Supply-Side Innovations to Increase Equitable Access to Digital Financial Services: Experimental Evidence from Mozambique

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Acknowledgments and Declaration of Interests

This study was registered in the AEA RCT Registry, RCT ID AEARCTR-0003987. Link to registration: https://www.socialscienceregistry.org/trials/3987. The study was approved as non-human subjects research by the Harvard University Institutional Review Board (Protocol No: IRB18-1926). We are grateful to Jonathan Greenacre, Fatima Zahra, Nishith Prakash, and seminar participants at the 2021 NEUDC Conference for their comments and feedback. The findings, interpretations, and conclusions expressed in this paper are entirely those of the authors. Declarations of interest: none.

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Author Contributions

MK: Data curation; Formal analysis; Writing - original draft; Writing - review & editing. CB: Data curation; Investigation; Project administration; Writing - review & editing. MH: Conceptualization; Funding acquisition; Investigation; Methodology; Project administration; Supervision; Writing - review & editing. MM: Conceptualization; Formal analysis; Funding acquisition; Investigation; Methodology; Supervision; Writing - original draft; Writing - review & editing. All authors agreed to be accountable for all aspects of the work. All authors had full access to the study data and have accessed and verified the data over the course of the study period.

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Abstract

Access to digital financial services has expanded in sub-Saharan Africa, but this expansion may not be distributed equitably. Improved access may require increased engagement with traditionally under-served groups, particularly women. In collaboration with M-Pesa in Mozambique, we worked with Telephonic Sales Representatives (TSRs) to target outreach efforts towards populations that are less likely to utilize mobile money accounts. TSRs were divided into teams by gender and were trained to support clients with opening M-Pesa accounts after clients had purchased a SIM card. We randomized the market that male or female TSR teams were sent to each day. Midway through the intervention, we introduced incentives for enrolling women in rural areas into M-Pesa. We assessed the impact of gendered outreach and incentives on new SIM card registrations and clients enrollment into M-Pesa accounts. Although female TSR teams registered fewer clients to SIM cards relative to male TSR teams, they were more successful at converting clients to M-Pesa, resulting in similar overall M-Pesa enrollments. Introducing incentives to engage with female clients in remote areas also increased overall M-Pesa enrollment rates, particularly among female TSR teams. We find that supply-side innovations can be effective in increasing digital service access and utilization.

Keywords: mobile money; digital financial services; M-Pesa; gender; financial inclusion; Mozambique

JEL Codes: J13, J16, O15, O33, I15, Z13.

1 Introduction

Ensuring equitable access to digital financial services (DFS) has been recognized as a pathway to sustainable development (GSM Association, 2019; World Bank, 2012). To this end, governments have begun to leverage the spread of digital technologies, from automated wage payments to mobile healthcare (mHealth) coverage, to more effectively and transparently deliver goods and services to their constituents. The expansion of mobile money and DFS as part of larger social programs also have significant implications for promoting financial inclusion, improving population health, and advancing social and economic well-being (Hamani et al., 2023; World Bank, 2022). By the same token, the demand for digitizing and streamlining payments for services has also increased in the private and non-profit sectors, where mobile telephone networks (MTNs) have been engaged as active partners in efforts to improve efficiency and expand access to services (Bill and Melinda Gates Foundation, 2021).

In 2019, the number of mobile money accounts (MMAs) in the world surpassed one billion (GSM Association, 2019). Sub Saharan Africa remains the global epicenter in the use and expansion of mobile money. In 2018, the region was host to almost half (396 million) of all globally registered MMAs and added almost 50 million new MMAs from the previous year alone (GSM Association, 2017, 2019). The rapid expansion of mobile money and DFS in Sub-Saharan Africa has generated significant benefits to the region, particularly for low-income households without access to formal banking (Aker et al., 2016; Aker and Mbiti, 2010; Aron, 2018; Jack and Suri, 2011; Mbiti and Weil, 2015). A number of studies have documented the potential of DFS to increase remittances as well as individual and household savings (Dupas et al., 2018; Morawczynski, 2009; Morawczynski and Pickens, 2009; Suri and Jack, 2016), while other studies have identified the role of mobile money as a means to insure against risk and negative shocks (Alinaghi, 2019; Jack and Suri, 2011; Riley, 2018; Suri et al., 2012). Mobile money and DFS in Sub-Saharan Africa have significant implications for poverty reduction, especially for female-headed households (Suri and Jack, 2016). Evidence from the introduction of mobile money in rural Mozambique suggests that it can increase rates of migration and remittances and increase resilience to shocks (Batista and Vicente, 2020b). Studies have also identified the potential of mobile money to shift household decision making power to women by allowing women to exercise greater control over household finances and resources (Aker et al., 2016; Gichuki and Mulu-Mutuku, 2018), and recent evidence has shown how mobile money may provide low-income women with the means to improve their financial literacy (Batista and Vicente, 2020b; Tiwari et al., 2019). At the same time, evaluations of mobile money programs have documented the uneven success of mobile money and DFS adoption both within and across countries, whereby efforts to introduce services have been met with limited success (Adjasi et al., 2023).

In spite of the remarkable progress that has been made over the past two decades, significant gaps in mobile money access and use persist in Sub-Saharan Africa, particularly for women. In low- and middle-income countries, women are 13 percent less likely to own a mobile phone and are 37 percent less likely to have access to mobile internet services, both of which impede women's access to mobile money (GSM Association, 2020). Globally, mobile money account ownership among women is about 7 percentage points lower than account ownership among men, and these gender gaps in account ownership have persisted over time (GSM Association, 2020). Analyses of the mobile money market have identified several key barriers that prevent women from adopting digital financial

services, including: 1) a lack of awareness among women of mobile money options and the benefits associated with DFS; 2) a lack of access to mobile money agents (or other role models) who are available and whom women can trust; 3) a lack of confidence among women in their ability to use mobile money services; 4) low levels of mobile phone ownership by women; 5) low levels of control by women over household finances and decision making, and 6) low levels of financial literacy among women (Penicaud-Scharwatt and Minischetti, 2014; Schaner, 2018).

The expansion of mobile money services into more rural and remote areas has been similarly slow, with pronounced impacts on women's mobile money adoption. A first order barrier is the low rates of mobile phone ownership, which is especially problematic in Mozambique. Of seven African countries surveyed in the 2019 GSMA's Mobile Gender Gap Report, the gender gap between men and women in ownership of a mobile phone was the highest in Africa in Mozambique at 24 percent (Association, 2020). A closer examination of this data finds that the rural/urban divide is driving this gap: the gender gap in mobile phone ownership in rural Mozambique is 33 percent, compared to only 8 percent in urban Mozambique. These gender differences do not reflect lower demand for mobile money access. According to a 2016 USAID study in Mozambique, when respondents were asked what features they desired in their phones, slightly more women than men named mobile money as a desired feature (17 percent of women compared to 14 percent of men) (USAID, 2016). Evidence from Mozambique suggests that when female heads of household are specifically and systematically targeted, there are no differences in the take-up of mobile money accounts between male and female household members (Batista and Vicente, 2020a).

In this study, we evaluate a suite of supply-side changes aimed to increase MM uptake and use of DFS among women and in remote, hard to reach areas in rural Mozambique. The interventions were designed to expand women's access to M-Pesa, a leading MM service in Sub-Saharan Africa, by 1) increasing client awareness and knowledge of M-Pesa upon registration, 2) expanding women's representation in MM by increasing the number of female mobile money agents, known as Telephonic Sales Representatives (TSRs) in Mozambique, to interact with potential M-Pesa clients and 3) introducing incentives to encourage TSRs to more intensively engage with female clients, particularly in harder to reach areas.

The interventions were implemented in two stages across 10 rural markets in Nampula province. In the first stage, the hiring process for new TSRs was modified to ensure that equal numbers of

male and female TSRs would be recruited. TSRs were grouped into teams of three by gender, and on each day, gendered (male only or female only) TSR teams were randomly assigned to visit different markets. All TSRs were trained to encourage and support clients to open an M-Pesa account at the time of purchasing a SIM card. The second phase was introduced after 12 weeks and consisted of a 11-week incentive scheme to encourage TSRs to more effectively engage with and register women and clients in more rural markets to M-Pesa. The incentive introduced TSRs to a raffle lottery with prizes, where "raffle tickets" were assigned to TSRs based on the number of new female clients they registered to M-Pesa and the number of female clients registered from hard to reach markets. Specifically, TSRs received one raffle ticket (their name entered once into the prize drawing) for every woman they registered on M-Pesa. TSRs received two raffle tickets (their names entered twice) for every woman in a hard to reach market that they registered on M-Pesa. Hard to reach markets were defined as markets in our sample that were 40 minutes or more by bus on an unpaved road from Nampula's city center. Taken together, the interventions sought to address both the lack of female visibility and representation in DFS as well as relatively low engagement with and utilization of MM services for women and in remote areas within Mozambique.

We find that female TSR teams registered fewer clients to SIM cards per market-day compared to male TSR teams. Among clients who were registered, however, female TSR teams were more successful at converting SIM clients to M-Pesa, to the extent that there was no significant difference in the overall number of M-Pesa clients registered per market day between female and male TSR teams nor was there any difference in M-Pesa account use by clients by TSR gender. The introduction of the incentive had a strong and positive effect across all teams on client enrollment to both SIM cards as well as M-Pesa. In particular, female TSR teams became even more successful at converting clients to M-Pesa than male TSR teams following the introduction of the incentive. This effect was strongest for new female clients and new female clients living in remote markets. Analyses of transaction data find no differences in transaction frequency or amount between clients who were enrolled by female TSR teams and clients who were enrolled by male TSR teams, suggesting that female TSR teams were equally as successful at convincing clients to engage with M-Pesa as male TSR teams.

Our study contributes to a limited but growing body of evidence on the impact of interventions, and particularly randomized controlled trials, that seek to promote financial inclusion through im-

proved access to MM and DFS in resource-poor settings (Jack et al., 2013; Jack and Suri, 2011, 2014; Mbiti and Weil, 2015; Riley, 2018). More recently, randomized controlled trials in Kenya, Malawi, Bangladesh, and Afghanistan have documented a range of effects of MM use on savings behavior and transfers (Aggarwal et al., 2020; Blumenstock et al., 2015; Breza et al., 2020; Jack and Habyarimana, 2018; Suri and Jack, 2016). Our work also builds on recent experimental evidence by Batista and Vicente (2021), who found that the introduction of MM services to rural households led to increases in transfers and remittances, reductions in households' vulnerability to shocks, as well as increased migration out of rural areas and to urban areas (Batista and Vicente, 2021).

The expansion of access and agent networks, particularly for women and geographically hard-to-reach populations who likely face additional barriers to accessing and adopting MM services, may require increased outreach and engagement on the part of mobile network operators and providers to meet latent client demand (Aker et al., 2020). Our evidence complements recent innovative work by (Batista and Vicente, 2021), which showed that increasing outreach of TSRs to rural areas can substantially increase take-up of mobile money. Proposals for supply-side interventions have noted that mobile money operators need not design a new service, marketing campaign, or distribution model to attract more female customers to their services; rather, reorienting the marketing and distribution of existing products and services and altering the incentives of TSRs may be enough to ensure greater uptake of DFS by women as well as by men (Aker and Mbiti, 2010; Suri and Jack, 2016). To this end, we offer new programmatic insights by considering whether typical sales operations can be made more equitably by changing the processes surrounding hiring, training and incentivizing mobile money agents.

Given the importance of mobile money agents to client recruitment and engagement, the study of agent gender, and agent characteristics more generally, is an important part of understanding client adoption and use of DFS. Observational studies have examined how the gender and characteristics of agents and other financial service providers may impact both agent-level and client-level outcomes (Beck et al., 2013; Cull et al., 2018; Hartarska et al., 2014). More recently, an impact evaluation of a microfinance institution (MFI) in the Democratic Republic of the Congo (DRC) documented evidence of assortative matching between MFI agents and clients by gender, where female clients were more likely to engage and transact with female MFI agents than male clients (Chamboko et al., 2021). These and other studies have noted the potential benefits from hiring of female mobile money

agents who may serve to attract a larger female client base, particularly in contexts where social and cultural norms make it challenging for women to interact with men (Melnyk et al., 2009; Penicaud-Scharwatt and Minischetti, 2014). On the other hand, recent findings have documented how the assortative matching of mobile money agents and clients by gender may create opportunities for vendor misconduct and gender-based discrimination, particularly against female clients who may be less informed about MM and DFS (Annan, 2022).

Our experimental findings demonstrate that client recruitment and transaction behavior was no different between clients who were engaged with female TSRs compared to clients who were registered to male TSRs. While female TSR teams sold fewer SIM cards, they were more likely to convert a SIM card into a new M-Pesa account leading to an equal number of new M-Pesa accounts for male and female TSRs. Taken together, our findings highlight the role of gender in promoting agent-client engagement and add to a literature that investigates the nature of the agent-client relationship in mobile banking (Beck et al., 2013; Chamboko et al., 2021; Cull et al., 2018; Rusu and Harten, 2015; Suri and Jack, 2016). More broadly, our study relates to a larger evidence base on interventions that aim to reduce gender gaps in the private sector, where the incentives to test, promote, and integrate such policies are weak (Chatterji et al., 2011; Rindfleish, 2002; Tansel, 2005). As governments increase their reliance on mobile money to improve the operation of basic goods and services, such as health and social protection (World Bank, 2022), they may be in the position to demand the private sector to take additional steps to improve equity in access to mobile money tools.

The rest of the paper proceeds as follows. Section 2 presents the TSR recruitment and hiring process, the incentive program, randomization of TSR teams to markets, and the empirical analysis. We present and discuss the main results as well as findings from the sub-group analysis in Section 3, and we discuss the implications and conclusions of our study in Section 4.

2 Study Design

2.1 Study Setting: Nampula

Our study is situated in Nampula province, Mozambique. With an estimated 5.7 million people, Nampula province is the most populous province in Mozambique, and its capital city of Nampula has a metro area population of 877,000 as of 2020 (MacroTrends, 2021). The average monthly

household income per capita in the province is 389 Mozambican Meticals (6.09 USD) per month, and the province has one of the highest poverty incidences in the country, with over 65 percent of the province living below the global poverty line (Baez et al., 2018; Global Data Lab, 2020). With an M-Pesa penetration rate of 37 percent, mobile money uptake in urban Nampula is one of the lowest relative to the rest of Mozambique, where most urban areas have penetration rates of over 50 percent. On average, mobile money users in Nampula province have less than 228 Meticals (4 USD) in their accounts, less than the national average, and findings from a recent evaluation of mobile money use in Mozambique show a significant gender gap in M-Pesa use in Nampula, with men making up a large majority (almost 70 percent) of users in the province (Financial Sector Deepening Mozambique, 2018). Taken together, the findings from these and other evaluations in Mozambique suggest that significant barriers to MM adoption and financial inclusion continue to exist for a large proportion of the population, and particularly for poor and rural women (Batista and Vicente, 2021).

2.2 Experimental Design

Client registration and transaction data was collected over a 22 week period, from December 15, 2017 to May 15, 2018. Our field experiment consists of two intervention components, a primary intervention with TSRs that was implemented over a 20 week period, starting in week 2, across 10 markets[1] in Nampula province, and an additional incentive program that was introduced in the second half of the intervention period, starting in week 12 (day 83 from the start of data collection). The markets were chosen within Nampula province according to their potential demand for SIM / M-Pesa services and their viability to roll out the intervention.

2.2.1 SIM Card and M-Pesa Sales

Mobile sales agents, known as "TSRs" (Telephonic Sales Representatives), are the primary vendors for SIM cards throughout Mozambique. TSRs sell Vodafone products (SIM cards and mobile minute "top-ups") in local marketplaces, usually focusing on the more urban or peri-urban markets due to convenience and high volume, among other reasons. TSRs sell SIM cards for mobile phones, and customers who purchase a SIM card have the option to register for M-Pesa. Under the standard practice, TSRs are not trained or required to introduce or register SIM customers to M-Pesa, and

[1]Only eight markets were part of the study at any one time; two of the original eight markets became inaccessible after a cyclone caused a bridge to break in week 4 of the study. As a result, the intervention was reassigned to two other markets.

they typically do not provide customers with extensive support or instruction in getting set up with or using M-Pesa.

2.2.2 TSR Selection and Training

As part of Vodafone's hiring practice, TSR candidates are usually initially found and screened through a subcontractor. After the screening process, M-Pesa requires that candidates participate in a one week paid training program, during which time they learn about how to sell to and register customers to Vodafone SIMs. As part of this intervention, TSRs were also trained on registering clients onto M-Pesa as well as providing a brief overview of how to use M-Pesa. After completing the training, the TSR candidates are tested on the material covered throughout the week, and the highest scorers are offered a position as a TSR. Lower scorers are offered spots as alternates or "back-ups."

Twelve TSRs were hired to work across 10 markets as part of the study, which was implemented in partnership with the NGO, Mobiles4All (M4A), and M-Pesa. While an estimated 90 percent of hired M-Pesa TSRs in Mozambique are male, these interventions hired an even number of male and female TSRs to examine the effects of hiring a higher proportion of female TSRs on sales and M-Pesa use. A total of 20 TSR candidates passed the screening process and participated in the week-long training. Potential candidates were given an assessment, which included a written test, to assess their capacity to perform their roles as promoters and marketers. The top six scoring male and the top six scoring female TSRs[2] were subsequently offered positions. TSRs were hired using the standard hiring processes and criteria set by Vodacom and M-Pesa, with a focus on hiring an equal number of male and female TSRs. The 12 hired TSRs were divided into four teams of three members each by gender, resulting in two teams of female only TSRs and two teams of male only TSRs.

All twelve TSRs were trained in the M4A SIM sales and M-Pesa registration protocols, which guides TSRs on the process to guide a client who purchases a new SIM to register for M-Pesa. As part of the process, clients registering for a SIM card were to be automatically defaulted into the M-Pesa sign up process, which differs from the existing Vodacom practice of M-Pesa in Mozambique.

[2]Female TSRs were hired even if they did not score in the top 12. As shown in Table A14, the average score on the post-training exam was higher for men than for women, with the average exam score for the lower ranking male TSR team being higher than the average test score for the higher female TSR team. As part of our analysis, we explore heterogeneity in the impact of the interventions by TSR performance on this screening assessment; results from this analysis are presented from Table A15 to Table A20 in the Appendix.

To sign up for M-Pesa, an initial deposit of 20 Meticals was required to register the account. This amount would then be immediately available for the client to use; no other fees were charged to clients to enroll into M-Pesa. For clients who complete the M-Pesa registration process, M4A TSRs were instructed on how to review M-Pesa use with each client, including how to deposit, withdraw, and send funds, and how to find their nearest M-Pesa MM agent. M4A TSRs were also trained to actively offer SIM customers the option to register for M-Pesa and make the process as easy as possible by providing instruction and assistance with setup and usage for customers who were unfamiliar with mobile money and/or who had trouble navigating the interface. These protocols aimed to promote a more in-depth introduction to and discussion of M-Pesa than the typical Vodacom registration process in Mozambique. Table A1 and Table A2 in the Appendix present comparisons of the hiring and sales protocols between the M4A TSR approach and standard Vodacom TSR approach, respectively.

2.2.3 Randomization

Using a Python randomization script, TSR teams were randomly assigned to a different market each day from Mondays to Saturdays to sell new SIM cards and to register SIM customers to M-Pesa. Randomization of market assignments for each day was implemented at the TSR team level, and teams were informed of their assigned, randomly selected markets a week in advance. Each day, TSR teams sold SIM cards and registered customers for M-Pesa in their assigned market. The unit of randomization, and main level of variation, is therefore the market-day. Over the 22-week study period, teams were randomly assigned to the same market on different days and therefore revisited markets multiple times over the study period.

2.2.4 Incentive Program

Starting in week 13, TSRs teams were introduced to an incentive program that aimed to reward them for registering female clients to M-Pesa, with extra incentives for selling SIMs and registering female clients who resided in more rural markets. Prior to the intervention, M-Pesa's standard practice was to provide monetary bonuses to TSRs for exceeding SIM registration goals. The prior incentive system did not reward for M-Pesa registration or for registering harder to reach clients. The intervention incentive program was introduced in addition to the primary intervention. As part of the incentive structure, TSRs received one "raffle ticket" (their name entered once in the raffle) for every woman who was registered to M-Pesa and two tickets (their name entered twice) for each

woman who was registered in one of three most rural markets in Nampula province. Winners were drawn every two weeks, and two winners were announced for each lottery draw. Winners won 300 Meticals (approximately $5.00 USD). Every three weeks, an additional winner was drawn to win a low-end smartphone, valued approximately at $25.00 USD. This monetary amount was chosen in consultation with M-Pesa to approximate incentives the company could sustain overtime.

2.2.5 Data Collection

Figure A1 in the Appendix presents the interventions and data collection timeline. Assigned market locations, SIM card sales, and M-Pesa registrations for each TSR team were tracked throughout the 22 week data collection period across all 10 markets. For completed transactions and sales, data was collected through the M-Pesa client database for a period of 17 weeks to assess client M-Pesa use over time. By matching transaction-level outcomes with data on TSR team outreach by market, we are able to assess the extent to which exposure to female TSR teams impacts SIM and M-Pesa registration and use over time, particularly by female clients as well as clients in more rural markets.

Data on SIM card sales and M-Pesa registrations was also collected to track the effectiveness of each TSR in being able to register new clients to M-Pesa. Additional data was collected through M-Pesa on client activity after initial registration, to view how their activity on the platform progressed over time and to understand how the profile of client changed under different supply-side conditions. All client data was anonymized, and clients provided consent at the time of registration to have their anonymized registration and transaction data used for the study. Transaction data included the frequency and currency amount of each transaction that was executed from the time the customer was registered up to two months after the intervention concluded.

Demographic data on TSRs was also collected at the time of hiring. Additional data was collected on the market location and sales of each TSR each day, and communication between TSRs and study coordinators was maintained to document TSR turnover and any issues that were observed or reported at various markets.

2.3 Key Outcomes

Key outcomes include the number of new SIM cards registered, the number of new M-Pesa accounts created and the number of new M-Pesa accounts that are ever used. These outcomes are measured as counts at the market day level. We also present the "conversion rate" of new M-Pesa accounts which is the share of new SIM cards that also open an M-Pesa account.

For outcomes that leverage the team randomization, we conduct our analysis at the market day level. Specifically, outcomes are calculated for each day in each market, and we compare average differences in these outcomes between markets that were randomly assigned to male TSR teams on a given day to markets that were randomly assigned to female TSR teams on that day. For our interrupted time series analysis of the introduction of the incentive program, we assess outcomes at the day level.

2.4 Analysis

2.4.1 Interrupted Time Series Analysis

Our interrupted time series analyses assesses the extent to which the introduction of the financial incentive was successful in motivating TSRs, and particularly female TSRs, to introduce clients, particularly female and more rural clients, to M-Pesa. We use the following specification to estimate the effects of the incentive:

$$\begin{aligned} Y_d = \beta_0 + \beta_1 FTSR_d + \beta_2 I_d + \beta_3 d + \beta_4 (FTSR_d \cdot I_d) \\ + \beta_5 (FTSR_d \cdot d) + \beta_6 (I_d \cdot d) + \beta_7 (FTSR_d \cdot I_d \cdot d) + \varepsilon_d \end{aligned} \tag{1}$$

Here, Y_d is the outcome on day d, $FTSR_d$ is a binary indicator for the female TSR team gender, and I_d is a binary indicator for the implementation of the incentive in that day. For this analysis, each observation is the average of outcome Y for either male TSR teams or female TSR teams on day d, resulting in two observations per day over the study period (a male TSR team average and a female TSR team average, respectively).

2.4.2 Market Day Level Analysis

In order to identify the causal impact of female TSRs relative to male TSRs, we exploit the experimental variation that was induced among the sub-sample of clients who were contacted by male or female TSR teams in the ten markets. Given that TSR teams were randomly assigned to different markets each day, we conduct adjusted analyses for our key outcomes at the market-day level, which is the unit of randomization. We estimate the following:

$$Y_{md} = \beta_0 + \beta_1 FTSR_{md} + \mathbf{X}_{md}\gamma + \delta_m + \delta_d + \varepsilon_{md} \tag{2}$$

where Y_{md} is the outcome for market m on day of the week d. The vector $\mathbf{X}_{md}$ includes market-

day-level covariates such as client year of birth, the proportion of female clients per market-day. In addition, we include an indicator for market days when the incentive program was implemented as well as market-level and day of the week fixed effects (δ_m and δ_d, respectively). As these analyses are conducted at the market-day level, the unit of randomization, we present heteroskedastic-robust standard errors in our specifications. For analyses where our outcomes are assessed at a finer level (e.g. client, transaction), standard errors are clustered at the market-day level. The main coefficient of interest, β_1, describes the adjusted mean differences in client outcomes for clients who are contacted by female TSR teams relative to clients who are contacted by male TSR teams. Finally, we present robustness checks to account for the fact that we have a limited number of teams that are randomized across markets.

2.5 Sub-Group Analyses

We conduct a range of sub-group analyses to identify potential heterogeneity in the impacts of being contacted by female TSRs relative to male TSRs. We particularly explore the impacts of gendered TSR teams on female clients and clients who are approached in more rural (far) markets, both of which were part of the incentive program. Using the TSR test scores from the hiring assessment, we calculate average test scores for each TSR team and conduct sub-group analyses to compare differences in outcomes between teams, both by gender (male versus female teams) and by relative test performance (higher-scoring teams versus lower-scoring teams). Findings from these analyses are presented in the Appendix.

3 Results

3.1 Sample Description and Balance

Over a 22-week period between December 15, 2017 and May 15, 2018, 12 TSR teams engaged with a total of 6,564 clients across 10 markets and: 1) registered clients with new Vodafone SIM cards; and 2) enrolled clients into M-Pesa. Of these new clients, 52 percent (3,465) registered for (were converted to) M-Pesa. Among converted clients, the time from registering for a new SIM card to conversion to M-Pesa was relatively short, with 40 percent of M-Pesa clients converting to M-Pesa on the same day when they registered for a new SIM card, while 80 percent of clients converted to M-Pesa within a week of registering for their SIM card. The average client who was registered for a new SIM card was 30.2 years old, 98.9 percent of clients were under the age of 50, and 36.2 percent

of newly registered clients were women. Of the 17 total weeks that clients were tracked, transactions were made on 41.4 percent of the days. Clients made an average of 1.79 transactions valued at an average of 474.61 Meticals per week. Table A3 in the Appendix presents a balance table of random assignment of TSR teams to each of the 10 different markets over the study period, and Table A4 in the Appendix presents additional descriptive statistics for each market. On average, markets were equally likely to be assigned to be visited by male and female TSR teams, although male TSR teams were marginally more likely to be assigned to visit the three rural markets that were more remotely located (Murriase, Chiequele, and Marratane). In addition, TSR teams were equally likely to be working in these markets on any given day of the week. Taken together, the findings from the balance table provide evidence to support the randomized assignment of TSR teams to each of the markets over the study period.

Table 1 presents mean outcome comparisons between clients who were registered by male TSR or female TSR teams. On average, male TSR teams reached an average of 4.8 more clients per market day relative to female TSR teams. However, the M-Pesa conversion rate for female TSR teams is significantly higher (7.8 p.p.) than the conversion rate for male TSR teams. Moreover, male and female teams were equally likely to create a new M-Pesa account that was actually used; however, we find that clients who registered with female TSRs had 0.72 fewer M-Pesa transactions over the past 4 weeks relative to clients who registered with male TSRs. We observe no significant differences in transaction frequency or transaction amount between clients who were registered for M-Pesa by female TSR teams and clients who were registered by male TSR teams; in fact, clients who were registered by female TSR teams were found to conduct transactions of marginally higher value (by 267 Meticals, or 4.18 USD) compared to clients registered by male TSR teams. We also find that female clients were equally likely to be registered for SIM cards and to M-Pesa by female TSR teams compared to male TSR teams.

3.2 Market-Day Analysis Results

Findings from a regression-adjusted market-day level analysis are presented in Table 2. We find that female TSR teams registered 4.47 fewer clients, including 1.29 fewer female clients and 1.64 fewer rural clients, to SIM cards per market-day compared to male TSR teams (column 1). Among clients who were registered, however, female TSR teams were 7.4 percentage points (14.5 percent) more likely to be successful at converting clients to M-Pesa than male TSR teams (column 4). Moreover,

Table 1: Comparison of Outcomes by Male TSR Group and Female TSR Group, Market-Day Level

Variable	(1) Male TSR	(2) Female TSR	(3) Difference (F - M)
Total No. of Clients, Mkt. Day	19.917	15.148	-4.769***
Total No. of M-Pesa Clients, Mkt. Day	9.710	8.824	-0.886
Total M-Pesa use, Mkt. Day	8.527	7.795	-0.731
Tot. M-Pesa use in last 4 Wks, Mkt. Day	3.405	2.682	-0.723**
M-Pesa Conversion Rate	0.506	0.584	0.078***
Convert within 1 Wk	0.741	0.818	0.078***
Avg. Number of Transactions	2.115	2.038	-0.078
Avg. Value of Transactions	472.946	740.711	267.765
Client Sex	0.353	0.329	-0.024
Observations	169	176	345

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.
The unit of observation is the market-day.

there was no significant difference in the number of M-Pesa clients registered per market day between female and male TSR teams (column 2), nor was there any difference in M-Pesa account use by clients by TSR gender (column 3).

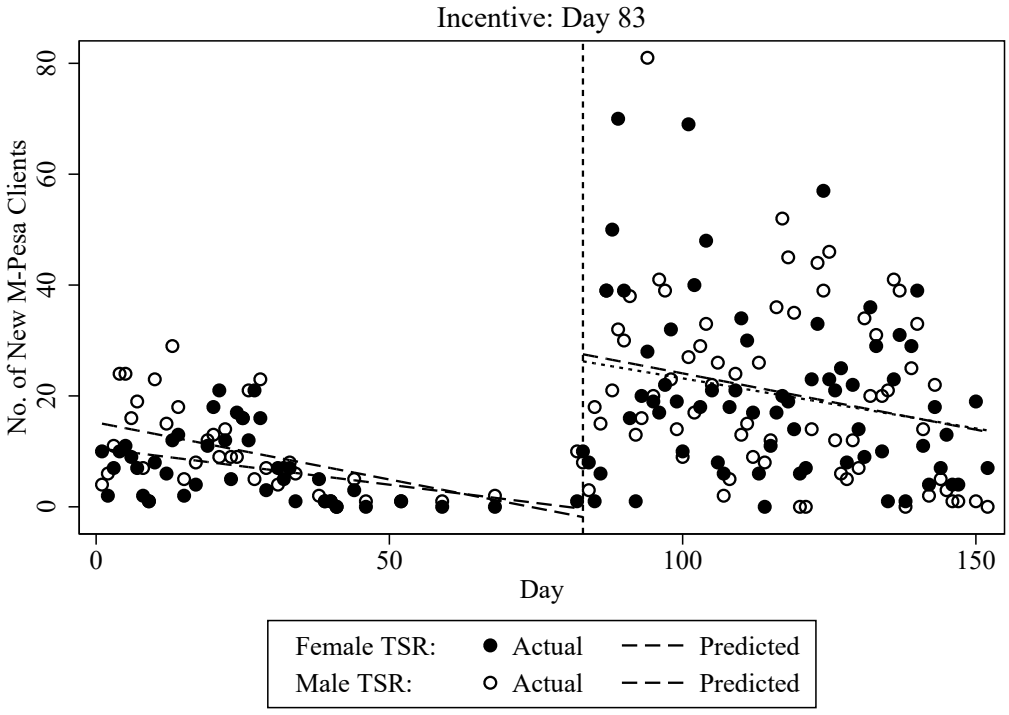
3.3 Interrupted Time Series Results

Figure 1 present results from the interrupted time series (ITS) analysis on the average number of new M-Pesa clients enrolled by TSR team gender over the study period[3]. Table 3 and Table 4 present ITS results for a range of client-level outcomes by TSR team gender. Concordant with our market-day results, we note that female TSR teams reached a lower absolute number of clients per day relative to male TSR teams before the incentive was introduced. We also observe a decrease over time in the rate of new SIM and M-Pesa clients enrolled per day by male TSR teams prior to the introduction of the incentive. In contrast, the rate of new clients who signed up for new SIM accounts and registered with M-Pesa, particularly female and rural clients, actually increased over time for female TSR teams before the incentive was introduced. The introduction of the incentive had a generally strong and positive effect on client enrollment to both SIM cards as well as to M-Pesa. Similarly to the market-day analysis, we find that female TSR teams were 24.4 percentage points

[3]The ITS results for the average number of new female M-Pesa clients, rural M-Pesa clients, and rural female M-Pesa clients enrolled by TSR team gender are presented in Figure A2, Figure A3, and Figure A4 in the Appendix, respectively.

(51.8 percent) more successful in converting clients whom they did register to M-Pesa relative to male TSR teams. Moreover, the M-Pesa conversion rate following the introduction of the incentive increased at a significantly higher rate for female TSR teams relative to male TSR teams (Table 4).

Figure 1: Number of New M-Pesa Clients per Week by TSR Gender



To confirm our findings, we conduct a supplementary ITS analysis on transaction-level outcomes, the results for which are presented in Table A5 in the Appendix. Both the number and value of transactions among registered M-Pesa clients increased over the 22 week period. In terms of transaction behavior, we find small and insignificant differences in transaction frequency and positive, but insignificant, differences in the average transaction value among clients who were registered by female TSR teams relative to clients who were registered by male TSR teams. Transaction activity, both in terms of the number and value of transactions, declined among clients following the introduction of the incentive even though the number of SIM and M-Pesa registrations increased over this same period. Across our ITS analyses, we find no significant differences in transaction outcomes between male TSR and female TSR teams after the introduction of the incentive.

3.4 Sub-Group Analyses

We run a series of stratified analyses to infer potential channels of interest. We first stratify by the introduction of the incentive and present these analyses in Table A6 and Table A7. Findings from these models show that prior to the introduction of the incentive, female TSR teams, on average, registered fewer clients to SIM accounts and M-Pesa accounts per market-day and were no more successful at converting clients to M-Pesa relative to male TSR teams. Following the introduction of the incentive, female TSR teams continued to register fewer SIM clients relative to male TSR teams; however, they were 12.6 percentage points (24.7 percent) more likely than male TSR teams to convert registered SIM clients to M-Pesa. As a result, female TSR teams were, on average, able to enroll as many M-Pesa clients per market-day as male TSR teams. Taken together, our findings suggest that female TSR teams are better than male TSR teams at converting clients to M-Pesa, both before incentive and even more so after the incentive.

In Table A15 to Table A20, we present results from our comparisons of higher-scoring TSR teams against lower-scoring TSR teams by gender using the average test scores of each team as the benchmark for performance potential. We find little significant difference in outcomes when comparing higher-scoring teams against lower-scoring teams within gender; that is, we find no difference in TSR performance on SIM and M-Pesa registration between lower-scoring (fe)male teams and higher-scoring (fe)male teams. When comparing across gendered teams, we find that higher-scoring male TSR teams were not more likely to outperform lower-scoring female TSR teams. Lower-scoring female TSR teams did outperform lower-scoring male TSR teams in converting clients to M-Pesa, but not in daily SIM registration. In concordance with our main findings, we see that higher-scoring female TSR teams outperformed both higher-scoring as well as lower-scoring male TSR teams in converting clients to M-Pesa, though male TSR teams were more successful at registering clients to SIM accounts.

3.5 Additional Robustness Checks

We implement a series of robustness checks to provide additional support for our results. Given the small number of teams that were randomized across markets and that individual teams may be repeatedly assigned to markets, we recognize that there may be less true variation in our data and that our findings may be explained by factors other than the randomized gender composition of the team. To address these concerns, we conduct a randomization inference exercise in which we

simulate 500 permutations of TSR team assignment by gender across markets on each market day and estimate the impact of each permuted assignment on our main outcomes of interest that we present in Table 2. Results from this exercise are presented in Table A21 and suggest that our main findings may be robust to this standard error correction to account for the limited number of teams that are randomly assigned.

Table A22, presents additional results from a comparison of our findings for our main outcomes under alternate model assumptions. Our inferences from our primary specifications do not significantly change when we cluster standard errors by market. In addition, our findings are robust to conducting a stepwise bootstrapped multiple hypothesis testing (MHT) correction across all outcomes presented in Table 2 that controls for the familywise error rate (FWER) and also accounts for the joint dependence structure of the test statistics (Romano and Wolf, 2005a,b). We implement this approach, which corrects for false discovery rates under multiple outcomes and multiple treatments, to account for the fact that our outcomes (and their corresponding p-values when we test them) are likely to be on the same causal path and therefore be correlated.[4] We prefer the Romano and Wolf (2005a,b) adjustment over other MHT corrections (also presented in Table A22) because this approach calculates adjusted p-values that control for the FWER across all of our outcomes while also allowing for the inclusion of control variables and market fixed effects in our specifications.

[4]Specifically, our outcomes may be direct functions of each other, where clients who are assigned to a particular TSR group may: a) register for SIM cards based on their group assignment; b) register and use M-Pesa conditional on registering for a SIM card.

Table 2: Male TSR vs. Female TSR - Market-Day Level

	New SIM Accounts per Market Day	New M-Pesa Accounts per Market Day	M-Pesa Used per Market Day	M-Pesa Conversion Rate per Market Day
A: All Clients				
Female TSR	-4.473***	-0.775	-0.579	0.074**
	[-7.332, -1.614]	[-2.527, 0.976]	[-2.182, 1.025]	[0.014, 0.133]
Observations	345	345	345	345
Control Mean	19.92	9.71	8.53	0.51
B: Female Clients				
Female TSR	-1.290**	0.096	0.145	0.008
	[-2.558, -0.022]	[-0.854, 1.045]	[-0.745, 1.035]	[-0.038, 0.053]
Observations	345	283	283	345
Control Mean	7.01	4.01	3.56	0.19
C: Rural Clients				
Female TSR	-1.644*	-0.336	0.091	0.018
	[-3.369, 0.081]	[-3.357, 2.685]	[-2.692, 2.875]	[-0.012, 0.049]
Observations	345	116	116	345
Control Mean	7.59	9.03	7.75	0.19
D: Rural Female Clients				
Female TSR	-0.653	0.488	0.585	-0.005
	[-1.433, 0.128]	[-0.744, 1.719]	[-0.556, 1.727]	[-0.034, 0.024]
Observations	345	104	104	345
Control Mean	2.76	3.21	2.77	0.08
Controls	✓	✓	✓	✓
Market FE	✓	✓	✓	✓
Day of Week FE	✓	✓	✓	✓

The unit of analysis is the market day. All models are estimated using ordinary least squares models, with 95 percent confidence intervals presented in brackets. Covariates in adjusted models include whether the incentive was implemented, market and day of the week fixed effects. Heteroskedastic-robust standard errors are presented. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 3: ITS Analysis of M4A Incentive - Day

	No. of New M-Pesa Clients per Day	No. of New Female M-Pesa Clients per Day	No. of New Rural M-Pesa Clients per Day	No. of New Rural Female M-Pesa Clients per Day
Time (Week)	-0.206***	-0.006	-0.203**	-0.063**
	[-0.343, -0.068]	[-0.070, 0.058]	[-0.363, -0.043]	[-0.118, -0.009]
Female TSR	-4.544*	0.132	-9.491***	-2.868***
	[-9.639, 0.551]	[-1.755, 2.020]	[-15.697, -3.286]	[-4.578, -1.157]
Female TSR × Time	0.074	-0.031	0.302**	0.142***
	[-0.076, 0.223]	[-0.104, 0.042]	[0.021, 0.582]	[0.045, 0.240]
Incentive	29.373***	8.882***	18.484***	6.060***
	[18.421, 40.325]	[3.737, 14.028]	[7.469, 29.499]	[2.171, 9.949]
Time × Incentive	0.002	-0.082	0.112	0.057
	[-0.232, 0.237]	[-0.185, 0.022]	[-0.119, 0.343]	[-0.023, 0.137]
Female TSR × Incentive	-2.768	2.717	-14.802	-5.430
	[-17.231, 11.696]	[-4.421, 9.856]	[-35.754, 6.151]	[-14.411, 3.550]
Female TSR × Time × Incentive	-0.051	0.025	-0.309	-0.208**
	[-0.366, 0.264]	[-0.123, 0.174]	[-0.692, 0.075]	[-0.378, -0.037]
Constant	15.008***	3.013***	12.570***	2.975***
	[10.639, 19.377]	[1.508, 4.519]	[7.416, 17.724]	[1.426, 4.523]
Observations	214	192	99	90

Notes: The unit of analysis is the day by TSR gender, where average outcomes are calculated for each day by TSR gender. All models are estimated using interrupted time series specifications to identify the impact of the introduction of the M4A incentive, with 95 percent confidence intervals presented in brackets. The variable Female TSR is a binary indicator for TSR gender, the variable Time indicates the day (days 1-152), and the variable Incentive is a binary indicator for the introduction of the incentive. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 4: ITS Analysis of M4A Incentive - Day

	New SIM Accounts per Day	M-Pesa Accounts Used per Day	M-Pesa Conversion Rate per Week
Time (Week)	-0.444***	-0.133**	0.007***
	[-0.664, -0.224]	[-0.241, -0.025]	[0.004, 0.010]
Female TSR	-11.762***	-4.013**	0.244***
	[-19.986, -3.538]	[-7.598, -0.427]	[0.069, 0.419]
Female TSR × Time	0.255**	0.058	-0.013***
	[0.014, 0.496]	[-0.057, 0.173]	[-0.021, -0.004]
Incentive	62.694***	26.359***	-0.522***
	[43.227, 82.160]	[16.638, 36.079]	[-0.734, -0.309]
Time × Incentive	0.129	-0.078	-0.008***
	[-0.324, 0.582]	[-0.283, 0.128]	[-0.012, -0.004]
Female TSR × Incentive	-19.415	-2.226	0.866***
	[-43.604, 4.774]	[-15.282, 10.830]	[0.330, 1.402]
Female TSR × Time × Incentive	-0.224	-0.019	0.014***
	[-0.781, 0.334]	[-0.302, 0.264]	[0.005, 0.023]
Constant	28.473***	10.609***	0.471***
	[21.399, 35.547]	[7.488, 13.729]	[0.396, 0.545]
Observations	214	214	214

Notes: The unit of analysis is the day by TSR gender, where average outcomes are calculated for each day by TSR gender. All models are estimated using interrupted time series specifications to identify the impact of the introduction of the M4A incentive, with 95 percent confidence intervals presented in brackets. The variable Female TSR is a binary indicator for TSR gender, the variable Time indicates the day (days 1-152), and the variable Incentive is a binary indicator for the introduction of the incentive. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

4 Discussion and Conclusions

In this study, we analyze the impact of modifying the hiring, training and incentives of mobile money agents to improve the penetration of mobile money access and use among Mozambican populations, particularly women living in rural and remote areas. We find that female agent teams sell fewer new SIM cards overall relative to male agent teams but are more effective in converting new SIM clients to mobile money accounts. These patterns suggest that female agents may be less successful at initiating contact with clients relative to male agents, but may be relatively more successful at retaining client attention and engagement following a successful first contact. More generally, our results imply that male and female agents may have different comparative advantages when engaging with and registering clients to mobile money and that having a more diverse profile of mobile money agents could be achieved without altering the overall enrollment rate of new clients, particularly those who may not otherwise have the opportunity to adopt digital financial services. Additional research is needed to unpack the potential mechanisms that may be driving this finding.

Our results suggest that relatively low-cost incentives can increase the enrollment of women overall and women living in remote areas in particular. Incentives were effective in encouraging enrollment of women for both male and female TSR teams. Our supply-side variations are embedded within a suite of interventions that seek to improve and enhance the overall effectiveness of TSR agents in enrolling clients to mobile money. Future research is needed to assess whether similar interventions could work in settings with less intensive training and team composition protocols.

Our study allows us to effectively test the role of agent-client concordance and incentives on mobile money adoption and engagement in a setting where the market for mobile money, both in terms of DFS penetration and mobile phone ownership, is less mature and where the gender gap in mobile money access is larger relative to other sub-Saharan African contexts (e.g. Kenya, Tanzania, Ghana). With this said, we recognize that the effects of our supply-side interventions may be larger in Mozambique than in other sub-Saharan African contexts where markets for mobile money are more established. By the same token, it is also possible that that the impacts of our interventions may attenuate over time as mobile money access continues to expand in Mozambique.

Because we rely exclusively on administrative records, our study is not able to assess how clients felt about their enrollment experiences. While we are able to document the intervention's impact on transaction frequency and amount, we do not have more information about the types of transactions

that our clients are undertaking, which would have allowed us to identify how transaction behavior and access to credit may differ by gender. The lack of granularity in our administrative data also limits our ability to match specific agents with clients whom they served, which would allowed us to more precisely infer variation in agent performance within a team (e.g. whether there were some high-performing / low-performing agents within a team) and whether the variation in individual agent performance differed by gender. However, we do note that the evidence on outcomes by TSR team "quality", as measured by the average hiring test scores of the team, is mixed, suggesting that the scores that TSRs received on their screening and hiring assessments may be an imperfect indicator of agent performance and may, in fact, act as a barrier to identifying, hiring, and recruiting qualified TSRs and female TSRs, in particular.

Digital financial services are a promising opportunity for promoting women's economic empowerment and can help facilitate women's access to transactions, savings, credit, and insurance. Ample evidence suggests that the expansion of mobile money has lifted many households out of poverty, particularly female headed households. Nonetheless, many women, particularly those in remote areas, have not benefited from this expansion. Evidence from our study suggests that attempts to expand access should consider how to more effectively engage mobile network operators in order to expand mobile money services to populations that are less well served by current efforts. The increased use of mobile money will require public-private partnerships, which will allow multilaterals and governments to more effectively demand how mobile money operators can improve equity in service provision. To this end, the expansion of access to such services will require cross-sectoral coordination between individual consumers, facilitators of mobile money and digital financial services, and higher-level managers of digital public infrastructure.

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5 Appendix Figures

Figure A1: Data Collection Timeline

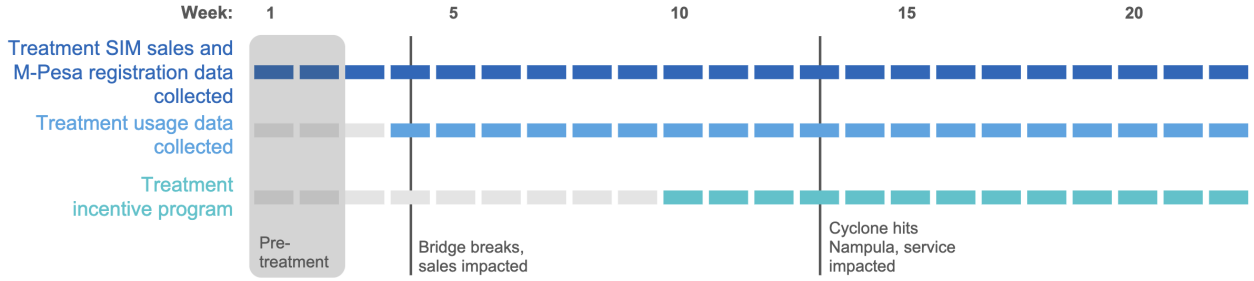


Figure A2: Number of New Female M-Pesa Clients per Week by TSR Gender

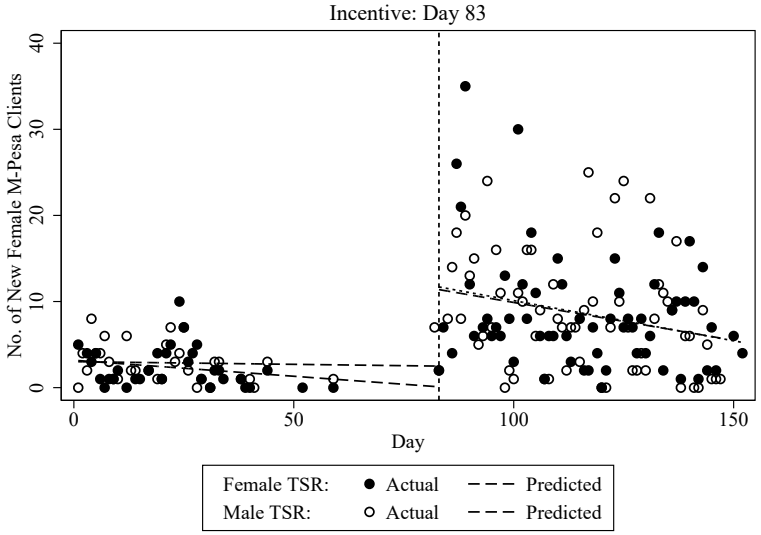


Figure A3: Number of New Rural M-Pesa Clients per Week by TSR Gender

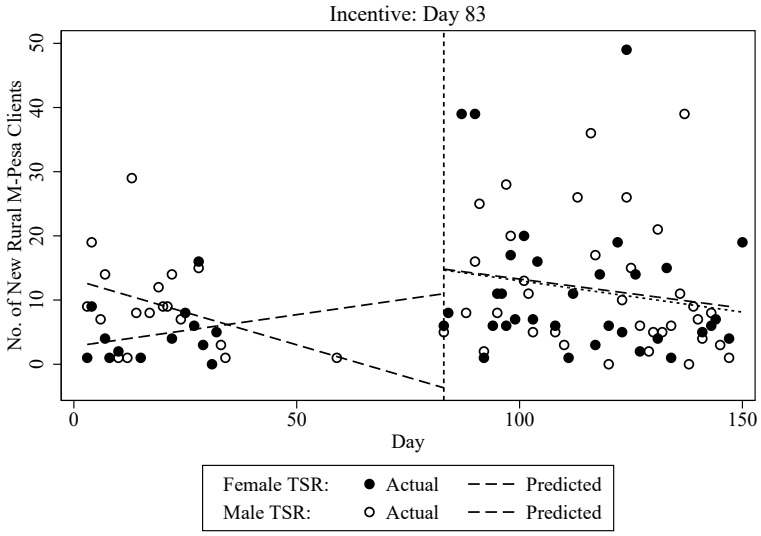


Figure A4: Number of New Rural Female M-Pesa Clients per Week by TSR Gender

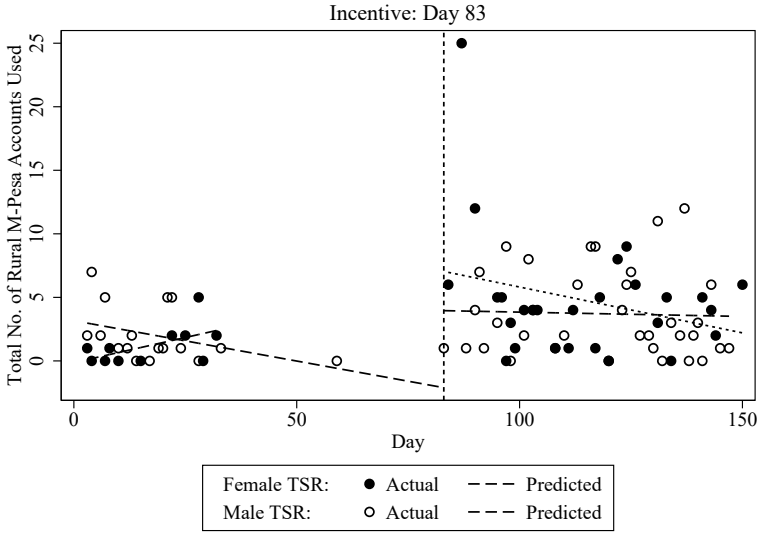


Figure A5: Number of New SIM Clients per Week by TSR Gender

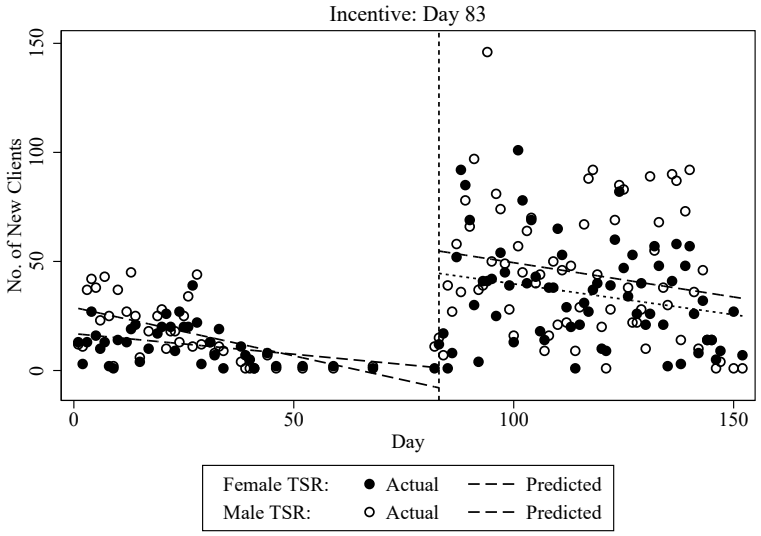


Figure A6: Number of New Female SIM Clients per Week by TSR Gender

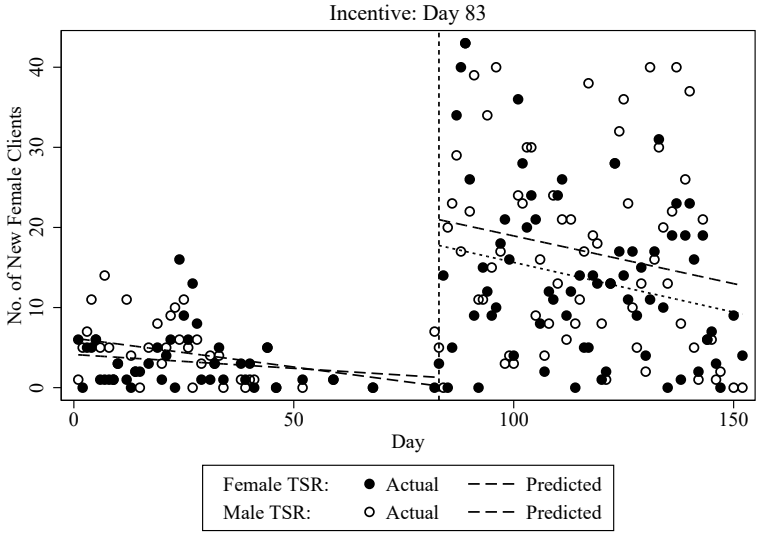


Figure A7: Number of New Rural SIM Clients per Week by TSR Gender

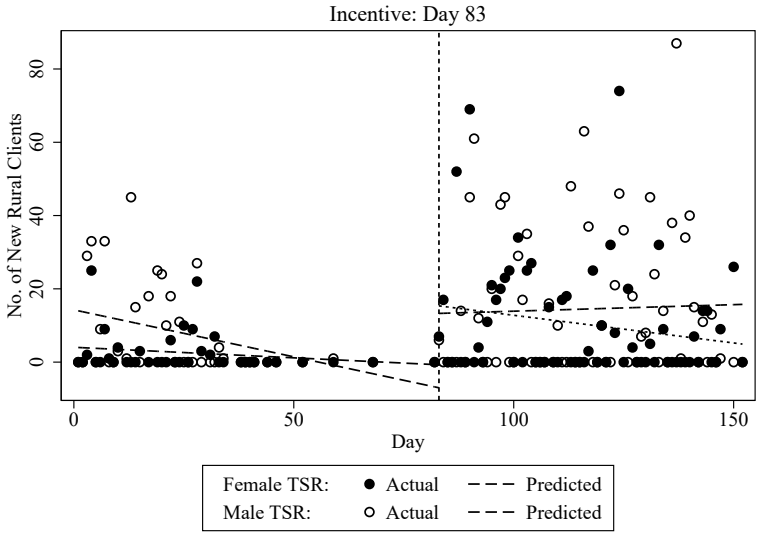
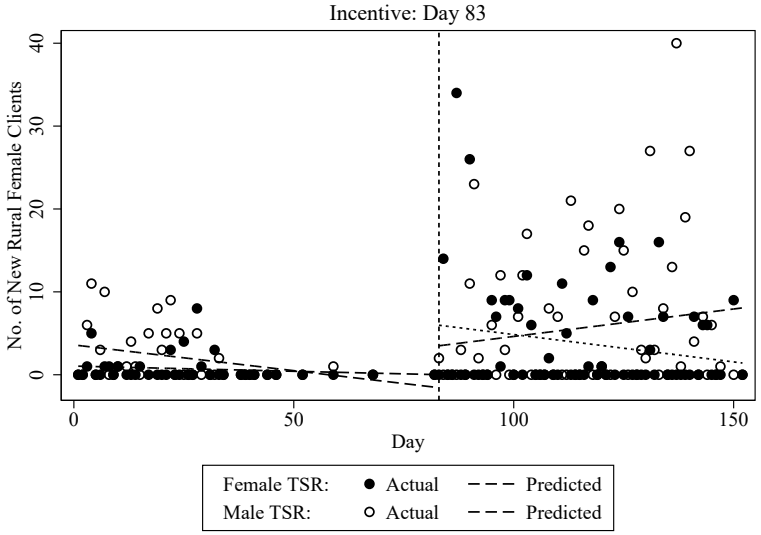


Figure A8: Number of New Female Rural SIM Clients per Week by TSR Gender



6 Appendix Tables

Table A1: TSR Hiring Process

	Standard Vodacom TSRs	**M4A TSRs**
Identification and Screening Process	Subcontractor	Subcontractor
Training Length/Content	One week	One week
Qualification Process	Exam, top scorers hired	Exam, equal number of top female and male scorers hired
Gender Breakdown of Hires	10 percent female	50 percent female

Table A2: TSR Selling Procedure

	Standard Vodacom TSRs	**M4A TSRs**
Location	No assigned markets, skewed urban	Assigned markets, rural and peri-urban
TSR Demographics	10 percent female	50 percent female
Selling process	SIM card sale, no active registration of M-Pesa	SIM card sale, active push to register M-Pesa
Instruction on M-Pesa setup/use?	No	Yes
Support with first M-Pesa transaction?	No	Yes

[htb] [htb]

Table A3: Balance Table of Team Visits by TSR Team Gender

Variable	(1) TSR Male	(2) TSR Female	(3) Difference (F - M)
Anchilo	0.136	0.125	-0.011
Chiequele	0.109	0.094	-0.015
Elipisse	0.016	0.027	0.012
Marratane	0.117	0.094	-0.023
Moacoanvela	0.125	0.133	0.008
Murriase	0.132	0.086	-0.046*
Murrupula	0.113	0.148	0.036
Nameteca	0.109	0.113	0.004
Namiepe	0.097	0.109	0.012
Rapale	0.012	0.039	0.027**
Far Market	0.358	0.273	-0.085**
Sunday	0.019	0.016	-0.004
Monday	0.163	0.164	0.001
Tuesday	0.163	0.164	0.001
Wednesday	0.167	0.172	0.005
Thursday	0.163	0.164	0.001
Friday	0.156	0.156	0.001
Saturday	0.167	0.164	-0.003
Observations	257	256	513

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.
The unit of observation is the group-day (for example, Female TSR Group A on December 15, 2018 or Male TSR Group B on January 3, 2019).

Table A4: Descriptive Statistics by Market

Market Name	No. of Agents in Market before M4A	Distance to Market from Nampula (km)	Time to Market from Nampula (min)				Road Type to Market
			Car	Bus	Taxi	Motorcycle	
Marratane	7	25	25	40	25		Off road
Anchilo	10	18	20	35	25		Asphalt
Namiepe	2	9	15	30	15		Off road
Rapale	10	14	15	30	20		Asphalt
Murriase	2	22	20	40	30		Off road
Controle	1	10	10	30	15		Asphalt
Moacoanvela	16	4	15	20	10		Asphalt
Chiequele	2	36	45	75	60		Off road
Namateca	36	11	20	30	15		Off road
Elipisse	15	8	15	30	15		Off road

Table A5: ITS Analysis of M4A Incentive - Week Enrolled

	No. of Transactions per Week	Value of Transactions per Week
Time (Week)	0.110**	20.457***
	[0.010, 0.210]	[6.319, 34.595]
Female TSR	-0.085	45.504
	[-0.619, 0.448]	[-94.046, 185.053]
Female TSR × Time	-0.004	-20.034*
	[-0.156, 0.149]	[-40.758, 0.691]
Incentive	2.044*	476.713
	[-0.317, 4.404]	[-140.807, 1094.232]
Time × Incentive	-0.674**	-155.066*
	[-1.248, -0.099]	[-320.081, 9.948]
Female TSR × Incentive	1.491	-200.940
	[-4.744, 7.726]	[-915.972, 514.092]
Female TSR × Time × Incentive	0.222	260.428
	[-1.807, 2.251]	[-100.586, 621.442]
Constant	0.166	72.085*
	[-0.201, 0.532]	[-13.010, 157.181]
Observations	34	34

Notes: The unit of analysis is the week enrolled by TSR gender, where average outcomes are calculated for each week by TSR gender. All models are estimated using interrupted time series specifications to identify the impact of the introduction of the M4A incentive, with 95 percent confidence intervals presented in brackets. The variable Female TSR is a binary indicator for TSR gender, the variable Time indicates the week (weeks 1-17), and the variable Incentive is a binary indicator for the introduction of the incentive. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A6: Stratified Analysis of Male TSR vs. Female TSR, Pre-Incentive Period - Market-Day Level

	New SIM Accounts per Market Day	New M-Pesa Accounts per Market Day	M-Pesa Used per Market Day	M-Pesa Conversion Rate per Market Day
Female TSR	-3.471**	-1.801**	-1.633**	-0.008
	[-6.311, -0.631]	[-3.561, -0.042]	[-2.915, -0.351]	[-0.137, 0.121]
Observations	125	125	125	125
Control Mean	19.92	9.71	8.53	0.51
Controls	✓	✓	✓	✓
Market FE	✓	✓	✓	✓
Day of Week FE	✓	✓	✓	✓

The unit of analysis is the market day. All models are estimated using ordinary least squares models, with 95 percent confidence intervals presented in brackets. Covariates in adjusted models include market and day of the week fixed effects. Heteroskedastic-robust standard errors are presented. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A7: Stratified Analysis of Male TSR vs. Female TSR, Post-Incentive Period - Market-Day Level

	New SIM Accounts per Market Day	New M-Pesa Accounts per Market Day	M-Pesa Used per Market Day	M-Pesa Conversion Rate per Market Day
Female TSR	-4.730**	-0.051	0.076	0.126***
	[-8.997, -0.462]	[-2.613, 2.512]	[-2.337, 2.488]	[0.061, 0.191]
Observations	220	220	220	220
Control Mean	19.92	9.71	8.53	0.51
Controls	✓	✓	✓	✓
Market FE	✓	✓	✓	✓
Day of Week FE	✓	✓	✓	✓

The unit of analysis is the market day. All models are estimated using ordinary least squares models, with 95 percent confidence intervals presented in brackets. Covariates in adjusted models include market and day of the week fixed effects. Heteroskedastic-robust standard errors are presented. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A8: Comparison of Outcomes within Female TSR Group Pre- and Post-Incentive, Market-Day Level

Variable	(1) Female TSR Before Incentive	(2) Female TSR After Incentive	(3) Difference (After - Before)
Total No. of Clients, Mkt. Day	6.803	20.155	13.352***
Total No. of M-Pesa Clients, Mkt. Day	4.061	11.682	7.621***
Total M-Pesa use, Mkt. Day	2.636	10.891	8.255***
Tot. M-Pesa use in last 4 Wks, Mkt. Day	1.589	3.487	1.898***
M-Pesa Conversion Rate	0.592	0.579	-0.013
Convert within 1 Wk	0.782	0.838	0.056
Avg. Number of Transactions	1.817	2.153	0.337
Avg. Value of Transactions	330.189	955.564	625.375
Client Sex	0.258	0.371	0.112***
Observations	66	110	176

*** p < 0.01, ** p < 0.05, * p < 0.1.
The unit of observation is the market-day.

Table A9: Comparison of Outcomes within Male TSR Group Pre- and Post-Incentive, Market-Day Level

Variable	(1) Male TSR Before Incentive	(2) Male TSR After Incentive	(3) Difference (After - Before)
Total No. of Clients, Mkt. Day	10.678	24.873	14.195***
Total No. of M-Pesa Clients, Mkt. Day	5.983	11.709	5.726***
Total M-Pesa use, Mkt. Day	4.356	10.764	6.408***
Tot. M-Pesa use in last 4 Wks, Mkt. Day	2.132	4.329	2.197***
M-Pesa Conversion Rate	0.601	0.455	-0.146***
Convert within 1 Wk	0.676	0.774	0.099**
Avg. Number of Transactions	1.912	2.221	0.309
Avg. Value of Transactions	287.811	569.143	281.331
Client Sex	0.265	0.400	0.136***
Observations	59	110	169

*** p < 0.01, ** p < 0.05, * p < 0.1.
The unit of observation is the market-day.

Table A10: Interaction Analysis, Male TSR vs. Female TSR - Market-Day Level

	New SIM Accounts per Market Day	New M-Pesa Accounts per Market Day	M-Pesa Used per Market Day	M-Pesa Conversion Rate per Market Day
Female TSR	-6.662***	-2.690*	-2.505*	0.140*
	[-11.685, -1.639]	[-5.614, 0.234]	[-5.078, 0.068]	[-0.012, 0.291]
Client Sex	-3.903	-2.234	-1.864	0.076
	[-15.367, 7.561]	[-8.215, 3.748]	[-7.187, 3.459]	[-0.230, 0.382]
Female TSR × Client Sex	7.376	5.368	4.985	-0.183
	[-6.445, 21.198]	[-2.704, 13.440]	[-2.271, 12.242]	[-0.577, 0.212]
Market is far (1 = Yes)	4.265	0.777	-0.045	-0.080
	[-4.509, 13.038]	[-4.115, 5.669]	[-4.359, 4.269]	[-0.266, 0.106]
Female TSR × Market is far (1 = Yes)	-6.207	-1.970	-1.127	-0.020
	[-15.548, 3.134]	[-7.288, 3.349]	[-5.909, 3.655]	[-0.234, 0.195]
Market is far (1 = Yes) × Client Sex	-11.379	-5.795	-4.576	0.196
	[-27.669, 4.911]	[-13.990, 2.400]	[-11.877, 2.724]	[-0.220, 0.612]
Female TSR × Market is far (1 = Yes) × Client Sex	13.261	5.483	4.503	0.069
	[-7.628, 34.150]	[-6.322, 17.288]	[-6.301, 15.306]	[-0.497, 0.634]
Observations	345	345	345	345
Control Mean	19.92	9.71	8.53	0.51
Controls	✓	✓	✓	✓
Market FE	✓	✓	✓	✓
Day of Week FE	✓	✓	✓	✓

The unit of analysis is the market day. All models are estimated using ordinary least squares models, with 95 percent confidence intervals presented in brackets. Covariates in adjusted models include whether the incentive was implemented, market and day of the week fixed effects. Heteroskedastic-robust standard errors are presented. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A11: Analysis of Treatment Male TSR versus Treatment Female TSR, Interaction with Client Sex and Rural Client

	Total No. of Transactions in First 8 Wks.	Total Value of Transactions in First 8 Wks.	No. of Transactions in Last 4 Wks.	Value of Transactions in Last 4 Wks.
Female TSR	-0.286	-383.728	-2.614**	-391.838**
	[-8.934, 8.361]	[-3813.922, 3046.465]	[-4.773, -0.456]	[-759.684, -23.992]
Client Sex (1 = Female)	-4.251	-2254.942	-1.574	-282.135
	[-10.766, 2.264]	[-5675.598, 1165.714]	[-3.631, 0.483]	[-630.358, 66.087]
Female TSR × Client Sex (1 = Female)	-1.261	630.793	1.683	300.020
	[-11.865, 9.343]	[-3977.696, 5239.281]	[-0.602, 3.968]	[-79.147, 679.187]
Market is far (1 = Yes)	-1.968	-208.498	-2.137*	-281.024*
	[-8.580, 4.644]	[-3143.181, 2726.186]	[-4.624, 0.350]	[-567.128, 5.079]
Female TSR × Market is far (1 = Yes)	-1.781	-457.490	3.415**	412.272**
	[-12.311, 8.749]	[-4205.424, 3290.444]	[0.793, 6.038]	[45.772, 778.773]
Female TSR × Client Sex (1 = Female) × Market is far (1 = Yes)	-4.777	-3364.086	-2.261	-271.145
	[-18.068, 8.514]	[-9338.829, 2610.658]	[-5.467, 0.946]	[-670.889, 128.599]
Observations	267	267	195	195
Control Mean	1.08	313.47	0.17	36.88
p-value: Male TSR = Female TSR for Male Clients - Over Last 8 Weeks	0.95	0.83	0.02	0.04
p-value: Male TSR = Female TSR for Female Clients	0.81	0.79	0.15	0.12
Controls	✓	✓	✓	✓
Market FE	✓	✓	✓	✓
Day of Week FE	✓	✓	✓	✓

Notes: The unit of analysis is the client. All models are estimated using ordinary least squares, with 95 percent confidence intervals presented in brackets. Covariates include: age (in four age groups), whether the incentive was implemented, and market and day of the week fixed effects. Standard errors are clustered at the market-day level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A12: Analysis of Treatment Male TSR versus Treatment Female TSR, Interaction with Client Sex and Rural Client

	No. of Transactions per Market Day in First 8 Wks.	Value of Transactions per Market Day in First 8 Wks.	No. of Transactions per Market Day in Last 4 Wks.	Value of Transactions per Market Day in Last 4 Wks.
Female TSR	-0.181	-129.938	-0.368	-98.592
	[-0.989, 0.626]	[-448.054, 188.178]	[-1.110, 0.375]	[-391.934, 194.751]
Client Sex (1 = Female)	-0.539*	-266.868	-0.610*	-148.830
	[-1.175, 0.096]	[-701.121, 167.385]	[-1.230, 0.010]	[-520.597, 222.937]
Female TSR × Client Sex (1 = Female)	-0.284	47.025	-0.022	-38.234
	[-1.301, 0.733]	[-446.690, 540.739]	[-0.947, 0.902]	[-503.729, 427.261]
Market is far (1 = Yes)	-0.113	-97.856	-0.345	13.208
	[-1.064, 0.837]	[-413.467, 217.754]	[-1.311, 0.620]	[-329.211, 355.627]
Female TSR × Market is far (1 = Yes)	0.090	5.035	0.403	3.891
	[-0.934, 1.113]	[-355.850, 365.921]	[-0.613, 1.419]	[-354.230, 362.012]
Female TSR × Client Sex (1 = Female) × Market is far (1 = Yes)	0.238	162.260	-0.101	178.075
	[-1.392, 1.868]	[-587.386, 911.907]	[-1.780, 1.579]	[-628.898, 985.048]
Observations	12752	12752	6376	6376
Control Mean	0.51	143.84	0.51	143.84
p-value: Male TSR = Female TSR for Male Clients - Over Last 8 Weeks	0.66	0.42	0.33	0.51
p-value: Male TSR = Female TSR for Female Clients	0.58	0.85	0.96	0.87
Controls	✓	✓	✓	✓
Market FE	✓	✓	✓	✓
Day of Week FE	✓	✓	✓	✓

Notes: The unit of analysis is the transaction. All models are estimated using ordinary least squares, with 95 percent confidence intervals presented in brackets. Covariates include: age (in four age groups), whether the incentive was implemented, and market and day of the week fixed effects. Standard errors are clustered at the market-day level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A13: Analysis of TSR Sex Treatment - Over Last 8 Weeks

	Total No. of Transactions per Market Day	Total Value of Transactions per Market Day	No. of Transactions in Last 4 Wks. per Market Day	Value of Transactions in Last 4 Wks. per Market Day
A: All Clients				
TSR Sex (1 = Female)	-1.902	-693.201	-0.974**	-159.340**
	[-5.330, 1.526]	[-2157.043, 770.640]	[-1.923, -0.024]	[-317.032, -1.647]
Observations	267	267	195	195
Control Mean	1.65	466.40	0.36	92.31
B: Female Clients				
TSR Sex (1 = Female)	-2.092	-501.214	-0.246	-14.881
	[-4.819, 0.635]	[-1401.611, 399.183]	[-0.873, 0.382]	[-63.551, 33.789]
Observations	100	100	68	68
Control Mean	0.45	115.02	0.09	24.62
C: Rural Clients				
TSR Sex (1 = Female)	-0.160	-27.989	0.594	46.237
	[-4.227, 3.908]	[-689.785, 633.808]	[-0.417, 1.606]	[-54.462, 146.937]
Observations	88	88	70	70
Control Mean	0.56	100.91	0.12	25.63
Controls	✓	✓	✓	✓
Market FE	✓	✓	✓	✓
Day of Week FE	✓	✓	✓	✓

Notes: The unit of analysis is the client. All models are estimated using ordinary least squares, with 95 percent confidence intervals presented in brackets. Covariates include: age (in four age groups), client sex, whether the incentive was implemented, and market and day of the week fixed effects. Standard errors are clustered at the market-day level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A14: TSR Descriptive Statistics: TSR Exam Scores

TSR ID	TSR Group No.	Group No.	TSR Test Score (out of 10)	Group Avg. Test Score
212	1	Female Group A	9	8.0
336	1	Female Group A	6	
093	1	Female Group A	9	
052	2	Female Group B	7	6.6
958	2	Female Group B	6	
959	2	Female Group B	7	
271	3	Male Group A	8	8.3
060	3	Male Group A	9	
556	3	Male Group A	8	
276	4	Male Group B	9	8.5
406	4	Male Group B	8	
614	4	Male Group B	9	
880	4	Male Group B	8	

Table A15: Sub-Group Analysis: Male TSR Group B (High) vs. Female TSR Group A (High) - Market-Day Level

	New SIM Accounts per Market Day	New M-Pesa Accounts per Market Day	M-Pesa Used per Market Day	M-Pesa Conversion Rate per Market Day
Female TSR	-3.113	0.198	0.160	0.084*
	[-7.365, 1.138]	[-2.329, 2.725]	[-2.174, 2.494]	[-0.007, 0.175]
Observations	167	167	167	167
Control Mean	19.92	9.71	8.53	0.51
Controls	✓	✓	✓	✓
Market FE	✓	✓	✓	✓
Day of Week FE	✓	✓	✓	✓

The unit of analysis is the market day. All models are estimated using ordinary least squares models, with 95 percent confidence intervals presented in brackets. Covariates in adjusted models include whether the incentive was implemented, market and day of the week fixed effects. Heteroskedastic-robust standard errors are presented. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A16: Sub-Group Analysis: Male TSR Group B (High) vs. Female TSR Group B (Low) - Market-Day Level

	New SIM Accounts per Market Day	New M-Pesa Accounts per Market Day	M-Pesa Used per Market Day	M-Pesa Conversion Rate per Market Day
Female TSR	-3.671	-0.980	-0.983	0.058
	[-8.369, 1.026]	[-3.761, 1.802]	[-3.554, 1.588]	[-0.037, 0.153]
Observations	152	152	152	152
Control Mean	19.92	9.71	8.53	0.51
Controls	✓	✓	✓	✓
Market FE	✓	✓	✓	✓
Day of Week FE	✓	✓	✓	✓

The unit of analysis is the market day. All models are estimated using ordinary least squares models, with 95 percent confidence intervals presented in brackets. Covariates in adjusted models include whether the incentive was implemented, market and day of the week fixed effects. Heteroskedastic-robust standard errors are presented. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A17: Sub-Group Analysis: Male TSR Group A (Low) vs. Female TSR Group A (High) - Market-Day Level

	New SIM Accounts per Market Day	New M-Pesa Accounts per Market Day	M-Pesa Used per Market Day	M-Pesa Conversion Rate per Market Day
Female TSR	-4.378**	0.028	0.177	0.101**
	[-8.258, -0.499]	[-2.412, 2.469]	[-2.081, 2.436]	[0.023, 0.178]
Observations	178	178	178	178
Control Mean	19.92	9.71	8.53	0.51
Controls	✓	✓	✓	✓
Market FE	✓	✓	✓	✓
Day of Week FE	✓	✓	✓	✓

The unit of analysis is the market day. All models are estimated using ordinary least squares models, with 95 percent confidence intervals presented in brackets. Covariates in adjusted models include whether the incentive was implemented, market and day of the week fixed effects. Heteroskedastic-robust standard errors are presented. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A18: Sub-Group Analysis: Male TSR Group B (Low) vs. Female TSR Group B (Low) - Market-Day Level

	New SIM Accounts per Market Day	New M-Pesa Accounts per Market Day	M-Pesa Used per Market Day	M-Pesa Conversion Rate per Market Day
Female TSR	-5.333**	-1.103	-0.969	0.080*
	[-9.706, -0.961]	[-3.675, 1.469]	[-3.294, 1.357]	[-0.011, 0.170]
Observations	163	163	163	163
Control Mean	19.92	9.71	8.53	0.51
Controls	✓	✓	✓	✓
Market FE	✓	✓	✓	✓
Day of Week FE	✓	✓	✓	✓

The unit of analysis is the market day. All models are estimated using ordinary least squares models, with 95 percent confidence intervals presented in brackets. Covariates in adjusted models include whether the incentive was implemented, market and day of the week fixed effects. Heteroskedastic-robust standard errors are presented. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A19: Sub-Group Analysis: Female TSR Group A (High) vs. Female TSR Group B (Low) - Market-Day Level

	New SIM Accounts per Market Day	New M-Pesa Accounts per Market Day	M-Pesa Used per Market Day	M-Pesa Conversion Rate per Market Day
Female Group B	-1.345	-1.845	-1.829	-0.036
	[-5.101, 2.411]	[-4.291, 0.600]	[-4.096, 0.439]	[-0.122, 0.050]
Observations	169	169	169	169
Control Mean	15.45	9.41	8.38	0.59
Controls	✓	✓	✓	✓
Market FE	✓	✓	✓	✓
Day of Week FE	✓	✓	✓	✓

The unit of analysis is the market day. All models are estimated using ordinary least squares models, with 95 percent confidence intervals presented in brackets. Covariates in adjusted models include whether the incentive was implemented, market and day of the week fixed effects. Heteroskedastic-robust standard errors are presented. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A20: Sub-Group Analysis: Male TSR Group A (Low) vs. Male TSR Group B (High) - Market-Day Level

	New SIM Accounts per Market Day	New M-Pesa Accounts per Market Day	M-Pesa Used per Market Day	M-Pesa Conversion Rate per Market Day
Male Group B	-0.455	0.709	0.764	0.035
	[-5.358, 4.448]	[-1.941, 3.358]	[-1.655, 3.184]	[-0.058, 0.127]
Observations	161	161	161	161
Control Mean	20.57	9.86	8.58	0.50
Controls	✓	✓	✓	✓
Market FE	✓	✓	✓	✓
Day of Week FE	✓	✓	✓	✓

The unit of analysis is the market day. All models are estimated using ordinary least squares models, with 95 percent confidence intervals presented in brackets. Covariates in adjusted models include whether the incentive was implemented, market and day of the week fixed effects. Heteroskedastic-robust standard errors are presented. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A21: Robustness Check: Randomization Inference, Market-Day Level

	New SIM Accounts per Market Day	New M-Pesa Accounts per Market Day	M-Pesa Used per Market Day	M-Pesa Conversion Rate per Market Day
female	-4.473	-0.775	-0.579	0.074
	(0.006)	(0.450)	(0.498)	(0.040)
	[0.002]	[0.384]	[0.478]	[0.015]
Observations	345	345	345	345
Control Mean	19.92	9.71	8.53	0.51
Controls	✓	✓	✓	✓
Market FE	✓	✓	✓	✓
Day of Week FE	✓	✓	✓	✓

The unit of analysis is the market day. All models are estimated using ordinary least squares models, with randomization inference-generated p-values (500 replications) presented in parentheses and standard heteroskedastic-robust p-values presented in brackets. Covariates in adjusted models include whether the incentive was implemented, market and day of the week fixed effects.

Table A22: Robustness Check: Multiple Hypothesis Testing, Market-Day Level

	New SIM Accounts per Market Day	New M-Pesa Accounts per Market Day	M-Pesa Used per Market Day	M-Pesa Conversion Rate per Market Day
female	-4.473	-0.775	-0.579	0.074
	(0.010)	(0.373)	(0.449)	(0.038)
	<0.016>	<0.707>	<0.449>	<0.048>
	|0.011|	|0.456|	|0.524|	|0.084|
	[0.002]	[0.384]	[0.478]	[0.015]
Observations	345	345	345	345
Control Mean	19.92	9.71	8.53	0.51
Controls	✓	✓	✓	✓
Market FE	✓	✓	✓	✓
Day of Week FE	✓	✓	✓	✓

The unit of analysis is the market day. All models are estimated using ordinary least squares models, corrected for multiple hypothesis testing using the Romano-Wolf correction in parentheses (500 replications), the Holm correction in angled brackets (500 replications), market-level clustered p-values in vertical brackets, and standard heteroskedastic-robust p-values in square brackets. Covariates in adjusted models include whether the incentive was implemented, market and day of the week fixed effects.