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From Pawn Shops to Banks

The Impact of Formal Credit on Informal Households

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Abstract

This paper examines the effects of expanding access to credit on the decisions and welfare of households. It focuses on the entry of Banco Azteca, the first bank in Mexico targeting households from the informal sector. Panel data suggest that informal households in municipalities with Banco Azteca branches experienced several changes in their saving, credit and consumption patterns. In order to estimate the impact of Azteca's entry, the paper develops a dynamic model of household choices in which the bank is endogenously selecting the municipalities for branch openings. The analysis finds that in municipalities in which the bank entered, households were better able to smooth their consumption and accumulate more durable goods even though the overall proportion of households that save went down by 6.6 percent. These results suggest that the use of savings as a buffer on income fluctuations declines once formal credit is available. What is more, these effects vary across households. Among informal households, those who never receive formal job offers have the highest decline in saving rates. The model is also used to evaluate a legislation to cap interest rates levied by formal credit institutions. Simulations suggest that if the Mexican government were to cap the interest rate of Azteca at the rate for traditional banks, Azteca would stop operating in the poorest and least populated municipalities.

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From Pawn Shops to Banks: The Impact of Formal Credit on Informal Households

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1 Introduction

Formal credit institutions are reluctant to lend to households without credit history and verifiable steady employment. These two characteristics are inherent to people employed in the informal sector, which includes any economic activity that is not taxed or monitored by the government. This is a concern in developing countries, where the fraction of people working in an informal occupation is considerably large. In 2002, for example, 55% of Mexicans belonged to the informal sector. This does not imply that usage of credit among these people is low. On the contrary, households that cannot obtain credit from banks are very active borrowers with alternative suppliers. They rely heavily on loans from relatives and friends, and on more expensive credit suppliers such as pawn shops and moneylenders. According to the Mexican Family Life Survey 2002, of all informal households in 2002, 3.7% of them used pawn shops or moneylenders' credit and 13.8% obtained loans from friends or relatives.

The goal of this paper is to analyze the effects of expanding access to credit on households' decisions and welfare. To do this, I examine the opening of Banco Azteca, the first bank in Mexico that targeted households employed in the informal sector. Using panel data at the household level, I first analyze households' saving and consumption patterns before and after the entrance of this bank. I then develop and estimate a dynamic model of household choices in which Banco Azteca selects the municipalities for branch openings. This is, to my knowledge, the first structural attempt at jointly modeling household choices and the location decisions of banks to measure the impact of access to credit.

There are several advantages of using this structural approach. First, since the entry of Azteca in a given municipality is unlikely to be exogenous, estimating its impact on households' welfare is difficult. The model deals with this issue by endogenizing the location decisions of the bank. Second, the estimated model allows to quantify the impact of the expansion of credit caused by the entrance of Banco Azteca. Third, the model can be used to evaluate alternative policies aimed at extending access to credit. In this paper, I evaluate the proposed regulation of capping interest rates of formal credit institutions.

In October 2002, Banco Azteca opened more than 800 branches inside all Elektra stores that existed in the country. Some months later, various Azteca branches began relocating independently of the Elektra stores. At the time, these branches accounted for 15% of the supply of bank branches in Mexico. This new bank eliminated the proof of income requirement and hence allowed all Mexicans

from the informal sector to obtain bank credit for the first time. In terms of costs for borrowers, Azteca's annual percentage rate (APR) has been significantly higher than traditional banks': its APR in 2005 was 130% compared to 40% for regular banks. Nevertheless, it is lower than its competitors; in this same year, pawn shops charged on average an APR of 220%[1].

Panel data suggest that households whose members were employed in the informal sector had significant changes in their saving and consumption patterns after an Azteca branch appeared in their municipalities. The household data consist of two waves that were collected in 2002 and 2005. By the time of the first wave, Banco Azteca had not opened its branches, but by 2005, Banco Azteca's presence varied across municipalities. I exploit this variation over time and across municipalities of Azteca's branches to compare household outcomes before and after the entrance of Banco Azteca.

I find evidence that relative to households from municipalities where this bank did not open, informal households in Azteca municipalities were more likely to borrow from banks, less likely to obtain loans from pawnshops and less likely to hold savings. In addition, the fraction of informal households owning durable goods increased as did the value of these goods. Moreover, in municipalities where Azteca opened, the data suggest that informal households were more likely to increase their consumption during bad economic times, such as illness of family members, unemployment or failure of the family business. Importantly, I find no substantial change in the saving or consumption behavior of households from municipalities where Azteca entered until 2006, suggesting that changes in these outcomes are associated to the opening of Azteca branches.

The model includes important features from the Mexican economy. To capture heterogeneity among municipalities in Mexico, the economy in this model consists of M municipalities that differ in their composition of households, population size, percapita income and presence of credit suppliers. As in the Mexican credit market, households can borrow from traditional banks, pawn shops, Banco Azteca and friends or relatives.

In the model, Banco Azteca is a for-profit institution that selects the municipalities for branch openings. The bank locates in municipalities where its expected profits are high enough to cover its operating costs. In this economy, credit suppliers differ in their costs, availability and requirements for clients. The APR of each institution is set to the average rate observed from the data, with pawn shops being the most expensive and friends the least costly. When borrowing from Azteca and pawn shops, households need to own collateral to back up their loans. Durable goods serve as households'

[1]Information on the APR of different institutions was obtained from the National Committee for the Defense of Users of Financial Institutions (CONDUSEF) and the Federal Bureau of Consumer Interests (PROFECO).

collateral and in case of default, the credit institution retains it. Traditional banks have the additional constraint of requiring their clients to belong to the formal sector.

Given all these constraints, households maximize their expected lifetime utility each period by making several choices. First, households who receive job offers from the formal and the informal sectors must select their sector. Households then decide how many durable goods to own and how much savings or debt to acquire. After choosing their savings and expenditure on durable goods, the remaining resources at each period determine the consumption of the non-durable good.

Consistent with the data, the quantitative results indicate that population size and income of municipalities are important determinants of the location choices of Azteca. However, access to other forms of financing matters, particularly among municipalities where Azteca just breaks even. Everything else constant, Banco Azteca is less likely to locate in municipalities where a large fraction of households have access to credit from friends and relatives. Likewise, the impact of Azteca is more modest as municipalities rely more in friends and relatives loans.

According to the model results, having an Azteca branch allows households to smooth their consumption and to accumulate more durable goods. Providing them with access to bank credit translates in lower usage of pawn shop loans and lower levels of savings. Once access to formal credit is available, the fraction of households that save declines by 6.6%. This suggests that savings were being used as a buffer on income fluctuations in the absence of credit. Consistent with the targeted population of Banco Azteca, households who remain in the informal sector experience higher changes. But even among informal households, the effects of Banco Azteca are larger for households in the informal sector who never received a formal job offer.

Since the model includes the entry and exit decisions of this bank, it is well suited to evaluate a regulation that would cap the interest rate that formal credit institutions charge. Several policy makers in Mexico have suggested this measure in order to make loans more affordable to people. However, as capping the interest rate would alter Azteca's expected profits, this policy could have the unintended consequence of forcing Azteca out of municipalities where it is no longer profitable to maintain a branch. My results suggest that if the government were to cap Azteca's APR to 40%, more households would obtain bank loans and the average size of these loans would be larger. However, in some municipalities households' response would not compensate for the decrease in the APR. Simulations of this model indicate that the bank would exit from half of the currently covered municipalities. The likelihood of losing a branch is higher in municipalities with lower percapita income and smaller population.

Broadly, my results fit into the literature that analyzes the impacts of expanding financial services to poor households. There have been several studies using randomized settings to examine the impact of expanding access to credit. Banerjee et al. (2009) exploit the random expansion of a microfinance institution in urban India, and find that in slums where the MFI entered, borrowing from MFIs increased as did expenditure on durable goods. They also found heterogeneous effects on business creation and non-durable consumption, which depended on households' propensity to become entrepreneurs. Crépon et al. (2011) find similar results for a randomized microcredit intervention in rural Morocco. On the other hand, Karlan and Zinman (2009) evaluated an individual lending program for micro entrepreneurs in urban Philippines, finding almost no effects on profits and business expansion.

In addition to these papers, there is a growing literature studying the effects of expanding access to credit to low-income households in more quasi-experimental settings. Burgess and Pande (2005) exploit the implementation of a bank branch licensing rule in India to estimate the effect of rural bank branches on poverty. They find that the expansion of branches significantly decreased poverty in rural areas. Aportela (1998) examines the impact of an expansion of a savings institute across Mexican cities. He finds strong positive effects in the average saving rates of low-income households. In the same context as this paper, Bruhn and Love (2013) analyze the effects that the entrance of Banco Azteca had on business and employment outcomes in urban municipalities in Mexico. Their evidence suggests that relative to municipalities without Azteca, in municipalities where Azteca initially entered, workers were more likely to open an informal business and benefited from higher income levels.

Kaboski and Townsend (2009) and Kaboski and Townsend (2011) analyze the impact of the Thai Million Baht Village Fund program, a major microcredit initiative that was rapidly implemented in one year across all villages in Thailand. Exploiting that the same amount of funds was injected to all villages regardless of their size, they first use a reduced form approach to examine the data patterns. They then develop and estimate a structural model to predict and evaluate the impact of the program. They find sizeable effects on consumption as a result of the credit program.

My paper contributes to this literature by providing one of the first attempts to estimate a model of household decisions that considers the endogenous location of credit providers.

This paper is organized as follows. The next section describes Azteca's background and outlines its business model. Section 3 describes the data set used and the patterns of households over time in municipalities with and without Azteca branches. Sections 4, 5 and 6 present the model, the model

solution and its estimation. Section 7 presents the estimation results and the model fit assessment. The robustness of the model and the quantification of Azteca's impact are examined in Sections 8 and 9. The policy experiment is discussed and evaluated in Section 10. Finally, Section 11 concludes.

2 Background of Banco Azteca

Banco Azteca is owned by Grupo Elektra, Latin America's leading retail company. Elektra stores have operated in Mexico since 1957 and specialize in selling consumer electronic products, household appliances, and furniture through sales on credit schemes. Its in-store credit schemes have consisted of weekly payments at high interest rates that appeal to customers lacking alternative credit options (mainly people from the informal sector). By 2001, Grupo Elektra applied for a license to open a bank, which was approved in March 2002. In October 2002, Banco Azteca started operations inside all Elektra branches that existed in the country. After some months of operation, several Azteca branches began relocating independently of the Elektra stores.

Banco Azteca's business model closely replicates Elektra's. Its loans are collateralized, they range from 2,000 to 20,000 Mexican pesos and their average maturity term is one year. Different from Elektra's credit, Azteca's loans are in the form of cash, and are not tied to the purchase of any item in the store. To obtain a personal loan, applicants visit a branch where, among other things, they state a list of belongings to be pledged as collateral for their loan. Household appliances such as refrigerators or televisions are common collateral accepted by the bank[2]. To assess their value and to obtain more information about the applicant, a loan agent mounted on a motorcycle visits the applicant's house shortly after the application is processed. After this visit, the bank decides whether or not to approve the loan. Once a loan is approved, Azteca's clients begin making weekly payments, and those who delay receive weekly visits from loan agents requesting their payment[3]. As stated by Azteca, its default rate is as low as that of traditional banks, plausibly due to its crude collection and repossession mechanisms[4].

[2] In case of default, collateral is repossessed and resold at Elektra's Bodega de Remates outlet stores.

[3] Annual Report of Grupo Elektra, 2002.

[4] According to Rhyne (2009), "Azteca has reportedly fired agents for crossing the line between peer pressure and public humiliation".

3 Data and Empirical Findings

The data used to examine Banco Azteca's entry combine three sources of information. First, the data for households come from the Mexican Family Life Survey (MxFLS), waves 2002 and 2005. At the time of the 2002 wave, Banco Azteca had not opened its branches, but by 2005, its presence varied across municipalities. MxFLS is representative at the national level and importantly, it is the only survey providing detailed information about Mexicans' credit and savings habits during these years. I focus the analysis on households that were surveyed in both waves and in which the household head is between 18 and 65 years old. The final sample from the baseline survey consists of 5,639 households in 136 Mexican municipalities. Second, municipalities from the household data were merged with a panel dataset from the National Banking and Securities Commission (CNBV), which contains the location and year of opening of all bank branches across Mexican municipalities. With this dataset it is possible to identify the location decisions of Banco Azteca across municipalities over the period examined. Finally, aggregate variables at the municipality level such as population size and percapita income were added to examine the characteristics of municipalities attracting Banco Azteca's branches. These variables were obtained from the 2000 Mexican Census and the Human Development Index of Mexican Municipalities[5].

To first explore which factors determine the location decisions of Banco Azteca, I classify municipalities in four groups according to the presence of Banco Azteca: i) municipalities that had an Azteca branch from 2002 to 2005 (63 of them); ii) municipalities where Azteca entered in 2002 but by 2005 the branches were no longer there (2 of them); iii) municipalities where Azteca did not enter at the beginning but by 2005 the bank was already there (4 of them); iv) and finally, municipalities that never had an Azteca branch in these years (67 of them). In table 1, I examine the distribution of population size and percapita income for each group. The table also includes the fraction of municipalities that had traditional bank branches by presence of Azteca.

There are three patterns in the location of Azteca to highlight from the table. First, population size, per capita income and presence of traditional bank branches are strongly correlated with the presence of Azteca's branches. Municipalities with an Azteca branch are more populated, have higher percapita income and are also more likely to have traditional bank branches than the average municipality in Mexico. On the contrary, municipalities where Azteca never entered have smaller

[5]The Human Development Index imputes the percapita income for each municipality in Mexico using information from the National Income and Expenditure Survey (ENIGH) and the Census (see López Calva and de la Torre García (2003) and López Calva and de la Torre García (2005)).
The index can be downloaded from: http://www.undp.org.mx/desarrollohumano/disco/index.html.

populations, lower per capita income and less penetration of traditional banks than the average municipality. Second, the entry of Azteca is very persistent. Most municipalities from this sample either had an Azteca branch from 2002 to 2005 or never had one. Only in six municipalities Azteca decided to exit before 2005 or enter after 2002. Third, although highly correlated, these variables do not explain completely the location decisions of the bank. There are some municipalities with sufficiently high income percapita and population size where Azteca did not enter and some smaller municipalities where the bank did locate. A plausible explanation could be that the degree of competition that Azteca faces varies across municipalities. For instance, in a municipality where Azteca might be indifferent about entering, if the fraction of households having access to transfers from friends or relatives suddenly increases, Azteca may find it unprofitable to open a branch since fewer households may want to commit to an Azteca loan. This however, is information that remains unobserved in the data, but that is considered in the model.

3.1 Empirical Strategy

I now examine whether households' saving and consumption patterns changed over time in municipalities that received an Azteca branch. To do so, I exploit variation over time and across municipalities of Azteca's branches to compute difference-in-difference (DID) estimates. The DID estimates compare the difference in households' mean outcomes before and after Azteca's opening between Azteca and non-Azteca municipalities. Azteca municipalities are classified as those that had an Azteca branch by 2005 while non-Azteca are all other municipalities[6]. The econometric specification to compute the DID estimates consists of:

$$y_{h,m,t} = \alpha_0 + \alpha_1 Azteca_m + \alpha_2 year_t + \alpha_3 Aztyear_{m,t} + \alpha_4 X_{h,m,t} + \alpha_5 Z_h + \varepsilon_{h,m,t} \tag{1}$$

where h, m, t denote households, municipalities and whether the year is 2002 or 2005. $X_{h,m,t}$ is a vector of time-varying controls for household demographics and municipality characteristics that are: if household is in a rural village, size of the municipality and presence of traditional bank branches or other government credit institutions. Z_h is a set of household fixed effects that control for all the unobserved variation of households that is fixed over time, such as household preferences

[6]Different treatment groups were tested, such as municipalities where Azteca first appeared in 2002, or municipalities with an Azteca branch from 2002 to 2005. While the magnitudes vary, the empirical results hold for the different classifications.

towards risk aversion. The DID estimator is captured by α_3, the coefficient of the indicator variable $Aztyear_{m,t}$, which corresponds to the interaction of $Azteca_m$ and $year_t$. The former is a dummy that equals one if the municipality had an Azteca by the time the second wave of MxFLS was collected. The latter equals 0 if the year is 2002 and 1 otherwise.

Table 2 presents descriptive statistics on the households data classified according to the presence of Azteca across municipalities. The first column reports information of households from municipalities that had an Azteca branch in 2005. Information of all other households is shown in column 2. The baseline year consists of 3,483 households in municipalities with presence of this bank and 2,156 households in municipalities where Azteca did not open. Since Banco Azteca targets clients employed in the informal sector, classifying households into formal and informal is needed. Following Levy (2008), I consider a household as formal if any of its nuclear members- household head, spouse and sons or daughters- has a job that provides Social Security benefits. Otherwise, the household is considered informal. The share of households that belong to the formal sector was higher in Azteca municipalities than in non-Azteca ones in the baseline year, 0.238 and 0.131, and stayed higher in 2005, 0.229 and 0.125 respectively.

3.2 Saving patterns

Table 3 presents the saving patterns of households over time. The first two columns report the 2002 and 2005 means for households from Azteca and non-Azteca municipalities. The last column presents the DID coefficient (α_3) of equation (1) on the different outcomes. The first outcome measures households' awareness about bank loans. This outcome is important since it proxies for households' potential ability to borrow in the future from banks, which could be altering their consumption and saving decisions in the present. This indicator variable equals one if a household knows it can obtain loans from banks and zero otherwise. As seen from the table, the fraction of households that knew they can obtain bank loans increased from 2002 to 2005 in both Azteca and non-Azteca municipalities. Nevertheless, the DID estimator indicates that in municipalities with Azteca branches, the probability that households knew they can obtain bank loans increased substantially more than in municipalities with no Azteca. The DID estimator (0.0887) implies that after Banco Azteca opened, relative to municipalities with no branch of this bank, the probability that households in Azteca municipalities knew they can borrow from banks was 60% higher once this bank opened.

The next variable examined is the probability that households obtain bank loans. While take up of bank loans is very low, the fraction of households with bank credit substantially increased in

municipalities where Azteca entered[7]. According to the DID estimator, households from municipalities where Azteca opened were twice more likely to obtain bank loans than in other municipalities[8] ($\alpha_3 = 0.0108$). These results suggest that once Banco Azteca opened its branches in a municipality, households' borrowing from banks increased. To explore if households from municipalities where Banco Azteca opened reduced their usage of more expensive credit suppliers, the next rows present the means over time and the DID estimates of the probability that households borrowed from pawn shops. The results suggest that the likelihood that a household borrowed from pawn shops dropped significantly by 0.0087 points in municipalities in which Azteca located its branches relative to municipalities where Azteca did not enter, which is a sizeable decline of 39%. This change in borrowing from pawn shops to banks is consistent with Karlan and Zinman (2009)'s findings for consumption loans in South Africa, where they find suggestive evidence that expanded access to formal credit changed households' borrowing sources from informal to formal ones.

If the opening of Azteca branches increased households' ability to borrow from formal providers, households' decisions to save may also be changing. According to the precautionary savings model (Deaton (1991), Carroll (1997)), in the presence of uncertainty about future income, households will use savings as buffer stocks to counter the effects of future income shocks. Maintaining savings is even more important for credit constrained households, who are unable to borrow when times are bad. An implication of this model is that when households' ability to borrow in the future increases, their need to hold liquid assets declines. To examine whether there is evidence of this behavior in the data, I estimate DID regressions on the proportion of households holding savings. Similar to the findings in Kaboski and Townsend (2009) for the Thai Baht microcredit program evaluation in Thailand and Lee and Sawada (2010) for credit constrained rural households in Pakistan, my results suggest that in Azteca municipalities, the fraction of households holding savings significantly decreased in 0.0403 by 2005. This decline represents a drop of 11% from the 2002 mean. While the average household did not decrease its saving levels, households below the 40th income percentiles were holding significantly less savings once Azteca entered in their municipalities.

The results outlined in table 3 suggest that the saving patterns of households from Azteca municipalities significantly changed after Banco Azteca opened, relative to non-Azteca municipalities. However, given that Banco Azteca targets clients employed in the informal sector, these changes

[7]In different settings, take up of credit products has also been found to be very low. In rural Kenya for instance, after randomly providing information on credit options and lowering the eligibility criteria for loan applicants, only 3% of people initiated the loan process (Dupas et al. (2012)).

[8]Moreover, the median size of a bank loan in municipalities where Azteca entered decreased from 11,000 Mexican pesos in 2002 to 10,000 Mexican pesos in 2005, suggesting that the composition of clients borrowing from banks was different.

should be driven by informal households. Tables 4 and 5 explore whether this is the case by separately focusing on the sample of households that are informal or formal in both periods. According to table 4, compared to informal households from non-Azteca municipalities, informal households in Azteca municipalities were 76% more likely to know they can borrow from banks ($\alpha_3 = 0.1009$) after the opening of Azteca. Their likelihood of obtaining loans from banks more than doubled ($\alpha_3 = 0.0139$)[9]. Moreover, after the entrance of Azteca in their municipalities, the probability that informal households obtained pawnshop loans decreased in 45% ($\alpha_3 = -0.01$). In addition, the fraction of informal households saving substantially decreased in 13% ($\alpha_3 = -0.043$). While the average savings of households below the 40th income percentile declined by 46% (Mx $2,264), savings held by households below the 60th income percentile did not change substantially, suggesting that it was poorer households those reducing their savings.

Consistent with the clients that Banco Azteca targets, table 5 suggests that formal households from municipalities with Azteca branches did not experience significant changes on their saving patterns after the opening of this bank. Altogether, this exercise suggests that informal households from municipalities where Azteca opened concentrate the changes in saving patterns observed from the data.

3.3 Consumption patterns

In the MxFLS questionnaire, each household that obtained a loan is asked about its stated reasons for borrowing. The two most reported reasons were: i) to finance consumption expenditures during a bad economic situation such as unemployment, sickness of family member, etc. (50% of responses); and ii) to purchase/repair durable goods (35% of responses). Only 8.5% of the borrowers stated that they obtained their loan to start a new business or to invest in one.

Table 6 examines whether consumption patterns of households in municipalities where Azteca opened a branch experienced any change. In particular, since borrowers report using loans towards durable goods purchases/repairs, this exercise first explores if households from Azteca municipalities own more durable goods and of higher value. Panel A of the table presents the means over time and DID estimates on: the proportion of households owning electronic appliances (radio, TV set, VCR, computer, etc.), furniture and large appliances (washing and dryer machine, stove, refrigerator), and other appliances (blender, iron, microwave, etc.), and the value of these goods. The

[9]Conditional on borrowing from banks, the average loan size also declined: while in 2002 the median bank loan size obtained by informal households in Azteca municipalities was 23,141 Mexican pesos, by 2005 it was 19,494.

results suggest that in Azteca municipalities, households were more likely to own electronic appliances (α_3 =0.0223) and large appliances and furniture (α_3 =0.0228). Moreover the value of these goods significantly increased in $2,305 Mexican pesos for electronic appliances and $2,342 Mexican pesos for furniture and large appliances. These patterns are consistent with Banerjee et al. (2009) who find that on average, Indian households were more likely to purchase durable goods such as televisions and refrigerators if a microfinance institution opened an office in their slums.

As with changes in the saving patterns, table 7 (panel A) suggests that these changes are coming from the sample of households whose members are employed in the informal sector. In Azteca-municipalities after the opening of Banco Azteca, informal households were more likely to own electronic appliances (0.0244) . The value of their electronic appliances increased by 22% (Mx $1,456), and of their furniture and large appliances by 30% ($2,756 Mexican pesos). On the other hand, households with members belonging to the formal sector do not report significant differences in their likelihood of owning durable goods or their average value (See table 8, panel A).

From the responses of borrowers, there is reason to believe that credit is also being used by households as an instrument to protect against bad economic shocks or to smooth consumption. Testing for consumption smoothing would require following households over several points in time and comparing their consumption to their income patterns. Since the first wave of MxFLS was collected in 2002, households are observed only one period before Azteca's entry and one period afterwards, making this test infeasible. However, MxFLS collects information about certain events that caused economic losses to households and the date when these events occurred.

Using this information, I explore whether households are better able to deal with economic shocks in the presence of formal credit. To do so, I examine the percapita expenditure of households that experienced a bad economic shock in the last 12 months they were surveyed, defined as: $i)$ death of a family member; $ii)$ serious illness of a family member; and $iii)$ unemployment or failure of business of a family member[10].

Panels B of tables 6, 7 and 8 present the DID results for the sample of all households, informal households and formal households experiencing bad economic shocks. The results however, must be taken as weak suggestive evidence of consumption smoothing for two reasons. First, the DID

[10] 1% and 1.4% of households in Azteca and non-Azteca municipalities experienced the death of a family member in 2002. This share increased to 1.3% and 2.4% in 2005. Serious illness of a family member was reported by 2.4% and 2.1% of households in Azteca and non-Azteca municipalities in 2002; by 2005 this share was 2.8% and 2.2%. Unemployment or failure of family business was reported by 5% and 2.8% of households in Azteca and non-Azteca municipalities in 2002; this share was 4.4% and 3.6% in 2005.

regressions for this exercise are estimated without household fixed effects[11]. Second, since the number of households in the sample experiencing shocks is low, the 2002 and 2005 means of per capita expenditures in Azteca and non-Azteca municipalities are noisy, especially for the control group. With these drawbacks noted, there is some evidence suggesting that households from Azteca municipalities were better able to increase their consumption during bad economic times after Azteca opened branches. The OLS DID estimates suggest that informal households in Azteca municipalities increased their percapita expenditure by Mx $9,339 and Mx $8,463 if experiencing illness of a household member or failure of the family business (panel B of table 7). As seen from panel B of table 8, formal households from Azteca municipalities experienced no significant change relative to formal households from other municipalities.

3.4 Robustness Check

According to the data, informal households from municipalities with an Azteca branch experienced various changes on their saving and consumption patterns once the branch opened. However, a concern with these findings is that informal households from municipalities where Azteca entered were in a different trend from households in other municipalities, and would have actually experienced these results even in the absence of this bank. One possible way to rule out this possibility would be to examine whether the trends in saving and consumption patterns between treated and control households were similar in the periods before Azteca opened. As the first wave of MxFLS was in 2002, this test is not feasible. However, an alternative robustness check is to analyze the change in saving and consumption patterns from 2002 to 2005 of households from municipalities that would get an Azteca until 2006 or later. If informal households from municipalities selected by Azteca have different trends to other households, and this is driving the results, then we should expect the saving and consumption patterns of these households to be changing even in the absence of Azteca. If the entrance of Azteca is altering households' behavior, then households from municipalities where Azteca entered in later periods must not have experienced substantial changes.

Tables 9 and 10 report the DID coefficients of equation (1) on the saving and consumption outcomes of informal households using two different treatments. The first treatment corresponds to the standard group of informal households from municipalities with an Azteca by 2005 (Column 1). The alternative treatment is composed of informal households from municipalities where Azteca

[11]Since less than 5% of all households experienced shocks both before and after Azteca opened its branches, the household fixed effects DID estimates are positive but not significant, due to the lack of within-household variation.

only entered by 2006 or later (Column 2). If Azteca changed the behavior of informal households in municipalities where it opened, one might then observe that the DID coefficients from column 2 (municipalities where Azteca have not entered yet) are not substantially different from zero. Overall, the results confirm that in municipalities that have not yet received an Azteca branch, the saving and consumption patterns of informal households are not different from other households in municipalities without a branch.[12]

4 Model

I now present the dynamic model in which households interact, among other credit suppliers, with Banco Azteca. The economy in this model consists of M municipalities populated by households. Consistent with the data, municipalities differ from each other in their composition of households, their population size (P^m), percapita income (Y^m) and presence of credit suppliers (cr_t^m).

As in related literature modeling the coexistence of several lenders (Giné (2011), Jain (1999)), this model allows for four credit suppliers that are traditional banks, Banco Azteca, pawn shops and friends or relatives, $cr = \{B, A, PS, FR\}$.

The model can be divided in two parts: the problem of the households and the problem that Banco Azteca solves.

4.1 Households' problem

Households in the model have preferences over consumption goods (c_t^h) and the service flow of durable goods $(\widetilde{D}_t^h)$. While consumption goods only last one period, durable goods yield utility over time, but depreciate periodically at a rate of δ. Households' preferences are summarized by the utility function $u[c_t^h, \widetilde{D}_t^h]$.

The model of households is a standard precautionary savings model in which future income is uncertain (as in Deaton (1991), Aiyagari (1994) and Kaboski and Townsend (2011)), that includes non-durable as well as durable goods, in which borrowing constraints are mainly determined by the availability of credit suppliers in the municipality, the stock of durable goods held by households (i.e., Bertola et al. (2006), Alessie et al. (1997)), and the employment sector of households.

Every period, households make three decisions in order to maximize their expected lifetime util-

[12]The fact that more households are aware that they can borrow from banks even in municipalities where Azteca did not open is not surprising given the intense TV advertisements that Banco Azteca products have throughout the country.

ity. Households decide whether to belong to the formal sector or not ($F_t^h = 0, 1$), how many durable goods to purchase (i_t^h), and how much to save or borrow of a liquid asset $\left(s_t^h\right)$.

At every period t, households' liquid resources R_t^h consist of two components: their labor income y_t^h and their savings from last period s_{t-1}^h, which include both the principal and the interest, $r^{cr_{t-1}^h}$. The model assumes that all households have access to the same saving technology that pays a positive interest rate, while for loans, the interest rate r^{cr} varies across credit suppliers[13]. If households borrowed last period, $s_{t-1}^h < 0$, default can occur. Let $def_t^{cr,h}$ be an indicator function that equals one if h defaults on its $t-1$ loan to credit supplier cr. Liquid resources are then given by:

$$R_t^h = y_t^h + (1 - def_t^{cr,h}) \cdot (1 + r^{cr}) s_{t-1}^h \tag{2}$$

Households obtain their income y_t^h from one of the two sectors of the economy, a formal sector and an informal one. Let $y_t^{F,h}$ be the income offered from the formal ($y_t^{1,h}$) and the informal sector ($y_t^{0,h}$) to household h at period t. For both sectors, the realized income depends on the previous income of the household $\left(y_{t-1}^h\right)$ and the education and age of the household head $\left(e^h, a_t^h\right)$. These variables proved to explain accurately the two income processes in the data. In the model, the magnitude in which these variables determine income is allowed to differ between sectors. In addition, every period each income offer is subject to an idiosyncratic shock, $\upsilon_t^{F,h} \sim N(0, \upsilon^F)$:

$$y_t^{F,h} = f_F\left(y_{t-1}^h, e^h, a_t^h, \upsilon_t^{F,h}\right) \tag{3}$$

At every period, all households receive an income offer from the informal sector, but they only receive a formal-sector income offer with probability f_t^h.[14] Therefore, the income offers that household h observes each period are given by:

$$y_t^h = \begin{cases} y_t^{1,h}, y_t^{0,h} & with\ prob \quad f_t^h \\ y_t^{0,h} & with\ prob \quad 1 - f_t^h \end{cases} \tag{4}$$

[13] As in the Mexican credit market, the model assumes that $r^{Fr} < r^B < r^A < r^{PS}$

[14] According to the data, more educated households are more likely to be in a formal occupation, and once a household belongs to the formal sector, the probability of staying in this sector is high. Hence, the model allows f_t^h to depend on whether the household belonged to the formal sector in the last period and on the education of the household head, e^h.

Households that have job offers from both sectors, decide in which sector to be employed by comparing their value functions of belonging to each sector. Households who only observe an offer from the informal sector, stay in the informal sector.

Households in this model own durable goods that are used as collateral if borrowing from Azteca or pawn shops. Let q be the market price of one unit of the durable good relative to one of consumption, then the value of durable goods at each t, qD_t^h, must equal the value of the depreciated durable goods from period $t-1$ plus any purchase made at t. In case of default to a loan from Azteca or pawn shops- i.e. when $def_t^{A,h} = 1 \; or \; def_t^{PS,h} = 1$, h loses the durable goods that were pledged as collateral of the loan (qx_{t-1}^h):[15]

$$qD_t^h = (1-\delta)qD_{t-1}^h + i_t^h - def_t^{cr,h} \cdot qx_{t-1}^h \tag{5}$$

Note from equations (2) and (5) that when the default indicator function equals 1, h's debt disappears but as a penalty, h loses the durable goods x_{t-1}^h that were pledged as collateral.

Households face four constraints in the credit market that are summarized next.

1) Geographic constraints. The first constraint refers to the inability of households to borrow from suppliers that are not located in their municipalities. The set of lenders in m at period t is given by $\{B^m, A_t^m, PS^m, FR_t^m\}$, where B^m and A_t^m are indicator variables that equal 0 or 1, depending on whether there are branches of these suppliers in m or not. Since all municipalities have pawn shops, PS^m equals 1 for any m. In the model, credit from friends and relatives exists everywhere, but the fraction of households with access to these loans varies over time and across municipalities. This fraction is assumed to take two values: $FR_t^m = \{\underline{FR}, \overline{FR}\}$. Therefore, municipalities can have a low or a high fraction of households with access to these lenders. Every period, each m draws FR_t^m with a probability that depends on the percapita income of the municipality and the fraction of households with access to loans from friends and relatives in the last period, $g = g(Y^m, FR_{t-1}^m)$.

2) Negative credit history. This constraint only applies to clients of Azteca and traditional banks. In Mexico, these suppliers rely on households' payment histories to approve loans, and do not lend to households with previous history of default. Interestingly, banks and Azteca do not share information with each other, therefore if a household defaulted in the past to an Azteca loan, traditional banks

[15] Different from Azteca, pawn shops retain the collateral while the loan is paid. To capture this in the model, during periods when households borrow from pawn shops, households do not derive utility from the durable goods pledged as collateral.

are not aware of it. Thus in the model, if borrowing from Azteca or traditional banks, households need to have no default incidents in the past with them.

3) Official proof of income. This restriction only applies to clients requesting loans to traditional banks, who are required to be employed in the formal sector at the time of the loan request.

4) Collateral. Azteca and pawnshops require households to pledge durable goods as collateral to secure the repayment of their loans. The amount that a household can borrow is bounded by a limit that depends on the value of durable goods that households own.

In sum, the set of lenders that households have access to is determined by the following municipality characteristics and decisions that households make:

$$cr_t^h = \begin{cases} B_t^{h,m} & if\ B^m = 1,\ def_{t-1}^{B,h} = 0,\ F_t^h = 1 \\ A_t^{h,m} & if\ A_t^m = 1,\ def_{t-1}^{A,h} = 0,\ D_t^h > 0 \\ PS_t^{h,m} & if\ D_t^h > 0 \\ fr_t^{h,m} & with\ prob\ FR_t^m = f_{FR}(FR_{t-1}^m, Y^m) \end{cases} \tag{6}$$

Besides these four constraints that limit households' access to suppliers, loan size is also bounded differently by lenders. The bounds on loans from Azteca and pawn shops are determined by the value of durable goods pledged as collateral.[16] The bounds on loans from traditional banks and friends and relatives are determined outside the model:

$$cr_t^h = \begin{cases} A \longrightarrow & s_t^h \geq \phi_1 \cdot qD_t^h \\ PS \longrightarrow & s_t^h \geq \phi_2 \cdot qD_t^h \\ B \longrightarrow & s_t^h \geq \phi_3 \\ FR \longrightarrow & s_t^h \geq \phi_4 \end{cases} \tag{7}$$

Under this setting, households' problem consists of selecting the optimal set of decisions $(F_t^{h^*}, i_t^{h^*}, s_t^{h^*})$ that maximizes their expected lifetime utility, defined as:

$$E\left[\sum_{t=1}^{T} \beta^t u[c_t^h, \widetilde{D}_t^h]\right],$$

[16]The collateral requirements are considered exogenous in the model. Their values were obtained from CONDUSEF, Azteca's Financial Reports and PROFECO. According to these sources, the average collateral required by a pawn shop in Mexico is three times the value of the loan . Thus ϕ_2 is set to $1/3$. According to CONDUSEF and Banco Azteca's reports, Banco Azteca requires a collateral equivalent to the value of the loan, hence ϕ_1 is set to 1.

subject to $(2) - (7)$, and the budget constraint equation:

$$c_t^h + i_t^h + s_t^h = R_t^h \tag{8}$$

If households' liquid resources R_t^h fall short of a subsistence consumption level $(\underline{c})$, it is assumed that households have a form of insurance or consumption floor that allows them to achieve the subsistence level. This consumption floor is a parameter estimated in the model.

In the model, default occurs when a household with $s_{t-1}^h < 0$ receives an income shock such that the maximum amount of debt it can borrow is not enough to pay off s_{t-1}^h and cover its minimum consumption $(\underline{c})$. In this situation, $def_t^{cr,h} = 1$ and if the supplier was Azteca or a pawn shop, h loses the durable goods pledged as collateral. The optimal policy of the defaulting household is then given by:

$$c_t^h = \underline{c}$$
$$s_t^h = 0$$
$$i_t^h = 0$$

In this model, the state space at period t consists of the following variables at the household and municipality level:

$$w_t = \{s_{t-1}, y_{t-1}, F_{t-1}, cr_{t-1}, D_{t-1}, def_{t-1}^{cr}, e, a_{t-1}, B^m, P^m, Y^m, FR_{t-1}^m\} \tag{9}$$

4.2 Problem of Banco Azteca

Banco Azteca's total expected profits are given by the sum of expected profits from each of the M municipalities:

$$E\left[\Pi_t\right] = \sum_{m=1}^{M} E\left[\Pi_t^m\right] \tag{10}$$

The problem of this bank is to maximize its expected profits by deciding in which municipalities to open its branches. Therefore, at every period t and for each municipality m, Azteca selects $A_t^m = \{0, 1\}$ such that:

$$E\left[\Pi_t^m\right] = \max\left\{E\left[\Pi_t^m | A_t^m = 1\right], 0\right\} \tag{11}$$

Two components determine the expected profits of opening an Azteca branch in municipality m. The first one corresponds to the gains that Azteca expects to receive at $t+1$ from lending at t. The second component refers to the cost associated to the operation of the branch, χ^m, which is a cost at the municipality level that must be paid every period that Azteca operates in a municipality.

To compute the expected gains from lending at t, it is assumed that Azteca knows and solves the problem of the households, and observes the state space of each household (w_t), as well as the processes and parameters determining: i) the income draws; ii) the job offers of households; iii) and the friends and relatives credit draws (FR_t^m). Like households themselves, Azteca is unable to observe the realization of shocks at $t+1$, mainly: i) whether households will have a formal job offer at $t+1$, f_{t+1}^h; ii) the income shocks at $t+1$ of the formal and informal sectors, $\upsilon_{t+1}^{1,h}, \upsilon_{t+1}^{0,h}$; and iii) whether households will have access to loans from friends and relatives at $t+1$, fr_{t+1}^h.

With the information that Azteca has, at the beginning of each period the bank is able to determine the pool of loan applicants that in each municipality will visit its branch at t to obtain a loan l_t^h. Azteca computes each applicant's expected profits by estimating the probability that the loan is paid back at $t+1$. Let this probability be p_t^h, which is simply the likelihood that $h's$ liquid resources at $t+1$ are high enough to cover $\underline{c}$ and pay off l_t^h. Then, with probability p_t^h, h will pay off its loan and Azteca will receive a net gain of $r^A l_t^h$. With probability $1-p_t^h$, h will default on its debt and Azteca will lose l_t^h but will recover the collateral, qx_t^h. Therefore, the expected profits of lending to household h at period t are given by:

$$E\left[\pi_{t+1}^{h,m} \mid l_t^h > 0, \omega_t^h\right] = p_t^h \cdot r^A(l_t^h) + (1-p_t^h)\cdot(qx_t^h - l_t^h) \tag{12}$$

As equation (13) indicates, Azteca's expected profits from households who do not borrow at all, or borrow from a different lender, are zero.

$$E\left[\pi_{t+1}^{h,m} \mid l_t^h = 0, \omega_t^h\right] = 0 \tag{13}$$

Let H be the number of households in m. From these H households, every period some will borrow from Azteca while others will not borrow at all or will borrow from different lenders. Let J be the number of households borrowing from Azteca. Azteca's expected gains from lending at t in municipality m are then given by summing up the expected gains of its J clients:

$$\sum_{h=1}^{H} E\left[\pi_{t+1}^{h,m} \mid \omega_t^h\right] = \sum_{j=1}^{J} E\left[\pi_{t+1}^{h,m} \mid l_t^h > 0, \omega_t^h\right] \tag{14}$$

The second component of Azteca's expected profits at the municipality level is the cost of operating a branch, χ^m. As equation (15) shows, there are two variables that determine χ^m, which are population size and whether the municipality has an Elektra store. Let I_E be an indicator variable that equals 1 if m has an Elektra store and 0 otherwise. To account that having an Elektra store substantially facilitates Azteca's operations (Conger (2003)), χ^m consists of a fixed cost that differs for municipalities with an Elektra store. Population size enters Azteca's cost function through a linear spline approximation to reflect potential economies of scale of having a branch in large enough municipalities, where I_P is an indicator variable that equals 1 if $m's$ population size exceeds a threshold χ_4 estimated in the model.

$$\chi^m = \chi_0 + \chi_1 \cdot I_E + \chi_2 \cdot P^m + \chi_3 \cdot (P^m - \chi_4) \cdot I_P \tag{15}$$

Therefore, the expected profits of opening an Azteca branch in municipality m are given by:

$$E\left[\Pi_t^m | A_t^m = 1\right] = \sum_{h=1}^{H} E\left[\pi_{t+1}^{h,m} \mid \omega_t^h\right] - \chi^m \tag{16}$$

As this model focuses on the short-term effects of the entry of Banco Azteca, Azteca is the only credit supplier in the model that decides where to locate its branches. The location of the other credit suppliers is considered exogenous. A potential concern is the response of pawn shops to the entrance of Banco Azteca, not only in location of their branches but also in pricing of their loans. Since there is no reliable information at the national level on pawn shops' pricing or location decisions before 2005, the reaction of pawn shops to the entrance of Azteca is unknown. The model assumes that in the short-run, pawn shops did not change their behavior once Azteca entered the market.

Additionally, the model abstracts from other decisions that credit suppliers make such as the interest rate to charge or the collateral to require. Data on these decisions began to be collected by the Mexican authorities after 2005. Hence, in the model these decisions are fixed to the choices observed from the 2005 data, which are assumed to be the optimal decisions that credit suppliers made in the past under the assumption that these decisions did not change by the entrance of Azteca.

5 Model Solution

The interaction between households and credit suppliers is as follows.

- At the beginning of each t, the idiosyncratic shocks are drawn and observed by all households and credit suppliers. Concretely:
  - Each municipality draws $FR_t^m = \{\underline{FR}, \overline{FR}\}$; based on FR_t^m, each household draws its realization of credit from friends and relatives $fr_t^h = \{0, 1\}$,
  - Households find out whether they receive an offer from the formal sector or not, and observe their formal and informal labor incomes, $y_t^{1,h}, y_t^{0,h}$.
- Once the shocks are realized and observed, households who brought a debt to the period and have not enough resources to pay it back, default. Collateral pledged to pawn shops and Azteca is collected by the lenders.
- Azteca observes all information from households and municipalities, and decides in which municipalities to open its branches.

To decide the location of its branches, Azteca computes the profits it expects to receive from every household, $E\left[\pi_{t+1}^{h,m} \mid \omega_t^h\right]$, and sums up the expected profits by municipality. Based on them, the bank opens its branches in municipalities where its expected gains cover the operation cost,

$$A_t^m = \begin{cases} 0 & if \sum_{h=1}^{H} E\left[\pi_{t+1}^{h,m} \mid \omega_t^h\right] \leq \chi \\ 1 & if \sum_{h=1}^{H} E\left[\pi_{t+1}^{h,m} \mid \omega_t^h\right] > \chi \end{cases} \quad for\ m = 1, ..., M$$

Once Azteca opened its branches across municipalities, households make their decisions. The recursive problem of each household at every period t can be written in the following form:

$$V^h(\omega_t^h, t) = \max_{s_t^{h*}, i_t^{h*}, F_t^{h*}} u^h[c_t^h, \widetilde{D}_t^h] + \beta E\left[V^h\left(\omega_{t+1}^h, t+1\right)\right]$$
$$s.t. (2) - (7)\ and$$
$$c_t^h + i_t^h + s_t^h = R_t^h,$$

I solve the model by backwards recursion, starting from the assumed last period of life of the household $T = 75$, to the assumed initial period of its formation $t_0 = 18$. As it is a finite horizon

problem, it is assumed that the terminal value is equal to zero- i.e. in their terminal period of life, the value functions of the households equal the utility at T. At periods $t < T$, the value functions of the households equal the utility at t plus the expected value function of $t + 1$.

Keane and Wolpin (1994) show how to recover these expected value functions, which they call the Emax function. This function is calculated for every point of the state space, any period t and every possible choice set. In this model, the size of the state space was discretized and, following Keane and Wolpin (1994), the Emax functions were approximated by a parametric function of the current state variables.

5.1 Empirical specification

Functional form assumptions were made for the following processes of the model: household utility function; labor income process from the formal and informal sectors; and transition of credit from friends and relatives across municipalities and over time.

Utility: Households' preferences $u[c_t^h, \widetilde{D}_t^h]$ are assumed to have the following functional form with respect to the nondurable goods and the service flow of durable goods:

$$U_t^h = \left(\frac{c_t^h}{1-\gamma}\right)^{1-\gamma} + \eta_0 \widetilde{D}_t^h \tag{17}$$

where the flow of services from durable goods ($\widetilde{D}_t^h$) is produced by a linear household production function, in which the stock of durable goods D_t^h is transformed by the productivity parameter $\eta_1 > 0$ into the flow of services enjoyed by the household at each period t:

$$\widetilde{D}_t^h = \eta_1 D_t^h \tag{18}$$

The parameter γ captures the intertemporal substitution of the nondurable good c_t^h. This parametrization implies that household h's intertemporal elasticity of substitution is $-1/\gamma$. Since the flow of services of durable goods is produced by a linear household production function, it is not possible to separately identify the preference for the service flow of durable goods (η_0) from the productivity parameter η_1. Only their product $\eta_0\eta_1$ is identified.

Labor income from the informal and formal sectors: Labor income offers from the formal and informal sectors are drawn from the following processes:

$$y^1_{t,h} = \alpha_{1,1} \cdot y^h_{t-1} + \alpha_{2,1} \cdot e^h + \alpha_{3,1} \cdot a^h_t + \alpha_{4,1} \cdot \left(a^h_t\right)^2 + \upsilon^h_{1,t} \tag{19}$$

$$y^0_{t,h} = \alpha_{1,0} \cdot y^h_{t-1} + \alpha_{2,0} \cdot e^h + \alpha_{3,0} \cdot a^h_t + \alpha_{4,0} \cdot \left(a^h_t\right)^2 + \upsilon^h_{0,t} \tag{20}$$

Equations (19) and (20) relate the labor income offer of household h at t to h's labor income at $t-1$ plus a linear return to education and a quadratic return to age of the household head. The labor income parameters are allowed to differ between the two sectors.

Municipalities' access to credit from friends and relatives: It is assumed that each period municipalities can draw either a high ($\overline{FR}$) or low ($\underline{FR}$) access to credit from friends with probability g, which depends on: i) whether municipalities' percapita income is above or below the national percapita income; ii) and whether access to credit from friends and relatives at $t-1$ was low or high. These conditions give more flexibility to the modelling of credit from friends and relatives by: allowing wealthier municipalities to have different informal credit arrangements than poorer municipalities such as family networks, "tandas" or cooperatives; and also by allowing for persistence within a municipality over time on the fraction of households with access to loans from friends and relatives. Therefore, the probability that a municipality draws $\overline{FR}$ at t is given by:

$$g = \begin{cases} g_1 \; if \; (FR^m_{t-1} = \overline{FR}, Y^m > \overline{Y}) \\ g_2 \; if \; (FR^m_{t-1} = \overline{FR}, Y^m \leq \overline{Y}) \\ g_3 \; if \; (FR^m_{t-1} = \underline{FR}, Y^m > \overline{Y}) \\ g_4 \; if \; (FR^m_{t-1} = \underline{FR}, Y^m \leq \overline{Y}) \end{cases}$$

where the probabilities $g_1 - g_4$ are parameters estimated in the model.

6 Model Estimation

There are 28 structural parameters of the model which are estimated by the method of simulated method of moments. The goal of this method is to estimate a vector of structural parameters Ψ, by matching a set of simulated statistics, denoted as μ, with the corresponding set of actual data

statistics, denoted as m. The estimated structural parameters are those that minimize the weighted average distance between the set of simulated statistics and the set of data statistics. Because the simulated statistics depend on the underlying structural parameters, minimizing this distance will provide consistent estimates of the structural parameters under certain conditions. The estimator of Ψ is defined as the solution to the minimization of

$$\widehat{\Psi} = \arg\min_{\Psi} \left[m_n - \tfrac{1}{s}\mu_n^s(\Psi)\right]' \widehat{W}_N \left[m_n - \tfrac{1}{s}\mu_n^s(\Psi)\right]$$

where the subscript n refers to the number of households in the sample and s denotes the number of simulations. $\widehat{W}_N$ is a positive definite matrix that converges in probability to a deterministic positive definite matrix W. I use the inverse of the covariance matrix of the data moments as the weighting matrix $\widehat{W}_N$. The covariance matrix is computed using a standard bootstrap method with 1000 bootstraps.

The statistics to be matched are listed in table 11. The first four moments correspond to the proportion of households that belonged to the formal sector in 2005, conditional on the education of their head and on their employment sector in 2004. Statistics from 5 to 14 are related to the labor income process from the formal and informal sectors[17]. Statistic 5 captures the persistence of labor income in the formal sector, by regressing the 2005 labor income of formal households on their 2004 labor income. The next moment captures the returns to education on the formal labor income by computing the mean difference between labor income of household heads with less and more than nine years of schooling that belonged to the formal sector in 2005. Moments 7 and 8 describe the returns to age in the formal sector, by comparing the 2005 labor income of household heads older and younger than 35 years and household heads older and younger than 50, conditional on being employed in the formal sector. Moment 9 captures the variance of the income shocks received by formal households in 2005. These shocks are the residuals from the OLS regression of formal labor income in 2005 on 2004 labor income, education, age and age squared for households observed in the formal sector at 2005. The same statistics are used to capture the income process of the informal sector (moments 10 to 14).

The next four moments relate to households' consumption behavior. These moments correspond to the 5th percentile of the distribution of households' percapita expenditure in 2005; the proportion of households that owned radio, TV sets, VCRs or computers in 2005; the 2005 ratio of percapita

[17]The households' data (MxFLS) includes retrospective information for the years 2004 and 2001 regarding labor decisions, which is used to compute these moments.

expenditure to total income across households; and the log of the ratio of percapita expenditure in 2005 to the 2002 percapita expenditure across households.

Moments 19 to 24 describe the patterns of access to friends and relatives credit over time and across municipalities. Moments 19 and 20 capture the 2005 fraction of households with loans from friends and relatives in municipalities below and above the mean access to friends and relatives credit. To compute them, I first obtained the 2005 average fraction of households with loans from friends and relatives across municipalities. Moment 19 uses the sample of municipalities below this average, while moment 20 corresponds to the sample of municipalities above the average fraction of households with credit from friends or relatives in 2005. The next four moments capture the persistence of credit from friends and relatives over time. I first computed the average fraction of households with credit from friends and relatives in 2002 and 2005, respectively. I then classified municipalities into two groups: municipalities below the average fraction in 2002 and municipalities above. Moments 21 to 24 report the proportion of households that in 2005 obtained a loan from friends or relatives conditional on whether municipalities are low/high income and below/above the 2002 mean of credit from friends and relatives.

The last five moments describe the entry patterns of Azteca branches into MxFLS municipalities. Moment 25 corresponds to the fraction of municipalities with an Azteca branch in 2005. Moments 26 to 28 report the fraction of municipalities with an Azteca branch in 2005 conditional on their population size being: between the 10th and 30th percentiles; 30th and 50th percentiles; and 50th and 70th percentiles. The last moment refers to the fraction of municipalities that had an Azteca branch from 2002 to 2005 conditional on having an Elektra store in 2002.

7 Estimation results and model fit

The estimation of the model requires some choices regarding the size of the state space. I discretize households' savings and labor income, the value of the durable goods, the household head's years of schooling, the fraction of households covered by friends and relatives, and the income of the municipalities, which are the continuous state variables of the model. The grids were selected so that they reflect the distributions of these variables in the data. The grid of savings consists of 10 points, the first one equals the 5th percentile of the empirical savings distribution and the consecutive points refer to the 15th, 25th,..., 85th and 95th percentiles. I tested the robustness of the simulations using fewer grid points and I found that it is important to include at least 10 points. The value of the durable goods

was discretized to 4 point grids. The first point corresponds to a value of \$0 and the last 3 points reflect the empirical distribution of durable goods value: these points correspond to the 30th, 60th and 90th percentiles of the data distribution. Household heads' years of schooling were discretized into two grid points: the first point corresponds to all household heads with less than 9 years of schooling and the second point includes all households in which the head had 9 or more years of education. At the aggregate level, municipalities were classified by their fraction of households with access to credit from friends and relatives into two categories: below and above the mean fraction of households who borrowed from friends and relatives. Municipalities were also classified in two groups according to their percapita income, using the median income as the cut-off. Households' labor income was also discretized using a 3-point grid, whose points correspond to the mean values between the 1st and the 33th percentiles, the 33th and 66th percentiles and above the 66th percentile of the distribution of total labor income. Finally, I approximate the discrete distributions of formal and informal labor income shocks following Kennan (2006). I specify a continuous distribution for each sector shock, and given the parameters of this distribution, I specify a discrete approximation to them. I allow for 3 support points for these discrete approximations.

7.1 Estimation results

Table 12 presents the estimated parameters and their asymptotic standard errors. I compute the asymptotic standard errors following Berndt, Hall, and Hall (1974) and Nash (1990).

Probability parameters of receiving a formal offer: $f_t^h \mid e^h, F_{t-1}^h$

In the model, the probability that a household receives a formal-sector job offer depends on whether the household belonged to the formal sector in the last period, $F_{t-1}^h = \{0, 1\}$, and on the education of the household head, $e^h = \{0, 1\}$. According to the estimation results, the probability of receiving an offer from the formal sector increases substantially if households were formal in the previous period. For low and high educated households, the estimated probabilities are 0.55 and 0.72, respectively. Households employed in the informal sector have a lower probability of receiving a formal job offer in the next period. These probabilities are 0.07 for low educated households and 0.132 for high educated ones.

Parameters for formal labor income process: $\alpha_{1,1}$, $\alpha_{2,1}$, $\alpha_{3,1}$, $\alpha_{4,1}$, σ_1

The labor income process is allowed to depend on previous labor income, education and age. The estimated persistence for the formal income is 0.492, which means that each period, households income consists of 49% of their lagged labor income. The returns to education in the formal sec-

tor are estimated to 1.1. This coefficient implies that in the formal sector, income of high-educated households is 42% higher than low educated households. Regarding returns to age, the estimated coefficients are 0.04 and -0.0004, reflecting a concave pattern of income with respect to age. The estimated standard deviation of the income shocks from the formal sector is 2.03.

Parameters for informal labor income process: $\alpha_{1,0}$, $\alpha_{2,0}$, $\alpha_{3,0}$, $\alpha_{4,0}$, σ_0.

According to the estimated model, the persistence of lagged labor income on current income in the informal sector is 0.51, higher than in the formal sector. The returns to education (1.0) imply that relative to households with low education, the income of high-educated households in the informal sector is 60% higher. The estimated coefficients on age are 0.02 and -0.0002, respectively. Compared to the formal sector, the peak income age is reached earlier in the informal sector, when household heads are 41 years old. The standard deviation of the informal income shocks is 2.1, slightly higher than the variance from the formal sector.

Parameters for access to credit from friends and relatives: FR_t^m

In municipalities with low access, only 5% of households can borrow from friends or relatives if they need to. In municipalities with high coverage ($\overline{FR}$), each period 32.1% of households have a friend or relative from whom they can borrow.

Parameters for the transition of fraction of households with access to credit from friends and relatives: g_1, g_2, g_3, g_4

Low-income municipalities who had low access to credit from these suppliers in the previous period, stay with low access to credit from friends and relatives with probability 0.89, and experience high access with probability 0.11. If low-income municipalities previously had high access to these lenders, they stay with high access with probability 0.87. For high-income municipalities, the transition probabilities are the following. Municipalities who had low access to friends and relatives credit in the previous period, stay with low access with probability 0.81. Municipalities that experienced high access to these lenders in the past, remain with high access at t with probability 0.93.

Households' preferences parameters: γ, $\eta_0\eta_1$.

The estimated intertemporal substitution of nondurable goods, γ, is 2.14. The estimated joint product of $\eta_0\eta_1$ is 2.1 but given the parametrization, it is not possible to identify separately the preference for the service flow of durable goods (η_0) from the household productivity η_1.

Banco Azteca's operating cost parameters: $\chi_0, \chi_1, \chi_2, \chi_3, \chi_4$.

According to the estimation, the fixed cost that Azteca faces in municipalities with no Elektra branches is $\chi_0 = 432$, while for municipalities with an Elektra store $\chi_0 + \chi_1$ equals 221.7, suggesting

that the operating costs are substantially lower if Azteca serves a municipality previously covered by Elektra.

Consumption floor: $\underline{c}$

This parameter determines the minimum consumption that a household receives. Its estimated value is 0.365, which corresponds to a daily percapita consumption of $\$0.83USD$.

Exogenous parameters. The parameters that are not estimated inside the model and that are considered exogenous are the following: information about interest rates and collateral requirements was obtained from CONDUSEF, Azteca's Financial Reports and the households' data. According to this information, the average APRs of pawnshops, Banco Azteca, traditional banks and friends or relatives in 2005 were 220%, 130%, 40% and 0% respectively. Regarding collateral, 90% of the households in the dataset that obtained credit from friends and relatives reported they were not required to own any collateral, therefore in the model, the collateral that friends and relatives require is set to zero. According to reports from PROFECO, the average collateral required by a pawn shop in Mexico is three times the value of the loan. According to CONDUSEF and Banco Azteca's reports, Banco Azteca requires that the value of collateral is equivalent to the value of the loan. The maximum loan that households can borrow from traditional banks and friends and relatives is also determined outside the model as a function of the head's education. The maximum loan size from friends and relatives is $\$3,000USD$, while bank loans can reach $\$5,500USD$. These values were obtained from the distribution of loans from banks and friends and relatives from the households data. 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.

7.2 Model Fit

As seen from table 13, the estimated model matches closely the simulated statistics to the real ones. The first panel presents the moments for the share of households employed in the formal sector in 2005, conditional on their education level and previous sector employment. The likelihood of being employed in the formal sector is strongly correlated with having participated in the formal sector in the previous period, for both low and high educated households. But also, regardless of whether households were formal or not in the previous period, education increases the probability of being formal. The simulated moments replicate these data patterns closely. Interestingly, while 7% and 13% of low educated households receive formal job offers each period, only 4% and 11% of these

households end up switching to the formal sector. A similar pattern occurs with high educated households, suggesting that for some households it is optimal to stay in the informal sector even when they have access to formal employment opportunities.

The model fits well the labor income process of households employed in the formal and informal sectors, as the next panels show. The simulated statistics for the 5th percentile of the distribution of households' percapita consumption, the fraction of households who own durable goods and the consumption moments are close to the data moments. The simulated moments governing the behavior of credit from friends and relatives across municipalities accurately fit the data patterns, and the persistence of access to friends and relatives loans over time are also replicated by the simulated statistics. Regarding Azteca's entry patterns, the model slightly overpredicts the fraction of municipalities with an Azteca branch in 2005 (0.52 vs 0.51).

Table 14 examines the performance of the model in predicting the type of municipalities where Azteca locates. The table compares the characteristics of municipalities with Azteca between the simulations and the real data. Information in the first column refers only to municipalities in which Azteca operated from 2002 to 2005. The second column contains statistics only for municipalities where Azteca located in 2002 but exited before 2005. The third column presents information of municipalities where Azteca entered after 2002 and stayed until at least 2005. The fourth column contains information from municipalities where Azteca opened after 2002 and exited before 2005. Finally, the fifth column presents statistics for municipalities that never had an Azteca branch. The table summarizes population size and percapita income distributions, as well as the fraction of municipalities with branches of traditional banks. The first panel of the table reports information from the real data and the second panel reports on the simulated data.

At the estimated parameters, the model replicates closely Azteca's location patterns. In the model, Azteca selects more populated municipalities with higher percapita income and higher presence of commercial banks. Also, as in the data, Azteca's decision of location is very persistent. Out of 136 simulated municipalities, Azteca only relocates branches in 12, compared to 6 in the data. Finally, while population size and income are important drivers of the location decision, not all populated municipalities get an Azteca branch. Likewise, Azteca decides to enter in some smaller and poorer municipalities. In the model, besides population size and percapita income, the differential access of credit from friends and relatives across municipalities is a relevant factor explaining Azteca's location.

Figure 1 provides some insights of how credit from friends and relatives influences the decision

of location of Azteca. This figure holds all the parameters of the model constant and only varies the fraction of households with access to credit from friends and relatives. First, as the fraction of households with access to credit from friends and relatives increases in a municipality, Azteca's expected profits decrease. Second, in low populated and poorer municipalities (such as Jopala, Puebla), Azteca would not open a branch even if few households have access to credit from friends and relatives. In municipalities closer to the median income and population size (such as Amecameca or Linares), Azteca's entry or exit decision is influenced by the access to credit from friends and relatives. In larger municipalities (such as Apodaca), Azteca would enter even if most households have access to loans from friends and relatives.

8 Robustness of the model

Saving outcomes were not used as moments in the estimation of the structural parameters. A robustness check to examine the performance of the model is to analyze if the model can reproduce the change in saving outcomes experienced by households in municipalities where Azteca located its branches. To do this, I estimate the difference-in-difference regressions using the simulated data and compare them with the real data results. As in equation (1), the regressions compare the saving patterns of simulated households in 2002 (before Azteca started) and 2005 (once Azteca had decided location for 3 periods).

Table 15 presents the DID coefficients (α_3) for all households, and for households who were informal or formal in both periods, using real data (column 1) and simulated data (column 2). Overall, the model reproduces the change in saving patterns observed in the data. In municipalities where Azteca enters, simulated households are more likely to borrow from banks, and less likely to borrow from pawn shops and to hold liquid savings. As in the data, these results are concentrated among informal households, and formal households remain practically unaffected.[18]

8.1 Different counterfactuals in the model

The reduced form results presented in tables 3 to 8 compare outcomes over time of households from municipalities where Azteca entered with municipalities where Azteca did not open branches. If households from control municipalities respond as households in treated municipalities in the pres-

[18] While the magnitude of the coefficients in the model is larger than in the data, this occurs mainly because saving in the model is a continuous variable, so any loan or saving greater than zero is recorded as one in the dependent variable. In the data, households are not likely to report loans and savings lower than a certain threshold.

ence of Azteca, then the difference-in-difference specification would provide valid estimates of the impact of Azteca. However, if there are differences (observed or unobserved) between control and treated municipalities that affect the impact of Azteca, the effect of Azteca will then differ if the bank were to locate in control or treated municipalities. In this case, the difference-in-difference will no longer produce unbiased estimates.

The estimated structural parameters governing municipalities' access to credit from friends and relatives reflect substantial differences between low and high income municipalities. Municipalities that tend to be selected by Azteca (high income municipalities) also tend to have more access of credit from friends and relatives. In the model, as municipalities have more access to credit from friends and relatives, they demand less credit from Azteca, since households can borrow from these suppliers at lower interest rates and more flexible contract terms. Hence, everything else constant, the opening of an Azteca branch will produce more modest changes in municipalities with more access to credit from friends and relatives, which tend to be the treated municipalities.

Comparing municipalities selected by Azteca with other municipalities therefore may produce biased estimates of the impact of the bank, since treated municipalities have more access to credit from friends and relatives than control ones. This bias can be measured in the model by examining what would have happened with households from municipalities selected by Azteca in the case that Azteca would not have entered. Column 1 of table 16 presents the biased DID regressions that use as a control group municipalities that were not selected by Azteca in 2005. Column 2 presents the DID regressions that use as control group households from the same municipalities where Azteca entered under the scenario that Azteca never entered. The size of the bias is then given by the difference in DID estimates. According to the model, comparing households from municipalities selected by Azteca with households from municipalities where Azteca decided not to enter overestimates the real impact that Banco Azteca had on the likelihood of saving. In the absence of this bank, the fraction of households saving in treated municipalities would not have decreased as much as what control municipalities suggest.

9 Quantification of the Impact of Banco Azteca

9.1 Estimating the Impact of Banco Azteca on households' outcomes

Saving and Consumption patterns Table 17 presents the means of saving and consumption outcomes of households from municipalities selected by Azteca under two scenarios: with and without

the presence of Azteca. The first two columns present the outcomes for the entire sample of households. The next two columns restrict the sample to households who did not obtain offers from the formal sector in any period, and the last columns report outcomes for the sample of households with access to formal jobs.

Once Azteca's credit is available in municipalities, households accumulate more durable goods. Consumption of nondurable goods, however, remains mostly unchanged once Azteca operates its branches. In addition, the fraction of households saving declines, but only households with income below the 40th percentile save less. On average, the fraction of households saving declined by 6.6%. Households who did not obtain any formal-sector offer experience the largest changes from the entrance of Azteca.

Consumption Smoothing To analyze consumption smoothing of households over time, I adapt the index proposed in Mazzocco (2012). The consumption smoothing index is defined as follows:

$$I = \frac{Var(y^h) - Var(c^h)}{Var(y^h)},$$

where $Var(y^h)$ and $Var(c^h)$ correspond to the labor income and consumption variances of household h over time. This index (I) takes values from 0 to 1. See for example the extreme case in which households' consumption equals their labor income each period. In this case the numerator would equal zero, and hence, $I = 0$. If households smooth their consumption entirely, then each period households would consume the same amount, $Var(c^h)$ would equal zero and $I = 1$. Therefore, the higher the index, the better able are households smoothing their consumption.

Figure 2 plots the density of this index for households from municipalities selected by Azteca with and without an operating branch of Banco Azteca. Households' ability to smooth consumption increases when an Azteca branch operates in the municipality, as seen from the shift to the right of the distribution. This effect is larger for the set of households who are constrained to the informal sector (figure 3).

10 Policy Evaluation

The model can be used to understand what would happen if the interest rate that Banco Azteca charges were to be capped by the central authority. Capping interest rates of formal credit institutions has been suggested by several Mexican policy makers who are opposed to excessive interest rates

charged to households. This policy however, could have the unintended effect of making Azteca re-locate its branches and exit from municipalities where it currently operates. As the model includes Azteca's location choices, it is well suited to analyze this issue.

I simulate the model at different APRs charged by Azteca to examine changes in household credit requests, loan sizes and ultimately Banco Azteca selection of municipalities. In the model, Azteca locates in municipalities based on its expected profits, which depend on households' demand for Azteca's loans. As the number of clients and the amount borrowed by them changes with the APR, Azteca's selection of municipalities can also change.

Figure 4 presents the average size of loans conditional on obtaining Azteca's credit and the proportion of households obtaining Azteca's credit at different APRs. As the APR declines, the fraction of households requesting Azteca's credit increases. At an APR of 130%, 3.4% of households obtain credit from Azteca, while at an APR of 40%, this number increases to 5.8%. The average loan of households borrowing from Azteca at an APR of 130% is $\$462\ USD$. This average increases to $\$885$ USD when the APR charged is 40%.

At the current APR, Azteca locates in 0.52 of all municipalities. However, as the APR of Azteca decreases, the number of municipalities with Azteca's branches declines (Figure 5). At an APR of 40%, Azteca would only open in 25% of the simulated municipalities. Figure 6 provides information regarding the average population size and percapita income of municipalities where Azteca would locate at different APRs. As Azteca's APR decreases, the average population size of municipalities with Banco Azteca increases. This implies that at lower APRs, Azteca would exit from less populated municipalities and would locate in the more populated ones. The same pattern is observed when examining the percapita income of municipalities with Azteca's branches. At lower APRs, Azteca's branches would concentrate in wealthier municipalities. Altogether, these results suggest that if Banco Azteca were forced to charge lower rates and no other adjustment is done, households from poorer and smaller municipalities would lose their Azteca branches.

11 Conclusions

This paper examined the impact of expanding access to credit on the decisions and welfare of households. To do so, the paper focused on the opening of Banco Azteca, the first bank in Mexico that targeted households whose members belong to the informal sector. A comparison of household outcomes from municipalities where this bank opened with other municipalities suggests that house-

holds, especially those employed in the informal sector, experienced significant changes in their saving, credit and consumption patterns. In order to address the impact of Banco Azteca and the issue of endogenous location of its branches, I developed a model of household choices in which the bank endogenously selects municipalities for branch openings.

I used the model to quantify the impact of Banco Azteca. I find substantial effects on household saving and consumption decisions once access to credit is available. First, households increased their bank credit usage and decreased loans from other more expensive suppliers, such as pawn shops. Second, in municipalities with presence of Azteca branches, the fraction of households saving declined. These effects suggest that the use of savings as a buffer on income fluctuations declined once formal credit was available. Simulations of the model indicate that consumption smoothing improved once households had access to credit from Azteca. Consistent with the targeted population of Banco Azteca, informal households experienced most changes.

I then use the estimated model to evaluate the effect of capping the APR that Azteca currently charges on household demand for credit and Azteca's location choices. Several policy makers in Mexico have suggested imposing a ceiling on the interest rates of formal credit institutions in order to make loans more affordable to people. The model simulations indicate that if the APR that Azteca charges were capped to 40%, both the fraction of households obtaining Azteca loans and the average loan size of those borrowing would increase. Nevertheless, this increase in demand would not compensate for the reduction in APR, and half of the municipalities that currently have branches of this bank would lose them. The likelihood of losing a branch is higher for poorer and less populated municipalities.

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Table 1: Characteristics of municipalities by presence of Banco Azteca

Variable	All muns	muns with Azteca from 02 to 05	muns with Azteca from 02 before 05	muns with Azteca after 02 until 05	muns without Azteca's branches
Population size					
$p10$	$9,413$	$57,375$	$62,773$	$47,106$	$4,318$
$p25$	$19,475$	$78,512$	$62,773$	$50,168$	$10,644$
$p50$	$59,675$	$227,026$	$63,319$	$57,602$	$19,447$
$p75$	$226,642$	$516,255$	$63,864$	$366,068$	$41,402$
$p90$	$609,829$	$1,110,997$	$63,864$	$670,162$	$69,381$
Percapita Income					
$p10$	$18,789$	$31,642$	$48,436$	$25,375$	$15,100$
$p25$	$28,687$	$38,561$	$48,436$	$26,349$	$22,908$
$p50$	$37,136$	$50,912$	$48,876$	$31,308$	$30,434$
$p75$	$54,551$	$66,846$	$49,317$	$57,985$	$37,044$
$p90$	$71,967$	$76,379$	$49,317$	$80,676$	$50,423$
Other banks	0.71	0.98	1.00	1.00	0.43
# muns	136	63	2	4	67

Table reports population size and percapita income percentiles (10th,25th,50th,75th,90th) of the 136 municipalities of the sample, and the fraction of municipalities with presence of branches from other banks. Data from Mexican Economic Census, Human Development Index and CNBV.

Table 2: Households' Descriptive Statistics

	Azteca	No Azteca
Number of households		
2002	3,483	2,156
2005	3,470	2,146
Fraction of formal hhds		
2002	0.238	0.131
	(0.426)	(0.337)
2005	0.229	0.125
	(0.421)	(0.331)

Table reports means and standard deviations (in parenthesis) of households' characteristics from muns with and without an Azteca branch in 2005.

Table 3: Saving patterns of all households

	Azteca	No Azteca	DID
Probability hhd is aware it can obtain loans from bank			
2002	0.1513	0.1026	0.0887***
2005	0.3064	0.1740	[0.0312]
Probability hhd obtained loan from bank			
2002	0.0083	0.0042	0.0108**
2005	0.0242	0.0093	[0.0042]
Probability hhd obtained loan from pawnshop			
2002	0.0221	0.0088	-0.0087*
2005	0.0112	0.0065	[0.0050]
Probability hhd saved			
2002	0.3672	0.2500	-0.0464**
2005	0.2646	0.1943	[0.0208]
Average savings of hhds			
2002	9,588.4	5,774.6	447.3
2005	8,508.1	4,244.7	[1,294.2]
Avg savings of hhds below the 40th income pctile			
2002	4,978.7	3,431.4	-2,449.7*
2005	2,232.1	2,259.9	[1,486.1]
Avg savings of hhds below the 60th income pctile			
2002	5,417.2	4,910.6	418.8
2005	2,999.2	2,714.8	[1,335.0]

Columns 1 and 2 report means of households' characteristics from municipalities with and without Azteca in 2005. Column 3 reports the difference-in-difference (DID) estimates and the standard errors in parentheses. Standard errors are clustered at the municipality level.

Table 4: Saving patterns of informal households

	Azteca	No Azteca	DID
Probability hhd is aware it can obtain loans from bank	Azt	No Azt	DD
2002	0.1322	0.0966	0.1009***
2005	0.2761	0.1537	[0.0305]
Probability hhd obtained loan from bank			
2002	0.0064	0.0037	0.0139***
2005	0.0232	0.0075	[0.0045]
Probability hhd obtained loan from pawnshop			
2002	0.0218	0.0069	-0.0105*
2005	0.0105	0.0059	[0.0059]
Probability hhd saved			
2002	0.3337	0.2231	-0.0438*
2005	0.2290	0.1677	[0.0230]
Average savings of hhds			
2002	9,000.3	4,969.2	-926.1
2005	6,396.4	2,975.4	[1,452.5]
Avg savings of hhds below the 40th income pctile			
2002	4,855.5	3,164.7	-2,264.7*
2005	1,633.4	2,142.7	[1,239.7]
Avg savings of hhds below the 60th income pctile			
2002	5,142.7	4,173.7	257.3
2005	2,365.9	2,504.0	[1,526.7]

Columns 1 and 2 report means of informal households' characteristics from municipalities with and without Azteca in 2005. Column 3 reports the difference-in-difference (DID) estimates and the standard errors in parentheses. Standard errors are clustered at the municipality level.

Table 5: Saving patterns of formal households

	Azteca	No Azteca	DID
Probability hhd is aware it can obtain loans from bank			
2002	0.2121	0.1418	0.0147
2005	0.4056	0.3146	[0.0819]
Probability hhd obtained loan from bank			
2002	0.0145	0.0071	-0.0135
2005	0.0276	0.0224	[0.0203]
Probability hhd obtained loan from pawnshop			
2002	0.0229	0.0213	0.0163
2005	0.0138	0.0112	[0.0213]
Probability hhd saved			
2002	0.4746	0.4291	-0.0214
2005	0.3844	0.3806	[0.0685]
Average savings of hhds			
2002	11,474.2	11,126.7	2,490.5
2005	15,575.6	13,120.7	[7,218.5]
Avg savings of hhds below the 40th income pctile			
2002	5,552.4	6,182.7	2,636.1
2005	5,718.0	3,681.2	[3,760.6]
Avg savings of hhds below the 60th income pctile			
2002	6,551.7	11,308.0	5,609.1
2005	5,993.5	4,959.5	[5,486.2]

Columns 1 and 2 report means of formal households' characteristics from municipalities with and without Azteca in 2005. Column 3 reports the difference-in-difference (DID) estimates and the standard errors in parentheses. Standard errors are clustered at the municipality level.

Table 6: Consumption patterns of all households

	Azteca	No Azteca	DID
PANEL A			
Probability hhd owns electronic appliances			
2002	0.9730	0.9336	0.0223**
2005	0.9668	0.9057	[0.0104]
Avg value of electronic appliances			
2002	7,162.1	5,704.0	2,305.4***
2005	8,349.2	4,919.2	[633.9]
Probability hhd owns large appliances/furniture			
2002	0.9641	0.8876	0.0228*
2005	0.9442	0.8466	[0.0135]
Avg value of large appliances/furniture			
2002	9,715.4	8,031.4	2,342.1**
2005	10,779.0	7,190.7	[1,173.1]
Probability hhd owns other appliances			
2002	0.9540	0.8862	0.0224
2005	0.9271	0.8386	[0.0153]
Avg value of other appliances			
2002	2,003.9	1,358.2	463.7
2005	2,465.7	1,363.5	[566.6]
PANEL B			
Avg pce if death of a hhd member			
2002	21,456.2	23,523.3	9,324.3*
2005	20,069.9	11,371.7	[5,192.3]
Avg pce if serious illness of a hhd member			
2002	19,557.2	19,517.7	6,973.9*
2005	20,791.5	12,526.2	[3,973.4]
Avg pce if unemployment/failure of business			
2002	18,674.0	17,455.5	7,244.6**
2005	20,787.2	10,985.6	[3,080.9]

Columns 1 and 2 report means of households' characteristics from municipalities with and without Azteca in 2005. Column 3 reports the difference-in-difference (DID) estimates and the standard errors in parentheses. Standard errors are clustered at the municipality level.

Table 7: Consumption patterns of informal households

	Azteca	No Azteca	DID
PANEL A			
Probability hhd owns electronic appliances			
2002	0.9691	0.9257	0.0244*
2005	0.9625	0.8949	[0.0129]
Avg value of electronic appliances			
2002	7,083.9	5,458.7	1,456.1**
2005	7,207.3	4,156.4	[589.6]
Probability hhd owns large appliances/furniture			
2002	0.9578	0.8739	0.0207
2005	0.9345	0.8290	[0.0178]
Avg value of large appliances/furniture			
2002	9,495.6	7,543.9	2,756.6*
2005	9,830.4	5,820.9	[1,623.8]
Probability hhd owns other appliances			
2002	0.9465	0.8771	0.0282
2005	0.9146	0.8225	[0.0191]
Avg value of other appliances			
2002	2,049.5	1,298.5	351.0
2005	2,527.7	1,166.3	[503.0]
PANEL B			
Avg pce of hhds if death of a hhd member			
2002	22,120.5	24,962.5	9,034.2
2005	18,425.2	10,760.8	[5,529.7]
Avg pce of hhds if serious illness of a hhd member			
2002	17,860.4	20,307.0	9,339.0**
2005	19,631.0	12,133.1	[4,160.4]
Avg pce of hhds if unemployment/failure of business			
2002	17,766.4	16,543.9	8,463.0**
2005	20,469.0	9,700.7	[3,421.0]

Columns 1 and 2 report means of informal households' characteristics from municipalities with and without Azteca in 2005. Column 3 reports the difference-in-difference (DID) estimates and the standard errors in parentheses. Standard errors are clustered at the municipality level.

Table 8: Consumption patterns of formal households

	Azteca	No Azteca	DID
PANEL A			
Probability hhd owns electronic appliances			
2002	0.9855	0.9858	-0.0174
2005	0.9811	0.9813	[0.0114]
Avg value of electronic appliances			
2002	7,405.5	7,254.7	1,671.9
2005	11,965.9	9,739.8	[2,984.8]
Probability hhd owns large appliances/furniture			
2002	0.9843	0.9787	0.0073
2005	0.9760	0.9700	[0.0148]
Avg value of large appliances/furniture			
2002	10,396.2	11,057.1	-6,370.2
2005	13,709.2	15,063.1	[9,272.7]
Probability hhd owns other appliances			
2002	0.9783	0.9468	-0.0018
2005	0.9684	0.9513	[0.0263]
Avg value of other appliances			
2002	1,863.3	1,732.7	282.4
2005	2,278.7	2,514.1	[428.4]
PANEL B			
Avg pce of hhds if death of a hhd member			
2002	18,989.0	14,528.3	10,187.7
2005	33,227.4	15,299.4	[7,254.4]
Avg pce of hhds if serious illness of a hhd member			
2002	25,272.6	16,755.4	-3,936.1
2005	23,915.7	15,907.1	[9,632.4]
Avg pce of hhds if unemployment/failure of business			
2002	21,235.4	21,922.2	1,240.1
2005	21,685.9	19,722.5	[7,375.3]

Columns 1 and 2 report means of formal households' characteristics from municipalities with and without Azteca in 2005. Column 3 reports the difference-in-difference (DID) estimates and the standard errors in parentheses. Standard errors are clustered at the municipality level.

Table 9: DIDs of informal households using alternative treatment group

	Azteca in 05	Azteca by 06 or later
Probability hhd is aware it can obtain loans from bank		
2002	0.1009***	0.0767*
2005	[0.0305]	[0.0420]
Probability hhd obtained loan from bank		
2002	0.0139***	0.0096
2005	[0.0045]	[0.0078]
Average size of bank loans		
2002	485.7*	283.6
2005	[273.8]	[272.1]
Probability hhd obtained loan from pawnshop		
2002	-0.0105*	-0.0018
2005	[0.0059]	[0.0047]
Probability hhd saved		
2002	-0.0438*	-0.0129
2005	[0.0230]	[0.0487]
Average savings of hhds		
2002	-926.1	-3,051.5
2005	[1,452.5]	[3,698.3]
Avg savings of hhds below the 40th income pctile		
2002	-2,264.7*	-2,508.6
2005	[1,239.7]	[2,232.8]
Avg savings of hhds below the 60th income pctile		
2002	257.3	-1879.9
2005	[1,526.7]	[3,766.5]

Table reports DID estimates and their standard errors in parentheses. Standard errors are clustered at the municipality level.

Table 10: DIDs of informal households using alternative treatment group

	Azteca in 05	Azteca by 06 or later
Probability hhd owns electronic appliances		
2002	0.0244*	0.0017
2005	[0.0129]	[0.0225]
Avg value of electronic appliances		
2002	1,456.1**	-120.9
2005	[589.6]	[920.4]
Probability hhd owns large appliances/furniture		
2002	0.0207	0.0459
2005	[0.0178]	[0.0293]
Avg value of large appliances/furniture		
2002	2,756.6*	1,553.6
2005	[1,623.8]	[2,000.8]
Probability hhd owns other appliances		
2002	0.0282	-0.0301
2005	[0.0191]	[0.0326]
Avg value of other appliances		
2002	351.0	-902.40
2005	[503.0]	[584.1]
Avg pce of hhds if death of a hhd member		
2002	9,034.2	-6,970.10
2005	[5,529.7]	[12,020.3]
Avg pce of hhds if serious illness of a hhd member		
2002	9,339.0**	-12,700.1
2005	[4,160.4]	[7,801.8]
Avg pce of hhds if unemployment/failure of business		
2002	8,463.0**	5,707.1
2005	[3,421.0]	[3,608.6]

Table reports DID estimates and their standard errors in parentheses. Standard errors are clustered at the municipality level.

Table 11: Moments used in the model estimation

Fraction of households in the formal sector at 2005 that
1) belonged to the informal sector in 2004 whose head had less than high school
2) belonged to the informal sector in 2004 whose head had at least high school
3) belonged to the formal sector in 2004 whose head had less than high school
4) belonged to the formal sector in 2004 whose head had at least high school

Labor income from the formal sector
(sample of formal households at 2005)
5) OLS coefficient of labor income of 2004 on labor income of 2005
6) Difference between mean income of low- and high-educated hhds
7) Difference between mean income of hhds with head older/younger than 35
8) Difference between mean income of hhds with head older/younger than 50
9) Variance of the residuals from the OLS regression of current labor income

Labor income from the informal sector
(sample of informal households at 2005)
10) OLS coefficient of labor income of 2004 on labor income of 2005
11) Difference between mean income of low- and high-educated hhds
12) Difference between mean income of hhds with head older/younger than 35
13) Difference between mean income of hhds with head older/younger than 50
14) Variance of the residuals from the OLS regression of current labor income

Percapita expenditure and durable goods consumption patterns
15) 5th percentile of the households' percapita expenditure distribution
16) Fraction of households that own household and electronic appliances
17) Average ratio of percapita expenditure to total labor income in 2005
18) Average log ratio of percapita expenditure (pce) in 2005 to pce in 2002

Credit coverage of friends and relatives (F-R) in muns in 2005
19) % of hhds with F-R loans in muns below the mean fraction of F-R credit
20) % of hhds with F-R loans in muns above the mean fraction of F-R credit
21) % of hhds with F-R loans in low-income muns below mean fraction of F-R credit
22) % of hhds with F-R loans in low-income muns above mean fraction of F-R credit
23) % of hhds with F-R loans in high-income muns below mean fraction of F-R credit
24) % of hhds with F-R loans in high-income muns above mean fraction of F-R credit

Entry patterns of Banco Azteca at the municipality level
25) % of muns with an Azteca branch in 2005
26) % of muns with pop. size >10th & <30th pctiles with an Azteca branch in 2005
27) % of muns with pop. size >30th & <50th pctiles with an Azteca branch in 2005
28) % of muns with pop. size >50th & <70th pctiles with an Azteca branch in 2005
29) % of muns with Elektra in 2002 and Azteca branch from 2002 to 2005

Table 12: Estimated parameters

	param	ASE
Probability of job offer from the formal sector		
Low educated households, informal sector at t-1	0.070	0.0020
Low educated households, formal sector at t-1	0.550	0.0172
High educated households, informal sector at t-1	0.132	0.0014
High educated households, formal sector at t-1	0.772	0.0035
Labor income from the formal sector		
Persistence of one-year lagged labor income	0.492	0.0659
Returns to education	1.102	0.0255
Returns to age	0.036	0.0071
Returns to age squared	−0.0004	0.0002
St dev of residuals	2.037	0.2488
Labor income from the informal sector		
Persistence of lagged labor income	0.516	0.0190
Returns to education	1.022	0.0683
Returns to age	0.019	0.0047
Returns to age squared	−0.0002	0.0000
St dev of residuals	2.095	0.1183
Credit coverage from friends and relatives (F-R)		
% hhds with access to F-R credit in muns with low coverage	0.050	0.0172
% hhds with access to F-R credit in muns with high coverage	0.321	0.1545
Probability that mun has high coverage from F-R		
if mun is low income and had low coverage of F-R credit in t-1	0.114	0.0625
if mun is low income and had high coverage of F-R credit in t-1	0.879	0.2348
if mun is high income and had low coverage of F-R credit in t-1	0.186	0.0025
if mun is high income and had high coverage of F-R credit in t-1	0.936	0.0731
Utility parameters		
Intertemporal substitution of the nondurable good	2.145	0.5593
Preference from durable goods service flow	2.100	0.3420
Subsistence consumption level	0.365	0.0000
Azteca's operating cost parameters		
fixed cost to operate a branch	221.7	79.71
additional fixed cost in muns without Elektra stores	210.3	58.22
pop size shifter	0.00453	0.0006
pop size shifter for muns above pop size threshold	−0.0039	0.0003
pop size threshold	55000	23571

Columns 1 and 2 report the structural parameters and their asymptotic standard errors.

Table 13: Model Fit- Households' moments in 2005

	model	data
Fraction of households in the formal sector at 2005 who were:		
Informal at 2004 and low educated	0.0416	0.0437
Informal at 2004 and high educated	0.4906	0.4931
Formal at 2004 and low educated	0.1114	0.1100
Formal at 2004 and high educated	0.7020	0.7096
Labor income from the formal sector		
OLS coefficient of y_t^h on y_{t-1}^h	0.4097	0.4264
Returns on education	1.9516	1.9623
Returns on age (if age $\geq$ 35)	1.0374	1.0094
Returns on age (if age $\geq$ 50)	-0.1385	-0.1441
Variance of OLS residuals of labor income regression	1.8980	2.4480
Labor income from the informal sector		
OLS coefficient of y_t^h on y_{t-1}^h	0.4304	0.4301
Returns on education	1.1606	0.9027
Returns on age (if age $\geq$ 35)	0.1295	0.0167
Returns on age (if age $\geq$ 50)	-0.3838	-0.2463
Variance of OLS residuals of labor income regression	1.7277	2.1096
Durable and non-durable goods consumption patterns		
5th percentile of hhds' consumption	0.3651	0.3658
Fraction of hhds that own durable goods	0.9970	0.9567
Average ratio of c_{2005}^h to y_{2005}^h	0.8214	0.7708
Average log ratio of c_{2005}^h/y_{2005}^h	0.0949	0.1030
Credit coverage of friends and relatives (F-R) at the mun level		
% hhds with F-R loans in muns below mean F-R credit	0.0157	0.0141
% hhds with F-R loans in muns above mean F-R credit	0.0699	0.0812
% hhds with F-R loans in low-income muns $<$ mean F-R credit	0.0333	0.0384
% hhds with F-R loans in low-income muns $>$ mean F-R credit	0.0580	0.0740
% hhds with F-R loans in high-income muns $<$ mean F-R credit	0.0362	0.0376
% hhds with F-R loans in high-income muns $>$ mean F-R credit	0.0521	0.0541
Entry patterns of Banco Azteca at the mun level		
% muns with an Azteca branch in 2005	0.522	0.510
% muns with pop. size >10th & <30th pctiles with Azteca in 2005	0.086	0.114
% muns with pop. size >30th & <50th pctiles with Azteca in 2005	0.594	0.514
% muns with pop. size >50th & <70th pctiles with Azteca in 2005	1.000	0.923
% muns with Elektra in 2002 and Azteca from 2002 to 2005	0.867	0.883

Table 14: Municipalities characteristics by presence of Banco Azteca

Variable	from 02 to 05	from 02 before 05	after 02 until 05	after 02 before 05	no Azteca's branches
DATA					
Population size					
p10	57,375	62,773	47,106		4,318
p25	78,512	62,773	50,168		10,644
p50	227,026	63,319	57,602		19,447
p75	516,255	63,864	366,068		41,402
p90	1,110,997	63,864	670,162		69,381
Percapita Income					
p10	31,642	48,436	25,375		15,100
p25	38,561	48,436	26,349		22,908
p50	50,912	48,876	31,308		30,434
p75	66,846	49,317	57,985		37,044
p90	76,379	49,317	80,676		50,423
Other banks	0.98	1	1		0.43
Number of muns	63	2	4	0	67
MODEL					
Population size					
p10	61,974	53,229	47,934	49,145	2,723
p25	88,343	57,375	48,917	49,145	9,862
p50	227,026	62,773	93,476	49,145	15,261
p75	516,255	63,864	145,622	49,145	30,017
p90	1,110,997	68,738	491,436	49,145	46,053
Percapita Income					
p10	28,612	35,293	29,606	26,207	13,762
p25	36,705	39,447	29,885	26,207	20,134
p50	50,200	45,680	31,587	26,207	30,842
p75	66,846	48,436	33,916	26,207	41,212
p90	80,676	49,317	67,025	26,207	51,731
Other banks	1	1	0.83	1	0.36
Number of muns	65	5	6	1	59

Panels compare the presence of Azteca branches between model simulations and real data, by population size, percapita income of municipalities (10th,25th, 50th,75th, 90th percentiles) and presence of other bank branches.

Figure 1: Expected profits of Azteca in different municipalities

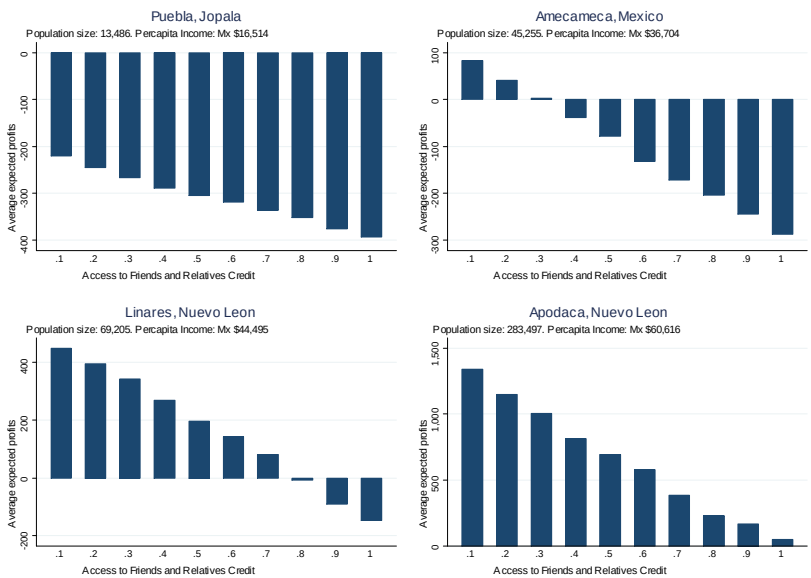

Table 15: DID on saving outcomes for real and simulated data

	DID data	DID model
Probability of borrowing from banks		
All households	0.0108**	0.0315***
	[0.0042]	[0.0014]
Informal households	0.0139***	0.0421***
	[0.0045]	[0.0014]
Formal households	-0.0135	-0.009**
	[0.0203]	[0.0041]
Probability of borrowing from pawn shops		
All households	-0.0087*	-0.021***
	[0.0050]	[0.0022]
Informal households	-0.0105*	-0.028***
	[0.0059]	[0.0024]
Formal households	0.0163	0.0042**
	[0.0213]	[0.0016]
Probability of saving		
All households	-0.0464**	-0.052***
	[0.0208]	[0.0094]
Informal households	-0.0438*	-0.057***
	[0.0230]	[0.0100]
Formal households	-0.0214	-0.016**
	[0.0685]	[0.0077]

Table 16: DID coefficients with different control groups (simulated data)

	Muns where Azteca decided not to enter	Muns where Azteca decided to enter
prob borrowing from pawn shops		
All households	−0.021	−0.019
Informal households	−0.028	−0.025
Formal households	0.0042	0.000
prob saving		
All households	−0.052	−0.007
Informal households	−0.057	−0.009
Formal households	−0.016	0.001

Figure 2: Density of the consumption smooting index

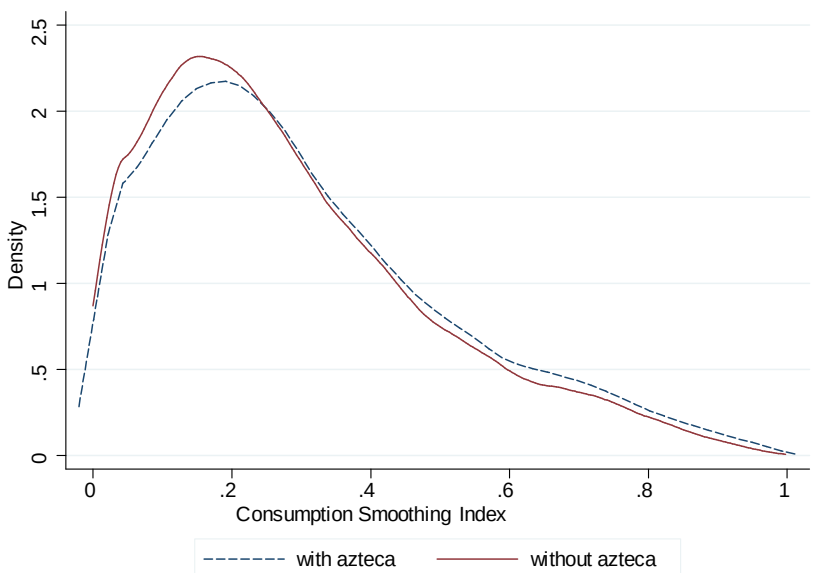

Figure 3: Density of the consumption smooting index by access to the formal sector

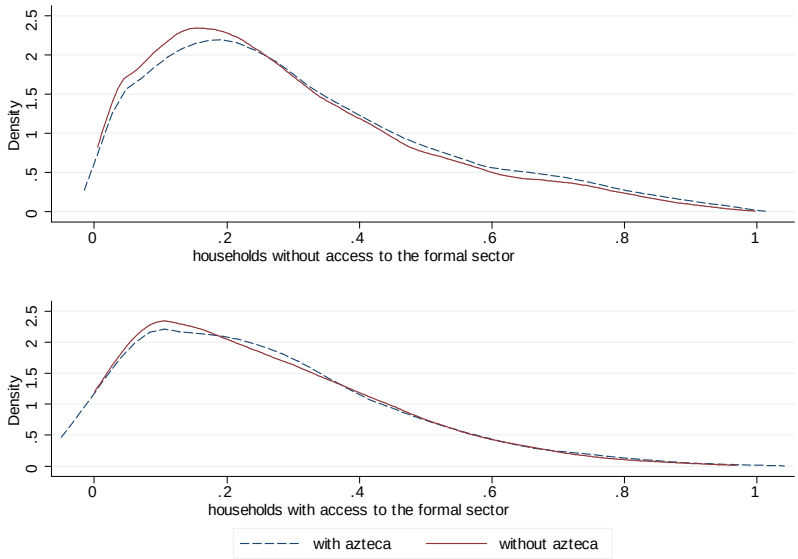

Table 17: Saving and consumption patterns of households by presence of Azteca

	All households		Hhds with no access to the formal sector		Hhds with access to the formal sector	
	No Azteca	Azteca	No Azteca	Azteca	No Azteca	Azteca
Average value of durable goods	27845.3	28907.2	22730.6	23899.0	30730.8	32014.8
Average consumption	24746.8	24849.6	23035.7	23173.2	25712.2	25795.4
Fraction of hhds saving	0.769	0.721	0.682	0.633	0.818	0.811
Average savings	8435.8	9767.8	3689.6	4522.9	11113.4	12726.8
Avg savings below 40th pctile	2042.5	2011.4	1275.8	1078.8	2882.3	2959.1
Avg savings below 60th pctile	3479.3	3886.7	2092.7	2439.3	4726.0	5236.2

Figure 4: Azteca loans by APR

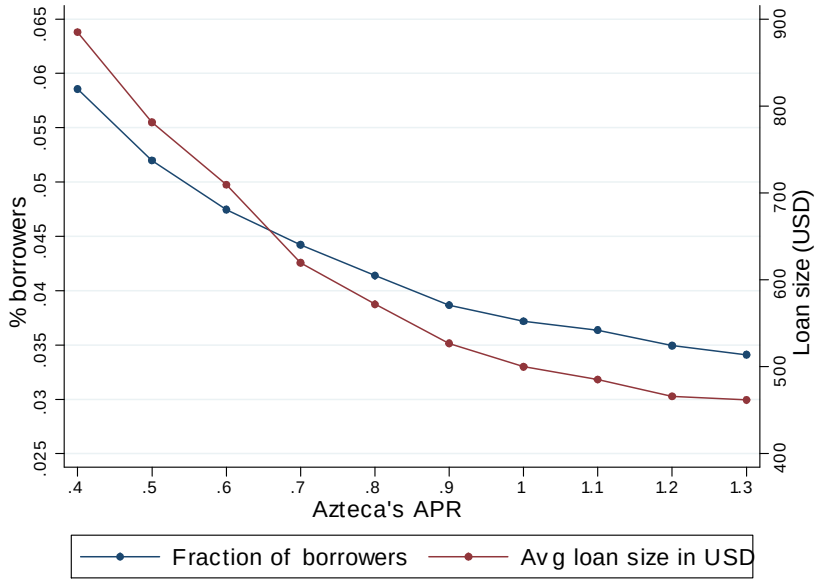

Figure 5: municipalities with Banco Azteca branches by APR

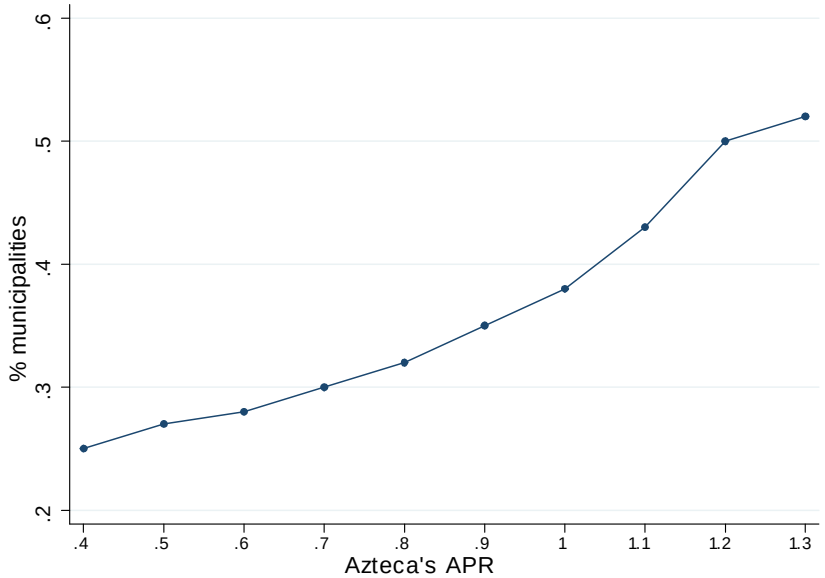

Figure 6: Size and income of Azteca municipalities by APR