, the location of the microfinance institution is not random but depends on a number of factors. For instance, an NGO is more likely to set up a microfinance institution in a place that is seen as having a more entrepreneurial spirit and is less prone to drought, floods, or other natural disasters than in other communities. If these factors remain unaccounted for and correlate with the decision of individuals to participate in the activities of the microfinance institution, then the impact of microfinance on the outcomes of interest will be biased.

The ideal way to address such biases in the impact analysis would be to conduct a randomized control trial. However, a few studies such as Banerjee et al. (2015) and Karlan and Zinman (2009) randomized selection for participation in a microfinance program. Other studies nonetheless made use of non-experimental or quasi-experimental approaches to construct the counterfactual from observational data. To address the problems of self-selection and endogenous program placement, some studies also resorted to a cohort analysis where new clients/borrowers were compared to older ones (Adjei et al. 2009, Samer et al. 2015).

Consistent with the existing empirical literature, we therefore adopted methodological approaches (such as doubly robust and propensity score matching estimators) to reduce these statistical biases in our analysis.

### 3.1 Microfinance Effects on Poverty

Most previous studies have used objective measures of poverty. Objective measures such as income (Barnes et al. 2001, Ashraf et al. 2008, Nanor 2008, Swamy 2014, Samer et al. 2015), expenditure (Khandker 2005, Chowdhury et al. 2005, Nanor 2008, Swamy 2014, Banerjee et al. 2015), asset accumulation (Adjei et al. 2009) and poverty index (Imai et al. 2010) were used as proxies. Chowdhury et al. (2005) is among the few studies that asked respondents to indicate whether they were poor or not – a subjective poverty measure.

Banerjee et al. (2015) and Karlan and Zinman (2009) found no impact of microcredit on poverty reduction in randomized control trials conducted in the cities of Hyderabad, India and Manila, Philippines. In a quasi-experiment conducted in Northeast Thailand in 1995–96 to address the problems of self-selection and endogenous program placement, Coleman (1999) found that microcredit has little impact on poverty reduction. This study showed that, had self-selection and endogenous program placement not been accounted for, the impact would have been significantly overestimated.

Using a difference-in-difference approach, Li et al. (2011) found that microcredit improves household welfare (measured by income and consumption) in China. Nevertheless, the majority of the program participants in the study were non-poor, calling for more studies on the poverty reduction role of microcredit. In the Philippines, Kondo et al. (2008) used both a quasi-experiment to control for non-random program participation and fixed-effects estimation to correct for non-random program placement. They found a marginal positive effect on per-capita food expenditure. However, this effect is negative or insignificant for poor households and only becomes positive and important for the richer households. Also using a quasi-experimental approach, Nanor (2008) found that microcredit combined with financial literacy training had a mixed effect on the household incomes of women in rural Ghana.

Chowdhury et al. (2005) found that access to microcredit is associated with lower objective and subjective levels of poverty in Bangladesh. This study also showed that the strong impact of microcredit on poverty lasts for about six years. Using panel data from Bangladesh, Khandker (2005) also found that access to microfinance contributes to poverty reduction among female participants and, furthermore, in their village communities. The use of panel data with a household-level fixed-effects model helped the author circumvent the problem of self-selection within a specific program and village. Imai et al. (2010) used national household data from India and a treatment-effects model to estimate the poverty-reducing effects of microcredit on households while addressing the problem of self-selection. They developed a multidimensional welfare indicator called index based ranking that captures households' basic needs, wealth, type of housing, job security, sanitation, and food security, and found that microcredit reduces poverty. The authors also carried out a robustness test using propensity score matching (PSM).

Among the studies that performed a cohort analysis, Samer et al. (2015) compared older and newer female clients of an institution in Malaysia and found that microcredit has a positive impact. By comparing new and old clients, Adjei et al. (2009) also found that microfinance has contributed to poverty reduction in Ghana by supporting microfinance clients through both financial and non-financial services. The authors, who addressed the problem of selection bias by using a Heckman selection model, also found that clients who remained in microfinance programs for a long period of time eventually suffered diminishing marginal returns. In India, Swamy (2014) examined the gender

dimension of the economic impact of microfinance on poor households by using a difference-in-differences estimator. The author found that although microfinance reduces poverty via income growth for both genders, the impact on women far outweighs that on men.

A recent study by Dahal and Fiala (2020) that replicated eight randomized control trials found no significant effect of microfinance on business profits, business revenue, and household assets. However, when pulling together the data of all eight studies, the effect of microfinance on business profits, business revenue, and household assets became statistically significant. Even though the minimum detectable effect sizes were large, pooling data improved the power test for most outcomes, leading the authors to conclude that existing studies on the impact of microfinance are mostly underpowered, which made it difficult to reliably detect impact. This study supports an earlier systematic review study by Duvendack et al. (2011), which found no robust evidence of a positive impact of microfinance on women's status, or girls' enrolments.

### **3.2 Women's Economic Empowerment**

According to Ganle et al. (2015), common to most conceptualizations of women's empowerment is the idea that "empowerment is about change, choice, and power." Common measures of women's empowerment in the economics literature have focused on economic empowerment based on 'power and agency' and 'economic advancement.' Proxies of women's empowerment have included autonomy, authority, individual capacity, and economic and inter-spouse consultation.

Studies of the impact of microcredit on women's economic empowerment have used both qualitative and quantitative methods. Ganle et al. (2015) used longitudinal qualitative techniques to analyse the effect of microcredit on the empowerment of rural women in Ghana. They found that while some women are empowered by access to microcredit, others have little control over the use of their loans, leaving them worse off than before. The authors found that some women with access to loans become subjected to harassment.

Amin et al. (1998) used both qualitative and quantitative methods (focus group discussions and multivariate analysis) to examine the effect of a microcredit program on women's empowerment in rural Bangladesh. The authors focused on autonomy, authority, and inter-spouse consultation as measures of empowerment. They found that membership of a microfinance program is positively associated with women's empowerment. In rural Uganda, using a quantitative (regression) analysis, Lakwo (2006) found that microcredit promotes women's empowerment by increasing their financial management skills, ownership of bank accounts, mobility, and contribution to household income.

In South Asia, Kabeer (2005) found that although access to financial services provided by microfinance institutions makes an important contribution to the economic productivity of poor women, it does not guarantee their empowerment. Barnes et al. (2001) and Pronyk et al. (2008) also found a mixed effect of microcredit on women's empowerment in urban Zimbabwe and rural South Africa, respectively. Barnes et al. (2001) showed that, although involvement in a microfinance program does not result in greater control over business earnings by women in Zimbabwe, it leads to greater consultation and joint decision-making with their spouses (Barnes et al. 2001). In South Africa, Pronyk et al. (2008) found an improvement in women's ability to negotiate safe sexual practices and a decline in intimate partner violence, but these findings were likely due to intervention aspects other than access to microcredit. Similarly, using multiple logistic regression models, Wakoko (2004) found a mixed effect of microcredit

on women’s empowerment in rural Uganda - they found that involvement in microfinance increases women’s decision-making power regarding household income, but not agricultural production. On the other hand, a randomized control trial study among slum dwellers in Hyderabad in India by Banerjee et al. (2015) showed no impact of microcredit on women’s decision-making.

### 3.3. Theory of Change

Our theory of change hypothesizes a link between poverty reduction and women’s economic empowerment. This link may apply to inter- and intra-household dynamics. As recognized in the literature on the feminization of poverty, women and female children do not have the same opportunities as their male counterparts<sup>76</sup>. For instance, women tend to spend more time on a greater number of household chores than men, leading to a gender gap in unpaid household labor, as documented for Ghana and Gambia by Chant and Jones (2011). Moreover, Bessel (2011) noted that gaps between male and female educational enrolment rates are explained by income, social norms, and the perceived value of formal education for girls. Thus, families tend to spend more on boys’ education than on girls’. Finally, Bird and Espey (2011) pointed out that despite the existence in Rwanda and Uganda of legislation providing women access to land, access is still unequal. Local practices and norms also affect the ability of women to control the resources and income obtained from farming, thereby limiting their ability to access capital to expand their business (Bird and Espey 2011). Altogether, these findings suggest that in many contexts, women’s economic opportunities are limited, relative to those of men. This influences the likelihood of female-headed households falling into poverty. This also reduces the bargaining power of women and girls within households, which can influence outcomes such as investment in education.

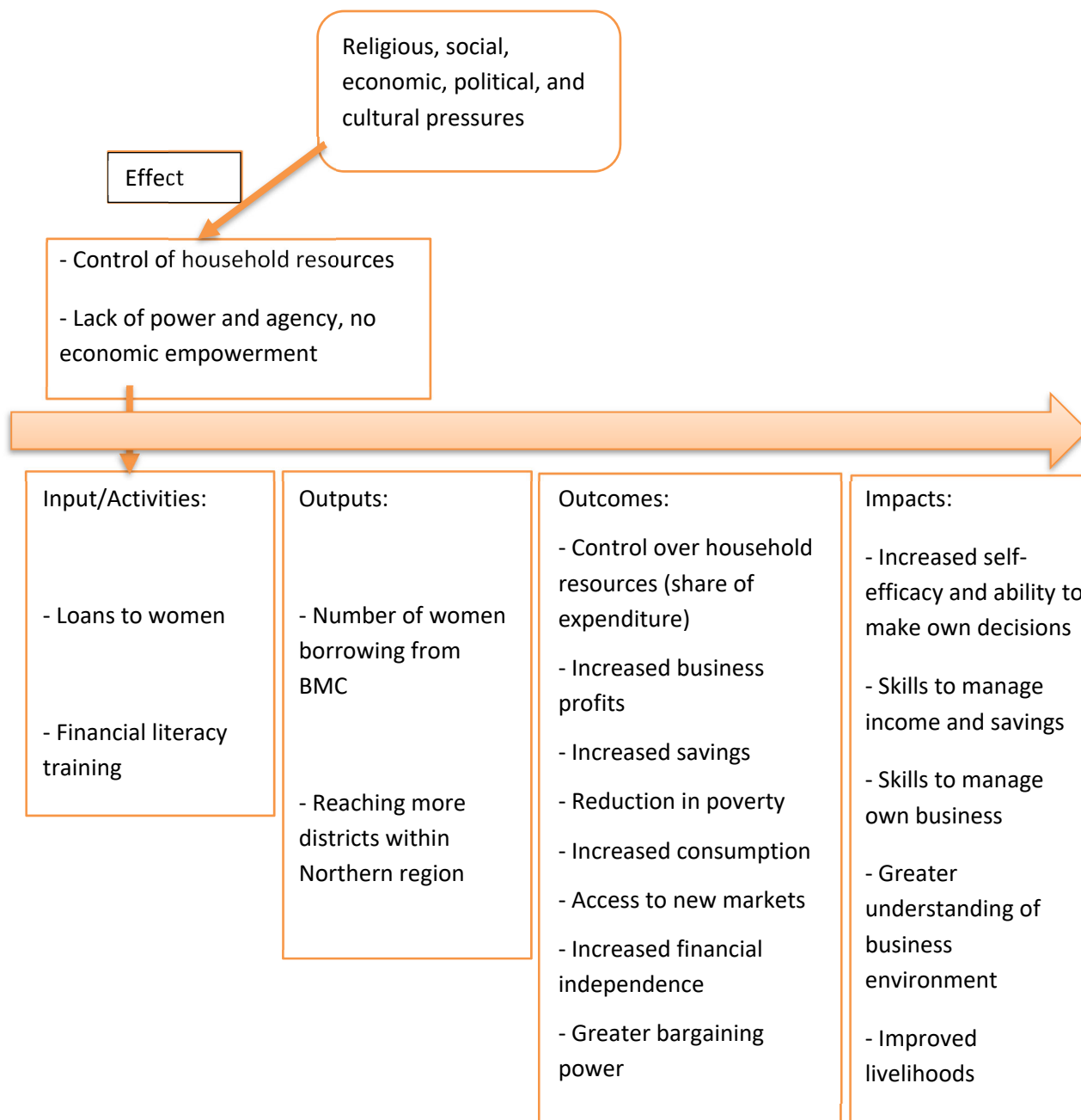
Our theory of change, therefore, takes as a starting point a scenario where social norms and practices as well as economic, religious, cultural and social pressures limit the opportunities available to women in Ghana. Noting that the ability of women to individually access capital is restricted, group loans from microfinance institutions can create the necessary economic opportunities for women to start or expand their own business—without having to worry about providing a collateral as a guarantee to their loans. This study explores women’s economic empowerment through the lens of ‘power and agency’ and ‘economic advancement.’ ‘Power and agency’ refers to a woman’s ability to control and direct her own life and resources (Santillán et al. 2004), while ‘economic advancement’ reflects an increase in her economic prosperity (Golla et al. 2011). Figure 1 presents our framework for analysing the economic empowerment of women and how it may lead to poverty reduction. Essentially, as suggested in the literature, a range of religious, social, economic, political, and cultural pressures affect women’s ability to assert control and thus power over the use of resources at home.

There is a vast literature on various models and theories about the household decision-making process (see for example, Rangel and Thomas 2019 and earlier studies such as Bourguignon and Chiappori, 1992, Bourguignon et al., 1993, Bourguignon et al., 1995, Chiappori et al., 1998, Bourguignon, 1999, Blundell et al. 2007, among others). Rangel and Thomas (2019) suggest that consumption-based models rather than production-based models provide unique lessons about the decision-making in complex households. They find that the theory of collective rationality (i.e. households consist of individuals that have their respective preferences and together they maximize their welfare through jointly deciding on household consumption, Bourguignon and Chiappori 1992) holds in understanding

<sup>76</sup> See Chant, S. (2011), and references therein.

the complex structure of Burkinabe farm households. The cited literature provides a theoretical basis in using consumption and poverty as outcomes in our analysis. The pressures affecting women described in the preceding paragraph can affect the decision-making process in households and rather limit women’s access to household resources through their joint consumption decisions with other members of the household.

**Figure 1: Analysis framework for women’s economic empowerment process among BMC clients**



Source: Authors’ adaptation of Golla et al. (2011)

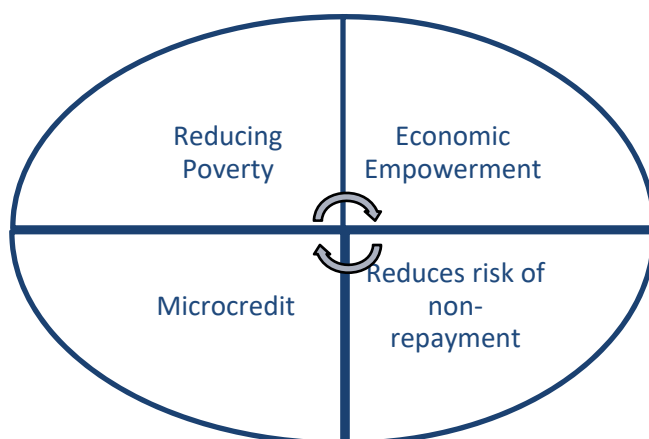
The ability to access loans from BMC and to be trained in financial literacy is expected to increase the women’s ability to make financial decisions both at home and in their business, to manage their own incomes, and to have increased bargaining power at home. As a result, women should have increased control over household resources (since they now contribute more to household income than before),

increased business profits, financial independence, and improved welfare. The increased profits and reduction in poverty levels will contribute to their economic advancement.

Our theory of change assumes that BMC’s operations (i.e., offering access to both financial resources and literacy) reach women, including women living below the poverty line. We also assume that BMC clients have the capacity and opportunity to utilize the skills they acquired in the financial literacy program. A final assumption is that there is no escalation of violence on women due to their access to microcredit. Our final assumption may be risky, as there is evidence demonstrating an escalation of violence after receiving microcredit in some contexts—essentially linked to the greater financial independence of women and their exerting of autonomy regarding financial matters at home (e.g., Kabeer 1999, Ganle, Afriyie, & Segbefia 2015). However, other evidence suggests that, in other contexts, violence against women may decline after receiving microcredit due to lower poverty-related anxiety and pressures (e.g., Kabeer 1999, Cornwall 2016). These findings were consistent with the testimonies of our focus group discussion participants, who suggested that access to the loans reduced violence at home.

Empowering female clients and reducing their poverty levels is likely to have the effect of reducing the risk of loan non-repayment and raising the saving rates of BMC. A rise in women’s savings can in turn enable BMC to mobilize funds for further loans to new and existing clients, reducing rates of default in the longer term. (See Figure 2).

**Figure 2: Link between microcredit, poverty, economic empowerment, and loan non-repayment**



## 4. Methods and Data

### 4.1. Sampling Design

Our sample included women who were clients of BMC and women who had never borrowed from a formal financial institution. We classified female BMC loan clients as the treated group. We used a screening question to select the control group of female respondents that had never borrowed from a financial institution. These women may have borrowed from informal sources such as family and friends. A multiple sampling design was adopted. We sampled both control and treated respondents from the BMC branch districts. We then chose (with the help of BMC) two additional districts with no BMC branch to select more women that had never borrowed. The main reason for including the additional districts was to control for spillover effects within the BMC districts of operation. At the time of the survey, BMC had opened a new branch in the Sawla district. This was included in with the survey, but only treated respondents were interviewed.

Our sample size was determined based on the United Nations Framework Convention on Climate Change's (UNFCCC) formula for stratified designs. We determined a sample size ranging between 900 and 985 respondents as an ideal sample size<sup>77</sup>. While we interviewed a total of 1005 women, this initial sample was reduced to 952 women (411 clients of BMC and 541 control respondents) after completing data checks and cleaning exercises. The number of interviewed women nonetheless provided an adequate sample to estimate the impacts of interest.

For our treated sample, we carried out a stratified random sampling based on a sampling frame for the solidarity loan groups within each BMC district that was provided by the company. The solidarity loan groups were randomly sampled based on the population share of each district relative to the total population in all the treated districts. From each sampled loan group, two women were randomly selected to be interviewed. Our limit of two women per interview was introduced because women in one group are likely to share a number of characteristics, so including a larger number from each group would have limited the variability in our data. A larger number of groups were sampled to increase variation among the women interviewed. As for our control sample, we randomly selected enumeration areas (EAs) based on information from the Ghana Statistics Service (GSS) and then used GSS maps to identify the enumeration areas. The sampling of the control respondents was thus done in three steps: (a) EAs were randomly selected; (b) a household within the randomly-selected EA was systematically<sup>78</sup> selected; and (c) within the selected household, a woman aged 18 years or older (not in school) was randomly selected. Selecting our sample in this way implied lower costs, as it was unnecessary to list all households in each EA and randomly select the households. Therefore while we did not use a pure random sample, the random selection of both EAs and women within each household was expected to provide some random element in our sample design instead.

Finally, a focus group discussion was conducted separately with members of the treated and control groups. The focus group discussions sought to gain a more in-depth understanding of some of the answers collected during the main survey.

<sup>77</sup> Please see Annex B for a more detailed note on the choice of sample size to minimize the margin of error.

<sup>78</sup> As suggested by Vanderstoep and Johnston (2009), systematic selection was used as a random sampling approach. The households were thus selected in a specific order, every third household in our case.



## 4.2. Methodological Approach

Our main outcomes of interest were household consumption, poverty (as measured by the Poverty Probability Index, or PPI) and a range of women’s economic empowerment indicators<sup>79</sup>. Altogether, the main survey questionnaire consisted of seven sections, each of them with subsections and multiple questions to aid in computing our outcomes.

To compute our consumption values, we asked respondents about their household spending on both food and beverages and non-food items (i.e., transportation, education, personal effects, communication technologies, non-major house fixtures, medical care, utilities, fuel, miscellaneous items such as funeral rituals, gifts to others, personal care, clothing, and footwear) as well as unpurchased items (i.e., received gifts and consumption of own produce). We also included the rental value of their homes (using imputed rent for owner-occupied homes) in the questionnaire. The sum of all reported household spending on food, beverages, non-food items and rent, received gifts, and consumption of own produce provided our consumption estimate. The consumption value was adjusted by dividing it by the household size categorical variable to ascertain consumption per capita.

The PPI poverty rate<sup>80</sup> was calculated based on ten questions included in our field questionnaire that were each converted to a score based on the responses. The scores were then transformed into a poverty likelihood using a look-up table provided by the Innovations for Poverty Action. The average of the respondents’ poverty likelihoods provided an estimate of the poverty rate that was consistent with the Ghana Living Standards Survey Round 7 (GLSS7) dataset.

To measure women’s economic empowerment, we constructed yes/no and Likert-scale questions for the purpose of constructing our indicators. The indicators were computed based on underlying questions addressing agency, mobile phone usage for business transactions, business practices, decision-making at home, group participation, control over spending, allocation of personal time for domestic activities, personal autonomy, and self-confidence<sup>81</sup>.

### The Average Treatment Effect (ATE)

To calculate the ATE, we used an inverse probability weighted-regression adjustment (IPW-RA) estimator (see Annexes for an in-depth discussion of methods). Our preference for this estimator was due to its capacity to account for differences in observable characteristics (such as age, married status, educational level, and so on) in the outcome variables and the treatment indicator. This way, we reduced the problem of having large variations in the outcomes and in the decision to borrow as a result of the differences in observed characteristics between the two groups. As a robustness check of our estimates, we also present results based on a propensity score matching approach in Annexes. There, we used the observable characteristics that are not influenced by receiving a loan to reduce the impact of the differences in our measure of the ATE. The overlapping graphs for our treatment groups are shown in Figure B1 in Annexes. Our treatment variable was having received a loan from BMC by the time of the survey. The control respondents were identified as those who had never received any formal loan.

<sup>79</sup> We present a more detailed description of this and other approaches adopted in our study in Annex B.

<sup>80</sup> The detailed PPI methodology for Ghana including the score cards and look-up table can be found at <https://www.povertyindex.org/country/ghana>.

<sup>81</sup> A detailed elaboration of how the outcomes were calculated is presented in Annex B.

The control respondents may not be a good comparison group for the BMC clients. One reason is the potential spillover due to control respondents benefiting from loans borrowed by other members of their household. As part of our main strategy, we adopted a multiple treatment framework by comparing individuals with (1) no loan and one loan cycle; (2) two to three loan cycles and one loan cycle (3); and four or more loan cycles and two to three loan cycles. The rationale for our approach was that, if there were any differences in entrepreneurial ability and other unobserved factors between the control group and BMC clients, our estimates would be biased without these controls.

The three aforementioned comparisons allowed us to compare groups that were similar and more comparable. For instance, borrowers who have experienced at least one loan cycle are more likely to be similar to borrowers with more cycles than the control group in respect of any unobserved differences including entrepreneurial ability. Likewise, women with one loan are more comparable to women without a loan than those with many loan cycles. At the time of receiving the loan, the women with one loan (and women with no loan) would have the same unobserved characteristics determining whether they receive the loan. In other words, the unobserved drivers of loan risk are likely to be similar across the two groups and will only change upon successful repayment of the initial loan.

For this comparison between cycles, we estimated a multinomial logit regression where the category consisted of four levels: 1 (no loan); 2 (one loan); 3 (two to three loans); and 4 (four or more loans). The multinomial logit framework allowed us to compare each level to the one-loan level, which was taken as the base or reference category. We allowed the contrasting cases to be sequentially compared to generate the ATE. We compared the four or more to the two-to-three loan level; the two-to-three loan to the one-loan level; and finally, the one-loan to the no-loan level to determine differences among the four levels.

Following Cintina and Love (2017), to adjust for the differences across our treatment categories, we selected household characteristics that were unaffected by being a client of BMC as our variables for the multinomial logit. These variables were: dummies for the respondent's age group (18 and above), educational level, household head, religion, marital status, and household size. The same set of variables was used to control for the differences in the outcomes (the regression adjustment estimator part). In the propensity score regressions, we applied a richer specification that included the previously mentioned variables and the household accommodation status as well as interactions among our variables. Because some covariates perfectly predicted the treatment status, it was not possible to estimate all sets of interactions and include additional variables as we wished. Our propensity score matching was based on the nearest neighbour matching with a replacement. We selected a caliper of 0.01 to 0.001 as the distance within which we would find controls to match with our treated. This allowed us to obtain the closest matches to our treated observations, in order to reduce the bias coming from selecting participants with scores further away from the treated.

### Potential sources of bias

To give reliable answers to our research questions, our multi-pronged approach needed to satisfy all the following assumptions:

- No spillover effects
- No unobservable influences on treatment
- No observable influences on treatment
- Common support or overlap

While we can control for observable differences between the treatment and control groups, it is more difficult to control for unobservable differences and spillover effects. To reduce the effect of biases, we included the women’s characteristics in the various analyses. Furthermore, we present results of the propensity score and carried out our matching analysis based on both the control and the treated respondents having an overlapping propensity score distribution. Although it is difficult to adjust for unobserved differences, various methods exist to determine whether there are significant changes in the average treatment effect that are due to unobserved differences between the groups<sup>82</sup>.

### Use of Narratives—Focus Group Discussions

We carried out two focus group discussions to delve deeper into the impact of the loans on the women’s businesses and daily lives and their views on how this, in turn, empowered them economically. The focus groups were meant to complement our quantitative data collection. One group consisted of nine women that had never borrowed before (from a randomly selected community in Tamale). The second group consisted of 11 women from one of the BMC loan solidarity groups. The discussions were conducted in the local language and translated into English for analysis.

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<sup>82</sup> The approaches described by Manski (1989), Manski (1990), Manski and Pepper (2000), DiPrete and Gangl (2004), Rosenbaum (2005), Nannicini (2007), and McCarthy et al. (2015) are insightful in revealing the effect of unobserved influences on estimated ATEs.

## 5. Results

### 5.1. Descriptive Results

#### Household characteristics and consumption

Table A1 offers an overview of the individual characteristics of participants. Across all loan categories, most of the women had no education (about 64.9%); and the majority of them were married (about 79.3%). The average ages of respondents in the treated and control groups are 43 years and 38 years respectively. The household size was larger for the BMC clients than for the control group. Between 63.7% -72.96% of the borrowers in the treatment sample had a household of 8 or more members, compared to 46% of women in the control group. A little over a fifth of all responding women were household heads (20.3%-22.4%). The majority of the BMC clients were self-employed<sup>83</sup> (68.4%-98.3%), compared to 48.4% of the women in the control group. Most respondents were located in the Tamale Metropolis region (see Table A2).

On average, the BMC clients had more years of experience in running their businesses (12 years for the treatment group against 9 years for the control group) and made higher profits. Among the self-employed respondents, those with no loans (that is, the control group) had the lowest profits, while those with four or more loan cycles reported the highest profits (see Table A3).

About 56.8% of the sample belong to the control group while 43.2% belong to the treated group. About a third (32.2%) of the total sample had gone through four or more loan cycles from BMC. Those with one loan and two or three loan cycles represented 6.1% and 4.8% of the sample, respectively (Table A4).

Figure 3 shows the average monthly consumption expenditure across each welfare quintile by the number of borrowed loans (the means are significantly different across the quintiles). The quintile distribution helps us to explore how the distribution of expenditure differs across the four categories of clients and controls. Women with four or more loans showed higher values of average consumption expenditure at each welfare quintile compared to the group with no loan, apart from the fourth quintile. For instance, the second and fourth quintiles indicated a higher average for the single-loan BMC clients compared to the two to three-loan clients as well as to the clients with four or more loans. However, the two to three-loan clients recorded higher averages at the remaining quintiles compared to both the single-loan clients and the clients with four or more loans (except at the fifth quintile, where the four or more-loan category had a higher average than the fifth quintile). The one-loan and two or three-loan clients showed higher averages for the first to fourth quintiles compared to the four or more-loan client category. For the fifth quintile, the average consumption expenditure of GH¢ 2,244 (\$429.89) was higher than the recorded average of GH¢ 2,113.21 (\$404.83) and GH¢ 2,199.43 (\$421.35) for the single-loan and the two or three-loan categories, respectively.

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<sup>83</sup> The self-employed/clients run their own businesses and, in some cases, employ other workers. The type of businesses vary along the value chain. Some businesses are run from home and consist in either running an adjacent small-to-large shop or micro-trading over a table. A few self-employed women own larger shops in the town.

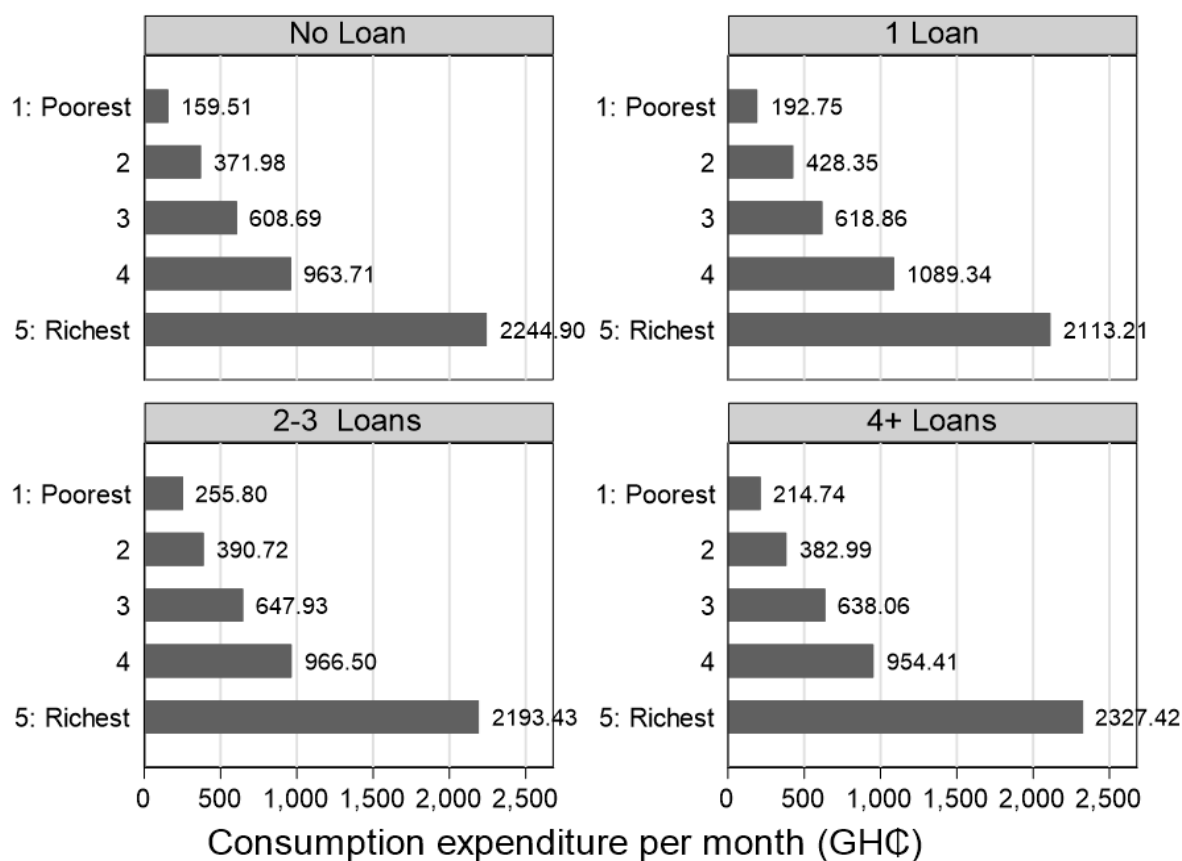
**Figure 3: Distribution of Monthly Consumption Expenditure by Welfare Quintile (Mean)**

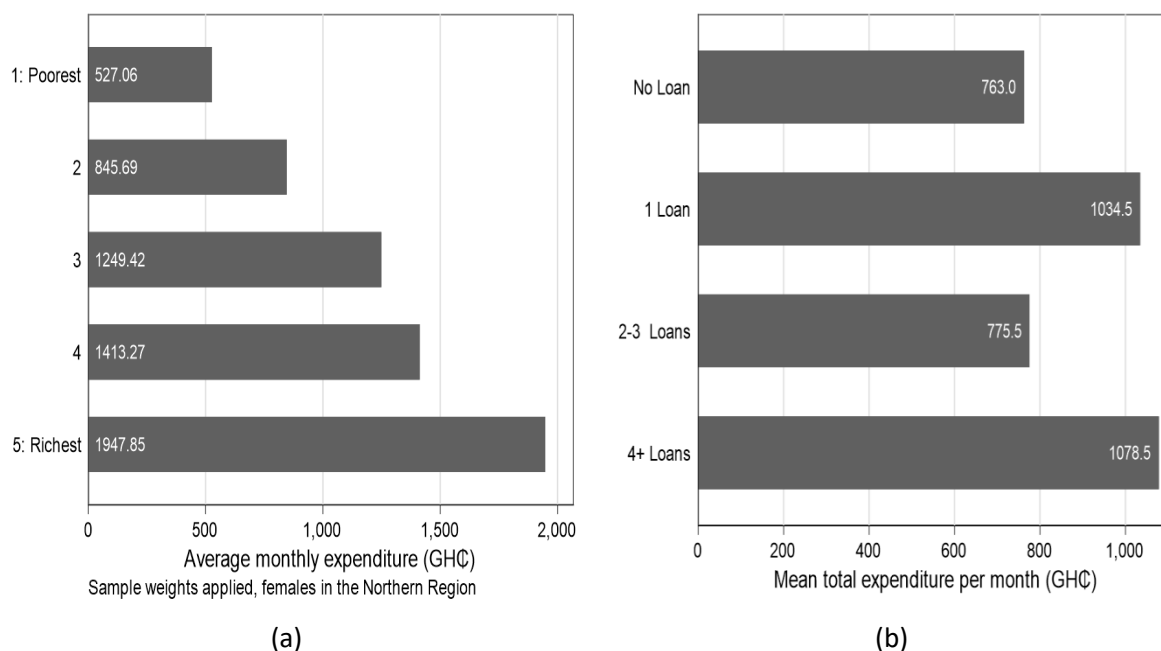
Figure 4 offers a simple comparison of the distribution of average monthly consumption expenditure across welfare quintiles in the Northern region based on the nationally representative survey (GLSS7) and across the loan categories in our field survey sample. Figure 4a shows a smaller gap between the richest and the poorest households than we see in Figure 3. Furthermore, the first to fourth quintiles in the national survey (Figure 4a) recorded higher averages for consumption than our sample in Figure 3 (with a higher average consumption expenditure in our sample for the fifth quintile)<sup>84</sup>. Furthermore, the first and second quintiles in the national survey recorded an average unadjusted consumption spending that fell below the extreme poverty line—implying that in per capita terms the amounts will be much lower than the extreme poverty line (GH¢ 982.20). In fact, in per capita terms it is only the fifth quintile of the single loan and the no loan groups that had expenditure exceeding the extreme poverty line (Figure B2). Further analysing our sample data shows that the women represented by the first four welfare quintiles were likely to be poor<sup>85</sup>. As shown in Figure 4b, the consumption average for the four or more-loan category was the highest (GH¢ 1,078.50/\$206.61), followed by the one-loan category (GH¢ 1,034.50/USD198.18). The lowest reported consumption average was for the no-loan category (GH¢ 783.00/\$150). Thus, in our sample, the distribution of monthly consumption expenditure by welfare quintile (Figure 3) provides a more comprehensive picture of consumption than the distribution by loan number (Figure 4b). Thus, the fifth welfare

<sup>84</sup> Using the Consumer Price Index (CPI) values of 242.0 (July 2019) and 207.2 (December 2017) yields an adjustment factor of 1.17. Adjusting the values of the national survey to 2019 prices would lead to an increase in the reported consumption expenditure values by a factor of 1.17.

<sup>85</sup> Using the CPI values of 242.0 (July 2019) and 207.2 (December 2017) yields an extreme poverty line of GH¢ 1147.16. All the first four welfare quintiles in our survey sample remained below the extreme poverty line.

quintile of the no-loan category essentially pushed up the average for that category—with a similar effect in all the other loan categories.

**Figure 4: Distribution of Average Consumption by Welfare Quintile and Loan Number**



Notes: Distribution of monthly consumption across welfare quintiles in the field survey region based on national data (a). Mean monthly consumption across the number of loans (loan cycles) based on our survey sample data (b). Source: Authors’ elaboration of GLSS7 (a). Authors’ elaboration of field data (b).

### Client Satisfaction

Generally, BMC clients were satisfied with the loan processing time (88%), the length of time for credit repayment (73%), the products offered (89%), and the attitude of BMC agents (98%). They also agreed with the statement that BMC provides adequate financial education (85%); the location of the branches is convenient (80%); and the interest rates charged on the loans are high (42%). Among the non-clients, about 69.9% had not heard of BMC. On average, a greater proportion of non-clients within BMC’s operation districts had not heard of the company compared to non-clients outside BMC’s districts<sup>86</sup>. Among those who had heard of BMC, about 79% mentioned having done so through an advert on radio or TV (Table C1 and Table C2 in Annexes).

### Savings and loans borrowed

A considerable share (74.7%) of the BMC clients interviewed had borrowed at least four times. About 14.1% of the women had borrowed only once—these were mainly women from Sawla where BMC commenced operations in 2019 (Table A4). About 23.1% of the BMC clients had also borrowed money from friends and family, compared to 33.3% in the control group. The proportion of BMC clients who had also borrowed from family and friends was driven by the two to three-loan category, where 39.1% of respondents reported borrowing from family and friends (Table A8). Only 28.9% of the entire sample borrowed from friends and family. While the majority of BMC clients maintained some form of

<sup>86</sup> One possible explanation is that the residents in the districts with a branch have not associated the company’s brand with the group lending product which is called *bonsali* in the local dialect. Hence, they normally refer to microcredit firms offering group loans as *bonsali*.

savings accounts (86.9%), their amount of savings (GH¢ 457.38/\$87.62) was lower than that of the control group (Table A8). Among the BMC clients, the one-loan category seemed to be driving the savings average (GH¢ 549.60/\$105.29). The two or three- and four or more-loan categories saved less than GH¢ 254.00 (\$48.66). Since the control respondents did not have access to formal loans, they might have maintained more assets (in the form of livestock or other items) or guaranteed access to pooled savings to meet emerging financial difficulties. While some of the control respondents might not hold individual accounts at formal financial institutions, they were able to maintain savings by joining a *susu* group<sup>87</sup> (89 respondents), which in turn might keep members' funds in an account with a formal institution.

The data, however, suggested that most control respondents with savings accounts (80.9%) supplemented their savings by also contributing to the *susu* group on a regular basis. A similar pattern was observed among the BMC clients. As suggested during the focus group discussions, one explanation might be that being a member of a *susu* group offers easy access not only to your savings but also to those of the other members once your turn has come to withdraw your contribution from the group. Thus, members can access additional funds without facing the disadvantages associated with having a savings account at a formal institution (including the lengthy documentation for opening an account, account maintenance charges, very low interest rates, sometimes limits on withdrawals, and the queues at the cashier's tills and potential bankruptcy of the institution.) to support their family or their business activities.

The BMC clients maintained savings to support household members, hold ceremonies, and prepare for unexpected events. A higher proportion of the control respondents maintained savings for unexpected events (33.8%) and to support household members. Finally, both food and non-food expenditures were higher for the BMC clients than for the control group.

### **Economic Activities**

Our data suggested that few of the businesses run by the self-employed<sup>88</sup> were originally financed by loans. For instance, during the focus group discussions, a few of the BMC clients reported that they were already running their business prior to joining their loan solidarity group. Furthermore, the majority of the survey respondents in both the treated and control groups self-financed the initial capital necessary for starting their business. Given the age of the women and the fact that BMC started operations about 11 years ago, the majority of the women were likely to have started micro businesses prior to joining BMC as clients.

About 42.6% of the BMC clients reported borrowing to finance the daily operations of their businesses. In contrast, 90.8% of the control respondents self-financed daily operations. For both groups, the key constraint for business expansion was the availability of credit—a sentiment supported by our focus group discussions with control participants. However, while the second most important constraint was finding customers for their operations in the case of the BMC group, it was childcare for the control group.

<sup>87</sup> A *susu* group is an informal savings society, where all members contribute money on a regular basis and hand over the pooled savings to one of the members on a rotational basis.

<sup>88</sup> The businesses run by the self-employed include any main activities that the women undertake on a regular basis that generates income for them. The women dedicate time to their business, run and manage it, and may or may not employ workers to help them in day-to-day operations.

## Poverty Rates

The district ranking based on our estimated female extreme poverty rates in the Northern, Savannah, and North East regions<sup>89</sup> indicated that BMC is located in the fourth poorest district (based on rates of extreme poverty) in the region<sup>90</sup>. The presence of BMC in Sawla and the remaining districts provides an opportunity for the company poor women in this region.

Table 3 provides a comparison of extreme poverty rates, calculated based on the PPI questions, between the different borrowers' categories in our sample and GLSS7 data. The average poverty likelihood across our entire sample indicated a poverty rate that was consistent with the national poverty lines and headcount poverty rates. The latest national poverty rate (based on GLSS7) for all females was 22.7% (with standard error [SE] = 0.003) and 7.9% (SE = 0.001)<sup>91</sup> for extreme poverty. The PPI headcount rate for females (based on GLSS7) in the Northern region (corresponding to the seven districts of the survey) was 53.8%, compared to our headcount of 48.9%<sup>92</sup> for the one to three-loan BMC clients, 50.1% for the four plus-loan clients, and 55.3% for the control group. In the case of extreme poverty, our PPI headcount rate was 16.4% for the BMC clients and 25% for the control group, compared to 17.6% for the Northern Region (based on GLSS7).

There were large differences between our poverty rates in Nanumba North, East Gonja, Sawla, and Yendi across treatments and the national data. These differences may be explained by the proportion of the poor reached by BMC in these various districts and across the Northern region relative to the national data. For instance, in Yendi, we found that the PPI headcount rate (for one to three loans) was 14.4 percentage points higher than the district PPI rate from national data and 10.5 percentage points (for four plus loans) higher than the district PPI rate from national data. This implies that BMC successfully reaches a larger proportion of the poor female population relative to the district PPI poverty level. As one caveat, there is the possibility that some of the BMC clients were lifted out of poverty due to earlier loans obtained by the time of our survey—especially those that borrowed several times. This could explain the lower PPI headcount rates among the BMC clients compared to the control headcount rates. For example, in Yendi—the no loan PPI headcount rate is at least 11.8 percentage points higher than the BMC client PPI rates.

The PPI extreme poverty rates for both males and females in the Northern, Savannah, and North East regions were included to provide an overall picture of extreme poverty. The extreme poverty rates were higher among the no-loan group (control) than among the 1-loan, 2 to 3-loan, and 4 or more-loan groups. Thus, we would expect women with loans to have a lower poverty rate, since their access to loans can reduce their level of poverty. Two exceptions were the districts of Nanumba North and Tamale, where the rates were higher for the one-loan group than for the no-loan group. Additionally,

<sup>89</sup> At the start of the project, the three regions were all located within the Northern region of Ghana. For simplicity, in this report we will continue to consider all three regions as one region—the Northern region.

<sup>90</sup> This ranking is however likely to change if we consider the new regional division. Until the year 2019, Ghana had ten administrative regions, which have been further divided into 16 through a national referendum. The Northern region has now been divided into three regions, namely the Northern, Savannah, and North East regions.

<sup>91</sup> The reported standard errors indicate the precision with which the national female poverty rates have been calculated. The very low standard errors (which are much smaller than the estimated poverty rate) suggest that any errors in estimation are at most a hundredth of the estimated poverty rate. We do not provide standard errors for the PPI poverty rates in Table 1.

<sup>92</sup> With a 5% margin of error, the 95% confidence interval for our sample PPI poverty rates indicates that an estimated PPI poverty rate of 48.9%, for example, will lie between 43.9% and 53.9% of the poverty rate of all BMC clients (i.e. BMC's client population).



in Tamale, the PPI poverty rate was higher in the two or three-loan group than that in the no-loan category. Comparing our extreme poverty rates to the GLSS7 rates indicated that poverty rates were higher for the borrowers in Nanumba North, Tamale Metropolis, and Yendi Municipal—a result consistent with our comparison of the PPI rates with the national monetary poverty rates.

**Table 3: PPI-Based Extreme Poverty Rates**

Categories	(1) GLSS7	(2) All	(3) No Loan	(4) 1 Loan	(5) 2-3 Loans	(6) 4+ Loans
Northern Region (All districts, both sexes)	27.6	n/a	n/a	n/a	n/a	n/a
East Gonja	31.2	n/a	n/a	n/a	n/a	n/a
Nanumba North	30.6	n/a	n/a	n/a	n/a	n/a
Other districts	29.3	n/a	n/a	n/a	n/a	n/a
Sawla	30.8	n/a	n/a	n/a	n/a	n/a
Tamale Metropolis	12.5	n/a	n/a	n/a	n/a	n/a
Yendi Municipal	20.5	n/a	n/a	n/a	n/a	n/a
1-4 household members	10.7	n/a	n/a	n/a	n/a	n/a
5-7 household members	37.4	n/a	n/a	n/a	n/a	n/a
8+ household members	40.1	n/a	n/a	n/a	n/a	n/a
Northern Region (BMC districts, females only)	17.6	21.3	25.0	12.5	21.2	16.5
East Gonja	31.8	19.4	31.5	8.3	9.9	7.0
Nanumba North	22.9	40.8	46.3	57.5	33.7	35.2
Other districts	21.5	23.2	23.2	n/a	n/a	n/a
Sawla	25.0	11.9	n/a	11.9	12.1 <sup>a</sup>	n/a
Tamale Metropolis	7.9	10.4	10.3	17.3	19.6	9.9
Yendi Municipal (females only)	14.0	32.2	40.2	n/a	28.4	24.5
1-4 household members	9.9	6.9	8.2	4.0	2.1	3.8
5-7 household members	36.6	24.3	29.1	16.6	16.3	11.3
8+ household members	42.6	24.3	30.1	12.9	26.6	19.5
<b>PPI poverty headcount rates:</b>						
Northern Region (7 districts)	53.8	48.9	55.3	48.9	50.1	

Notes: “n/a” signifies not applicable or no survey data. “Other districts” encompass all remaining districts for the GLSS7 data in column (1) but include only Central Gonja and East Mamprusi in columns (2) – (5). All refers to the total sample. The gendered national data and our field data are both based on females aged 18 and above. <sup>a</sup> Two respondents in Sawla indicated they had borrowed on two occasions. Source: Authors’ calculations based on the Ghana Living Standards Survey round 7 and own survey data.

A preliminary conclusion is therefore that BMC has succeeded in reaching extremely poor women in three areas of operations. Having three out of five districts recording higher poverty rates than the GLSS7 district PPI poverty rates indicated that BMC was able to target the extremely poor to a large extent. Comparison with the control group (no loan) also supported the notion that in Tamale and Nanumba North, the company was able to target extremely poor women. However, in East Gonja and Sawla, BMC is reaching out to extremely poor women to a more limited extent, and may need to do more to reach this group.

Differences between our survey and GLSS7 data emerged when we considered households with one to four members, five to seven members, and eight and above members. For all these household categories, the PPI headcount rate was lower in our treated sample than that in the GLSS7 dataset and the control group.

Altogether, we can conclude that a good proportion of the BMC clients were poor. The insights obtained from our PPI poverty comparison is consistent with our previous finding that the consumption per capita expenditure values in the first four welfare quintiles were below the extreme poverty line<sup>93</sup>.

## 5.2. Average Treatment Effect

### Borrower and non-borrower characteristics

The determinants of borrowing in our survey sample were investigated using a multinomial logit model (Table B2 in Annexes). The one-loan group was used as the reference category due to its similarity with the control group. In addition, we compared clients with a higher number of loans to the clients with a single loan.

The main drivers for having a single loan relative to no loan were age, marital status and education level. Women within the 41–50 age group are 0.46 times less likely to borrow than those within 18–30 age group, all other things being equal. Married women are 2.8 times less likely to borrow than those who are single, divorced/separated, or widowed. Meanwhile, women with some level of education are 0.27 times less likely to borrow than those women with no education.

We found no significant differences in characteristics between the two or three-loan category and the single-loan category. For the four or more-loan category, religion was an additional variable that affected whether a woman borrowed many times relative to borrowing once. Women in both the 51–60 and the above-60 age group are 5.1 and 9.8 times more likely to borrow four or more loans than the 18–30 age group, respectively, all other things being equal. Similarly, married women are 2.2 times more likely to borrow four or more loans than single, divorced/separated, or widowed women, compared with those with single loan. Muslim women were 6.4 times more likely to borrow four or more loans than women belonging to another religion, compared to Muslim women with a single loan.

On average, the clients with four or more loans were older, married, and most were Muslim. Islam is the predominant religion in the districts visited, hence the greater number of Muslim women interviewed. The homogeneity of the solidarity groups, since they were largely Muslim women, made

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<sup>93</sup> Our poverty values in Table 1 exclude loans. The poverty rates calculated are based on 10 questions that are highly correlated with poverty and have been shown to yield estimates consistent with poverty estimated from the national survey.

it easier to follow up on repayments and to “*be each other’s keeper*”. Nonetheless, they had several other avenues of meeting beyond the solidarity group meetings which helped to keep each member committed to their repayments and the success of the solidarity group. We think homogeneity rather than religion played the key role here. The clients with a single loan were relatively more numerous in the 41–50 age group compared to the women that never borrowed. In addition, the clients with a single loan were more educated and included more unmarried women than clients in the control (no loan) group.

### **Poverty: PPI and Consumption**

Table 4 presents our main results on the average treatment effect of the loans based on our proxies for poverty, namely, (1) PPI-based extreme poverty; (2) PPI-based poverty; and (3) an adjusted consumption expenditure. We estimated a regression of consumption on our dummies for household size and computed the residual. We then used the residual for estimating our ATEs in the table. The correlations among the various consumption variables and the PPI poverty rates are provided in Table A5 in Annexes.

Three comparisons were made. These were between: (1) BMC clients with one loan and control (no-loan) respondents; (2) BMC clients with one loan and two to three-loan clients; and (3) BMC clients with two to three loans and four and more-loan clients. The comparison among BMC clients served as a check on our comparison between the single-loan clients and the control respondents. One reason was that, in principle, BMC clients with several loans may be more directly comparable with those with a higher number of loans than with the control respondents. We control for the relevant observed differences in characteristics for each comparison pair in all our specifications<sup>94</sup>.

In principle, the average treatment effects estimates of negative average treatment effects on poverty would indicate that access to microfinance reduces the likelihood a household falls below the poverty line, whereas positive average treatment effects on consumption would be expected if access to microfinance increases household welfare (and thus also reduces poverty). The results in Table 4 show a significantly lower level of poverty and a higher level of consumption among BMC clients with one loan relative to the control holding all relevant observed characteristics constant. The clients with a single loan recorded -11.34 and -11.33 percentage points lower for extreme poverty and poverty, respectively, compared to the control group. The difference in consumption was 0.37, indicating that on average, the clients with one loan had higher consumption expenditure than the control group.

The story changed, however, when we compared the BMC clients with one loan to the clients with two or three loans. Our results showed a significant high poverty level among clients with two or three loans than among those with only one loan. The higher consumption expenditure of the clients with one loan compared to the clients with two or three loans at the fourth welfare quintile might have been driving the result. Essentially, the difference in consumption at the fourth quintile exceeds the differences observed at the remaining quintiles across the two groups. However, the results showed a

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<sup>94</sup> Although not shown, our simulations of the sensitivity of our estimates indicated that unobserved effects (in most cases) would have to be large to affect our estimates. Also, our attempts at using alternative methods such as an instrumental variable regression to control for unobserved influences did not strongly suggest an endogeneity problem. However, we do note that instrumental variable results are dependent on having a variable(s) that is strongly correlated with the treatment but uncorrelated with the errors in the outcome regression. Our instruments were dummies for not having been sick in the past 5 years, not ever borrowing from family and friends, and not having a member of the household borrow from a formal financial institution.

significantly lower poverty level and a higher consumption for clients with four or more loans relative to those with two to three loans.

**Table 4: Average Treatment Effect for Poverty Outcomes**

	<b>1 Loan vs No Loan</b>	<b>2-3 Loans vs 1 Loan</b>	<b>4+ vs 2-3 Loans</b>
PPI-extreme poverty	-11.34*	6.15**	-6.63***
<i>Z-statistic</i>	-1.82	1.99	-2.68
PPI-poverty	-11.33*	7.90*	-9.61**
<i>Z-statistic</i>	-1.74	1.91	-2.28
Adjusted consumption (logs)	0.37**	-0.07	0.22*
<i>Z-statistic</i>	2.03	-0.55	1.66

*Notes: The reported Z values are based on standard errors clustered by district. N = 952 for poverty estimates and N = 951 for consumption estimates. Explanatory variables: household size (3 levels), education (=1 if completed some education), age (5 levels), married (=1 if married), religion (=1 if Muslim), household head (= 1 if household head). \*p < 0.1; \*\*p < 0.05; \*\*\*p < 0.01.*

Furthermore, we estimated three separate regressions based on each category as a binary variable rather than using a single regression with multiple categories. The estimates were consistent with the results described above (Table B4 in Annexes). The one-loan clients had higher consumption expenditure (ATE = 0.41) relative to the no-loan group. The signs of the ATE were consistent with those in Table 4. Additionally, our propensity score estimates, which also drew on the binary treatment variable, generated estimates that were consistent with the signs of the ATE in Table 4. Although the ATE for poverty status was not significant, it was significant for extreme poverty status in the comparison between the one-loan clients and the control group. The ATE for consumption was also significant for the one-loan versus the no-loan group (ATE = 0.44). In addition, we found significantly higher consumption per capita for the four or more-loan clients compared to the two or three-loan group. Restricting our sample to only the self-employed also revealed a significantly lower PPI poverty rate among the four and more-loan clients than the two to three-loan clients (Table B5).

### **Women’s Economic Empowerment**

We performed the same comparisons for our women’s economic empowerment indicators (Table 5). Six out of the nine indicators of women’s economic empowerment were significantly affected by access to loans. Business practice, business decision-making, agency, personal autonomy, social capital, and the share of household spending were all significantly higher among clients with one loan than among the control (no loan) respondents. In other words, BMC clients were more likely to make key decisions in running their business independently. Also, their personal autonomy in decision-making at home was higher. Their social capital in the form of the networks and social groups they belonged to also recorded a positive ATE, suggesting that they engaged in more networking and group meetings than the control respondents. The single-loan clients also experienced a higher share in household spending than the control group. Altogether, these six outcomes offered an indication that access to a BMC loan may have boosted women's economic empowerment for the one-loan clients.

**Table 5: Average Treatment Effect (ATE) for Women’s Economic Empowerment Outcomes**

	<b>1 Loan vs No Loan</b>	<b>2-3 Loans vs 1 Loan</b>	<b>4+ vs 2-3 Loans</b>
Business practice	0.45***	0.81***	-0.16
<i>Z-statistic</i>	2.90	5.00	-0.82
Decision-making role in business	2.38**	2.63***	-0.16
<i>Z-statistic</i>	2.08	9.72	-0.14
Use of phone and technology in business	0.70	0.55	-0.22***
<i>Z-statistic</i>	1.61	1.62	-3.20
Agency/decision-making at home	1.96***	0.69*	-0.68
<i>Z-statistic</i>	6.02	1.87	-0.75
Self-confidence	-0.04	0.16*	0.13***
<i>Z-statistic</i>	-0.54	1.71	3.57
Personal autonomy	0.25**	-0.13***	-0.02
<i>Z-statistic</i>	2.02	-4.05	-0.77
Social capital/group participation	2.34***	-0.27	0.11
<i>Z-statistic</i>	9.91	-1.54	0.86
Time allocation and workload	0.09	-0.12	0.01
<i>Z-statistic</i>	1.38	-1.27	0.12
Share of household spending	0.37***	-0.29***	-0.07
<i>Z-statistic</i>	5.96	-3.73	-1.39

*Notes: The reported Z values are based on standard errors clustered by district. Business-related outcomes are based on comparing the self-employed respondents only (N = 571). All other household-related outcomes were based on the full sample of 952 respondents. Explanatory variables: household size (3 levels), education (=1 if completed some education), age (5 levels), married (=1 if married), religion (=1 if Muslim), household head (= 1 if household head). \*p < 0.1, \*\*p < 0.05, and \*\*\*p < 0.01.*

A similar comparison revealed some differences across groups based on the number of loans (Table 5). Business practice, business decision-making, agency/decision-making at home, and self-confidence were positively affected by obtaining loans for the clients with two or three loans compared to the clients with one loan. However, social capital and personal autonomy were negatively affected. These results indicated that, while there was high women’s economic empowerment along four dimensions, another two dimensions experienced were lower. Overall, these two lower dimensions did not negate our earlier result of high women’s economic empowerment. Social norms and customs still play a strong role in the daily lives of women in Ghana, making it difficult at times to observe high dimensions of women’s economic empowerment. The lower share of household spending, in particular, could be explained by the spouse overseeing a greater share of spending, as expected by social norms and customs in the Ghanaian society.

When comparing the two or three-loan clients with the four or more-loan clients, we found that those with a higher number of loans reported higher self-confidence, but at the same time less use of phone and technology in business. In other words, the group with four or more loans made less use of

technology in running their business compared to the two or three-loan clients. One could attribute this result to the interaction of age and education in promoting the use of technology. The four and more-loan group had significantly more members in the 50 and over age group, and older people tend to be slower than younger groups to take up new technologies. This group also had fewer educated members.

### 5.3 Discussion and Implications

Our findings indicated that BMC is reaching extremely poor clients, in line with its own objectives. BMC reaches a particularly large share of the extremely poor in Tamale, Nanumba North, and Yendi Municipal, while in East Gonja and Sawla-Tuna-Kalba their outreach to the extreme poor is below the district rate of extreme poverty. In Sawla, where a new BMC branch recently started operations, BMC should be able to reach a larger proportion of the poor through adequate client targeting. In particular, the company could draw upon the PPI methodology proposed by the ‘Innovations for Poverty Action’ organization to target a larger number of poorer women in their poverty outreach and support of the vulnerable in the community<sup>95</sup>. In scoping out the districts and forming their solidarity groups, BMC could easily add the ten PPI questions to their questionnaire to the women and then use the Excel tools provided by the organization to calculate the poverty likelihood of their clients. This will be a way of monitoring BMC’s outreach to the poor and measuring their ability to meet their goal of reducing poverty in Northern Ghana.

Furthermore, the study provides evidence to suggest that access to a BMC loan reduces poverty and boosts consumption—a result that was consistent across the different approaches that we used. The use of a number of controls and tests of robustness leave us confident that the presented results were not significantly affected by unobserved differences among groups, such as the potentially greater entrepreneurial ability of the female loan clients compared to the control group. First, our use of a multiple treatment category was helpful in checking whether unobserved differences were influencing our results. Second, we can consider our results as the upper bound in terms of the impact of BMC. And third, women experienced an improvement in some of the women’s economic empowerment outcomes studied. While not all of the indicators for women’s economic empowerment yielded significant results, there was a significant increase in agency and power at home and in business. Our qualitative results in the narratives presented below support this finding.

The ATE can be reported as a percentage of the potential outcome mean, under the assumption that none of the women took out a loan. Similarly, we can also divide the ATE by the potential outcome mean if none of the women were in the two or three-loan category. In this case, the ATE reported for the four or more- versus the two to three-loan category can provide us with an upper bound. In summarizing the impact, we found that consumption per capita was higher by approximately 11% between the no-loan versus one-loan respondents, and by 32.6% between the four or more- versus the two or three loan respondents. Our results therefore indicated an increase in consumption that can lead to a fall in poverty where it pushes households across the poverty line<sup>96</sup>.

Our analysis of the PPI poverty rates also confirmed the results provided for consumption expenditure. The lower poverty rates for the one-loan versus the no-loan category and the four or more- versus the

<sup>95</sup> The tool and related materials can be downloaded for free from <https://www.povertyindex.org/country/ghana>.

<sup>96</sup> The use of increase here refers to the counterfactual group (no loan). Thus, we are interpreting the effect as an increase over what the BMC clients are estimated to have prior to taking up the loan.

two to three-loan category indicated a lower poverty level among BMC clients (compared to the counterfactual). The values ranged from 31.5% to 43.3% for the extreme poverty rate, and from 17.6% to 19.6% for the poverty rate based on our different specifications estimated for each poverty classification. As one exception, the two to three-loan showed a higher poverty level than the single-loan clients. However, the propensity score matching results did not show any significant results between the two to three-loan and the single-loan clients. A binary treatment yielded a non-significant difference between the two groups for the extreme poverty rate, but not for the poverty rate.

We have controlled for the observable differences, so there is a difference in poverty that can be attributed to access to loans if our assumption of no unobserved effects holds. Using a doubly robust estimator, and thus controlling for differences in outcomes as well, led to a stronger set of results. Any biases from unobserved differences were likely to be small, as supported by our simulations of the unobserved effects as well as the literature suggesting that such biases tend to be small (among others, Cintina and Love 2017)<sup>97</sup>.

Our quantitative evidence fit many of the narratives that emerged from our separate focus group discussions with female BMC clients and the control group in Tamale. Below, we list the narratives derived from our focus group discussions with the control group and BMC clients.

*Narrative 1: BMC clients feel economically empowered*

BMC clients provided examples of ways in which the loans affected their lives. For instance, one participant mentioned that, thanks to the BMC loan, she was able to pay school fees for her children and cover basic needs without relying on her husband. Another woman said she was able to acquire a ‘container shop’ stocked with clothing and a motorbike for her business rounds. Another BMC client added that the loan helped her meet her trading activities. Yet another participant said she was able to build her own house. While these examples indicated an improvement in the livelihood of the women who borrowed, it also provided support to the evidence for the economic empowerment of the women. Essentially, the women had become more independent both in doing the spending for the household and in making their own financial decisions. The discussions seemed to support the fact that not all the women directly used the loans for their business activities. For some households, consumption was the key. For instance, one of the elderly women explained that her spouse was older than her and not working anymore, so she needed to work. Being part of the BMC loan solidarity group provided women with easy access to a loan to cover the cost of emergencies and other sizable expenses that had to be incurred from time to time.

Interestingly, one of the participants suggested that being financially ‘able’ meant that she was no longer required to reveal her secrets to people she would normally borrow from (essentially, she did not have to tell people the real reasons why she had to borrow from them). Overall, the group noted there was an improvement in women’s economic empowerment.

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<sup>97</sup> Based on Rosenbaum’s sensitivity analysis the order of the unobserved effects must be larger than the gamma odds of 1.3 for our estimates to be significantly affected by the unobserved effect. In some of our other variables, the odds must be higher than 1.3 for any serious effect on our estimates.

*Narrative 2: Access to loans reduces violence at home*

It was suggested in both focus groups that being financially independent reduced the quarrels (in some cases, violence) that arose at home from having to rely on the husband for money, or even from asking for money. The key message was that being economically empowered meant having fewer disagreements at home about money. It reduced the financial burden on the men, and it brought more peace, and less violence, between the couple.

*Narrative 3: Responsibilities at home negatively affect running a business*

Participants in the two focus groups generally agreed that their responsibilities at home, such as taking care of the children, among other things, limited their ability to run their business efficiently. However, in our quantitative analysis, we did not find any significant differences between the treated and the control group in their workload and working time. We can attribute this result to the fact that both groups of women (especially the self-employed) carried out similar chores at home in addition to running their business. This suggests that taking up the challenge of running a business and keeping up with loan repayments places a greater personal and professional burden on the clients. Thus, while in some instances, there was a higher index in some dimensions of women's economic empowerment, in a few other dimensions a lower index was observed. However, the overall effect was a higher level of women's economic empowerment for BMC clients compared to the no loan group. To observe a higher level of economic empowerment across all dimensions, some of the cultural and social norms regarding the roles of women in the house and in society in general will have to change. Nevertheless, we can conclude that the women who were able to make independent financial decisions, support the household, cater for their own needs, and make decisions at home would have a higher level of economic empowerment relative to the no loan group (control respondents), who were not yet financially independent from their spouses or other household members.

*Narrative 4: Larger households spend profits and loans on consumption*

The loans were nevertheless important in improving the women's livelihood and the profitability of their businesses. Nevertheless, the size of some households directly affected the ability of the women to reinvest the profits they made in their business. In large households, the increased profits leaked into household consumption rather than serving to increase the women's investments or expand their business. Similarly, in some cases, loans had to be diverted towards assisting with household consumption.

*Narrative 5: Borrowing from family and friends only meets basic needs*

The participants suggested that borrowing from family and friends usually involved low monetary amounts. As a result, such borrowing was not sufficient to support business-related spending and only met basic needs. The reason for borrowing from family and friends, as suggested by both focus groups, was the ease with which money could be secured, with no requirement for documentation or long bureaucratic processes to go through.

This suggested that borrowing from family and friends is no substitute for borrowing from a microfinance institution—especially when the women have access to loans. When access to loans is available, borrowing from family and friends serves to complement borrowing from the microfinance institution. As one participant suggested, even after borrowing from BMC, there were times when sales



were low, causing the women to turn to friends and family to meet basic needs. For the control respondents, borrowing from family and friends tended to be the only and easiest option in the absence of formal loans.

Altogether, the insights from the focus groups suggested that informal borrowing is insufficient for borrowers to meet their business and consumption needs, explaining why many seek to complement informal loans with formal finance. Many of the comments made by the women were consistent with our quantitative results. The small monetary amounts that borrowing from family and friends provides makes a strong case for scaling up micro-lending in poor communities to support business and consumption, particularly as, should all households within the community face the same income or consumption difficulties, borrowing from family and friends might become more difficult.

## 6. Conclusions

### 6.1 Summary

The share of extreme poor and poor BMC clients is 16.4% and 49.8% respectively. Approximately 25% and 55.3% of the control group are extremely poor and poor respectively. The share of poor and extreme poor women in the control group exceed that of the BMC clients. The share of BMC's clients that are extremely poor or poor in each district is above the district average in three out of the five districts where the company operates—namely, Nanumba North, Tamale, and Yendi. Further, BMC's branch in Sawla-Tuna-Kalba is serving the fourth most extremely poor district in the Northern, Savannah, and North East regions.

There is evidence to suggest that access to BMC loans boosts women's economic empowerment. Loans can empower women to take control of their household- and business-spending choices. There is a significant positive difference between the one-loan clients and the control respondents in six out of nine women's economic empowerment dimensions. For the majority of the outcomes with a significant impact, we found a positive effect on the clients with a higher number of loans compared to the clients with a lower number of loans (2 to 3-loan versus 1-loan clients). This implies that BMC clients benefited from an improvement in their economic empowerment outcomes thanks to the loan. For the four or more- and two to three-loan clients, we observed an increase in self-confidence relative to the two to three-loan clients.

Finally, there is evidence that BMC loans can contribute to reducing poverty. The evidence persists even after making various comparisons between the BMC clients and the control respondents. Both the PPI poverty rates and consumption expenditures indicate that the BMC loan helped to reduce poverty. We observed lower PPI poverty rates and higher consumption expenditures, implying a reduction in poverty if beneficiaries are pushed over the poverty line. The reduction was maintained when different definitions of our consumption variable were applied, especially in the four or more-versus the two to three-loan group comparison. We estimated loans increased consumption per capita by up to 32.5% (36.5% for consumption expenditure) and reduced the likelihood of a household being in extreme poverty by 43.3%, or being in poverty by 19.6%.

We are confident that any unobserved differences that remain between the compared groups after the use of the various controls applied were too small to generate significant biases or errors in our ATE estimates. The literature suggest that, in practice, the biases from unobserved errors would be small (among others, Cintina and Love 2017).

### 6.2 Study limitations

The main limitations in our study arose during the fieldwork where we faced several challenges in interviewing the control respondents. In some districts, the residents were unwilling to be interviewed even though they had originally given their consent, or they were not forthcoming with their responses. Furthermore, there commonly were interruptions (such as having to feed an infant, cook for the family, or serve business customers) that led to the duration of the interview being longer than expected; in some cases the interview had to be continued on another day. In contrast, in other districts, the control respondents were more than willing to speak to the enumerators. However, we believe that it was for the wrong reasons. For example, they wanted to state their case because they

probably believed that a new microfinance institution was to be established in the community, or that the government (or an NGO) was about to provide some support for households within the community. Nonetheless, we do not think that the keenness to speak to our enumerators has seriously biased the information collected.

A second limitation is that we were unable to use the information provided by BMC on group characteristics for analysis. The main reason was the difficulty in matching the names of the groups in the master list to the ones in our sample, mainly due to typographical errors in the data entry program as the names were in the local language. We believe that randomly sampling the groups and the women within the groups largely solved the problem in the comparisons among clients. Additionally, in Tamale, we interviewed the universe of current loan recipients. Importantly, it has been shown in the literature that a random sample can lead to an unbiased ATE estimate even if the researcher does not control for the differences in characteristics.

Another limitation is the lack of data over time which makes it difficult to control for unobservable characteristics which may affect the results. However, we believe that our robustness test reduces the impact of this limitation on our results. Finally, a minor limitation was that, since the BMC database only had information on current loan recipients, we could not include information on other clients that were not currently clients of BMC.

A final limitation is that our methodological approach does not account for the rank ordering of the frequency of loans. We assumed that the four categories are mutually exclusive. However, it is possible that if the rank ordering is important, our estimated average treatment effect estimates could be slightly larger than the true effect. From empirical analysis it has been suggested that inference on the average treatment effect based on ordered and multinomial estimators could produce similar results under certain conditions. However, binary and multinomial estimates tend to dominate the empirical treatment effects literature. The propensity score matching with binary treatment variables (in Annexes) for each loan category and the zero loans is one way to determine the robustness of our choice of the multinomial estimator used.

### **6.3 Further research**

There are several lines of future work that could help overcome some of the limitations we faced in our research. If BMC kept information on clients whose loan applications were narrowly rejected, that information could be compared to clients whose loan applications were narrowly accepted. The two groups are likely to be more comparable and would provide a more robust estimate of the ATE.

A further line of inquiry should take into account the definition of the treatment variable—in terms of its ordering and its stochastic nature. Current methods do not adequately account for the nature of our treatment variable. A deeper dive into the econometrics and the treatment effects literature should provide possible estimation candidates to reduce any potential biases that might arise.

### **6.4 What are the lessons for BMC going forward?**

Our study shows that BMC is actively engaged in achieving its mission statement. However, there is still more work to be done in targeting poor clients in East Gonja and Sawla-Tuna-Kalba, in particular.

There is a sense of satisfaction among BMC clients, and it will be beneficial for the company to continue consolidating the gains it has made so far. Finally, in the districts of BMC's operations, a majority of non-clients are unaware of the company. This may be due to other existing microfinance institutions, rural banks, and savings and loans companies engaged in group lending (*bonsali* in the local dialect) in those districts. However, there are potential long-term gains for BMC if non-clients (and thus potential future clients) can differentiate the company's group lending products from those of its competitors.

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## Annex A: Summary Statistics

**Table A1: Respondent Characteristics, by Number of Loans**

	No Loan	1 Loan	2-3 Loans	4+ Loans	Total
Age group	2.314	2.190	2.717	3.003	<b>2.548</b>
Married (= 1)	0.824	0.638	0.761	0.772	<b>0.793</b>
Education (= 1)	0.348	0.586	0.391	0.306	<b>0.351</b>
Household size	2.244	2.500	2.522	2.625	<b>2.396</b>
Income source	1.917	1.983	1.957	1.743	<b>1.867</b>
Religion (Muslim = 1)	0.87	0.81	0.94	0.97	<b>0.90</b>
Household head (= 1)	0.203	0.224	0.217	0.212	<b>0.208</b>
Relation to household head	1.980	1.983	1.935	2	<b>1.984</b>
Food monthly expenditure (percent of total)	38.36	39.58	48.85	39.98	<b>39.47</b>
Observations	952				

**Table A2: Respondents by District and Treatment Group**

District	Control	Treatment	Total
East Mamprusi	75	0	75
Gonja Central	87	0	87
East Gonja	66	70	136
Nanumba North	53	52	105
Yendi Municipal	86	90	176
Tamale Metropolis	174	150	324
Sawla-Tuna-Kalba	0	49	49
<b>Total</b>	<b>541</b>	<b>411</b>	<b>952</b>

**Table A3: Profits for the Self-Employed, by Number of Loans**

	No Loan	1 Loan	2-3 Loans	4+ Loans	Total
Profit in months of high cost/sales	184.3	89.51	470.3	530.7	<b>332.7</b>
Profit in months of low cost/sales	90.58	90.35	280	278.7	<b>178.9</b>
Profit in months of average cost/sales	136.4	106.6	364.1	414.2	<b>259.9</b>
Observations	514				

**Table A4: Loan Frequency among Respondents**

	All		BMC only	
	Count	%	Count	%
No Loan	541	56.83		
1 Loan	58	6.09	58	14.11
2-3 Loans	46	4.83	46	11.19
4+ Loans	307	32.25	307	74.70
Total	952	100.00	411	100.00

**Table A5: Correlations between Consumption Variables and PPI-based Poverty Rates**

	Consumption (log)	Monthly total expenditure	Consumption per capita	Residual of Consumption (log)	PPI Poverty - EPL	PPI Poverty - NPL
Consumption (log)	1					
Monthly total expenditure	0.813***	1				
Consumption per capita	0.679***	0.826***	1			
Residual of Consumption (log)	0.999***	0.814***	0.666***	1		
PPI Poverty – EPL	-0.377***	-0.271***	-0.335***	-0.363***	1	
PPI Poverty – NPL	-0.332***	-0.246***	-0.433***	-0.312***	0.864***	1
Observations	952					

Notes: PPI-EPL is the extreme poverty rate. PPI-NPL is the poverty rate. \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

**Table A6: Summary Statistics, Treatment Variables**

	Count	Mean	Standard Deviation	Min	Max
Treatment (having borrowed before)	952	0.432	0.496	0	1
Frequency of loan (3 categories)	952	0.754	0.912	0	2
Frequency of loan (4 categories)	952	1.125	1.376	0	3
1 Loan vs No Loan	599	0.097	0.296	0	1
2-3 Loans vs 1 Loan	104	0.442	0.499	0	1
4+ vs 2-3 Loans	353	0.870	0.337	0	1
1-3 Loans vs No Loans	645	0.161	0.368	0	1

**Table A7: Loan Number and Income Source**

	No Loan	1 Loan	2-3 Loans	4+ Loans	Total
Other	162	1	3	88	<b>254</b>
Self-employed/employer	262	57	42	210	<b>571</b>
Agricultural production	117	0	1	9	<b>127</b>
Total	541	58	46	307	<b>952</b>

**Table A8: Outcome Variables by Number of Loans**

	No Loan	1 Loan	2-3 Loans	4+ Loans	Total
Residual of Consumption (log)	-0.202	0.341	0.0775	0.280	<b>7.80e-09</b>
Monthly total expenditure (GH¢)	763.0	1034.5	775.5	1078.5	<b>881.9</b>
Consumption per capita (GH¢)	415.2	494.9	346.9	452.4	<b>428.7</b>
PPI Poverty – EPL	25.03	12.50	21.17	16.46	<b>21.31</b>
PPI Poverty – NPL	55.31	42.84	56.60	50.13	<b>52.94</b>
Business practice	1.185	2.017	2.587	2.782	<b>1.818</b>
Decision making in business	4.375	9.103	11.46	10.50	<b>6.982</b>
Agency/decision-making at home	8.695	12.38	11.91	11.26	<b>9.901</b>
Group participation (social capital)	0.824	3.448	2.848	2.837	<b>1.731</b>
Phone and technology	2.146	4.259	4.413	4.218	<b>3.053</b>
Self-confidence (= 1)	0.259	0.276	0.391	0.521	<b>0.351</b>
Personal autonomy	0.680	0.931	0.848	0.850	<b>0.758</b>
Personal time	0.689	0.724	0.674	0.625	<b>0.670</b>
Control over spending (share: 0 to 1)	0.0924	0.466	0.217	0.147	<b>0.139</b>
Ever borrowed f & f	0.333	0.172	0.391	0.218	<b>0.289</b>
Savings (GH¢)	741.50	549.60	247.10	253.70	<b>376.70</b>
Observations	952				

*PPI-EPL is extreme poverty; PPI-NPL is the poverty rate. Ever borrowed f & f: Ever borrowed from family and friends.*

## Annex B: Supplementary Results

Figure B1: Overlap graphs for the treatment

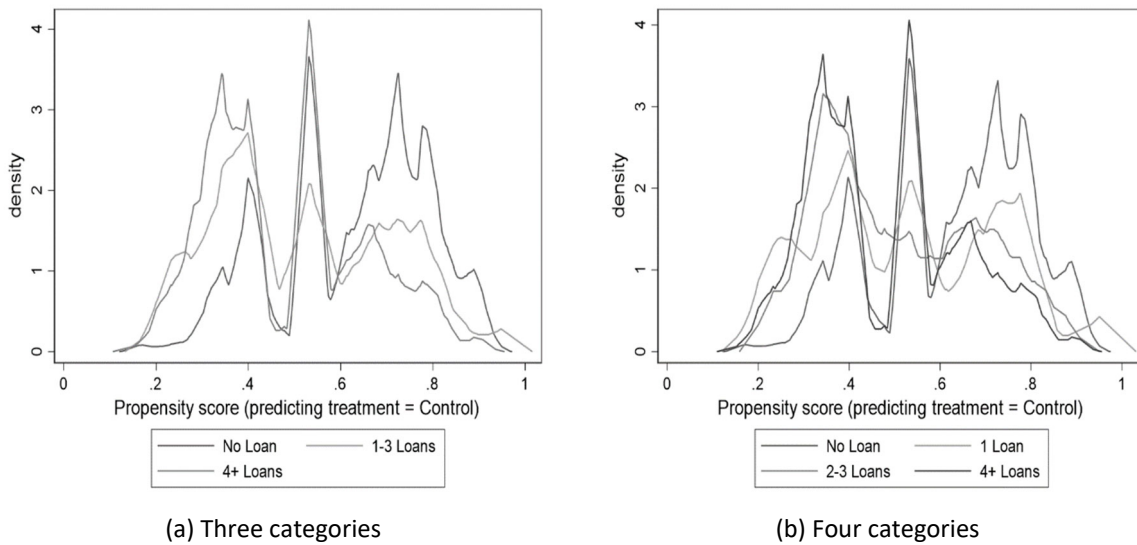
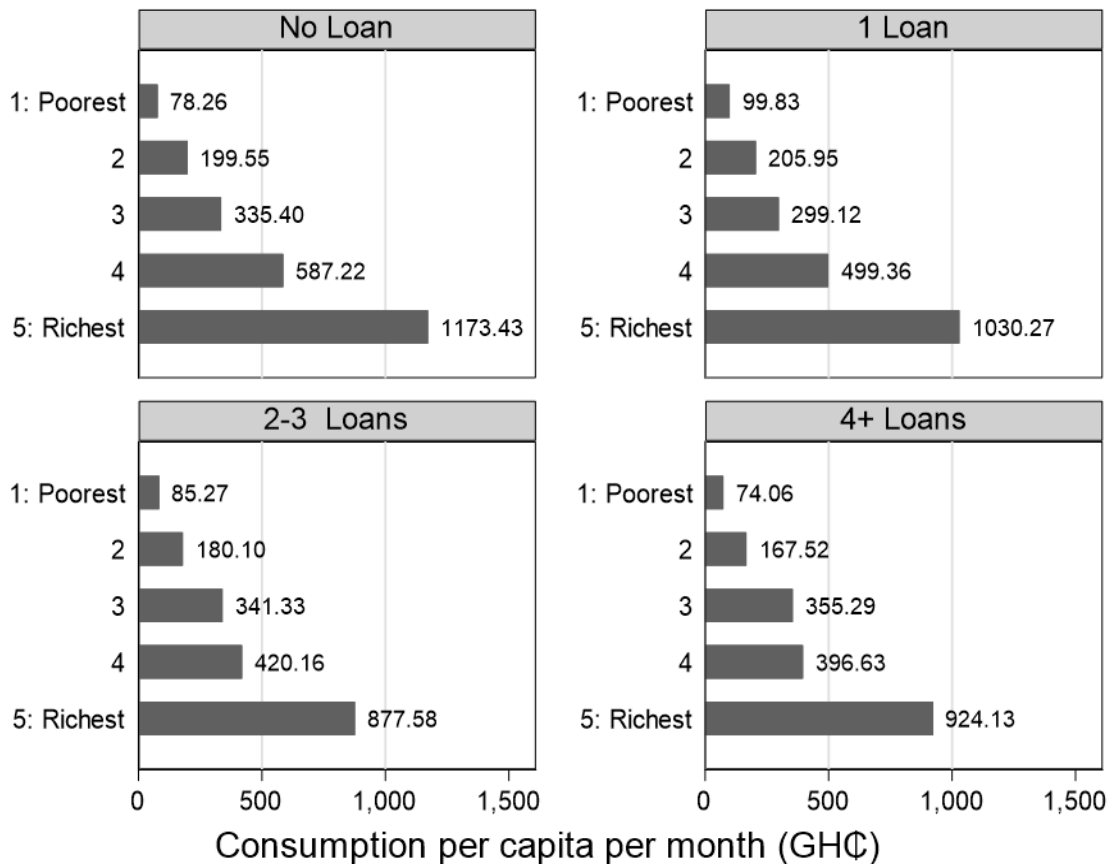


Figure B2: Distribution of Consumption per Capita



Notes: Our consumption per capita is a proxy obtained by dividing consumption expenditure by a dummy for household size. The dummy takes three values 1 (1-4 members); 2 (5-7 members); and 3 (8+ members).

**Table B1: Average Treatment Effect Based on Propensity Score Matching, for the Self-Employed**

	(1) 1 vs No Loan	(2) 2-3 vs 1 Loan	(3) 4+ vs 2-3 Loans	(4) 1-3 vs No Loan
PPI-NPL ATE	-6.370 (-1.10)	11.47 (1.32)	-12.87** (-2.31)	-2.457 (-0.48)
PPI-NPL ATT	3.173 (0.50)	10.53 (0.96)	-14.78** (-2.37)	6.628 (1.14)
PPI-EPL ATE	-7.142** (-2.00)	8.937 (1.35)	-10.05*** (-2.61)	-1.498 (-0.34)
PPI-EPL ATT	-0.155 (-0.03)	6.333 (0.86)	-11.06** (-2.53)	3.765 (0.98)
Consumption ATE	0.444** (2.39)	-0.222 (-0.78)	0.181 (1.17)	0.331** (2.30)
Consumption ATT	0.437 (1.54)	-0.200 (-0.55)	0.209 (1.22)	0.130 (0.51)
N	319	99	252	361

Notes: Bootstrapped standard errors with 200 replications are reported in parentheses. Significance stars based on z-values as reported by the Stata software. Namely, \*  $p < 0.1$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$ . The average treatment effect on the treated (ATT) is also shown. PPI-EPL is the extreme poverty rate. PPI-NPL is the poverty rate. The consumption value is based on the residual obtained after running a regression of consumption on dummies for household size. Results use data from respondents that reported that they were self-employed or an employer. The propensity score is calculated based on the nearest neighbour approach. We used a caliper of 0.01 to 0.001 to select neighbours within that distance of the propensity score of the control. In the cells where we show significant values, the estimate was not sensitive to changing the caliper score between the range provided in the preceding sentence.

**Table B2: Determinants of Treatment Status (Multinomial Logit)**

	No Loan	1 Loan	2 – 3 Loans	4+ Loans
18-30 years	Base category for age group			
31-40 years	0.700 (0.239)		1.137 (0.462)	1.856 (0.891)
41-50 years	0.459* (0.210)		1.794 (1.349)	2.033 (1.371)
51-60 years	0.815 (0.486)		2.573 (2.629)	5.069** (3.867)
Above 60 years	1.721 (1.283)		4.514 (6.293)	9.799*** (4.287)
Married (= 1)	2.842** (1.259)		1.924 (0.863)	2.165** (0.843)
Education (= 1)	0.268*** (0.120)		0.647 (0.418)	0.532 (0.243)
One to four	Base category for household size			
Five to Seven	0.682 (0.511)		0.888 (0.903)	0.799 (0.552)
Eight or more	0.239 (0.237)		0.744 (0.747)	0.897 (0.625)
Other	Base category for religion			
Muslim	1.352 (0.485)		3.030 (2.271)	6.420*** (3.847)
Other	Base category for household head			
Household head	1.103 (0.236)		1.065 (0.311)	1.050 (0.375)
Observations	952	952	952	952
Pseudo R <sup>2</sup>	0.095	0.095	0.095	0.095

Notes: Exponentiated coefficients (odds ratios) are reported. Standard errors based on clustering by district are reported in parentheses. One loan is the reference category in the multinomial logit. Thus, the odds ratios reported in the three other cells are relative to the one-loan category. The base category for education is “no education” and for married is “other”. Standard errors in parentheses. \* $p < 0.1$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$ .

**Table B3: Determinants of Treatment Status (Propensity Score Regressions)**

	<b>1 Loan vs No Loan</b>	<b>2-3 Loans vs 1 Loan</b>	<b>4+ vs 2-3 Loans</b>	<b>1-3 Loans vs No Loan</b>
18-30 years	Base category for age group			
31-40 years	1.588 (0.572)	0.525 (0.279)	1.919 (0.989)	1.564 (0.470)
41-50 years	3.335** (1.646)	0.647 (0.689)	1.392 (0.684)	3.071** (1.490)
51-60 years	2.468* (1.332)	1.279 (1.858)	2.212 (1.431)	2.472* (1.194)
Above 60 years	0.580 (0.424)	5.662 (6.009)	2.883 (4.238)	1.431 (1.465)
No education/other	Base category for education			
Primary, secondary or tertiary	4.108*** (1.774)	0.564 (0.349)	0.759 (0.262)	3.642*** (0.772)
One to four	Base category for household size			
Five to Seven	0.470 (0.497)	2.105 (3.624)	1.612 (1.025)	1.214 (0.570)
Eight or more	2.814 (3.185)	2.202 (2.764)	0.432** (0.151)	1.721 (1.177)
Single, divorced, or widowed	Base category for married			
Married	0.0930* (0.127)	26.57*** (29.28)	0.558 (0.533)	0.468*** (0.115)
One to four x Single, divorced, or widowed	Base category for interaction between 1 – 4 members and married			N/A
One to four x Married	Base category for the interaction between 1 – 4 members and married and the remaining household size/married interactions			N/A
Five to seven x Single, divorced or widowed	Base category for the interaction between 5 – 7 members and married			N/A
Five to seven x Married	18.29** (24.95)	0.0957 (0.160)	1.029 (0.818)	N/A
Eight or more x Single, divorced or widowed	Base category for 8+ members and married			N/A
Eight or more x Married	2.915 (3.628)	0.0478** (0.0690)	5.613** (4.909)	N/A
Other	Base category for religion			
Muslim	0.605* (0.174)	5.115*** (1.969)	1.780* (0.610)	0.752 (0.258)
Household head	Base category for relationship with head			
Spouse (wife)	2.956***	0.464	0.869	1.592



	(0.694)	(0.295)	(0.567)	(0.690)
Other	2.148** (0.757)	0.176 (0.214)	1.986 (1.489)	1.017 (0.585)
Rented	Base category for status of accommodation ownership			
Owner	0.497 (0.377)	1.845 (1.203)	1.773* (0.581)	N/A
Family house	0.217*** (0.114)	1.561 (1.539)	1.981 (1.182)	N/A
Other (specify)	0.0592*** (0.0642)	28.86* (54.35)	0.566 (0.548)	N/A
Observations	319	99	252	361
Pseudo R <sup>2</sup>	0.169	0.191	0.076	0.082

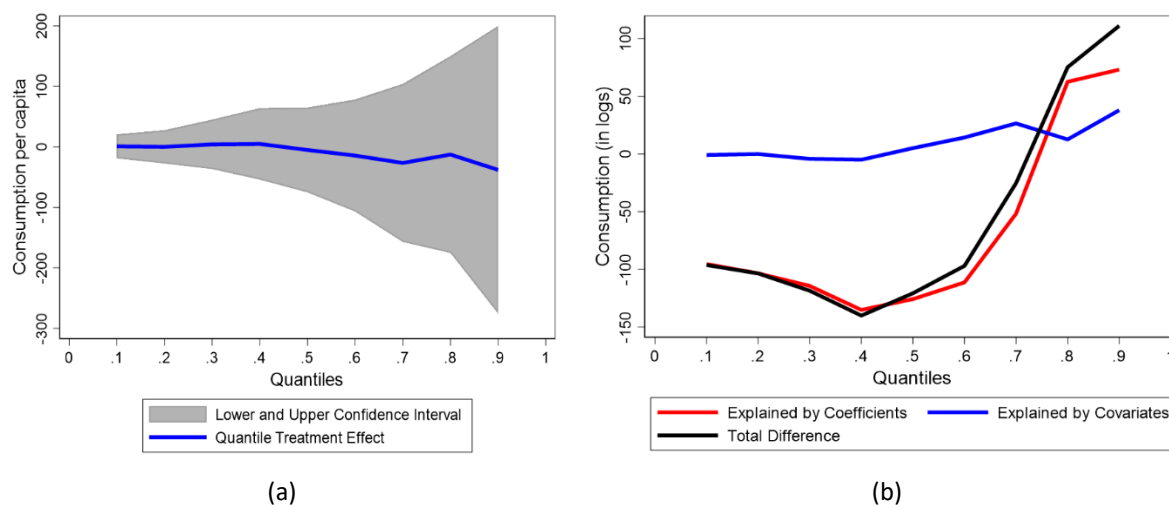
Notes: Binary logit regressions are estimated and exponentiated coefficients (odds ratios) are shown. Standard errors based on clustering by district are reported in parentheses. Due to varying observations and the variables perfectly predicting success (i.e. an individual receives treatment), we could not use the same set of variables for all four regressions as the algorithm could estimate the regressions. n/a (not applicable) indicates that the variable was not included. \* $p < 0.1$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$ .

**Table B4: Impact on Poverty (Consumption), Average Treatment Effect**

	(1) 1 vs No Loan	(2) 2-3 vs 1 Loan	(3) 4+ vs 2-3 Loans	(4) 1-3 vs No Loan
ATE	0.407* (0.168)			
ATE		-0.202 (0.138)		
ATE			0.227* (0.177)	
ATE				0.394* (0.189)
Observations	598	104	353	644

Notes: z-values are shown in parentheses. Standard errors clustered by district are reported in parentheses. Each column is a separate inverse probability weighted-regression adjustment (IPW-RA) estimation based on a binary treatment variable. The first category in the column heading takes the value 1 and the second category takes the value zero. ATE is the average treatment effect. A positive ATE indicates an increase in the outcome variable (log of adjusted consumption in this case). \* $p < 0.1$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$ .

**Figure B3: Quantile Treatment Effect (1 Loan versus No Loan) for Per Capita Consumption**



Notes: Estimation of the counterfactual difference between the two groups (1 loan and no loan) (a). The 95% confidence interval encompasses zero, hence the two distributions are similar and there is no significant difference between the two groups. Total difference between the two distributions, decomposed into the effects from covariate differences and coefficient differences (b). The difference is affected by both covariate and coefficient differences. The coefficient and covariate differences are larger in magnitude at the lower quantiles and at the top decile. The graphs are included to show that the mean effects are adequate in estimating the ATEs. Also, the impact across the distribution is not heterogeneous.

**Table B5: Impact on Poverty (Consumption per Capita and Poverty), Average Treatment Effect Among the Self-Employed**

	(1) Consumption (all)	(2) Consumption (self-employed)	(3) Poverty (self-employed)	(4) Extreme Poverty (self-employed)
1 vs No Loan	42.81 (0.59)	36.36 (0.67)	-5.67 (-0.79)	-7.85 (-1.14)
2-3 vs 1 Loan	-37.82 (-0.60)	-58.25 (-1.03)	9.92* (1.81)	8.48** (2.38)
4+ vs 2-3 Loans	128.45*** (3.44)	62.96 (1.34)	-9.47** (-2.32)	-7.29*** (-3.06)
Observations	952	571	571	571

Notes: The contrasts from an inverse probability weighted-regression adjustment (IPW-RA) based on a multinomial logit treatment regression are shown. z-values are indicated in parentheses based on standard errors clustered by district. The first column is based on the full sample (N = 952). The second to fourth columns are based on only the self-employed sample (N = 571). ATE is the average treatment effect. The consumption value is divided by the dummy for household size, which has three values (1: 1-4 members; 2: 5-7 members; and 3: 8+ members). While this is not a good measure of per capita consumption, it is representative enough. A positive ATE for per capita consumption indicates a reduction in the poverty level, while a negative ATE for poverty implies a reduction in poverty. \* p < 0.1; \*\* p < 0.05; \*\*\* p < 0.01.

**Table B6: Average Treatment Effect Based on Propensity Score Matching (all Employment Categories)**

	(1) 1 vs No Loan	(2) 2-3 vs 1 Loan	(3) 4+ vs 2-3 Loans	(4) 1-3 vs No Loan
PPI-NPL ATE	-14.93*** (-2.70)	21.33*** (2.74)	-4.402 (-0.87)	-11.35** (-2.15)
PPI-NPL ATT	-4.952 (-0.84)	27.45*** (2.74)	-3.627 (-0.64)	4.017 (0.81)
PPI-EPL ATE	-11.96*** (-3.84)	10.68* (1.78)	-3.619 (-0.93)	-8.712*** (-2.66)
PPI-EPL ATT	-3.805 (-0.84)	11.37* (1.69)	-3.119 (-0.70)	1.347 (0.35)
Consumption (residual, log) ATE	0.431*** (3.11)	-0.290 (-1.17)	0.193 (1.26)	0.435*** (3.46)
Consumption (residual, log) ATT	0.495* (1.90)	-0.425 (-1.37)	0.213 (1.27)	0.586*** (2.63)
Consumption per capita ATE	47.35 (0.64)	-296.6* (-1.79)	116.6* (1.90)	68.52 (0.84)
Consumption per capita ATT	41.49 (0.31)	-402.7* (-1.93)	115.9* (1.86)	130.1 (1.44)
Observation	597	104	353	645

Notes: Z values are calculated based on standard errors clustered by district and indicated in parentheses. The average treatment effect on the treated is shown. Two consumption values are used. Rows 5 to 8 are based on the residual obtained after running a regression of consumption on dummies for household size. The last four rows are based on dividing consumption by the categorical variable for household size, which has three values (1: 1-4 members; 2: 5-7 members; and 3: 8+ members). The numbers of observations are N = 596 and N = 644 in columns (1) and (4) in the case of the log of residual consumption. \* p < 0.1; \*\* p < 0.05; \*\*\* p < 0.01.

## Note on sample size

Using the United Nations Framework Convention on Climate Change’s (UNFCCC) formula for stratified designs, we calculated that our total sample should be between 900 and 985 respondents, to be split between the treated and control respondents—based on different assumptions. Using the population of adult women in each district, we obtained proportional samples for each district. Assumptions for our sample were based on the mean poverty status, standard deviation, and female adult population, which were all calculated using the Ghana Living Standards Survey round seven (GLSS7) database. A precision of 5% and a 90%-95% confidence level were used.

We also confirmed the desired number of BMC clients with the PPI sample calculator. The PPI sample calculator estimated a sample of 378 women based on a client base of 22,000, using a 95% confidence level and a 5% margin of error. Thus, an estimated sample PPI poverty rate of 49.8% would lie between 44.8% and 54.8% (with a 95% level of confidence) of the poverty rate for all clients. We expected a 70% to 80% response rate. However, our final sample was within the required range. We also oversampled our BMC clients, so our sample had more clients than those suggested by the PPI sample calculator in order to increase confidence in our estimates.

Data were collected over 25 days spanning the months of June and July 2019. We carried out 1005 interviews, with 413 BMC clients (the 'treatment' group) and 592 respondents who had never borrowed from a formal institution, including two districts with no BMC branch (the 'control' group). After processing the data, we had to eliminate 53 cases from our sample, mainly due to (a) our inability to verify whether an actual interview took place; (b) the absence of GPS recordings; or (c) the interview duration was less than 6 minutes. Also, one respondent was 17 years of age, a year younger than the minimum selection age of 18 years (this was before we included a rule in the data capture program to alert the enumerator). There were 29 cases in which the control clients had previously borrowed a loan, resulting in discontinuation of the interview. Among these 29 interviewees, only one was a former BMC client.

Our final sample consisted of 411 Baobab clients and 541 control respondents, representing a total of 952 respondents, as shown in Table A8.

## Estimating the Average Treatment Effect Approach<sup>98</sup>

The literature proposes three measures of the impact of a treatment, namely (a) the average treatment effect (ATE); (b) the average treatment effect on the treated (ATET); and (c) the average treatment effect on the non-treated (ATENT).

The average treatment effect is the difference in mean outcomes between the treated and the control units assuming random assignment to treatment. Thus, the ATE can be formulated as follows:

$$ATE = E(Y_1 - Y_0) = E(Y_1) - E(Y_0)$$

Where  $(Y_1, Y_0)$  are our potential outcomes, E is our expectations operator.

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<sup>98</sup> Our methodology largely draws on Cerulli (2015) and Guo and Fraser (2010).

The ATET and ATENT are linked to the ATE—the ATE is a weighted average of the two measures (Equation 1).

$$ATET = E(Y_1 - Y_0 | D = 1)$$

$$ATENT = E(Y_1 - Y_0 | D = 0)$$

$$(1) ATE = ATET \times p(D = 1) + ATENT \times p(D = 0)$$

Where  $D$  is the binary treatment indicator (in our case, receiving the loan). The ATET is calculated for the treated subsample (that is, those with  $D = 1$ ) while the ATENT is based on the control subsample ( $D = 0$ ).

Each of the three measures yields an estimate that is reliable in the absence of observable or unobservable differences across the two groups of comparison.

If we suppose that treatment is non-random, and the non-randomness is due to observable characteristics of the units, then we can condition our estimates on these observable characteristics (known as selection on observables).

$$ATE(x) = E(Y_1 - Y_0 | x)$$

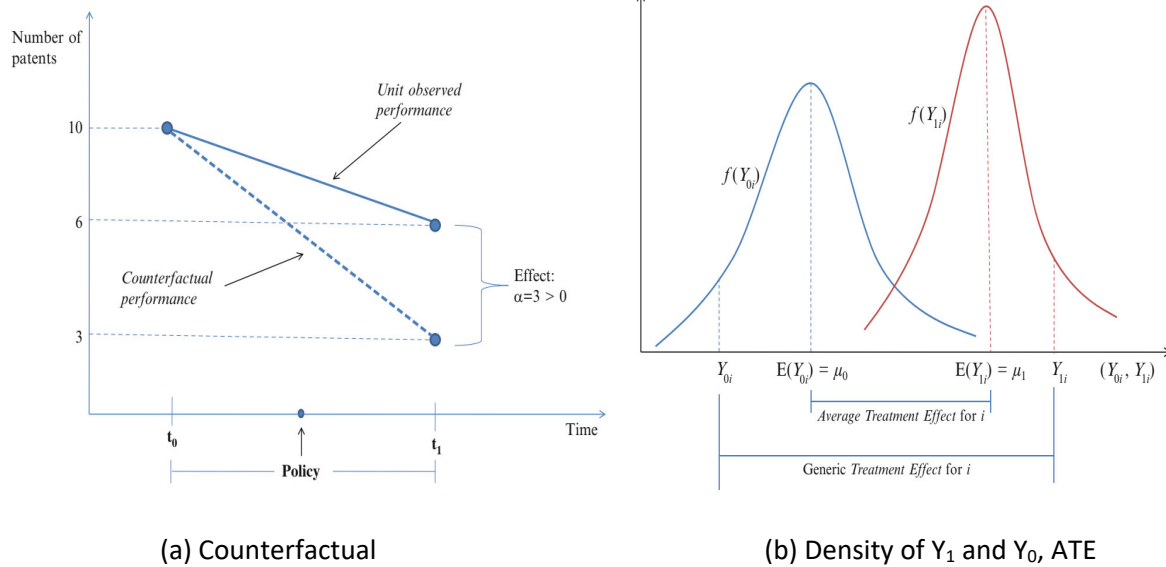
$$ATET(x) = E(Y_1 - Y_0 | D = 1, x)$$

$$ATENT(x) = E(Y_1 - Y_0 | D = 0, x)$$

Where  $x$  is the vector of pre-treatment exogenous covariates.

Figure B4 shows that since we did not observe what the outcome would be for the treated in the absence of the treatment, we used the outcome for the control as the counterfactual to represent the treatment effect. Panel (b) shows the density of the outcomes for the treated and the control units. The difference in their mean outcomes represents the ATE.

**Figure B4: Applying the Counterfactual Approach**



Source: Cerulli, (2015: Figures 1.1 and 1.2.)

**Selection based on observables**

If we assume that there is selection based on observable characteristics, then we can consider the potential outcome means (POMs) as follows:

$$(2) \quad E(Y|x, D) = E(Y_0|x, D) + D[E(Y_1|x, D) - E(Y_0|x, D)] \\ = E(Y_0|x) + D[E(Y_1|x) - E(Y_0|x)]$$

If  $D = 1$  or  $D = 0$  in Equation (2), then we obtain the following results

$$(3) \text{ if } D = 1: E(Y|x, D = 1) = E(Y_1|x)$$

$$(4) \text{ if } D = 0: E(Y|x, D = 0) = E(Y_0|x)$$

The difference between Equations (3) and (4) gives us:

$$E(Y|x, D = 1) - E(Y|x, D = 0) = E(Y_1|x) - E(Y_0|x) = ATE(x)$$

In this case, the  $ATE(x)$  estimate is identified and controlling for observable characteristics has eliminated the bias.

**Selection based on unobservables**

If we suppose that selection into treatment is due to characteristics that are unobservable, then the conditional mean independence assumption (CIA) is violated. Thus,

$$E(Y_1|x, D) \neq E(Y_1|x)$$

$$E(Y_0|x, D) \neq E(Y_0|x)$$

So,

$$\begin{aligned}
 E(Y|x, D = 1) - E(Y|x, D = 0) &= E(Y_1|x, D = 1) - E(Y_0|x, D = 0) \\
 &+ [E(Y_0|x, D = 1) - E(Y_0|x, D = 1)] \\
 &= [E(Y_0|x, D = 1) = E(Y_0|x, D = 0)] + ATET(x)
 \end{aligned}$$

Hence, a bias in the estimated effect of the treatment on the outcome exists due to the unobservable effects, even after controlling for the observed characteristics. One way to address this bias is to estimate the ATE by the instrumental variable approach.

We now provide a background for the four estimators mentioned above that are applicable in the presence of selection on observables.

### Regression Adjustment (RA)

The RA approach works well when the conditional independence assumption (CIA) holds. That is:

$$(Y_1, Y_0) \perp D | x$$

The symbol  $\perp$  represents the probabilistic independence. The conditional independence implies that:

$$E(Y_1|x, D) = E(Y_1|x)$$

$$E(Y_0|x, D) = E(Y_0|x)$$

The counterfactuals are given by the following observed quantities on the right hand side (RHS) of the above equations.

$$E(Y_0|x, D = 1) = E(Y_0|x, D = 0)$$

$$E(Y_1|x, D = 0) = E(Y_1|x, D = 1)$$

Thus, the ATE is given by:

$$ATE(x) = E(Y|x, D = 1) - E(Y|x, D = 0)$$

### Propensity Score Matching

The overlap assumption (common support) requires that the propensity score lies between 0 and 1 for each unit. That is,

$$p(D = 1|x) = \text{propensity score}$$

$$0 < p(D_i = 1|x_i) < 1$$

In the presence of a weak overlap, the estimation of the ATE is affected (where there are certain specific values of the 'x' variable associated with either the treated or the control units but neither of the two units) (Cerulli 2015). In other words, it might mean that comparing individuals in different

groups (with a large difference in propensity scores) leads to imprecise estimates of the ATE (Cerulli 2015).

The propensity score can be estimated via a logit or probit regression. The nearest neighbour matching or other matching techniques can be applied to the propensity score. The advantage of the propensity score matching approach is that it allows for continuous variables and is not affected by matching on several variables. The approach allows us to find a control individual within ‘ $\delta$ ’ units of the propensity score of the treated unit. The two individuals are considered to be matched and similar given their characteristics. The difference in the outcomes provides an estimate of the impact of the treatment.

### Reweighting—inverse probability weighting (IPW)

In the IPW approach, we estimate the propensity score and use it as weights for calculating the ATE.

$$ATE = E \left[ \frac{DY}{p(x)} \right] - E \left[ \frac{(1-D)Y}{(1-p(x))} \right]$$

and the sample version is:

$$\widehat{ATE} = \frac{1}{N} \sum_{i=1}^N \frac{D_i Y_i}{p(x_i)} - \sum_{i=1}^N \frac{(1-D_i) Y_i}{1-p(x_i)}$$

The IPW provides an alternative estimation in the presence of selection on observables. The weights allow a rebalancing in the distribution of covariates (Cerulli 2015).

### Doubly Robust Estimators

Cerulli (2015) notes that the combination of different methods can lead to a more robust estimate of the ATE. In this study, our approach combines the IPW with the RA approach. Since either the conditional mean or the propensity score is required to be specified correctly, it yields a more robust estimate of the ATE in the case of selection on observables.

After estimating the propensity score, we applied the weights of the inverse probability score in a weighted least squares regression to obtain:

$$\min_{a_1, b_1} \sum_{i=1}^N D_i (y_i - a_1 - b_1 x_i)^2 / \widehat{p(x_i)}$$

$$\min_{a_0, b_0} \sum_{i=1}^N (1 - D_i) (y_i - a_0 - b_0 x_i)^2 / (1 - \widehat{p(x_i)})$$

After obtaining the parameters we applied the RA approach to estimate the ATE.

$$\widehat{ATE} = \frac{1}{N} \sum_{i=1}^N [(\widehat{a}_1 - \widehat{b}_1 x_i) - (\widehat{a}_0 - \widehat{b}_0 x_i)] \quad (5)$$



## Women’s Economic Empowerment Outcomes

Altogether, we considered nine outcomes measuring women’s economic empowerment based on different sections of the survey questionnaire presented in Annex C.

(1) Business Practice (BP), based on section F(I) of the questionnaire. All responses were recoded as 0 or 1, with ‘yes’ equal to 1. The outcome was calculated as the sum of responses and ranged from 0 for respondents answering ‘no’ to all six questions to the maximum score of 6 for respondents answering ‘yes’ to all six questions.

(2) Decision-making role in business (DMB), section F(II). Each individual was assigned a score of 2 if the answers to Question 1 was ‘yes’ and to Question 2 was ‘no’. The score was 1 if the answer to the two questions were ‘yes’, and the score was 0 if either Question 1 ‘did not apply’ or the answer to Question 2 was ‘no’. The final score was based on the sum of the generated scores. Higher values indicate a stronger decision-making role in the business for the respondent.

(3) Use of phone and technology in business (MOB), section F(III). Respondents that answered ‘no’ to Question (3a) were given a score of 0. The score of the outcome was generated by summing the ‘phone for business calls’ and ‘phone for mobile money transactions’ recorded values. A high score indicates that the respondent uses the mobile phone very often. It gives a rough approximation of technology use, given that the women are engaged in businesses that require relatively simple tools for business operations.

(4) Agency/decision-making at home (Agency), based on section F(IV). The responses were recoded as 0 or 1 and summed across all questions. The exception was Question 6 (in section iv of the questionnaire below), where either ‘owning the item alone or jointly with someone else’ was coded as 1. Also, if the asset could be sold by the respondent without seeking anyone else’s permission, the value 1 was assigned. All other values were recoded as 0. The sum of all scores provided the outcome, with higher values denoting strong agency at home.

(5) Self-confidence (Self-Conf), section F(V). Based on the statements provided in Questions (5a), (5b), and (5d), we recoded ‘partly agree’ and ‘strongly agree’ to 1. Question (5c) had the responses ‘strongly disagree’ and ‘partly disagree’ recoded to 1. The sum of responses was obtained and values larger than 4 were taken to represent self-confidence and as such recoded to 1. Values lower than 4 were recoded to 0 to signify a lack of self-confidence.

(6) Personal autonomy (Auto), section F(VII). The outcome was created based on recoding a subset of responses given in Question 1 as ‘one’, ‘three’, ‘five’, and ‘six’ to 1 and all other responses to 0. If both the scores on Questions (1a) and (1b) equalled 1, then the outcome was assigned a value of 1; if either (1a) or (1b) equalled 1, the value of 1 was assigned. All other combinations were recoded as zero. The binary variable indicated whether the respondent has personal autonomy or not.

(7) Social capital/group participation (Soc Cap), F(VIII). The score is based on counting the number of ‘yes’ responses. Higher values of the outcome indicate that the respondent is involved in several groups and participates actively in the community. This is linked to social capital in the sense that by participating actively and having a large network, the respondent has a higher level of social capital. Lower values of the outcome denote a lower level of social capital.

(8) Time allocation and workload (Time), section F(IX). The outcome variable is recoded as 1 if the answer to Question 2 is 1 for each of the items listed, and as 0 otherwise. The outcome captures the respondent's time spent on activities at home and at work. A response of 1 indicates a relatively higher workload and amount of time spent.

(9) Share of expenditure (Share), based on a self-reported assessment of spending by the respondent. The respondents were asked 'how much do you contribute to household spending? 1. None; 2. Less than 50%; and 3. 50% or more'. The answers were recoded to 0 if less than 50% and to 1 if 50% or more.

## Annex C: Client satisfaction and non-client awareness of BMC

**Table C1: BMC (Baobab) Client Satisfaction**

Are you satisfied with the ...	Satisfied	Neither	Dissatisfied
loan processing time of BMC?	88.08%	6.57%	5.35%
length of credit repayment from Baobab?	72.99%	9%	19%
products offered to you?	88.56%	4.87%	6.57%
behaviour of Baobab microfinance's agents?	97.81%	1.7%	0.49%
Statements	Agree	Neutral	Disagree
Interest rate charged on loan is very high	42.09%	25.79%	32.12%
Interest rate on savings is very low	26.03%	55.47%	18.49%
Baobab's branch locations are convenient	80.29%	10.71%	9%
Baobab provides sufficient financial education	84.91%	13.14%	1.95%

**Table C2: Awareness of Baobab among Non-Clients**

N = 541	Yes	No
Have you heard of Baobab microfinance?	30.13%	69.87%
<i>East Mamprusi</i>	30.67%	69.33%
<i>Gonja Central</i>	21.84%	78.16%
<i>East Gonja</i>	21.21%	78.79%
<i>Nanumba North</i>	11.32%	88.68%
<i>Yendi Municipal</i>	18.6%	81.4%
<i>Tamale Metropolis</i>	48.85%	51.15%
If yes, where did you hear of Baobab; (N=163)	(%)	
Advert on radio/TV	79.14%	n/a
Advert in the daily newspapers	1.23%	n/a
Banner of Baobab in town	6.13%	n/a
Other (specify)	13.5%	n/a

## Annex D: Questionnaire Excerpts<sup>99</sup>

### Part F: Empowerment

*Enumerator: Sections I-II should be asked to those who answered that they own a business. Write answer to **Part C.Q1e** here, \_\_\_\_\_. If **2** or **3** then continue if **1** skip to section III.*

#### I. Adoption of business practices

Please respond to the following questions

Question	Response Yes...1, No.....2
a. Do you keep records of your business, including sales, expenses, and inventory?	
b. Do you keep your business and household finances separated?	
c. Does your business have an updated business plan?	
d. Have you ever applied for a loan from a bank or other formal financial institution for your business?	
e. Do you invest in your business?	
f. Do you advertise at least once in 6 months? (this includes formal and informal sources)	

#### II. Decision-making role in own business

I am going to list some typical tasks you have to perform in your business. Please tell me if these tasks are under your sole responsibility, that of another person, or shared?

Task description	Q1. Are you involved in this task? 1 = Yes 2 = No >> Next Task 97 – Does not apply to this business	Q2. Is anyone else involved in this task? 1 = Yes 2 = No
a. Deciding which products or services to make or sell		
b. Procurement of inputs or goods		
c. Deciding whether to invest in the business (a machine, large tool, adding more stock to sell)		
d. Deciding whether to take out a loan to invest in the business		
e. Negotiating with suppliers		
f. Setting the prices of goods or negotiating with buyers/middlemen		

<sup>99</sup> We present an extract of our questionnaire due to space considerations. The full questionnaire is available from the authors upon request. Similarly, the focus group discussion script is also available upon request.

g. Selling goods to customers		
h. Dealing with officials (banks, market, government)		

### III. Women's use of phones or technology

Question		Response
a. Do you personally own or have regular access to a mobile phone	<ol style="list-style-type: none"> <li>1. Yes</li> <li>2. No &gt;&gt;IV</li> </ol>	
b. How often do you use your mobile phone for business calls or income generating activity?	<ol style="list-style-type: none"> <li>0. Never</li> <li>1. Seldom (e.g., once per month)</li> <li>2. Sometimes (e.g., once per week)</li> <li>3. Often (e.g., every day)</li> <li>4. Very often (e.g., several times per day)</li> </ol>	
c. How often do you use your mobile phone for business related mobile money transactions?	<ol style="list-style-type: none"> <li>0. Never</li> <li>1. Seldom (e.g., once per month)</li> <li>2. Sometimes (e.g., once per week)</li> <li>3. Often (e.g., every day)</li> <li>4. Very often (e.g., several times per day)</li> </ol>	

### IV. Agency/Decision-making at home

Please respond to the following questions.

Question	i. Response	ii. If decisions are NOT normally solely or jointly made by the respondent herself: To what extent do you think you can influence the person who makes the decisions to change their decision?
	<ul style="list-style-type: none"> <li>• Respondent (skip to next question) = 1</li> <li>• Husband/partner = 2</li> <li>• Respondent and husband/partner jointly (skip to next question) = 3</li> <li>• Someone else = 4</li> <li>• Respondent and someone else jointly (skip to next question) = 5</li> <li>• Decision not made/not applicable (skip to next question) = 6</li> </ul>	<b>1 = Not at all</b> <b>2 = To some extent</b> <b>3 = To a large extent</b> <b>9 = N/A</b>
<b>Q1. Who in your family usually has the final say on whether or not you should work to earn money?</b>		
<b>Q2. Who normally makes most of the decisions about the following:</b>		
a. What food to buy and consume?		
b. Purchase of furniture, large cooking utensils (e.g. large saucepan) and other household items?		
c. How to spend the money made from [other income-generating activity]		

where the woman is mainly contributing]?		
d. Whether the household should take out a small loan, from what source, and how much to borrow?		
<b>Q3. Who in your family usually has the final say on the following decisions concerning your child(ren):</b>		
a. Any decisions about children's schooling?		
b. What to do if a child falls sick?		
c. How children should be disciplined?		
d. Whether to have another child?		

<b>Q4. Do you and your husband/partner talk about the following with each other often, sometimes or never</b>	<b>Response:</b> 1. Often 2. Seldom 3. Never
a. Things that happen at this work/on the farm?	
b. Things that happen at home?	
c. What to spend money on?	
d. Things that happen in the community?	

<b>Q5.i. Do you control the money needed to buy the following things?</b>	<b>Response:</b> 1. Yes 2. No 3. Does not buy
a. Vegetables or fruits?	
b. Clothes for yourself?	
c. Any kind of medicine for yourself?	
d. Toiletries for yourself (t-roll, bathing soap, toothpaste, etc.)	
<b>Q5.ii. Do you have full control of your own earnings?</b>	1. Yes 2. No 3. Does not apply
<b>Q5.iii. If yes, do you give part or all of your earnings to the household head (or husband)?</b>	1. Yes, give part 2. Yes, give full 3. No

<p>Now I would like to ask you some questions about financial matters. I ask these questions only to understand more about the financial position of women.</p> <p>6. Please tell me if you alone, or jointly with your husband or someone else own</p>	<p><i>Response to Q6</i></p> <ol style="list-style-type: none"> <li>1. Alone</li> <li>2. Jointly with husband</li> <li>3. Jointly with someone else</li> <li>4. Owned by another household member</li> <li>5. Household does not own [item] (skip to next item)</li> </ol>	<p>Q7. If you ever need to, can you sell (ASSET) without anyone else's permission?</p> <ol style="list-style-type: none"> <li>1. Yes</li> <li>2. No</li> <li>3. Don't know</li> </ol>
a. Land?		
b. The house/dwelling you live in?		
c. Any other house, apartment or dwelling?		
d. Jewellery or gems?		
e. Poultry (guinea fowl, chicken, etc.) or livestock (such as cow, goat, sheep, etc.)?		
f. Motorbike?		
g. Bicycle?		
h. Car?		

## V. Self-confidence

1. To what extent do you agree or disagree with the following statements?	1= Strongly disagree	2 = Partly disagree
a. I feel that I'm a person of worth, at least on an equal plane with others		
b. I feel that I have a number of good qualities		
c. I feel I do not have much to be proud of		
d. I am equal to my peers (e.g. sisters, friends, colleagues, etc.)		

**VII. Personal autonomy**

1. In your household, who normally makes most of the decisions about the activities listed below?	<p><b>Responses to 1.</b></p> <p>1= Respondent herself (skip to next item)</p> <p>2 = Husband</p> <p>3 = Respondent and husband jointly (skip to next item)</p> <p>4 = Another household member</p> <p>5 = Respondent and another household member jointly (skip to next item)</p> <p>6 = Someone outside the household</p> <p>0 = Household is not involved in this activity (skip to next item)</p>	2. If decisions are NOT normally solely or jointly made by the respondent herself: To what extent do you think you could influence the person who makes the decision to change their decision?
a. Can you personally travel to visit relatives outside the community?		<p>1 = Not at all</p> <p>2 = To some extent</p> <p>3 = To a large extent</p> <p>9 = N/A</p>
b. Can you personally participate in community groups, activities or meetings taking place in your community?		

**VIII. Group participation and degrees of influence in community groups**

1. Do you regularly attend meetings of this group?	<p><b>Response to 1</b></p> <p>1 = Yes</p> <p>0 = No</p> <p>9=N/A</p>	2. If yes: To what extent are you involved in making important decisions in the group?
a. Women's association		<p>1 = Not at all</p> <p>2 = To a small extent</p> <p>3 = To a medium extent</p> <p>4 = To a large extent</p> <p>9 = N/A</p>
b. Credit or microfinance group (including Baobab)		
c. Mutual/self-help group		
d. Civic group (improving the community)		
e. Religious group		



**IX. Time allocation**

Activities carried out	1. How many hours did you spend doing this activity?	2. If hours > 0: While doing this, were you also responsible for the care of children, or other adult household members, at the same time?  1 = Yes 0 = No	<b>Enumerators: ask this only to Baobab clients</b>	
			3. Has the amount of time that you spend on this activity increased or decreased since joining Baobab? 1 = Increased 2 = Stayed the same 3 = Decreased 9 = Not involved in this activity from the time joining Baobab until now	4. Has the amount of time that the husband in the household spends on this activity increased or decreased since joining Baobab? 1 = Increased 2 = Stayed the same 3 = Decreased 9 = Not involved in this activity since the time of joining Baobab until now 0= No husband in the household
a. Responsible for the care of children, elderly people or other household members				
b. Household chores				
c. Farming activities				
d. Leisure (e.g. socializing with neighbours)				
e. Sleeping at night				



# The Impact of Customer Relationship Management Software on Firm Performance in Kenya

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**Keywords:** Customer relationship management (CRM), customer experience, firm performance, instrumental variables, mobile CRM, web-based CRM

**JEL codes:** O12, O14, M219

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## Summary

### Research focus

With more than 500 million mobile phone subscribers in Africa, mobile phones now provide a cheaper and quicker way for businesses to communicate with customers through mobile customer relationship management (mCRM) systems.

Founded in 2015 and based in Kenya, Ajua provides mobile customer relationship management (CRM) software to businesses in Africa. The platform allows businesses to gather feedback on customers more quickly and more cost-effectively than ‘traditional’ surveys. Ajua software uses online and mobile-based text platforms, allowing companies to perform deep analytics about existing and potential customers. The results can feed into marketing, customer retention and acquisition strategies. Ajua is a portfolio company of TLcom Tide Africa, a Venture Capital firm focused on tech enabled companies across Sub Saharan Africa, which has received funding under the IFE.

This impact study was designed to investigate the impact of CRM software on firms in Kenya. The study’s primary research questions are as follows:

- What are the determinants of mCRM software adoption?
- What is the impact of mCRM software on customer volume?
- What is the impact of mCRM software on revenues (including interest revenues and fees) performance?

Data was collected from 162 financial sector firms: banks, insurance companies, microfinance institutions, and savings and credit co-operative societies (SACCOs). The survey was conducted from June to August 2019. The survey instrument collected data on general firm characteristics such as age, industry sector and size, on use of mCRM software and customer relationship management practices more generally, and on the number of customers served and revenues earned during the past year.

### Summary findings

**Of the 162 firms interviewed, 22% reported using mCRM software although only 5 respondents were using Ajua’s products.** Since the amount of data collected directly from Ajua customers was relatively small, the study investigates the impact of mCRM systems more generally on company performance in Kenya, aiming to provide insights into the potential of Ajua’s mCRM software to benefit its customers.

### Determinants of CRM software adoption

**Younger firms, firms with more experienced managers and larger firms were the most likely to turn to innovative mCRM solutions.** Adoption was particularly high those that had already taken steps to boost their customer orientation and formalize internal IT services. Competition from informal firms also seemed to push firms to take up mCRM. Controlling for other factors, the likelihood of adopting CRM software was:

- 12 percentage points higher for firms with an IT department than for firms without such a department

- 29.5 percentage points higher for firms with a formal customer strategy
- 12 percentage points higher for a firm whose manager had at least 15 years' experience in a given sector
- 13 percentage points higher for firms that reported tough competition from informal firms<sup>100</sup>
- Increased by 6 percentage points, on average, for every additional full-time employee in the firms
- Decreased by 5 percentage points, on average, for each year since the firm was established.

The use of mobile money payments systems and the gender of a firm's manager were not significantly related to mCRM software adoption.

### **The impact of mCRM software on firm performance**

**The study suggested that the use of mCRM can boost firm performance.** Differences in firm performance between users of mCRM software and other firms are unlikely to reflect only the impact of CRM software. Some characteristics of firms, such as firm age, can be observed. These were controlled for in the analysis. However, others are hard or impossible to measure, such as motivation and having an innovative mindset. If these factors influence performance, but also make the firms more likely to adopt mCRM, the estimated impact of mCRM on performance will be biased upwards. An instrumental variable approach was used to control for this possible bias, using IT orientation and customer insight orientation as "instruments" for the adoption of mCRM. The analysis using this approach suggested that that:

- Firms using CRM software had 1.8 times as many customers as firms not using mCRM software.
- The revenues of firms using mCRM software were 1.9 times higher than the revenues of their peers.

Collecting customer feedback through CRM software likely provides a vital means of engaging with customers and leads to changes in business practices in response to feedback, boosting revenues and helping firms attract and retain clients.

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<sup>100</sup> Almost all firms reported stiff competition from other formal sector firms, so the impact of varying levels of formal competition could not be assessed.

## Abstract

This study investigates the determinants of customer relationship management (CRM) software adoption and its impact on firm performance. An instrumental variable endogenous treatment-effects approach was used to analyse data collected from financial sector firms in Kenya. Our results demonstrated that information technology infrastructure, firm size, and informal competition are positively associated with the adoption of CRM software. We also found that CRM software has a positive and significant impact on both measures of firm performance studied. Thus, investing in CRM software is likely to yield business benefits. Furthermore, by enhancing access to the Internet and facilitating the use of mobile and web-based CRM interfaces, government investment in information and communications technology infrastructure could play a critical role in fostering firm performance and overall economic growth. Nevertheless, it is important to note that desirable business outcomes are conditioned by a sound investment climate.

## Acknowledgments

The authors would like to thank Ajua CEO Kenfield Griffith for giving us the opportunity to conduct this study. The authors are also grateful for the support given by Claire Munene, Samuel Kamande, Caroline Onyari, Lawrence Wamweya, and all other Ajua staff members.

The authors would also like to give special thanks to our expert advisors, Arianna Legovini (manager of Development Impact Evaluation (DIME) in the research department of the *World Bank* Group), Shahrokh Fardoust (Institute of the Theory and Practice of International Relations at the College of William and Mary), the expert advisors, and the specialist advisor, Matt Ripley (The Good Economy) for their helpful comments on this report.

## Executive Summary

Customer relationship management (CRM) is a critical activity in today's competitive business landscape. Ajua Limited (formerly mSurvey), a medium-sized software firm, is allowing firms to harness the power of mobile CRM by providing mobile customer feedback software. Through its products and services, Ajua aims to enhance customer experience with the view to improving firms' performance by increasing their customer volumes and annual sales.

Focusing on Ajua CRM software, this study investigated the determinants of strategic CRM software adoption—relating to the adoption of mobile CRM—and its impact on business performance. Between June and August 2019 we surveyed 162 financial sector players, including banks, insurance companies, microfinance institutions, and savings and credit cooperative societies (SACCOs). We collected data on general characteristics such as firm size as well on potential outcomes of CRM use for the firms, namely annual numbers of customers and sales volumes. The survey instrument also collected data on mobile commerce, business competition, IT use, customer orientation, customer centricity, and the use of CRM software, including web-based and mobile-based software.

A probit regression was used to investigate the determinants of CRM software adoption by modeling binary outcome variables. Firms with an IT department were found to have a significantly higher likelihood of adopting CRM software than firms without an IT department. Large firms were also more likely to adopt CRM software than smaller firms. Furthermore, high-performance firms are more likely to adopt CRM software than low-performance firms. Lastly, firms that faced competition from the informal sector were more likely to adopt CRM software.

An instrumental variables endogenous treatment-effects approach was used to investigate the impact of CRM software on customer volume and sales performance. This approach was used because the adoption of CRM software was likely to be non-random. Thus, large profitable firms are likely to have better managerial abilities and to be more customer-centric, leading to better performance than for smaller and less profitable firms. They are also more inclined to adopt CRM software. On the other hand, in a competitive environment, it could be the case that less profitable firms are pushed to adopt CRM software to improve their performance. Hence, the decision to adopt CRM software could be related to other factors that affect firm performance, biasing the estimated impact upwards or downwards.

The instrumental variables endogenous treatment-effects approach addressed the non-random decision to adopt CRM software. This enabled us to investigate the nature of the bias in our study. We found that customer volume was about 1.8 times higher, and sales were about 1.9 times higher, for the firms that used CRM software than for the firms that did not. These findings suggest that CRM software has a positive impact on business performance of firms in the financial sector. The CRM software effects were statistically significant. Furthermore, the estimates from the instrumental variables endogenous treatment-effects approach were compared to the estimates from the ordinary least squares estimator to reveal the nature of the bias. The comparison suggests that the ordinary least squares estimator—which does not take into account the non-random nature of the sample—overestimated the impact of CRM software. This finding suggests that high-performance firms are more likely to adopt CRM software than low-performance firms. However, the estimates from the



instrumental variable approach (which aims to control for this bias) suggested that the adoption of CRM may have a positive impact on business performance.

The results suggested that small businesses often encounter obstacles to investing in CRM software, including a lack of information and limited access to finance. Hence, raising awareness of the benefits of CRM software among small businesses and improving their access to finance may result in a greater uptake of CRM software.

Finally, our study also has implications for firm management, highlighting the need for integrated CRM processes and the adoption of a formal customer strategy. Moreover, training in CRM is likely to improve awareness of this business activity and to foster the use of CRM software for enhancing business performance. Similarly, investing in IT training is likely to enhance skills that may prove helpful in converting CRM software use into actionable insights to improve business outcomes.

## 1. Introduction

In today's competitive business environment, customer relationship management (CRM) has become an important activity for companies. CRM strategies have now gone beyond tracking shopping behavior and implementing customer feedback and are used to enhance firm performance by harnessing customer data for the management of long-term commercial relationships (Rodriguez et al. 2018). The CRM industry has been estimated at USD40 billion (2018), and it is projected to double in value by 2025 (Shipp 2018). The use of CRM. Although CRM can encompass all the different aspects of interaction with customers (including face to face), the term is more commonly associated with the use of IT in managing relationships with customers.

One big challenge confronting firms in Africa has been the high cost of accessing customer feedback (Wiese et al. 2016). However innovative CRM strategies have become possible in recent years with the introduction of new information and communication technologies (ICT).

Over the years, technological innovation has changed how businesses interact with customers. Today, there are over 500 million mobile phone subscribers in Africa, with Kenya being a frontrunner. The ubiquity of mobile phones provides firms with a cheaper and quicker mode of communicating with customers (Riivari 2005). This is especially important in Africa, where broadband infrastructure remains relatively underdeveloped and expensive. Mobile CRM (mCRM) leverages off of mobile telephony, SMS, and 3G wireless mobile services (Payne and Frow 2005). These technologies are usually interfaced with web-based CRM platforms. The use of mCRM offers the distinct advantage of reaching a larger number of customers more swiftly, in comparison to traditional CRM methods.

Ajua Limited<sup>101</sup>, a medium-sized software as a service (SaaS) company in Nairobi, Kenya, has leveraged on the high mobile phone penetration in the country to meet increasing company needs for customer feedback. Ajua provides a CRM mobile platform to gather real-time customer feedback. Launched in 2015, Ajua's mobile-based text messaging platform is more accessible to customers than web-based CRM platforms since it does not require an Internet connection. Ajua has built an integrated customer experience platform that enables businesses in Africa and beyond to swiftly connect with their customers in a highly fragmented market environment, providing businesses with a unique overview of their customers, whether online or offline. This allows companies to perform deep analytics about their existing and potential customers, which they can use to inform their marketing, customer retention, and acquisition strategies. Ajua's software is integrated into various ICT infrastructure components such as mobile network operators, mobile money, other CRM platforms, and point-of-sale systems.

Among Ajua's products are two feedback services called "Voice of the Customer" and "Audience on Demand." "Voice of the Customer" gathers live insights from customers that use mobile money. This product is useful for identifying and proactively communicating with customers. It is also used for generating the net promoter score (NPS), a measure of customer loyalty. It allows firms to monitor customer behaviour, address customer complaints in a timely manner, and improve their products. "Audience on Demand" entails the use of mobile surveys among the firm's own customers or Ajua's broader audience to understand consumer spending habits. These services can help firms to become more competitive and find themselves in a better position to increase their customer volume (i.e. their

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<sup>101</sup> More information can be found on the company website: [www.ajua.com](http://www.ajua.com).

number of customers) and sales performance. Ajua's clients include leading telecommunications companies such as Safaricom in Kenya, Airtel Kenya, Mobile Telephone Network in South Africa, and Digicel in Jamaica. Ajua also serves firms in the financial services and leisure sectors, including banks, insurance companies, deposit and non-deposit taking savings and credit cooperative societies (SACCOs), microfinance institutions, and restaurants.

Harnessing mCRM is imperative for business success in Kenya, according to several recent reports (Gupta and Zeithaml 2006, Battor and Battour 2013, Herhausen and Schögel 2013). Kenyan firms now have the option to adopt mCRM to complement existing web-based CRM strategies (Zheng 2011).

However, empirical data on the adoption and use of mCRM and web-based CRM software are scarce, especially in Africa. Thus, the overarching research question that this study aims to address is: What is the impact of CRM software on firms in Kenya? We aimed to shed light on:

1. What are the determinants of CRM software adoption?
2. What is the impact of CRM software on customer volume?
3. What is the impact of CRM software on sales performance?

This study thus provides insights into how CRM software may drive business growth in Africa. To the best of our knowledge, this is the first empirical study to investigate the impact of CRM software in Africa.

## 2. Theoretical Background

### 2.1. Customer Relationship Management Overview

There is a distinction between operational, analytical, and strategic CRM. Operational CRM focuses on optimizing technologies and business processes to improve customer-facing operations. This involves the automation of sales, marketing efforts, and customer services. Analytical CRM involves data mining and analysis of customer data to better inform decision-making. Strategic CRM covers a range of dimensions relating to communicative, operational, analytical, social, and mobile CRM. It shapes the interaction between businesses and customers for increased firm performance, and enhances the knowledge a business has on customers and their preferences. This study focuses on strategic CRM, which is the core of Ajua's business.

The technical building blocks for developing mCRM systems draw on the company's existing IT infrastructure. Corporate IT systems store business-related data with a view to enhancing efficiency and effectiveness in business processes. Besides personal information such as contact details, demographic characteristics, and consumer preferences, customer databases contain information that is important for providing better and personalized services. Customers are required to give their consent to participate in mCRM campaigns. They can also control their privacy settings and avoid mobile spam, which ensures that mCRM offers a convenient and unobtrusive communication medium (Alahuhta et al. 2005, Camponovo et al. 2005).

### 2.2. Adoption of Customer Relationship Management Software

This study considers mCRM as an innovative customer relationship strategy emerging from the introduction of new mobile technologies at the firm level. We employed the technology, organization, and environment (TOE) framework developed by DePietro, Wiarda, and Fleischer (1990). It identifies three contextual aspects that can influence the process by which a firm adopts and implements technological innovations. The technological context refers to the firm's existing IT infrastructure, including other new technologies that are relevant to the firm. The organizational context relates to firm characteristics such as the company's size, scope, and managerial structure. Finally, the environmental context refers to the operating environment, as described by factors including the industry sector, business competition, and business-government relations. The operating environment context thus provides a basis for examining opportunities and constraints for firms to adopt and implement technological innovations.

Several authors have used the TOE framework when analysing the adoption of technologies in diverse IT domains (Oliveira and Martins 2011). For example, Thong (1999) and Zhu and Kraemer (2005) investigated the adoption and use of e-business, both in developed and developing countries. These studies demonstrated that the TOE framework provides a comprehensive analytical framework for investigating the adoption of CRM software. Based on the TOE framework, we developed a theory of change that attempts to provide the causal logic underlying the impact of CRM software on firms (Gertler et al. 2016). Our theory of change is based on the results chain shown in Figure 1. The inputs in this model consist in financial resources, IT infrastructure, human resources, and investment in CRM software. The main activity is the use of CRM software, which is expected to result in several outputs, namely increased customer engagement, more customer data, and improved data analytics. The immediate outcomes include improved business practices, increased customer satisfaction and

customer retention, and enhanced customer acquisition. The final outcomes include a greater customer volume and improved sales performance.

**Figure 1: Results chain for the impact of customer relationship management (CRM) software use on firm performance**

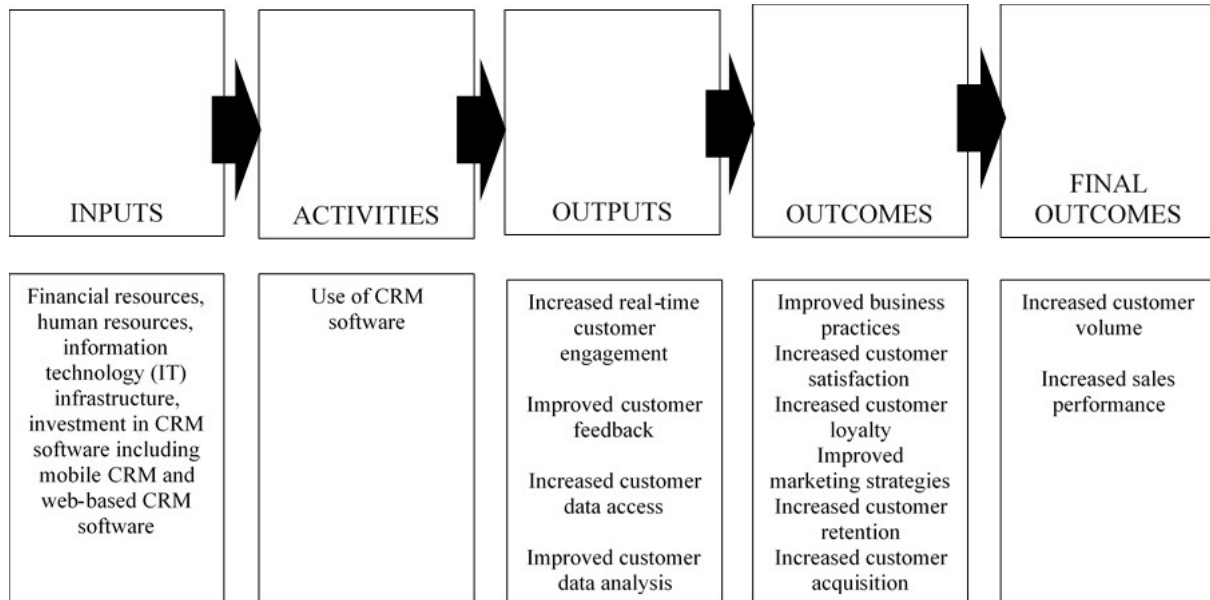
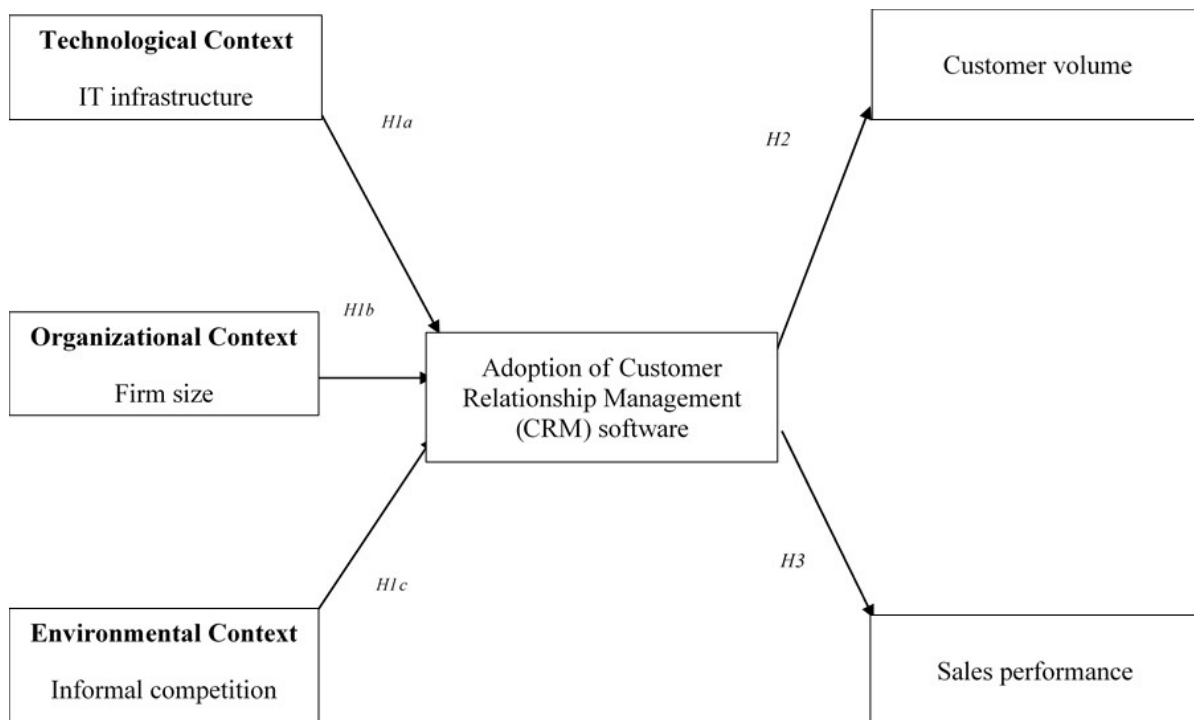


Figure 2 illustrates how the TOE framework and theory of change were applied to develop and test our hypotheses on the adoption of CRM software by firms and the impact on their customer volume and sales performance, as described in more details in the subsequent sections.

**Figure 2: Conceptual framework**



The hypotheses illustrated in Figure 2 are as follows:

H1a: Firm IT infrastructure is positively associated with the adoption of CRM software.

H1b: Firm size is positively associated with the adoption of CRM software.

H1c: Competition is positively associated with the adoption of CRM software.

H2: The use of CRM software has a positive impact on customer volume.

H3: The use of CRM software has a positive impact on sales performance.

### 3. Hypotheses

#### 3.1. Determinants of CRM Software Adoption

##### Technological Infrastructure

Mobile network infrastructure is relatively well-developed in Africa, especially in Kenya, where the use of mobile phones has grown particularly. In the 1990s, less than 1% of adults in Kenya owned mobile phones, compared to 100% mobile penetration today. This surpasses Africa's mobile penetration of 80% (Communications Authority of Kenya 2018). The existing telecommunications infrastructure has been providing a sound platform for mobile technology, supporting high-volume activities such as mobile money transactions and SMS exchange.

IT knowledge and skills are also crucial for developing mCRM data content from existing customer databases. Firms whose employees lack IT expertise have a lower likelihood of adopting mCRM than better-prepared firms (Oliveira and Martins 2011, Negahban et al. 2016). These studies also confirm the importance of physical IT infrastructure. Hence, internal and external IT infrastructure underlies CRM software adoption (Nguyen and Waring 2013). Altogether, this leads to our first hypothesis that information technology infrastructure is positively associated with CRM software adoption (H1a).

##### Organizational Characteristics

Firm size has received considerable attention as the primary organizational characteristic determining IT adoption (Oliveira and Martins 2011). Studies on the effect of firm size on technology adoption have yielded mixed results (Lee and Xia 2006). Various studies demonstrated that firm size is positively associated with the adoption of new technologies (Ko et al. 2008, Alshawi et al. 2011, Nguyen and Waring 2013) and that, large enterprises are more likely to have formalized IT systems in place (Venter and Tustin 2009). In contrast, Zhu and Kraemer (2005) found that firm size has a negative effect on IT adoption.

In the African context, firm size may enhance the likelihood of mCRM and overall CRM software adoption, leading to our second hypothesis that firm size is positively associated with CRM software adoption (H1b). This may be the case for two reasons. Firstly, large firms are more likely to employ a bigger pool of technical specialists than small firms (Dewar and Dutton 1986). Secondly, large firms may have more financial resources at their disposal (Thong 1999).

##### Operating Environment

In recent years, the number of mobile phone users has surpassed that of Internet users in most developing countries (Chong 2013, Ascarza et al. 2017). Furthermore, Kenya has one of the most vibrant mobile phone industries in the world (Mas and Morawczynski 2009, Aker and Mbiti 2010). In such an environment, using SMS is a key CRM strategy with a wide reach potential (Collins and Sarpong 2014).

A competitive business environment may provide an impetus for adopting new technology in the view of potential profits (Mamer and McCardle 1987). Competition may also generate environmental uncertainty, fostering the need for firms to adopt technological innovations (Thong 1999) to gain a competitive advantage. A competitive environment can stimulate changes in business practices linked

to the adoption of technological innovations such as mCRM software (Garrido-Moreno and Padilla-Meléndez 2011, Wu and Lu 2012, Garrido-Moreno et al. 2014, Šebjan et al. 2014). This is particularly important in a changing industry sector where firms in the formal sector face competition from the informal sector. Therefore, we further hypothesized that *competition is positively associated with CRM software adoption (H1c)*.

In developing countries, formal firms can face competition from both their formally regulated peers and from informal, unregulated institutions. The informal sector is often considered as a major obstacle to the flourishing of formal firms in developing countries, as informal enterprises face lower production costs and can offer lower prices, leading to unfair competition for formal enterprises (Mendi and Costamagna 2017). Mendi and Costamagna (2017) argue that informal firms affect innovation practices in formal firms. First, informal firms compete with formal firms for the same customers and resources. Second, informal firms typically provide cheaper products or services than formal firms. As such, the adoption of CRM software is likely to be perceived by enterprises as a technological development giving them a competitive edge.

### **3.2. Customer Relationship Management Software and Customer Volume**

It is widely accepted that customer retention is critical for increasing the total number of customers (Klaus and Maklan 2013). Retaining customers confers several advantages. Firstly, it reduces costs, as acquiring new customers is costlier for firms than retaining existing ones (Berezina et al. 2016). Moreover, existing customers tend to bring new ones, at no charge. Overall, high customer retention rates are associated with faster growth and successful business outcomes (Reichheld 2006, Reichheld et al. 2011, Josiassen et al. 2014, de Haan et al. 2015). Firms undertake various CRM strategies to enhance customer satisfaction and thereby boost customer retention rates.

Leveraging on the significant penetration of mobile phones, mCRM offers companies a practical, affordable, and fast channel for conducting text-based feedback surveys. mCRM also provides firms with a tool for monitoring and influencing customers' decisions and actions. Consequently, mCRM is likely to have a positive impact on the number of customers (Ang and Buttle 2006, Lemon and Verhoef 2016). We therefore hypothesized that *CRM software has a positive impact on customer volume (H2)*.

### **3.3. Customer Relationship Management Software and Sales Performance**

The importance of CRM technology in improving sales performance has been underscored by several authors (Jelinek 2013, Rodriguez et al. 2015, Agnihotri et al. 2017). For example, mCRM provides sales-focused firms with a mechanism for performing specific sales-related tasks (Panagopoulos and Avlonitis 2010, Jelinek 2013). The success of mCRM hinges on the ability of different functional departments to act upon the customer feedback. For example, mCRM may foster greater efficiency and effectiveness within the sales teams (Rodriguez and Honeycutt 2011). It may also enhance overall interaction between individual salespersons and customers (Jelinek 2013, Agnihotri et al. 2017, Singh et al. 2019).

In this study, we argue that mCRM can have a positive impact on sales performance. mCRM offers firms a practical and cost-effective avenue for reaching a large number of customers (Riivari 2005). Secondly, mCRM provides new ways for firms to understand customers' needs and behaviours, thereby fostering customer satisfaction and loyalty (Long et al. 2013). Thirdly, mCRM technology can



be used to create targeted marketing campaigns (Ascarza et al. 2017). Lastly, mCRM tools can speed up the process of interacting with customers at every touchpoint and thus support the customer journey to a large extent (Marino and Lo Presti 2018). mCRM offers a quick channel for firms to make customer value propositions. Hence, firms can exploit mCRM and related CRM software features for cross-selling (i.e. selling additional products) and up-selling (i.e. selling more expensive products to existing customers) (Ang and Buttle 2006). We therefore formulated the additional hypothesis *that CRM software has a positive impact on sales performance (H3)*.

## 4. Econometric Specification and Models

Based on the TOE framework, this study investigated the impact of using CRM software on firm performance. We first investigated the determinants of CRM software adoption. The treatment equation (Equation 1), which was based on a probit regression model for CRM software adoption, was modelled as follows:

$$(1) \text{ CRM software adoption}_i = \gamma_x w_i + \gamma_z x_i + u_i,$$

$$\text{CRM software adoption}_i = \text{CRM software adoption}_i^* \text{ if } \text{CRM software adoption}_i^* > 0; \text{ CRM software adoption}_i = 0 \text{ otherwise}$$

where  $\text{CRM software adoption}_i$  is a binary treatment latent variable that represents the use of CRM software for firm  $i$ . This is observed when a firm uses CRM software, i.e.,  $\text{CRM software adoption}_i^*$ .  $w_i$  is a vector of firm characteristics associated with the adoption of CRM software, namely IT infrastructure, firm size, and competition.  $x_i$  represents control variables including firm age, mobile money, formal customer strategy, customer orientation, manager gender, managerial experience, and institution type dummies. Lastly,  $u_i$  represents the idiosyncratic error term. It is assumed to be independent and identically distributed, i.e.,  $\sim \text{iid } N(0, \sigma^2)$ .

Our second step consisted in estimating the impact of CRM software on firm performance by specifying an outcome equation (Equation 2). The average treatment effect on the treated (ATT) was estimated as the mean of the differences in outcome variables for the firms that received the treatment. This was a log-linear regression modelled as follows:

$$(2) y_i = f(\text{CRM software adoption}_i; \beta) + x_i + \varepsilon_i,$$

where  $y_i$  represents the outcome variables, i.e. customer volume and sales performance, for firm  $i$ .  $\text{CRM software adoption}_i$  represents CRM software use.  $x_i$  represents a vector of firm characteristics, namely firm age, size, competition, manager gender, managerial experience, and institution type dummies. Finally,  $\varepsilon_i$  is the idiosyncratic error term.

The explanatory variables included in the models were based on existing theory and empirical literature on the adoption of technology and firm performance (Garrido-Moreno and Padilla-Meléndez 2011, Wu and Lu 2012, Nguyen and Waring 2013, Garrido-Moreno et al. 2014, Šebjan et al. 2014).

### 4.1. Identification Strategy

The accurate estimation of the impact of CRM software on firm performance using simple regression techniques requires that the adoption of CRM software be uncorrelated with unobserved characteristics – such characteristics would need to be similar for the CRM software users (treatment group) and non-users (comparison group). In other words, the estimation must meet the conditional-independence assumption, which requires that the potential outcomes—customer volume and sales performance—be independent of treatment status after conditioning on a set observable covariates. If this assumption holds, the difference in outcomes between the treated and comparison groups could be entirely attributed to the use of CRM software.

A randomized control trial would have ensured that the conditional independence assumption held. However, this was not possible because of the time and financial constraints. We thus relied on quasi-

experimental techniques to control for the possibility of unobserved heterogeneity. Unobservable factors such as the CRM capability and the managerial ability of a firm are likely to affect both the decision to adopt CRM software and firm performance. This implies that the decision to adopt CRM software is correlated with unobservables that also affect firm performance, resulting in endogeneity (Rodriguez et al. 2018, Rutz and Watson 2019). For example, compared to smaller and less profitable firms, large profitable firms are likely to have a better managerial ability, a more customer-centric approach, and a higher CRM capability and thus are more likely to adopt CRM software but also to have a relatively higher performance, all other things being equal. Failure to control for such a correlation would yield an estimated CRM software effect on firm performance that suffers from an upward bias.

This problem is often compounded by the difficulty of predicting bias direction. For instance, high-performance firms might adopt CRM software under the expectation that it will further enhance their performance. But it is also possible that, low-performance firms might adopt CRM software to boost their performance. Bias direction is therefore ambiguous, and estimates can suffer from either upward or downward bias. Therefore, estimating Equation 2 using the ordinary least squares (OLS) estimator or other ordinary treatment effects estimators such as regression adjustment, inverse-probability weighting, and propensity-score matching could result in an estimated impact that is biased or inconsistent. This is because these estimators ignore possible bias from confounding variables.

#### 4.2. The Instrumental Variable Endogenous Treatment-Effects Approach

This study applied an instrumental variable endogenous treatment-effects estimator to address endogeneity (Wooldridge 2010, Lance et al. 2014). The treatment was assumed to be endogenous, thus a probit regression was used to model the endogenous treatment assignment in a log-linear regression that included exogenous covariates:

$$(3) y_{1i} = x_i\beta_1 + \varepsilon_{1i}$$

⋮

$$y_{Ti} = x_i\beta_T + \varepsilon_{Ti}$$

$$y_i = \sum_{j=1}^T 1(t_i = v_j) y_{ji}$$

where  $y_i$  represents the potential outcomes of firm performance (i.e. customer volume and sales performance).  $x_i$  represents the exogenous covariates.  $\varepsilon_{Ti}$  represents the treatment assignment error. Endogenous treatment  $t_i$  is a discrete variable taking the values  $v_1, \dots, v_T$ . The  $T$  values are used to index  $T$  potential outcomes of the outcome  $y_i$ :  $y_{1i}, \dots, y_{Ti}$ .

Moreover, unobservable factors might be different for firms with and without CRM software. There was also a significant likelihood of unequal variability in the unobservable factors between the firms with and without CRM software. This model was therefore extended to include different correlation and variance parameters for each potential outcome such that for  $j = 1, \dots, T$ ,  $\varepsilon_{ji}$  and  $\varepsilon_{ti}$  are a bivariate normal with a zero mean and the following covariance:

$$(4) \sum_j \begin{bmatrix} \sigma_j^2 & \sigma_j \rho_{jt} \\ \sigma_j \rho_{jt} & 1 \end{bmatrix}$$

The treatment is endogenous when  $\rho_{jt} \neq 0$ . In this study, CRM software adoption was assumed to be endogenous. We were therefore required to specify a model for CRM software adoption using instrumental variables. Essentially, the instrumental variable strategy can be implemented to recover the causal effect of CRM software adoption on firm performance provided the instruments satisfy two conditions: instrument relevance and the exclusion restriction. Instrument relevance implies that the instruments are significantly correlated with the treatment. On the other hand, exclusion restriction implies that the instruments should only affect the outcome through their effect on the treatment. The first condition can be tested by examining the statistical significance of all the instruments to establish whether it is sufficiently strong (i.e. with an  $F$ -statistic  $> 10$ ). The second condition cannot be tested, and so its justification must rely on theoretical arguments (Wooldridge 2010, Lance et al. 2014).

Two instrumental variables, namely IT orientation and customer insight orientation, were employed to identify the outcome equation. These instruments were assumed to be directly correlated with CRM software adoption but not with firm performance (affecting firm performance only through their indirect effect on CRM software adoption).

IT orientation relates to whether firms have an IT department, maintain a functional website, and use mobile money for financial transactions. IT orientation is likely to be positively correlated with the adoption of advanced IT tools such as web-based CRM and mCRM. Firms that extensively use technology have a higher likelihood of further investing in advanced technology (Islam et al. 2018).

Customer insight orientation reflects the degree of importance that customer insights play in a company's strategies. Customer insights can potentially provide firms with business and market intelligence that may be critical in formulating and implementing business strategies. Firms that continuously collect and analyse digital transaction data from mobile, web, and social platforms may harness valuable customer insights that can be used to make appropriate customer-facing decisions. In this sense, CRM platforms play a crucial role in consolidating and translating customer insights into actionable business plans. Hence, firms that value customer insights are likely to invest in CRM platforms to identify actionable observations that may be relevant to their business growth strategies (Mandal 2018).

The key concern with using instrumental variables is checking whether they satisfy the exclusion restriction (Lance et al. 2014). From a theoretical point of view, it is possible that IT orientation and customer insight orientation might enhance firm performance other than through their impact on the adoption of mCRM. This could come about because of their relationship with firm characteristics such as age and size. We limited this possibility by including several firm characteristics as exogenous covariates in our estimated model, namely firm age, firm size, competition, manager gender, managerial experience, and institution type dummies. Due to lack of variation in the responses to the question about competition from formal sector firms (almost all firms reported a highly competitive operating environment), we focused on the impact of informal competition only by using a dummy variable indicating whether a firm reported facing significant competition from informal providers of similar services.

The instrumental variables endogenous treatment-effects approach involved the maximum likelihood estimation of the ATT. This approach controls for endogeneity in the treatment assignment by applying a linear endogenous treatment-effects specification that models the deviation from the conditional-independence assumption. It does this by allowing the unobservables affecting the treatment and

those affecting the potential outcomes to take a specific correlation structure. The error terms from the treatment equation and the outcome equation are assumed to follow a bivariate normal distribution. In addition, the instrumental variables appearing in the treatment equation but not in the outcome equation allow for identification of the causal effect of CRM software on firm performance (Wooldridge 2010, Lance et al. 2014).

## 5. Data and Descriptive Statistics

### 5.1. Data

Cross-sectional data were collected from June to August 2019 from a sample of financial intermediaries, including banks, insurance companies, SACCOs, and microfinance institutions. The survey instrument comprised a first section on firm characteristics such as age, size, and industry and a second section on the firms' annual number of customers and annual sales. The data on the outcome variables were collected for the five-year period from 2014 to 2018. The survey instrument also included sections on business competition, mobile commerce, ICT, use of CRM software, customer orientation, and customer-centric culture. The survey respondents were managers from different department categories, including customer experience, human resources, and finance.

The sample frame was constructed from existing national population registers of banks, insurance companies, SACCOs, and microfinance institutions. The source of the population register for banks and microfinance institutions was the Central Bank of Kenya. The population register for insurance companies and SACCOs was provided by the Insurance Regulatory Authority and Sacco Societies Regulatory Authority, respectively. An initial sample of 579 firms was selected using the stratified random sampling technique, with firms being stratified by sector. Pilot testing was conducted to assess the reliability of the questionnaire. The survey instrument was hand-delivered to the firms. Firms that could not be traced were replaced with comparable firms from the same sector. Altogether, the data were collected from a final sample of 162 firms, representing a response rate of about 28%.

#### Variables of Interest

The treatment variable was adoption of CRM software, a dummy variable with value of 1 if the firm reported using mCRM or web-based CRM software and 0 otherwise.

The outcome variables of interest included customer volume and sales performance. Customer volume was measured as the total number of customers during fiscal year 2018. Sales performance was measured as the total annual sales in local currency (Kenyan shilling [KSh]) during the fiscal year 2018. The total annual sales corresponded to the firms' gross revenue in a fiscal year. For banks, SACCOs, and microfinance institutions, the gross revenue consisted in the total of net-interest income and non-interest income, both of which depend on customers deposits. For insurance companies, the gross revenue consisted in underwriting and investment income. The ability to invest depends on the available resources from deposits and customer premia, and as such is expected to be impacted indirectly by mCRM.

The first instrumental variable, IT orientation, is measured as a dummy variable taking 1 if the firm has an IT department, a website, and uses mobile money for financial transactions. The customer insight orientation of a firm is measured using a 3-point scale (1=No/Never, 2=Sometimes/Partially, 3=Always/Yes) taken from an item in the Customer Centricity Scorecard (Simon et al. 2016) that asks whether "customer insights challenge or even set the direction of company projects and strategies" (see Table A1 in Annex).

## Predicting CRM Software Adoption

**IT infrastructure.** This variable was measured as a dummy variable that took the value 1 if a firm reported the presence of an IT department and 0 otherwise.

**Firm size.** Firm size was measured as the number of full-time permanent workers in the firm at the end of the fiscal year.

**Informal Competition.** This study measured informal competition as a dummy variable taking the value 1 if a firm reported facing competition from informal enterprises and 0 otherwise. As noted above, we focused on informal competition because almost all firms reported facing competition from formal sector institutions.

## Control Variables

**Firm age.** Previous studies have provided mixed evidence on the effect of age on firm performance (Arvanitis and Hollenstein 2001, Saini et al. 2010, Haller and Siedschlag 2011). This variable was measured as the difference between the latest fiscal year and the year in which the firm began its operations.

**Mobile money use.** Firms that use mobile money for transactions to meet customer requests are more likely to adopt CRM software and demonstrate enhanced firm performance (Josiassen et al. 2014, de Haan et al. 2015). Moreover, Ajuu's CRM software specifically targets firms that use mobile money to receive payment for services. Mobile money use was measured as a dummy variable taking the value 1 if a firm reported that the main reason of using mobile money was "to satisfy customer requests" and 0 otherwise.

**Formal customer strategy.** Customer-oriented strategies are important in enhancing customer experience and overall firm performance (Saini et al. 2010, Wang and Feng 2012). This was measured by a dummy variable that took the value 1 if a firm reported having a formal customer-oriented strategy and 0 otherwise.

**Customer orientation.** Customer centricity fosters the implementation of business processes that may enhance sales and customer retention (Rapp et al. 2010, Saini et al. 2010, Haller and Siedschlag 2011). This variable was calculated using the Customer Centricity Scorecard (Simon et al. 2016), which is composed of 10 statements (see Table A1 in Annex). In a first step, the responses to all statements were summed up at the firm level, with a total ranging from the minimum value of 10 and the maximum value of 30. The sum was then divided by the maximum value of 30 and multiplied by 100 to obtain a percentage score. A high score indicated a high degree of customer orientation.

**Manager gender.** Gender gaps are observed in the adoption of technological innovations perceived as risky or uncertain. Empirical evidence provides mixed evidence on the links between manager gender and firm performance. Nguyen and Waring (2013) demonstrate that male managers are more likely to engage in risky business ventures compared to their female counterparts. As such, firms run by male managers could outperform firms managed by women (Nguyen and Waring 2013). In contrast, various studies demonstrate that having a female manager is positively associated with firm performance (Watson 2002, Flabbi et al. 2019). Manager gender was measured as a dummy variable taking the value 1 if the manager was female and 0 otherwise.

**Managerial experience.** Experienced managers are more likely to adopt technological innovations that enhance their firm’s competitive advantage and performance (Ko et al. 2008, Nguyen and Waring 2013). This variable was measured as a dummy variable taking the value 1 if managerial experience in given sector was at least 15 years, and the value 0 otherwise.

**Institution type.** Dummies were used to take into account differences in performance outcomes between different types of financial institutions (Oliveira and Martins 2011). Institution type dummies took the value 1 if a firm was a deposit taking SACCO, a non-deposit taking SACCO, or a microfinance institution, and took the value 0 if otherwise. Firms classified as banks or insurance companies were the reference category.

## 5.2. Descriptive Statistics

Table A2 and Table A3 in Annex provide the descriptive statistics of our sample and correlation matrix of the variables used in our analysis. The financial institutions surveyed were primarily SACCOs (52%), they had an average age of 17 years and employed on average 66 employees. The management of those financial institutions had at least 15 years of experience. Only 13% of responding firms had female managers. About 28% of the firms reported facing informal competition, i.e. competition from unregistered or informal firms. A vast majority of the firms (76%) reported having a formal customer strategy in place. However, the mean value of the customer orientation score (constructed based on the Customer Centricity Scorecard) was only 55%. About 22% of the firms reported using CRM software, with only about 3% of the firms using Ajua mCRM software.

The outcome variables—customer volume and sales performance—were higher in the fiscal year 2018 than in 2015 (Table A2 in Annex). The correlation coefficients between CRM software adoption and our outcome variables indicated that firms were more likely to adopt CRM software if: they had an IT department, they had more employees, they faced informal competition, they were older, they used mobile money, they had a formal customer strategy, they scored higher on our measures of customer orientation, IT orientation and customer insight orientation, they had a male manager, or they had a more experienced manager. Non-deposit taking SACCOs were less likely to adopt CRM software than banks, while deposit taking SACCOs and microfinance institutions were more likely to adopt (Table A3 in Annex).

The mean differences in outcome variables and firm characteristics relative to the use of technological innovations are reported in Table A4 and Table A5 in Annex. The firms that used CRM software had consistently higher mean values for customer volume, sales performance, and most other firm characteristics than non-CRM software users. These differences were significant based on a two-sample t-test (Table 4 and Table 5).



## 6. Empirical Results and Discussion

### 6.1. Determinants of Customer Relationship Management Software Adoption

A probit regression was used to investigate the determinants of CRM software adoption (Table A6 in Annex). The main variables of interest were firm size, IT department, and informal competition. All three of them showed positive and statistically significant coefficients.

Some of the key points emerging were that the likelihood of adopting CRM software was approximately:

- 12 percentage points higher for the firms with an IT department. This finding is consistent with previous studies showing that an IT department indicates the presence of the advanced IT infrastructure necessary for handling CRM software, including hardware, software, and skilled IT employees (Oliveira and Martins 2011, Negahban et al. 2016).
- 6 percentage points higher as the number of employees increased by one unit. As shown in previous studies, large firms are more likely than smaller firms to have formalized IT systems (Venter and Tustin 2009) and to employ a larger pool of technical specialists (Dewar and Dutton 1986). Large firms may also have better access to financial resources for purchasing CRM software (Thong 1999).
- 13 percentage points higher for the firms that faced informal competition compared to the other firms. As noted above, almost all firms reported facing competition from formal sector firms, but informal competition may be making the operating environment even more challenging for these firms. A competitive environment is likely to drive firms to adopt CRM software, especially in Kenya, where there is a large number of informal enterprises (Garrido-Moreno and Padilla-Meléndez 2011, Wu and Lu 2012, Garrido-Moreno et al. 2014, Šebjan et al. 2014). It is thus likely that the formal firms that adopt CRM software face a higher degree of informal competition. Hence, formal firms are more likely to incur the additional costs of adopting CRM software if the perceived advantages are strong in the face of informal competition (Fu et al. 2018).

Taken together, the results of this study support our hypotheses that IT infrastructure, firm size, and informal competition had a positive and statistically significant effect CRM software adoption. Moreover, among the control variables with statistically significant coefficients, firms with customer strategy had a 29% likelihood of adopting CRM software. Also, a high degree of firms' customer orientation increased the likelihood of adoption by 0.2% only. This suggests that customer orientation might not be very important in predicting CRM adoption. Firms with managers possessing at least 15 years of experience had a 12% likelihood of adopting CRM software. In contrast, firm age was negatively associated with CRM software adoption. An increase in firm age reduced the likelihood of CRM adoption by 4.8%. Similarly, deposit taking SACCOs had a 6% lower likelihood of adopting CRM software than firms in the banking and insurance industry.

### 6.2. Impact of Customer Relationship Management Software on Firm Performance

Table A7 in Annex shows the estimated impact of CRM software on firm performance using two estimators, namely the ordinary least squares (OLS) estimator and the instrumental variables estimator. The coefficient of the OLS estimate was positive and statistically significant for sales

performance only. However, the OLS estimates in our study were likely to be biased, due to the presence of unobservable factors potentially correlated with both treatment status and outcomes.

To address endogeneity we used the instrumental variables endogenous treatment-effects approach described above. We checked whether the instrument relevance condition had been met by examining the significance of the instruments. Both instruments—IT orientation and customer insight orientation—were sufficiently strong with an  $F$ -statistic  $> 10$  (Wooldridge 2010, Lance et al. 2014). The coefficient of the estimated impact of CRM software on customer volume was positive and statistically significant. These estimates suggest that customer volume was about 1.8 times higher for firms using CRM software than for firms not using it, controlling for other factors including unobservables. Furthermore, we observed that the estimated correlation between the errors from the outcome equation and the treatment equation was negative and significant for the firms without CRM software. Thus, CRM software adoption was an endogenous treatment for this group. The negative sign implied that the unobservable factors that increased the likelihood of adopting CRM software tended to decrease customer volume.

Additionally, Table A7 in Annex shows that CRM software had a positive and significant impact on sales performance. The coefficients suggest that sales for firms using CRM software are about 1.9 times higher for firms that adopt CRM than for firms not using it, again controlling for other factors including unobservables. The estimated correlation between the errors from the outcome equation and the treatment equation was negative and significant for the firms without CRM software. In contrast, the estimated correlation was positive and significant for the firms that used CRM software. Hence, CRM software adoption was an endogenous treatment for both groups. The negative correlation coefficient for the firms without CRM software implied that the unobserved factors that increased the likelihood of adopting CRM software tended to decrease sales performance. In contrast, the positive correlation coefficient for the firms using CRM software suggested that the unobserved factors that increased the likelihood of adopting CRM software tended to increase sales performance.

A comparison of the estimated impacts from the OLS estimator and the instrumental variables endogenous treatment-effects estimator revealed that the OLS estimator was biased upwards. This suggests that OLS overestimated the impact of CRM software on firm performance. Thus, a correction of the upward bias through the instrumental variables endogenous treatment-effects approach resulted in a smaller estimated impact of CRM software on customer volume and sales performance. This finding suggests that high-performance firms are more likely to adopt CRM software than low-performance firms. Consequently, the endogenous treatment-effects approach accounted for the tendency of high-performance firms with CRM software to yield significantly smaller yet robust estimates.

### **Robustness Checks**

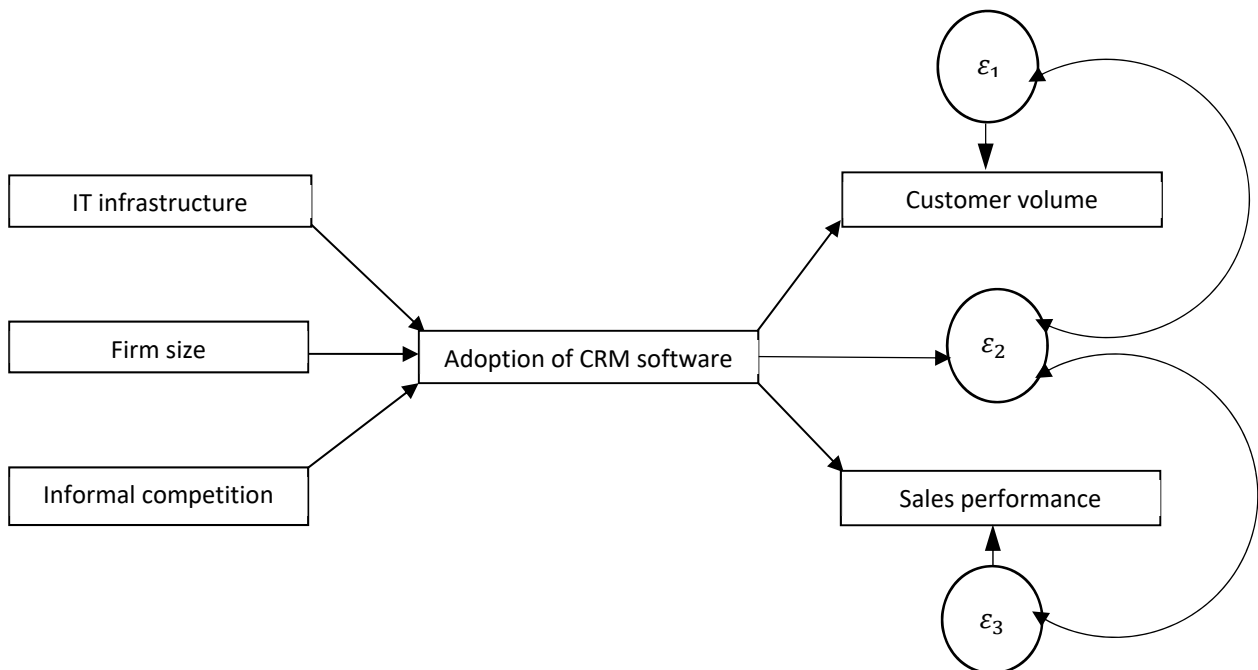
Two additional approaches were used to estimate the impact of CRM software on firm performance, namely the two-step control function estimator and structural equation modelling (SEM).

The two-step control function estimator was applied to address endogeneity (Maddala 1983, Kim and Kim 2011, Wooldridge 2015) in the use of CRM software by including residuals from the CRM software adoption model as regressors in the potential outcomes model. This model was based on the assumption of bivariate normality, which implies a nonlinear functional form based on the normal

distribution. The first stage entailed regressing the binary treatment on the independent variables as specified in the treatment equation, Equation 1. Probit estimates obtained from this estimation were then used to compute a non-selection hazard. In the second stage, the outcomes were regressed on the treatment as well as the covariates used to model the outcome equation, Equation 2 and the non-selection hazard obtained from the first-stage regression. The two-step parameter estimates were then obtained by augmenting the regression equation with the non-selection hazard. As shown in Table A8 in Annex, the estimated impact of CRM software on customer volume and sales performance was found to be positive and statically significant.

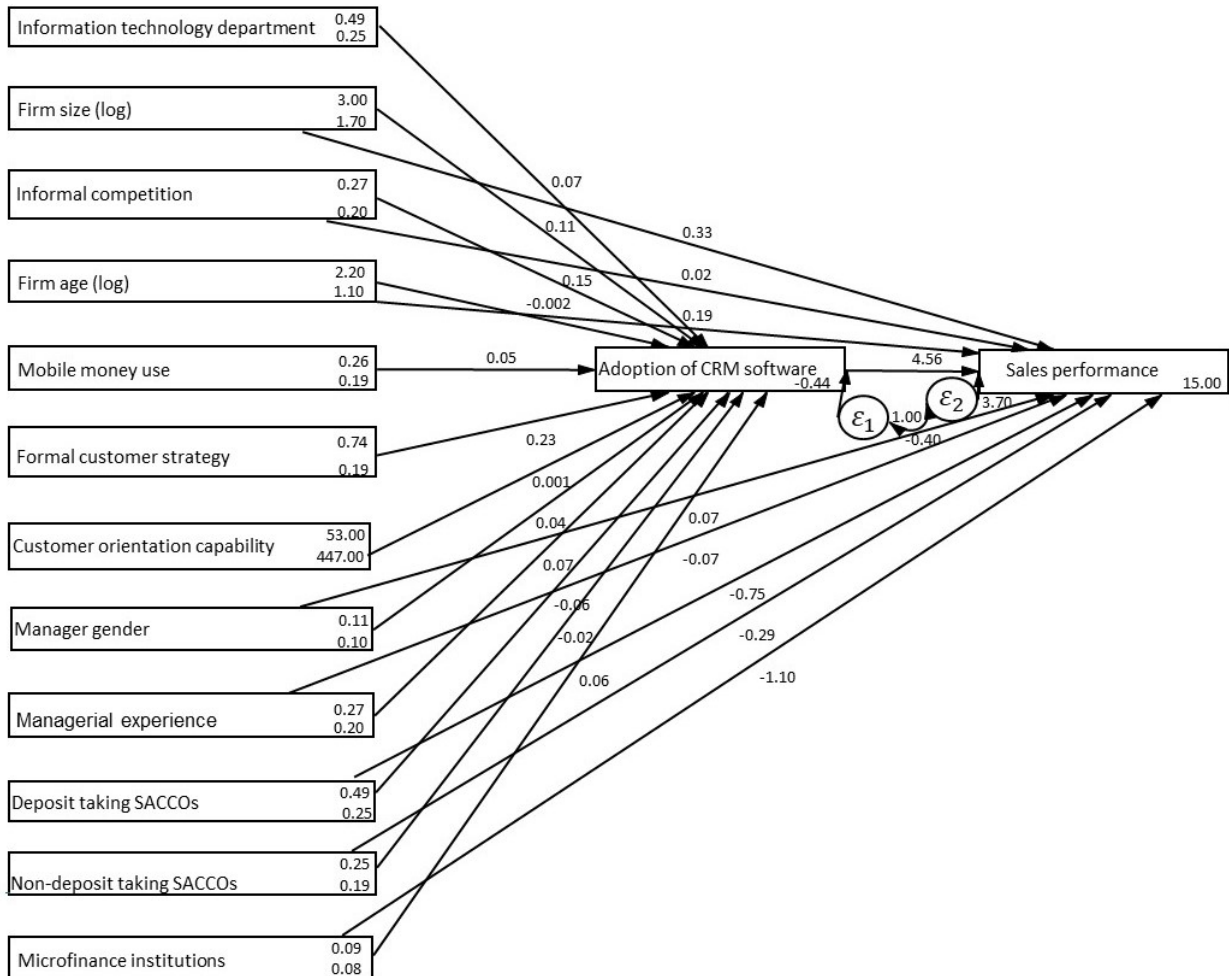
SEM is a confirmatory technique that checks the validity of a proposed causal process and model (Wang and Feng 2012). When using Equation 1 and Equation 2 to model the treatment and outcome, the model specified that the unobservable factors that affected both the treatment and outcome were correlated, as shown in Figure 3.

**Figure 3: Structural equation model with correlation between treatment and outcome variables**

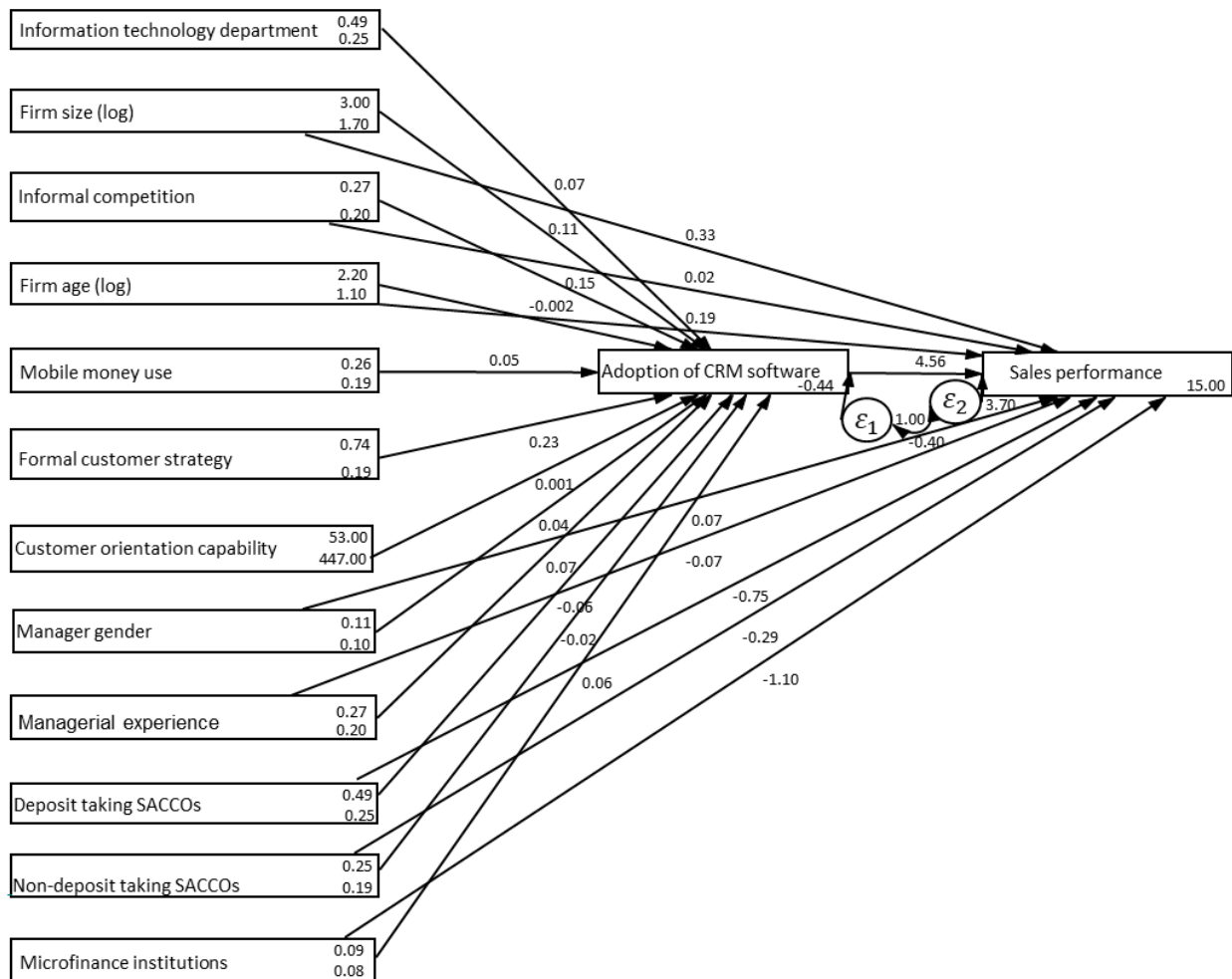


SEM parameters were estimated assuming joint normality of the unobservable factors. The estimated coefficients are reported in Table A9 in Annex. CRM software use had a positive and significant impact on both customer volume and sales performance. The path diagrams displaying these results are shown in Figure 4 and Figure 5. The likelihood-ratio (LR) statistic was used to check the validity of the model. The model is considered adequate in the case of failure to reject the null hypothesis when comparing the proposed model to the saturated model. In our study, this test failed to reject the null hypothesis, indicating that the proposed model was adequate for both outcomes—customer volume and sales performance.

**Figure 4: Path diagram of structural equation model analysis with impact of customer relationship management (CRM) software on customer volume**



**Figure 5: Path diagram of structural equation model analysis with impact of customer relationship management (CRM) software on sales performance**



Furthermore, an alternative SEM analytical framework was used to model the impact of CRM software. The use of different methods for collecting customer feedback, including CRM software, is likely to lead to changes in business practices, resulting in enhanced customer satisfaction and, ultimately, in increased customer volume and sales. Yet, the impact of CRM adoption on firm performance may depend on a firm’s customer retention capability (CRC). CRC is an unobserved latent variable that is measured by three observable variables, namely customer orientation, CRM use, and formal customer strategy. Consequently, CRC is expected to boost customer volume and sales revenue. Firms with a high degree of CRC are thus likely to be more competitive relative to those with a low degree of CRC.

As the variables used to measure the latent CRC variable were not exogenous, they were treated as endogenous by SEM. Moreover, SEM allowed estimating the impact of CRC on firm performance while capturing the effects of all potential confounders in terms of measurement errors. The estimation of SEM parameters was based on the assumption that the overall dataset followed a multivariate normal distribution (Wang and Feng 2012). Figure 6 shows the relationships between the observable variables, the unobservable latent variable, and the outcome variables.

Figure 6: Structural equation model with customer retention capability as latent variable

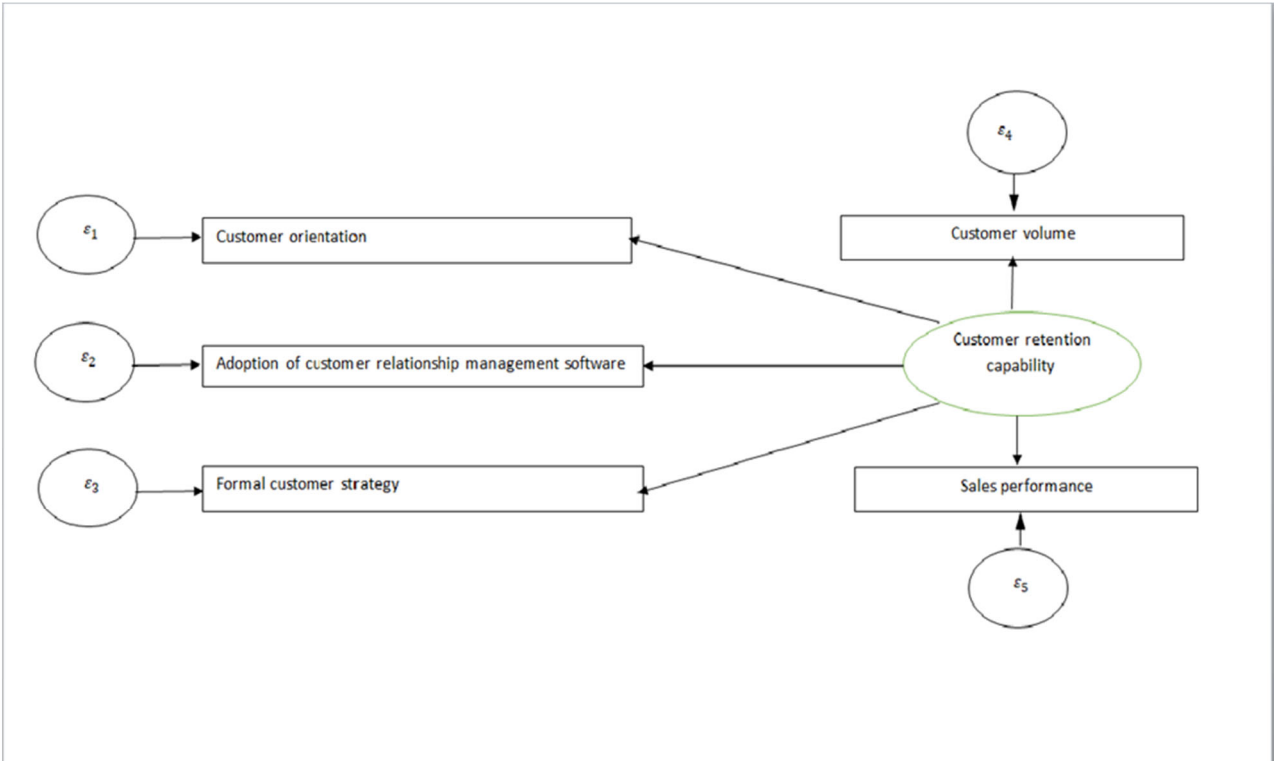
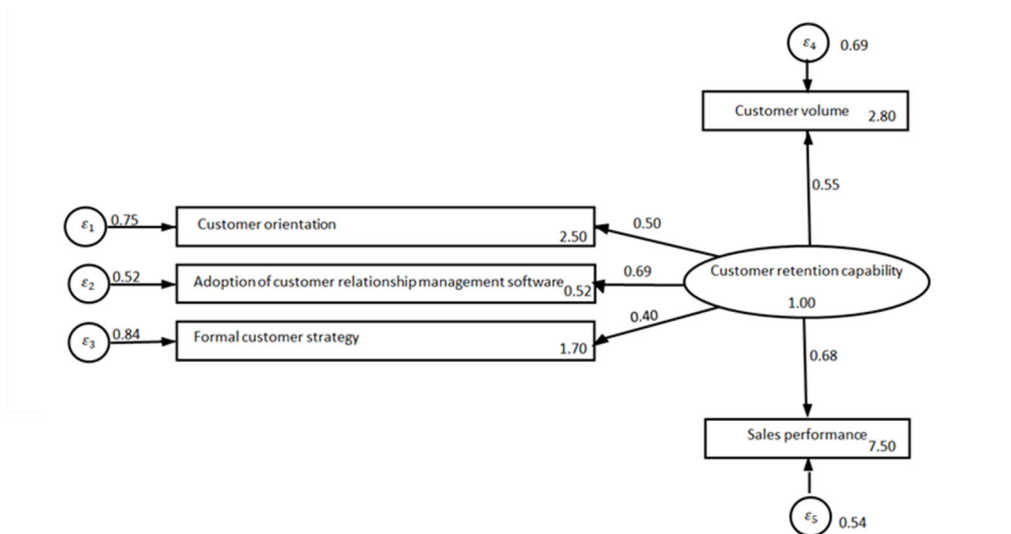


Table A10 in Annex shows that the correlation coefficients for customer orientation, CRM use, and formal customer strategy—the variables used in constructing CRC—were positive and statistically significant. Standardized coefficients were reported to account for differences in the measurement scales of the three CRC measure variables. Furthermore, the use of CRM software offered the highest explanatory power, as compared to the other measures of CRC. More importantly, CRC had a positive and significant impact on customer volume and sales performance.

Moreover, the LR statistic was used to test the fit of our estimation model. The model was found to be adequate in comparison to the saturated model, since the LR test failed to reject the null hypothesis (Figure 7).

**Figure 7: Path diagram of structural equation model analysis with customer retention capability as latent variable**



Notes. <sup>a</sup>CRM: customer relationship management

Finally, this study estimated the specific impact of Ajua CRM software on firm performance. Ajua CRM software has wider potential applications than the software services offered by other firms in Kenya, since it interfaces mCRM with web-based CRM platforms. The fact that Ajua launched its CRM software in 2015 was used as a means to identify the impact of CRM software on business performance. Thus, gathering 2014 data (corresponding to the pre-treatment period) and 2018 data (post-treatment) in our survey allowed us to take a quantile matched difference-in-differences (MDID) approach to estimate the impact of Ajua CRM software on customer volume and sales performance (Khandker et al. 2009, Gertler et al. 2016). Combining a matching and difference-in-differences (DID) approach may help improve the balance between the treatment and comparison groups on unobserved factors with time-varying effects, thereby reducing the risk of bias. For the DID-estimated treatment effect to be valid, the assumption of equal trends must hold (Gertler et al. 2016). This implies that in the absence of Ajua CRM software, customer volume and sales performance in the treatment group and the comparison group would have followed similar trajectories. There were no data available prior to the pre-treatment period to test this assumption, so this study relied on a falsification test using a placebo outcome—the firm size—that was theoretically unaffected by the use of Ajua CRM software (Gertler et al. 2016). A zero-impact result would suggest that the treatment and comparison groups followed parallel trends in the absence of Ajua CRM software. Table A11 in Annex shows that the impact of Ajua CRM software on firm size was not significant. It was therefore concluded that the observed impact on firm performance could be attributed to effects directly caused by Ajua CRM software use.

Table 12 shows that the OLS estimator yielded positive but non-significant impact coefficients. In contrast, the ATT coefficients calculated with the quantile MDID estimator were positive and statistically significant. Hence, the results suggest that Ajua CRM software had a positive impact on customer volume and sales performance. However, these results were based on a very small sample.

In sum, most of the results from all the robustness checks reflected the results from the main analysis, further confirming the validity of the qualitative conclusions derived from our findings.

## 7. Conclusions and Implications for Policy and Practice

The study aimed to examine the impact of CRM software on firm performance in Kenya, as primarily measured by customer volume and sales performance. Our research focused on strategic CRM, which encompassed the use of mCRM and web-based CRM. We considered financial institutions in Kenya, namely banks, insurance companies, microfinance institutions, and SACCOs.

First, a Probit regression was used to investigate the determinants of CRM software adoption. The main findings were that IT infrastructure was associated with a 12% likelihood of adopting CRM software. Similarly, an increase in firm size increased the likelihood of adoption by 6%. Informal competition increased the likelihood of adopting CRM software by approximately 13%. Second, an instrumental variables endogenous treatment-effects estimator was used to estimate the impact of CRM software on firm performance. The results indicated that CRM software had a positive impact on customer volume and sales performance for financial institutions.

There are several policy implications to these findings. The study suggests that the adoption of CRM software can help firms in the financial sector to increase customer volume and achieve higher sales. However, not all firms are adopting CRM software, with smaller firms being the least likely to adopt. Hence, raising awareness of the potential relevance and benefits of CRM software could be beneficial, and it might be particularly relevant to target this at small firms. In addition, small businesses are likely to encounter obstacles that may prevent them from investing in CRM software, including limited access to finance. Improving access to finance could foster the uptake of CRM software. Nevertheless, more needs to be done to understand the factors that hinder small firms from adopting CRM software. It is also possible that formal firms that do not adopt CRM software face relatively less competition from the informal sector than other formal firms, due to the different products and services they offer and customers they aim to reach. Thus, formal firms may have little incentive to adopt CRM software if the perceived benefits are meager in the face of informal competition.

This study also has relevant implications for firms at the managerial level. Firms are likely to benefit from the formulation and implementation of a formal customer strategy. For instance, formal training is likely to improve awareness of the role and use of CRM software in enhancing firm performance.

While this study offers useful insights into the customer experience landscape in Kenya, it has several limitations. First, the sample size was rather small. Our empirical estimations were based on various econometric assumptions to tackle this limitation. Second, firms generally reported using mCRM together with web-based CRM, potentially confounding the results. In addition, very few firms reported using Ajua mCRM software. Among those using Ajua, some also indicated that they still used web-based CRM rather than mCRM. This meant that the estimates of the impact of Ajua's service (as opposed to the impacts of MCRM in general) have to be interpreted with some caution, although the impact was found to be statistically significant.

Further research is thus warranted to clarify the impact of the exclusive use of mCRM software on firms. In addition, future studies could investigate the mechanisms underlying the effects of CRM software on firm performance. Furthermore, future research could examine the effect of formal competition on CRM software adoption. Finally, our study was restricted to the impact of strategic CRM on the private financial sector. Further research could investigate whether the findings of this study could be generalized to other aspects of CRM, including operational and analytical CRM, and to



other sectors. Such new insights could shed light on indirect relationships between firm characteristics and firm performance.

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## Annex A: Tables

**Table A1: Customer Centricity Scorecard\***

Question	Response		
	No /Never	Sometimes /Partially	Always /Yes
1. Are staff incentives based on customer-related key performance indicators?	1	2	3
2. Are business decisions based on integrating disparate datasets (e.g., in-person interactions, social media feedback, and call center data), rather than relying on a single source?	1	2	3
3. Is customer-facing data cross-functional (e.g., sales figures are combined with customer satisfaction), rather than kept in silos?	1	2	3
4. Does a CRM platform—accessed by all staff—present a ‘single version of the truth’?	1	2	3
5. Are current technology solutions adequate to support the company’s information needs?	1	2	3
6. Is customer insights a fully independent function in direct communication with the chief executive officer (or managing director)?	1	2	3
7. Does the customer insights function have budget autonomy?	1	2	3
8. Are the company’s data science and analytics capabilities fit for purpose?	1	2	3
9. Does the company bring data to life, producing narratives that can resonate both internally and externally?	1	2	3
10. Do customer insights challenge or even set the direction of company projects and strategies?	1	2	3

\* This is an adaptation of Simon et al.'s (2016) Customer Centricity Scorecard



**Table A2: Descriptive statistics and correlation matrix (N=120)**

	<b>Variables</b>	<b>Mean</b>	<b>Standard Deviation</b>	<b>Min</b>	<b>Max</b>
1	Sales (KSh) <sub>2015</sub> (log)	17.02	2.37	12.90	29.18
2	Sales (KSh) <sub>2018</sub> (log)	17.27	2.24	10.31	24.85
3	Number of customers <sub>2015</sub> (log)	6.76	2.80	1.61	18.52
4	Number of customers <sub>2018</sub> (log)	7.19	2.49	3.40	12.95
5	CRM <sup>a</sup> software use	0.22	0.41	0.00	1.00
6	Ajua mCRM <sup>a</sup> software use	0.03	0.16	0.00	1.00
7	Information technology department	0.53	0.50	0.00	1.00
8	Number of employees <sub>2018</sub>	66.30	128.75	2.00	700.00
9	Informal competition	0.28	0.45	0.00	1.00
10	Firm age (years)	17.11	16.27	1.00	89.00
11	Mobile money use	0.28	0.45	0.00	1.00
12	Formal customer strategy	0.76	0.43	0.00	1.00
13	Customer orientation	54.61	21.00	0.00	100.00
14	Manager gender	0.13	0.33	0.00	1.00
15	Managerial experience	0.28	0.45	0.00	1.00
16	Deposit taking SACCOs <sup>b</sup>	0.52	0.50	0.00	1.00
17	Non-deposit taking SACCOs <sup>b</sup>	0.26	0.44	0.00	1.00
18	Microfinance institutions	0.08	0.26	0.00	1.00
19	Information technology orientation	0.44	0.50	0.00	1.00
20	Customer insight orientation	1.83	0.67	1.00	3.00

Notes: The statistics are based on observations with non-missing values. KSh represents the local unit of currency in Kenya. <sup>a</sup>CRM: customer relationship management. <sup>b</sup>SACCOs: savings and credit cooperative societies.

**Table A3: Descriptive statistics and correlation matrix (N=120)**

	Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	Sales (KSh) <sub>2015</sub> (log)	1.00																		
2	Sales (KSh) <sub>2018</sub> (log)	0.82	1.00																	
3	Number of customers <sub>2015</sub> (log)	0.58	0.50	1.00																
4	Number of customers <sub>2018</sub> (log)	0.54	0.46	0.94	1.00															
5	CRM <sup>a</sup> software use	0.52	0.52	0.34	0.34	1.00														
6	Ajua mCRM <sup>a</sup> software use	0.32	0.16	0.22	0.24	0.30	1.00													
7	Information technology department	0.40	0.37	0.56	0.56	0.33	0.15	1.00												
8	Number of employees <sub>2018</sub>	0.52	0.54	0.49	0.49	0.46	0.14	0.34	1.00											
9	Informal competition	0.31	0.29	0.13	0.17	0.34	0.14	0.25	0.13	1.00										
10	Firm age (years)	0.57	0.50	0.54	0.48	0.33	0.19	0.31	0.43	0.12	1.00									
11	Mobile money use	0.10	0.08	0.03	0.04	0.13	0.02	0.28	0.07	0.28	0.05	1.00								
12	Formal customer strategy	0.24	0.28	0.13	0.16	0.25	0.09	0.21	0.07	-0.03	0.17	-0.04	1.00							
13	Customer orientation	0.37	0.27	0.37	0.35	0.35	0.23	0.20	0.24	0.01	0.33	-0.20	0.34	1.00						
14	Manager gender	-0.02	0.00	-0.02	-0.03	-0.02	-0.06	-0.05	-0.11	-0.13	0.08	-0.06	0.15	0.17	1.00					
15	Managerial experience	0.34	0.27	0.33	0.28	0.22	0.14	0.16	0.35	0.07	0.45	0.00	-0.13	0.13	-0.12	1.00				
16	Deposit taking SACCOs <sup>b</sup>	-0.05	-0.07	0.16	0.19	0.06	0.05	0.23	-0.14	0.05	0.13	0.15	0.27	0.13	0.01	0.00	1.00			
17	Non-deposit taking SACCOs <sup>b</sup>	-0.25	-0.18	-0.29	-0.32	-0.22	-0.09	-0.48	-0.12	-0.29	-0.28	-0.24	-0.25	-0.24	-0.05	-0.02	-0.61	1.00		
18	Microfinance institutions	0.05	0.08	0.07	0.09	0.08	-0.05	0.20	0.18	0.17	-0.12	0.25	-0.13	-0.13	-0.01	-0.03	-0.29	-0.17	1.00	
19	Information technology orientation	0.46	0.40	0.52	0.50	0.38	0.19	0.87	0.39	0.23	0.41	0.29	0.26	0.45	-0.03	0.19	0.17	-0.41	0.19	1.00
20	Customer insight orientation	0.30	0.27	0.24	0.25	0.30	0.12	0.34	0.18	0.18	0.24	-0.01	0.21	0.76	0.10	0.21	0.16	-0.30	0.12	0.39

Notes: The correlations are based on observations with non-missing values. KSh represents the local unit of currency in Kenya. <sup>a</sup>CRM: customer relationship management. <sup>b</sup>SACCOs: savings and credit cooperative societies

**Table A4: Balance on firm characteristics for customer relationship management (CRM) software users and non-users**

Variables	No. of observations	Mean control (CRM <sup>a</sup> non-users)	No. of Observations	Mean treated (CRM <sup>a</sup> users)	MeanDiff
Sales (KSh) <sub>2015</sub> (log)	100	16.419	30	19.502	-3.083***
Sales(KSh) <sub>2018</sub> (log)	121	16.656	34	19.471	-2.815***
Number of customers <sub>2015</sub> (log)	97	6.319	30	8.676	-2.357***
Number of customers <sub>2018</sub> (log)	119	6.492	35	8.959	-2.468***
Information technology department	124	0.403	38	0.868	-0.465***
Number of employees <sub>2018</sub>	124	2.725	34	4.310	-1.584***
Informal competition	124	0.218	38	0.421	-0.203**
Firm age (years)	123	2.112	38	2.653	-0.541***
Mobile money use	124	0.234	38	0.395	-0.161*
Formal customer strategy	123	0.683	38	0.974	-0.291***
Customer orientation	124	50.215	38	69.298	-19.083***
Manager gender	124	0.105	38	0.105	0.000
Managerial experience	124	0.226	38	0.474	-0.248***
Deposit taking SACCOs <sup>b</sup>	124	0.500	38	0.421	0.079
Non-deposit taking SACCOs <sup>b</sup>	124	0.282	38	0.079	0.203***
Microfinance institutions	124	0.065	38	0.158	-0.093*
Information technology orientation	124	0.347	38	0.816	-0.469***
Customer insight orientation	116	1.741	37	2.270	-0.529***

Notes. KSh represents the local unit of currency in Kenya. The results are based on a two sample t-test. <sup>a</sup>CRM: customer relationship management; <sup>b</sup>SACCOs: savings and credit cooperative societies. \*\*\* Significant at the 1 percent level. \*\* Significant at the 5 percent level. \* Significant at the 10 percent level.

**Table A5: Balance on firm characteristics for firms using Ajua customer relationship management (CRM) software and non-users**

Variables	No. of observations	Mean control (Ajua non-clients)	No. of observations	Mean treated (Ajua clients)	Mean difference
Sales (KSh) <sub>2015</sub> (log)	127	17.023	3	21.688	-4.666***
Sales(KSh) <sub>2018</sub> (log)	152	17.228	3	19.538	-2.310*
Number of customers <sub>2015</sub> (log)	123	6.747	4	10.820	-4.072***
Number of customers <sub>2018</sub> (log)	148	6.849	6	12.086	-5.238***
Information technology department	156	0.494	6	1.000	-0.506**
Number of employees <sub>2018</sub>	152	2.982	6	5.188	-2.206***
Informal competition	156	0.263	6	0.333	-0.071
Firm age (years)	155	2.204	6	3.177	-0.973**
Mobile money use	156	0.263	6	0.500	-0.237
Formal customer strategy	155	0.742	6	1.000	-0.258
Customer orientation	156	53.526	6	85.000	-31.474***
Manager gender	156	0.109	6	0.000	0.109
Managerial experience	156	0.276	6	0.500	-0.224
Deposit taking SACCOs <sup>a</sup>	156	0.487	6	0.333	0.154
Non-deposit taking SACCOs <sup>a</sup>	156	0.244	6	0.000	0.244
Microfinance institutions	156	0.083	6	0.167	-0.083

Notes. KSh represents the local unit of currency in Kenya. The results are based on a two sample t-test. <sup>a</sup>SACCOs: savings and credit cooperative societies. \*\*\* Significant at the 1 percent level. \*\* Significant at the 5 percent level. \* Significant at the 10 percent level.

**Table A6: Probit Estimates of the determinants of customer relationship management (CRM) software adoption**

Variables	Logit coefficients		Marginal effects	
Information technology department	0.716*	(0.411)	0.121*	(0.078)
Firm size <sub>2018</sub> (log)	0.343**	(0.147)	0.058**	(0.021)
Informal competition	0.789***	(0.265)	0.133***	(0.040)
Firm age (log)	-0.282**	(0.125)	-0.048**	(0.021)
Mobile money use	0.402	(0.314)	0.068	(0.057)
Formal customer strategy	1.754***	(0.410)	0.295***	(0.054)
Customer orientation	0.0118*	(0.007)	0.002*	(0.001)
Manager gender	0.227	(0.370)	0.038	(0.063)
Managerial experience	0.725***	(0.280)	0.122***	(0.039)
Deposit taking SACCOs	-0.358**	(0.144)	-0.060**	(0.029)
Non-deposit taking SACCOs	-0.0158	(0.284)	-0.003	(0.048)
Microfinance institutions	0.405	(0.380)	0.068	(0.058)
Constant	-4.473***	(0.784)		
LR Chi2	55.81			
Prob>Chi2	0.000			
Pseudo R2	0.42			
No. of observations	156			

Notes: Standard errors robust for clustering at industry level. \*\*\* Significant at the 1 percent level. \*\* Significant at the 5 percent level. \* Significant at the 10 percent level.

**Table A7: Impact of customer relationship management (CRM) software use on firm performance**

	Ordinary Least Squares Estimator				Endogenous Treatment Effects Instrumental Variable Estimator			
	Customer volume		Sales performance		Customer volume		Sales performance	
ATT <sup>a</sup>	2.468***	(0.472)	2.815***	(0.393)	1.898***	(0.605)	1.925***	(0.461)
<b>Instruments for CRM<sup>b</sup> adoption</b>								
Information technology orientation					1.168***	(0.163)	1.115***	(0.142)
Customer insight orientation							0.438***	(0.093)
<b>var(e.outcome)</b>								
CRM <sup>b</sup> software non-users					3.917	(0.472)	2.430	(0.222)
CRM <sup>b</sup> software users					3.519	(1.034)	2.146	(0.170)
<b>corr(e.CRM<sup>b</sup>,e.outcome)</b>								
CRM <sup>b</sup> software non-users					-0.410***	(0.153)	-0.379***	(0.081)
CRM <sup>b</sup> software users					-0.463	(0.329)	0.482***	(0.148)
Controls	No		No		Yes		Yes	
No. of observations	154		155		142		151	

Notes: Standard errors robust for clustering at industry level in parentheses. var(e.outcomes) represents the error variance of the outcome variables (customer volume and sales performance). corr(e.CRM software, e.outcome) represents the correlation between the error term of the treatment variable (CRM software) and the error terms of the outcome variables (customer volume and sales performance). <sup>a</sup>ATT: Average treatment effect on the treated. <sup>b</sup>CRM: customer relationship management. \*\*\* Significant at the 1 percent level. \*\* Significant at the 5 percent level. \* Significant at the 10 percent level.

**Table A8: Control-function estimates of the impact of customer relationship management (CRM) software use on firm performance**

Variables	Customer volume		Sales performance	
<b>Structural</b>				
CRM <sup>a</sup> software	2.207**	(0.993)	2.769***	(0.864)
Firm size <sub>2018</sub> (log)	0.649***	(0.194)	0.559***	(0.163)
Informal competition	-0.756*	(0.405)	0.305	(0.341)
Firm age (log)	0.751***	(0.194)	0.226	(0.156)
Manager gender	-0.229	(0.546)	0.227	(0.442)
Managerial experience	-0.009	(0.408)	-0.055	(0.334)
Deposit taking SACCOs <sup>b</sup>	0.331	(0.468)	-0.812**	(0.386)
Non-deposit taking SACCOs <sup>b</sup>	-0.484	(0.548)	-0.388	(0.447)
Microfinance institutions	-0.147	(0.700)	-0.987*	(0.594)
Constant	3.066***	(0.706)	14.940***	(0.592)
<b>Adoption of CRM software</b>				
Information technology department	0.714*	(0.404)	0.751*	(0.414)
Firm size <sub>2018</sub> (log)	0.343***	(0.131)	0.355***	(0.131)
Informal competition	0.744**	(0.332)	0.804**	(0.331)
Firm age (log)	-0.097	(0.204)	-0.139	(0.201)
Mobile money use	0.329	(0.353)	0.357	(0.359)
Formal customer strategy	1.511**	(0.729)	1.684**	(0.792)
Customer orientation	0.014	(0.009)	0.009	(0.009)
Manager gender	-0.046	(0.526)	0.205	(0.478)
Managerial experience	0.424	(0.440)	0.506	(0.426)
Deposit taking SACCOs <sup>b</sup>	-0.152	(0.443)	-0.059	(0.434)
Non-deposit taking SACCOs <sup>b</sup>	0.360	(0.629)	0.355	(0.622)
Microfinance institutions	0.638	(0.613)	0.655	(0.627)
Constant	-4.832***	(0.979)	-4.855***	(1.011)
<b>Hazard</b>				
Lambda	-1.172*	(0.607)	-1.179**	(0.517)
Rho	-0.593		-0.724	
Sigma	1.978		1.630	
Observations	150		150	

Notes: Standard errors in parentheses. <sup>a</sup>CRM: customer relationship management. <sup>b</sup>SACCOs: savings and credit cooperative societies. \*\*\* Significant at the 1 percent level. \*\* Significant at the 5 percent level. \* Significant at the 10 percent level.

**Table A9: Structural equation model analysis of correlations between treatment and outcome variables**

Variables	Customer volume		Sales performance	
<b>Structural</b>				
CRM <sup>a</sup> software	4.254**	(1.694)	4.562***	(1.619)
Firm size <sub>2018</sub> (log)	0.376	(0.279)	0.328	(0.251)
Informal competition	-1.043**	(0.499)	0.018	(0.451)
Firm age (log)	0.690***	(0.226)	0.186	(0.187)
Manager gender	-0.329	(0.632)	0.066	(0.535)
Managerial experience	-0.002	(0.470)	-0.071	(0.395)
Deposit taking SACCOs <sup>b</sup>	0.466	(0.546)	-0.754	(0.459)
Non-deposit taking SACCOs <sup>b</sup>	-0.313	(0.640)	-0.286	(0.534)
Microfinance institutions	-0.292	(0.811)	-1.098	(0.708)
Constant	3.593***	(0.874)	15.420***	(0.778)
<b>Adoption CRM software</b>				
Information technology department	0.191***	(0.054)	0.065	(0.054)
Firm size <sub>2018</sub> (log)	0.091***	(0.025)	0.108***	(0.025)
Informal competition	0.142**	(0.062)	0.150**	(0.062)
Firm age (log)	-0.007	(0.032)	-0.002	(0.032)
Mobile money use	0.028	(0.057)	0.051	(0.055)
Formal customer strategy	0.107*	(0.065)	0.233***	(0.057)
Customer orientation	0.004***	(0.001)	0.001	(0.001)
Manager gender	0.001	(0.089)	0.040	(0.087)
Managerial experience	0.033	(0.069)	0.067	(0.067)
Deposit taking SACCOs <sup>b</sup>	-0.042	(0.077)	-0.061	(0.077)
Non-deposit taking SACCOs <sup>b</sup>	0.047	(0.092)	-0.020	(0.093)
Microfinance institutions	0.076	(0.115)	0.062	(0.119)
var(e.outcome)	5.195***	(1.587)	3.726***	(1.367)
var(e.CRM software)	0.101***	(0.012)	0.102***	(0.012)
cov(e.outcome, e.CRM software)	-0.434**	(0.192)	-0.401**	(0.181)
No. of observations	150		150	

Notes: Standard errors in parentheses. var(e.outcome) represents the error variance of the outcome variables (customer volume and sales performance). var(e.CRM software) represents the error variance of the endogenous variable, CRM software. cov(e.outcome, e.CRM software) represents the covariance between the error terms of the outcome variables (customer volume and sales performance) and the error term of the treatment variable (CRM software). <sup>a</sup>CRM: customer relationship management. <sup>b</sup>SACCOs: savings and credit cooperative societies. \*\*\* Significant at the 1 percent level. \*\* Significant at the 5 percent level. \* Significant at the 10 percent level.



**Table A10: Structural equation model analysis of customer retention capability as latent variable**

Measurement	Standardized Coefficients	
<b>Customer Orientation</b>		
Customer retention capability	0.505***	(0.079)
Constant	2.518***	(0.167)
<b>Use of CRM<sup>a</sup> software</b>		
Customer retention capability	0.692***	(0.067)
Constant	0.523***	(0.087)
<b>Formal Customer Strategy</b>		
Customer retention capability	0.396***	(0.085)
Constant	1.680***	(0.127)
<b>Customer Volume</b>		
Customer retention capability	0.554***	(0.075)
Constant	2.808***	(0.182)
<b>Sales Performance</b>		
Customer retention capability	0.682***	(0.068)
Constant	7.481***	(0.441)
var(e.customer orientation)	0.745	(0.080)
var(e.CRM software)	0.521	(0.092)
var(e.formal customer strategy)	0.843	(0.067)
var(e.customer volume)	0.693	(0.083)
var(e.sales performance)	0.535	(0.092)
var(customer retention capability)	1.000	
No. of observations	149	149

Notes: Standard errors in parentheses. var(e.customer orientation) represents the error variance for customer orientation; var(e.CRM software) represents the error variance for CRM software; var(e.formal customer strategy) represents the error variance for formal customer strategy; var(e.customer volume) represents the error variance for customer volume; var(e.sales performance) represents the error variance for sales performance; var(customer retention capability) represents the variance for customer retention capability. <sup>a</sup>CRM: customer relationship management. \*\*\* Significant at the 1 percent level. \*\* Significant at the 5 percent level. \* Significant at the 10 percent level.

**Table A11: Structural equation model analysis of customer retention capability as latent variable**

	Ordinary Least Squares Estimator	Matched Differences-in-Difference Estimator <sup>a</sup>	
	Employee number	Employee number	
		Before	After
Treatment group		5.521	5.308
Control group		2.996	3.219
ATT <sup>b</sup>	-0.019 (0.171)		-0.436 (1.556)
Controls	No		Yes
No. of observations	186		148

Notes: Standard errors in parentheses. Control variables include firm age and industry dummies. <sup>a</sup>Values are estimated at the 0.5 quantile. <sup>b</sup>ATT: Average treatment effect on the treated. \*\*\* Significant at the 1 percent level. \*\* Significant at the 5 percent level. \* Significant at the 10 percent level.

**Table A12: Impact of Ajua customer relationship management (CRM) software use on firm performance**

	Ordinary Least Squares Estimator		Matched Differences-in-Difference Estimator <sup>a</sup>			
	Customer volume	Sales performance	Customer volume		Sales performance	
			Before	After	Before	After
Treatment group			10.306	11.607	19.189	18.858
Control group			9.671	9.386	18.064	17.371
ATT <sup>b</sup>	0.133 (0.255)	0.234 (0.556)		1.586*** (0.418)		0.362** (1.324)
Controls	No	No		Yes		Yes
No. of observations	199	202		142		142

Notes: Standard errors in parentheses. Control variables include firm age and industry dummies. <sup>a</sup>values are estimated at the 0.5 quantile. <sup>b</sup>ATT: Average treatment effect on the treated. \*\*\* Significant at the 1 percent level. \*\* Significant at the 5 percent level. \* Significant at the 10 percent level.

# Access to Finance and Growth-Oriented Investments in Ethiopia's Manufacturing Sector

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**JEL Classification:** L00, L11, L60

**Keywords:** Finance, Private Equity, Venture Capital, Growth, Investment, Ethiopia

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## Summary

### Research focus

Access to finance is a key factor determining firm expansion, especially for small and medium-sized enterprises (SMEs) in developing countries. A lack of access to external finance is thought to be a key bottleneck for enterprises' growth in sub-Saharan African countries, for a number of reasons, including high collateral requirements for bank loans. In Ethiopia, the value of the collateral required to borrow can be up to twice the value of the loan.

The study provides empirical data on the capacity of firms – in particular, manufacturing enterprises' – to access debt and equity finance in Ethiopia and the main determinants for making growth-orientated investments. The key research questions were:

- What are the main barriers to financial access for firms in Ethiopia? How does this influence the firms' view towards growth-orientated investments?
- Does a lack of access to finance constrain firms' growth and investment decisions?

The study focused on companies that engaged in manufacturing or agro-processing activities, as these two sectors have been identified as high potential by private equity funds active in Ethiopia. A list was obtained from the Ethiopian Central Statistical Agency of all the relevant enterprises in Addis Ababa or the Oromia region with a minimum of ten employees and a survey conducted between August and September 2019. Data was collected from 199 companies through face-to-face interviews and an online survey.

### Summary findings

**Ethiopian firms have limited access to external finance.** Less than a third of those interviewed (29%) had obtained external funding in the past three years, with the majority of those relying on banks:

- 26% of firms had obtained finance from formal sources, mainly banks, with a quarter of these firms complementing with informal financing from family, friends or acquaintances
- 3% obtained finance from informal sources only
- 1% obtained finance from private equity funds

**Access to debt finance to fuel company growth did not vary significantly according to firm size.** Roughly 30% of small firms, 28% of medium-sized firms and 29% of large firms obtained debt capital<sup>102</sup>.

**Small firms are more likely to rely on informal sources, while medium and large firms have better access to bank lending.** Only 4% of small firms obtained debt finance from banks, compared to 20% and 21% of medium-sized and large firms respectively. The impact of firm size on access to credit was robust to controlling for other observable firm characteristics. The results also show that firms with better educated managers and firms located in an industrial park were less likely to face constraints.

**High collateral requirements are reported as the main barrier to accessing bank loans.** About 70% of firms had applied for a bank loan over the three years preceding the survey, but almost two thirds of

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<sup>102</sup> Note that small firms are defined as 10-30 employees, medium-sized firms as 31-100 employees and large firms >100 employees. This is in line with the Ethiopian Central Statistical Agency's categorizations.

them were rejected. The most commonly reported reason for rejection (47% of cases) was inability to fulfil the bank's collateral or guarantee requirement. Among the firms who did not apply for bank loans, fear of rejection was also the most commonly reported reason for not applying (39% of cases), although significant numbers of firms were also put off by high costs of borrowing or lack of flexibility in financial solutions.

**Firms were using both debt capital equity to make growth-oriented investments.** 45% of the growth-oriented investments made by companies were fuelled by debt and 55% by equity. The vast majority of external financing was used to invest in industrial processes or products, with investments in ICT or human resources rarely reported.

**Firms had very little access to formal equity investors.** Nearly all of the firms' equity capital came from either personal savings accounts or friends and families in the form of shares. Only one medium and one large-sized firm obtained investment from private equity or venture capital funds. Fewer than 30% of firms expressed an interest in accessing finance from private equity funds.

**The main reason for lack of interest in accessing private equity was lack of awareness.** 76% of the companies who did not seek external equity funds were unaware of the existence or function of private equity funds. A few medium or larger firms were concerned about the danger of losing control of the management of the company (8% of firms) or that the exit of the fund could affect longer term stability (12% of firms).

**Capital was growing or stable for the majority of the firms, while a larger share of firms reported declining worker headcounts.** Medium and large enterprises were most likely to have grown their capital (65% and 61% of firms in the respective categories, compared to only half of small firms), but only around 12% of firms reported falling capital. By contrast, over 40% of firms reported a shrinking workforce.

**The evidence suggests that access to finance may be important in helping firms grow capital and labour force.** Firms that used bank debt grew their capital and labour force 5.5% and 10.3% faster, respectively, than firms without bank debt. Analysis using an instrumental variable approach suggested that the presence of a credit constraint may reduce the probability of firms increasing their investments. However, there are possible shortcomings with the instrumental variable used so this evidence should be interpreted with caution. Further research would be needed to conclusively demonstrate a causal relationship between credit constraints and growth oriented investments in Ethiopia.

**Overall, the findings demonstrate that a lack of access to finance constrains investment decisions in Ethiopia, with implications for firm performance.** These results have implications for entrepreneurs as well as for policymakers wishing to address the bottlenecks of access to finance and growth-oriented investments among SMEs in Ethiopia. Also, the current industrial policy of the Ethiopian government promotes the expansion of industrial parks, and access to finance could be used as an incentive to make investments in an industrial park.

## **Abstract**

This work explores the barriers to external finance for enterprises in Ethiopia and how financial constraints impact firms' growth and investments. A field study and a web-based survey were conducted among manufacturing enterprises in Addis Ababa and the Oromia region. About 27% of the surveyed enterprises obtained a bank loan, while 10% of them relied on informal sources. Inability to comply with bank collateral requirements was one of the main causes of rejection of loan applications. The majority of debt secured is directed to investments aimed at improving products and industrial processes. Overall, firms that used debt capital showed a capital growth rate of at least 7.6% higher than that of firms with no external debt capital. Enterprises rarely obtained finance from private equity or venture capital firms.

## Acknowledgments

The authors gratefully thank two expert advisors of the project (Professor Emeritus François Bourguignon and Professor Emeritus Alexandros Sarris) for their helpful comments and suggestions on the preliminary draft of this paper, according to which the content was improved. They would also like to thank Abhay Gupta, Nina Fenton, Cali Claudio, and Matt Ripley for their helpful discussions and comments on this paper. The authors also gratefully acknowledge Enterprises Partners (EP) for providing them with a list of enterprises to be interviewed and for advice and information. They also thank the enterprises and other stakeholders for spending their time in the interviews. Financial support from the European Investment Bank through the Global Development Network (GDN) is gratefully acknowledged.

### Executive Summary

Access to finance is a key determining factor for firm growth and expansion, and can be a particular challenge for small and medium-sized firms (SMEs). In Ethiopia, SMEs also have limited access to credit due to high collateral requirements for bank loans, which can be as much as twice the value of the loan. This work explores the main barriers to external finance for enterprises in Ethiopia and the effects of financial constraints on firm growth and growth-oriented investments.

To this end, between August and September 2019 an enterprise survey was conducted on manufacturing enterprises in Addis Ababa and the Oromia region. Data collection was performed using a two-pronged approach, namely in the field through questionnaires and online through the SurveyMonkey tool. Overall, 199 firms were surveyed. Less than a third of those interviewed had obtained external funding in the past three years, with the majority of those relying on banks. About 70% of firms had applied for a bank loan over the three years preceding the survey, of which 27% obtained the loan and 43.7% were partially or fully rejected. The bank collateral or guarantee requirement was the main reason for bank rejection. Approximately 30% of the sampled firms did not apply for bank loans, with fear of rejection reported as the main reason for not applying. About 2.5% of firms borrowed from informal sources only and another 7% of firms used both obtained finance from both formal (mainly from banks) and informal sources, suggesting that the amount of debt these firms secured from banks was insufficient to cover all their planned investments. Only 1% of firms financed new investments with the support of private equity funds, reflecting the lack of development of Ethiopia's private equity/venture capital (PE/VC) sector, although 12% of the companies in the study reported being willing to approach PE/VC firms. About 55% of the total companies either did not know that PE/VC firms existed or did not know that one of their roles was to provide funds.

The majority of enterprises which received any debt financing dedicated about half of their debt financing to investments in industrial processes or products. Investments were typically financed with 45% of debt—mostly from banks—and the remaining 55% by the firm's own capital. Over 24% of firms reported having no interest in making growth-oriented investments.

Using an instrumental variable (IV) approach, we tested whether constraints to accessing bank credit have an impact on a firm's investment decisions and growth. The educational qualification (master's degree or higher) of the firm managers was used as an instrument for the bank credit constraint

variable. In a country like Ethiopia, where educational achievement is generally low, masters and higher educational qualifications are highly valued by banks and other institutions, releasing the credit constraint facing their firms they manage. The first stage result showed the relevance of this variable. Thus, the IV-regression results showed that being constrained in accessing credit from banks was negatively and significantly associated with firm investments. The presence of a credit constraint reduced the probability of firms increasing their investments by at least 38 percentage points. These results must be interpreted with caution as the instrument does not adjust for possible omitted variables.

Firms that used bank debt grew their capital at a rate that was 5.5% higher and their labor force at a rate that was 10.3% higher than the rates of firms without bank debt. The research confirmed that small businesses were more likely to be constrained in accessing credit from banks than larger companies. The results also show that firms located in an industrial park were less likely to face constraints on access to bank credit than firms outside a park.

Overall, the findings demonstrate how a lack of access to finance impedes firm performance and investment decisions. These results have implications for entrepreneurs as well as for policymakers wishing to address the bottlenecks of access to finance and growth-oriented investments among SMEs in Ethiopia. Also, the current industrial policy of the Ethiopian government promotes the expansion of industrial parks, and access to finance could be used as an incentive to make investments in an industrial park. Another important point is that soft information such as education is extremely important in this collateral-scarce environment.



## 1. Introduction

Facilitating access to external finance for local firms could help foster economic growth in developing countries. Many studies have shown that credit constraint is one of the major causes of income and productivity gaps between countries (Bartelsman, Haltiwanger, and Scarpetta 2000, Caselli 2005, Demirguc-Kunt and Levine 2009, Banerjee and Duflo 2014, and Midrigan and Xu 2014).

The financial context in Ethiopia is complex due to the existence of state-owned enterprises (SOEs) with preferential access to finance. As of 2016, bank credit dedicated to SOEs in Ethiopia represented 17.2% of the gross domestic product (GDP), compared to 9% of GDP directed to firms in the private sector (World Bank 2018)<sup>103</sup>. This shows that financial sector in the country remains shallow and underdeveloped. In 2016 only 16% of the private enterprises in Ethiopia accessed bank loans to finance their business activities, compared to 41% in Kenya. For this and other reasons, Ethiopia was ranked 109 out of 137 countries in terms of financial market development in the 2017-18 Global Competitiveness Report (World Bank 2018).

Ethiopian firms access external finance from formal sources, semi-formal sources, and informal sources. The formal financial sources are banks and microfinance institutions, which are regulated and supervised by the National Bank of Ethiopia (NBE). The semi-formal financial sources include savings and credit cooperatives (SACCOs), which are regulated under the Ethiopian general cooperative law and jointly supervised by the Federal Cooperative Agency (FCA) and the regional cooperative development bureaus. Such semi-formal sources of finance mainly target micro-enterprises. Informal sources of financing are diverse, but they all have in common a lack of national regulation. Informal financing may involve participation in a traditional association like an *iqub* (an ad-hoc credit union established to provide substantial funding to its members on a rotating basis) or an *idir* (an insurance association established among workers or neighbours to raise funds for financial emergencies like a funeral), obtaining loans or gifts from relatives and friends, or borrowing from traders and money lenders, for example (Woldehanna 2017).

External finance may involve equity investments, in the form of shares in ownership. Such investments may come from both formal and informal financial sources. Equity may be obtained from friends and family or private equity (PE) and venture capital (VC) firms. However, in contrast to African countries like Kenya, in Ethiopia this sector is still in its infancy. The first PE firm in the country, SGI Ethiopia, was established in 2012 and has made investments in agro-processing, manufacturing, education, and healthcare companies. Since then, a dozen PE firms have followed suit. However, only a few of these equity firms have so far been able to close significant investments. Most of them are still at the fundraising stage or working to reach deals with target companies.

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<sup>103</sup> The median amount of credit allocated to the private sector in SSA is 20%.

**Box 1: The European Investment Bank and access to finance in Ethiopia**

*Under the Impact Financing Envelope (IFE), the European Investment Bank (EIB) has been supporting many projects in Ethiopia, including an investment in Cepheus Growth Capital Partners, which has closed two investments, in ceramics and fast moving consumer goods. The EIB has also invest in Novastar East Africa Ventures, a regional fund which has an active investment in organic avocado farming activities. Additionally, the EIB supporting access to finance for Ethiopia’s female entrepreneurs through investment in microfinance institutions. The aim of the EIB in participating in such funds and microfinance activities is to help create the conditions for the growth of local SMEs and innovation. In the long term, these efforts should contribute to the implementation of the Ethiopian government’s economic strategy and to the industrialization, job creation, gender equality, and poverty reduction objectives of the EU for the country.*

Although there is a growing number of studies on the impact of finance access on company growth and growth-oriented investments in developing countries, only a few of them have been conducted in SSA countries (e.g., Fowowe 2017). Evidence remains especially scarce in Ethiopia. Furthermore, even though the two aspects of growth and productivity are related, most of these studies focused on company productivity rather than company growth and growth-oriented investments (e.g., Caselli 2005, Restuccia and Rogerson 2008, Rahaman 2011, and Fowowe 2017). Finally, the few studies that examined firm growth in developing countries remain inconclusive. While some studies found that company growth is constrained by finance in the form of internal funds such as savings (e.g., Carpenter and Petersen 2002 and Rahaman 2011), others found no relationship with access to funds when these came from an external source (Allen et al. 2012 and Beck, Lu, and Yang 2015).

The purpose of this study was twofold: 1. to identify key factors limiting the capacity of firms—in particular, manufacturing enterprises—to access debt and equity finance in Ethiopia, and 2. to identify the main determinants of firm engagement in growth-oriented investment activities.

We chose to focus our study on manufacturing enterprises. The survey was conducted in Addis Ababa and the Oromia region. We investigated the following key research questions:

- a) What are the main barriers to financial access for firms in Ethiopia?
- b) How do these barriers influence of the likelihood of making growth-oriented investments of various types?
- c) Does a lack of access to finance constrain firm growth and investment decisions?

Identifying the key constraints and barriers that hinder firms from accessing external finance from banks and the PE/VC sector could help guide the Ethiopian government as well as banks and PE/VC firms in their strategic decisions. More broadly, identifying financing issues and addressing them in a timely fashion could attract a larger number of investors (domestic and international) who would bring much-needed knowledge and capital to local enterprises in Ethiopia. Over time, this could allow Ethiopian companies to expand their business activities and play an important role in transforming the country’s economy to its full potential.

## 2. Data and Methodology

### 2.1. Survey Sample and Questionnaire

In consultation with PE firms in Addis Ababa, we decided to focus on companies that engaged in manufacturing or agro-processing activities, as these two sectors represent the major sectors in Ethiopia.

For our study, we limited our sample area to Addis Ababa and its regional state Oromia, where the Ethiopian Central Statistical Authority (CSA) regularly collects data from a total of 963 medium- and large-sized manufacturing enterprises. We were able to obtain a recent list of all the manufacturing enterprises with a minimum of 10 employees from CSA.

Initially, we planned to conduct a study of all 963 enterprises in the region using a web-based survey. However, we realized that some of the companies may lack Internet access (or an email address), and that most of them likely suffered frequent Internet interruptions. Because online surveys are uncommon in Ethiopia, we also anticipated a low response rate. Therefore, we decided to complement our web-based survey with a field survey of 190 companies that we randomly selected from our original list. All of the selected companies were willing to be interviewed, and we conducted our field survey between August and September 2019. In addition to the remaining companies listed by CSA, 500 other enterprises were invited to participate in our web-based survey through Enterprise Partners (EP)<sup>104</sup> (see Box 2).

In total, about 946 companies<sup>105</sup> were invited to take part in our SurveyMonkey online survey. The same structured survey questionnaire, which can be seen in the Annex, was used in both the web-based and field surveys to explore firms' past investment history, growth strategies, sources of financing, relationships with equity and debt finance providers, perceptions of PE/VC financing, and difficulties in accessing equity and debt finance. In particular, firms were asked whether they obtained a full bank loan for growth-oriented investments, received a partial bank loan, got their bank loan application rejected, or did not apply for any bank loans in the three years preceding the survey. If the firm did not apply, they were asked their reasons for not applying.

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<sup>104</sup> <https://enterprisepartners.org>.

<sup>105</sup> We could not find an email address for the remaining 291 companies. Moreover, as expected, we only obtained a response from 26 companies, with missing values for many variables.

**Box 2: Enterprise Partners**

*Enterprise Partners (EP) is a program funded by the UK Department for International Development (DFID) that supports the private sector (especially SMEs) in gaining access to finance and in creating jobs across various sectors in Ethiopia. EP has developed interventions to improve the capacity of lending financial institutions (e.g., microfinance institutions, capital goods financing companies, and the Development Bank of Ethiopia) to address the finance needs of SMEs. Most recently, EP has been providing technical assistance to microfinance institutions under two large-scale initiatives, namely the Women’s Entrepreneurship Development Programme (WEDP) and the SME Finance Project (SMEFP). EP has also been facilitating finance lease mechanisms as a more flexible way of financing assets for SMEs—the first of their kind in Ethiopia.*

*EP also runs a capacity-building program aimed at bridging the gap between invited enterprises and investor companies. For instance, EP runs workshops to improve deal negotiation skills among SMEs and PE and collaborates with a leading bank in Ethiopia to provide advice on private capital loans to enterprises. EP also showcases specific investment opportunities through its Investors’ Linkage Platform and supports building capacity in the investment advisory market.*

The response rate from the web-based survey was very low. Furthermore, firms with fewer than 10 employees and with incomplete information in their questionnaire responses were excluded from the analysis. After pulling together the responses from both our field and online surveys, a total of 199 firms were used in the final analysis. Of them, however, only two were identified as having already obtained PE investment in the past, and none of the companies had won an investment from VC investors.

**2.2. Data Analysis**

To examine the firms’ sources of financing and their subsequent effects on firm investments and growth, we performed both descriptive and econometric analysis. In our descriptive analysis, we used cross tabulation and analysis of variance (ANOVA) to evaluate the relationship between multiple firm characteristics. In our econometric analysis, we used instrumental linear probability and probit models to analyze the impact of bank credit constraint on firms’ growth-oriented investments. Our dependent variable was a dummy that indicated whether a firm had made any growth-oriented investments over the three years preceding the survey. The presence of a bank credit constraint, which was the main explanatory variable in our study, was assessed based on the bank credit financing that the firms reported having received over that same period. The dummy variable takes a value of 1 if the firm’s bank loan application was rejected, or if the firm received only a partial amount of its requested loan, or if the firm did not apply for a bank loan because it feared its application would be rejected, or if the firm found the cost of borrowing too high, or if it could not fulfill the bank’s collateral requirement. The dummy variable was equal to 0 if the firm obtained a full loan for growth-oriented investments in the past three years. Only 176 firms were used for the regression because 23 that did not have any plan to make growth-oriented investments and were excluded from the regression analyses.

The following general regression equation is behind our econometric analysis:

$$(1) \quad I_i = \alpha + \delta \text{bank credit constraint} + \mathbf{X}_i \beta + \epsilon_i$$

where  $I$  is a binary variable indicating our outcome of interest, whether the firm had made any growth-oriented investments over the three years preceding the survey, which is an indication of whether they are subject to credit constraints.  $X$  is a vector of other control variables that may influence the outcome variable.  $X$  includes firm characteristics such as age, size, sector, and location as well as attributes of the firm's manager and investor(s) such as work experience and nationality. The effect of the bank credit constraint on firm investment is captured by the parameter,  $\delta$ . We expected  $\delta$  to be negative, as access to finance is key for investment. However, credit constraint is an endogenous variable, as firms with poor investment opportunities may be assessed as such by banks, making them more likely to be credit constrained. At the same time, firms with poor investment opportunities would be less likely to grow, even if they could access a loan. That is, investment opportunities are an unobserved firm heterogeneity variable potentially correlated with the credit constraint variable. Hence, running a linear probability or probit model on Equation (1) will bias the true effect of credit constraints. To reduce the potential bias from such endogeneity, we used the master's or PhD education level of the firm's manager as an instrument for the bank credit constraint variable. This variable is a dummy variable which took the value 1 if the manager's education level corresponded to a master's degree or PhD, and 0 otherwise. The hypothesis that this variable may affect credit constraints directly is confirmed from the first stage regression results. However, it does not have a direct impact on firm investment as shown in Table 12. In other words, we argue that whether a manager has a master's or PhD degree or only primary school education is irrelevant to their decision to expand their firm, once they have access to finance. However, bankers may trust firm managers more if they are highly qualified, resulting in more willingness to accept their loan applications. In a country like Ethiopia where educational achievement is low on average, having an education level of a master's or above is highly valued by banks and other institutions.

We also used a propensity score matching (PSM) method to estimate the effects of bank debt on firm growth. In this study, we assessed capital and labour force growth of the firms. Our treatment variable took the value 1 if the firm had obtained bank debt in the three years preceding the survey to make growth-oriented investments. The variable took the value 0 if the firm planned to make growth-oriented investments but did not receive the necessary finance from banks. We applied the nearest neighbourhood propensity matching method to select control firms with similar characteristics to the treated firms based on their propensity score. The propensity score matching used a logistic regression in which the dependent variable was equal to 1 if the firm had obtained bank debt for growth-oriented investments and 0 otherwise. The independent variables consisted in a range of manager, entrepreneur, and firm characteristics that may affect the firm's propensity to obtain bank debt.

### 3. Results and Discussion

#### 3.1. Descriptive Analysis

##### Firm Characteristics

The average age of the surveyed companies was about 21 years; however, some companies were as old as 100 years or as young as two years (Table 1). The majority of firms were located outside an industrial park

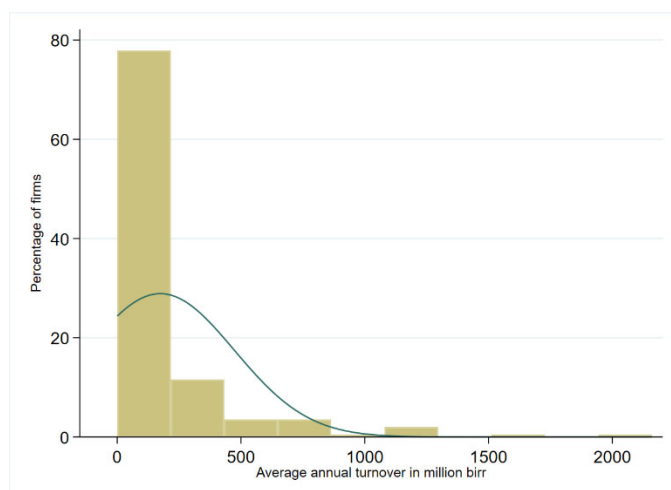
**Table 1: Enterprise Characteristics**

Company characteristics	N	Mean	Standard Deviation	Minimum	Maximum
Company age	199	21.13	18.23	2	100
Located outside industrial park	199	0.70	0.45	0	1
Number of shareholders	198	3.23	2.66	1	25
Start-up capital (million birrs)	199	25.02	113.34	0.001	1495.42
Current capital plus assets (million birrs)	199	188.86	464.77	0.5	5778.76
Previous year's capital plus assets (million birrs)	196	170.80	450.41	0	5778.76
Average monthly sales (million birrs)	199	14.52	24.86	0.02	180
Total number of current workers	199	264.65	532.07	10	4500
Total number of workers, previous year	198	266.29	543.22	10	5000

*Note: The exchange rate was about 29.44 Ethiopian birr per \$at the time of the survey.*

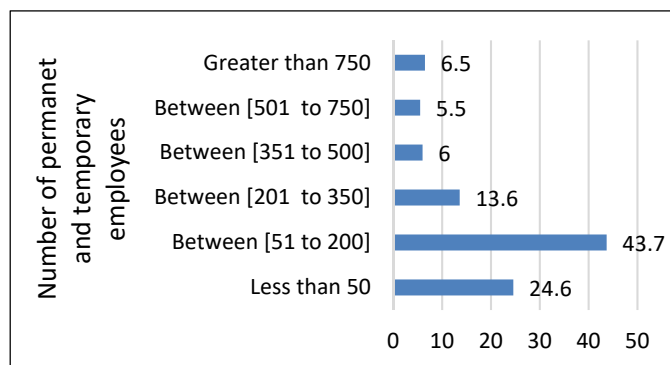
Almost 80% of firms have a yearly turnover below 250 million birrs, with only few firms exceeding 500 million birrs (Figure 1).

**Figure 1: Average annual turnover of firms**



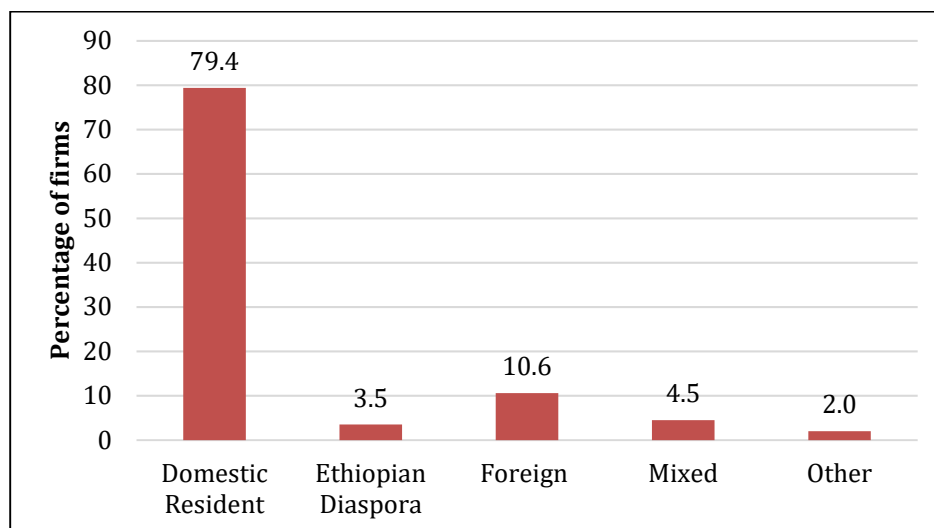
Labour force is usually used as a measure of the size of a firm (e.g., the Ethiopian CSA Survey and World Bank Enterprise Survey). As categorized by CSA, small firms have 10-30 workers, medium firms 31-100 employees, and large firms more than 100 employees. Based on this classification, our sample included 23 small firms, 65 medium-sized firms, and 111 large firms. On average, the enterprises employed about 265 permanent and temporary workers (Figure 2).

**Figure 2: Distribution of firms, by employee number**



Original investments from foreign nationals or diaspora entrepreneurs play an important role in mitigating foreign currency constraints. Besides, foreign involvement can bring additional managerial and financial skills to companies, which may then be transferred to local employees. Figure 3 shows the country of origin of the entrepreneurs who originally launched or owned the surveyed companies. In our study, about 19% of the sampled manufacturing enterprises were at least partly owned by foreigners or members of the Ethiopian diaspora.

**Figure 3: Country origin of entrepreneur/company owner**



Survey data showed that about 60% of firm owners also managed the company and only 34% of firms employed a professional manager.<sup>106</sup> This may indicate that owners in Ethiopia are reluctant to give others some control over their firm, the firms are not profitable enough to justify hiring a professional manager, or that there is a lack of suitable professionals in the Ethiopian market.

<sup>106</sup> The remaining 6% of firms did not respond to this question.

### Sources of External Finance

We asked firms what external sources of finance they had used over the past three years to cover their expenditures and make new investments. Less than a third obtained external funding. Of these, about 19% said that they had obtained finance from banks only, whereas 2.5% of firms borrowed from informal sources only (Table 2). Around 7% of firms used both formal (mainly from banks) and informal sources. Only 1% of firms got their new investments financed by PE funds, reflecting the fact that the PE/VC sector is not well developed in the country. The remaining 71% of the firms used internal funds to make new investments.

**Table 2: Firms' Sources of External Finance for New Investments (N=99)**

<b>Financial sources</b>	<b>Share of firms</b>	<b>Standard Deviation</b>
Borrowed from banks only	18.59%	0.390
Borrowed from informal sources only	2.51%	0.156
Borrowed from formal and informal sources	7.04%	0.250
Obtained funds from PE/VC firms	1.01%	0.099
Used only internal funds	70.85%	0.455



### Firms' Access to Debt Finance, Collateral Needs and Firms' New Investments

Approximately 30% of small, medium-sized, and large firms used debt to make growth-oriented investments (Table 3). The sources of external finance used differed significantly by firm size. The medium-sized and large firms had obtained more than 85% of their total debt from banks, while the small firms took just 55% of their debt from banks, obtaining about 20% of their debt from informal sources (Table 3). There was no significant difference in firm size in terms of the percentage of firms that obtained debt finance from all types of sources combined.

**Table 3: Sources of Debt Financing for New Investments, by Firm Size**

Source of debt financing	Small firms Mean [Standard Deviation]	Medium-sized firms Mean [Standard Deviation]	P-value for difference between small and medium-sized firms	Large firms Mean [Standard Deviation]	P-value for difference between medium-sized and large firms
The firm used debt capital (all types) for new investments (%)	30.43 [0.449]	27.70 [0.451]	0.804	28.82 [0.455]	0.873
The firm got a bank loan for new investments (%)	4.35 [0.344]	20.00 [0.403]	0.079*	20.72 [0.407]	0.909
Average debt (all types) for new investments (million birrs)	0.783 [1.946]	3.302 [7.888]	0.135	13.684 [46.031]	0.073*
Average bank debt for new investments (million birrs)	0.433 [1.692]	3.035 [7.319]	0.096*	11.753 [44.341]	0.118
Average debt from informal sources for new investments (million birrs)	0.154 [0.624]	0.131 [0.527]	0.862	1.603 [10.049]	0.240
Other sources (e.g Leasing)	0.196 [0.93]	0.136 [0.77]	0.76	0.328 [2.87]	0.59
Number of firms	23	65		111	

Note: The exchange rate was about 29.44 Ethiopian birr per US dollar at the time of the survey. \*\*Significant at the 5 percent level. \*Significant at 10 percent level.

We also asked firms what types of activities they had invested in (Table 4). Companies invested the largest volume of capital in improving their industrial or manufacturing processes (e.g., building a new plant, the purchase of new machinery or equipment, the acquisition of patents, licenses, or other intangible assets). The companies also spent a significant portion of their debt money on developing products and strategies (e.g., by investing in research and development or creating new marketing and communication campaigns).

The size of the investments that the firms subsequently made varied according to firm size. In fact, over the three years preceding the survey large firms invested an average of 13.5 million Ethiopian birr (\$0.4 million), while the small and medium-sized firms invested 0.8 million and 3.3 million birr. We found small investment in human resources, especially for medium-size enterprises.

**Table 4: Growth Strategies, by Firm Size**

<b>Amount invested (million birr)</b>	<b>Small firms Mean [SD]<sup>b</sup></b>	<b>Medium-sized firms Mean [SD]</b>	<b>Large firms Mean [SD]</b>	<b>P-value</b>
Amount of money invested in ICT <sup>a</sup>	0.298 [1.045]	0.096 [0.409]	0.915 [4.918]	0.344
Amount of money invested in products	4.715 [20.799]	2.580 [6.271]	10.427 [27.326]	0.064
Amount of money invested in processes	5.807 [15.873]	2.811 [5.420]	22.103 [94.230]	0.187
Amount of money invested in human resources	1.977 [9.379]	0.091 [0.270]	0.739 [4.822]	0.264

Notes: <sup>a</sup>ICT, information and communication technologies. <sup>b</sup>SD = Standard Deviation.

The 2016 World Bank's Ethiopian Enterprise Survey showed that the value of the collateral typically required by banks is about twice the value of the loans. Moreover, the difficulties associated with the need to provide collateral are greater for microenterprises and enterprises that are located away from Addis Ababa, meaning that these firms are more likely to obtain loans from informal sources (Gebreyesus et al. 2018). Consistently with previous reports, our study found that bank collateral and guarantee requirements are one of the main causes for the entire or partial rejection of loan applications (Table 5). About half of the surveyed firms reported that they could not provide collateral. In addition to this, about 22% of medium-sized and 16% of large firms did seek any bank loans due to the high cost of borrowing.

**Table 5: Reasons for Partial or Full Rejection of Bank Loans**

Reported reasons	Small firms	Medium-sized firms	Large firms
Banks considered the new investment as risky	9.00%	12.50%	13.64%
Banks considered the firm as highly indebted	18.18%	6.25%	11.36%
The firm could not provide collateral and guarantee	36.36%	50.00%	47.73%
Cost of borrowing was too high	9.09%	21.88%	15.91%
Other reasons	27.27%	9.38%	11.36%
Number of firms	11	32	44

In all, about 29% of all the responding firms (59 firms) did not apply for any bank loans to support their growth-oriented investments (Table 6). Among small and medium firms, the most common reason given for not applying was that they knew they would not satisfy bank requirements (45% and 57% of firms respectively), whereas 56% of the large firms looked for other, more flexible or cheaper financial solutions.

**Table 6: Reasons for not Applying for Bank Loans**

Reported reasons	Small firms	Medium-sized firms	Large firms
The firm knew it could not satisfy bank requirements	45.45%	57.14%	29.41%
The firm sought more flexible financial solutions	9.09%	21.43%	41.18%
The firm sought less costly financial solutions	27.27%	21.43%	14.71%
Other reasons	18.18%	0.00%	14.71%
Number of firms	11	14	34

### Firms' Access to Equity Finance and Firm's New Investments

We asked the sampled companies whether they had attracted PE/VC investments over the three years preceding the survey. Altogether, 22% of the small, 26% of the medium-sized, and 29% of the large-sized firms had used equity capital to make new growth-oriented investments over the past three years (Table 7). Almost the totality of the firms' equity investment came from personal savings accounts or was given by friends and families in exchange for shares in the business. Large firms used their own capital for growth-oriented investments, which altogether was worth 16.69 million birr (\$0.57 million), more often than did medium-sized firms. Only one medium-sized and one large firm had obtained funds for investments from PE /VC companies. Statistically, firm size had no impact on the number of firms that received equity investments or on the size of such investments.

**Table 7: Equity Financing for New Investments, by Firm Size**

Equity financing status	Small firms Mean [Standard Deviation]	Medium-sized firms Mean [Standard Deviation]	P-value for difference between small and medium-sized firms	Large Mean [Standard Deviation]	P-value for difference between medium-sized and large firms
The firm used equity capital (of any type) for new investments (%)	21.74 [0.423]	26.15 [44.29]	0.679	28.83 [0.455]	0.704
The firm secured PE/VC <sup>a</sup> equity for new investments (%)	0.00	0.015 [0.124]	0.443	0.009 [0.095]	0.192
Average equity for new investments (million birrs)	9.71 [41.62]	1.67 [6.61]	0.132	18.36 [91.57]	0.145
Number of firms	23	65		111	

Notes: The exchange rate was about 29.44 Ethiopian birr per \$ at the time of the survey. <sup>a</sup>PE/VC, private equity/venture capital.

Firms were also asked whether they had applied to equity funds to obtain capital for investments over the three years before the survey. Table 8 shows that more than 70% of the companies, independently of size and age, did not apply to equity funds, and that none of the small and medium-sized or young companies (<=10 years in the market) had directly applied to a PE/VC company. Thus, only a very small proportion of responding companies had applied to PE/VC firms, either after having had a bank loan application refused or while applying for other loans from banks simultaneously. Only 1.9% and 1.4% of large-sized and old firms, respectively, had applied directly to PE/VC funds before requesting a bank loan. About 5% of small, 13% of medium-sized, and 18% of large firms were interested in engaging with PE/VC funds; however, they could not attract them.

**Table 8: Formal Equity for New Growth Investment Financing over Last Three Years, by Firm Age and Size**

Formal equity status	Size of firms			Age of firms	
	Small	Medium	Large	Young	Old
The firm applied directly to equity investors	0.00	0.00	1.85 [2]	0.00	1.44 [2]
The firm applied to equity investors after bank refusal	9.09 [2]	1.67[1]	4.63 [5]	5.88 [3]	3.60[5]
The firm applied to both PE/VC and banks	0.00	0.00	4.63 [5]	1.96 [1]	2.88[4]
The firm applied to PE/VC to benefit from their management expertise	4.55 [1]	3.33 [2]	0.93 [1]	1.96 [1]	1.44 [2]
The firm was interested in engaging with PE/VC <sup>a</sup> companies, but not able to attract them	4.55 [1]	13.33 [8]	17.59 [19]	13.73 [7]	15.83 [22]
The firm did not apply to formal equity sources	81.82 [18]	81.97 [50]	70.37 [76]	76.47 [39]	74.82 [104]
Number of firms	22	60	108	39	104

Notes: The numbers in square brackets are frequencies?. <sup>a</sup>PE/VC, private equity/venture capital.

We asked those firms that did not apply to any formal equity funds the reasons for their decision, and the responses are summarized in Table 9.

**Table 9: Reasons for not Involving Formal Equity (PE/VC) Companies, by Firm Size And Age**

	Size of firms			Age of firms	
	Small [number]	Medium [number]	Large [number]	Young [number]	Old [number]
There is a danger to have to consolidate firm governance and lose control	0.00%	8.00% [4]	10.53% [8]	10.26% [4]	7.62% [8]
The eventual exit of PE/VC company from the firm will negatively affect its long-term stability	0.00%	12.00% [6]	18.42% [14]	12.82% [5]	14.29% [15]
We did not think that PE/VC <sup>a</sup> companies provided funds	21.05% [4]	16.33% [8]	13.16% [10]	12.82% [5]	16.19% [17]
We did not know such firms as PE/VC companies existed	78.95% [15]	61.22% [30]	56.58% [43]	64.10% [25]	60.00% [63]
Other reasons	0.00	2.04% [1]	1.32% [1]	0.00%	1.90% [2]
Number of firms	19	49	76	39	105

Notes: The numbers in square brackets are frequencies. <sup>a</sup>PE/VC, private equity/venture capital.

About 79% of small, 61% of medium-sized, and 57% of large enterprises did not apply to PE/VC firms due to a lack of knowledge about the existence or functioning of PE/VC funds. Over 21% and 16% of the small and old companies, respectively, did not realize that PE/VC companies provided funds. This suggests that workshops such as those organized by Enterprise Partners to raise awareness could play an important role in enhancing investment opportunities for PE funds in Ethiopia. Our results show that a few of the larger firms that had some knowledge of the PE market were interested not only in getting investment capital but also in benefiting from the managerial and strategic financial advice and networking opportunities offered by PE funds.

### Firm Growth

In this section, we discuss company growth—as captured by the capital and employment growth rates between 2018 and 2019—by firm age and size. Across the entire samples, on average, the younger companies demonstrated greater capital growth than did the older firms ( $p < 0.10$ ) (Table 10).

**Table 10: Capital and Employment Growth Rates Between 2018-2019 (%), by Firm Age**

Company growth	Young firm Mean [Standard Deviation]	Old firm Mean [Standard Deviation]	P-value for Mean Difference
Capital growth rate	1.922 [13.254]	0.408 [1.740]	0.092
Employment growth rate	-0.055 [0.193]	-0.001 [0.199]	0.047

On average, capital growth was higher for large companies than for small and medium-sized companies (Table 11); the difference in capital growth rate was not statistically significant, however. The reported employment growth rate was negative on average for all age groups, and small and medium companies. These results contradict previous findings for developed countries, where the younger firms were shown to drive job creation, suggesting that age, and not size, is a key determinant of employment growth (Haltiwanger 2011 and Criscuolo et al. 2014).

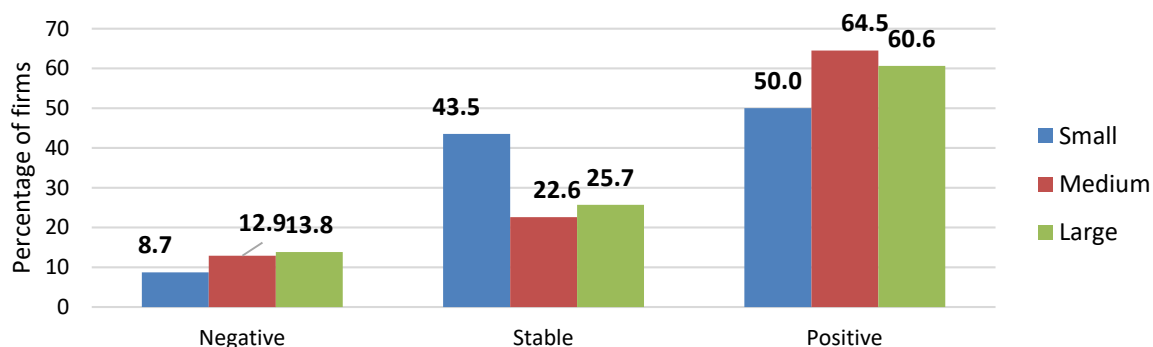
**Table 11: Capital and Employment Growth Rates Between 2018-2019 (%), by Firm Size**

Company growth	Small firms Mean [SD] <sup>a</sup>	Medium-sized firms Mean [SD]	Large firms Mean [SD]	Prob > F
Capital growth rate	0.013 [0.213]	0.272 [1.366]	1.260 [9.197]	0.560
Employment growth rate	-0.074 [0.306]	-0.026 [0.183]	0.003 [0.178]	0.213

<sup>a</sup>SD, standard deviation.

The firms interviewed exhibited the full range of declining, stable, and rising capital growth rates, but the majority of firms saw their capital grow between 2018 and 2019 (Figure 4 and Figure 5). Large and medium companies were more likely than small ones to report capital growth, with 44% of the smallest companies reporting no change, compared to just 50% who were growing (Figure 4). Around 63% of older firms reported capital growth, compared to only half of newer firms (Figure 5). About half of the large firms had increased their staff numbers, as shown in Figure 6 and Figure 7, with larger and older companies more likely to report positive employment growth.

**Figure 4: Trends in firms' capital growth, by company size**



**Figure 5: Trends in firms' capital growth, by company age**

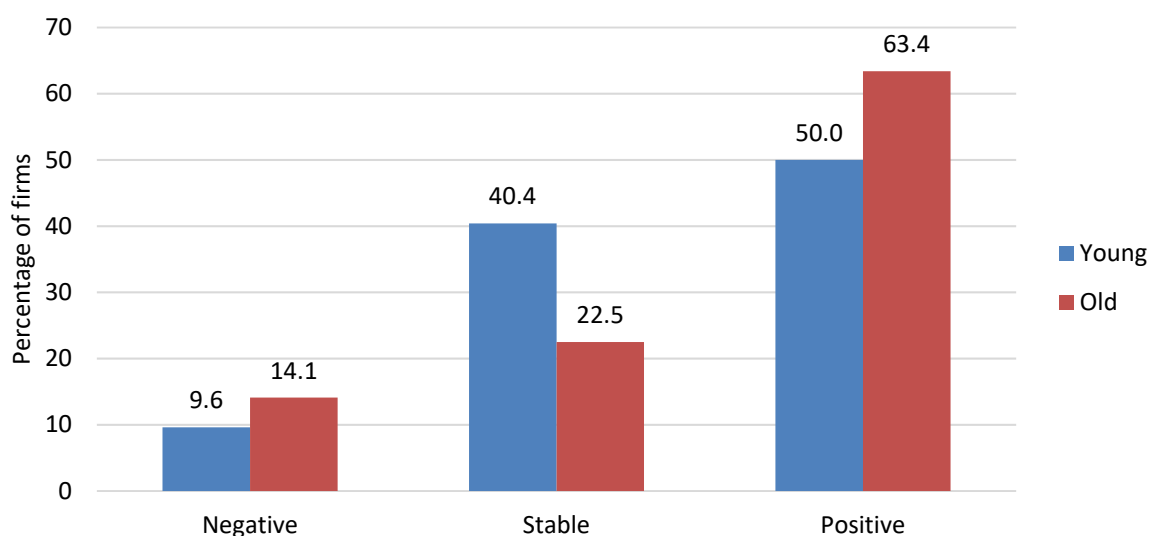


Figure 6: Trends in firms' employment growth, by company size

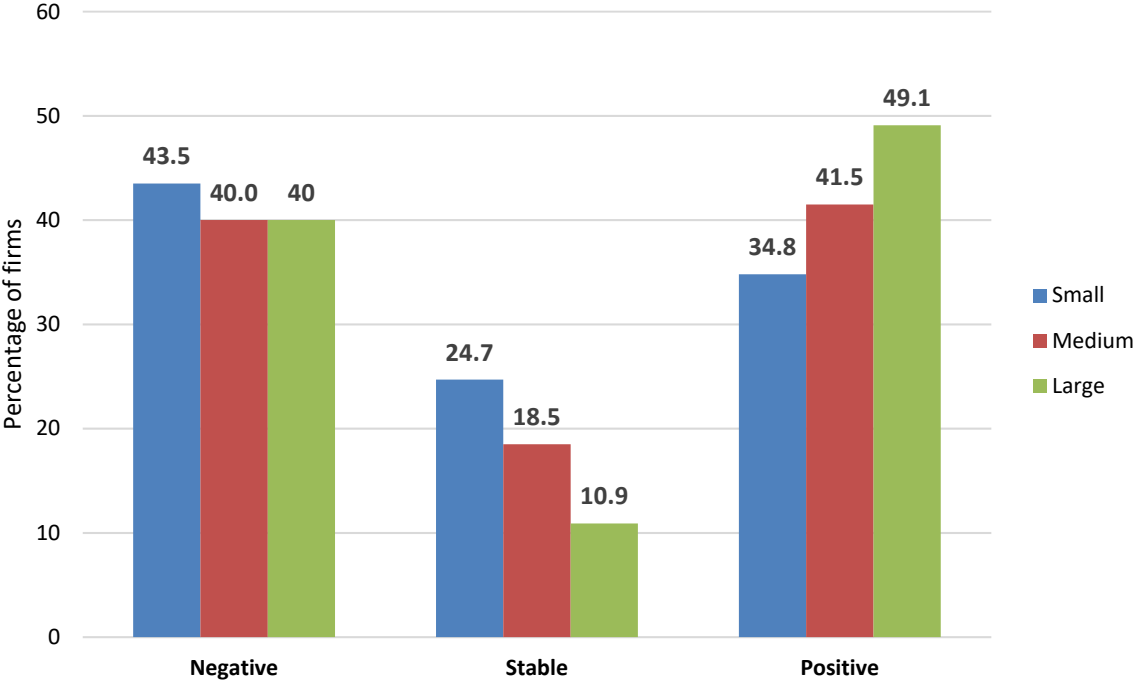
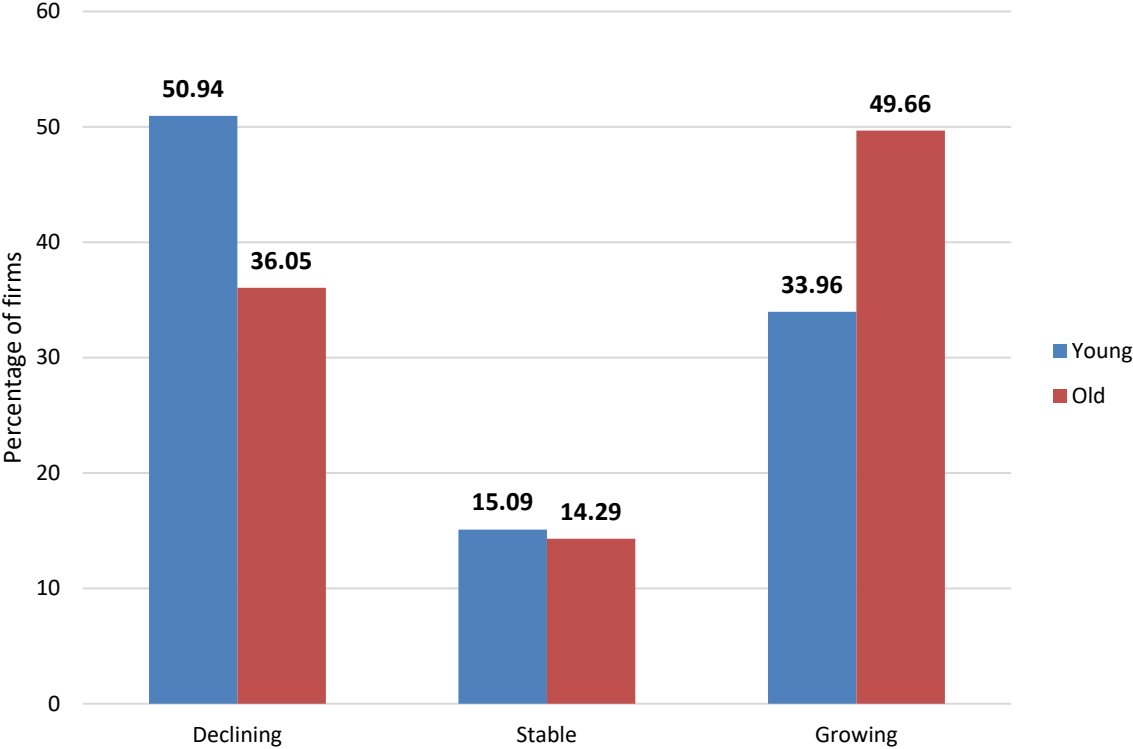


Figure 7: Trends in firms' employment growth, by age





Altogether, 10 of the sampled companies more than doubled their capital between 2018 and 2019, and were thus identified as high-growth companies. Surprisingly, four of these companies reported flat or even negative employment growth rates over the same period. Nine of the high-growth companies operated in the manufacturing/ industrial product sub-sector, and five of them were old, large-sized companies. Of note, more than 82% of all the sampled companies operated in the manufacturing and/or industrial product sub-sector, and most of the investments they had made over the three years preceding the survey, were directed to products and processes (a minimal share was invested in ICT). The fact that these companies did not increase their staffing might reflect automation of the production process, or that they economized on staff costs in order to make savings to finance investments. Five of the high-growth companies did not make any growth-oriented investments.

### **3.2. Regression Analysis**

#### **Determinants of Bank Credit Constraint and Effects on Investment**

In our econometric analysis, we used multivariate regression to study the key determinants of bank credit constraints and their impact on the likelihood of firms making growth-oriented investments. To avoid potentially biased estimates emerging from our use of the standard linear probability or probit model given the possible endogeneity of the bank credit constraint, we used the educational level of the firm's manager as an instrument for this variable. To be a valid instrument, the firm manager education level with a master's degree or above should not affect the investment variable directly but only do so indirectly, through the credit constraint variable. With only one instrument, a Sargan-Hansen test of overidentification test cannot be conducted but the first stage regression and the regression of the outcome variable on the instrument can show the relevance and exogeneity of the instrument, respectively.

We tested the statistical significance of the effects of education on investments and credit constraint in our regressions. Table 12 presents a linear probability regression of the investment variable on education, credit constraint, and other control variables. The results show that whether the firm's manager held at least a master's degree did not have a significant effect on the investment variable, controlling for the other covariates, which implies that statistical exogeneity of the instrument.

**Table 12: Testing of Direct Effect of Manager's Educational Level on Firms' Growth-Oriented Investments, Using Ordinary Least Squares**

Variables	Coef.	SE <sup>a</sup>
The manager holds a master's degree or higher educational level	0.034	0.074
Bank credit constraint	-0.342***	0.071
Medium-sized firm	0.154	0.105
Large firm	0.295***	0.104
Firm age	0.006***	0.002
The firm is located in an industrial park	0.166**	0.068
The investor is a domestic citizen (=1) or foreigner (=0)	0.179**	0.076
Managerial experience	0.002	0.004
The firm is within the manufacturing sector (1=Manufacturing/industrial sector)	-0.032	0.083
The firm is located in the Oromia region	0.109	0.093
Constant	0.18	0.15
Observations	199	
R-squared	0.328	

Notes: The dependent binary investment variable=1 if the firm made any growth-oriented investments in the past three years and 0 otherwise. <sup>a</sup>SE, standard error. \*\*\*Significant at the 1 percent level. \*\*Significant at the 5 percent level. \*Significant at the 10 percent level.

Table 13 presents the first-stage regression results of the instrumental variable regressions. The results indicate that whether the firm's manager had attained advanced educational levels significantly affected the credit constraint variable, showing the validity of our instrument.

**Table 13: First-Stage Regression of Determinants of Bank Credit Constraint**

Variables	Linear Probit Model (LPM)		Marginal Effect (Probit Model)	
	Coef	SE <sup>a</sup>	Coef	SE <sup>a</sup>
The manager holds a master's degree or higher educational level	-0.429***	0.073	-0.429***	0.071
Medium-sized firm	-0.246**	0.111	-0.246**	0.108
Large firm	-0.247**	0.108	-0.247**	0.105
Firm age	0.002	0.002	0.002	0.002
The firm is located in industrial park (cluster)	-0.178**	0.072	-0.178**	0.07
The investor is domestic (=1) or foreign (=0) citizen	-0.009	0.084	-0.009	0.081
Managerial experience	-0.003	0.004	-0.003	0.004
The firm is within the manufacturing sector (1=non-Agriculture)	0.022	0.088	0.022	0.085
The firm is located in the Oromia region	-0.107	0.099	-0.107	0.097
Constant	1.036***	0.138		
Observations	176		176	
R-squared	0.150			

Notes: <sup>a</sup>SE, standard error. \*\*\*Significant at the 1 percent level. \*\*Significant at the 5 percent level. \*Significant at the 10 percent level.

The first-stage regression results of the IV linear and probit regression presented in Table 13 show the determinants of bank credit constraint. The coefficients were the same for the linear probit model (LPM) and the marginal effects, and their standard errors differed only slightly. Both Table 12 and Table 13 show that firms with a manager holding a master's or a higher degree are about 43% more likely to get their bank loan application fully accepted. This result was consistent with our expectation that a banker is more likely to trust managers who have attained the highest education level. Characteristics inherent to the firms, such as firm size, also had an effect on the presence of a bank credit constraint. Small firms were more likely to be bank credit constrained than large and medium-sized firms. This may be explained at least in part by the fact that large and medium-sized firms are likely to be in a position to provide better collateral than small firms. Consistently, Ben et al. (2011) and Garcia-Posada (2018) found a negative relationship between firm size and the probability of facing credit constraints. Additionally, the firms that were located in an industrial park were about 18% less likely to be bank credit constrained than the firms located outside an industrial park. Today's Ethiopian government industrial policy promotes the expansion of industrial parks across the country, and access to finance may be one of the incentives encouraging entrepreneurs to establish their firms and make business investments in an industrial park. Finally, the estimated coefficient of the age of the firm was statistically non-significant. This result ran against our expectation that the older, and thus the more established, the firms were, the higher their probability of having access to bank finance.

Table 14 and Table 15 show the instrumental variable regression of the effects of bank credit constraint on a firm's growth-oriented investments. Because the number of small firms was lower (about 23), we combined them with medium-sized firms to have a reasonable variation in separate

regressions. In all of the regressions, credit constraint had a negative and significant effect on a firm's growth-oriented investments, which was consistent with previous studies (Garcia-Posada, 2018). The probit model indicated that the presence of a credit constraint reduced the probability of investment by 36 percentage points, significant at the 1% level. This IV regression coefficient is higher by 33% in absolute value than OLS regression coefficient of the variable as shown in the annex (Table A1), which implies that OLS regression understates the coefficient of the variable in absolute value.

It is important to note, however, that our results may be affected by our lack of data on firms that may have shut down or have not entered the market to start with because of the impossibility to obtain financing for their investment projects, which may understate the magnitude of the coefficient in absolute value. Finally, our results might show that large firms were more likely to make growth-oriented investments than small firms, but there was no significant difference between small and medium-sized firms.

**Table 14: Instrumental Variable Regression of The Effect of Bank Credit Constraint on Firms' Investments**

Variables	IV-LPM <sup>a</sup>		Marginal Effects (IV-Probit)	
	Coef	SE <sup>b</sup>	Coef	SE <sup>b</sup>
Bank credit constraint	-0.417**	0.171	-0.360***	0.107
Medium-sized firm	0.172	0.12	0.181	0.128
Large firm	0.298**	0.121	0.279**	0.133
Firm age	0.006***	0.002	0.006***	0.002
If the firm is located in industrial park	0.130*	0.078	0.111	0.075
If the investor is domestic (=1) or foreign (=0) citizen	0.148*	0.085	0.130*	0.075
Managerial experience	0.002	0.004	0.003	0.004
The firm is within the manufacturing sector (1=non-Agriculture)	-0.023	0.089	-0.019	0.08
The firm is located in the Oromia region	0.109	0.1	0.096	0.092
Rho				
Ln(sigma)				
Constant	0.271	0.207		
Observations	176		176	
R-squared	0.275			

Notes: Investment=1 if the firm had made growth-oriented investments in the past three years and =0 otherwise. Instrument: The manager has an educational level equivalent to a master's degree or above. <sup>a</sup>LPM, linear probit model. <sup>b</sup>SE, standard error. \*\*\*Significant at the 1 percent level. \*\*Significant at the 5 percent level. \*Significant at the 10 percent level.

In Table 15, we have examined whether the effects of the credit constraint variable differed by firm size. Both the linear probability and the Probit models showed that the effects of credit constraint differed according to the size of the firm. In the Probit model, presence of a credit constraint reduced

the probability of increasing investment by 49 percentage points for the medium-sized firms and 31 percentage points for the large firms.

**Table 15: Instrumental Variable Regression of Effects Of Bank Credit Constraint on Firms' Investments, by Firm Size**

Variables	IV-LPM <sup>a</sup> Estimates				IV Probit Marginal Effects			
	Medium Firms		Large Firms		Medium Firms		Large Firms	
	Coef.	SE <sup>b</sup>	Coef.	SE <sup>b</sup>	Coef.	SE <sup>b</sup>	Coef.	SE <sup>b</sup>
Bank credit constraint	-0.781**	0.354	-0.345*	0.194	-0.489***	0.053	-0.307**	0.122
Firm age	0.003	0.003	0.006***	0.002	0.002	0.003	0.007***	0.002
If the firm is located in industrial park	0.178	0.115	0.1	0.106	0.142	0.155	0.063	0.093
If the investor is domestic (=1) or foreign (=0) citizen	-0.1	0.124	0.264**	0.126	-0.084	0.085	0.200**	0.096
Managerial experience	0	0.007	0.003	0.006	0	0.006	0.002	0.005
The firm is within the manufacturing sector (1=non-Agriculture)	-0.045	0.092	-0.045	0.169	-0.04	0.086	-0.03	0.136
The firm is located in Oromia region	-0.033	0.152	0.192	0.133	-0.029	0.14	0.184	0.118
<i>rho</i>								
<i>Insigma</i>								
Constant	0.956**	0.387	0.429*	0.22				
Observations	77		99		77		99	
R-squared	0.53		0.075					

Notes: Investment=1 if the firm made growth-oriented investments in the past three years and =0 otherwise. <sup>a</sup>LPM, linear probit model. <sup>b</sup>SE, standard error. \*\*\*Significant at the 1 percent level. \*\*Significant at the 5 percent level. \*Significant at the 10 percent level.

### Impact of Bank Debt on Firm Growth

The nearest neighbourhood propensity matching method was used to investigate the impact of bank debt on firm growth, which was measured both in terms of capital and labour force. Firms were classified as treatment firms (the firms that obtained bank debt) or control firms (the firms that did not obtain bank debt but had a plan to make growth-oriented investments). We dropped 23 firms which did not apply for bank loans and had no plan to make growth-oriented investments.

When using a propensity matching approach, it is crucial to first establish whether the treated and control variables are balanced with respect to observed firm characteristics. After matching our treated and control firms based on the characteristics listed in Table 13, we obtained 37 treated firms matched with 134 untreated firms. None of the treated and control firms were outside the common support. A test of balance of the treated and control firms was conducted using variables capturing firm, entrepreneur, and manager characteristics (Table 16). We calculated that if the variance ratio of

the treated to the control firms (V(T)/V(C)) was outside the 0.51-1.94 range, then the matched treated and control firms would not be balanced with respect to the variable. The results show that the control and treatment firms were balanced with respect to most of the variables, except the current capital of the firm.

**Table 16: Test of Balance between Control and Treatment Firms**

Mean			t-test			V(T)/V(C)
Variable	Treated	Control	% bias	t	p > t	
<b>Manager and Entrepreneur Characteristics</b>						
Educational level (=1 if master's degree or above)	0.52	0.15	18.3	0.67	0.503	
Years of manager's experience	16.24	19.5	-40.90	-1.71	0.091	0.86
Manager's gender (= 1 if male)	0.95	0.95	0.0	-0.0	1	
If the manager was recruited	0.35	0.32	5.7	0.24	0.80	
If the entrepreneur is a domestic resident	0.91	0.94	-7.7	-0.46	0.64	
<b>Firm Characteristics</b>						
Firm age	24.2	26.1	-10.5	-0.45	0.64	
Current firm capital	170.7	169.5	0.03	0.98	0.24	2.69*
Current workers at the company	267.05	188.16	19.7	1.56	0.12	1.86
If the legal ownership of the firm corresponds to a partnership	0.05	0.08	-10.2	-0.46	0.64	
If the company is a private limited firm	0.54	0.62	-16.1	-0.70	0.47	
If the company is a share company	0.05	0.05	0.0	0.0	1.00	
If the legal ownership of the firm is cooperative in nature	0.00	0.00				
If the legal ownership of the firm is public in nature	0.03	0.03	0.00	0.00	1.00	
Firm location	0.64	0.62	5.8	0.24	0.812	

Notes: The treatment consisted in having received a bank loan. \* The variance ratio was outside the 0.51-1.94 range.

Given these balance test results, Table 17 and Table 18 show the average treatment effects on the treated (ATT) of receiving a bank loan on the firms' labour force and capital growth, respectively. The ATT of bank loans on the growth of labour force was 10.3% per annum. This means that the labour force of firms that used bank debt capital grew at a rate that was 10.3% higher than that of firms that

did not use bank debt capital but had a plan to make growth-oriented investments. The latter firms did not use bank debt capital either because their loan application was rejected or because they did not apply out of fear of rejection or lack of collateral. Moreover, the capital of firms that used bank debt grew 5.5% more per year than that of firms that did not use bank debt. This may seem inconsistent with the result in the descriptive statistics that firms expend their capital more on processing than on human resources. This could be explained by the fact that the descriptive result is based on all sources of finance including own capital. Further, the descriptive result also does not control for the effect of other factors. Overall, based on this result, obtaining a bank loan was correlated with labour force and capital growth.

**Table 17: Effect of Access to Bank Loans on Labor Force Growth, as Measured by Propensity Matching Approach**

Variable Sample	Treated	Control	Difference	SE <sup>a</sup>	T-stat
Average treatment effects on the treated	0.036	-0.067	0.103**	0.044	2.020
Average treatment effects on the untreated	-0.026	0.022	0.049		
Average treatment effects			0.061		

Notes: <sup>a</sup>SE, standard error. \*\*Significant at the 5 percent level.

**Table 18: Effect of Access to Bank Loans on Capital Growth, as Measured by Propensity Matching Approach**

Variable Sample	Treated	Control	Difference	SE <sup>a</sup>	t-statistics
Average treatment effects on the treated	0.147	0.092	0.055**	0.025	2.2
Average treatment effects on the untreated	0.367	0.131	-0.235		
Average treatment effects			-0.08		

Notes: <sup>a</sup>SE, standard error. \*\*Significant at the 5 percent level.

Previous studies on the impact of external capital on firm growth have yielded mixed results, with some showing an inverse relationship and others finding no effect. For example, using data from the 2011 and 2015 World Bank's Ethiopian Enterprise Survey, Regassa (2017) found that firms that use external finance sources have about 6% less sales growth over the following three-year period than firms that are financing their capital entirely from internal sources. This suggests that the Ethiopian firms that borrow capital may use most of their loans to cover the firm's financial losses. On the other hand, Allen et al. (2012) and Beck, Lu, and Yang (2015) found no relationship between access to external funds and firm growth in other developing countries. One possible explanation for these previous findings is that in countries with weak regulations for financial institutions, external finance may primarily be allocated to politically well-connected firms with a low marginal return to capital. Alternatively, firms may use the loans to cover expenditures that are not aimed at expanding their capital, including the personal expenditures of owners and managers.

## 4. Conclusions

In this study, we identified the main demand-side constraints that Ethiopian firms face in accessing finance from external providers of debt and equity, and how a lack of access to external finance can limit their growth. To this end, an enterprise survey was conducted in Addis Ababa and the Oromia region between August and September 2019 through a field and a web-based approach using the same questionnaire. A total of 199 companies were interviewed and their responses used in the analysis.

Our survey results show that around one-third of the company managers were educated to the level of a bachelor's degree or above. About 80% of the companies were owned by Ethiopians (domestic residents), and about 75% of the selected companies were either private limited or sole proprietorship companies. Only a small fraction of the companies were shareholding companies.

About 45% of the funds that firms invested in growth-oriented strategies came in the form of debt and the remaining 55% in the form of equity. Most of the debt was provided by banks (both private and state-owned banks), while most of the equity funds were taken from the firms' own capital as retained earnings. Only two of the firms interviewed had obtained investment from PE companies. Both medium-sized and large firms used or considered using informal credit sources to finance growth-oriented investments. These results were consistent with World Bank findings that in the absence of an efficient financial market, firms rely heavily on internal funds and informal sources such as family and friends (World Bank 2015).

More than 70% of companies did not apply to formal equity funds of any kind, most of them due to a lack of knowledge about PE/VC firms. Over 12% of companies did not think that PE/VC companies provided funds. These results imply that a lack of knowledge is one of the demand-side constraints hindering companies from accessing capital from PE/VC firms. Only 12% of companies showed a willingness to involve PE/VC firms. The companies that apply may have more than capital to gain, as PE investors can bring new management skills, financial control systems, and a network that can help raise the reputation of investee companies.

The majority of firms surveyed saw their capital grow compared to the previous fiscal year, while employment in most firms was declining or stagnant. While, on average, the firms' capital was growing, not all of the firms reported having made growth-oriented investments in the three years preceding the survey. For example, some firms did not invest due to insufficient revenues or assets, while some other firms did not have any interest in making growth-oriented investments. Many firms, including some who had made growth-oriented investments, reported that their growth was limited by access to finance. About 44% of firms reported that the inability to borrow sufficient funds had prevented them from making all or part of their desired growth investments in the previous three years.

Our results also suggest that the firms that obtained bank debt saw their labor force and their capital grow at 10.3% and 5.5% higher rates than the rates of the firms that did not use any debt capital, respectively. This finding highlights the importance of external finance in enhancing firm performance.

This study is not without limitations. First, our survey had limited coverage both in terms of geographic areas and firm types, so the findings should not be generalized to the entire private sector in Ethiopia. Second, we could not differentiate permanent and temporary employees in our data, which may obscure the definition of firm size and skew our results. Moreover, the findings of the econometric



analysis should be interpreted with caution, as an exclusion restriction of the instrumental variable might be violated, i.e., the education variable which was used as an instrument may not satisfy the strict exogeneity assumption although it satisfies the relevance assumption. Finally, further studies are warranted to better identify the different types of capital that firms may be looking for, namely debt versus equity/quasi-equity, short-term versus long-term finance, and funds in foreign or local currency. Furthermore, future research could shed light on the different ways that companies want to use the capital.

Our study may have important policy implications. Although the government of Ethiopia has been implementing various measures to foster the development of the private sector in the country, our results generally suggest that policymakers should be concerned about the lack of access to external finance for private companies. The government should create a more conducive business environment by removing the bureaucratic barriers to investments. Raising awareness of the advantages of cooperation with PE/VC funds and helping relevant firms access funding from these funds could also pay off in supporting private sector development.

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## Annex A: Additional Tables

**Table A1: OLS Regression of the effect of Bank Credit Constraint on Firms' Investments**

VARIABLES	Coef.	SE
Bank credit constraint	-0.296***	0.071
Medium-sized firm	0.204*	0.112
Large firm	0.335***	0.110
Firm age	0.006***	0.002
If the firm is located in industrial park	0.150**	0.073
If the investor is domestic (=1) or foreign (=0) citizen	0.148*	0.084
Managerial experience	0.003	0.004
The firm is within the manufacturing sector (1=non-Agriculture)	-0.030	0.088
The firm is located in the Oromia region	0.114	0.099
Constant	0.161	0.150
Observations	176	
R-squared	0.288	

Significance \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

## Annex B: Survey Questionnaire

### Section A: General Information

Var Name	Question	Answer code	Answer
1	Enterprise ID		____
2	Enterprise Name		____
2a	Please select the most appropriate industry sector category that your enterprise/company belongs to	1. Agro-Processing/Agri-business 2. Manufacturing/Industrial product 3. Services 4. Import and export 5. Energy 6. Construction 7. Health 8. Information & communication technology (ICT) 9. Other (Specify)_____	
2B	Physical address of the company		
3	Region	1. Addis Ababa 2. Oromia 3. Amhara 4. Tigray 5. SNNP 6. Benshangul-Gumuz 7. Somalia 8. Afar 9. Harer 10. Diredawa	____
4	City		____
5	Subcity		____
6	Wereda		____
6_1	GPS coordinates	Lat	Lon
6_2	Name of enumerator		____
7	Name of the respondent		
8	Respondent's position	1. CEO 2. Owner/Manager 3. Vice Manager 4. Production Manager 5. Finance/Accounts manager 6. Marketing Manager 7. Spouse of the owner 8. Employee 9. Other Specify)_____	____

**Section B: Entrepreneur/Owner Characteristic**

Var Name	Question	Answer code	Answer
9	Name of enterprise entrepreneur /owner		____
10	Who is the General Manager of the enterprise is	1. Owner of the enterprise 2. Recruited personnel 3. Family Member 4. Other (specify)	____
11	Is the manager a professional?	0=No; 1=Yes	
12	General manager's experience in Business Management position (in Years)		____
13	Gender of the General manager is	0=Female 1=Male	____
14	Level of education of the General manager?	1. Primary 2. Secondary 3. Diploma 4. Degree 5. Master 6. PHD and above	____
15	The entrepreneur is	1. Domestic Resident 2. Ethiopian Diaspora 3. Foreign (non-Ethiopian origin) 4. Other 5. Mixed	____
16	Does the entrepreneur/owner's family members have engaged in similar business?	0=No; 1=YES	

**Section B: Entrepreneur/Owner Characteristic**

Var Name	Question	Answer code	Answer
17	How old is the company? (in years)		____
18	Legal ownership form of the company	1. Sole proprietorship 2. Partnership 3. Private Limited 4. Share company 5. Cooperatives 6. Public 7. Other (specify)	____
19	Owners of the enterprise	1. Family members 2. Shareholders 3. Single businessman/woman 4. Other (specify)	
20	Number of owners/shareholders		____
21	Location of the enterprise	0. Industrial park/cluster 1. Outside the industrial park	____
22	How much was the startup capital of the enterprise if the entrepreneur started from scratch? If inherited/bought, how much was the estimated value of the business when acquired? (In Birr)		____
23	Current total estimated total Capital including assets in Birr		____
24	What is the company's total capital including assets in the previous fiscal year		____
25	Current total number of workers		____
26	Total number of workers in the previous year		
27	What is the average monthly sales of the enterprise in BIRR?		____

**Section D: The firm’s Growth strategies**

28. During the last three year has your firm made any new investment or expenditure intended to result in growth?

Yes       No      (go to Q33)

29. What was the total amount in BIRR? BIRR \_\_\_\_\_

30. In the last three years, how much of new investments and growth-oriented expenditures were made by your firm in the following expenditure categories?

<p><b>ICT</b> (e.g., Hardware/software; Internet/Intranet/Extranet; and other ICT investments)  <b>Birr</b> _____</p>
<p><b>PRODUCT</b> (e.g., Research &amp; Development; improving the quality of existing products; creation of new products; marketing &amp; communication and Other investments on products)  <b>Birr</b> _____</p>
<p><b>PROCESS</b> (e.g., New plant; new machinery &amp; equipment; patents, licenses or other intangible assets; increasing efficiency (by reducing inputs or labour); quality certifications; reduction of environmental impact; and Other investments in process)  <b>Birr</b> _____</p>
<p><b>HUMAN RESOURCES</b> (e.g., Training courses; promoting advancement in management education; improving the “working environment”; and Other Investments in HR)  <b>Birr</b> _____</p>

**Section E: The Financing of New Growth Strategies**

31. How much was obtained through **DEBIT** financing for the new investments and expenditures in the last three years?

*[Then please indicate in percentage terms how much financing was obtained through each subcategory of financing].*

<b>DEBT FINANCE:</b> Total amount in Birr _____		
1	Long-term bank loans (%)	
2	Short and medium-term bank loans (%)	
3	Government-guaranteed bank loans (%)	
4	Leasing (%)	
5	Fiscal facilities (%)	
6	Other long term financial liabilities (%)	
7	Other short and medium-term financial liabilities (%)	
8	Borrowing from families or friends (%)	



32. How much was obtained through **EQUITY** financing for the new investments and expenditures in the last three years? *[Then please indicate in percentage terms how much financing was obtained through each subcategory of financing.]*

EQUITY FINANCE: Birr _____		
1	Own capital (%)	
2	Equity transferred to banks and other traditional investing institutions (%)	
3	Equity transferred to PE and VC investors (%)	
4	Equity transferred to individual investors (family, friends, acquaintances, etc.) (%)	
5	Government capital transfers through business supporting policies and incentives (%)	

33. Did an inability to borrow sufficient funds prevent the firm from making all or part of the desired growth investments and expenditures in the last three years?

Yes       No

34. Could you please explain why your firm made no new growth investments or expenditures by indicating which of the following statements best describes your situation?

- The firm does not have sufficient revenues or assets to support new growth investments and expenditures, and it does not believe that it can raise the required funds through external fund providers.
- The firm has sufficient revenues to support new growth investments and expenditures but prefers to retain these resources for future operational expenditures.
- The firm is still consolidating its position and finds it premature to launch any new growth-oriented strategy.
- For the time being, the firm has no interest in expanding production, changing processes or exploiting new markets.
- Others (Specify) \_\_\_\_\_

35. If you were offered 5million Birr for investment, what would you do the most? (Give only one answers)

- Expand the business geographically.
- Improve the technology infrastructure.
- Launching a new product.
- Increase human resource.
- Others (Specify) \_\_\_\_\_

### Section F: The relationship with Debt Finance Providers

36. Which of the following statements best describes the relationship between your firm and banks as concerns the financing of new growth investments and expenditures made in the last three years?

- Banks provided us with all the funds we requested from them.
- Banks refused to provide the requested funds.
- Banks provided only partial funding.
- The firm did not apply to banks for financing. (Go to Q38).

37. In those cases where banks have provided none or only part of the requested amounts, what was the main reason that the funds were not provided?

- Banks considered the firm's growth project to be too risky according to their operational standards.
- Banks considered the firm was already over-exposed in terms of bank loans and additional borrowing would have badly damaged its solvency rate.
- Banks asked for additional guarantees that the firm could not provide.
- The cost of debt was at too high a level and the firm decided to forgo a bank loan.
- Others (Specify) \_\_\_\_\_

38. If your firm has not applied to banks in order to finance last year's new growth investments and expenditures; could you please explain why by selecting one of the following statements?

- The firm knew in advance that it could not meet the Bank's loan requirements.
- The firm was seeking more flexible financial solutions.
- The firm was seeking less costly financial solutions.
- Others (Specify) \_\_\_\_\_

39. As concerns the financing of new growth investments and expenditures made in the last three years, which of the following statements best describes the decision to seek financing from debt finance providers other than banks?

- The firm applied directly to other debt finance providers rather than banks.
- The firm applied to other debt finance providers after a previous refusal from traditional banking institutions.
- The firm did not apply to other debt finance providers.

**Section G: Own Resources**

40. In those cases where the firm's own resources have not or have only partially contributed to the funding of the last three years new growth strategies, what was the main reason for that?

- Firm's own resources were simply insufficient to finance the planned new investments.
- The firm's own resources, though sufficient to finance all or part of last year's new investments, were retained for other operational or precautionary reasons.
- Others (Specify) \_\_\_\_\_

**Section H: The Relationship with Equity Finance Providers**

41. Which of the following statements best describes the relationship between your firm and external "formal" equity providers, such as PE/VC funds, regarding the financing of last year's new growth investments and expenditures?

- The firm applied directly to formal equity investors.
- The firm applied to formal equity investors after banks (and other debt finance providers) refused to finance its project(s).
- The firm strategically applied to PE/VC investors in order to have them to co-fund its growth strategies together with banks or other debt finance providers.
- The firm strategically applied to PE/VC investors in order to benefit from their involvement in the management of the firm.
- The firm was interested and willing to involve PE/VC investors but was unable to attract such an investment.
- The firm did not apply to formal equity investors at all.

42. If your firm refrained from involving formal investors such as PE/VC funds in the financing of its growth strategies, could you please indicate the main reason for your decision?

- Opening ownership to third parties such as PE/VC funds, whose involvement in the firm goes beyond the supply of financing, has been viewed as a possible danger to consolidated governance and firm control.
- PE and VC funds are guided purely by financial consideration and eventually, they will exit from their investment. This was perceived as negatively affecting the firm's long-term stability.
- We did not think that formal equity providers such as PE/VC funds would provide funds to our firm, taking our firm's size and sector of activity into account.
- Did not know such firms as PE/VC existed.
- Others (Specify) \_\_\_\_\_

43. In those cases where informal, individual investors, such as family members or friends, took part in financing last year’s new growth investments and expenditures through equity, what was your main reason for seeking their involvement?

- The firm applied to them in order to overcome the difficulties encountered in getting financial resources from traditional fund providers.
- The firm sought to reduce its exposure to external fund providers by involving individual investors in the financing of new growth strategies.
- Family members and friends were involved in order to allow them an active and operational role in the firm’s management and governance.
- Others (Specify) \_\_\_\_\_

**Section I: A Glance at Future Growth Strategies**

44. Has your firm planned new growth investments and expenditures for next year?

- Yes       No      (Q47)

45. In which of the following indicated sectors you want to invest? *[Please select the main sector (ICT, PRODUCT, PROCESS, HUMAN RESOURCES) for which next year’s growth investments or expenditures will be made.]*

- ICT** (e.g., hardware, software, internet/intranet/extranet, and other ICT investments).
- PRODUCT** (e.g., research & development, improving the quality of the product, creation of a new product, marketing & communication, etc.).
- PROCESS** (e.g., new plant, new machinery & equipment, patent licenses, increasing efficiency, reductions of environmental impact, quality certificate, and other investments in process).
- HUMAN RESOURCE** (e.g., training, promoting advancement in management education, improving the working environment, other investment in HR).

46. How is your firm planning to finance next year’s new growth investments and expenditures? *[Please indicate whether your firm is planning to finance next year’s new growth investments and expenditures through debt, equity or both and then select – where possible – the specific financing tool(s) that are likely to be used.]*

46a: DEBT		
1	Long-term bank loans	
2	Short and medium-term bank loans	
3	Government-guaranteed bank loans	
4	Leasing	
5	Fiscal facilities	
6	Other long term financial liabilities	
7	Other short and medium-term financial liabilities	
8	Borrowing from families or friends	

46b. EQUITY		
1	Own capital	
2	Equity transferred to banks and other traditional investing institutions	
3	Equity transferred to PE and VC investors	
4	Equity transferred to individual investors (family, friends, acquaintances, etc.)	
5	Government capital transfers through business supporting policies and incentives	

### Section J: SMEs Constraints

47. Have you ever faced a problem in raising capital for a new business?

Yes       No      (proceed to Q50)

48. Rate the problems you have faced in raising **equity capital** (self and individuals sources).

	<i>(1 = No Problem, 5 = Great Problem)</i>				
Funds are insufficient to meet the requirements	1	2	3	4	5
Difficult to convince them as there is a lack of trust	1	2	3	4	5
Cost of funds is high	1	2	3	4	5
Process is time consuming	1	2	3	4	5
Collateral/guarantee is required	1	2	3	4	5
Excessive paper work	1	2	3	4	5
References/assurances are required	1	2	3	4	5
Chances of obtaining finance are low	1	2	3	4	5

49. Rate the problems you have faced in raising **debt capital** (Banks and Financial institutions)

	<i>(1 = No Problem, 5 = Great Problem)</i>				
Funds are insufficient to meet the requirements	1	2	3	4	5
Difficult to convince them as there is a lack of trust	1	2	3	4	5
Cost of funds is high	1	2	3	4	5
Process is time consuming	1	2	3	4	5
Collateral/guarantee is required	1	2	3	4	5
Excessive paper work	1	2	3	4	5
References/assurances are required	1	2	3	4	5
Chances of obtaining finance are low	1	2	3	4	5

50. Do you have a new business idea (or expanding your business), which requires funds?

Yes       No      (end of the survey)

51. How much funds would you require in Birr? Birr \_\_\_\_\_

52. Do you feel it would be easy to raise capital?

Yes       No

53. Venture Capital can fund risky and new ideas without any guarantee. Have you heard of venture capital?

Yes       No

54. Have you approached or availed Venture Capital funds for financing your business requirements?

Yes       No

55. What problems did you face/perceive with Venture Capital Funds? Kindly rate the following

<i>(1 = Strongly Disagree, 5 = Strongly Agree)</i>					
Venture capitalist are unapproachable	1	2	3	4	5
Venture capital is a costly source of raising capital	1	2	3	4	5
Lack of control on the business decision as VC interfere in business decisions	1	2	3	4	5
Venture capital finances only high technology firms	1	2	3	4	5
Confidentiality is lost as business plans have to be to the disclosed venture capitalist	1	2	3	4	5
Funds requirement for the new venture are too small for Venture Capital funding	1	2	3	4	5
Negotiations with venture capitalist are time-consuming	1	2	3	4	5
Chances of obtaining finance from Venture Capital is low	1	2	3	4	5

56. The venture capitalist can provide assistance to the entrepreneur in various forms. The list given below shows the various methods by which a venture capital fund can provide help. Kindly rate their importance for your business.

<i>(1 = No important, 5 = Very important)</i>					
Venture capital can provide funds for business	1	2	3	4	5
Association with a venture capital can improve the brand image of your company	1	2	3	4	5
VC provides help in strategic Planning	1	2	3	4	5
VC can provide help in marketing your products/services	1	2	3	4	5
VC fund can provide technical assistance	1	2	3	4	5
VC fund can help in raising funds from other sources	1	2	3	4	5
VC fund can provide operational help	1	2	3	4	5
VC fund can assist in manpower recruitment and training	1	2	3	4	5
VC provides assistance to improve corporate governance	1	2	3	4	5

**Section K: General questions**

57. To what extent the following conditions are affecting your company? Rate the conditions.

<i>(1= a lot negatively; 2= somewhat negative; 3= No impact; 4= somewhat positive; 5=a lot positively)</i>					
Shortage of foreign exchange	1	2	3	4	5
Custom procedures and regulation or government bureaucracy	1	2	3	4	5
Corruption	1	2	3	4	5
Inflation	1	2	3	4	5
Tax burden	1	2	3	4	5
Access to finance	1	2	3	4	5
Bad road infrastructure	1	2	3	4	5
Power outage (interruption)	1	2	3	4	5
Frequent policy changes and policy uncertainty (predictability of economic policy)	1	2	3	4	5
Insecurity and political instability	1	2	3	4	5







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Cycle 2



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© European Investment Bank, 11/2020 EN

ISBN 978-92-861-4843-9