From Pawn Shops to Banks: The Impact of Banco Azteca on Households' Credit and Saving Decisions

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Abstract

This research examines the effects of relaxing credit constraints on households' saving and credit choices. I focus in the opening of a new bank in Mexico that targeted workers of the informal sector that were previously denied access to bank credit. I first explore the difference-in-difference effects of the appearance of this bank. Important changes are found in households from municipalities with branches of this new bank, whose members are employed in the informal sector. First, they are three times more likely to use bank credit. They are also 46% less prone to obtain pawn-shop credit. I also find some evidence that they are 15% less likely to keep precautionary savings, and they increase their percapita consumption by 46% when faced with a bad income shock. I then develop and estimate a dynamic structural model that I use to evaluate the effects of setting a ceiling on the interest rate this new bank charges, which is a very popular regulation suggested by several policy makers in Mexico. The model predicts that capping the interest rate would make the bank close its branches in some municipalities that now have a branch, resulting in a general loss of households' welfare.

1 Introduction

What are the effects of relaxing credit constraints on households' welfare? In developing countries, formal credit institutions are reluctant to lend, which results in a low access of households to bank credit. The lack of a verifiable steady employment, the limited credit history available, and the absence of collateral are the main reasons for this situation.

It is safe to assume that the impact on welfare from relaxing these contraints should be large. Still, the empirical research on this impact is relatively scarce. This paper addresses this gap by examining the effect of expanding access to formal credit on the credit and savings decisions of previously constrained households.

I focus on the opening of the first bank in Mexico to target households working in the informal sector. Before Banco Azteca appeared, workers in the informal sector had no access to bank credit. In a country where more than 50% of its workforce is employed in the informal economy, this new bank represents a relevant alternative of access to credit.

Banco Azteca is owned by Grupo Elektra, a major retail retail group, and opened in 2002 with more than 800 branches across the country. These were located inside existing establishments of the Elektra retail stores. This new bank represented a significant increase of 15% in the supply of bank branches across the country. Due to its success, a few months later it opened up branches independent of the retail stores. This bank has been a success history and in 2009 it became the second bank in the number of branches in the country. A crucial factor for the opening of Banco Azteca rests on the private credit information that Elektra had been collecting on its retail clients. Elektra has long been offering credit for its products to households employed in the informal sector. Therefore, it had inherited know-how on both the credit operations and on the credit history of more than a million Mexicans.

Using new panel household data, I first estimate the difference-in-difference short-term effects on households' credit and savings behavior resulting from the entrance of this bank. The panel data consists in two waves, collected in 2002 and 2005. By the time the first wave was collected, Banco Azteca had not opened yet but by the second wave Banco Azteca's presence varied across municipalities.

The empirical results reveal that households whose members pertained to the informal economy had significant changes after an Azteca branch appeared in their municipalities. The proportion of informal households using bank credit was three times larger once an Azteca branch opened in their municipalities. In addition, in these municipalities, the proportion of informal households using pawn-shop credit dropped by 42%. Also, in the presence of an Azteca branch, households holding savings declined by 15%, suggesting the existence of precautionary savings when households are credit constrained. Finally, I find that households who faced a bad economic shock increased their percapita expenditure by 40.7% once they had an Azteca branch in their municipalities.

After examining the patterns found from the data, I then develop and estimate a dynamic model of households' choices of credit and savings in which simultaneously Banco Azteca is deciding whether to open or close branches across municipalities. The model provides a framework to understand the causal impact of Azteca branches on households' changes in credit and saving habits. But the main advantage of estimating this model, is that I then use it to evaluate a regulation on the interest rates banks charge, which has been heavily suggested by several policy makers in Mexico. As the model includes the entry and exit decisions of Banco Azteca, it is well suited to evaluate this policy. The model suggests that capping the interest rate this new bank charges, will push this bank to close branches in municipalities it currently operates.

2 Data

The Mexican Family Life Survey (MxFLS) is a well suited data source to examine changes in credit and saving decisions of households, before and after the entrance of Banco Azteca. It is a panel survey at the household level that was collected in 2002 and 2005. This is the only national representative survey that collects detailed information about Mexicans' credit and savings habits.

Importantly, this data provides information about the number of households that obtained credit, the number of credits they got in the last 12 months and the institutions or places from which they got them. Additionally, it reports the number of households saving and the institution or place where they keep their savings. Using information about the occupation of the family members, I classify households as informal or formal. The survey also has the usual demographic variables that serve as controls in my empirical strategy.

MxFLS also surveys about other household characteristics needed for the estimation of the structural parameters of the model, such as household assets, which are Banco Azteca's collateral to secure the repayment of loans. These assets are bicycles, motor vehicles, electronic appliances, household appliances and furniture.

Finally, to match household level information with the presence of Azteca branches across municipalities, I merged the MxFLS data with a panel dataset from the National Banking and Securities Commission (CNBV). This dataset contains the location and year of opening of all existing commercial bank branches in the country at the municipality level, including the new Banco Azteca branches.

3 Identification Strategy

To identify in the data the effects that the presence of Azteca had on credit and saving decisions of households, I exploit the cross-time and cross-municipality variation of the location of Azteca branches. The first wave of MxFLS was collected in the summer of 2002, and the first Azteca branches appeared several months later, in October of that year. Thus, for the 2002 sample no municipality had an Azteca branch. By 2005, out the 136 MxFLS municipalities, 63 had an Azteca branch for the entire period examined; 2 of them had a branch by October 2002 but Azteca exited before MxFLS 2005 was collected; in 4 municipalities Azteca opened branches after October 2002 and kept them opened after MxFLS 2005; and finally, in the remaining 67 municipalities, Azteca never opened branches.

This variation in the data allows me to estimate difference-in-difference regressions that compare municipalities with and without Banco Azteca in 2002 and 2005. The econometric specification consists of:

$$y_{h,m,t} = \alpha_0 + \alpha_1 Azteca_m + \alpha_2 year_t + \alpha_3 Aztyear_{m,t} + \alpha_4 X_{h,m,t} + \varepsilon_{h,m,t}$$

where h denotes households, m denotes municipalities and t denotes if the year is 2002 or 2005. $X_{h,m,t}$ is a vector of controls for household demographics and municipality characteristics that are: age, gender and education of the household head, if household is in a rural village, size of municipality, presence of traditional bank branches and presence of government credit programs. To allow for heteroskedasticity of residuals along municipalities, standard errors are clustered at the municipality level. The variable of interest in this specification is ${Aztyear^1}_{m,t}$, and is the interaction of $Azteca_m$ and $year_t$. The former is a dummy that equals one if the municipality had an Azteca from 2002 until at least the second wave of MxFLS was collected. The latter equals 0 if the year is 2002 and 1 otherwise. The difference-in-difference estimate of the effect of the presence of Azteca in a municipality is captured by α_3.

4 Empirical Results

This section presents the difference-in-difference results. First, I examine if households' credit usage from banks and pawn shops experienced significant changes in municipalities where Azteca entered. I then test for the existance of precautionary savings by observing if the proportion of households that hold savings decreased in the presence of an Azteca branch. Finally, I explore some welfare implications of having access to this bank in the data, such as the ownership of assets and the consumption of households when these faced an economic crisis.

I define formal employment as any occupation or job that provides social security to the worker. I consider a household to be formal if any of its members is employed in a formal job, and informal if none of them is. To compare the results across formal and informal households, I divide the sample into three groups: all households, informal households and formal households. Finally, to control for all the unobserved variation of households that is fixed over time, such as household preferences towards risk aversion, I show the results including fixed effects at the household level.

4.1 Banks' Credit Usage

I start by analyzing if in the data households were indeed less credit constrained once Azteca appeared in their municipalities. In the data, households are asked

[1] In the appendix I define this variable in different ways to see how the difference in difference effects vary according to the intensity of Azteca's presence in municipalities.

whether in the last 12 months they obtained a loan, and for those that did, they are asked to report who the credit provider was. I look at the proportion of households that obtained a loan from banks. The results are shown in Table 1. From column 1 we can see that for the whole sample of households, the probability of obtaining credit from banks rised by 0.0224 points in municipalities where Azteca opened. This effect corresponds to an increase of three times the 2002 mean of 0.0074. As seen in Column 2, these effects are concentrated in the sample of informal households, who experienced a positive change in their probability of 0.0205 points that corresponds to an increase of more than four times their 2002 mean. Formal households living in Azteca municipalities did not have significant changes in their bank credit usage (Column 3), which is an expected finding since they were not constrained from using banks credit.

One drawback of only looking at the proportion of households that obtained a bank loan is that we do not observe if households that did not obtain a loan were aware that they were less credit constrained after Azteca opened branches. To overcome this problem, I use a question from the survey that asks respondents if they are aware or know about any place where they can borrow. In table 2, I compare if households were more likely to know about banks credit once they had an Azteca branch in their municipalities. The difference-in-difference estimates show a significant increase in the probability that a household knows it can borrow from banks (0.0946), and again, the effects are concentrated in households whose members were employed in the informal sector (0.0882). Informal households were 73% more likely to know they can get credit from banks in 2005 than in 2002.

4.2 Pawn shops

In table 3 I investigate if the entrance of Azteca had an effect on the proportion of households obtaining credit from pawn shops, which are widely used in Mexico by households with no access to banks to fulfill their credit needs. As the price of a loan from an average pawn shop is twice as expensive as Azteca's, it would be expected to see households decreasing the usage of pawn shops in municipalities where an Azteca branch opened.

The first column of table 3 presents the difference-in-difference effects of the probability that a household uses credit from pawn shops. We can see that this probability declined in 0.0099 points for households living in a municipality where Azteca entered. In columns 2 and 3 we see that the effect consistently comes from the sample of informal households. The probability of observing a formal household using pawn shops was not significantly different in a municipality with an Azteca than in any other municipality, while informal households decreased pawn shops credit by 0.0079 points, corresponding to a reduction of 42% of the 2002 mean.

4.3 Savings

I next examine if the probability that households keep savings changed for households living in municipalities with an Azteca branch. In the lack of credit, households could rely more on their savings. Therefore, the presence of an Azteca branch could have a negative effect on the precautionary-savings behavior of households, i.e- households have less incentives to hold precautionary savings after knowing there is a bank from which they can obtain credit if they need to. Table 4 examines this hypothesis.

Column 1 of table 4 presents the difference-in-difference estimates of the probability that a household keeps savings. The results are consistent with the story of households' reliance on precautionary savings, suggesting that a lower proportion of households are holding savings if living in municipalities with Azteca. The effects for the sample of all households are negative but not significant (column 1). However, when only examining the sample of informal households, the difference-in-difference effects suggest that the probability that an informal household hold savings was reduced by 0.0439 points, which correspond to a decline of 15.6% from the 2002 probability. Column 3 shows that the overall effect is certainly not coming from formal households, for which the difference-in-difference coefficients are not only insignificant but have the opposite sign.

4.4 Assets

The results shown so far provide evidence that households, especifically informal ones, are less credit constrained in municipalities where Banco Azteca appeared.

In the next tables, I now turn to analyze whether having relaxed bank credit constraints made households better off.

Surveyed households who reported requesting credit, were asked to mention the reasons they had to request it. Table 5 presents the most common reasons households said. The two most frequent answers are to purchase physical possessions, such as cars, household appliances or electronics, and to overcome a bad economic situation derived from unemployment or health problem of a family member.

With this information, I now explore whether households in municipalities where Azteca entered, are on average more prone to own physical possessions than they were in the absence of this bank. To do this, I construct a variable that takes the value of 1 if a household owns home appliances and electronics, and zero otherwise. Table 6 presents the results. Even though the 2002 mean of this variable is high, the results suggest that the probability that an informal household owns these goods increased by 0.0299 points in a municipality with an Azteca branch. The effect is again concentrated in households employed in the informal sector. These results provide some suggestive evidence that informal households in a municipality with an Azteca branch, find it easier to purchase these goods than informal households in municipalities without Azteca branches.

4.5 Bad economic shocks

Finally, I examine whether households are better able to deal with bad economic shocks once they have access to an Azteca branch. In the survey, households were asked about certain events that caused economic losses to them and the date when these events occurred. I define a bad economic shock as the unemployment or business failure of a family member that took place during the year of the survey. I then compare the per-capita expenditure of households who faced this shock. The results are shown in table 7. Households with members employed in the informal sector significantly increased their per-capita expenditures by 536 pesos if they belonged to a municipality with an Azteca. Compared to the 2002 mean of 1317 pesos, the difference-in-difference effect represents an increment of 40.7% by 2005. Results in this table suggest that households from the informal sector are better able to cope with bad economic shocks in the presence of banks credit.

5 Model

I develop a dynamic stochastic model in which credit constrained households make decisions about sectoral employment, asset accumulation and saving or borrowing. When making these decisions, they interact with different credit suppliers, one of which is Banco Azteca. The model focuses on the short-run transition of the entrance of Banco Azteca into the Mexican credit market.

Let h and m identify a household and a municipality, respectively. The economy is populated by households of different ages who live in municipalities. The model begins one year before Banco Azteca opened its first branches, and the agents solve it for the next 10 years. When in need, households use credit suppliers to borrow money from. The existent credit institutions vary across municipalities, but in total there are traditional banks, pawn shops and informal suppliers, that are relatives and friends. After the first period, Banco Azteca enters in this economy as an additional credit supplier. This bank decides in which municipalities to locate its branches.

I now describe the problem that the households solve. Then, I present the problem that Banco Azteca faces.

5.1 Problem of the Households

Households have preferences over consumption (c) and durable goods (D). While consumption goods only last one period, durable goods yield utility over time, but depreciate periodically at a rate of δ. Examples of these goods are household appliances, furniture or cars. Households' preferences are summarized by

$$u^h[c_t^h, (1-\delta)D_t^h].$$

The goal of households is to maximize their expected lifetime utility. To do so, they make decisions at every period t about whether to work in the formal sector F_t^{*h}, the optimal level of consumption (c_t^{*h}) and durable goods (D_t^{*h}) to acquire, and finally, how much to save or borrow $\left(s_t^{*h}\right)$. These choices are constrained by several restrictions that I explain next.

5.2 Households' state space

The state space of a household in period t consists of household-specific variables, $z(t)$; and municipality-level variables, $M(t)$. The state variables included in vector $z(t)$ are:

$$z(t) = (e^h, s_{t-1}^h, D_{t-1}^h, y_{t-1}^h, F_{t-1}^h, cr_{t-1}^h, d_{t-1}^{A,h}, d_{t-1}^{B,h}, \gamma^h)$$

where e^h is the household-head education level, which is fixed over time and observed from the data. I classified e^h into low and high education: ($e^h = 0$ *or* 1). s_{t-1}^h and D_{t-1}^h are the net savings and durable goods that h brings from period $t-1$ to t. y_{t-1}^h is the last period labor income of household h and F_{t-1}^h its employment sector at $t-1$, which can be formal ($F_{t-1}^h = 1$) or informal ($F_{t-1}^h = 0$). cr_{t-1}^h is a variable that indicates the credit institution the household used at $t-1$. $d_{t-1}^{A,h}$ and $d_{t-1}^{B,h}$ record the credit histories of a household with Banco Azteca and with traditional banks, respecitvely; these are dummy variables that equal one if a household defaulted in the past to Banco Azteca ($d_{t-1}^{A,h} = 1$) or to traditional banks ($d_{t-1}^{B,h} = 1$).

γ^h is observed only by the household and it measures the household preferences towards risk. These preferences are assumed to vary across households; hence, γ^h is an unobserved source of heterogeneity at the household level. I assume γ^h can take two values, γ_{low}^h and γ_{high}^h. At the time the model begins, each household draws its risk-degree type from a uniform distribution with a support $[0, 1]$, where:

$$\gamma^h = \begin{cases} \gamma_{low} & \text{with probability } \iota \\ \gamma_{high} & \text{with probability } 1-\iota \end{cases}$$

The other state variables are characteristics that vary across municipalities and are contained in the vector $M(t)$:

$$M(t) = (B^m, P^m, Y^m, A_t^m, tr_{t-1}^m)$$

Let m be the municipality of household h. B^m is an indicator variable that equals 1 if municipality m has traditional bank branches, and 0 otherwise; P^m and Y^m are the population size and the mean per-capita income of municipality m. These three variables are observed from the municipality-level data and, as this is a short-run-period study, they are assumed to be fixed over time. The only two variables of $M(t)$ that change over time are A_t^m and tr_{t-1}^m. A_t^m is an indicator function equal to 1 if Azteca has a branch in m at t, and 0 otherwise. The last variable, tr_{t-1}^m, measures the degree of informal credit or transfers from friends and relatives each period at every municipality m.

I call this degree of credit the coverage of municipality m at period t. This coverage can be understood as the proportion of households living in m for which credit from friends and relatives was available at t, regardless of whether they used it or not. Thus, it takes values between 0 and 1. I assume municipalities can have two types of coverage from friends and relatives: high and low.

5.3 Households' Constraints

Budget Constraint. The first restriction households face is the budget constraint. Households' expenditures must equal their resources at every t. Households' resources consist of the income they obtain from being employed at t, $\left(y_t^h\right)$, the savings or debt they bring from period $t-1$, $\left(s_{t-1}^h\right)$, and the value of the durable goods they brought from $t-1$ to t, $\left(pD_{t-1}^h\right)$. D_{t-1}^h depreciates at t by the rate of δ, and p is the market price of one unit of the durable good relative to one of consumption. Their expenditures, on the other hand, consist of consumption and durable goods purchases $\left(c_t^h \text{ and } pD_t^h\right)$ and the money households decide to save or borrow at t, $\left(s_t^h\right)$.

$$c_t^h + s_t^h + pD_t^h = y_t^h + (1 + r_{t-1}^{cr})s_{t-1}^h \cdot (1 - d_t^h) + (1 - \delta)pD_{t-1}^h \cdot (1 - d_t^h)$$

s_{t-1}^h is multiplied by an interest rate r_{t-1}^{cr}. If s_{t-1}^h is positive, r_{t-1}^{cr} is the return the household receives from its savings at $t-1$ and it is assumed to be the same accross all credit suppliers. If s_{t-1}^h is negative, r_{t-1}^{cr} is the price the household pays for having borrowed s_{t-1}^h, and varies accross credit institutions (cr). The lowest interest rate is from relatives and friends (r^R), followed by traditional banks' (r^B), and then by Banco Azteca's (r^A). Pawn shops charge the highest interest rate ($r^P > r^A > r^B > r^R$).

d_t^h is an indicator function of default and only equals 1 when a household brought a debt from $t-1$ that is greater than its resources at t:

$$d_t^h = 1 \text{ if } s_{t-1}^h < 0 \text{ and } ABS\left(s_{t-1}^h\right) \geq y_t^h + (1-\delta)D_{t-1}^h$$

Notice that when the indicator function equals 1, the budget constraint becomes:

$$c_t^h + s_t^h + pD_t^h = y_t^h$$

In this case, the household's debt disappears, but the borrower household gives up the durable goods from $t-1$ that were pledged as collateral. Therefore, the household's only resource is the income it earns at t.

Credit constraints. The last restrictions households face are the requirements of each credit supplier when engaging in a credit transaction. I now describe these requisites in detail.

1- Collateral. All credit institutions require collateral from households to secure the repayment of their loans. Households use their durable goods as this collateral, which value is perfectly observed by everyone. Pawn shops are the only suppliers that retain the collateral while the loan is paid. The rest collects it at t only if a household fails to pay a loan acquired at $t-1$.

2- Location. Households have access to loans from credit institutions located in their municipalities. Pawn shops exist in all municipalities, so any household with collateral can request credit from them. Branches from banks vary across municipalities (B^m) and so do Banco Azteca's branches (A_t^m). Informal credit from relatives and friends is present in all municipalities, but its coverage is different across municipalities and varies through time (tr_t^m).

3- Default history. Banco Azteca and traditional banks keep track of households that have defaulted to their loans, and restrict those households not to borrow again from them. As in the Mexican credit market, these two institutions do not share information with each other, therefore if a household defaulted in the past to an Azteca loan, ($d_{t-1}^{A,h} = 1$), traditional banks ignore it; in the same way, Azteca does not observe if a household has a default history with traditional banks ($d_{t-1}^{B,h} = 1$).

4- Proof of steady employment. I introduce this restriction to capture the constraint that motivated this paper, which is that traditional banks do not provide credit to households employed in the informal sector. This is the only credit institution that restricts households to be employed in the formal sector at the time of the loan request. No household can obtain credit from traditional banks while employed in the informal sector.

5.4 Households' shocks

At each period t, every household h draws five stochastic realizations. These are summarized in the following vector:

$$\left(tr_t^m, tr_t^h, f_t^h, y_t^{I,h}, y_t^{F,h}\right)$$

Where tr_t^m is the indicator variable of the coverage of informal credit from friends and relatives of municipality m at period t. Each period, every municipality draws its coverage. This draw depends on the coverage of m at $t-1$, which generates persistence on the degree of credit from friends and relatives through time in a municipality. In addition, to account for differences in the coverage between largely populated and smaller municipalities, the draw also depends on the population size of each municipality m, P^m. Therefore, conditional on the coverage at $t-1$ and the population size of m, the probability that m draws a high coverage at t is $p\left(tr_t^m = High \mid tr_{t-1}^m, P^m\right)$; likewise, the probability of drawing a low coverage is $p\left(tr_t^m = Low \mid tr_{t-1}^m, P^m\right)$.

tr_t^h corresponds to the realization of whether credit from friends and relatives is available to h, thus it takes values 0 or 1, and its probability is given by $p\left(tr_t^m = High \mid tr_{t-1}^m, P^m\right)$ and $p\left(tr_t^m = Low \mid tr_{t-1}^m, P^m\right)$. Thus, the probability of drawing $tr_t^h = 1$ is:

$$low \cdot p\left(tr_t^m = High \mid tr_{t-1}^m, P^m\right) + high \cdot p\left(tr_t^m = Low \mid tr_{t-1}^m, P^m\right)$$

f_t^h is the realization of whether the household receives an employment offer from the formal sector. At each t, only a fraction of households are offered a formal employment, and the rest are constrained to work for the informal sector during that period. Conditional on the sectoral employment at $t-1$, $\left(F_{t-1}^h\right)$, and the head's education, $\left(e^h\right)$, every household draws a probability of obtaining a formal sector offer from a uniform distribution.

The last shocks are $y_t^{I,h}$ and $y_t^{F,h}$, and correspond to the income draws from the formal and informal sectors. For both sectors, these draws are a function of the education, $\left(e^h\right)$ past income $\left(y_{t-1}^h\right)$ and past sector employment $\left(F_{t-1}^h\right)$ of the household.

$$\begin{aligned} y_{t,h}^F &= \alpha_{1,F} + \alpha_{2,F} \cdot y_{t-1}^h + \alpha_{3,F} \cdot e^h + \alpha_{4,F} \cdot e^h \cdot F_{t-1}^h + \upsilon_{F,t,h} \\ y_{t,h}^I &= \alpha_{1,I} + \alpha_{2,I} \cdot y_{t-1}^h + \alpha_{3,I} \cdot e^h + \alpha_{4,I} \cdot e^h \cdot F_{t-1}^h + \upsilon_{I,t,h} \end{aligned}$$

$$\begin{aligned} \upsilon_{F,t}^h &\sim N(0, \sigma_F), \\ \upsilon_{I,t}^h &\sim N(0, \sigma_I) \end{aligned}$$

Both processes include a persistence parameter ($\alpha_{2,F}$ and $\alpha_{2,I}$). Different returns to the worker human capital (e_h) are captured by $\alpha_{3,F}$ and $\alpha_{3,I}$. Also, according to the empirical findings, the premium of not switching sectors only exists for higher educated employees, and is captured by $\alpha_{4,F}$ and $\alpha_{4,I}$. The shocks $\upsilon_{F,t,h}$ and $\upsilon_{I,t,h}$ are also allowed to differ between sectors.

5.5 Lending Decision Rule

The size of the agreed loan between a household and a credit institution is a direct function of the value of the collateral, and it varies for each credit supplier.

The maximum loan that a household obtains from pawn shops and relatives equals the value of its durable goods. Therefore, these suppliers have the following trivial lending decision rule:

$$\text{For a loan } s_t^h \begin{cases} \text{Lend,} \quad \text{if } ABS\left[(1+r^{cr})s_t^h\right] \leq pD_t^h \\ \text{Reject, if } ABS\left[(1+r^{cr})s_t^h\right] > pD_t^h \end{cases}$$

For traditional banks and Banco Azteca, the size of loans depend not only on the value of the collateral, but also in the probability of default they assign to a household. A household with low probability of default has less risk of failing to pay back the loan, hence the loan this household can get will be larger than the value of its collateral.

To compute the probability of default, both Banco Azteca and traditional banks solve the problem that households face. From it, they compute the expected profits at every possible state of nature and any period t, $\big(z^h(t), M^h(t)\big)$. These expected profits are given by:

$$E\left[\pi_t^{h,m} \mid z^h(t), M^h(t)\right] = (1-p_t^h)\cdot r^{cr}(s_t^h) - p_t^h r^{cr}(s_t^h) + p_t^h \cdot D_t^h$$

where p_t^h is the probability that h defaults to the loan s_t^h and is conditional on being in the state of nature $(z^h(t), M^h(t))$. Notice that the uncertainty that h defaults at $t+1$ to its period t loan comes from the realization of idyosincratic shocks at $t+1$. Banks and Azteca know all the possible states at which a household coming from $z^h(t), M^h(t)$ can be at $t+1$, and the probability of being in each of them. Therefore, to compute p_t^h, they identify the states for which h defaults $\left(d_t^{A,h}=1\right)$ by just noting in which of these states $s_t^h<0$ and $ABS\left(s_t^h\right) \geq y_{t+1}^h+(1-\delta)D_t^h$. As they also know the probability that these states occur, they weight the default cases by its corresponding probability and obtain for every possible state, the probability of default of any household.

Neither traditional banks nor Azteca observe the risk preference of a household, ie- whether the household's risk aversion is γ_{low}^h or γ_{high}^h, but they know ι, the proportion of households with each of the two types. Hence, when assigning a probability of default $\left(p_t^h\right)$ to a household that is requesting a loan, they average out both types of risk aversion:

$$\iota \cdot p_t^h(\gamma_{low}^h) + (1-\iota) \cdot p_t^h(\gamma_{high}^h)$$

After determining the probability of default of each household, Azteca and traditional banks now decide whether to lend the household the money h requested or not. To decide this, they follow the next decision rule:

$$\text{For a loan } s_t^{*h} \begin{cases} \text{Lend,} & \text{if } E\left[\pi_t^{h,m} \mid z^h(t), M^h(t), s_t^{*h}\right] \geq 0 \\ \text{Reject,} & \text{if } E\left[\pi_t^{h,m} \mid z^h(t), M^h(t), s_t^{*h}\right] < 0 \end{cases}$$

5.6 Problem of Banco Azteca

Banco Azteca maximizes its expected lifetime profits by deciding, for every municipality m, whether to open or keep a branch at t ($A_t^m=1$) or not ($A_t^m=0$). Later, if Azteca opened a branch in a municipality at t, it must accept or reject the credit requests of the households that visited it at t, by following the lending decision rule just described.

Azteca's expected profits are obtained by adding up the profits from all municipalities at each t:

$$\sum_{t=1}^{T}\sum_{m=1}^{M}\left\{E\left[\pi_t^m\right]-\chi\cdot(1-A_{t-1}^m)\right\}$$

where χ is a sunk cost of opening a branch, and is only paid at t when Azteca decides to open a new branch in a municipality with no previous branch at $t-1$. Notice that at any period t, $E\left[\pi_t^m\right]$ are given by summing up the expected profits of all the households living in m $\left(\sum_{h=1}^{H}E\left[\pi_t^{h,m}\right]\right)$. Hence, the problem can be rewritten as follows:

$$\sum_{t=1}^{T}\sum_{m=1}^{M}\left\{\left[\sum_{h=1}^{H}E\left[\pi_t^{h,m}\right]\right]-\chi\cdot(1-A_{t-1}^m)\right\}$$

Therefore, Azteca's expected profits are obtained by calculating and adding up the expected profits of all households in each municipality.

5.7 Expected profits at the municipality level

To compute its overall expected gains, Azteca calculates its expected profits from all households of each municipality, and at every possible state of nature a municipality can be in, $M(t)=(B^m,P^m,Y^m,A_{t-1}^m,tr_{t-1}^m)$. These expected profits are given by:

$$E\left[\pi_t^m \mid M(t)\right]=\left\{\left[\sum_{h=1}^{H}E\left[\pi_t^{h,m}\mid M(t)\right]\right]-\chi\cdot(1-A_{t-1}^m)\right\}$$

For every m, Azteca observes B^m,P^m,Y^m and whether there was one of its branches one period ago A_{t-1}^m. Azteca also knows the coverage of friends and relatives credit in each municipality, tr_{t-1}^m.However, Azteca is uncertain about future coverage draws of municipalities but knows the probability that conditional on the observed characteristics of every m, the coverage switches at $t+1$. Azteca uses this probability to average out the uncertainty of this coverage.

After obtaining the expected profits at every possible state of nature of each municipality, the decision of location of Azteca's branches becomes simply:

$$A_t^m = \begin{array}{l} 1 \text{ if } E\left[\pi_t^m\right] \geq 0 \\ 0 \text{ otherwise} \end{array}$$

Notice three facts of Azteca's model. First, by introducing a sunk cost in Azteca's problem, I induce persistence in Azteca's presence, by lowering the cost of Azteca of keeping a branch in a municipality when there was a branch the period before. Second, the fact that the coverage of credit from relatives and friends can change in municipalities changes Azteca's optimal decision of having a branch in municipalities through time. Third, as the expected profits at the municipality level are only the addition of the expected profits of its households, everything else constant, more populated municipalities have higher expected profits.

6 Timing and Model Solution

The timing of events that occur at each period t is as follows. First, at the beginning of each t all the shocks $\left(tr_t^m, tr_t^h, f_t^h, y_t^{I,h}, y_t^{F,h}\right)$ are realized and observed by all households and credit suppliers. At this point households carrying a loan from $t-1$, know if they default or not. So do credit providers, and in this stage the defaulter households give up the durables pledged as collateral to their lenders. Immediately after, Azteca decides the location of its branches so that at period t households know if there is an Azteca branch in their municipalities. Finally, households make their decisions about savings, employment sector, durable and consumption goods. Those households in need of a credit, visit the credit supplier that fits their characteristics and convey a loan, following the lending rule, to be paid back at the beginning of the next period.

Let each set of households' decisions be one of the mutually exclusive available set of choices, $k \in K(t)$. Let $d_k(t) = 1$ be an indicator function equal to one if the household chooses the set of decisions k at period t and equal to zero otherwise.

The households problem is to maximize the present discounted value of their remaining lifetime utility at each t by choosing some option $k \in K(t)$. This problem can be represented in:

$$V(z(t), M(t), t) = \max_{k \,\in\, K(t)} E\left(\sum_{t=1}^{T} \beta^{T-t} U^k(t) \mid z(t), M(t)\right)$$

where β is the discount factor and the expectation is taken over the distribution of all the stochastic shocks. The solution to this problem consists of a set of the optimal decision rules k^*, at each period and state space, $(z(t), M(t))$, that maximize the expected lifetime utility at each t. This problem can be stated in a dynamic programming framework using the Bellman equation representation:

$$V(z(t), M(t), t) = \max_{k \,\in\, K(t)} V^k(z(t), M(t), t)$$

where the right-hand side consists of the maximization over all alternative choices. Each V^k represents the value function of each choice k, and is given by:

$$V^k(z(t), M(t), t) = U^k(z(t), M(t), t) +$$
$$\beta E\left\{V(z(t+1), M(t+1), t+1) \mid d_k(t) = 1, z(t), M(t), t\right\}, \forall t < T,$$

$$V^k(z(T), M(T), T) = U^k(z(T), M(T), T),\; t = T$$

Azteca's problem, on the other hand, is to maximize its expected profits. At each period t, after observing the shocks, Azteca decides the location of its branches across all municipalities, $A^m(t)$, that maximizes the present discounted value of its remaining expected profits. The profits at a particular municipality m can be represented in the following form:

$$\pi(M(t), t) = \max_{A^m \in A(t)} E\left(\sum_{t=1}^{T} \phi^{T-t} \pi^{A^m}(t) \mid M(t)\right)$$

where ϕ is the discount factor and the expectation is taken over the distribution of the stochastic shocks (tr_t^m) of each municipality. The solution to the optimization problem is a the set of choices $A^{*,m}$ for every municipality's state space at period t, $M(t)$. This problem can be stated in a dynamic programming framework using the Bellman equation representation:

$$\pi^m(M(t),t) = \max_{A^m\ \in\ (0,1)} \{\pi^m(M(t),t \mid A_t^m = 1), 0\}$$

where the right-hand side represents the maximization over the value function of opening a branch in m ($A_t^m = 1$) and not opening one ($A_t^m = 0$). The value function of opening a branch is given by:

$$\pi^m(M(t),t \mid A_t^m = 1) =$$
$$\pi^m(M(t),t \mid A_t^m = 1) + \beta E\left\{\pi^m(M(t+1),t+1) \mid\mid A_t^m = 1, M(t)\right\}, \forall t < T,$$

$$\pi^{A^m}(M(T),T \mid A_T^m = 1) = \pi^m(M(T),T \mid A_T^m = 1), t = T$$

The model does not have a closed form solution, only a numerical one. I solve the model by backwards recursion, starting from the last period, T, to the initial period t_0, for a given household. From the backwards solution, I recover the probability of default and Azteca's expected profit at every state space and period t. As it is a finite horizon problem, it is assumed that the terminal value is equal to zero, i.e. at time T the value function given by an option k is equal to the utility at T obtained from that option with no expectation term about the future. The same happens for the problem of Azteca. At period T, households and Azteca would choose the option that maximizes their instant utility or expected profits, given all possible states at T. Then, at period $T-1$, both households and Azteca would have to calculate the alternative-specific value functions using the distribution of shocks at period T, i.e. the household has to compute $E\{V(z(T), M(T), T) \mid d_k(T-1) = 1, z(T-1), M(T-1)\}$ for all $k \in K(T-1)$ and all the elements of the state space, $z(T-1), M(T-1)$. Similarly, Azteca computes $E\left\{\pi^m(M(T),T) \mid A_{t-1}^m, M(T-1)\right\}$ for every state space in $M(T-1)$. Keane and Wolpin call this function the Emax. The same procedure is followed until the initial period, t_0 is reached.

The Emax function has to be obtained for each point in the state space that could be reached from the current space point and every available choice. In this model the size of the state space was discretized and I used an approximation method proposed in Keane and Wolpin that expresses the Emax functions as a parametric function of the current state variables.

7 Empirical specification

The preferences of households are assumed to have the following functional form with respect to the nondurable and the durable goods:

$$U_t^h = \left(\frac{c_t^h}{1-\gamma^t}\right)^{1-\gamma} + \rho \log \left[(1-\delta)\, D_t^h\right]$$

The parameter ρ captures a household's taste for the flow of services of its nondurable goods relative to the consumption of durable goods (c_t^h).

8 Estimation

The dynamic model is estimated by the method of Indirect Inference using the dataset described in the Data section. The mechanism behind this estimation method consists of generating the same statistics in the simulated and the real data, and then selecting values for the parameters to estimate that approximate the simulated moments to the moments observed in the data. The objective of this method is to find the structural parameters that minimize the weighted sum of the distances between the simulated and data moments. The estimation uses the inverse of the covariance matrix of the data moments as a weighting matrix. The covariance matrix is computed using a standard bootstrap method with 1000 bootstraps.

There are 25 parameters to estimate that can be classified in six groups. I now describe the moments used to estimate them.

1- **Households' preferences parameters:** γ_{high}, ι, ρ. The first two parameters describe the preferences of the households towards the nondurable consumption good, and are estimated by matching two moments. The first one is the mean of the logarithmic ratio of consumption of the nondurable good in 2005 to that of 2002. The second one is the mean across households of the ratio of consumption of the nondurable good to the income in 2005. To identify the structural parameter for the preference of the flow of services from durable goods relative to the consumption of nondurable goods, ρ, the moment used is the proportion of households with durable goods.

2- **Probability of formal offer parameters:** p^{FH}, p^{FL}, p^{IH}, p^{IL}. These parameters refer to the probability that a household draws a formal job offer at each period t. This probability is drawn conditional on the educational level (H if $e = 1$ or L if $e = 0$) and the sector the household was employed in at period $t-1$,(I if $F^h_{t-1} = 0$ or F if $F^h_{t-1} = 1$). I use four moments to estimate these parameters. The first two are the proportion of households employed in the formal sector at $t-1$ who, conditional on their educational level, work at a formal job at t. The last two are the proportion of households employed in the informal sector at $t-1$ who, conditional on their educational level, work at a formal job at period t.

3- **Formal and informal income processes parameters:** $\alpha_{1,F}$, $\alpha_{2,F}$, $\alpha_{3,F}$, $\alpha_{4,F}$, σ_F, $\alpha_{1,I}$, $\alpha_{2,I}$, $\alpha_{3,I}$, $\alpha_{4,I}$, σ_I. The statistics for the formal income parameters were obtained from the coefficients of a reduced form specification that regressed the 2005 income of all households employed in the formal sector at 2005 to a constant term $\alpha_{1,F}$, the 2002 income of these households $\alpha_{2,F}$, their educational level $\alpha_{3,F}$, and the interaction of their education with their sector at 2002, $\alpha_{4,F}$. σ_F was computed by computing the variance of the residuals of this regression. The same statistics were used for the informal income parameters, but using the sample of households employed in the informal sector at 2005.

4- **Credit coverage from friends and relatives parameters:** $p\left(tr^m_t = High \mid tr^m_{t-1} = Low, P^m = 0\right)$, $p\left(tr^m_t = High \mid tr^m_{t-1} = High, P^m = 0\right)$, $p\left(tr^m_t = High \mid tr^m_{t-1} = Low, P^m = 1\right)$, $p\left(tr^m_t = High \mid tr^m_{t-1} = High, P^m = 1\right)$, *low* tr^m_{t-1}, *high* tr^m_{t-1}. The first four parameters represent the probabilities that municipalities transtion from the coverage they had at t-1, tr^m_{t-1}, that can be $High$ or Low, to the period t coverage, tr^m_t. Recall that this transition is assummed to be different for small and large populated municipalities, $P^m = 0$ and 1 respectively. The moments used to estimate these parameters are the proportion of households where the coverage in 2002 was low or high, that at

2005 were obtaining credit from friends and relatives, conditional on their municipality size and the coverage at 2005. The last two parameters refer to the levels of coverage a municipality can have. To estimate the level of *low* coverage municipalities, I use the average proportion of households using credit from friends and relatives in the 25th lowest covered municipalities. To estimate the level of *high* coverage municipalities, I use the average proportion of households using this credit in the 25th highest covered municipalities.

5- **Banco Azteca's sunk cost parameter:** χ. The sunk cost of Azteca is estimated by matching the proportion of municipalities that had an Azteca by 2005 both in the data and in the model simulation. The intuition for the identification of the fixed cost with this moment is that everything else constant, the higher the sunk cost, the more costly for Azteca to open a branch, hence the lower the proportion of municipalities with Azteca branches.

5- **Consumption floor.** I estimate an additional parameter that stands for the lowest level of consumption a household can have. The moment I use to estimate this parameter is the per-capita expenditure of households that belong to the 5th percentile of the per-capita expenditure distribution.

Intuitively, we expect these moments to respond monotonically to movements in the parameters they are estimating. Therefore, monotonicity is a necessary condition for the minimization process. Figures 1 to 25 show the monotonicity of the simulated moments with respect to variation in the parameters they are estimating. From the figures we can see that the moments do have this monotonic response.

There are five parameters that are not estimated. The risk aversion parameter γ_{low} was fixed to 2. The depreciation of the durable goods, δ, was fixed to 0.10. The relative price of the durable goods with respect to the consumption goods, p, was obtained from the Consumer Price Index in 2002, and was set to 10. The discount factor, β, was fixed to 0.99 and finally, the interest rates charged for a loan by all the credit suppliers were set to their 2005 values: $r^B = 30\%$, $r^A = 130\%$, $r^{PS} = 200\%$, $r^F = 0\%$. The interest rate these institutions pay households for keeping savings with them is set to 0, which is also obtained from the real interest rate they charged in 2005.

9 Estimation results and model fit

Table 8 presents the final estimated parameters. The simulated data using the final estimation of the structural parameters show very similar patterns to those observed in the real data. Tables 8 and 9 present the results.

Table 9 compares the mean across several variables of the simulated households with the households observed in the data. As MxFLS was only collected three years after 2002, the simulated data can only be compared in the first two columns for the 2002 patterns, and the last two columns, for those in 2005. The outcomes compared are the age of the households; their mean income; the normalized per-capita expenditure in consumption goods; the normalized mean value of their durable goods; the proportion of households that belong to the formal sector; the proportion of households obtaining credit from banks (including both traditional banks and Azteca) and pawn shops; and finally, the proportion of households holding savings. For all the variables shown, the model replicates closely the statistics observed in 2002 and the evolution of the simulated variables coincides with the data statistics observed in 2005.

Table 10 shows the fit of Azteca's opening of branches in the model with the real openings at the municipality level. I divide municipalities into four categories. Municipalities that had an Azteca branch from 2002 to 2005 are shown in the first category. The second group are municipalities where Azteca opened by 2002 but exited before 2005. The third classification are municipalities where Azteca opened after 2002, but stayed opened there after. And finally, the last group of municipalities are those in which Azteca decided to never open a branch. The last row presents all the municipalities in the sample. The first two columns contain the proportion of municipalities with high income and large population. The third column presents the proportion of households employed in the formal sector. The fourth column shows the coverage of credit from friends and relatives. The last column shows the number of municipalities that fall in each category.

From this table we can see that in the model, Azteca enters to municipalities with similar patterns to those in the real data. Also, the model does a good job matching the proportion of municipalities with Azteca across the four different groups of municipalities.

10 Robustness of the model

To examine the performance of the model in reproducing the empirical results that were not used to match the real with the simulated data, I compare whether the model can reproduce the reduced form findings. Table 11 compares the difference in difference outcomes of the real data with the results using the simulated households. The first panel of the table is for the sample of households belonging to the informal sector, which concentrate all the effects of opening an Azteca branch. On the second panel, I present the results for the sample of households that are employed in the formal sector. For each of the two panels, I then present the 2002 and 2005 means of the proportion of households obtaining credit from banks (including Azteca's credit) and pawn shops; and the proportion of households holding savings. I do this both for households living in a municipality with an Azteca and for those living in a municipality where Azteca chose not to open. The last three rows of each panel present the difference-in-difference results. In general, the model replicates the means and the difference in difference reduced form findings of the data.

11 Policy evaluation

In order to limit excessive interest rates charged to households, several policy makers have suggested to cap interest rates. I use this model to evaluate how Azteca would respond if it were to charge a different interest rate than the one it now charges. Figure 1 presents the results. Azteca's entrance in municipalities goes up as the interest rate increases, and it stays constant when the allowed interest rate reaches an annual value of 150%. For higher interest rates, Azteca is not willing to enter into more municipalities, due to the high default rate these higher interest rates would generate. However, the model results suggest that setting a ceiling on the interest rate would make Azteca exit some municipalities, reaching less households than it currently is.

12 Conclusions

This research examined the effects of relaxing households' credit constraints on households credit and savings decisions. To do so, it centered on the opening of the first bank in Mexico that targeted for the first time households whose members belong to the informal sector.

I found that households from municipalities with an Azteca branch experienced important changes in their bank and pawn shop credit usage and in their savings. I also present some evidence that the percapita expenditure of households facing bad economic shocks is significantly higher once they have an Azteca branch in their municipalities. Importantly, all these effects are concentrated only in informal households.

I then estimate a dynamic model that is used to evaluate policies that the reduced form results cannot predict. A concrete policy examined in this research is the effect of a ceiling on the interest rate Azteca now charges. The model predicts that the proportion of municipalities in which Azteca decided to open a branch, would have been lower that the current level, if a regulation limiting the interest rate had been imposed. The policy results suggest that the coverage of Banco Azteca across municipalities is monotonically increasing up to an interest rate of 150%. Therefore, fixing an interest rate below the one Azteca now charges, could probably push Azteca to close branches in some municipalities it now has.

13 References

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Table 1: Probability that a household obtains credit from a bank

	All	Informal	Formal
azteca	-0.0241	-0.0240	-0.0299
	[0.0629]	[0.0741]	[0.1632]
year	0.0060	0.0035	0.0244
	[0.0040]	[0.0039]	[0.0180]
*azt*year*	*0.0224****	*0.0205****	*0.0055*
	[0.0051]	*[0.0054]*	*[0.0209]*
constant	0.0213	0.0189	0.0336
	[0.0382]	[0.0417]	[0.1187]
obs	10229	7501	2728
R2	0.0157	0.0139	0.0152
2002 mean	0.0074	0.0047	0.0133

Table 2: Probability that a household knows it can get credit from a bank

	All	Informal	Formal
azteca	-0.1295	-0.1284	-0.1939
	[0.1814]	[0.2322]	[0.4292]
year	0.0623***	0.0402***	0.1420***
	[0.0115]	[0.0123]	[0.0476]
*azt*year*	*0.0946****	*0.0882****	*0.0519*
	[0.0148]	*[0.0171]*	*[0.0554]*
constant	0.2085*	0.1813	0.3365
	[0.1095]	[0.1296]	[0.3120]
obs	10099	7383	2716
R2	0.0585	0.0414	0.0828
2002 mean	0.15	0.12	0.19

Table 3: Probability that a household obtains credit from pawn shops

	All	Informal	Formal
azteca	0.0109	0.0107	0.0171
	[0.0550]	[0.0637]	[0.1590]
year	-0.0030	-0.0028	-0.0244
	[0.0035]	[0.0034]	[0.0175]
*azt*year*	*-0.0099***	*-0.0079**	*0.0073*
	[0.0045]	*[0.0046]*	*[0.0204]*
constant	0.0108	0.0073	0.0190
	[0.0334]	[0.0358]	[0.1156]
obs	10229	7501	2728
R2	0.0043	0.0040	0.0073
2002 mean	0.023	0.019	0.032

Table 4: Probability that a household keeps savings

	All	Informal	Formal
azteca	-0.1867	0.1004	-0.4573
	[0.1935]	[0.2512]	[0.4546]
year	-0.0544***	-0.0566***	-0.1098**
	[0.0122]	[0.0133]	[0.0501]
*azt*year*	*-0.0257*	*-0.0439***	*0.0670*
	[0.0157]	*[0.0183]*	*[0.0582]*
constant	0.3931***	0.1855	0.7273**
	[0.1174]	[0.1414]	[0.3306]
obs	10229	7501	2728
R2	0.0170	0.0263	0.0127
2002 mean	0.31	0.28	0.39

Table 5. Reasons of households to ask for credit

reason	mean	std. dev
health expenditures	0.200	0.400
house or vehicles repairs	0.173	0.378
pay other debts	0.098	0.297
bad economic situation	0.089	0.285
invest or open business	0.085	0.278
consumption expenditures	0.082	0.275
schooling of children	0.067	0.250
vehicle purchase	0.066	0.249
purchase household appliances	0.064	0.244
travel expenditures	0.047	0.211
a party/celebration	0.029	0.169

Table 6: Probability that a household owns physical possessions

	All	Informal	Formal
azteca	-0.1052	-0.1780	-0.0128
	[0.1541]	[0.2425]	[0.2109]
year	-0.0808***	-0.1020***	-0.0122
	[0.0097]	[0.0128]	[0.0232]
*azt*year*	*0.0465****	*0.0299**	*0.0250*
	[0.0125]	*[0.0177]*	*[0.0270]*
constant	0.9592***	0.9843***	0.9499***
	[0.0935]	[0.1365]	[0.1534]
obs	10229	7501	2728
R2	0.0171	0.0319	0.0018
2002 mean	0.91	0.90	0.94

Table 7: Percapita expenditure of a household that experienced unemployment

	All	Informal	Formal
azteca	101.4	204.6	118.8
	[213.5]	[201.7]	[616.8]
year	-432.6*	-505.0**	288.3
	[224.4]	[205.5]	[680.6]
*azt*year*	*509.4**	*536.5***	*-518.7*
	[267.0]	*[247.1]*	*[796.1]*
constant	1,359.3***	1,212.9***	1,632.0***
	[179.1]	[166.0]	[543.2]
obs	483	354	129
R2	0.2	0.2	0.1
2002 mean	1456	1317	1781

Table 8. Parameter Estimates

	Parameter	Value
	Preference parameters	
γ^H	High risk aversion	3.00
q	Probability of low risk aversion	0.80
ρ	Relative preference for service flow from durable goods	1.00
	Probability of formal offer	
p^{FL}	Probability of formal offer if formal at t-1 and low educated	0.029
p^{FH}	Probability of formal offer if formal at t-1 and high educated	0.688
p^{IL}	Probability of formal offer if informal at t-1 and low educated	0.106
p^{IH}	Probability of formal offer if informal at t-1 and high educated	0.941
	Income parameters	
$\alpha_{1,F}$	Constant formal income	0.208
$\alpha_{2,F}$	Persistence formal income	0.054
$\alpha_{3,F}$	Education formal income	0.124
$\alpha_{4,F}$	Education*past sector formal income	0.033
σ_F	Variance of formal income shocks	0.383
$\alpha_{1,I}$	Constant informal income	0.130
$\alpha_{2,I}$	Persistence informal income	0.055
$\alpha_{3,I}$	Education informal income	0.122
$\alpha_{4,I}$	Education*past sector informal income	0.043
σ_I	Variance of informal income shocks	0.383
	Consumption floor parameters	
ς	Mean of consumption floor	-4.10
η	Variance of consumption floor	0.005
λ	Persistence of consumption floor	0.875
Ω	Variance of consumption floor shocks	0.005
	Banco Azteca's parameters	
$fixed$	Banco Azteca's fixed cost	350
	Other parameters	
θ	Probability of credit from friends and relatives	0.90

Table 9. Descriptive statistics between Real and Simulated Data

	2002		2003	2004	2005	
Variable	Real data	Sim data	Sim data	Sim data	Real data	Sim data
age	25.84	25.84	26.84	27.84	28.34	28.84
income	0.26	0.29	0.30	0.29	0.20	0.29
nondurable	0.18	0.39	0.30	0.29	0.15	0.29
durable	33.1	33.1	26.2	25.8	31.2	24.2
formal	0.19	0.185	0.182	0.172	0.18	0.163
banks	0.01	0.011	0.084	0.081	0.02	0.087
pawns	0.02	0.160	0.112	0.043	0.01	0.044
savings	0.28	0.240	0.675	0.609	0.24	0.607

Table 10. Municipality characteristics and Azteca entry. Real and Simulated Data

	Income		Size		% formal		%friends credit		# of muns	
Azteca:	Real	Sim	Real	Sim	Real	Sim	Real	Sim	Real	Sim
02-05	0.810	0.807	1.000	1.000	0.175	0.177	0.05	0.07	63	57
02-04	1.000	1.000	1.000	0.667	0.000	0.174	0.04	0.06	2	3
03-05	1.000	0.889	1.000	1.000	0.000	0.157	0.06	0.10	47	18
never	0.642	0.603	0.731	0.707	0.104	0.104	0.10	0.12	67	58
all muns	0.735	0.735	0.868	0.868	0.132	0.143	0.093	0.095	136	136

Table 11. Comparison of results between Real Data and Simulated Data

	type of hhd	year	variable	Real Data	Sim Data
A) Informal	With Azteca				
		2002	banks	0.005	0.000
			pawns	0.019	0.123
			savings	0.282	0.689
		2005	banks	0.024	0.163
			pawns	0.011	0.010
			savings	0.254	0.551
	Without Azteca				
		2002	banks	0.005	0.000
			pawns	0.007	0.146
			savings	0.189	0.611
		2005	banks	0.008	0.000
			pawns	0.007	0.151
			savings	0.179	0.578
	diff in diff effect:		banks	0.02***	0.163***
			pawns	-0.008**	-0.118***
			savings	-0.044**	-0.106***
B) Formal	With Azteca				
		2002	banks	0.013	0.093
			pawns	0.033	0.017
			savings	0.391	0.740
		2005	banks	0.033	0.109
			pawns	0.012	0.000
			savings	0.335	0.752
	Without Azteca				
		2002	banks	0.012	0.051
			pawns	0.021	0.069
			savings	0.399	0.689
		2005	banks	0.020	0.076
			pawns	0.010	0.048
			savings	0.384	0.751
	diff in diff effect:		banks	0.005	-0.009
			pawns	-0.007	0.004
			savings	0.067	-0.050

Figure 1: Proportion of municipalities with an Azteca branch