

Financial Inclusion, Remittances and Entrepreneurship: an experiment in the state of Tlaxcala, Mexico

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ABSTRACT

This paper presents a Randomized Control Treatment (RCT) that consisted in providing smartphones, training in business skills and financial education to individuals in the State of Tlaxcala, Mexico to study its impact on measures of Financial Inclusion and other household outcomes in the period 2011-14. The results show statistically significant effects in measures of usage and quality, but not in measures of depth or stability of financial services. The results also show positive effects on micro business activities and wealth, but no effects on household income and expenditures. All effects are found to be smaller for households that receive remittances. These results show that, in the presence of low-cost financial services, households prefer to invest their savings in micro business activities or real assets and confirm that households that receive remittances relax their credit constraints.

Keywords: Financial Inclusion, Household Demand for Financial Services, Randomized Control Experiments.

JEL classification: O16, C93, D14.

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RESUMEN

Inclusión Financiera, Remesas y Emprendurismo: un experimento en el estado de Tlaxcala, México

Se estudia un Tratamiento Controlado Aleatorizado (RCT) consistente en proveer celulares, capacitación empresarial y educación financiera a individuos en Tlaxcala, México, para analizar su impacto sobre medidas de Inclusión Financiera en el periodo 2011-14. Se encuentran resultados significativos en las medidas de inclusión financiera relacionadas al uso y calidad, pero no en las medidas de profundidad o estabilidad. Se encuentran resultados positivos sobre actividades de micro negocios y en índices de riqueza, pero no sobre los ingresos o los gastos. Todos los efectos son menores para hogares que reciben remesas. Estos resultados demuestran que, en presencia de servicios financieros a un costo bajo, los hogares prefieren invertir sus ahorros en actividades de micro negocios o en activos reales y confirman que los hogares receptores de remesas enfrentan menores restricciones de crédito.

Palabras clave: Inclusión financiera, Demanda de los Hogares por Servicios Financieros, Experimentos Controlados Aleatorizados.

Clasificación JEL: O16, C93, D14.

INTRODUCTION

Financial inclusion is considered nowadays a key element for the financial system to generate positive effects on economic development (Ang, 2010; Pinar, Imboden and Latortue, 2013). Financial inclusion has been shown in the literature as positively related with economic growth and reductions in income inequality (Demirguc-Kunt and Levine, 2005; Ang, 2010).

In 2017, Mexico had 37% of its population 15 years and older with an account in a financial institution, while the average for Latin American countries and the Caribbean was 58% (World Bank, 2017). The reasons behind the low level of financial development for Mexican households in Mexico are found both in the demand and supply of financial services. On the supply side, authors have argued the lack of competition at local level and for specific market segments (Honohan, 2014), as well as the weakness in institutions that make very hard for

banks to recover non-performing loans (Hernandez, 2010). Traditional banking technology has also been blamed for the low level of development of the financial system in Latin America in general (Portocarrero, Tarazona and Westley, 2006). On the demand side, cultural reasons rooted on mistrust for banks are said to be the culprit (Beck and De la Torre, 2007).

Mexico has a high reception of remittances, which has been argued can generate opportunities for financial development (Cuecuecha, 2014) that, however, may be hindered because the informal financial markets (Ambrosius & Cuecuecha, 2016) are also used by households that receive remittances.

This paper contributes to the discussion about the different causes behind the low level of financial development observed in Mexico. It uses a randomized control trial (RCT) to study whether training on financial education, entrepreneurial skills as well as access to new technologies can increase financial inclusion in Mexico, and whether it can have impacts on entrepreneurial activities, household income and wealth. RCT's are characterized for assigning randomly individuals into treatments, which ensures that, after controlling for observable characteristics, any difference in observed behavior can be attributed to the treatment (Banerjee and Duflo, 2011). The RCT took place in the Mexican state of Tlaxcala during the period 2013 and 2016, among communities with high and low reception of remittances to explore the relation of the RCT with the reception of remittances.

Smart phones with access to bank accounts were provided to a treatment group, together with training about how to use the technology, financial education and entrepreneurial skills. The intention was to reduce the cost of access to the bank, since the treatment provided the smartphone, the data service, and the basic knowledge to install and operate the application.

The treatment provided training in financial education and entrepreneurial skills with the expectation that if the households engage in micro business activities, they may obtain higher benefits in using the banking app. The only caveat, is that if micro business activities are performed outside the financial system, providing entrepreneurial skills in Mexico could lead to a limited use of the formal financial system.

The final net benefits of using the banking app, however, depend on the financial products offered by the banks to the clients. In other

words, even if the access to bank accounts is provided at no cost, other financial inclusion indicators still depend on the household's expected benefits of using those banking services.

According to Gould, Melecky and Panterov (2016) the measures that allow the study of the development of the financial system in macroeconomic analysis are: (i) the intensive margin (depth—measured by credit/GDP), (ii) the extensive margin (financial inclusion—measured by either access or usage), (iii) efficiency (measured by the Lerner index or other measures of financial efficiency), and (iv) stability (measured by nonperforming loans or other measures of systemic risk).

For other authors, financial inclusion is thought as an ideal state of nature under which the access to the different products offered by the financial system is universal (Roa, 2015), and not only the extensive margin in the development of the financial sector. The different measures of financial inclusion that are used under this approach measure the level of advancement in achieving that ideal state, under different dimensions, which are: (i) access (measured for example by bank branches per ten thousand people), (ii) usage (measured for example by percentage of households with bank accounts), (iii) depth (measured for example by credit/GDP), and (iv) quality, which is supposed to be achieved whenever households' financial needs are covered without generating systemic risk in the financial industry (Roa, 2015). Pinar, Imboden and Latortue (2012) argue that the dimensions of financial inclusion ought to include access, usage, depth and stability (measured by percentage of nonperforming loans).

Given that this paper applies the concept of financial inclusion in a household survey for one single Mexican state, it was decided that the best measures to apply in this context were: (i) usage (measured by access to any type of bank account), (ii) depth (measured by the account balance), (iii) stability (measured by an index of missed payments in outstanding credits) and (iv) quality (measured by an index of the complexity of the bank account used). The paper also shows results on whether the RCT had impacts on entrepreneurial activity, household income, household expenditure and household wealth.

The Mexican state of Tlaxcala is located 150 kilometres east of Mexico City. It is the smallest state by geographical size and the 28th, out of 32, in GDP per capita in 2015 (INEGI, 2016). It occupied the

last place in financial access in Mexico in 2011 (CNBV, 2011). Consequently, it was considered that the experiment would provide an important description to achieve financial inclusion under an environment of weak supply of financial services.

The RCT presented in this paper is the first of its kind in Mexico. It is related to other studies done to study attempts to increase financial inclusion, financial literacy and entrepreneurial skills in other parts of the world. Karlan and Valdivia (2011) designed an RCT where entrepreneurial classes were provided to clients from Micro finance institutions (MFI) in Peru, which found that individuals stayed as MFI's clients but did not report effects on income or profits. Ashraf, et. al. (2015) performed an RCT with Salvadorian migrants in the US where individuals received traditional bank accounts with different degree of control over the money they remit to El Salvador, and also financial literacy. They found that migrants that can control their savings accounts in their origin countries send more remittances and increase their savings. The RCT presented in this paper innovates over those studies in two aspects: with respect to Karlan and Valdivia (2011) the RCT provides mobile banking and not traditional MFI's accounts. Over the RCT developed by Ashraf, et. al. (2015) the RCT provides mobile banking and not traditional banking as well as entrepreneurial skills and not only financial literacy.

The results of this paper show that the use of training on entrepreneurial skills, financial literacy and new technology increased measures of usage and quality but did not have effects on measures of stability or depth. It also shows that such positive changes are also accompanied by increases in entrepreneurial activity and wealth, but not by increases in household income or expenditure. This is evidence that households changed the composition of its expenditure. The paper also shows evidence that there exists a negative relation between the reception of remittances and the results of the RCT. We interpret this result as showing evidence that households that do not receive remittances face more stringent credit constraints.

The rest of the paper is organized as follows, the first part summarizes the relevant literature on financial inclusion, its determinants and its relation with remittances; the second part, presents the institutional context under which the experiment took place, as well as introduces the experiment carried out in the Mexican state of Tlaxcala;

the third part, presents the empirical implementation of the RCT and its results; the fourth part concludes.

1. THEORETICAL CONSIDERATIONS

1.1 Financial inclusion: Definitions and Interrelations

Financial inclusion is defined as achieved whenever all the adult population has an effective access to financial services including savings, credit, payments and insurances (Roa, 2015). For Roa (2015) it is measured by: access (Bank branches or ATM's per 10,000 inhabitants), usage (deposit bank accounts per 1000 adults) and quality of services. This later dimension is achieved whenever households' financial needs are covered without generating systemic risk in the financial industry (Roa, 2015). For others, (Pinar, Imboden and Latortue, 2013) it has to be measured over four dimensions: access, usage, depth (private domestic credit over GDP) and stability (unpaid credits over total credit).

This paper focuses on the measurement of usage, depth, stability and quality adapting those measures to a household survey. Usage is measured by an indicator variable that takes the value of 1 if the household has any type of bank account, while it takes the value of zero on any other case. Depth is measured by measuring credit balances, as reported by households in the survey. Stability is measured by an index based on two questions of the survey: on the household expenditure module it was asked if they have made payments for outstanding credits, while in the financial module of the questionnaire it was asked if they have a credit with a bank. The variable takes the value of 1 if the household answered yes to have a credit balance with a bank and reported no payments made; it takes the value of zero if the household reported having no credit balances; while it takes the value of 2 if the household reports having made a payment and having a credit balance with a bank. While this measure is not perfect of whether or not the household is late on its payments, it imperfectly measures such state of nature. Quality is measured by a variable that takes the value of zero if the household has no bank account, it takes the value of 1 if it has only a debit account, it takes the value of 2 if the household reports to have a debit card and a savings account, while it takes the value of 3 if the account represents access to any type of credit. It is not a perfect measure of quality since the survey did not ask directly to the households about their perception

about the quality of service being provided to them, it simply measures the complexity of the account that the household has access.

Usage, depth, stability and quality are all different dimensions of financial inclusion, which has been shown in the literature as positively related with economic growth and reductions in income inequality (Demirguc-Kunt and Levine, 2005; Ang, 2010). The measures of access, usage, depth and stability are correlated positively with less inequality (Pinar, Imboden and Latortue, 2013). Similarly, it has been shown that a greater access to the financial system is positively correlated with a greater usage and depth. However, it has not been shown that greater access is related to greater stability, which remains an issue to be further studied (Pinar, Imboden and Latortue, 2013). There may be different reasons as to why greater access is not linked positively with stability. In the literature, it is mentioned that to a large extent the increase in access, usage and depth are linked to the growth of non-bank financial actors, such as credit unions and micro credit institutions. These agents are not necessarily equally regulated as banks which can generate non-stability of the system. For example, in India the microfinance sector had an unorganized growth which led to social unrest and this forced regulators to enact law that put an end to micro finance institutions in certain regions (Kaur and Dey, 2013).

1.2 The determinants of financial inclusion

Currently, Mexico under performs in the development of its financial system compared to other Latin American countries. In terms of access, it had 6.84 branches for each 1000 thousand inhabitants in 2014, which is below the average of Latin America at 13.27 branches (IMF, 2015). This statistic does not include banking associates, because they provide only limited access to banking services. In the dimension of usage, 37% of the population aged 15 and above have access to some type of bank account in 2017, which is below the average for Latin American Countries and the Caribbean that was 58% for the same year (World Bank, 2017). As for depth, Mexico had a credit/GDP ratio of 30% in 2014, below the Latin American average of 46% (World Bank, 2016). In the case of quality, in 2014 accumulated 11.52 complaints for each 1000 inhabitants, a growth of 16% since 2010 (CONDUSEF, 2015). Only in the dimension of stability the Mexican financial system is strong since Mexico has the third lowest risk weighted assets / total assets ratio in

LA, as well as three banks among the top ten LA banks with the largest amount of Tier 1 capital (The Banker Dataset, 2016).

The low level of financial development observed in Mexico and Latin America has been linked to both supply and demand factors. In the case of demand factors, culture and trust for banks (or the lack of) have been considered two important elements that limit financial inclusion (Beck and De la Torre, 2007; López-Rodríguez and Lima-Velázquez, 2015). For some authors, in the case of remittance receiver households the mistrust it is not only for banks, it is also about the final use that those savings may have in the receiving end of the transnational households (Ashraf, et. al., 2015). However, recent research shows that even people living in extreme poverty do use financial strategies to survive, using real assets and the informal financial sector (Collins, Rutherford, Morduch and Ruthven, 2009), which casts doubts on the extent at which self-chosen financial exclusion does not reveal a market failure or a lack of competitive behaviour in the supply of financial services. For other authors, the mistrust of individuals in the financial industry also reveals the need for financial education that will raise awareness among clients of micro finance institutions about their consumer rights (Roa, 2015).

In the case of supply factors, Honohan (2014) argues that non-competitive behaviour observed in the banking industry and information barriers help to explain the relatively reduced financial inclusion that exists in Latin American countries. Hernández (2010) argues that the high entry costs of the industry are linked more to the institutional weakness found in the judicial system than to the costs of capital, at least for the case of Mexico, since the weakness in the judicial system makes hard for banks to recover defaulted loans.

Technology is also a factor that has been argued can deter or foster financial inclusion. Portocarrero, Tarazona and Westley (2006) argue that operating costs for traditional banking technology are very large to cater for small savers. If the financially excluded are characterized by having small accounts, those authors conclude that under the traditional technology used by the banking system it is not profitable for banks to cater for such clients. Moreover, technology innovations in the form of ATM's (Westley and Martín-Palomas, 2010) and mobile banking (Mbiti and Weil, 2011; Plyler, Haas and Nagarajan, 2010) have been documented to increase financial inclusion, through direct and exter-

nality effects, with effects that cover direct users and non-users of the financial system.

1.3 Financial inclusion among households that receive remittances

As of 2019, Mexico received 36.4 billion dollars (Banxico, 2020a). These large amounts of money have been argued that represent an opportunity for financial development in Mexico (Cuecuecha, 2014). In absolute terms, the State of Tlaxcala occupies the 26th place in remittance reception (Banxico, 2020b). However, the 256 million dollars that are received by Tlaxcala, still represent an important fraction of the local economy (Cuecuecha, 2017).

In general, the literature has shown that households that receive remittances while they may have more bank accounts, they may not necessarily use them to invest. Ashraf, et. al. (2015) using an RCT with Salvadorian migrants in the US found that Salvadorians in the US increased their savings when they were offered the control over the resources they sent to El Salvador. Moreover, other studies have also shown that households that receive remittances in Mexico while they have more bank accounts, they do not receive more credit from formal sources, instead it seems that they receive more credit from informal sources (Ambrosius & Cuecuecha, 2016). Whether this credit reception was self-selected, or it shows the existence of credit constraints or credit rationing is something that has to be further studied.

2. THE MOBILE BANKING REFORM IN MEXICO AND ITS APPLICATION IN THE STATE OF TLAXCALA

2.1 Changes in financial regulation related to financial inclusion

Financial sector regulations have experienced continuous change over at least the last 16 years previous to 2016 because Mexican authorities are aware of the low level of financial inclusion that exists in Mexico (CNBV, 2010; 2011).

TABLE 1
MAIN CHANGES IN LAW AFFECTING LOW-COST ACCESS TO BANKING IN MEXICO,
2000-2014

Change in Law	Date	Main innovation
Internet banking	2000	Allows use of web portals for banking services
Electronic transfers	2005	Allows use of electronic transfers
Basic accounts	2007	Forces banks to offer zero cost accounts
Banking associates	2008	Allows third parties to offer certain financial services to bank clients
Mobile banking	2011	Allows the use of mobile apps in banking services
Debit accounts for wage or pensions reception	2012	Allows individuals to open zero cost accounts to receive wages or subsidies from the federal government
Association between debit accounts and cell phone number	2014	Not all banks allowed the use of mobile banking in basic accounts. This regulation allows any type of bank account to use mobile banking.
Financial Reform	2014	Strengthen government banks, strengthen institutions related to the financial industry, increase competition, strengthen prudential regulation

Source: Comisión Nacional Bancaria y de Valores (CNBV, 2016), Presidencia de la República (2014)

Table 1 shows the main changes in regulation that took place during the mentioned period. It is important to mention that one of those changes is a general change in the regulation which has been called the financial reform aimed to strengthen banks owned by the government, to facilitate the recovery of credits and the guarantees that commercial banks can use to insure credits, to strengthen competition and to strengthen prudential measures that will ensure the stability of the financial system in Mexico (Presidencia de la República, 2014). The table shows that after 2011 the financial regulators allowed Mexican banks to offer mobile banking services (CNBV, 2011). This in principle could allow for the use of quasi- experimental techniques. However, the total number of other changes occurring at the same time, particularly the general financial reform that took place in 2013, suggests the need for RCT techniques with panel data methodologies (Banerjee and Duflo, 2011).

TABLE 2
BANKS BY SEGMENT IN MEXICO (2010) AND THE STATE OF TLAXCALA (2014)

Market Segment	Number of banks available nationally (2010)	Number of banks available in Tlaxcala (2014)
Corporate and wholesale	18	7
Specialized Commercial banks	19	7
Commercial banks high end clients	11	8
Banks specialized in electronic payments	8	7
Banks specialized in services	10	6
Commercial banks low end clients	8	5

Source: Hernández (2010) and Cuecuecha and Montalvo (2014)

Table 2 shows a classification of banks in six categories, proposed by Hernández (2010). It shows how the different segments in the Mexican economy are covered by banking services, and also includes the same classification using data from the 2014 Financial Census carried out by Cuecuecha and Montalvo (2014) in the state of Tlaxcala. This classification is important in order to understand the context under which the experiment was carried out. It is important to mention that the experiment needed to offer mobile banking at zero cost, which at first it was believed could be provided by any of the banks that serve the low end of the commercial banks working in the state of Tlaxcala, given the 2007 law that forced all banks to offer zero cost accounts, called basic accounts. Under this assumption it was believed that at least five banks would be available to us to carry out the experiment. However, in practice not all banks offer basic accounts at their branches, as a team of simulated customers witnessed it. They visited bank branches in Tlaxcala during 2013 requesting to open basic accounts that would allow them to use mobile banking. Sometimes the banks denied the existence of basic accounts, until the simulated customer showed the website of the bank that offered the particular service. Then, bank executives conditioned the access to mobile banking to open accounts with relatively large minimum balances. It was specifically told to them that if such balances were not hold account fees would start to be imposed on the accounts.

During the first two years of the study described in this paper only two banks offered basic accounts with mobile banking services. The

identity of the banks will not be disclosed since as far as this research is concerned; it is only interested in reporting their business behaviour. Bank A started offering the basic accounts with possibility of mobile banking services during 2012. Bank B started offering the basic accounts with possibility of mobile banking during 2013.

2.2 The experiment

At the beginning of 2013, 180 households received 10 sessions of training about basic financial literacy and entrepreneurial skills. Households were provided training about how to use the smartphones and the mobile bank app, as well as training sessions about financial education and entrepreneurial skills. The training consisted in ten sessions that were designed following other models of training (Monares, Monares and Bustamante, 2001; Bauer, Finnegan and Haspels, 2004) that were simplified to take into account that in the treated households there is a heterogeneous population in terms of education levels. Training manuals are available upon request.

Households were told that they would receive a smartphone with a bank account at the end of the 10th session. The smartphone was provided along with bank accounts at Bank A, which it was more known to households than Bank B. The smart phone was provided with mobile and data services during the time of the treatment.

There was an unexpected shock during the implementation that was generated by the fact that the calendar of training sessions had to be adjusted to the schedule of some of the households. This ended up generating a time lag in the training sessions, with a group of 54 households finishing their training three months before a second group of 126 households started their training. During the described lag, the first 54 households reported that Bank A was changing the terms of contract and withholding the balances deposited in the accounts. Bank A argued that changes in regulation made for them impossible to continue offering the basic accounts free of charge and they condition households to deposit a large amount of money (10,000 pesos) to maintain their accounts open. It was decided to offer all households the possibility of switching bank accounts towards Bank B, but this generated that the 126 households that were waiting to open an account would not accept to open an account during this round of the experiment. These house-

holds did open accounts until the second wave of the experiment that took place at the end of 2014.

This episode in the RCT reveals that mistrust for banks is not only a cultural aspect, since it is also based on business practices used by banks. These business practices are clearly strategies to induce self-selection of individuals, which is known to occur under competitive and non-competitive scenarios (Nicholson & Snyder, 2014: 641), consequently its existence does not show evidence of a lack of competition. This behavior, however, does generate negative effects on the welfare of individuals. In our experiment we were able to control the damage generated by the behavior of Bank A because we attended the complaints immediately and offered our households an immediate solution. However, when the participants in our study complained before the Mexican authority that protects consumers (CONDUSEF), they were provided with a very complicated procedure, which represented large opportunity costs for them. Additional research into how to improve the procedures of CONDUSEF is beyond the scope of this research.

In terms of the RCT, it was decided that no separation of the two groups could be made in estimation because the individuals chose not to receive the bank accounts. Therefore, results from the RCT are better interpreted as being the result of the training in entrepreneurial skills, financial literacy and the provision of the smart phone, since this was provided to all 180 households.

Another obstacle faced in the RCT was the strength of signal to handle data. All households received the smartphones and the training about using them in the City of Tlaxcala, which had a good access to data signal. However, many households complained about the availability of signal in their communities. At the time of the experiment, antennas were being installed in all municipality capitals that provided access to wifi signal. Households were taught about how to use wifi signal from their smartphones, which solved the problem partially. Households revealed in focus groups that they use the smart phone looking for the signal while they are in route to other activities in larger municipalities with access to signal (Cuecuecha, 2017). While our households were taught to use wifi signals that at the moment of the RCT were being installed in some of their communities, this solution did not work for all households since some communities do not have such antennas. Moreover, this solution is nowadays not recommended

due to security concerns, unless additional security measures are taken (OSI, 2020). Consequently, in practice, communities with bad signal do not have a secure way to access financial apps.

This aspect reveals that while mobile technology has opened up, for the first time in history, the possibility of making accessible the financial system universally; it also opens very important infrastructure challenges in Mexico, in order to establish the capabilities to offer mobile services universally. This last aspect also is related to the competition in the telecommunication industry, which at time of the RCT described in the paper observed very important changes in behavior, prices and services being offered in response to changes produced by the 2014 telecommunications reform. In terms of the RCT, this obstacle is controlled by using fixed effects, whenever that was feasible.

The experiment was designed to be representative of the state of Tlaxcala following a strategy in which households were selected following a stratification of the state into 10 cells, that were obtained by splitting the municipalities of the state into two levels of poverty (high and low), three levels of population (high, medium, low) and two levels of remittance reception intensity (high, low). Later on, municipalities in the mentioned stratus were selected at random, and households within those municipalities were chosen randomly. In the case of households with migrants they are oversampled once they were found in a given municipality trying to reach a ratio of 1:3, between households with US migrants and households without US migrants for the entire sample. This was done to ensure a sufficiently large number of remittance receiver households in the treated and control groups. Consequently, the sample probability becomes municipality specific and endogenous to the migration status. In order to obtain the standard errors of our estimations we follow two approaches: first we take into account the sample design following the literature on choice-based sampling, which uses weighted estimations (Cuecuecha, 2017) or we use bootstrapped standard errors that estimate empirically the mean and variance from an unknown probability distribution using a non-parametric method known as bootstrapping (Efron, 1979).

The size of the sample is obtained based on the distribution of a discrete random variable, which in this case was the proportion of households that receive remittances in the state of Tlaxcala, which according to ENIGH was about 6% during the 2000-2010 periods.

Following a procedure described in Valdivieso-Taborga, et. al. (2011) and Cuecuecha (2017), given a sample error of 2.1%, an interval confidence of 95%, and an expected attrition of households of around 8% the total sample size for the survey carried over in the paper is 529 households.

3. IMPLEMENTATION OF THE RCT

3.1 Empirical models

For each outcome variable y_{it} , the following linear fixed effect panel data model is estimated:

$$y_{it} = \beta_1 + \delta T_{it} + \beta_2 educ_{it} + \beta_3 age_{it} + \beta_4 minors_{it} + \beta_5 adults_{it} + \beta_6 Hpop_{it} + \beta_7 Hrem_{it} + \beta_8 Hpov_{it} + \beta_9 Bank2000_{it} + \alpha_i + u_{it} \quad (1)$$

The linear fixed effect methodology is used to implement the doble difference approach and obtain the exogenous effect of the treatment (Wooldridge, 2018). The specification used in Equation (1) follows empirical models of technology adoption for panel data (Besley and Case, 1993), and empirical models for demand of financial services (Levine, 1997). The treatment relevant variable is T_{it} . The household level characteristics are the education years of the head of household, the age of the head of household, the number of minors in the household (individuals below 18 years old), and the number of adults in the household (individuals above 18 and below 65). These variables attempt to measure the household's expenditure and saving needs and therefore the household's demand for bank accounts. In preliminary work, income, expenditure or wealth indicators turned out to be highly endogenous and we decided not to use them as control variables. We introduced the following municipality level characteristics, which are dummy variables: *Hpop* measures if the municipality has thirty thousand inhabitants or more, *Hrem* measures if the household lives in a municipality with high reception of remittances because it is well known that such households have a higher probability of owning financial accounts (Ambrosius and Cuecuecha, 2016), *Hpov* measures if the household lives in a municipality with a high poverty ratio, and *Bank2000* measures the number of banks that are located within 2 kilometers of the cabecera municipal. All the municipality level variables are multiplied by the

square of the age of the head of household in order to obtain variation at the household level.

The δ parameter measures both the benefits that the adoption of the new technology represents for the household currently and in the expected future (Besley and Case, 1993). Because the treatment includes the introduction of training on entrepreneurial skills and financial literacy it is also the case that the parameter includes the benefits that come from those new knowledges acquired.

To better model the different non-linearities that exist for the measures of financial inclusion and other household outcomes studied, appropriate non-linear models were obtained for each outcome.

The probability of having a bank account (*Bank*) is modelled as:

$$P(Bank_{it} = 1 | X) = \varphi (\beta_1 + \delta T_{it} + \beta_2 educ_{it} + \beta_3 age_{it} + \beta_4 minors_{it} + \beta_5 adults_{it} + \beta_6 Hpop_{it} + \beta_7 Hrem_{it} + \beta_8 Hpov_{it} + \beta_9 Bank2000_{it}) \quad (2)$$

In the case of the dimension of depth, the dependent variable is the household's credit balance with banks in pesos (C_i). Since this variable takes zero values for households that have a zero balance or do not have an account with banks, the appropriate model to apply is a type I Tobit model (Amemiya, 1985) applied to panel data, as follows:

$$C_i = \begin{cases} C_i^* & \text{if } C_i > 0 \\ 0 & \text{if } C_i \leq 0 \end{cases} \quad (3)$$

and the equation for C_i^* is given by:

$$C_{it}^* = \beta_1 + \delta T_{it} + \beta_2 educ_{it} + \beta_3 age_{it} + \beta_4 minors_{it} + \beta_5 adults_{it} + \beta_6 Hpop_{it} + \beta_7 Hrem_{it} + \beta_8 Hpov_{it} + \beta_9 Bank2000_{it} \quad (4)$$

As it is clear, the variables chosen for the dimension of depth are similar to those used for the dimension of usage.

In the case of the dimension of stability, the dependent variable is measured by an index of stability (S_i) based on two questions of the survey: (1) whether the household made payments for outstanding credits, and (2) whether the household has a credit with a bank. The variable takes the value of 1 if the household answered yes to have a credit balance with a bank and reported payments not made; it takes

the value of zero if the household reported having no credit balances; while it takes the value of 2 if the household reports having made a payment and having a credit balance with a bank. While this measure is not perfect of whether or not the household is late on its payments, it imperfectly measures such state of nature. The model is then estimated using an ordered Probit panel model where S_{it} assumed to follow the next ordering:

$$S_{it} = \begin{cases} 2 & \text{if } S_{it}^* > \mu_1 \\ 1 & \text{if } \mu_0 < S_{it}^* \leq \mu_1 \\ 0 & \text{if } S_{it}^* \leq \mu_0 \end{cases} \quad (5)$$

and the equation for S_{it}^* is assumed to be given by a similar equation to (4).

In the case of the dimension of quality, the dependent variable is measured by an index of account complexity (Q_i) that takes the value of zero if the household has no bank account, it takes the value of 1 if it has only a debit account, it takes the value of 2 if the household has a savings account, and it takes the value of 3 if the account provides access to any type of credit. It is not a perfect measure of quality since that concept depends on the customer satisfaction or perception about the service just provided to her. The model is then estimated using an ordered Probit panel model where Q_{it} assumed to follow the next ordering:

$$Q_{it} = \begin{cases} 3 & \text{if } Q_{it}^* > \mu_2 \\ 2 & \text{if } \mu_1 < Q_{it}^* \leq \mu_2 \\ 1 & \text{if } \mu_0 < Q_{it}^* \leq \mu_1 \\ 0 & \text{if } Q_{it}^* \leq \mu_0 \end{cases} \quad (6)$$

The equation for Q_{it}^* is also a similar to equation (4).

In the case of the equations estimated for household income and household expenditures a Tobit model is implemented, since certain households did not declare expenditure or income. The model implemented in both cases is similar to the one presented in equations (2) and (3).

In the case of household wealth, a linear fixed effects panel data model is implemented for a normalized log linear index of wealth. The index of wealth (wealth) is based on a set of variables measured in the survey which are: the construction materials of the house in which the

household lives, the services that the house has, the total number of rooms, the ownership status, and the total number of land and housing assets that the household reports to have.¹ The index is normalized as a proportion of the maximum value observed in level, so that the index varies between -1 and 1. Then, a logarithmic transformation is performed adding 1 to the normalized wealth index. The fixed effect linear model estimated is similar to equation (1) shown before.

In the case of microbusiness activities (*MB*) a probit panel data model is implemented for the probability of owning a micro-business. The estimated equation is similar to that described in Equation (2).

Finally, all estimations were carried out for the sample of remittance receiving households and households with no remittances, and estimations were compared between the two populations.

3.2 Data

All data comes from the 2011 and 2014 waves of the Financial Inclusion and Level of Income and Expenditure of Households of the State of Tlaxcala (ESIFIGHT, by its acronym in Spanish). Table 3 shows mean values for the four measures of financial inclusion that are being studied in this paper.

In 2011, 31% of households had access to some type of bank account, while for 2014 such proportion had risen to 39%. In 2011, the average account balance was 1845 pesos (97 dollars at 2017 exchange rate) and increased to 1880 pesos in 2014 (98 dollars at 2017 exchange rate). The index of stability was -.06 in 2011, and it increased to -.04 points in 2014. The index of quality (complexity) of account went from .39 in 2011 to .49 in 2014. These numbers show an increase in all measures of financial inclusion, including a reduction in the risk of non-payment of credits.

¹ The wealth index was constructed using principal components analysis, the three first components are used in order to achieve an explained variance of 68%, and an orthogonal rotation is used. Results for this analysis are available upon request.

TABLE 3
MEAN VALUES FOR DEPENDENT VARIABLES AND HOUSEHOLD LEVEL CONTROL VARIABLES

	2011				2014			
	All	Control (a)	Treated (b)	Diff (a) (b)	All	Control (a)	Treated (b)	Diff (a) (b)
Bank account	0.31	0.41	0.12	Yes***	0.39	0.41	0.34	No
	(0.46)	(0.49)	(0.32)		(0.49)	(0.49)	(0.48)	
Account balance	1845	2739	111	No	1880	2690	309	No
	(18414)	(22620)	(933)		(18419)	(22625)	(1327)	
Stability index	-0.06	-0.08	-0.01	No	-0.04	-0.05	-0.02	No
	(0.39)	(0.40)	(0.35)		(0.33)	(0.37)	(0.26)	
Quality index	0.39	0.50	0.16	Yes**	0.49	0.50	0.45	No
	(0.66)	(0.71)	(0.46)		(0.71)	(0.71)	(0.71)	
Monthly Expenditure	4138.94	4562	3318	Yes***	4329.83	4663	3684	Yes***
	(2032.78)	(2081)	(1656)		(2507)	(2218)	(2889)	
Monthly Income	4701.51	5073	3981	Yes**	5133.08	5337	4738	No
	(2350.83)	(2378)	(2124)		(4152)	(2635)	(6092)	
Wealth index	-1.03	-0.55	-1.96	Yes***	1.03	1.27	0.57	Yes***
	(1.99)	(1.85)	(1.93)		(1.68)	(1.66)	(1.60)	
School years head of household	10.00	10.36	9.29	Yes***	10.00	10.37	9.29	Yes***
	(3.60)	(3.80)	(3.05)		(3.6)	(3.8)	(3.05)	
Age head of household	36.80	36.71	36.97	No	38.70	38.73	38.63	No
	(14.30)	(14.16)	(14.60)		(14.7)	(14.1)	(15.91)	
Minors	0.91	0.85	1.03	No	0.91	0.85	1.04	Yes**
	(1.00)	(0.99)	(1.02)		(1.01)	(0.99)	(1.03)	
Adult	1.41	1.46	1.32	Yes***	1.41	1.46	1.31	Yes***
	(1.22)	(1.25)	(1.16)		(1.22)	(1.25)	(1.16)	
Households with remittances	0.17	0.13	0.26	No	0.17	0.13	0.27	No
	(0.37)	(0.33)	(0.44)		(0.38)	(0.33)	(0.44)	
N	529	349	180		529	349	180	

Source: ESIFIGHT, 2011 & 2014.

Table 3 also shows these numbers for the group of treated households. The Table shows that treated households had less likelihood of having

a bank account in 2011, since only 12% of such households had a bank account. By 2014, the treated group reduces the gap with the rest of the population since 34% of the treated households had opened accounts by that year. The difference with respect to the control group is statistically significant in 2011, but it becomes insignificant in 2014.

In the case of account balances, treated households show an average balance of 111 pesos in 2011 (approximately 8 dollars) and an average balance of 309 pesos in 2014 (approximately 17 dollars). The difference in account balance between the treated and nontreated households is not statistically significant in either year.

In the case of the index of stability, treated households show an average index of stability of -.01 in 2011, and an average of -.02 in 2014. The differences with respect to the nontreated households is not statistically significant.

In the case of the index of quality, treated households show an average of .16 in 2011, and an index of .45 in 2014. The difference with respect to the control group in 2011 is statistically significant but is not significant in 2014.

All of these differences are presented only as illustrative comparisons since the paper will later show a formal test for their significance.

Table 3 also shows the mean values for the household level characteristics. The monthly expenditures for the average household in 2011 are 4138 pesos (approximately 217 dollars), while for the treated households is 3318 pesos (approximately 186 dollars), this difference is statistically significant at the 1% level. In 2014, the monthly expenditures for the entire sample are 4329 pesos (approximately 227 dollars) while for the treated households it is 3684 pesos (approximately 192 dollars), a difference that is also significant at the 1% level.

The monthly income for the entire sample was 4700 pesos in 2011 and 5133 pesos in 2014. For treated households it was 3986 pesos in 2011 and it was 4738 pesos in 2014. The difference in income in 2011 is statistically significant, while the difference in income in 2014 is not.

The Wealth index for the entire population is -1.03 in 2011 and rises to 1.03 in 2014. In the case of treated households, the wealth index is -1.96 in 2011 and it rises to .57 in 2014. The differences between treated households and nontreated households is statistically significant at the 1% level.

In the case of the schooling years of the head of household the Table shows that the average household is more educated than the average head of household from the treated households. Such differences are statistically significant at the 1% level.

The age of the head of household is on average 36 years in 2011 and 38 years in 2014. This variable is found to be statistically identical between treated and nontreated households.

The number of minors is .91 in 2011 and .91 in 2014. Among treated households, the number of minors is 1.03 in 2011 and 1.04 in 2014. The difference with respect to treated households is not statistically significant in 2011 and it is significant in 2014.

In the case of adults, Table 3 reveals that there are 1.41 in 2011 and 2014. Among treated households, the number of adults is 1.32 in 2011 and 1.31 in 2014. Differences are statistically significant.

It is shown that while the reception of remittances is more prevalent in the treated households, the difference with respect to the nontreated households in this variable is not statistically significant. It is important to mention that the average reception of remittances shown in the sample is 17%, which is above the average number of households that in Tlaxcala receive remittances. This was purposely induced in the sample since the study over represents households that receive remittances. The consequence of this overrepresentation requires the use of special weights as suggested by Manski and Lerman (1977).

TABLE 4
MEAN VALUES FOR MUNICIPALITY LEVEL CONTROL VARIABLES

Source	Variable	All households	Treated households	Difference
1	Number of Banks within 2 kilometres of cabecera municipal	3.8187 [4.0092]	3.7324 [3.6073]	No
2	Proportion of municipalities with high intensity of remittance reception	13% [0.3371]	16% [0.3749]	Yes**
3	Proportion of municipalities with more than 30 thousand people	69% [0.4589]	48% [0.5029]	Yes***
3	Proportion of municipalities with high poverty	65% [0.4755]	66% [0.4742]	No
N		529	84	

Significant at 5%. *Significant at 1%.

Sources: 1. Cuecuecha and Montalvo (2014); 2. CONAPO (2013); 3. CONAPO (2016)

In the case of the information at the municipality level they are obtained from different sources: All information in the study will be presented at 2014 constant pesos. Information about bank branches comes from the Census of Access points to the financial industry in Tlaxcala (Cuecuecha and Montalvo, 2014). Information about migration intensity and poverty at the municipality level comes from CONAPO (2013; 2016). Information about Population at the municipality level comes from INEGI (2010).

Table 4 shows the mean values for these additional control variables. The number of branches per ten thousand people within 2 kilometres of the cabecera municipal is 3.8 in the entire sample. There are no statistically significant differences with the municipalities where treated households live. The percentage of households that live in municipalities with high reception of remittances is 13% in the entire sample, while 16% of households that participated in the RCT live in municipalities with a high reception of remittances. The difference is statistically significant at the 5% level. 69% of the sample lives in municipalities with more than 30 thousand people, while 48% of households that participated in the RCT live in similar municipalities. The difference is statistically significant at the 1% level. The percentage of households that live in municipalities with high poverty is 65% in the entire sample and there are no differences with the treated households.

3.3. RESULTS

3.3.1. *Financial Inclusion: Linear models*

Table 5 shows the results for the estimations done for all financial inclusion indicators using the linear fixed effect specification. This specification eliminates all unobserved heterogeneity that is fixed over time and applying the difference between treated and non-treated households obtains the double difference ATT estimator (Wooldridge, 2018). It identifies only the sign of the treatment, since it does not model the non-linearity of the specification. This non-linear nature is explored in our next subsection.

The first column of Table 5 shows the estimation for the linear probability of having a bank account. The treatment increased the linear probability of having a bank account in .23 points. The effect is significant at the 1% level. The second column of Table 5 shows that the log of

the credit balance increased .55 points and the effect is significant at the five percent level. The third column of Table 5 shows that the treatment reduced in .08 points the stability index, an effect that is significant at the 10% level. The fourth column of Table 5 shows that the treatment increased the quality index in .29 points, and that the change is significant at the 1% level.

These results, however, must be taken with caution since they may be subject to specification bias, given the non-linearities found in all the dependent variables.

TABLE 5
FIXED EFFECTS ESTIMATION FOR LINEAR SPECIFICATIONS

Outcome	Bank account	Credit Balance	Stability index	Quality index
Treatment	0.23***	0.55**	-0.08*	0.34***
(s.e.)	(0.03)	(0.17)	(0.04)	(0.04)
Household controls	Yes	Yes	Yes	Yes
Municipality controls	Yes	Yes	Yes	Yes
Weighted estimation	Yes	Yes	Yes	Yes
N	1058	1058	1058	1058
R ²	1%	4%	2%	17%

*Significant at 10%; ** Significant at 5%; ***Significant at 1%.

Source: ESIFIGHT (2011, 2014). Own calculations.

3.3.2 Financial Inclusion: Non-Linear specifications

Table 6 presents the marginal effects for Random effects estimations done for each of the financial inclusion outcomes. Column 1 in Table 6 shows that the treatment increased 12.7% the probability of having a bank account, the effect is significant at the five percent level of significance. One additional year of education of the head of household increases 3.8% the probability of having a bank account. The above results imply that the effect found for the treatment is relatively large compared to the effect of other exogenous variables.

Column 2 in Table 6 shows that the treatment increased 5.2% the account balance held at the bank, an effect that is significant at the 5% level of significance. One more year of education, increases 1% the account balance and it is statistically significant at the 10% level. These results also show that the treatment generates a relatively large effect on

the account balances held at the bank, the treatment increased 5% the account balance. It is important to clarify that the weighted estimation for the Account Balance generated a non-significant effect, which is different from what is found with the linear model. Because this change in significance may indicate that the estimation is losing precision probably from potential heteroskedasticity and the number of observations, we decided to use bootstrapped standard errors, that can help to ameliorate those effects. The significant estimation shown is obtained using bootstrapped stadard errors.

TABLE 6
RANDOM EFFECTS ESTIMATION FOR NON LINEAR SPECIFICATIONS

Outcome	Bank account	Account Balance (log units)	Stability index	Quality
Model	Probit	Tobit	Ordered Logit (Y=2)	Ordered
Logit (Y=3)	(0.03)	(0.17)	(0.04)	(0.04)
Treatment	0.127**	0.052**	0.001	0.023
	(0.053)	(0.021)	(0.010)	(0.066)
Education	0.038***	0.008*	-0.002	0.005
	(0.012)	(0.004)	(0.002)	(0.015)
Age	0.001	0.001	-0.0004	0.0004
	(0.004)	(0.001)	(0.001)	(0.001)
Minors	-0.022	-0.007	-0.001	-0.002
	(0.042)	(0.014)	(0.004)	(0.007)
Adults	-0.030	-0.020	0.004	-0.004
	(0.040)	(0.013)	(0.004)	(0.011)
Community level controls	Yes	Yes	Yes	Yes
Weighted estimation	Yes	No	No	No
Bootstrapped se	No	Yes	Yes	Yes
N	1058	1058	1058	1058

*Significant at 10%; ** Significant at 5%; ***Significant at 1%.

Source: ESIFIGHT (2011, 2014). Own calculations.

Columns 3 and 4 in Table 6 show that the results for the stability and quality indexes are not statistically significant, which contrasts with the linear model result. These results may indicate that the number of observations is not enough to obtain a precise estimation when the

non-linear models are applied, or they can also imply that the results obtained in the linear model were biased due to the model specification. Bootstrapped standard errors were used in both cases, however, the non-significance of the estimated coefficients persisted. Consequently, we conclude that the evidence indicates that there is no effect of the treatment on the stability and quality indexes.

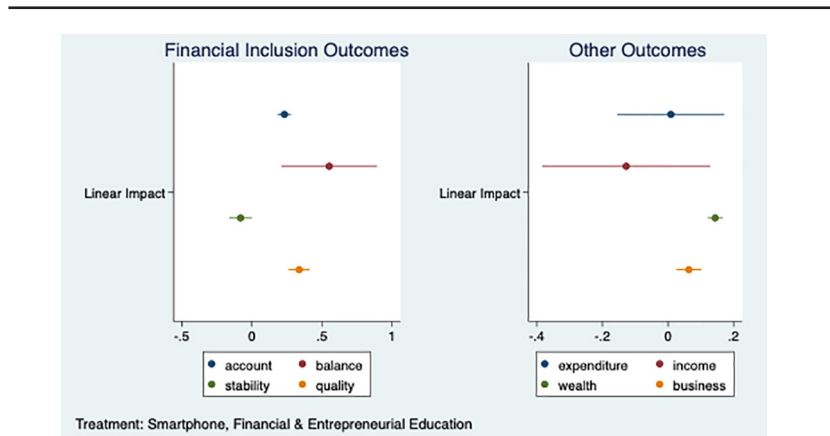
3.3.3 Results for other household outcomes

Figure 1 presents the results of the treatment for all linear models explained for financial inclusion outcomes in section 3.3.1 and the linear version of the models for expenditure, income, wealth and micro-business. As explained before, all linear effects for financial inclusion outcomes are significant and all are positive, with the exception of the effect on stability.

The effects for income and expenditure are non-significant while the effects for wealth and micro-business are positive and significant. All the estimations for linear models are only shown graphically and the tables for such results are available upon request.

Table 7 presents the estimations for different household outcomes, specifically expenditure and income per capita, the normalized wealth index in log units and the microbusiness activities. If non-linear estimations were required, they were implemented.

FIGURE 1. EFFECT OF TREATMENT
TLAXCALA 2011-2014, 95% CONFIDENCE INTERVALS



Columns 1 and 2 show that the effect of the treatment on the expenditure and income per capita is non-significant. This was found also in the linear versions of the model, and consequently no bootstrapped estimations were attempted.

Column 3 presents the results for the wealth index. The treatment generated an increase of 14% in the wealth index indicator. Considering that the wealth index measures investments that the household carries out in real assets, like renovations to their houses or the purchase of durable goods, and that no effect is found in total expenditure or income, this result indicates that households changed the composition of their expenditure, carrying out investments in real assets or durable goods. This result confirms results by other authors who have found that in less developed economies households invest in real assets or durable goods (Osili, 2004). Column 3 also shows that one more year of age increases wealth in 1% and that households with more minors have 22% more wealth.

TABLE 7
ESTIMATIONS FOR DIFFERENT HOUSEHOLD OUTCOMES, TLAXCALA, 2011-2014

Outcome	Expenditure per capita (log units)	Income per capita (log units)	Wealth Index (normalized log units)	Microbusiness activity
Model	Tobit	Tobit	Fixed Effect	Probit
Estimation	Marginal Effects	Marginal Effects	Coefficients	Marginal Effects
Treatment	-0.038 (0.047)	-0.085 (0.076)	0.144*** (0.012)	0.066*** (0.017)
Education	0.006 (0.016)	0.010 (0.020)	0.017 (0.013)	0.010*** (0.003)
Age	-0.0007 (0.004)	-0.002 (0.005)	0.009*** (0.001)	0.002** (0.001)
Minors	0.111 (0.055)	0.141 (0.066)	0.218** (0.087)	0.014* (0.008)
Adults	0.188 (0.049)	0.203 (0.058)	-0.024 (0.061)	0.001 (0.007)
Community level controls	Yes	Yes	Yes	Yes
Weighted estimation	Yes	Yes	Yes	No
Boot strapped se	No	No	No	Yes
N	1058	1058	1058	1058

*Significant at 10%; ** Significant at 5%; ***Significant at 1%.

Source: ESIFIGHT (2011, 2014). Own calculations.

Column 4 in Table 7 presents the results for microbusiness activities. The treatment increased 6.6% this activity. One more year of education increases in 1% the microbusiness activities, one more year of age increases microbusiness activities in .2% and having minors in the household increases microbusiness activities in 1.4%. These results imply that the treatment has a relatively large impact. It is important to emphasize that linear estimations of this probability also found a significant effect and that the weighted estimation did not generated significant results, consequently we look for the bootstrapped estimation which generates the results shown.

3.3.4 Robustness checks: the role of remittance reception

Table 8 presents alternative estimations for Tables 6 and 7. The estimations are performed for subsamples of households according to their remittance reception. In the case of the probability of having a bank account, the table shows that for households that receive remittance, the treatment is not statistically significant while for households that receive remittances the treatment increases 10% the probability of owning a bank account. The table also shows the 95% confidence intervals, which clearly show that the estimated treatment effect for households with remittances is smaller than the estimated treatment effect for household with no remittances, zero lies outside the 95% confidence interval.

TABLE 8
COMPARISONS OF TREATMENT EFFECTS, INTERACTIONS WITH REMITTANCE RECEPTION

	Remittances= 1		Remittances= 0	
	Treatment effect	95% confidence interval	Coefficient for treatment	95% confidence interval
Bank account	.34	[-.39, 1.04]	.10***	[.04, .15]
Account balance	.04	[-.96, 1.04]	.05**	[.001, .10]
Stability index	-.02	[-.09, .05]	.002	[-.02, .02]
Quality index	.06	[-.20, .31]	.01	[-.02, .05]
Log Income	.05	[-.08, .19]	-.11	[-.28, .11]
Log Expenditure	0.02	[-.05, .09]	-.05	[-.15, .11]
Wealth index	.12***	[.08, .16]	.14***	[.11, .16]
Micro business	.04	[-.22, .30]	.04*	[-.01, .10]

Notes: All results show similar estimations to those shown in Tables 7 and 8. *Significant at 10%; ** Significant at 5%; ***Significant at 1%.

Table 8 shows that the treatment has no effect in the account balance for households that receive remittances, while the treatment increases 5% the account balance among households that receive no remittances.

Table 8 confirms that the treatment has no effects on the stability and quality indexes for both types of households. A similar finding is obtained for income and expenditure.

Table 8 shows that the treatment increased 12% the index of wealth among households that received remittances, while it increased 14% among households that do not receive remittances. This result is interesting, revealing that the treatment affected the composition of expenditures for households.

Finally, Table 8 shows that microbusiness activities are increased 4% among households that receive no remittances, while it has no effect in that margin for households that receive remittances.

These results, however, must be taken with caution since remittance reception is endogenous and consequently, causality cannot be established. However, we certainly say that there exists an inverse relation between remittance reception and the estimated effects, namely households that receive remittances present lower effects than households that do not receive those resources. These results are consistent with the idea that households that receive remittances are able to reduce credit constraints as compared with households without remittances (Mackenzie & Rapoport, 2007).

3.3.5 Relation to literature

Ashraf, *et. al.* (2015) provided financial education and different types of bank accounts to migrant Salvadorian households in the USA. They report increases in bank account ownership and savings. No study was done about micro business activities or household income. They claim that account ownership was only increased if the household in the US had the control over the use of funds in the US. In the RCT presented in this paper, positive effects are found in bank account ownership and in account balances, as well as on wealth and micro business activity. The different results probably obey to structural differences in the countries studied, pertaining to differences in labour markets (i.e. the US labour market is more productive and therefore pays higher wages), as well as in institutions for financial markets (i.e. in the USA competition and consumer protection foster savings and consumer rights). The combi-

nation of those two structural differences probably generates the result that in Mexico whenever a household generates savings it immediately looks for investment opportunities that materialize in the form of micro-business or indicators associated to house construction. Compared to their intervention that provided accounts and financial literacy, the RCT presented in this paper provided also mobile technology and entrepreneurial training. The RCT presented here improves in two aspects the RCT performed by Ashraf, et al. (2015); first by supplying mobile technology, it provided households with a way to verify the use of their funds, as well as with all the conveniences of mobile banking over traditional banking, as well as the capabilities that mobile technology gives for households to access information in a very convenient way; second, by providing entrepreneurial skills complemented the lessons learned with the financial literacy because households can see a clear way to apply the knowledge learned in activities that directly benefit their welfare. It is clear that teaching entrepreneurship and financial literacy dominates to the strategy of only providing financial literacy. However, further research is needed to establish this fact.

Karlan and Valdivia (2011) provided entrepreneurial skills to individuals with traditional MFI's accounts in Peru. They report that households retained their accounts, but they did not increase income or profits. Our results also found no effect of the treatment on income, however, contrasts with their results because we found positive effects on wealth and microbusiness. We believe that this reveals that households prefer to start micro business, and invest in their houses, rather than saving in banks. Compared to their intervention, the RCT presented in this paper provided a new technology in banking services. It is clear that providing mobile banking technology is clearly a dominant strategy over MFI's accounts since it generates complementarities with entrepreneurial activities, which ended up increasing micro business activities and wealth in the treated households.

3.3.6 Limitations of the study

The RCT implemented in Tlaxcala faced two important challenges: the first was a change in contract terms by Bank A that held the household's accounts and the second one was the weak or lack of signal that some of our households faced in their communities. As far as the RCT is concerned, this was solved by not separating between households that

received the entire treatment and households that receive a partial part of it, which included the training and the cell phones. As far as the recommendations of policy are concerned, these two problems that were faced and solved during the RCT, reveal the need for large investments in infrastructure as well as changes needed in consumer protection regulation in order to achieve a universal coverage of mobile and banking services.

The RCT also faced two very important structural reforms that changed incentives for all households, including the control group. They are the Financial and Telecommunications reforms that took place in 2014. The first one allowed the entrance of more competitors in financial services and the second one reduced prices and increased services provided by telecommunications companies. As far as the RCT presented in this paper is concerned, the panel data methodology allows for general changes occurring at the same time of the treatment, whenever fixed effects were feasible.

CONCLUSIONS

Mexico underperforms in the levels of financial inclusion when compared to other Latin American countries (Honohan, 2004; Hernández, 2010; Cuecuecha, 2017). The reasons behind this lack of financial inclusion have been named in the literature to be both supply and demand based.

In this paper, an RCT is implemented in the State of Tlaxcala, Mexico to study how technology and training on financial education (TFE) and entrepreneurial skills (TES) relate to different dimensions of financial inclusion. Smart phones, TFE and TES were provided at no cost to 180 households.

Results show that among treated households, the probability of having a bank account increases 12% and account balances increase 5%. No effect is found in the stability or quality of the accounts held. The RCT did not generated changes in household income or household expenditure. However, the RCT increased the wealth index 14% and the microbusiness activities 6%. This shows evidence that the RCT affected the composition of expenditures of households, which led them to invest in microbusiness, and in the construction of their houses. This is evidence that households rather than save in the bank, preferred to carry out investments in real assets and small business.

The results imply that costs of accessing to financial services are important since when those costs are reduced, bank accounts increase. However, the results also show that services provided by the financial sector do not satisfy entirely the needs of the studied households, since account balances grew less than proportionally to the increase in account holding, and there is evidence that households change the composition of its expenditure investing in micro business and in real assets, rather than in savings or the use of bank credit.

The paper also presents evidence that the effects of the treatment have a negative relation with the reception of remittances. Households that receive remittances present lower effects than those found among households that do not receive remittances. This result is consistent with the idea that households that receive remittances are able to reduce credit constraints (Mackenzie and Rapoport, 2007), and consequently respond less to this type of intervention. However, the study found that the main effect of the treatment on this type of households was an increase of wealth of 12%, which shows evidence that the TFE and TES help them to change the composition of their expenditures, increasing their investments in real assets.

Further studies are required to better understand how TFE, TES and technology, if provided separately would generate similar results.

REFERENCES

- Ambrosius, C. and A. Cuecuecha (2016), "Remittances and the Use of Formal and Informal Financial Services", *World Development*, 77: 80-98.
- Amemiya, T. (1985), *Advanced Econometrics*. Cambridge: Harvard University Press.
- Ang, J. (2010), "Finance and Inequality: The Case of India", *Southern Economic Journal*, 76(3), 738-761.
- Ashraf, N., D. Aycinema, C. Martinez, and D. Yang (2015), "Savings in Transnational Households: A field experiment among migrants from El Salvador", *The Review of Economics and Statistics*, 97 (2), 332-351.
- Banco de México (Banxico, 2020a), Sistema de Información Económica. Remesas. Consulted on December 3rd, 2020. Available at: <https://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?accion=consultarCuadroAnalitico&idCuadro=CA11§or=1&locale=es>
- Banco de México (Banxico, 2020b), Sistema de Información Económica. Ingresos por Remesas. Distribución por Entidad Federativa. Consulted on

- December 3rd, 2020. Available at: <https://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?sector=1&accion=consultarCuadroAnalitico&idCuadro=CA79&locale=es>
- Banerjee, A. and E. Duflo, (2011), *Poor Economics*. New York: Public Affairs.
- Bauer, S., G. Finnegan, and N. Haspels (2004), *Gender and entrepreneurship together: Get ahead for women in enterprise*. Bangkok: International Organization for Labor (IOL).
- Beck, T. and A. De la Torre (2007), “The Basic Analytics of Access to Financial Services” *Financial Markets, Institutions and Instruments*, 16 (2), 79-117.
- Besley, T. and A. Case (1993), “Modeling technology adoption in developing countries”, *The American Economic Review*, 83 (2), 396-402.
- Collins, D., J. Morduch, S. Rutherford, and O. Ruthven (2009), *Portfolios of the Poor: How the World's Poor live on \$2 a day*. Princeton: Princeton University Press.
- Comisión Nacional Bancaria y de Valores (CNBV, 2016), *Disposiciones de Carácter General Aplicables a las Instituciones de Crédito (Circular Única de Bancos)*. Retrieved from: <http://www.cnbv.gob.mx/Prensa/Presentaciones%20Seminario%20Corresponsales/i.%20Circular%20Única%20de%20Bancos.pdf>
- Comisión Nacional Bancaria y de Valores (2010), *Corresponsales Bancarios: La oportunidad de llevar servicios financieros para todos*. Retrieved from: <http://www.cnbv.gob.mx/Prensa/Presentaciones%20Seminario%20Corresponsales/i.%20Folleto%20Corresponsales%20Bancarios.pdf>
- Comisión Nacional Bancaria y de Valores (2011), *Reporte de Inclusión Financiera*. Retrieved from: <http://www.cnbv.gob.mx/Inclusión/Documents/Reportes%20de%20IF/Reporte%20de%20Inclusion%20Financiera%205.pdf>
- Comisión Nacional para la Protección y Defensa de los Usuarios de los Servicios Financieros (CONDUSEF, 2015), *Anuario 2014*. Retrieved from: http://www.condusef.gob.mx/PDF-s/estadistica/anuario_2014.pdf
- Consejo Nacional de Poblacion (CONAPO) (2013), *Estadísticas sobre Mexicanos Residentes en los Estados Unidos* [data file]. Retrieved from: http://www.conapo.gob.mx/es/CONAPO/Poblacion_residente_en_Estados_Unidos
- Consejo Nacional de Poblacion (CONAPO) (2016), *Índices de Marginación 2010 por entidad federativa y municipio* [data file]. Retrieved from: http://www.conapo.gob.mx/en/CONAPO/Indices_de_Marginacion_2010_por_entidad_federativa_y_municipio
- Cuecuecha, A. (2014), “La migración, las remesas y las innovaciones financieras: un análisis comparativo entre el Estado de Tlaxcala y el resto del país”, en S. Flores, C. Reyes y J. Manjarrez (eds). *Las nuevas dimensiones del desarrollo regional en México durante el siglo XXI: lecturas en homenaje al Dr. Mario Carrillo Huerta*. Tlaxcala: El Colegio de Tlaxcala, A.C.

- Cuecuecha, A. (2017), *Las remesas, la tecnología móvil y el desarrollo sustentable*. El Colegio de Tlaxcala, A.C.
- Cuecuecha, A. and R. Montalvo (2014), *Censo de Puntos de Acceso al Sistema Financiero para el Estado de Tlaxcala*. Tlaxcala: El Colegio de Tlaxcala, A.C.
- Demirguc-Kunt, A. and R. Levine (2005), "Finance, Financial Sector Policies and Long Run Growth", *The World Bank Policy Research Working Paper* 4469.
- Efron, B. (1979), "Bootstrap methods: Another look at the Jack-knife", *The Annals of Statistics* 7 (1): 1-26.
- Gould, D., M. Melecky and G. Panterov (2016), *Finance, Growth and Shared Prosperity: Beyond credit deepening*. Working paper. The World Bank.
- Greene, W.H. (2000), *Econometric Analysis*. Fourth Edition. Upper Saddle River: Prentice Hall.
- Hernandez, F. (2010), *Obstáculos al desarrollo del sistema financiero en México*. Working Paper. Centro de Investigación y Docencia Económicas (CIDE).
- Honohan, P. (2004), "Financial Sector Policy and the Poor: Selected Findings and Issues", *The World Bank Working Paper* 43, Washington, D.C.
- Instituto Nacional de Estadística y Geografía (INEGI) (2016), *Banco de Información Económica* [data file]. Retrieved from: <http://www.inegi.org.mx/sistemas/bie/>
- Instituto Nacional de Estadística y Geografía (INEGI) (2010), *Censo de Población y Vivienda 2010* [data file]. Retrieved from: <http://www.inegi.org.mx/est/contenidos/proyectos/ccpv/cpv2010/Default.aspx>
- International Monetary Fund (IMF, 2015), *Financial Access Survey* [data file]. Retrieved from: <http://data.imf.org/?sk=E5DCAB7E-A5CA-4892-A6EA-598B5463A34C>
- Karlan, D. and Valdivia, (2011), "Teaching Entrepreneurship: Impact of business training on microfinance clients and institutions", *The Review of Economics and Statistics* 93 (2): 510-527.
- Kaur, P. and S. Dey (2013), "Andra Pradesh Microfinance Crisis and its Repercussions on Microfinancing Activities in India", *Global Journal of Management and Business Studies*, 3 (7), 695-702.
- Levine, Ross (1997), "Financial Development and Economic Growth: Views and Agenda", *Journal of Economic Literature*, 35 (2), 688-726.
- López-Rodríguez, P. and M. Lima-Velazquez (2015), El efecto de la desconfianza en el uso de los servicios financieros formales in Yunez, A., Rivera, F., Chávez, M., Mora, J. and Taylor, J. E. (Coords.). *La Economía del Campo Mexicano: Tendencias y retos para su desarrollo*. Ciudad de México: El Colegio de México, A.C.
- Mackenzie, D. and H. Rapoport (2007), "Network effects and the dynamics of migration and inequality: Theory and evidence from Mexico", *Journal of Development Economics* 84 (1): 1-24.

- Manski, C. and S. Lerman (1977), "The estimation of choice probabilities from choice based samples", *Econometrica*, 45(8), 1977-1988.
- Mbiti, I. and D. Weil (2011), *Mobile Banking: The Impact of M-Pesa in Kenya*. Working Paper 17129. National Bureau of Economic Research. Cambridge, USA.
- Monares, P., A. Monares, and W. Bustamante (2001), *Gestión de nuevos negocios para la microempresa rural*. Chile: Programa de Apoyo a la Microempresa Rural Promer.
- Nicholson, W. and C. Snyder (2014). *Teoría Microeconómica: Principios Básicos y Ampliaciones*. 11th Ed. Mexico: Cengage Learning.
- Oficina de Seguridad del Internauta (OSI, 2020). Protégete al Usar Wifi Públicas. Instituto Nacional de Ciberseguridad España. Consulted on December 3rd, 2020. Available at: <https://www.osi.es/es/wifi-publica>
- Osili, U. (2004). Migrants and Housing Investments: Theory and Evidence from Migeria", *Economic Development and Cultural Change*, 52 (4): 821-49.
- Pinar, O., K. Imboden and A. Latortue (2013), "Financial Access 2012: Getting to a more comprehensive picture", *CGAP Reports*, No. 6, June 2013.
- Plyler, M., S. Haas and G. Nagarajan (2010), *Community level economic effects of M-Pesa in Kenya*. IRIS Center, Department of Economics, University of Maryland.
- Portocarrero, F., A. Tarazona and G. Westley (2006), *How should microfinance institutions best fund themselves?* Washington, D.C.: Interamerican Development Bank.
- Presidencia de la República (2014), *4 Objetivos Fundamentales de la Reforma Financiera*. Retrieved from: <http://www.presidencia.gob.mx/4-objetivos-fundamentales-de-la-reforma-financiera/>
- Roa, M.J. (2015), "Financial Inclusion in Latin America and the Caribbean: Access, usage and quality", *Research Papers*, 19. Centro de Estudios Monetarios de América Latina (CEMLA).
- The Banker Data Set (2016) Latin American Top Banks Factsheet [data file].
- Valdivieso-Taborga, C. E., R. Valdivieso-Castellón, O. A. Valdivieso-Taborga (2011), "Determinación del tamaño muestral mediante el uso de árboles de decisión", *Revista Investigación y Desarrollo* 11: 148-176.
- Westley, G. and X. Martín-Palomas (2010), "Is there a business case for small savers", *CGAP Occasional Papers*, 18, 1-24, September.
- Wooldridge, Jeffrey. (2018), *Introducción a la Econometría*. 5ta ed. Ciudad de México, México: Cengage Learning.
- World Bank (2017), *Financial Inclusion Data/ Global Findex* [data file]. Retrieved from: https://globalfindex.worldbank.org/#data_sec_focus.
- World Bank (2016), Domestic credit to private sector data [data file]. Retrieved from: http://data.worldbank.org/indicator/FS.AST.PRVT.GD.ZS/countries?order=wbapi_data_value_2014%20wbapi_data_value%20wbapi_data_value-last&sort=asc&display=default