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Taking financial access to remote and insecure areas: Impacts of a comprehensive financial inclusion intervention in Papua New Guinea

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Abstract

We study the impacts of a comprehensive financial inclusion program in a particularly remote, insecure and low-trust setting, lacking bridging institutions to facilitate sustained interventions. We evaluate this program in Wewak district in northwest Papua New Guinea, by randomly assigning treatment to 41 of 79 villages. The program involves a two-day financial literacy training workshop, timely offers of no-fee bank accounts with reduced administrative hurdles, and savings 'nudges'. We use both survey and bank account administrative data to measure its impact on financial literacy, budgeting and savings behaviour, as well as on the ownership and use of bank accounts. Although 25% of adults in treatment villages attended the training and 70% of participants opened a bank account, we do not detect any significant downstream effects. Our results draw into question the benefit of initiatives aiming to 'bank the unbanked' in remote areas, revealing challenges in promoting financial inclusion among the next frontier of underserved and hard-to-reach populations.

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Taking financial access to remote and insecure areas: Impacts of a comprehensive financial inclusion intervention in Papua New Guinea

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Taking financial access to remote and insecure areas: Impacts of a comprehensive financial inclusion intervention in Papua New Guinea

1. Introduction

Policymakers seek to increase financial inclusion for the poor in developing countries to enhance resilience, mitigate inequality, and deepen financial markets. Financial inclusion enjoys a prominent position as part of the 2030 Sustainable Development Goals (SDGs), where it appears as a target in enabling seven of the seventeen goals, including in eradicating poverty (SDG1), ending hunger, achieving food security and promoting sustainable agriculture (SDG2), achieving gender equality and economic empowerment of women (SDG5), and reducing inequality (SDG10). Being part of the financial system can allow people to better manage risk, start or invest in a business, and fund large expenditures such as education or a home improvement (Ashraf et al, 2010; Bruhn et al, 2014; Burgess et al, 2005; Dupas & Robinson, 2013). However, despite progress in recent years in enhancing access to formal financial services, a number of open questions remain about enhancing financial inclusion, particularly in rural and remote areas lacking market access and in areas facing low trust and insecurity, and for households that are not easily reached through bridging institutions such as microfinance institutions, agricultural cooperatives, schools, or private companies.

Attempts to date at enhancing financial inclusion have largely focused on three key barriers: lack of financial literacy, the administrative, procedural and cost barriers to the take-up of formal financial services, and social and behavioural interventions that can stimulate and reinforce good financial health. However, insights from prior studies, which generally focus on tackling one barrier at a time in more densely populated areas through leveraging bridging institutions (such as existing community organisations), may be less relevant for more isolated, remote, and insecure populations. For example, while there is broad evidence that intensive financial education is more impactful (Kaiser & Menkhoff, 2017), intensive and prolonged interventions may be infeasible in hard-to-reach locations. Meanwhile, simply providing bank accounts, even after removing some fees

and administrative barriers, may not be impactful in the absence of additional support stimulating account utilisation (Dupas et al, 2018).

According to policymakers, only 37% of adults in Papua New Guinea (PNG) have access to a bank account, which is one of the highest rates of exclusion in the world (Pacific Financial Inclusion Program [PFIP], 2017). In the rural and remote areas covering most of the country, the majority of people lack basic financial knowledge about savings and budgeting. A comprehensive survey by the World Bank in two largely rural provinces in PNG (Madang and Morobo) showed that most households do not plan or budget and over two-thirds of households stated that they would not be able to cover a major unexpected expense tomorrow without borrowing (Zhang, 2016). The only nationwide survey on financial literacy in PNG showed that just 25% of respondents understood how to calculate compound interest and a little over half of respondents understood percentages (Anglo Pacific Research, 2013).

To address these challenges, the Asian Development Bank and Australian Government have supported the Bank of PNG to implement a highly scalable financial inclusion program over the past eight years that has reached more than 200,000 adults across all provinces of PNG (Asian Development Bank, 2016). The program includes a two-day training workshop on financial literacy, focusing on saving and budgeting. The features of the workshop match a number of best practices for financial training that have been uncovered in recent literature, including being "simple and actionable, personalised for individuals' needs and situations … convenient to access and entertaining to participate in" (Wagh, 2017). In particular, the workshops were simple and relevant to the local context, and personalised through individual budgeting exercises and role-playing. Bank agents then visited the same communities at the end of the training to offer bank accounts with limited to no fees. This careful timing allowed participants to make an immediate, convenient decision about accessing a bank account.

For the purposes of this study, we augmented the nationwide program with two additional intervention elements. First, reducing the burden of bank account sign-up, by allowing participants in the training to register for a bank account simply with the combination of their training certificate (verified by the training team), and physical

identification by the head of their ward.[1] Bank agents often augmented this by taking a photo of participants. Second, participants who had a mobile phone received six SMS reminders to save every two weeks following the training.

To identify the impact of the program, we conducted a randomised control trial in 2017-2018 across 79 wards in Wewak district in East Sepik province in northwest PNG, a remote part of the country with high levels of violence and theft, and hence low trust (Lakhani & Willman, 2014). The region had not previously been exposed to the training program. According to the 2011 PNG Census, there are over 87,000 people spread across 110 wards in Wewak district. The Wewak economy largely depends on cash crops and is isolated in terms of land transport from the broader PNG economy. Wewak town is the only urban centre in Wewak district. There are three main banks operating in the district and all have branches in Wewak town. All three banks offer mobile money services, most commonly through feature phones. However, most of the study wards were in rural areas outside Wewak town, where households are typically engaged in small-scale agriculture, such as cocoa. In the entire province, there were around 30,000 active bank accounts for over half a million people.

In August 2017, prior to treatment assignment, we conducted a baseline survey with an adult in each of a representative sample of 3,071 households, in the 79 candidate wards. Results of the baseline survey confirm low *ex ante* access to savings options outside the household. After treatment assignment, the training workshops were launched in September 2017. The training was socialised through ward leaders, and anyone in the community was free to join. Prior to the training the participants knew about a small in-kind incentive provided in the form of food (to the value of US$3) during the training, but they did not expect the bank account offers nor the SMS reminders, which were only offered to training participants in treatment wards. By the end of 2017, 80% of participants had completed the program, with the remaining 20% completing the program in January and February 2018. We conducted a follow-up survey in August 2018, which is on average nine months after the median participant completed the program.

[1] A ward is the lowest level of government demarcation. In rural areas, a ward typically covers one village. In urban areas, a ward typically refers to a neighbourhood.

Baseline survey data and administrative data from the training rollout corroborates the assumptions behind our pre-specified statistical power calculations (see section 3.2.2). On average 25% of the population in the treatment wards attended the training. This is notable, as previous studies have found that demand for financial education can be relatively low, even in the presence of incentives. For example, Bruhn et al (2014) found that only about one-third of participants took up a financial education training offer in Mexico City, in spite of larger incentives than in the current study. Hence, it is striking that a broadly targeted program with minimal incentives (US$3) managed to reach around a quarter of the targeted population. Furthermore, administrative data illustrates that bank agents were present at the end of the training in every treatment ward, and bank account take-up was around 70% among the trainees. Overall, this suggests a relatively strong "first stage" to the experiment, sufficient to make the detection of economically meaningful impacts on downstream outcomes feasible.

Despite the popularity of the program, we do not detect significant downstream effects across all respondents in our follow-up survey. Administrative data from the commercial banks in Wewak district is consistent with this as over 80% of the accounts that were opened as part of the program were not used. As per our pre-analysis plan, we study heterogeneity in the treatment effects from the program in terms of distance to Wewak town, frequency of attendance to Wewak town (where the banks are based) and ownership of a mobile phone (as savings SMS reminders were only sent to participants with a phone). We find some evidence that the program had a positive effect on the savings behaviour of respondents who rarely visit Wewak town and on those located in more remote wards. This higher level of savings did not lead to greater use of bank accounts potentially because these participants face higher transaction costs from visiting the bank in person, which is how almost 90% of transactions are made. There is very little evidence from either the survey or administrative data to suggest the SMS reminders had an impact on the behaviour of participants. Collectively, our results draw into question the benefit of initiatives aiming to 'bank the unbanked' in remote areas, revealing challenges in promoting financial inclusion among the next frontier of underserved and hard-to-reach populations.

This study provides a number of contributions to the literature on the impacts of financial education, and more broadly to the literature on financial inclusion, in developing

countries. First, while prior literature has shown limited impacts from more narrowly focused financial inclusion programs, this is one of the first randomised evaluations to consider an intervention that addresses multiple constraints. Prior studies have often shown relatively limited benefits from programs that only focus on one component of financial inclusion, such as low-fee bank accounts, particularly when focusing on usage (Dupas et al, 2018; Knowles, 2018), or financial education training on its own (Bruhn et al, 2014; Cole et al. 2014; Fernandes et al, 2014; Kaiser & Menkhoff, 2017; Miller et al, 2014). Among the few studies combining financial education and bank account offers, Jamison et al (2014) showed that this combined intervention increased the level of savings of households for 250 youth clubs in Uganda. However, the bank accounts were group-based. In a broadly similar vein, Calderone et al (2018) added a financial education program to the rollout of a branchless banking program, showing that this leads to an increase in savings. However, this relies on an intensive financial access program. Finally, there is evidence that SMS reminders can be an effective nudge to increase the use of savings accounts (Karlan et al, 2016), although there are relatively few studies that consider the impacts of follow-up account offers or training with regular reminders to save. We study one of the most comprehensive financial inclusion programs to be evaluated, as it aims to increase knowledge, accessibility to banks (through bringing in bank agents to do local sign-ups in a timely way, reducing or eliminating fees, and simplifying documentation requirements), and nudge people to use their bank accounts.

Second, with respect to the literature on financial education, we provide evidence on a program that integrates a number of 'best practice' characteristics highlighted in recent literature. There is promising evidence that financial education programs with features such as being simple and actionable (e.g. Drexler et al, 2014), targeted and personalised (e.g. Carpena et al, 2019), and convenient and entertaining (Berg & Zia, 2013), can have a significant benefit (Wagh, 2017). Meta-analyses of the literature on financial education interventions have also previously emphasised the importance of timeliness (Fernandes et al, 2014; Kaiser & Menkhoff, 2017). While by nature the intervention we consider is not timed to coincide with specific financial decisions of participants, the bank account offers and savings reminders are designed to build on and reinforce the education component in a timely way.

Third, we provide evidence on a scalable financial inclusion program in a relatively unique setting. Prior evaluations of financial inclusion programs, whether through bank accounts with reduced access constraints or other mechanisms to increase savings, have tended to be conducted in urban or peri-urban locations (e.g. Prina, 2015), and/or have leveraged bridging institutions to build and sustain connections to beneficiaries, such as formal and informal financial institutions, agricultural cooperatives and clubs, schools, and private companies (e.g. Ashraf et al, 2006; Brune et al, 2015; Dupas & Robinson, 2013). Programs on financial education have also tended to be conducted in urban areas (e.g. Bruhn et al, 2014; Carpena et al, 2019; Doi et al, 2014[2]), and also to leverage bridging institutions (e.g. Bruhn et al, 2016). Lessons that successful financial education programs tend to be more intensive (Kaiser & Mankhoff, 2017) may not be scalable in rural and remote contexts, particularly when bridging institutions are lacking, so this is an important question as various stakeholders look to increase financial inclusion among the next frontier of underserved and hard-to-reach populations. We provide evidence from a particularly remote setting in Papua New Guinea with relatively high risk of theft, insecurity, and lack of trust. Prior studies of financial inclusion interventions among populations facing insecurity or conflict are also relatively scarce (e.g. Blumenstock et al, 2015; Hetling et al, 2016).

Finally, we contribute what is to our knowledge the first large-scale randomised control trial of a primarily economic intervention in the country of Papua New Guinea, and one of the first in the Pacific Islands. A small set of prior studies in other Pacific Islands have leveraged randomisation to look at the impacts of community-driven development (Beath et al, 2018) and migration through a public lottery (Gibson & McKenzie, 2014). Our study contributes to evidence-based policymaking in this part of the world, by providing evidence on a highly policy-relevant issue for the region, from a preregistered study design.

[2] The population sample in Doi et al's study is mixed between an urban area and a rural area.

2. Background

2.1 Setting of the study

Papua New Guinea is a lower-middle-income country, with one of the highest rates of extreme poverty in Asia and ranks in the bottom 20% of countries globally in terms of the United Nations Human Development Index (World Bank, 2019; United Nations Development Programme, 2019). PNG also has a relatively low rate of bank account ownership, with only 37% of the adult population owning an account (PFIP, 2017), compared to 63% across low- and middle-income countries globally and over 70% in developing East Asia and the Pacific (World Bank, 2020). As of 2017, there were three main retail banks in PNG (Bank South Pacific, People's Micro Bank and MiBank), 227 branches, 464 ATMs, and 460 agents servicing a population of almost eight million people (PFIP, 2017).

The impact evaluation took place in the northwest of PNG in Wewak district in East Sepik province, which the best estimates suggest is a slightly wealthier than average district (Gibson et al., 2005; see also the map of the parts of Wewak district included in Appendix A). According to the 2011 PNG Census, there are 87,761 people in 16,278 households spread across 110 wards. Many of these wards are located on remote islands or in mountainous terrain, which makes them logistically very challenging to reach. Around 30,000 people live in Wewak town, the provincial capital, which is the only "urban" part of the district. Subsistence farming is the main activity and this occurs all year around. The only major source of economic activity that generates cash flow in the district is cocoa and copra farming. These crops are harvested all year round.

Access to bank accounts is slightly higher in Wewak district compared to the rest of the country according to administrative data provided by the three main banks that have retail operations there. At the time of the study, across East Sepik province, which has a population of over half a million people, there were around 30,000 active bank accounts in operation at the three retail banks (Bank South Pacific, People's Micro Bank and MiBank). Anecdotical evidence from these banks suggests that bank account ownership is higher in Wewak district compared to the rest of East Sepik province (but still low by global averages). This is largely driven by residents of Wewak town and may be because

the district is slightly wealthier than the median district in the province (Gibson et al., 2005). The only physical bank infrastructure in the district is in the town itself and there is only limited use of mobile cash agents by banks. The majority of wards in the district are located within two hours by public motor vehicle ride on sealed roads from Wewak town. As such access to banks to actually deposit or withdraw money is possible but time-consuming and relatively costly.

2.2 Intervention

The financial inclusion program we are evaluating is a key activity facilitated by the Centre for Excellence in Financial Inclusion at the Central Bank of PNG (BPNG). In total, US$25 million of financing, primarily by the Asian Development Bank (ADB), has been spent on this program from 2011 to 2019. Over 250,000 people, half of which are women, participated in the training across all provinces in PNG, and around 100,000 bank accounts have been opened by participants in conjunction with the program.

The financial inclusion program that we evaluate in Wewak district in East Sepik province took place primarily from September 2017 to February 2018. The program was open to all adults in the treatment villages and they were invited to preregister one to two weeks in advance at village meetings or at the end of their local church service. In this part of PNG, the head of each village commonly holds a meeting on Sunday (after the local church service) in a central part of the ward, where people can raise concerns or discuss issues. Anecdotal evidence suggests that around half of households in a village send a representative to attend the weekly meetings. It was during these meetings that village members were informed and reminded about registering for the financial education training.

There were three main components to the program:[3] (1) financial education training about the benefits of saving and budgeting; (2) access to fee-free bank accounts that can be opened away from bank branches with reduced administrative requirements; and (3)

[3] This is a more comprehensive version of the program than was rolled out elsewhere in PNG as SMS reminders were added, and the ADB partnered with the banks to reduce or remove the account opening fees, and reduce or remove ongoing usage fees.

savings reminders sent via SMS to the owners of the bank accounts. We look at each component in greater detail below.

Component 1: Two-day financial education training

The training course consisted of two (consecutive) nine-hour days focusing on the topics of savings and budgeting (a brief summary of topics can be found in Appendix B). The content of the course was developed by the US-based organisations Microfinance Opportunities and Freedom from Hunger through funding by the Citigroup Foundation, and we then tailored it to the local context (see Appendix B for details). The savings module (a total of 11 hours) focused on encouraging participants to set savings goals, increase their level of savings, and to prepare for emergencies by setting aside money in an 'emergency fund'. The budgeting module (7 hours) taught participants how to budget and keep records of their income and expenses as well as set short-term and long-term financial goals. Trainers were provided with A3 paper and permanent markers as the main form of teaching materials. All participants were required to develop their own personalised savings and budgeting plan and were encouraged to share their plans with the group. In addition, there were opportunities for participants to be involved in role-play and ask questions throughout the course. In most locations, the trainers stayed in the village overnight so individualised conversations about how to apply the skills learnt during the training often continued well into the evening of the first day. Participants only received a small in-kind incentive of US$3 worth of food during the training for their participation.

A widely respected local non-government organisation won the competitive tender process to conduct the training. The training took place at the village level, but there was a maximum of 30 participants per instructor. On average, three separate sessions were held simultaneously in each village (i.e. 60 to 90 people were trained). All instructors received a five-day training course by BPNG staff. The lead training instructor held two qualifications from the leading educational institution on this topic in PNG, the PNG Institute of Banking and Business Management. Specifically, they were qualified as a 'certified microfinance professional' and 'train-the-trainer expert'. The training was primarily conducted in the local dialect, Tok Pisin.

Component 2: Bank account offers

All participants in the program were immediately offered no-fee bank accounts[4] from the commercial banks that operate in Wewak district at the end of the training. The ADB partnered with all three banks with branches in Wewak district as part of the program. The banks agreed to send agents to the 41 treatment wards on the second day of the financial education training to sign people up to get bank accounts. In addition, they removed the onerous identification requirements (such as needing a driving licence or passport) that often inhibit people from accessing bank accounts, instead accepting customers on the basis of a training completion certificate and verification of their identity by the head of the ward. Bank agents also typically took a picture of newly registered clients. In practice, only one of the three banks, MiBank, regularly attended the training sessions (visiting all wards where the training was conducted); however, participants in all treatment wards had access to an agent from at least one bank. Only training program participants were eligible for the fee-free accounts (details in Appendix C), and the banks did not offer the accounts to other people in the treatment wards that did not attend the training, or anyone else from the control wards or elsewhere. This was verified using program data and random auditing by BPNG staff.

Component 3: Savings reminders

All participants in the training that signed up for a no-fee bank account and had a mobile phone received six SMS reminders every two weeks following the training, to encourage them to use their bank accounts. These messages referred to some of the themes discussed as part of the financial education training (see Appendix D). An example of an SMS message sent by Bank South Pacific is as follows: 'Thank you for saving with BSP. Grow your savings today by depositing extra funds into your BSP savings account.' Most of the participants elected to open mobile money accounts, which meant it was possible for them to transfer funds into their accounts upon receiving this SMS without needing to

[4] In PNG all banks charge either an account operating fee or a monthly account keeping fee. As part of this program, MiBank offered customers no-fee bank accounts over the life of the account; Bank South Pacific and People's Micro Bank only removed bank fees for the first three months. See Appendix C for details.

contact an agent or visit a branch. The messages were sent in both English and the local dialect, Tok Pisin.

2.3 Theory of change

The aims of the program are to increase financial literacy, budgeting, and savings behaviour as well as to integrate people into the formal financial system through the ownership of bank accounts. The program is clearly designed in a way that implies a lack of knowledge about financial literacy and a lack of access to formal financial products are binding constraints to improved budgeting and savings behaviour. This is reflected in the following hypotheses that we preregistered with the American Economic Association's randomised controlled trials (AEA RCT) registry on 30 August 2017 (AEARCTR-0002402).

Hypothesis 1: The training will increase participants' financial literacy and knowledge.

Hypothesis 2: The training will lead to a more disciplined management of money.

Hypothesis 3: The training will increase the savings behaviour and resilience of households.

Hypothesis 4: The training will lead to greater ownership and use of bank accounts.

As per the registration of this study, the main outcomes of interest are improved financial literacy, better financial planning, increased savings behaviour and increased use of financial products.

We describe in detail in Appendix E the questions in the survey that are used to measure these outcomes.

We also test the following heterogenous treatments to tease out the channels that might be driving the downstream effects. Specifically, we analyse whether people who had more access to Wewak town were more likely to benefit from the program as they had greater access to the banks, which is where most deposits were made. We also consider if the effect of the program varied by mobile phone ownership as the third component of the program was only delivered to participants who had a phone.

3. Methodology

3.1 Data collection

The main source of data for this study are the representative baseline and follow-up surveys of 3,071 households across the 79 treatment and control villages. The questions included in the survey cover background characteristics of households, budgeting activities, ownership and use of financial products, financial literacy, financial awareness, and decision-making within households (see variable definitions in Appendix F). The main source of questions was from a 2014 survey conducted by the World Bank in neighbouring provinces, which used a standardised questionnaire about financial capability that had been rolled out in 14 low- and middle-income countries in Latin America, Africa, the Middle East, East Asia, and the Pacific (Zhang, 2016). Additional questions were sourced from a 2013 survey on financial literacy in PNG conducted by the market research firm Anglo Pacific and funded by the ADB (Anglo Pacific Research, 2013).

The fieldwork for the baseline and follow-up surveys was conducted by Tebbutt Research, which is a leading survey firm in the Pacific region. Households included in the survey were selected using a 'random walk'[5] approach to approximate a representative sample of the ward. Enumerators were instructed to approach the household and first seek to interview the household head. If the household head was not available, then they were instructed to seek to interview the household head's spouse. If the spouse was not available, then they were instructed to interview an adult member of the household who is well informed about the household's financial behaviour.

Both the baseline and follow-up surveys took around four weeks in the field. The baseline survey was conducted in August 2017 and the follow-up survey took place in August 2018. This means that the follow-up survey was conducted about nine months after the median participant attended the training. In the baseline survey round, the termination of data collection occurred when the survey company had met its quota for the number of observations necessary to satisfy the assumptions in the statistical power calculations.

[5] There are no existing household listings in East Sepik. As a result, enumerators began interviewing households at a central location in each ward and then walked in a circular pattern out of the ward interviewing every third household on the left.

In the follow-up survey, enumerators attempted to follow up all baseline respondents three times when possible, and replaced respondents who could not be contacted (see also section 3.2.3).

Data quality was ensured at multiple steps throughout the collection process. First, there was one fieldwork supervisor for every two enumerators to ensure enumerators accurately recorded the responses given during the interview process. Second, officials from the Bank of PNG, independent from the survey firm, audited 10% of respondents to ensure that the survey firm who collected the data maintained a high level of accuracy. The results of the audit suggested a very high level of accuracy in data collection with an error rate well below 5%. Third, the survey instrument was piloted in two small samples for quality assurance purposes (e.g. to ensure that respondents clearly understood the survey questions). The first pilot was conducted around Port Moresby, the capital of PNG, and the second in Wewak town.

We complement this primary survey data with administrative data from the three main commercial banks in Wewak district and with program reporting data from the implementing partner that was independently verified by BPNG. Specifically, the commercial banks provided data about the number and size of transactions made by program participants over a six-month period from when accounts were opened (on average), details about bank account ownership and usage in treatment and control wards, and information about the timing and content of the SMS messages sent to participants. The program administrative data includes information about the number and gender of participants who completed the training as well as the existing levels of bank account ownership.

3.2 Identification strategy

3.2.1 Randomisation and statistical balance

To identify the impact of the program, we randomised the treatment at the ward level, with a single treatment arm (41 wards) compared to a single control arm (38 wards). Many of the wards in Wewak district are located on remote islands or in mountainous terrain, which makes them very challenging to reach. Due to logistical constraints, of the 110 wards in Wewak district only 79 of the more accessible wards were included in this

study. There are almost 13,000 households in these 79 wards. We stratified the randomisation of wards by sub-district to ensure the treatment and control wards were equally allocated within each of the five sub-districts in Wewak district.[6]

The random selection of which wards participated in the financial inclusion program resulted in statistical balance on observables between treatment and control wards. The baseline data shows that the differences in means between treatment and control wards across the key background characteristics are not statistically significant (see Table A1 in Appendix G).

3.2.2 Sample size and statistical power

We conducted statistical power calculations based on our main outcome of interest, bank account ownership, to determine the minimum sample size needed across these 79 wards to detect an increase of 10 percentage points at the level of the population in a single cross-sectional follow-up survey round. As per our AEA RCT registry preregistration, we made the set of assumptions shown in Table 1 below based on existing BPNG program data and the experience of the program managers in other parts of PNG. Baseline data, program administrative data, and administrative data from the banks we partnered with support the validity of these assumptions. Based on these assumptions, a sample size of at least 3,000 households in 79 wards was determined to be appropriate.

Table 1: Assumptions underpinning statistical power calculations

	Preregistered assumptions	Actual outcomes
Share of adults that attend training in ward	25%[(a)]	25%
Existing account ownership by participants	40%[(b)]	34%
Share of participants opening an account	67%[(c)]	70%
Intra-cluster correlations	0.08[(d)]	0.075

[(a)] Based on the experience of program managers [(b)] Based on program data from other parts of PNG [(c)] Based on program data from other parts of PNG [(d)] Based on what was used in other RCTs in similar settings

[6] A video documenting the random selection is available here: https://www.youtube.com/watch?v=tO00JAOmZxM.

Our experiment is adequately powered to be able to detect an effect on a range of outcomes of interest beyond a 10 percentage point increase in bank account ownership from a single post-treatment survey round. We will be able to detect an effect on behaviours that are plausibly directly impacted by the training program (e.g. savings and budgeting behaviour) at a similar order of magnitude to that of bank account ownership. Prior studies have found effects of a size that we would be powered to detect for such outcomes, such as a 10 percentage point increase in financial knowledge (Carpena et al, 2019).

3.2.3 Attrition at the household and individual level

Every effort was made to avoid attrition, including registering the GPS coordinates of all households at baseline and taking photos of respondents. However, there are challenges with conducting surveys in an insecure and remote part of PNG, which resulted in a moderate rate of attrition at the household level. For example, some enumerators experienced attempted carjacking and got caught in the crossfire of an armed conflict between rival gangs, which meant it was not always possible to return to households multiple times to try to reduce attrition to our survey. As a result, follow-up interviews were unable to be conducted with 17% of the households that participated in the baseline survey. When the household was not contactable a neighbouring household was interviewed instead.

A greater concern is there was considerable attrition at the individual level. Only 35% of respondents in our follow-up survey also participated in the baseline survey. In cases where the same respondents within a household could not be found, another adult in the household was interviewed instead. As such we only use the follow-up survey data in our analysis of the effect of the program through a cross-sectional randomised control trial. This reduces the power we have to detect an effect but as discussed above, we ensured that our study was reasonably powered in the event that this occurred. We show that the differences in means between treatment and control wards across key background characteristics in the follow-up data are not statistically significant (Table A2 in Appendix G).

3.2.4 Reducing the risk of contamination and expectancy bias

We took a number of steps to minimise the risk that respondents from control wards joined the program in the treatment wards. First, training workshops were conducted at the village level. There is a clear territorial demarcation at this level in this part of PNG due to tribal tensions. As a result, it is common knowledge which village each adult belongs to and a person from a neighbouring village could not attend the program without being noticed. Second, village members were only informed about the program within a week or two of the training taking place. As such, there was little time for people from the control villages to relocate to the treatment villages just to receive the training. Third, program participants had to enroll for the training in advance and the chief of each village had to verify that the people registered were actually village members. Fourth, the commercial banks only offered bank accounts to program participants as the subsidy they received for removing bank fees was only for participants. They were briefed that the administrative data provided by the bank would be crosschecked with the program administrative data to ensure they did not offer fee-free bank accounts to non-participants.

In addition, we minimised the potential for expectancy biases, as people living in the control villages were 'blinded' (masked) as they were not informed about the potential to receive the program in the future. We did this to minimise the possibility of cross-contamination of treatment.

3.3 Empirical analysis

3.3.1 Statistical model

We perform two types of empirical analysis. The first and most straightforward type of analysis we conduct is comparing the effect of the program on the outcomes discussed above using an Ordinary Least Squares (OLS) regression in the form of a linear probability model.[7] We use this model to test the overall effect of the program. This involved creating a dummy variable, (T_i), which takes on the value one if the respondent

[7] As a robustness check, we conduct logit regression analysis for binary outcomes regression and the results are qualitatively similar.

belongs to the treatment group and the value zero if the respondent belongs to the control group. In addition, we create a dummy variable for each of the outcomes of interest discussed above (Y_{it}):

$$Y_{ij} = \beta_0 + \beta_1 T_i + I[j] + \varepsilon_{ij}, \quad (1)$$

where i denotes households, j denotes sub-districts ($I[j]$ is a set of sub-district fixed effects), β_1 captures the average difference between respondents in the treatment group and the control group in regards to the outcome of interest (Y_{ij}), ε_{ij} is the model error term cluster robust standard errors will be estimated at the ward level, and β_0 is the intercept.

We also explore heterogeneous effects of the treatment between different groups of respondents. We preregistered our intention to explore heterogeneity in terms of respondents' distance from Wewak town, frequency of attendance to Wewak town and ownership of a mobile phone. Our descriptive analysis of the survey data lead us to test two additional dimensions of heterogeneity (education of respondents and household income). To conduct this analysis we use an OLS regression and interact the treatment with a dummy variable capturing one of these characteristics (A_{i0}):

$$Y_{ij} = \alpha_0 + \alpha_1 T_i + \alpha_2 T_i * A_{i0} + \gamma_{ij}, \quad (2)$$

where α_1 captures the average difference between respondents in the treatment group and the control group in regards to the outcome of interest (Y_{ij}) among those who do not have the characteristic (A_{i0}), α_2 captures the interaction effect of the treatment on respondents who have the characteristic (A_{i0}), γ is the model error term (cluster robust standard errors are estimated at the ward level), and α_0 is the intercept.

3.3.2 Multiple outcome and multiple hypothesis testing

Since our surveys contain a number of questions related to financial knowledge, behaviours, and outcomes, we follow Kling et al (2007) in creating aggregate indicators for different families of outcomes. This minimises the risk of a false positive due to multiple hypothesis testing, and is appropriate for this study as the number of outcomes is relatively limited (each survey takes only about 20–30 minutes in the field). These indexes are created by determining the average z-score of outcomes within a given

family, such as financial literacy (obtained by subtracting the mean of each variable and dividing it by its standard deviation). The three families of outcomes relate to financial literacy/knowledge, budgeting, and savings. In the main results section we present the impact on each of the individual questions that make up these aggregates along with the overall impact of the indexes. For the sake of brevity in the heterogenous treatment effects section, we only present the effects on the aggregate measures. As the questions regarding bank ownership/use are quite distinct,[8] we chose not to create an index for these outcomes.

4. Data

In this section we provide descriptive findings about the background characteristics of respondents, and what characteristics are associated with the kinds of financial literacy, planning and savings behaviour that the program is aiming to improve. We also present information about the program that took place.

4.1 Descriptive data from household survey

This subsection provides background information about all respondents. Using data from the control wards, we present information about the existing levels of financial inclusion and the characteristics associated with higher levels of financial inclusion.

4.1.1 Background characteristics of respondents

As discussed in Section 2.1, this study took place in the district surrounding a small, coastal urban area in a remote part of PNG. Just over half the respondents to our survey (51.4%) lived either in Wewak town or within 30 minutes travel to the main marketplace in the town. On average, respondents reported a monthly household income of K220 (approximately US$65) shared between six people.[9] Respondents who lived in Wewak town reported a household income around twice as large as those that lived in the other four rural sub-districts and 70% reported they earned an income through labour. As is

[8] One question is about whether respondents have a bank account (the extensive margin), one question is about the number of accounts (the intensive margin), and one question relates to account usage.

[9] On average, 3.5 household members were aged between 18 and 50.

the case in most subsistence settings, households in rural areas of Wewak district largely relied on food crops as their main source of income and around half earned an income from the main cash crop, cocoa. Levels of education were also substantially higher in urban areas with around 57% of respondents within Wewak town having attended secondary school compared to an average of 34% in the other four rural sub-districts.

4.1.2 Levels of financial inclusion

At first glance, survey respondents would appear to have a moderate level of financial inclusion without the program; however, this is largely on the extensive margin as opposed to the intensive margin. While half of respondents claimed they set a target of how much to spend each week or month (we use this as one indicator of budgeting), only 22% reported sticking to their targets. Similarly, around 42% of respondents claimed they save weekly, but only half of them reported saving each time they are paid. Surprisingly, around half of survey respondents reported owning a bank account prior to the start of the program. However, as is the case with budgeting and savings, this aggregate figure masks lower levels of financial inclusion. Only 16% of respondents reported actually depositing money in their bank accounts at least once a month. As such two-thirds of people that owned a bank account rarely or never used their bank account. Overwhelming the main benefit respondents gave for having a bank account is that they provide better security for their money. Almost 80% of respondents who had a bank account strongly agreed with the statement that 'Storing money in the bank provides better security'.

There was suggestive evidence from the survey that respondents may benefit greatly from the financial inclusion program that we evaluate. A deeper understanding of financial literacy and budgeting behaviour were strongly correlated with savings and being part of the formal financial system. For example, even after controlling for background characteristics, households that budgeted were 17 percentage points more likely to save than those that did not and households that stuck to their budget were 27 percentage points more likely to save than those that did not. Furthermore, one of the main reasons respondents stated for not owning a bank account was lack of access to banks and their agents. This can be seen by the fact that about 90% of respondents in Wewak town, Wewak rural and Dagua sub-districts (70% in Turubu and the islands sub-districts) had not encountered or heard of a bank agent visiting their ward in the six

months prior to the survey. In addition, less than 10% of respondents in the baseline survey stated they had access to informal savings outside the household. As such, prior to the program, most participants did not have access to savings options (either formal or informal) outside of their household.

4.1.3 Characteristics associated with financial literacy, budgeting, saving and using a bank account

To develop a better understanding of the characteristics associated with financial literacy, budgeting, saving and owning/using a bank account, we conduct multivariate regressions and report on the characteristics that are positively associated with these behaviours (see Table A3–A6 in Appendix G for the full results). Higher levels of household income, having attended secondary school, owning a mobile phone, wages being the main source of household income, believing one's household is not poor and being male were positively associated with these behaviours. In the following section we analyse how the treatment varied by each of these characteristics along with the frequency of respondents' attendance to Wewak town and living within 30 minutes of the centre of Wewak town (as we pre-specified our intent to examine heterogenous effects along these dimensions).

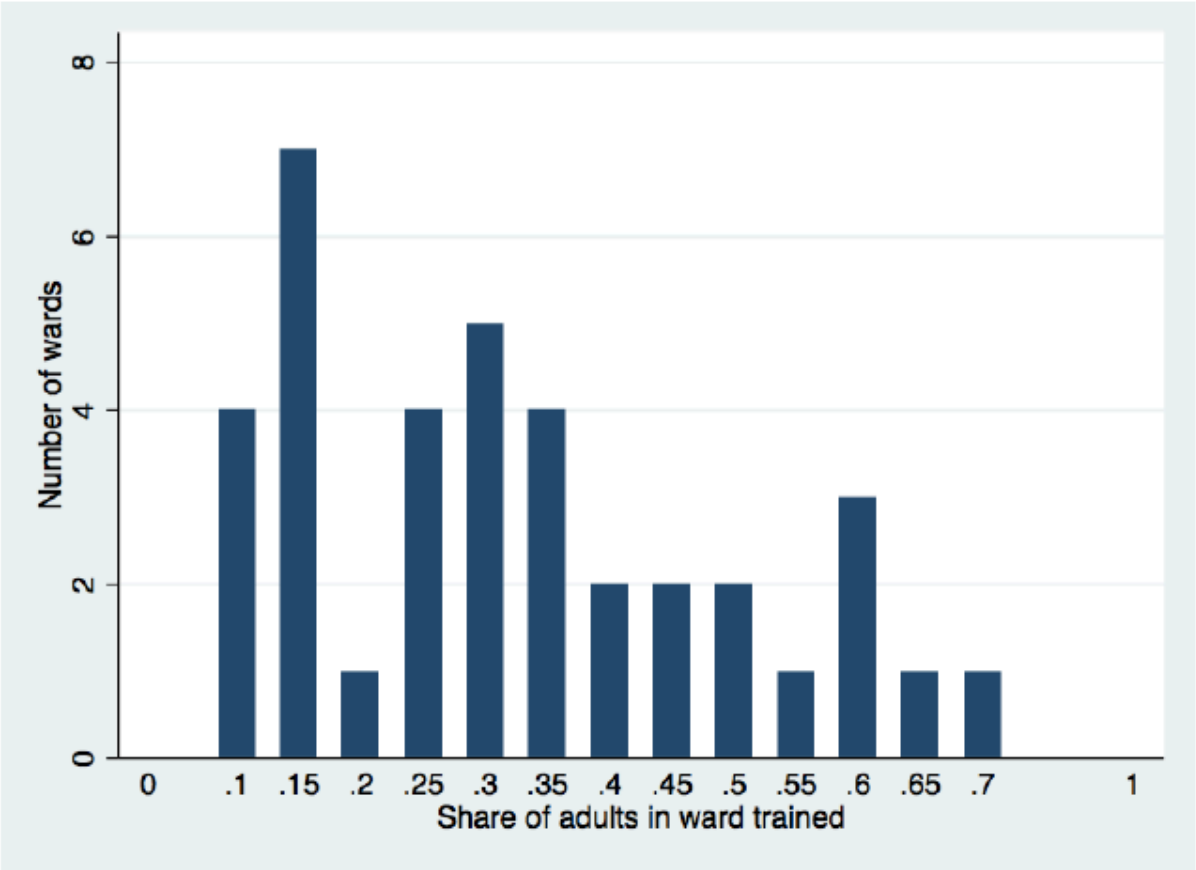
4.2 Program attendance and bank account take-up data

This subsection provides an overview of the implementation of the program by drawing on data about program participants and bank account take-up.

4.2.1 Program attendance data

On average, around 25% of the adult population attended the training in the 41 wards where the program took place. Figure 1 shows the variation in training between wards. The training was much more popular in wards in the three sub-districts further away from Wewak town, with over 25–30% of the adult population being trained. In the wards just outside Wewak town around 20% of the adult population were trained and in wards in Wewak town less than 15% attended.

Figure 1: Program attendance in each ward



Note: This figure is based on the program data and four wards are excluded because they were not labelled correctly.

As part of the registration for the program, we collected background characteristics about the gender of participants and their existing ownership of bank accounts. On average, 53.6% of participants were female and within each training session the share of females varied from 13% to 95%. Among people who attended the training, the ownership of existing bank accounts was only 34%, which is considerably lower than the rate of ownership reported in the survey data.

4.2.2 Bank account take-up

Around 70% of participants opened an account as part of the program (in total, 2,158 accounts were opened).[10] This meant that the account ownership rate among

[10] It is possible that participants opened an account with more than one bank. We are not able to verify whether this took place because it would be a breach of participants' confidentiality. However, it is unlikely. Participants waited for

participants more than doubled as at the start of the program only 34% of participants owned a bank account. Almost 75% of accounts were opened with MiBank, which is probably driven by the fact that MiBank was the only bank whose agents visited all wards where the program took place. When participants could pick from multiple banks at their training location, no single bank was substantially more popular than others.

5. Results

In this section we draw on the survey data to present our main results and also the heterogenous effects from the treatment. We also present data about bank account use that reinforces the main findings.

5.1 Main findings from survey data

In this subsection, we illustrate that the program failed to have a statistically significant impact (at a 5% significance level) on any of the outcomes of interest. Table 2 shows the program did not improve participants' financial literacy and knowledge. In the treatment and control groups, more than 80% of respondents answered a question on basic division correctly and had heard of budgeting (columns (1) and (4) respectively), while two-thirds of respondents answered a question about percentages correctly (column (2)), which is in line with previous surveys in PNG on this topic (Zhang, 2016). In both groups only a third of respondents answered a question about compound interest correctly (column (3)), and given there were only three options this means on average they failed to outperform a simple guess. The upper bound of the 95% confidence interval for the literacy index (column (5)) shows we can rule out even a small effect size (above 0.061 standard deviations).

long periods of time to open accounts (typically 1–2 hours), which means they would have had to queue up twice. In addition, only around half of wards had two banks attend.

Table 2 - Impact on participants financial literacy and knowledge

	(1) Division	(2) Percent	(3) Interest	(4) Know budget	(5) Literacy INDEX
Treatment	0.006	0.005	0.006	-0.003	0.008
	(0.01)	(0.02)	(0.02)	(0.02)	(0.03)
p-value	0.679	0.809	0.803	0.839	0.779
95% confidence intervals	-0.023,0.036	-0.039,0.050	-0.039,0.050	-0.037,0.030	-0.046,0.061
Mean dep. var.	0.814	0.665	0.331	0.816	-0.007
controls	Y	Y	Y	Y	Y
N	3071	3071	3071	3071	3071

Notes: Standard errors are clustered at the ward level. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Table 3 shows the program had no effect on budgeting behaviour. In general, many survey respondents illustrated poor financial planning behavior as only 36.2% state they rarely or never spend money on non-essentials before paying for food (column (1)) and only 14.0% state they rarely or never spend money on items they know they cannot afford (column (2)). In addition, 41.6% of respondents state they regularly spend money on drugs and alcohol, when they have money left over after paying for essentials (column (6)). While the majority of respondents (65.5%) set targets of how much to spend each week or month, only 35.0% reported sticking to this and only 17.6% write this down (columns (3) to (5)). The upper bound of the 95% confidence interval for the budget index (column (7)) shows we can rule out even a small effect size (above 0.069 standard deviations).

Table 3 - Impact on participants financial planning behaviour

	(1) B1	(2) B2	(3) B3	(4) B4	(5) B5	(6) B6	(7) Budget INDEX
Treatment	0.023	0.009	-0.007	0.003	0.005	-0.023	0.02
	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
p-value	0.266	0.480	0.754	0.864	0.788	0.353	0.411
95% confidence intervals	-0.018,0.064	-0.015,0.032	-0.051,0.037	-0.028,0.034	-0.033,0.044	-0.072,0.026	-0.029,0.069
Mean dep. var.	0.362	0.140	0.655	0.176	0.350	0.416	-0.010
controls	Y	Y	Y	Y	Y	Y	Y
N	3071	3071	3071	3071	3071	3071	3071

Notes: Standard errors are clustered at the ward level. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level. *B1* - Rarely or never purchase non-essential items before buying food, *B2* - Rarely or never purchase non-essential items they can not afford, *B3* - Set target amount to spend, *B4* - Write down target amount, *B5* - Stick to target amount, *B6* - Spend money on alcohol, betel nut and/or entertainment.

Table 4 shows the program had a positive effect on savings behaviour (statistically significant only at the 10% level). Respondents in the treatment group were more likely to report they could pay an unexpected expense tomorrow (between 1.8 to 3.1 percentage points; columns (1) and (2)) and slightly more likely to have money left over after paying for their weekly expenses (1.7 percentage points; column (3)). In addition, they were 4.7 percentage points more likely to keep money for the future (column (4)). The upper bound of the 95% confidence interval for the savings index (column (7))

suggests the program could have had a moderate effect size (up to 0.125 standard deviations).

TABLE 4 - IMPACT ON SAVINGS BEHAVIOR AND RESILIENCE OF HOUSEHOLDS

	(1) S1	(2) S2	(3) S3	(4) S4	(5) Save INDEX
Treatment	0.018	0.031	0.017	0.047*	0.060*
	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)
p-value	0.408	0.140	0.440	0.071	0.069
95% confidence intervals	-0.025,0.061	-0.010,0.072	-0.026,0.060	-0.004,0.097	-0.005,0.125
Mean dep. var.	0.144	0.232	0.560	0.591	-0.035
controls	Y	Y	Y	Y	Y
N	3071	3071	3071	3071	3071

Notes: Standard errors are clustered at the ward level. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level. *S1* - Meet large unexpected expense without borrowing, *S2* - Meet large unexpected expense with borrowing, *S3* - Have money left over, *S4* - Keep money for future.

Table 5 shows the program did not have a positive effect on the ownership and use of bank accounts. On average, more than half of respondents reported having a bank account (columns (1) and (2)) and just over a quarter of them used their accounts (column (3)). The upper bound of the 95% confidence interval for each of the outcomes is quite small, ranging from 1.5 to 3.2 percentage points.

TABLE 5 - IMPACT ON OWNERSHIP AND USE OF BANK ACCOUNTS

	(1) Own account	(2) Number of accounts	(3) Use account
Treatment	-0.018	-0.016	-0.020
	(0.02)	(0.02)	(0.02)
p-value	0.444	0.514	0.262
95% confidence intervals	-0.065,0.029	-0.063,0.032	-0.056,0.015
Mean dep. var.	0.518	0.514	0.269
controls	Y	Y	Y
N	3071	3071	3071

Notes: Standard errors are clustered at the ward level. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

5.2 Heterogeneous effects analysis, based on survey data

In this subsection we present the heterogenous effects of the treatment in terms of respondents' location, frequency of attendance to Wewak town, access to mobile phone, education, income, wages being the main source of household income, beliefs about whether respondents are in a poor household and gender.

5.2.1 Location of respondents

We consider how the effect of the treatment varied by location (we preregistered our intent to examine this heterogeneous treatment effect). As discussed above, respondents that live within 30 minutes travel from the centre of Wewak town have substantially

higher levels of financial literacy, budgeting, saving, and use of bank accounts than those that live further away. Table 6 shows that the program did not contribute substantially to closing this gap in outcomes. The treatment effect on savings behaviour was statistically significant at the 5% level for respondents who lived more than 30 minutes away from the centre of Wewak town (with a p-value of 0.046) (Panel B, column (3)). However, there was a negative point estimate (statistically significant at the 10% level) of the effect of the program on the ownership of bank accounts for these more remote respondents (Panel B, column (4)).

TABLE 6 - HETEROGENOUS TREATMENT EFFECTS BY LOCATION

	(1) Literacy INDEX	(2) Budget INDEX	(3) Save INDEX	(4) Own account
Panel A - Located less than 30mins from Wewak Town				
Treatment	-0.016	0.022	0.042	0.025
	(0.04)	(0.04)	(0.05)	(0.03)
p-value	0.687	0.573	0.398	0.446
95% confidence intervals	-0.096,0.064	-0.055,0.098	-0.058,0.142	-0.040,0.091
controls	Y	Y	Y	Y
N	1444	1444	1444	1444
Panel B - Located more than 30mins from Wewak Town				
Treatment	0.029	0.010	0.081**	-0.057*
	(0.03)	(0.03)	(0.04)	(0.03)
p-value	0.414	0.711	0.046	0.078
95% confidence intervals	-0.041,0.098	-0.045,0.066	0.001,0.161	-0.121,0.007
controls	Y	Y	Y	Y
N	1627	1627	1627	1627

Notes: Standard errors are clustered at the ward level. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

5.2.2 Frequency of attendance to Wewak town

Relatedly, we consider how the treatment varies by the frequency with which respondents visit Wewak town in Table 7 (we preregistered our intent to examine this heterogeneous treatment effect). We do detect a large, positive statistically significant effect on the savings behaviour from the program on respondents who rarely visit Wewak town (Panel B, column (3)). The upper bound of the 95% confidence interval for this outcome is around 0.2 standard deviations. Despite this we fail to detect any meaningful effect across the other outcomes of interest (i.e. financial literacy, budgeting and use of bank accounts). We do observe a negative effect (statistically significant at the 10% level) on account ownership among respondents who frequently attend Wewak town (Panel A, column (4),).

TABLE 7 - HETEROGENOUS TREATMENT EFFECTS BY FREQUENCY OF VISITS TO WEWAK TOWN

	(1) Literacy INDEX	(2) Budget INDEX	(3) Save INDEX	(4) Own account
Panel A - Visit Wewak Town at least once every two weeks				
Treatment	0.053	0.030	-0.006	-0.061*
	(0.03)	(0.03)	(0.04)	(0.04)
p-value	0.127	0.358	0.883	0.094
95% confidence intervals	-0.016,0.122	-0.035,0.095	-0.091,0.079	-0.132,0.011
controls	Y	Y	Y	Y
N	1361	1361	1361	1361
Panel B - Visit Wewak Town less than once every two weeks				
Treatment	-0.023	0.013	0.103**	0.016
	(0.04)	(0.03)	(0.04)	(0.03)
p-value	0.527	0.639	0.022	0.556
95% confidence intervals	-0.094,0.048	-0.043,0.070	0.015,0.191	-0.038,0.070
controls	Y	Y	Y	Y
N	1710	1710	1710	1710

Notes: Standard errors are clustered at the ward level. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

5.2.3 Ownership of a mobile phone

We also preregistered our intent to examine the effect of the treatment based on whether respondents had a mobile phone. Interestingly, Table 8 shows there were very few differences between respondents on this dimension except in terms of budget behaviour (Panels A and B, column (2)). In this case, the treatment had a positive effect (significant at a 10% level) on people with a mobile phone, but a negative effect (but insignificant effect) on those who do not.

TABLE 8 - HETEROGENOUS TREATMENT EFFECTS BY OWNERSHIP OF MOBILE PHONE

	(1) Literacy INDEX	(2) Budget INDEX	(3) Save INDEX	(4) Own account
Panel A - Own mobile phone				
Treatment	0.024	0.054*	0.050	-0.024
	(0.03)	(0.03)	(0.04)	(0.02)
p-value	0.379	0.062	0.203	0.239
95% confidence intervals	-0.029,0.077	-0.003,0.110	-0.027,0.127	-0.065,0.017
controls	Y	Y	Y	Y
N	1646	1646	1646	1646
Panel B - Do not own mobile phone				
Treatment	-0.010	-0.018	0.070*	-0.012
	(0.04)	(0.03)	(0.04)	(0.04)
p-value	0.804	0.577	0.092	0.746
95% confidence intervals	-0.090,0.070	-0.081,0.045	-0.012,0.151	-0.083,0.060
controls	Y	Y	Y	Y
N	1425	1425	1425	1425

Notes: Standard errors are clustered at the ward level. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

5.2.4 Education level of respondents

In control wards, respondents with higher levels of education tended to have higher levels of financial literacy, budgeting, savings and use of bank accounts. The effect of the treatment did not vary dramatically by the level of education of the respondents (see

Table 9). However we find some suggestive evidence that the program may have reduced the difference in some outcomes between respondents who had attended secondary school and those that had not. In particular, less educated respondents were more likely to report improvements in their savings and budgeting behaviour.

TABLE 9 - HETEROGENOUS TREATMENT EFFECTS BY EDUCATION

	(1) Literacy INDEX	(2) Budget INDEX	(3) Save INDEX	(4) Own account
Panel A - Attended secondary school				
Treatment	0.017	0.001	0.034	-0.019
	(0.03)	(0.03)	(0.04)	(0.03)
p-value	0.506	0.963	0.423	0.466
95% confidence intervals	-0.034,0.069	-0.054,0.056	-0.051,0.120	-0.072,0.033
controls	Y	Y	Y	Y
N	1308	1308	1308	1308
Panel B - Did not attend secondary school				
Treatment	0.000	0.034	0.074*	-0.019
	(0.04)	(0.03)	(0.04)	(0.03)
p-value	0.996	0.257	0.077	0.536
95% confidence intervals	-0.074,0.075	-0.025,0.093	-0.008,0.157	-0.078,0.041
controls	Y	Y	Y	Y
N	1763	1763	1763	1763

Notes: Standard errors are clustered at the ward level. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

5.2.5 Income level of respondents

Interestingly, the financial literacy and budgeting behaviour of respondents did not vary greatly by the income of households; however, richer respondents were more likely to save and own a bank account. Table 10 shows there was no sizeable difference in the treatment effect of the program between rich and poor respondents. However, poorer respondents appear to have been slightly more likely to benefit than richer respondents in terms of improvements in financial literacy, although this difference is not statistically significant.

TABLE 10 - HETEROGENOUS TREATMENT EFFECTS BY INCOME LEVEL

	(1) Literacy INDEX	(2) Budget INDEX	(3) Save INDEX	(4) Own account
Panel A - Household income below PGK200				
Treatment	0.031	0.014	0.059	-0.026
	(0.04)	(0.03)	(0.04)	(0.03)
p-value	0.425	0.636	0.101	0.378
95% confidence intervals	-0.046,0.108	-0.044,0.071	-0.012,0.129	-0.083,0.032
controls	Y	Y	Y	Y
N	1853	1853	1853	1853
Panel B - Household income equal to or above PGK200				
Treatment	-0.027	0.028	0.058	-0.004
	(0.03)	(0.03)	(0.04)	(0.03)
p-value	0.405	0.392	0.199	0.902
95% confidence intervals	-0.092,0.038	-0.036,0.092	-0.031,0.147	-0.063,0.056
controls	Y	Y	Y	Y
N	1218	1218	1218	1218

Notes: Standard errors are clustered at the ward level. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

5.2.6 Wages as the main source of household income

Wages being the main source of household income was positively associated with financial literacy, savings behavior and the ownership of a bank account. However Table 11 shows there was no sizeable difference in the treatment effect of the program between respondents who rely on wages as the main source of household income and those that do not. If anything households who do not rely on wages were more likely to benefit from the program in terms of improvements in savings behavior.

TABLE 11 - HETEROGENOUS TREATMENT EFFECTS BY WAGE INCOME

	(1) Literacy INDEX	(2) Budget INDEX	(3) Save INDEX	(4) Own account
Panel A - Wages are main source of household income				
Treatment	-0.019	0.029	0.037	-0.031
	(0.04)	(0.04)	(0.06)	(0.03)
p-value	0.609	0.478	0.551	0.342
95% confidence intervals	-0.092,0.054	-0.051,0.108	-0.087,0.162	-0.096,0.034
controls	Y	Y	Y	Y
N	653	653	653	653
Panel B - Wages are not the main source of household income				
Treatment	0.017	0.017	0.064*	-0.015
	(0.03)	(0.03)	(0.03)	(0.03)
p-value	0.598	0.528	0.051	0.566
95% confidence intervals	-0.046,0.079	-0.037,0.071	-0.000,0.129	-0.065,0.036
controls	Y	Y	Y	Y
N	2418	2418	2418	2418

Notes: Standard errors are clustered at the ward level. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

5.2.7 Beliefs about relative position of household in income distribution

Holding a belief that their household was relatively poor was positively associated with financial literacy, budgeting and saving behavior as well as owning bank accounts. However Table 12 shows there were no meaningful differences in the treatment effect on this dimension, except in regards to financial literacy whereby respondents who perceived themselves to be poor were more likely to benefit.

TABLE 12 - HETEROGENOUS TREATMENT EFFECTS BY BELIEFS ABOUT RELATIVE INCOME

	(1) Literacy INDEX	(2) Budget INDEX	(3) Save INDEX	(4) Own account
Panel A - Respondent believes their household is relatively poor				
Treatment	0.030	0.025	0.064	-0.005
	(0.03)	(0.03)	(0.04)	(0.03)
p-value	0.331	0.424	0.121	0.868
95% confidence intervals	-0.031,0.092	-0.036,0.085	-0.017,0.144	-0.060,0.051
controls	Y	Y	Y	Y
N	1795	1795	1795	1795
Panel B - Respondent does not believe their household is relatively poor				
Treatment	-0.026	0.016	0.053	-0.039
	(0.04)	(0.04)	(0.04)	(0.03)
p-value	0.520	0.641	0.192	0.226
95% confidence intervals	-0.106,0.054	-0.053,0.086	-0.027,0.133	-0.102,0.024
controls	Y	Y	Y	Y
N	1276	1276	1276	1276

Notes: Standard errors are clustered at the ward level. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

5.2.8 Gender

Males respondents had higher levels of financial literacy, budgeting and savings behavior as well as ownership of bank accounts. The program was substantially more likely to lead to women to save (although the difference between genders was not statistically significant) and reduce the likelihood of men owning an account (see Table 13). As such the treatment led to convergence between the genders on these dimensions. There were no meaningful differences between male and female respondents in terms of the impact of the treatment on levels of financial literacy and budgeting behavior.

Table 13 - Heterogenous treatment effects by gender

	(1) Literacy INDEX	(2) Budget INDEX	(3) Save INDEX	(4) Own account
Panel A - Male respondents				
Treatment	0.005	0.033	0.039	-0.054*
	(0.03)	(0.03)	(0.04)	(0.03)
p-value	0.865	0.247	0.308	0.073
95% confidence intervals	-0.053,0.063	-0.024,0.090	-0.036,0.114	-0.113,0.005
controls	Y	Y	Y	Y
N	1381	1381	1381	1381
Panel B - Female respondents				
Treatment	0.011	0.010	0.080**	0.011
	(0.03)	(0.03)	(0.04)	(0.03)
p-value	0.734	0.749	0.040	0.724
95% confidence intervals	-0.056,0.079	-0.052,0.071	0.004,0.157	-0.051,0.073
controls	Y	Y	Y	Y
N	1690	1690	1690	1690

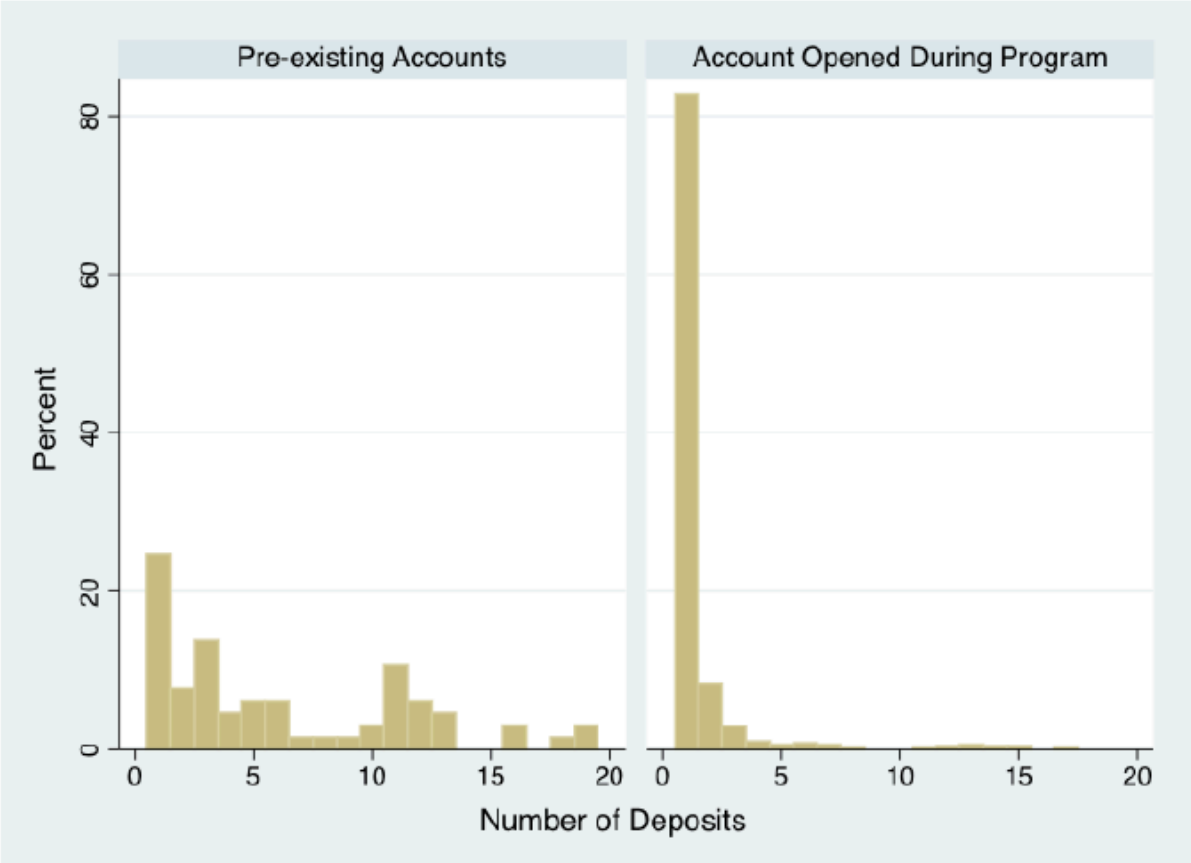
Notes: Standard errors are clustered at the ward level. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

5.3 Bank account data

This subsection presents analysis of administrative data provided by the bank that opened 75% of the accounts as part of the program (MiBank).[11] Over 80% of bank accounts were not used after being opened as part of the program (Figure 2). Over the same time period only 25% of pre-existing accounts in Wewak district were not used. Conditional on being used, accounts opened during the program and those that were pre-existing had similar sized deposits (the median deposit size was K30 for both groups, and the mean was K361 for pre-existing accounts and K407 for those opened during the program).

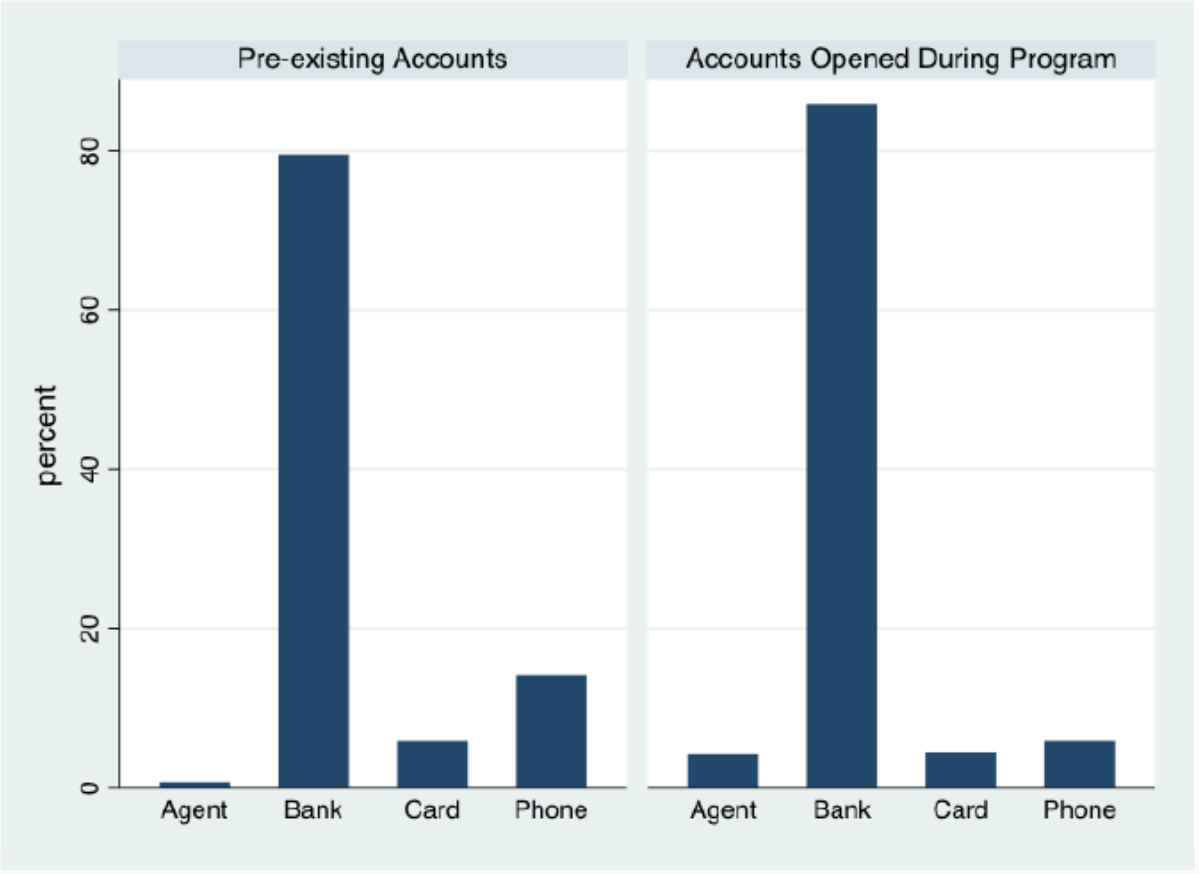
[11] We received incomplete data from the other two banks, Bank South Pacific and People's Micro Bank, which is why we focus our discussion solely on data from MiBank. The limited analysis that could be conducted of the other data from the other two banks showed very similar patterns of very limited use of accounts.

Figure 2: Number of deposits made by program participants and existing account holders



Overwhelmingly, the main channel through which bank account holders make transactions are in person at the bank (see Figure 3). This is the case for accounts opened as part of the program (86% of transactions) and pre-existing accounts (80%). Interestingly, program participants were more than six times more likely to use an agent than existing account holders. However, despite recently receiving training on mobile phone banking, program participants were almost three times less likely to make a transaction via the phone compared to existing account holders.

Figure 3: Channel through which transactions were made by program participants and existing account holders



We also consider the timing of when deposits are made as we would expect this to potentially increase immediately following the SMS saving reminders being sent. We do not observe a clear trend in the data to suggest that this is the case. The exception is in terms of the first SMS message being sent, whereby there is a noticeable increase in deposits. However, this was only after less than 20% of participants had been trained and the increase in deposits was only in the order of three times higher than the previous peak. As such we conclude this is weak evidence to suggest these nudges had an impact, especially in light of the fact that there was no further evidence to suggest that the SMS messages had an effect.

6. Discussion and Conclusion

Our results show there is a strong interest in learning more about savings and budgeting in the communities in Wewak district, and high demand for opening of bank accounts. According to the program data, around 25% of the adult population participated in the training in treatment wards and as part of the program over 1,000 people gained access to a bank account that had previously been 'unbanked'. The level of popularity of this program is higher than other types of financial inclusion programs around the world (Bruhn et al, 2014; Dupas et al, 2018). This is particularly remarkable in light of the fact that the program in Wewak was offered to the entire population in each treatment ward, whereas most financial inclusion programs rely on bridging institutions and established networks (Wagh, 2017). For example, a similar program in Uganda used existing 'youth club' networks to roll out training sessions and offer group-based bank accounts (Jamison et al, 2014).

A potential reason for the relatively high level of interest in the program compared to similar programs in other developing countries is that many of the treatment wards are very remote (in some cases several hours' walk from the closest road) and most people lack access to secure savings options (either formal or informal) outside of their household. This means there are very few opportunities for people in these wards to access any kind of training, formal financial institutions and/or safe places to store their savings. Anecdotal evidence from some program participants suggested this was the first time training had been held or a bank had visited these wards in living memory. Baseline survey responses indicated that in more than half of the wards a bank agent had not visited in the previous 12 months and over one-third of respondents reported either never or only visiting Wewak town (where the banks and all formal businesses in the district are located) once in the previous four weeks.

Despite the popularity of the program, there is little to no evidence to suggest participation resulted in improvements in downstream outcomes. The survey data shows there were no large improvements in financial inclusion as a result of the program. There was some evidence that people reported saving more (in more remote settings and those that do not frequently attend Wewak town), but this did not lead to them reporting greater use of bank accounts. The administrative data from banks reinforces this finding

as less than 20% of the accounts that were opened as part of the program were actually ever used. The lack of downstream effects from this program is in line with the evidence from similar financial inclusion programs around the world (Burgess et al, 2005; Fernandes et al, 2014). For example, a cross-country study in Uganda, Malawi and Chile showed that among people offered fee-free bank accounts, only 3–17% actually regularly used them (Dupas et al., 2018).

The program was designed in a way to maximise the likelihood of having a positive impact by combining multiple aspects of financial inclusion into a single intervention (i.e. training sessions using best practice approaches, no-fee bank accounts with reduced administrative hurdles, and SMS reminders). However, even though it was substantially more comprehensive than previous programs we still fail to detect even a moderate effect. This suggests that the limited impact of financial inclusion programs around the world is not simply due to the fact they do not address multiple binding constraints simultaneously. Instead there may be more fundamental reasons why interventions that aim to improve financial inclusion are typically unsuccessful, such as targeting people who have limited involvement in the cash economy and consequently do not need a bank account.

This study also points to some of the challenges that policymakers face in promoting financial inclusion among the next frontier of underserved and hard-to-reach populations. The program was far more popular further away from Wewak town and the heterogenous treatment effects provide suggestive evidence that respondents in these remote wards are more likely to save as a result of the training. However, these individuals also face larger transaction costs (in terms of transport costs and time) with accessing the physical bank infrastructure within Wewak town where over 80% of transactions are made. The inability of the program to lead participants to make transactions via mobile phone and the limited agent network within Wewak district means that physical access to the bank branch is likely to be a constraint to greater use of accounts. In addition, we show that a high take-up of no-fee bank accounts did not lead to considerable use of accounts and as a result it was unlikely that banks profited from investing in improving financial access, even though they were receiving a subsidy from the ADB.

While evidence from elsewhere in the world suggests that sustained interventions are more likely to be effective (Kaiser & Menkhoff, 2017), this would require even greater investment beyond the already high costs involved in the current version of this program (K65 or US$20 per participant for the two-day training alone). Our findings suggest that greater investment to increase the intensity of the program would not be warranted especially given the fact that those who are most likely to benefit would appear to face higher transaction costs from accessing a bank branch. An exception could be in regards to efforts that are made to increase the use of mobile money services as this could overcome some of the physical constraints that are likely to be limiting the impact of existing programs.

Future research could build on our study by taking at least two directions. First, there may be value in investigating the impact of more comprehensive financial inclusion programs, similar to the one we study, in urbans areas, especially among people who are part of the cash economy, but do not currently have a bank account. Second, greater efforts could be made to examine the impact of financial inclusion programs, particularly those that heavily promote the use of mobile money services, in remote and insecure areas similar to our setting as little is known about what programs, if any, are able to effectively involve this next frontier of underserved and hard-to-reach populations.

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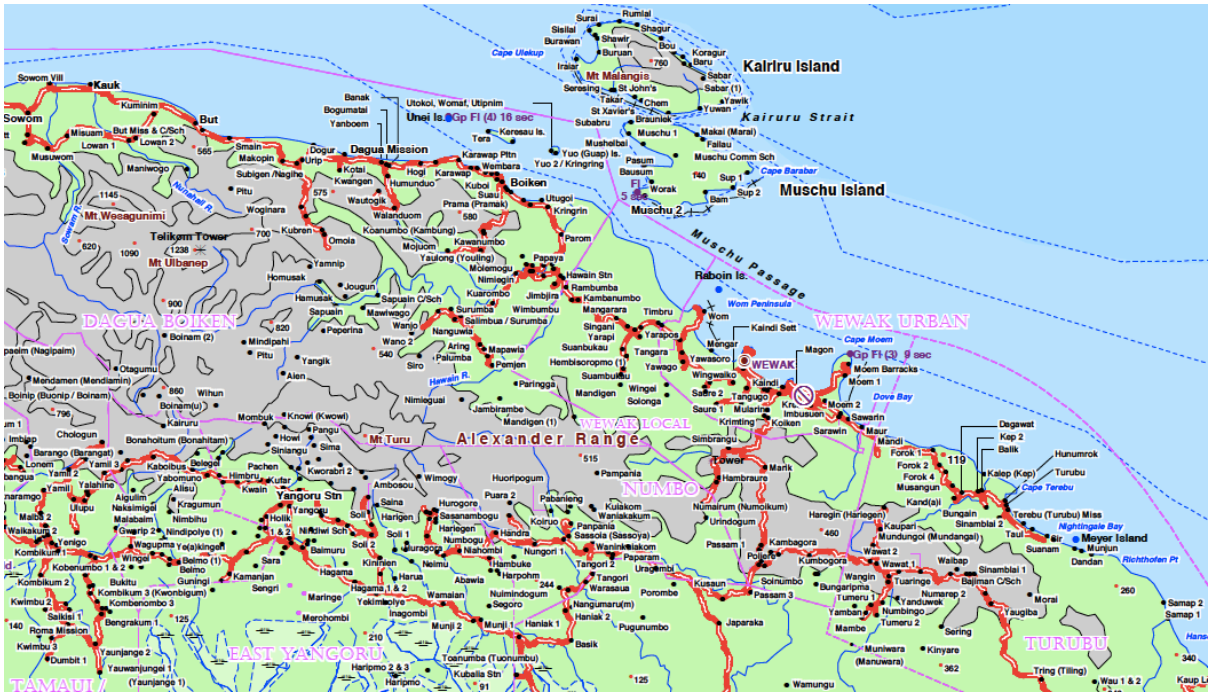
Appendices

Appendix A: Map of Wewak district



Appendix B: Training materials

Brief description of financial education modules

Savings:

- Set savings goals
- Increase savings
- Cope with emergencies better with an emergency fund
- Select the right savings plans by comparing different options
- Make and use a savings plan

Approximate duration: 11 hours

Budgeting:

- Set financial goals
- Make a budget
- Track income and expenses using simple tools
- Stay well within the budget made
- Keep records to manage money better

Approximate duration: 7 hours

Appendix C: Bank account fee reduction details

Prior to the study the fee structure on standard savings accounts were as follows:

Bank	Account opening fee	Monthly account fee	Fees for deposits/ withdrawals	Mobile money use	Minimum payment after 3 months
Bank South Pacific (BSP)	0 Kina	10 Kina	No fees	Yes	30 Kina
MiBank	25 Kina	0 Kina	Fees for withdrawals	Yes	25 Kina
People's Micro Bank	5 Kina	1 Kina	Fees for withdrawals (and coin deposits)	Yes (however additional paperwork required)	8 Kina

For the study the fee structure on the standard savings accounts for people who attended the training in treatment wards became:

Bank	Account opening fee	Monthly account fee	Fees for deposits/ withdrawals	Mobile money use	Minimum payment after 3 months
Bank South Pacific (BSP)	0 Kina	0 Kina	No fees	Yes	0 Kina
MiBank	0 Kina	0 Kina	Fees for withdrawals	Yes	0 Kina
People's Micro Bank	2.5 Kina	1 Kina	Fees for withdrawals (and coin deposits)	Yes (however additional paperwork required)	5.5 Kina

Appendix D: Content of SMS Messages

Date and content of SMS messages sent by MiBank
29-Sep-17: Save something every day or week. Have you done that this week? Visit a MiBank agent to make a deposit today
13-Oct-17: Reach your financial goals by saving some money today, Visit your MiBank Agent to save some money today
27-Oct-17: Remember to spend less than you earn, save today for a happy tomorrow. Deposit at MiBank today
10-Nov-17: The best way to save is a little every day. Deposit your money into your MiCash wallet today. Visit an Agent near you
24-Nov-17: Did you know your Micash wallet is safe, secure and easy to access, put some money into your MiCash wallet and Save today.
08-Dec-17: Save Today to pay for School Fees next year. Visit a MiCash Agent to make a deposit and Save money today
14-Jan-18: Save something every day or week. Have you done that this week? Visit a MiBank agent to make a deposit today
28-Jan-18: Reach your financial goals by saving some money today, Visit your MiBank Agent to save some money today
09-Feb-18: Remember to spend less than you earn, save today for a happy tomorrow. Deposit at MiBank today
23-Feb-18: The best way to save is a little every day. Deposit your money into your MiCash wallet today. Visit an Agent near you
16-Mar-18: Did you know your Micash wallet is safe, secure and easy to access, put some money into your MiCash wallet and Save today.
30-Apr-18: Save Today to pay for School Fees next year. Visit a MiCash Agent to make a deposit and Save money today

Appendix E: Survey questions related to hypotheses

The questions in the baseline and follow-up survey that correspond with each of the hypotheses are as follows.

Hypothesis 1: The training will increase participants' financial literacy and knowledge

Measured through the following:

- Correctly answering the basic division multiple choice question (B1)
- Correctly answering the basic percentage multiple choice question (B2)
- Correctly answering the compound interest rate multiple choice question (B3)
- Having knowledge of what budgeting is (C3 and C7 (if C3 doesn't equal yes))

Hypothesis 2: The training will lead to a more disciplined management of money

Measured through the following:

- Reduction in regular (monthly or weekly) spending on unnecessary items prior to buying necessary things, like food (C1, C2, D4v)
- Setting of a target amount to spend on important items, like food (C3)
- Writing down target expenditure amounts (C4)
- Regularly (monthly or weekly) sticking to target expenditure (C5)

Hypothesis 3: The training will increase the savings behaviour and resilience of households

Measured through the following:

- Largest unexpected expense you could meet tomorrow as a share of household income (D1 and D2 as a share of BC7)
- Regularly (monthly or weekly) have money left over after paying for necessary items (D3, D4i and D4ii)

Hypothesis 4: The training will lead to greater ownership and use of bank accounts

Measured through answers to the following:

- Ownership of a commercial bank/mobile money accounts (E1)
- Number of bank accounts owned (E1A)
- Regularly (monthly or weekly) save a fraction of income in commercial bank account (E2)

Appendix F: Variable definitions

Own phone – Coded 1 if the respondent stated they own or had regular access to a mobile phone and 0 otherwise (RX5).

Cost less than K5 to visit Wewak town - Coded 1 if the respondent stated it costs them less than K5 to visit Wewak town on their most common form of transport and 0 otherwise (BC6).

Less than 30mins to Wewak town - Coded 1 if the respondent stated it would take less than 30mins to visit Wewak town on their most common form of transport and 0 otherwise (BC5).

Wages are main source of household income – Coded 1 if the respondent stated wages are the main source of household income and 0 otherwise (BC8).

Household monthly income below K200 – Coded 1 if the respondent stated their household income over the previous four weeks was below K200 and 0 otherwise (BC7).

Believe household is poor – Coded 1 if the respondent stated today their household was on one of the three poorest steps on a six step scale (image shown to respondents) and 0 otherwise (BC9).

Believe household will be poor in one year – Coded 1 if the respondent stated in one year time they expect their household was on one of the three poorest steps on a six step scale (image shown to respondents) and 0 otherwise (BC10).

Male – Coded 1 if the respondent stated they were male and 0 otherwise (RX2).

Head of household – Coded 1 if the respondent stated they were the head of household and 0 otherwise (RX3).

Attended secondary school – Coded 1 if the respondent stated they attended secondary school and 0 otherwise (RX4).

Visited Wewak fortnightly – Coded 1 if the respondent stated they visited Wewak town at least twice over the last four-week period and 0 otherwise (BC6A).

Visited Wewak fortnightly last year – Coded 1 if the respondent stated they would normally have visited Wewak town at least twice over a typical four-week period at this time last year and 0 otherwise (BC6B).

Division – Coded 1 if the respondent correctly answered a basic multiple choice question about division and 0 otherwise (B1).

Percent – Coded 1 if the respondent correctly answered a basic multiple choice question about percentages and 0 otherwise (B2).

Interest – Coded 1 if the respondent correctly answered a basic multiple choice question about compound interest and 0 otherwise (B3).

Know Budget – Coded 1 if the respondent knows what budgeting is and if they set a target amount to spend on important items like food, otherwise it is coded as 0 (C3 and C7 (if C3 does not equal yes)).

B1 – Coded 1 if respondent stated they rarely or never buy things that are not necessary and 0 otherwise (C1).

B2 – Coded 1 if respondent stated they rarely or never buy things that are not necessary even though they can't afford them and 0 otherwise (C2).

B3 – Coded 1 if respondent stated they set a target amount to spend on important items like food and 0 otherwise (C3).

B4 – Coded 1 if respondent stated they write down a target amount to spend on important items like food and 0 otherwise (C4).

B5 – Coded 1 if respondent stated they stick to a target amount to spend on important items like food at least once a month and 0 otherwise (C5).

B6 – Coded 1 if respondent stated they spend money on non-essential items, like alcohol, betel nut and entertainment, at least once a month and 0 otherwise (D4e).

S1 – Coded 1 if respondent stated that their household could meet an unexpected expense of K200 tomorrow without borrowing and 0 otherwise (D1).

S2 – Coded 1 if respondent stated that their household could meet an unexpected expense of K200 tomorrow and 0 otherwise (D2).

S3 – Coded 1 if respondent stated that their household had money left over after paying for necessary items at least monthly and 0 otherwise (D3).

S4 – Coded 1 if respondent stated that when money is left over their household keeps it for unforeseen expenses or future purchases and 0 otherwise (D4a and D4b).

Own account – Coded 1 if respondent stated that they use a commercial bank account/Mobile money to store money and 0 otherwise (E1).

Number of accounts – Number of accounts that the respondents state they have (E1a).

Use accounts – Coded 1 if respondent stated that they save a fraction of their income in a commercial bank account atleast once a month and 0 otherwise (E2).

Appendix G: Additional Tables

Table A1 - Balance table based on Baseline Survey

Variable	(1) 0 N/[Clusters]	Mean/SE	(2) 1 N/[Clusters]	Mean/SE	T-test P-value (1)-(2)
Own phone	1461	0.490	1662	0.505	0.609
	[37]	(0.022)	[41]	(0.020)	
Cost less than PGK5 to visit Wewak town	1461	0.524	1662	0.565	0.703
	[37]	(0.081)	[41]	(0.070)	
Less than 30mins to Wewak town	1461	0.502	1662	0.516	0.896
	[37]	(0.081)	[41]	(0.069)	
Household monthly income below PGK200	1446	0.737	1637	0.732	0.901
	[37]	(0.028)	[41]	(0.027)	
Believe household is poor	1461	0.834	1662	0.828	0.755
	[37]	(0.012)	[41]	(0.014)	
Believe household will be poor in one year	1461	0.461	1662	0.512	0.114
	[37]	(0.021)	[41]	(0.024)	
Male	1461	0.551	1662	0.545	0.837
	[37]	(0.019)	[41]	(0.025)	
Head of household	1461	0.595	1662	0.576	0.515
	[37]	(0.019)	[41]	(0.021)	
Attended secondary school	1461	0.411	1662	0.367	0.198
	[37]	(0.027)	[41]	(0.021)	

Notes: The value displayed for t-tests are p-values. Standard errors are clustered at the ward level. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level. The baseline survey was not able to be implemented in one control ward, which is why there are only 37 control clusters (as opposed to 38 control clusters in the follow up survey).

Table A2 - Balance table based on Follow Up Survey

Variable	(1) 0 N/[Clusters]	Mean/SE	(2) 1 N/[Clusters]	Mean/SE	T-test P-value (1)-(2)
Own phone	1454	0.534	1617	0.537	0.927
	[38]	(0.026)	[41]	(0.021)	
Cost less than PGK5 to visit Wewak town	1454	0.510	1617	0.545	0.765
	[38]	(0.086)	[41]	(0.077)	
Less than 30mins to Wewak town	1454	0.455	1617	0.484	0.786
	[38]	(0.079)	[41]	(0.069)	
Household monthly income below PGK200	1454	0.611	1617	0.596	0.675
	[38]	(0.026)	[41]	(0.026)	
Wages are main source of household income	1454	0.191	1617	0.232	0.373
	[38]	(0.030)	[41]	(0.034)	
Believe household is poor	1454	0.605	1617	0.566	0.219
	[38]	(0.022)	[41]	(0.023)	
Believe household will be poor in one year	1454	0.460	1617	0.431	0.355
	[38]	(0.021)	[41]	(0.024)	
Male	1454	0.438	1617	0.460	0.490
	[38]	(0.026)	[41]	(0.019)	
Head of household	1454	0.484	1617	0.537	0.101
	[38]	(0.024)	[41]	(0.021)	
Attended secondary school	1454	0.426	1617	0.426	0.991
	[38]	(0.023)	[41]	(0.024)	

Notes: The value displayed for t-tests are p-values. Standard errors are clustered at the ward level. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Table A3 - Factors associated with higher levels of financial literacy

	(1) Percent	(2) Division	(3) Interest	(4) Know budget	(5) Literacy INDEX
Own phone	0.041***	0.081***	0.019	0.029*	0.098***
	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)
Cost less than K5 to visit Wewak town	0.006	-0.000	0.010	-0.005	0.005
	(0.02)	(0.03)	(0.04)	(0.02)	(0.05)
Less than 30mins to Wewak town	0.024	0.031	0.038	0.009	0.058
	(0.02)	(0.03)	(0.04)	(0.02)	(0.04)
Household monthly income below K200	-0.009	-0.040*	0.014	-0.051***	-0.052*
	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
Wages are main source of household income	0.025	-0.012	0.034	0.009	0.033
	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)
Believe household is poor	0.015	-0.002	-0.013	0.044***	0.029
	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
Male	0.039**	0.024	0.064***	-0.011	0.065***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Head of household	-0.021	0.035**	0.029	-0.027	0.003
	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)
Attended secondary school	0.098***	0.094***	0.123***	0.038**	0.203***
	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)
Visited Wewak fortnightly last year	0.002	0.023	-0.053**	0.011	-0.008
	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)
Constant	0.723	0.561	0.225	0.797	-0.189
	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)
N	3071	3071	3071	3071	3071

Notes: Standard errors are clustered at the ward level. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level. US$1 equaled 3.4 Kina (K) on the 1st of August 2020.

Table A4 - Factors associated with budgeting and financial planning behaviour

	(1) B1	(2) B2	(3) B3	(4) B4	(5) B5	(6) B6	(7) Budget INDEX
Own phone	0.013	0.026	0.047***	0.057***	0.053***	-0.018	0.082***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Cost less than K5 to visit Wewak town	-0.073**	0.025	-0.011	-0.012	-0.047**	0.046	-0.055*
	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)	(0.03)	(0.03)
Less than 30mins to Wewak town	0.102***	0.023	0.070***	-0.006	0.054***	0.046	0.071***
	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)	(0.03)	(0.03)
Household monthly income below K200	-0.101***	-0.033**	-0.021	-0.057***	-0.090***	-0.082***	-0.087***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Wages are main source of household income	0.093***	0.033*	-0.005	0.030	0.042*	0.097***	0.041
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.02)
Believe household is poor	0.019	0.029*	0.034	0.041***	0.045**	-0.051**	0.083***
	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)	(0.03)
Male	0.004	0.009	-0.010	-0.023	-0.008	0.025	-0.019
	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)	(0.03)	(0.02)
Head of household	-0.021	-0.005	-0.028	0.005	-0.009	-0.039*	-0.007
	(0.02)	(0.01)	(0.02)	(0.01)	(0.01)	(0.02)	(0.02)
Attended secondary school	-0.001	0.024*	0.029	0.095***	0.034*	0.022	0.067***
	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Visited Wewak fortnightly last year	-0.005	-0.014	0.008	0.038***	-0.010	-0.019	0.014
	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)
Constant	0.401***	0.098***	0.595***	0.111***	0.342***	0.438***	-0.076**
	(0.04)	(0.02)	(0.03)	(0.02)	(0.03)	(0.04)	(0.03)
N	3071	3071	3071	3071	3071	3071	3071

Notes: Standard errors are clustered at the ward level. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level. US$1 equaled 3.4 Kina (K) on the 1st of August 2020. *B1* - Rarely or never purchase non-essential items before buying food, *B2* - Rarely or never purchase non-essential items they can not afford, *B3* - Set target amount to spend, *B4* - Write down target amount, *B5* - Stick to target amount, *B6* - Spend money on alcohol, betel nut and/or entertainment.

Table A5 - Factors associated with savings behaviour and the resilience of households

	(1) S1	(2) S2	(3) S3	(4) S4	(5) Save INDEX
Own phone	0.044***	0.017	0.046**	0.032*	0.073***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Cost less than K5 to visit Wewak town	0.023	0.049*	-0.015	-0.018	0.023
	(0.02)	(0.03)	(0.04)	(0.03)	(0.04)
Less than 30mins to Wewak town	-0.029	-0.059**	0.002	0.020	-0.038
	(0.02)	(0.03)	(0.03)	(0.03)	(0.04)
Household monthly income below K200	-0.131***	-0.194***	-0.186***	-0.134***	-0.344***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
Wages are main source of household income	0.112***	0.079***	0.100***	0.031	0.171***
	(0.03)	(0.02)	(0.02)	(0.02)	(0.03)
Believe household is poor	0.074***	0.074***	0.068***	0.019	0.126***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
Male	0.021	0.055***	0.006	-0.032	0.030
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Head of household	0.005	-0.020	-0.026**	0.009	-0.017
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)
Attended secondary school	0.004	0.012	0.027	0.029	0.037
	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
Visited Wewak fortnightly last year	0.029	-0.004	0.005	0.005	0.018
	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
Constant	0.119***	0.282***	0.600***	0.658***	0.035
	(0.02)	(0.03)	(0.03)	(0.03)	(0.04)
N	3071	3071	3071	3071	3071

Notes: Standard errors are clustered at the ward level. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level. US$1 equaled 3.4 Kina (K) on the 1st of August 2020. *S1* - Meet large unexpected expense, *S2* - Meet large unexpected expense without borrowing, *S3* - Have money left over, *S4* - Keep money for future.

Table A6 - Factors associated with owning and using a bank account

	(1) Own account	(2) Number of accounts	(3) Use account
Own phone	0.202***	0.203***	0.118***
	(0.02)	(0.02)	(0.01)
Cost less than K5 to visit Wewak town	0.059	0.056	0.003
	(0.04)	(0.04)	(0.03)
Less than 30mins to Wewak town	0.013	0.014	0.026
	(0.04)	(0.04)	(0.03)
Household monthly income below K200	-0.094***	-0.096***	-0.111***
	(0.02)	(0.02)	(0.02)
Wages are main source of household income	0.147***	0.147***	0.213***
	(0.02)	(0.02)	(0.03)
Believe household is poor	0.060***	0.062***	0.062***
	(0.02)	(0.02)	(0.02)
Male	0.031	0.033	0.032**
	(0.02)	(0.02)	(0.02)
Head of household	0.031*	0.029	0.013
	(0.02)	(0.02)	(0.01)
Attended secondary school	0.111***	0.111***	0.058***
	(0.02)	(0.02)	(0.02)
Visited Wewak fortnightly last year	0.009	0.009	0.027
	(0.02)	(0.02)	(0.02)
Constant	0.278***	0.276***	0.115***
	(0.03)	(0.04)	(0.02)
N	3071	3071	3071

Notes: Standard errors are clustered at the ward level. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level. US$1 equaled 3.4 Kina (K) on the 1st of August 2020.

Appendix H: Administrative information

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