Intrahousehold Conflict and Commitment Savings Strategies

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Abstract

Intrahousehold conflict stemming from disagreements about what and when to consume can lead people to use commitment savings strategies. Using household survey information (MxFLS) for a large and nationally representative sample of couples in Mexico, I test whether one or the other or both disagreements engender higher use. Anderson and Baland (2012) model predicts that a female in a couple will use the strategies at mid-levels of her bargaining power. For identification I create a measure of relative earnings as a distribution factor that quantifies bargaining power and exploit the Great Recession as a labor shock that affected female employment disproportionally. A female who is less or more patient than her partner likely disagrees with him about when to consume (Schaner, 2015). Using discount factors elicited by the household survey, I test whether patience relative to the partner leads to higher use. In an instrumented difference-in-differences, I find that both disagreements engender higher use. Use is higher for a female with bargaining power equal to her partner's. Relative to a female as patient as her partner, a female who is less or more patient is twice as likely to use the strategy.

Keywords: Intrahousehold conflict; Commitment savings strategies; Bargaining power; Discount factors; Instrumental variables by the control function approach

JEL Codes: D13, D14, J16

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1 Introduction

Members of a couple sometimes disagree on how to spent their income. A member might prefer to buy a good her partner does not care for. Or both might have the same preference on what to consume but not on when to consume. Its members having different preferences, the couple is in conflict. Members of the couple might then resort to strategic behavior. For example, she or he might use commitment savings strategies to protect her or his savings from the partner. By using commitment savings strategies, she or he nudges the couple towards her or his preferences.

I provide empirical evidence that intrahousehold conflict impels females, who in a couple typically have the lowest bargaining power, to use commitment strategies to protect their savings from their partners.[1] I test the empirical predictions of the Anderson and Baland (2002) model. Following the collective framework, and when a female disagrees with her partner on what to consume, the model predicts that she will seek commitment savings strategies. The model links her bargaining power—her weight in the decision-making of the couple—to their use. She will only use them if her bargaining power is neither low nor high. Using instrumented and non-instrumented first-differences specifications on a nationally representative sample of Mexican females living with their partner, I show that use of Rotating Savings and Credits Associations (Rosca), a commitment savings strategy endemic worldwide, reaches its maximum at mid-levels of female bargaining power.

Testing the empirical predictions of the Anderson and Baland (2002) model is difficult. Commitment strategies protect savings not only from a partner, they protect savings from others and from oneself. Evidence abounds suggesting that people with self-control problems use them to force themselves to save (Bryan et al., 2010; Karlan et al., 2014). And empirical evidence shows that females use a Rosca to cope with self-controls problems (Gugerty, 2007). I extend the Anderson and Baland (2002) model. The extention shows that at high levels of bargaining power, the need to protect savings from her partner confounds with the need to protect them from herself. Measuring bargaining power is far from simple. The literature uses distribution factors. Because they must be unrelated to prices and to the income of the couple while justifiably affecting bargaining power, they are hard to come by. And using any of the few proposed by the literature involves dealing with identification threats.

[1] Commitment saving strategies are arrangements that restrict how and when savings are used; people seek them to achieve their savings goals (Bryan et al., 2010). Often the strategies are costly. When members of the couple have the same preferences, a member needs not to incur the cost of using the strategy to cope with intrahousehold conflict.

I deal with identification threats in two steps. First, I use a measure of relative earnings per hour and also account for wages and employment in local labor markets. I take the share of couple income of the female, a traditional distribution factor, and transform it. I remove non-labor income and express labor income, whether paid as wages or not, in earnings per hour. The measure ranges from 0, the female has no bargaining power, to 1, she has all the bargaining power in how the couple decides what to consume. The estimating equation includes the measure, its square, and the income of the couple. The measure mitigates the identification threats using the share of couple income involves. What matters, however, for bargaining power is not the earnings rate but the potential earnings rate (Pollak, 2005). To account for the gap between actual and potential earnings, I add to the estimating equation measures of jobs and wages available in the municipality for females and for males.[2] Using a census of formal employment, I create plausibly exogenous measures of jobs and wages. To do so, for employment I use the Bartik (1991) method; for wages, an adaption of the method that Aizer (2010) and Bertrand et al. (2015) use.

Second, I exploit as instrument the disproportional effect the Great Recession had on female employment. The Great Recession was an external shock with implications for labor and for marriage markets.[3] In Mexico, I show, it affected the export-manufacturing sector more than other sectors and female employment more than it affected male employment.[4] From before the recession to after it, bargaining power for all females, on average, increased. But for females who worked on manufacturing while her partner did not, bargaining power plummeted. For other groups of females according to her or her partner's employment in the manufacturing sector, I find no decrease.

In the non-instrumented first-differences specification, I find that use of a Rosca according to relative earnings reaches its maximum at 0.64. At this point, 20 percent of females use a Rosca. Use is 6 percentage points (43 percent) higher than the mean of use in the sample. In the instrumented first-differences specification, the maximum point decreases to 0.51, to

[2] Majlesi (2016) finds that Mexican females participate in more decisions of the household when more jobs are available for females relative to the ones available for males.

[3] For example, Sobotka et al. (2011) find for that recessions in developed countries decrease fertility and dampen marriage markets.

[4] The instrument I use is years of education of the female times a dummy equal to one if she but not her partner worked on the manufacturing sector before the Great Recession. The survey lacks information to distinguish manufacturing employment between export and non-export oriented. Because export-manufacturing jobs in Mexico require at least 9 years of education, interacting years of education with the dummy variables allows to focus the instrument to export manufacturing.

mid-levels of bargaining power, and at that point use is 15 percent.

Intrahousehold conflict stems not only from disagreements about what to consume, it also stems from disagreements about when to consume. Schaner (2015) proposes a model in which conflict stems from difference in discount factors. She tests her model in a sample of couples, dividing them into well-matched (both members have similar discount factors) and poorly-matched (remaining couples). She finds that well-matched couples are less likely to engage in costly strategic behavior. In the sample of Mexican couples, females and males who are less or who are more patient than their partner use a Rosca more. Motivated by her findings and the descriptive evidence, I augment the estimating equation. I add three dummy variables: if the female is more patient than her partner, if she is less patient, and if her partner uses a Rosca. I find in the augmented equation that females who are less or who are more patient use a Rosca 5 to 7 percentage points more relative to females who are as patient as their partners. Relative to females whose partner do not use a Rosca, use for females whose partner use a Rosca is four times higher.

Results are robust to two relevant checks. First, besides being a commitment savings strategy, a Rosca is a credit strategy. Because a Rosca eases credit constraints, people might use it to buy goods faster (Besley et al., 1993). Results are robust to adding variables that capture access to formal and informal credit. Second, the instrument is plausibly valid. After including exogenous measures of jobs and wages, I assume it relates to use of a Rosca only through its relation with the measure of relative earnings. But the Great Recession not only affected labor markets, it might had also affected marriage markets. Then, it might had also affected bargaining power and in turn use of commitment savings strategies. Accounting in the estimating equation for measures of migration and education that relate with marriage markets has no effects on the results.

I make two contributions to the literature. First, I provide robust empirical evidence. The available empirical evidence is limited. Anderson and Baland (2002) test the prediction of their model using the share of couple income as distribution factor. But using the variable, they note, entails omitted variable bias and reverse causality threats. Further, because the literature focuses on self-control problems, testing for intrahousehold conflict often is inadequate. Mainly as a robustness check, most papers use a dummy variable for whether the female is married.[5] Testing in this way is inadequate. The Anderson and Baland (2002) model

[5]For example, Ashraf et al. (2006) focus on use of a commitment savings product stemming from self-control problems. As a robustness check they show in their estimating equation that the interaction between being

predicts a specific relation of bargaining power with use of commitment savings strategies. And married females use the strategies not only because they disagree with their partners on what to consume but also because they disagree on when to consume.

Second, I provide evidence that supports the collective framework. Anderson and Baland (2002) embed their model in the framework. On it, couples learn how to reach binding aggrements through repetition (Chiappori, 1988; Browning et al., 1994). Recently matched couples have yet to learn. Following Angelucci and Garlick (2015), who find that younger couples are less likely to behave as the collective framework predicts they will, I split the sample by the median of the years each couple has been together. For couples above the median, I find, precision of estimates increase. For couples below the median, estimates neither are significant nor suggest higher use at mid-levels of bargaining power.

The paper proceeds as follows. Section 2 describes models of intrahousehold conflict. It also overviews identification threats and what I do to tackle them. Section 3 describes data sources and details the sample. It also provides descriptive evidence of the effects of the Great Recession on wages and on employment. Section 4 details the identification strategy. Focusing on the instrumental variables strategy, it details the instrument and how to use it in a control function approach. Section 5 presents the results. The first sub-section presents non-parametric regressions. They show the unconditional relation between use of the commitment savings strategy and each of four distribution factors. It also provides descriptive evidence, for females and for males, of use of the strategy according to patience relative to the partner. The second sub-section presents the parametric results. Section 6 provides robustness checks. Section 7 concludes.

2 Models of Intrahousehold Conflict

2.1 Conflict Stemming from Disagreement on What to Consume

Anderson and Baland (2002) develop a model in which a female uses a simple commitment savings strategy to lock away her savings.[6, 7] In the model the couple each period derives utility from consumption and from buying a good. The good is indivisible, the couple needs

married and being female is not significant. Gugerty (2007) and Dagnelie and Lemay-Boucher (2012) focus instead on a Rosca. They find no empirical evidence supporting intrahousehold conflict.

[6] Use of Roscas motivated the model. But its insights apply to all commitment savings strategies because it distills Roscas into a way to lock away savings in all periods but the last.

[7] In the model the 'female' stands for the person in the couple with the lower bargaining power. I keep the convention throughout the paper.

to save to buy it (no credit is available). Intrahousehold conflict stems from a disagreement about the value of the good. The good enters the utility function of the female but not the one of her partner—for him the good has no value. Utility maximization follows the collective framework (Chiappori, 1988). In the framework, couples maximize the weighted sum of the utility functions of each member. Bounded between 0 and 1, a Pareto weight (μ) constitutes the weight. It measures how important the utility of the female is in the couple's utility function and typifies her bargaining power. Once she pools her income alongside her partner's, the couple will buy the good only if her bargaining power is high enough.

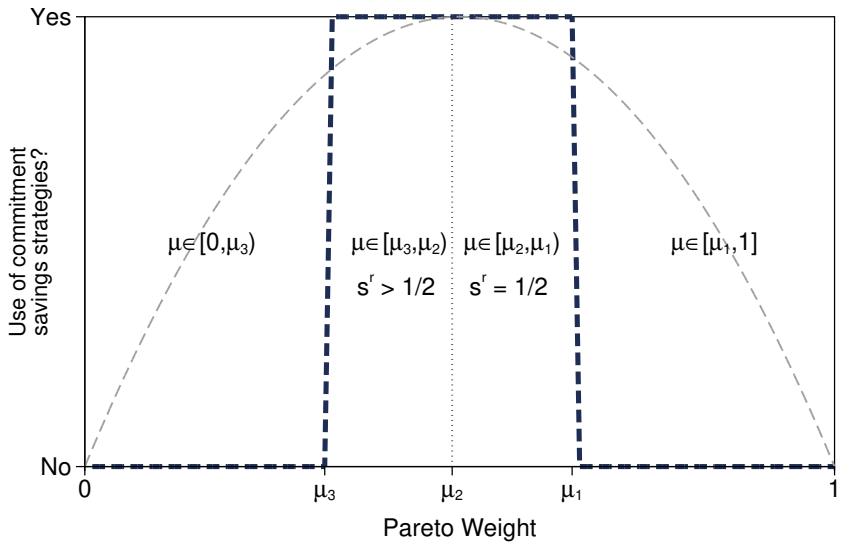
The model introduces a simple commitment savings strategy. It allows her to lock away her savings from the couple each period of the model but the last. In the last period, alongside her partner's income, she pools her income and what she saved using the strategy. If she uses the strategy, the couple buys the good. But aware of her bargaining power, and of her and her partner's utility functions, she only uses it when is worth it.

The strategy has a fixed cost. When her bargaining power is high enough, incurring the cost is not worth it because the couple regardless will buy the good. But when her bargaining power is lower, at levels at which the couple will otherwise not buy the good, incurring the cost might be worth it. By rendering illiquid her savings, the strategy allows her to save income that the couple otherwise would have consumed. In the last period of the model, her savings are unlocked. She pools them alongside her and her partner's income. If the pool of income is high enough, the couple will buy the good and consume what is left of the money. As her bargaining power decreases, for the couple the relative value of the good decreases and that of consumption, which she and her partner value, increases. The couple now will only buy the good if consumption increases further. To buy the good, she not only needs to save to cover its costs, she needs to save more to increase consumption further. She ponders whether saving more and incurring the fixed cost is worth doing. She decides by maximizing her utility subject to her Pareto weight and to her and her partner's utility functions. If her bargaining power is low enough, she consumes and forgoes the good.

Figure 1 summarizes at each value of the Pareto weight (μ) whether she uses a commitment savings strategy (thick, dashed line). The appendix details the version of the model with two periods (appendix A.2). It explains for four ranges of the Pareto weight how the assumptions and conditions in the model lead her to use, or not, the strategy. In the first range, $\mu \in [\mu_0, \mu_3)$, her bargaining power is so low that using the strategy is not worth it. In the second, $\mu \in [\mu_3, \mu_2)$, she finds the strategy useful but her savings (S^r) are higher than

the cost of the good (equal to 1). In the third, $\mu \in [\mu_2, \mu_1)$, she too finds the strategy useful but now her savings equal the cost of the good. In the fourth, $\mu \in [\mu_1, 1]$, her bargaining power is so high that she has no need for the strategy.

Figure 1: Female Bargaining Power and Use
of Commitment Savings Strategies
Anderson and Baland (2002) Model



Embedding a continuous function (thin, dashed line) for the binary decision, the figure makes clear the main insight of the Anderson and Baland (2002) model: the probability a female will use a commitment savings strategy to cope with intrahousehold conflict resembles an inverted U-shape. Given a measure of bargaining power, its relation with the probability of using the strategy is concave, reaching its maximum at mid-levels of bargaining power.

Distribution factors proxy bargaining power

The first step towards testing the prediction of the model is to measure bargaining power. The Pareto weight is unobserved, but it depends on prices, on household expenditure, and on distribution factors. Distribution factors affect neither preferences nor the budget constraint (Browning et al., 1994). A classical example is the share of couple income of the female. In the unitary framework, a couple maximizes a single utility function subject to a budget constraint, which only depends on prices and on total income. Who contributes more to total income has no role. But when the contribution of the female increases, and if the

increase nudges the couple towards her preferences, the unitary framework fails to predict the behavior of the couple. The collective framework serves as a better guide. In this framework, the share of couple income of the female is a distribution factor, a measure of bargaining power.

The literature offers other examples of distribution factors. One well-studied distribution factor is social programs received by only one household member. Beneficiaries of these program usually nudge the couple towards their preferences.[8] Another example is the sex-ratio in marriage markets. When the proportion of females to males increases, the bargaining power of females decreases. A final example is the relative size of family networks, proposed by Attanasio and Lechene (2014). When a member of the couple has more relatives than her partner (in particular if they are more educated or are wealthier), her bargaining power increases.

Distribution factors allow to test the prediction of the model. Barring identification threats, the relation of a continuous distribution factor and take-up of commitment savings strategies ought to be higher at mid-levels of the distribution factor. The relation should resemble an inverted U-shape. To test their model, Anderson and Baland (2002) follow this approach. They use the share of couple income of the female as a distribution factor. In a sample of couples in Kenya, they find that the coefficients of the share of couple income and its square predict participation in a Rosca. Take-up, the coefficients suggest, is higher at mid-levels of the share of couple income.

Self-control problems are a plausible confounder

A female might use commitment strategies to protect her savings not from her partner but from herself. People with self-control problems use commitment savings strategies to force themselves to save. They behave as if they were maximizing a quasi-hyperbolic utility function (Laibson, 1997). They are present-biased, and they might be sophisticated—aware that they are present-biased (O'Donoghue and Rabin, 1999). If they are sophisticated, they will seek commitment strategies to protect their savings from themselves.

Measures of bargaining power and self-control problems can be correlated, engendering a plausible identification threat. Because data sources lack measures for self-control problems, in the appendix I extend the Anderson and Baland (2002) model to allow for use stemming

[8]For example, pensions in South Africa (Duflo, 2003) or Conditional Cash transfers (CCT) in Mexico (Bobonis, 2009; Attanasio and Lechene, 2014; Angelucci and Garlick, 2015).

from self-control problems (section A.2.2).[9] When females also need to cope with self-control problems, the extension anticipates how use of commitment savings strategies will look across bargaining power levels. It shows that females with high bargaining power relative to females with low are more likely to use commitment savings strategies (see figure A.1 in the appendix). The relation between use and bargaining power remains concave, but now use reaches its maximum at higher levels of bargaining power.

Extending the model and getting the patterns in figure A.1 in the appendix require a critical assumption. I assume that the distribution factor based on relative earnings is positively correlated with individual income. When people match by assortative matching, the assumption might not hold. In assortative matching, a female at a percentile of the population of females ranked by positive attribute—income, education, family networks, etc.—matches with a male at the same percentile of his population (Bertrand et al., 2015). Consider the share of couple income as a distribution factor. Hypothetically, the female and male ranked at the 30th percentile have incomes of 100 and 200; those in the 50th percentile have incomes of 200 and 1800; and so on, the income gap increasing at each percentile. In this example, the share of couple income has a negative correlation with the income of the female. In this example, the assumption fails to hold in the data and patterns in figure A.1 in the appendix would be wrong. I test on the sample whether the assumption fits the data.

Rotating Saving and Credit Associations as a Commitment Savings Strategy

Rotating Saving and Credit Associations (Rosca) can be modeled as a simple commitment savings strategy, but they are more complex. Understanding how they work allows one to anticipate identification threats. A Rosca is a social activity. People in a Rosca meet to contribute fixed amounts of money, at fixed dates, to a common pot that one member will take home. For example, four people meet weekly, each contributing 10 USD to a common pot. After four meetings, everyone received 40 USD, and the process ends. People in a Rosca receive no payment or compensation for inflation—participating carries a cost. The money people contribute to the pot cannot be retrieved—participating locks savings away. A Rosca lacks formal contracts. Instead it uses social sanctions, screening, and peer pressure to force people to attend all meetings—participating helps people to save.

[9]The literature typically uses survey questions, or provides choices with monetary rewards, that elicit discount rates at two points in time, one in the near future, the other in the far future. The literature typically typifies self-control problems as people with high discount rates in the near future and lower in the far future (for an example see Ashraf et al. (2006)).

Tackling Identification Threats

Start with the share of couple income and with the identification threats germane to using a Rosca. Anderson and Baland (2002) stress two threats. First, by facilitating beneficial social connections, social activities might increase income. By using a Rosca, a female might increase her share of the income of the couple (a reverse causality threat.) Second, by having a higher preference for a good, a female both uses a Rosca and works more, increasing her income (an omitted variable bias threat.)

To abate the reverse causality and omitted variable bias threats, I adjust the variable share of couple income to create a new distribution factor. First, I remove non-labor income from the income of each member of the couple. Social connections from a Rosca might benefit non-labor income more than they benefit labor income. Removing non-labor income abates the reverse causality threat. Then, I express all labor income regardless of the occupation—regardless if the job pays wages or not—in earnings per hour worked. Expressing labor income in rate per hour abates the omitted variable bias threat. Finally, I create a measure of relative earnings rate. The measure is the earnings per hour of the female as proportion of her earnings rate plus her partner's. Expressed in this way, the new distribution factor, just as the share of couple income, ranges from 0 to 1.

Expressing the distribution factor as relative earnings rates abates the omitted variable bias, but it does not resolve it. A female in a couple might not be working. Her earnings rate is zero, but her bargaining power needs not to be. Even if she were working, what matters for bargaining power is not her current wage rate but her potential wage rate, her wage rate if she were single (Pollak, 2005). What matters is the jobs and wages available to her relative to the ones available to her partner. I add in the estimating equation wage rates and employment rates, for males and for females, at the municipality level. The methods use to calculate the rates partial out the local labor-supply characteristics; for example, education attainment. The rates are plausibly exogenous.

Now consider the way a Rosca assigns the order each participant receives the pot. If the order is random, a female might use a Rosca not to cope with intrahousehold conflict but to buy the good faster (Besley et al., 1993).[10] As a robustness check, the estimating equation accounts for credit availability. If the order is by bidding, a female might use

[10]Not all people in random Roscas want to receive the pot as soon a possible. Many hope to be the last (Dagnelie and Lemay-Boucher, 2012).

a Rosca if she experienced an income shock that only she knows about (Klonner, 2003). Because bidding Roscas in Mexico are uncommon, I assume most Roscas are random or fixed.[11]

To account for self-control problems, I rely on an instrumental variables strategy. As discussed, when bargaining power and self-control problems are correlated, females with high bargaining power likely will use commitment savings strategies more. Relative to a non-instrumented specification, its instrumented counterpart should show the higher use at mid- and not at mid-high levels of bargaining power.

2.2 Conflict Stemming from Disagreements on When to Consume

Intrahousehold conflict might come in many forms. Schaner (2015) proposes a model in which conflict leads to costly strategic behavior. Whereas intrahousehold conflict in the Anderson and Baland (2002) model stems from difference in preferences for an indivisible good, in her model it stems from difference in discount factors. In a field experiment, Schaner (2015) offered joint and individual savings accounts to a sample of couples. Individual accounts provided a lower interest rate. To estimate discount factors, she elicited time preferences using many choices, a random set of them paid. She split the sample into well-matched couples (the discount factors of its members differed from each other at most half a standard deviation) and poorly-matched couples (the remaining couples). Poorly-matched couples were twice as likely to use costly individual accounts. By not using the joint accounts, males or females in poorly-matched couples engaged in costly strategies. The couple left money on the table.[12]

In the collective framework outcomes are Pareto efficient (Chiappori, 1988; Browning et al., 1994).[13] In turn, decisions in the Anderson and Baland (2002) model are efficient. Whether it buys the good the couple exhausts its budget. When a female uses a commitment savings strategy, her partner is not worse-off. His utility is embedded into the utility of the

[11] See for example Vélez-I. (1982). Although dated, the ethnographic evidence he presents for Latino populations in the U.S. shows that use of bidding Roscas is uncommon.

[12] Not too much money, she notes. She estimates that the foregone interest rate is about 3 percent, equal to 24 Kenyan Shillings (Ksh) for those who save more than the median. The amount represents 2 percent of the 1177 Ksh weekly income of poorly-matched couples.

[13] Couples reach efficient outcomes by cooperating and by enforcing agreements. Social norms and tradition help to enforce agreements. In a dynamic setting, a repeated-game argument justifies enforcing them (Browning et al., 2014). In the repeated-game argument, couples learn through repetition how enforce agreements. The couples that fail to learn, might fail to survive. For example, Angelucci and Garlick (2015) find that older couples but not young behave as the collective framework predicts they will. For this reason, I split the sample of couples into young and old couples, and test whether females in older couples are more likely to use a commitment savings strategy at middle-levels of their bargaining power.

couple. And when her bargaining power is low, and she still uses the strategy, the couple both buys the good and increases consumption. Across all scenarios the solution is efficient. The couple leaves no money on the table.

Why is strategic behavior inefficient in one model and efficient in another? In the Schaner (2015) model, behavior is inefficient because the model focuses on consumption, explicitly ruling-out private goods either member of the couple might value. In the Anderson and Baland (2002) model, behavior is efficient because the model allows for the consumption of a private good that the female values. She ponders against the utility the good provides the costs of saving more and of using a commitment savings strategy. Foreseeing the solution of the utility maximization problem the couple faces, she decides whether to use the strategy. Her decision is optimal; no money is left on the table. The key feature of strategic behavior, whether or not efficient, of the models is conflict stemming from differences in preferences.

Intrahousehold conflict stemming from heterogeneity in discount factors is worth exploring. The information in the survey is not detailed enough to calculate discount factors. But it is detailed enough to calculate if a member of the couple either is more or is less patient than the partner.

3 Data and Sample

3.1 Individual-level Data

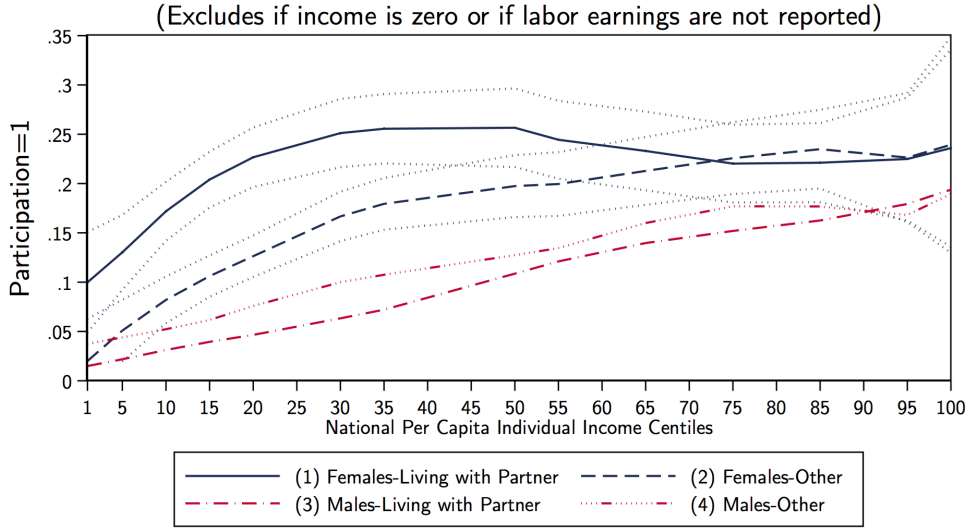
The individual-level data source is the Mexican Family Life Survey (MxFLS). The nationally representative survey comprises three waves. Across waves, it tracks people and households, even if they migrated. I only use the last two waves, 2005/06 and 2009/12, because they include questions that elicit time-discounting that the first wave lacks. The survey identifies whether a person has a partner and the corresponding individual identifier if she or he is part of the household. This information allows to match to each person's indicators those of her or his partner. Regarding Rosca the survey identifies whether the person participated in at least one over the last 12 month, but provides no other information.

Figure 2 presents local linear regressions of using a Rosca according to income. Income per person is the sum of labor and non-labor income after winsorizing.[14] The regressions

[14] I estimate two series of income per person: labor and non-labor income. Then I winsorize (top 1 percent) each income series per wave. The data has outliers. The maximum income of a person is 14,000 USD per month. After winsorizing, it drops to 2800 USD. When winsorizing, I make no distinction by gender. Besides

consider people 15 years of age or older, regardless of their marital status. The figure presents results for females or males and for living or not with their partner (four series). The use of a Rosca increases with income. Females use them more than males do, and females living with their partner more than other females do. Between national income centiles 5 to 50, females living with their partner use them significantly more than other females do. I attribute the difference to use stemming from intrahousehold conflict. Above centile 50, the difference disappears.

Figure 2: Use of a Rosca According to Income. MxFLS 2009/12
Females in Couple Use Them More
Local Linear Regressions



Local linear regressions: bandwidth of 10, epanechnikov kernel. Only the two regressions for females present the 95% confidence interval.

I create two distribution factors based on earnings for females living with their partners. Because bargaining power is a relative concept, I restrict the sample to couples in which both members reliably report their income. Namely, I drop from the sample couples in which at least one member works, declares being paid, and fails to report earnings.[15] The first distribution factor is the share of couple income (SC). I construct the second, the

income, I express all monetary amounts in constant December 2010 Mexican pesos and in constant USD. I link the sample to the national price index series using interview month and year, and I use the prevalent exchange rate in December 2010 (12.35 Mexican pesos per USD).

[15] For example, the sample of people 15 years of age or older in the wave 2009/12 is around 23,000. Of them, around 12,000 people report to work and to be paid, but 20 percent fail to report earnings. They do report how many hours they work. Those who report earnings work more hours than those who do not, but not by much (43.1 hours per week vs. 40.7 hours per week, t-stat=-5.9).

relative earnings rate (RER), by modifying the share of couple income. First, I exclude non-labor income. Second, I express labor income as income per hour worked per week. Both distribution factors range from zero, the female has no bargaining power, to one, by earning all the income of the couple she has all the bargaining power. The formulas below detail the two distribution factors:

$$SC = \frac{Labor_f + NonLabor_f}{(Labor_f + NonLabor_f) + (Labor_m + NonLabor_m)}$$

$$RER = \frac{\frac{Labor_f}{HrsWorked_f}}{(\frac{Labor_f}{HrsWorked_f}) + (\frac{Labor_m}{HrsWorked_m})}$$

If couples match by assortative matching, the share of couple income (or its derived measure) and income might not be positively correlated. As a simple exercise, using the in the MxFLS 2009/12, I match single females and males aged 15 to 30 years of age. First I estimate, for females and for males, the rank of each person in the corresponding distribution of income. Then I pair the poorest female with the poorest male, and proceed making pairs at each rank.[16] The mean share of couple income of females in matched couples is 0.23 (SD=0.19). The correlation between share of couple income and female income is r=0.41. Females with a relatively high share of couple income have a higher income than females with a low one have.[17] Albeit simple (pair-making assumes away that marriage markets are local), the exercise suggests that the assumption leading to patterns in figure A.1 in the appendix is consistent with the data.

Discount factors: Patience relative to the partner

The MxFLS survey uses a multiple-price-list module to elicit preferences of the interviewees about delayed payments. Similar to the module in the survey that elicits risk aversion using the Holt and Laury method, choices are unpaid; they are hypothetical. Interviewers offered respondents to choose between a payment of 1,000 pesos today (81 USD) and a higher payment a month from today. To entice the respondent away from choosing 1,000 pesos today, in a sequence of six choices the amount offered increased. People who got swayed first from 1,000 pesos today—those who chose the first alternative, the lowest amount offered—are the ones who I deem the most patient. People who pick the second, higher amount are less patient. And so on for each subsequent offer. People who prefer 1,000 pesos today against

[16] I drop the few females that I could not pair, the sample having more females than males.

[17] Females with share below 0.23 report a monthly income of 390 Mexican pesos (median=400) while females with share above 0.23 above report 4,200 pesos (median=3,000).

any other offer are those who I deem the most impatient.[18] I use the information to divide couples into well matched and poorly matched. In well-matched couples, both members picked the same choice. I then divide poorly matched couples into two groups: the female is less patient than her partner or she is more patient.

3.2 Municipality-level Data

Wages and employment

The data source for employment and wages is the census of formal employment by the Mexican Social Security Institute (IMSS). I divide employment and wages in export-intensive manufacturing, other manufacturing, and non-manufacturing. Similar to Atkin (2016), I divide manufacturing into export and non-export intensive. I define as export intensive manufacturing the industries that exported over 50 percent of their output every year between 1994 and 2000 (see table B.1 in the appendix.)

The Great Recession disproportionally affected female employment in export-intensive manufacturing. Panel a in figure 3 presents the number of jobs in manufacturing for females and for males. The recession affected export manufacturing employment more, and it affected female employment disproportionally. Female employment dropped over 20 percent while male employment dropped 16 percent (2007 Q4 to 2009 Q2). Whereas male employment in export-intensive manufacturing took seven quarters to recover (2009 Q2 to 2011 Q1), female employment took 12 quarters (2009 Q2 to 2012 Q2). Female employment dropped more and took longer to recover. On the other hand, the Great Recession affected male wages disproportionally. Panel b 3 presents constant wages across sectors for females and for males. The recession had no effect on wages for females. Their wages across all sectors (thick line) increased steadily. For males, it ended an increasing trend on wages in export-intensive manufacturing. Since the recession, wages for males stagnated.

I include in the estimating equation measures of jobs and wages for females and for males at the municipality level. For each gender, I express the number of jobs as a proportion of the corresponding working age population (15-64) at the time of the survey. To merge the measures to each person in the survey, I use municipality of residency and time of interview.[19] In total, I create six measures of jobs and six of wages (two genders, three

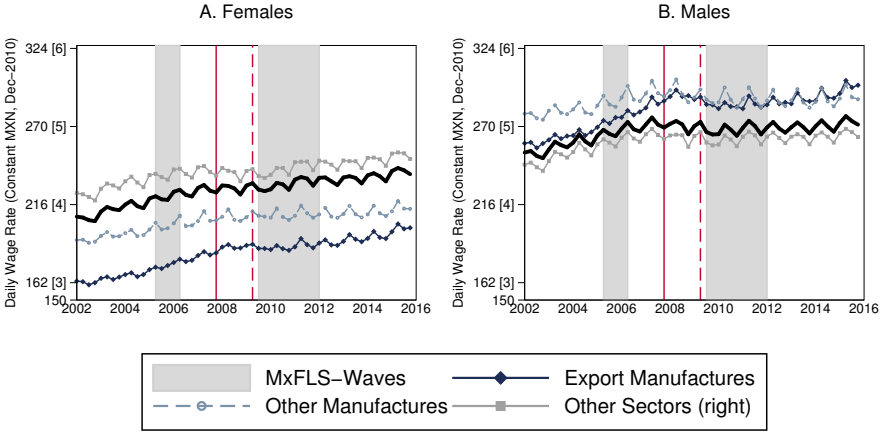
[18] The survey offered few choices (six). Not all people who could not be swayed have the same (im)patience. Had they been offered more choices, some could have been swayed.

[19] I merge the monthly measures corresponding to March, June, September, and December to their respective

Figure 3: Formal Employment and Wages by Gender
The Great Recession Affected Female Employment and
Male Wages in Export-Manufacturing

A. Employment

B. Wages



The red vertical lines denote the start and end of the Great Recession. The solid line marks the fourth quarter of 2007 and the dashed line the second quarter of 2009. For wages, in the y-axis number in brackets denote the number of minimum daily wages

sectors—export-intensive manufacturing, other manufacturing, and non-manufacturing).

The measures of jobs and wages exclude their plausibly endogenous labor supply component. Jobs and wages could respond to changes in local labor supply—for example, changes at the municipality in female education or in possibility, or willingness, to work. Changes in labor

quarter.

supply plausibly can affect both the use of commitment savings strategies and income. For employment, I create growth rates using the Bartik (1991) method:

$$\widehat{growth}^{gs}_{mt} = \sum_{j \in s} \gamma^{gs}_{j,2005} \times \frac{l^{g}_{-m,j,yq} - l^{g}_{-m,j,2005q}}{l^{g}_{-m,j,2005q}}$$

where $\widehat{growth}^{gs}_{mt}$ is the predicted employment growth rate for municipality m at time t for each gender g and for each sector s. $\gamma^{gs}_{j,2005}$ is the proportion of employment of each industry j of total employment in 2005, the year I use as reference point.[20] $l^{g}_{-m,j,2005q}$ is the total employment in the country at industry j, at quarter q in 2005, when municipality m is excluded. $l^{g}_{-m,j,yq}$ is the corresponding employment for each quarter and for each year from 2006 to 2012, the last year the MxFLS 2009/12 covers. In this way the growth rates both exclude the municipality (local labor market) and fix the industrial composition of employment at a point in time before the Great Recession. To create the employment levels I merge to the survey, I multiple the growth rates by the employment level in 2005.

For wages, I follow the adjustment of the Bartik (1991) method used by Aizer (2010) and Bertrand et al. (2015):

$$\widehat{w}^{gs}_{mt} = \sum_{j \in s} \gamma^{gs}_{j,2005} \times w^{g}_{-m,j,yq}$$

where $\widehat{w}^{gs}_{mt}$ is the predicted municipality wage rate. The wage $w^{g}_{-m,j,yq}$ is the national wage rate per gender in industry j in sector s at year-quarter yq when municipality m is excluded.

Other information

The data source for presence of banks at the municipality is the Municipalities Savings and Intermediation dataset (MSI). The datasets comprises indicators based on administrative records that banks and other financial institutions report to the banking and securities regulator (CNBV).[21] Indicators of education, population, and poverty (marginality index) come from official population census datasets. I merge indicators from the census 2005 to the MxFLS 2005/06 and from the census 2010 to the MxFLS 2009/12.

[20] The census of formal employment captures information for 276 industries j. I pooled the four quarters of 2005. The proportion for males or for females per sector adds to 1.

[21] The indicators in the dataset end in 2011. I use the last information, usually the first quarter of 2011, as the municipality level indicator for people interviewed after that point in time. Four percent of the interviews in the MxFLS 2009/12 concluded in 2011 and only one percent in 2012.

3.3 Sample and Descriptive Statistics

Table 1 details the sample for analysis. I make four sample restrictions to a balanced sample of females living with their partners. First, I focus on non-migrant couples: in the 2009/12 wave the female has to live with the same partner and in the same municipality. Second, in both waves, both the female and her partner must be between 15 and 64 years of age. Relevant for working-aged people, the distribution factors I use are relative measures of earnings. Third, as described before, I drop from the sample couples in which at least one member works but fails to report earnings. Four, the female has to live in a municipality in which export-manufacturing jobs were available in 2005. The last restriction aims at increasing the power of the instrument the identification strategy uses. As a robustness check, I assess the effect of these restrictions on the results. The final sample comprises 1,032 females.

Table 1: Sample for Analysis
Females 15+ Years of Age Who Are Living with Their Partners

	2005/06	%	2009/12	Pooled	%
Sample in the surveys	5,041	100%	5,768		
Only in wave 2005/06	1,693	34%			
Only in wave 2009/12			2,420		
Present in both waves	3,348	66%	3,348	6,696	100%
Sample restrictions					
(1) Same municipality and partner	3,211		3,211	6,422	96%
(2) Both are 15-64 in both waves	2,630		2,630	5,260	79%
(3) Both report income if working	1,329		1,329	2,658	40%
(4) Municipality has export manufacturing jobs	1,032		1,032	2,064	31%

Table B.2 in the appendix provides descriptive statistics for the sample. Around 14 percent of the females in the sample used a Rosca. The bargaining power of females is low. Their share of couple income is 0.12, and their relative earnings rate is 0.14. In this sample the bargaining power of males is six to seven times the one of females. The table also includes descriptive statistics for income per person and for the employment and wage measures at the municipality. Of the four sample restrictions, the third decreases the sample the most. Enforcing that both members must report earnings reduces the sample from 2630 to 1329 females (50 percent).

4 Identification Strategy

4.1 Estimating Equation

I use the linear probability model:

$$y_{imt} = \beta_1 z_{imt} + \beta_2 z_{imt}^2 + \beta_3 cinc_{imt} + \gamma_w \hat{w}_{mt}^{gs} + \gamma_l \hat{l}_{mt}^{gs} + \lambda_i + \lambda_t + \delta(w_{09/12}) + \varepsilon_{imt} \qquad (1)$$

where y_{imt} is a dummy variable that equals one if the female i at municipality m at time t used a Rosca. I express time in quarters, from the second quarter of 2005 (first interviews in the wave 2005/06) to the second quarter of 2012 (last interviews in the wave 2009/12). The variables of interest, z and z^2, equal the distribution factor and its square. Additional regressors are the income of the couple ($cinc$), and the measures of wages ($\hat{w}_{mt}^{gs}$) and jobs ($\hat{l}_{mt}^{gs}$) per gender and per sector. The remaining variables are time (λ_t) and individual (λ_i) fixed effects, and dummy variable ($w_{09/12}$) equal to 1 for the quarters corresponding to the MxFLS 2009/12. I cluster standard errors at the municipality level.

To assess whether females use commitment savings strategies at mid-levels of bargaining power, I test two hypotheses:

$$H_o : \hat{\beta}_1 = 0 \quad H_a : \hat{\beta}_1 > 0 \qquad\qquad H_o : \hat{\beta}_2 = 0 \quad H_a : \hat{\beta}_2 < 0$$

Rejecting both hypotheses denotes concavity but not necessarily higher user at mid-levels of bargaining power. The concave function might not achieve its maximum at mid-levels of bargaining power. As additional condition, I estimate the point at which use of commitment savings strategies (y) reaches its maximum ($\hat{z}_{max} = \hat{\beta}_1 + 2\hat{\beta}_2$). Besides reporting the point estimate and its confidence interval, I test the hypothesis:

$$H_o : \hat{z}_{max} = 1 \quad H_a : \hat{z}_{max} < 1$$

Finally, I use predicted probabilities to trace the shape that the parameters $\hat{\beta}_1$ and $\hat{\beta}_2$ suggest.

4.2 Instrumental Variables by the Control Function Approach

The instrument is years of education of the female in 2005 times a dummy equal to one if she but not her partner worked in the manufacturing sector in 2005. The Great Recession disproportionally affected female employment in the export intensive manufacturing sector. But the information on employment in the survey is not detailed enough to identify this

sector. Most jobs in export intensive manufacturing require secondary education (nine years of education in Mexico). For this reason, using years of education as part of the instrument helps to capture variation in earnings caused by the Great Recession. Table 2 presents descriptive statistics for the two distribution factors according to whether the female or her partner worked in the manufacturing sector. Rows denote four types of couples according to which member worked in the manufacturing sector. Columns denote information for 2005/06 and for 2009/12. For the first category (the female worked in the sector but not her partner), the table presents information for two sub-categories: the female had 8 or fewer or she had 9 or more years of education.

Table 2: Sample According to Manufacturing Employment
The Bargaining Power of Females Decreased Substantially
if Females But Not Males Worked on The Manufacturing Sector

Working on Manufacturing in 2005 (N=1032)				Share of couple income (0-100)			Relative Earnings Rate (0-100)		
				2005/06	2009/12	Δ	2005/06	2009/12	Δ
	Male	Female	(%)	Mean (SD)	Mean (SD)	(p-value)	Mean (SD)	Mean (SD)	(p-value)
(IV)	No	Yes	(2%)	44.0 (29.9)	26.6 (33.0)	-17.4 (0.12)	55.8 (32.6)	26.9 (34.7)	-29.0** (0.02)
By female education:									
	≤ 8 years (46%)			39.8 (32.6)	32.5 (39.8)	-7.4 (0.42)	43.1 (35.7)	34.2 (44.2)	-8.9 (0.54)
	≥ 9 years (54%)			47.7 (28.7)	21.9 (27.7)	-25.8 (0.13)	67.2 (26.6)	21.0 (25.9)	-46.1*** (0.00)
(2)	Yes	Yes	(1%)	31.7 (17.6)	33.2 (47.1)	1.5 (0.94)	43.7 (34.8)	36.7 (48.0)	-7.0 (0.82)
(3)	Yes	No	(39%)	7.1 (16.7)	11.9 (22.9)	4.9*** (0.00)	8.5 (21.3)	15.0 (28.1)	6.5*** (0.00)
(4)	No	No	(61%)	11.5 (23.7)	14.9 (26.6)	3.3** (0.01)	12.6 (26.4)	17.5 (30.7)	4.9*** (0.00)
			All	10.5 (21.9)	14.1 (25.6)	3.6*** (0.00)	11.9 (25.6)	16.8 (30.0)	4.9*** (0.00)

Standard errors clustered at the municipality level. *** p<0.01, ** p<0.05, * p<0.10.

For all the sample, female bargaining power as measured by the share of couple income and the relative earnings rate increased. Patterns between the distribution factors are the same, but they are subdued for the share of couple income. Describing the table, I focus on the relative earnings rate. For all females, the relative earnings rate increased from 0.12 in 2005/06 to 0.17 in 2009/12. For females across the four categories of couples, it increased for the two categories in which the female did not work in the manufacturing sector; it remained the same when both female and male worked in the sector; and it decreased when she but not her partner did. When she but not her partner worked in the sector, her bargaining power plummeted from 0.56 to 0.27. The decrease is more pronounced for females with nine or more years of education (the females who were more likely employed in export-intensive manufacturing sector). For them, it plummeted from 0.67 to 0.21.

With one instrument, however informative, and two endogenous variables (z and z^2), a traditional instrumental variables strategy is unfeasible. I then use the control function approach. The approach consists of adding to the estimating equation the residuals of a linear projection of the variable z onto the instrument and the remaining controls. Retrieving consistent estimates requires two assumptions. First, omitted variables—use of commitment savings strategies stemming from self-control problems, the unobserved female preference for indivisible goods, and the effect of social connections from a Rosca on income—must be summarized into a single positive linear relation between them and variable z. Second, the functional form in the reduced form must be correct.

To describe the approach, I use the notation and description of the control function approach by Imbens and Wooldridge.[22] Start by renaming the distribution factor z to y_2 and the outcome y to y_1. All remaining controls on equation 1 become Z_{other}. The structural and reduced form equations are:

$$\begin{aligned} y_{1imt} &= \beta_1 y_{2imt} + \beta_2 y_{2imt}^2 + Z_{other}\theta_1 + \varepsilon_{1imt} \\ y_{2imt} &= \pi_2 z_{imt} + v_{2imt} \end{aligned} \tag{2}$$

Consistent estimates of β_1 and β_2 require ε_{1imt} and v_{2imt} to be uncorrelated after controlling for Z_{other}, which includes the fixed effects. But we assume that omitted variables explain both y_{1imt} and y_{2imt}. A linear projection of ε_{1imt} onto v_{2imt} would be $\varepsilon_{1imt} = \rho_1 v_{2imt} + \xi_{1imt}$. Substituting the linear projection into the structural equation leads to:

$$y_{1imt} = \beta_1 y_{2imt} + \beta_2 y_{2imt}^2 + Z_{other}\theta_1 + \rho_1 v_{2imt} + \xi_{1imt}$$

To obtain consistent estimates of β_1 and β_2 exchange v_{2imt} for $\hat{v}_{2imt}$, the residuals from an ordinary least squares of the reduced form.

5 Results

5.1 Non-parametric

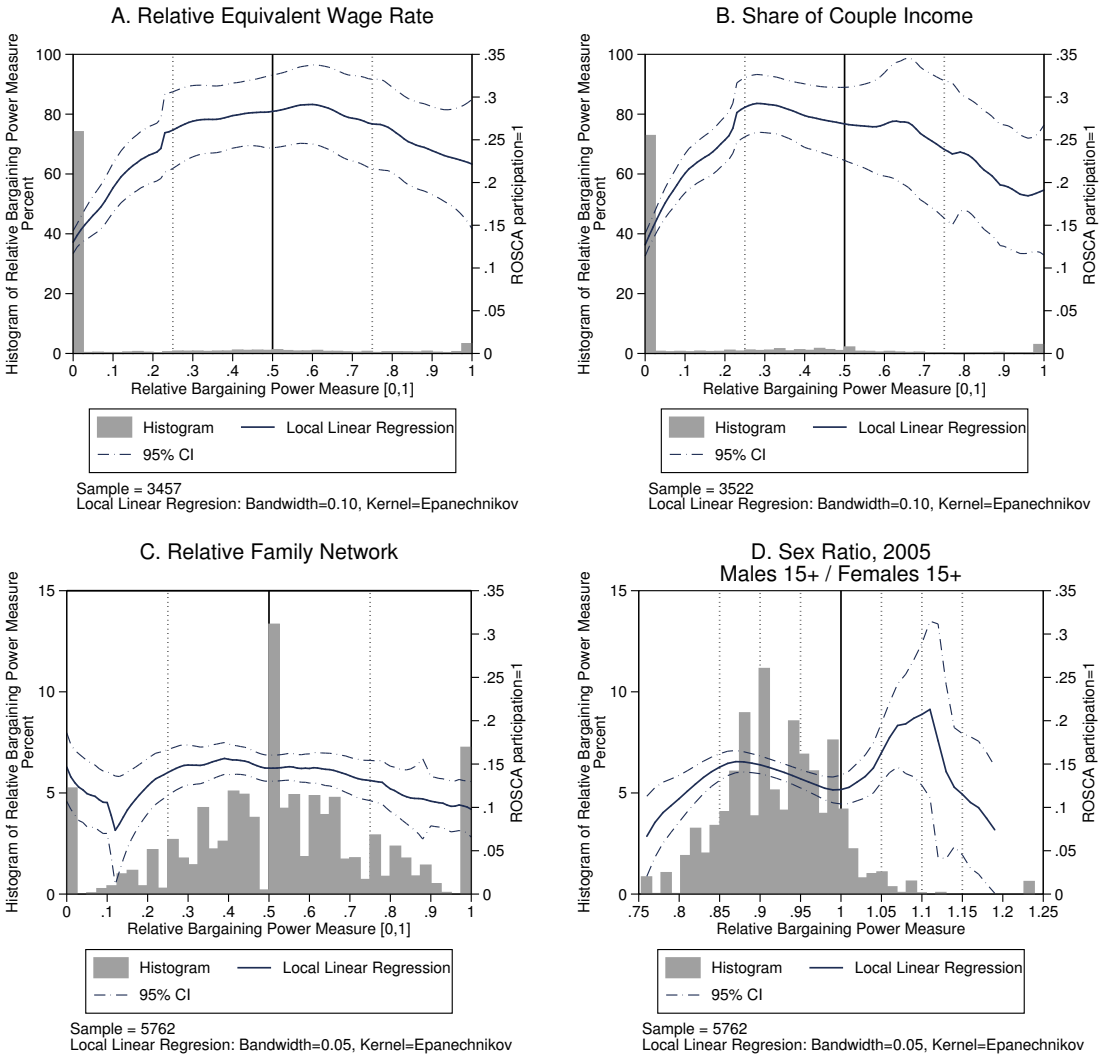
Conflict stemming from disagreement about what to consume

Figure 4 presents results of local linear regressions of the relation of four distribution factors with use of a Rosca. The sample comprises all females 15 years of age and older who

[22] http://www.nber.org/WNE/lect_6_controlfuncs.pdf

lived with their partner in 2009/12 (first row, column 4, in table 1). The four distribution factors are: the relative earnings rate, the share of couple income, the relative family network size, and the sex ratio. Across distribution factors, patterns are similar. Use of a Rosca is at its highest at mid-levels of bargaining power.

Figure 4: Non-parametric Relation of Distribution Factors with Use of a Rosca
Local Linear Regressions, MxFLS 2009/12
Use is Higher at Mid-levels of Bargaining Power



Relative family network is the number of non-resident parents and siblings of the female as proportion of the sum of non-resident parents and siblings of her and of her partner. For the relative earnings rate and the share of couple income, the sample excludes females if either she or her partner reported working but not reported the earnings.

The histograms imposed on each panel of figure 4 reveal a threat for identification: a large

proportion of the females in the sample report not being employed. In the differenced equation, identification comes from within variation. If many of the females who were not employed in 2009/12 alsowho were not employed in 2005/06, the precision of estimates drastically decreases.

Conflict stemming from disagreement about when to consume

Females or males who are more or who are less patient than the partner use a Rosca more. I construct six categories of patience: from most impatient (1: Prefers 1000 pesos today to any other choice offered) to most patient (6: prefers 1000 pesos in a month to 1000 pesos today). Then, for the sample of couples (first row, column 4, in table 1), I calculate for females and males category of patience minus category of patience of the partner.[23] Negative values signal people less patient than their partners. Positive values signal the opposite. A value of zero signals well-matched couples, its members being in the same category. Figure 5 presents use of a Rosca for females (panel a) and for males (panel b) according to patience relative to the partner. Males and females in well-matched couples use commitment savings strategies less. People in poorly-matched couples use them more, especially if they are more patient than the partner.

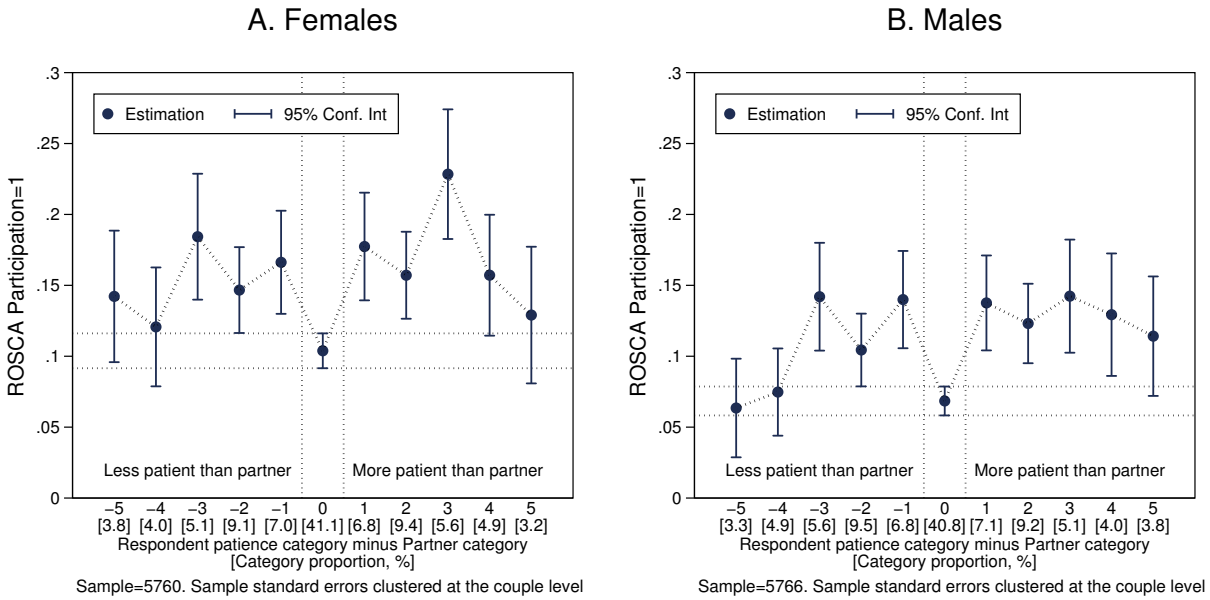
5.2 Parametric: whether disagreements on what to consume engender higher use

Table 3 presents results for the relative earnings rate. Each column presents pooled-ols (POLS), first-differences (FD), or instrumented first-differences (FD-IV) estimates. The first rows in the table present coefficients and standard errors for the distribution factor and its square, for the income of the couple, and for the predicted residuals used in the control function approach. Rows below them present information about the instrumental variables strategy: diagnostic tests and the coefficient and standard error for the excluded instrument (reduced form in equation 2). Last in the table are p-values, estimates, and confidence intervals for the hypothesis tests that assess concavity and higher use at mid-levels of bargaining power.

Results suggest that use of a Rosca is at its highest at mid-levels of bargaining power. Across estimation methods, hypothesis tests suggest a concave relation between relative earnings rate and use of a Rosca. Estimates of the point at which the use of a Rosca reaches its maximum (z_{max}) hover at mid-levels of bargaining power. Tests reject that z_{max} equals 1

[23] The variable ranges from -5 (a most impatient person has a most patient person as partner) to +5 (a most patient person has a most impatient person as partner).

Figure 5: Use of a Rosca According to
Patience Relative to Partner, MxFLS 2009/12



Standard errors are clustered at the couple level. Unweighted results. The x-axis presents categories of patience relative to the partner (category of patience minus the one of the partner). The survey allows to construct six categories of patience for each person: (1) Prefers 1000 pesos today to any other choice offered, (2) prefers 3000 pesos in a month to 1000 pesos today, (3) prefers 2000 pesos in a month to 1000 pesos today, (4) prefers 1500 pesos in a month to 1000 pesos today, (5) prefers 1200 pesos in a month to 1000 pesos today, and (6) prefers 1000 pesos in a month to 1000 pesos today. The number in brackets in the x-axis is the percent of respondents per category.

against the alternative that is below 1. Column 1 presents results for POLS. Use of a Rosca reaches its maximum when bargaining power is 0.71. After differencing (column 2), the point estimate decreases to 0.68 but is statistically similar. Column 3 presents FD-IV results when the instrument is a dummy equal to one if she but not her partner worked on manufacturing in 2005. The instrument has high predictive power to explain Δz (F.Stat=10.9), but results of the control function approach are imprecise. The point estimate for z_{max} is 0.55 but its confidence interval overlaps the whole range (0-1) of the variable z. In column 4, the instrument is the dummy interacted with years of education. Albeit more informative (F.Stat-14.4), the instrument leads to similar, imprecise results.

Table B.3 in the appendix presents results for the share of couple income. Results are similar, and conclusions are the same. As statistics in table 2 suggest, the instrument is less informative for the share of couple income. Results from the control function approach are

even less precise.

5.3 Parametric: whether one or the other or both disagreements engender higher use.

Table 4 presents results of adding to the estimating equation patience relative to partner. Adding the variables allows me to test formally whether one or the other or both disagreements engender higher use. I add three variables to the estimating equation. The first two are patience relative to partner. One denotes the female is less patient than her partner and the other that she is more patient. The reference category is female and male being well matched.[24] The third variable equals 1 if the partner uses a Rosca. Figure 5 shows that males in couple, albeit in lower numbers, also use a Rosca. I include the variable to assess the effect of his use on her use. Columns 1 to 3 present POLS, first-differences, and instrumented first-differences results. The instrument is years of education times a dummy equal to one if she but not her partner worked in the manufacturing sector. Regressions in the first three columns add to equation 1 the two dummy variables for patience relative to partner. Regressions in columns 4 to 6 further add the dummy variable of use by her partner. Results in column 6 constitute the final, main results.

Both disagreements engender higher use. Adding the variables restates and clarifies the results regarding disagreements on what to consume. Relative to table 3, standard errors decrease and point estimates accord with expected patterns more. In the non-instrumented first-differences specification (column 5), use of a Rosca according to relative earnings reaches its maximum at 0.64. At this point, 20 percent of females use a Rosca. Use is 6 percentage points (43 percent) higher than the mean of the sample. In the instrumented first-differences specification, the maximum point decreases to 0.51. At that point, use is 15 percent. Disagreements on when to consume also engender higher use. Across estimation methods and specifications, females who are less or who are more patient use a Rosca more. Relative to a female well matched with her partner, use increases between 5 to 7 percentage points (36 to 50 percent over the mean of the sample). Although point estimates for less patience are lower, I cannot reject that effects of being more or being less patience are the same. The variable with the highest correlation with use by a female is—by far—use by her partner. When her partner uses a Rosca, her use increases 19 percentage points.

Figure 6 depicts predicted probabilities of specifications in table 4. Panel a focuses on

[24] Both gave the same response in the hypothetical game that elicited time-discounting.

Table 3: Linear Probability Model of Use of a Rosca
Distribution factor (z): Relative Earnings Rate

	POLS	FD	FD-IV	FD-IV
	(1)	(2)	(3)	(4)
z	0.325***	0.446***	0.364	0.377*
	(0.122)	(0.154)	(0.230)	(0.216)
z^2	-0.228	-0.330*	-0.330*	-0.330*
	(0.143)	(0.168)	(0.169)	(0.169)
Couple income	0.0438**	-0.0436	-0.0381	-0.0390
	(0.0173)	(0.0369)	(0.0389)	(0.0388)
Predicted residuals			0.0848	0.0714
			(0.221)	(0.177)
Bartik Wage and Employment	Yes	Yes	Yes	Yes
First Stage. Dep. var: z				
Excluded instrument				
(a) Worked in Manufactures (2005)			-0.394***	
Couple: Fem=1 Male=0 × wave=2009/12			(0.119)	
(b) Excluded instrument interacted				-0.0487***
with female years educ. in 2005				(0.0128)
Underidentification test				
Kleibergen-Paap statistic			4.82	3.94
p-value			0.028**	0.047**
F Statistic of excluded instrument			10.92	14.40
Observations	2,056	1,029	1,029	1,029
Clusters	90	90	90	90
$H_o: \hat{\beta}_1 = 0 \quad H_a: \hat{\beta}_1 > 0$	0.005***	0.002***	0.059*	0.042**
$H_o: \hat{\beta}_2 = 0 \quad H_a: \hat{\beta}_2 < 0$	0.058*	0.027**	0.027**	0.027**
$\hat{z}_{max}: \hat{\beta}_1 + 2\hat{\beta}_2 = 0$				
$\hat{z}_{max}$	0.71	0.68	0.55	0.57
[95% CI]	[0.31 1.12]	[0.39 0.97]	[-0.13 1.23]	[0.02 1.13]
$H_o: \hat{z}_{max} = 1 \quad H_a: \hat{z}_{max} < 1$	0.081*	0.015**	0.099*	0.065*
Participation at $\hat{z}_{max}$				
$\hat{y}$	0.24	0.21	0.16	0.17
[95% CI]	[0.18 0.29]	[0.12 0.30]	[-0.05 0.38]	[-0.02 0.36]

Heteroskedasticity robust errors clustered at the municipality level in brackets. *** p<0.01, ** p<0.05, * p<0.10. Regressions use neither survey nor municipality weights.

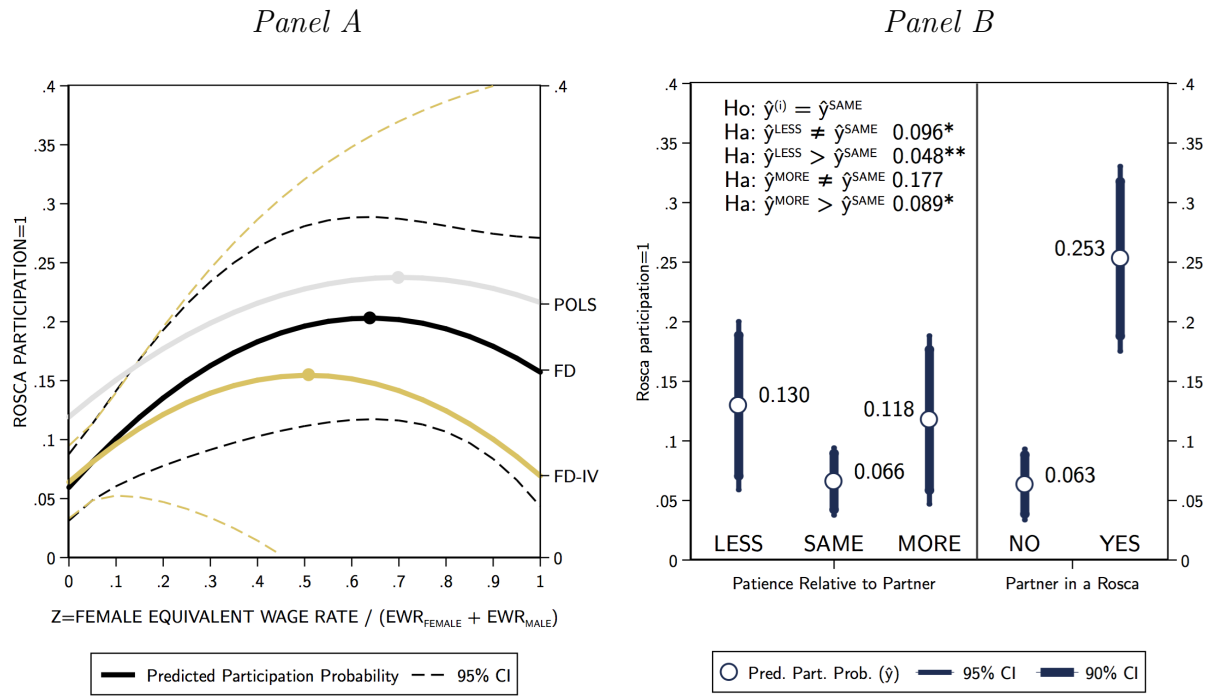
All equations include time-fixed effects (quarterly from 2005 to 2012) and a dummy for whether the sample is from the wave 2009/12. Bartik wages and employment are twelve indicators at the municipality level: two sets (wages and employment), two categories (female and male), and three sectors (export-intensive manufacturing, other manufacturing, and non-manufacturing)

The sample consists of females in which both members of the couple, and in both waves, were: living in the same municipality and with the same partner; being at working-age (15-65 years of age); reporting income if they work; and living in a municipality that had export-manufacturing jobs in 2005.

The hypothesis test for $\hat{z}_{max}$ uses the non-linear combination of estimators $\hat{\beta}_1$ and $\hat{\beta}_2$ in which a concave function of the form $y = \hat{\beta}_1 z + \hat{\beta}_1 z^2$ reaches its maximum. The estimate $\hat{y}$ is the predicted probability of participation at $\hat{z}_{max}$. Confidence intervals use standard errors estimated using the delta method.

use stemming from disagreements on what to consume. It traces use of a Rosca across levels of the relative earnings rate for POLS (column 4), FD (column 5) and FD-IV (column 6). Patterns for POLS and FD resemble the dotted line in figure A.1 in the appendix. Use at higher levels of bargaining power confounds the use induced by self-control problems with the use induced by disagreements on what to consume. Patterns for FD-IV resemble the solid line, suggesting that instrumenting partials-out self-control problems. Because confidence intervals are wide, instrumented results merely are suggestive. Panel b focuses on use stemming from disagreements on when to consume. It depicts use according to patience and to use of a Rosca by the partner (column 6). A female who is less or who is more patient than her partner is statistically more likely to use a Rosca than a female as patient as her partner. Use drastically increases when the partner uses a Rosca. When he does, use by the female increases fourfold.

Figure 6: Linear Probability Model of Use of a Rosca
Distribution factor (z): Relative Earnings Rate
Predicted Probabilities of Use of a Rosca



Predicted probabilities correspond to results on column 6 in table 4.

Table 4: Linear Probability Model of Use of a Rosca
Distribution factor (z): Relative Earnings Rate
Allowing Conflict Stemming from Disagreement on When to Consume

	POLS	FD	FD-IV	POLS	FD	FD-IV
	(1)	(2)	(3)	(4)	(5)	(6)
z	0.325***	0.458***	0.360	0.337***	0.449***	0.357*
	(0.120)	(0.156)	(0.218)	(0.115)	(0.153)	(0.211)
z^2	-0.230	-0.349**	-0.349**	-0.240*	-0.352**	-0.352**
	(0.143)	(0.174)	(0.174)	(0.136)	(0.169)	(0.169)
Less patient=1	0.0371**	0.0747***	0.0752***	0.0298*	0.0634**	0.0637**
	(0.0164)	(0.0265)	(0.0267)	(0.0161)	(0.0260)	(0.0261)
More patient=1	0.0428**	0.0515**	0.0550**	0.0362*	0.0484*	0.0517*
	(0.0185)	(0.0251)	(0.0275)	(0.0189)	(0.0261)	(0.0282)
Partner in Rosca=1				0.265***	0.186***	0.189***
				(0.0364)	(0.0405)	(0.0415)
Couple income	0.0426**	-0.0484	-0.0417	0.0328*	-0.0578	-0.0518
	(0.0172)	(0.0365)	(0.0381)	(0.0168)	(0.0348)	(0.0360)
Predicted residuals			0.101			0.0949
			(0.179)			(0.174)
Bartik Wage and Employment	Yes	Yes	Yes	Yes	Yes	Yes
First Stage. Dep. var: z						
Excluded instrument interacted			-0.0475***			-0.0474***
with female years educ. in 2005			(0.0128)			(0.0129)
Underidentification test						
Kleibergen-Paap statistic			3.94			3.95
p-value			0.047**			0.047**
F Statistic of excluded instrument			13.76			13.54
Observations	2,056	1,029	1,029	2,056	1,029	1,029
Clusters	90	90	90	90	90	90
$H_o: \hat{\beta}_1 = 0 \quad H_a: \hat{\beta}_1 > 0$	0.004***	0.002***	0.051*	0.002***	0.002***	0.047**
$H_o: \hat{\beta}_2 = 0 \quad H_a: \hat{\beta}_2 < 0$	0.055*	0.024**	0.024**	0.041**	0.020**	0.020**
$\hat{z}_{max}: \hat{\beta}_1 + 2\hat{\beta}_2 = 0$						
$\hat{z}_{max}$	0.71	0.66	0.52	0.70	0.64	0.51
[95% CI]	[0.31 1.10]	[0.39 0.92]	[0.01 1.02]	[0.34 1.06]	[0.40 0.88]	[0.01 1.00]
$H_o: \hat{z}_{max} = 1 \quad H_a: \hat{z}_{max} < 1$	0.072*	0.006***	0.031**	0.051*	0.002***	0.026**
Participation at $\hat{z}_{max}$						
$\hat{y}$	0.23	0.21	0.16	0.24	0.2	0.15
[95% CI]	[0.18 0.29]	[0.12 0.29]	[-0.02 0.33]	[0.18 0.29]	[0.12 0.29]	[-0.01 0.32]

Heteroskedasticity robust errors clustered at the municipality level in brackets. *** p<0.01, ** p<0.05, * p<0.10. Regressions use neither survey nor municipality weights.

All equations include time-fixed effects (quarterly from 2005 to 2012) and a dummy for whether the sample is from the wave 2009/12. Bartik wages and employment are twelve indicators at the municipality level: two sets (wages and employment), two categories (female and male), and three sectors (export-intensive manufacturing, other manufacturing, and non-manufacturing)

The sample consists of females in which both members of the couple, and in both waves, were: living in the same municipality and with the same partner; being at working-age (15-65 years of age); reporting income if they work; and living in a municipality that had export-manufacturing jobs in 2005.

The hypothesis test for $\hat{z}_{max}$ uses the non-linear combination of estimators $\hat{\beta}_1$ and $\hat{\beta}_2$ in which a concave function of the form $y = \hat{\beta}_1 z + \hat{\beta}_1 z^2$ reaches its maximum. The estimate $\hat{y}$ is the predicted probability of participation at $\hat{z}_{max}$. Confidence intervals use standard errors estimated using the delta method.

6 Robustness Checks

6.1 Other Rationales for Commitment Savings Strategies

Results are robust to including measures of credit availability and of the need to protect savings from others. Females who are credit constrained will use a Rosca to buy an indivisible good faster (Besley et al., 1993). And they might also use it to protect their savings not from the partner but from others. To proxy formal credit availability, I use the number of bank branches per person per kilometer squared at the municipality. To proxy the need to protect savings from others (and informal credit availability), I add two variables. One is the number of non-resident parents and adult siblings of the female and the other is the number corresponding to her partner. On one hand, Angelucci et al. (2018) finds that large family networks could ease credit constraints. On the other hand, large family networks might increase the need to protect savings from others.

Table 5 presents the results. Columns 1 to 3 equal columns 4 to 6 in table 4. Columns 4 to 6 presents results when the estimating equation adds the measures of credit availability and of the need to protect savings from others. The table adds information for a new hypothesis test. Using seemingly unrelated regressions (SUR), I assess the effect of adding the variables on $\hat{\beta}_1$ and $\hat{\beta}_2$. Column 4 presents POLS results. Formal credit availability has a negative relation with use of a Rosca whereas having more adult family members has a positive relation. The variables, however, have low within variation.[25] After differencing, estimates for the variables are no longer statistically different from zero (columns 5 and 6). Based on results from SUR regressions, hypothesis tests cannot reject that estimates for $\hat{\beta}_1$ and $\hat{\beta}_2$ are the same when the equation includes the additional variables. Results are robust to allowing for alternative uses of commitment savings strategies.

6.2 Collective Model: Younger vs. Older Couples

Older but not younger couples behave as the collective framework predicts they will. Table 6 presents the evidence. Column 1 equals column 5 in table 4. The table considers first-differences results only. First I split the sample by the median of the age of the male, the criterion Angelucci and Garlick (2015) use. Results on column 2 are for the sample below the median and on column 3 are for the sample above it. Then I use information from the marital module in the survey to calculate the number of years the couple already had been

[25] Using within variation only, the coefficient of variation (CV) for use of a Rosca is 160. For the size of her family network is 24, and for the size of his family network is 25. For the number of bank branches per person per km^2 the CV is 36.

together in 2005. I split the sample by the median of years in couple and present the results on columns 4 and 5. Using SUR, the table provides hypothesis tests that compare $\hat{\beta}_1$ and $\hat{\beta}_2$ between: columns 2 and 3, columns 4 and 5; and column 1 against each column from 2 to 5.

In younger couples, disagreements on what to consume do not engender higher use. Estimates $\hat{\beta}_1$ and $\hat{\beta}_2$ in columns 2 and 4 are no longer statistically different from zero. But in older couples, they do. In columns 3 and 5 the precision of estimates and the predicted use of a Rosca at mid-levels of bargaining power increase. The tests reject equality of $\hat{\beta}_1$ and $\hat{\beta}_2$ between below- and above-median samples. I find no difference in the results using the age of the partner or the number of years in couple. The results suggest that older but not younger couples behave as the collective framework predicts they will.

6.3 Other Robustness Checks

The Great Recession is an external shock. Local female bargaining power and local labor conditions were not its cause. The estimating equation includes measures of jobs and wages that are exogenous to local labor supply. After including the measures, the instrument, I assume, relates to use of a Rosca only through the relative earnings rate. The recession, however, might have local effects beyond labor markets. For example, once the recession dampened job opportunities, young males or females might have moved elsewhere or studied more, altering local marriage markets. The recession might have altered female bargaining power beyond its effects on relative earnings.

Table 7 presents results of allowing for other potential effects of the Great Recession. Rows in the table provide variations of the estimating equation. The first row corresponds to the benchmark equation (column 2, table 3), and the second to its instrumented version (column 4, table 3). The next pair of rows correspond to the preferred equation, the one that adds patience relative to the partner (columns 5 and 6 in table 4). For the next pair I use the preferred equation but construct relative earnings rates without winsorizing individual income. Below, all pairs add variables at the municipality level for: poverty (marginality index), outstanding amounts of credit and savings at banks, male and female population, and male and female mean years of education.[26] Columns provide coefficients and standard errors for β_1 and β_2 (columns 1 to 4) in the estimating equation and for π_2 in the reduced form (columns 5 to 7). Columns 8 to 10 provide the point z at which use of a Rosca y reaches its maximum as well as evidence of whether the maximum is below 1.

[26] I also consider changes in poverty and in the amount of savings and credit available. They might had affected use of a Rosca (e.g. the recession lowered the ability to save or to access credit.)

The instrument could be valid. Accounting in the estimating equation for other potential effects of the Great recession has minor effects on estimates for β_1 and β_2 in the estimating equation and for the estimate of π_2 in the reduced form. Finally, winsorizing or not individual income has no effect on point estimates.

Removing variables has a larger but still low effect. Table 8 summarizes the effect of removing wages, employment, and the income of the couple. The table has the same structure as the one before. It reveals that removing both wages and employment, or removing the income of the couple, changes estimates for β_1, β_2 but they still suggest both concavity and that females use a Rosca at mid levels of bargaining power. Results substantially are the same.

Sample restrictions have a low effect too. Using the MxFLS 2009/12, OLS, and predicted probabilities, figure 7 shows use of a Rosca according to the relative earnings rate. Panel a considers all municipalities while panel b considers only municipalities that have employment in export-manufacturing. Each panel traces four lines. The first uses a sample without restrictions. The second restricts the sample to females present in both waves. The third further restricts the sample to consider females living at the same municipality and with the same partner. The fourth further restricts the sample to females and partners between 15 and 64 years of age. Across and within panels, curves resemble the dashed line on panel b in figure A.1 in the appendix. Note, however, that the sample restriction with the largest effect on sample size is enforcing that both members of the couple report earnings when they work. The figure adds two panels. Both present predicted probabilities using FD-IV. Panel c summarizes the results of adding variables (table 7). Panel d summarizes the ones corresponding to removing variables (table 8). Across and within panels, curves resemble the solid line on panel a in figure A.1. The instrumental variables strategy by the control function approach likely partials-out use stemming from self-control problems.

Table 5: Robustness to Alternative Uses of Commitment Savings Strategies
Linear Probability Model of Use of a Rosca
z=Relative Earnings Rate

	POLS	FD	FD-IV	POLS	FD	FD-IV
	(1)	(2)	(3)	(4)	(5)	(6)
z	0.337***	0.449***	0.357*	0.337***	0.450***	0.377*
	(0.115)	(0.153)	(0.211)	(0.113)	(0.155)	(0.211)
z^2	-0.240*	-0.352**	-0.352**	-0.240*	-0.353**	-0.353**
	(0.136)	(0.169)	(0.169)	(0.134)	(0.171)	(0.171)
Less patient=1	0.0298*	0.0634**	0.0637**	0.0247	0.0630**	0.0632**
	(0.0161)	(0.0260)	(0.0261)	(0.0162)	(0.0262)	(0.0262)
More patient=1	0.0362*	0.0484*	0.0517*	0.0322*	0.0480*	0.0506*
	(0.0189)	(0.0261)	(0.0282)	(0.0191)	(0.0262)	(0.0281)
Partner in Roscas=1	0.265***	0.186***	0.189***	0.259***	0.185***	0.188***
	(0.0364)	(0.0405)	(0.0415)	(0.0369)	(0.0404)	(0.0414)
Couple income	0.0328*	-0.0578	-0.0518	0.0323*	-0.0584*	-0.0536
	(0.0168)	(0.0348)	(0.0360)	(0.0169)	(0.0344)	(0.0353)
Number of parents and adult siblings				0.00497*	0.00558	0.00560
				(0.00262)	(0.00488)	(0.00489)
Partner's parents and adult siblings				0.00208	-0.00530	-0.00536
				(0.00260)	(0.00473)	(0.00474)
Branches per person per km^2				-0.0337***	-0.0554	-0.0555
				(0.0117)	(0.0504)	(0.0504)
Predicted residuals			0.0949			0.0750
			(0.174)			(0.174)
Bartik type wage and employment	Yes	Yes	Yes	Yes	Yes	Yes
First Stage. Dep. var: z						
Excluded instrument interacted			-0.0474***			-0.0476***
with female years educ. in 2005			(0.0129)			(0.0129)
Underidentification test						
Kleibergen-Paap rk			3.95			3.95
p-value			0.047**			0.047**
F Statistic (rk)			13.54			13.64
Observations	2,056	1,029	1,029	2,056	1,029	1,029
Clusters	90	90	90	90	90	90
$H_o: \beta_1 = 0 \quad H_a: \beta_1 > 0$	0.002***	0.002***	0.047**	0.002***	0.002***	0.039**
$H_o: \beta_2 = 0 \quad H_a: \beta_2 < 0$	0.041**	0.020**	0.020**	0.038**	0.021**	0.021**
$H_o: \beta_1^{(i)} = \beta_1^{(i+3)} \quad H_a: \neq$				1.000	0.940	0.283
$H_o: \beta_2^{(i)} = \beta_2^{(i+3)} \quad H_a: \neq$				1.000	0.905	0.904

Heteroskedasticity robust errors clustered at the municipality level in brackets. *** p<0.01, ** p<0.05, * p<0.10. Regressions use neither survey nor municipality weights.

All equations include time-fixed effects (quarterly from 2005 to 2012) and a dummy for whether the sample is from the wave 2009/12. Bartik wages and employment are twelve indicators at the municipality level: two sets (wages and employment), two categories (female and male), and three sectors (export-intensive manufacturing, other manufacturing, and non-manufacturing)

The sample consists of females in which both members of the couple, and in both waves, were: living in the same municipality and with the same partner; being at working-age (15-65 years of age); reporting income if they work; and living in a municipality that had export-manufacturing jobs in 2005.

The hypothesis test for $\hat{z}_{max}$ uses the non-linear combination of estimators $\hat{\beta}_1$ and $\hat{\beta}_2$ in which a concave function of the form $y = \hat{\beta}_1 z + \hat{\beta}_1 z^2$ reaches its maximum. The estimate $\hat{y}$ is the predicted probability of participation at $\hat{z}_{max}$. Confidence intervals use standard errors estimated using the delta method.

Hypothesis tests that compare estimates for β_1 and β_2 rely on seemingly unrelated regressions (SUR).

Table 6: Younger vs. Older Couples
Linear Probability Model of Use of a Rosca First-Differences
z=Relative Earnings Rate

	All	Age of Partner (2005)		Years in Couple (2005)	
		<= 38	39+	<= 14	15+
	(1)	(2)	(3)	(4)	(5)
z	0.449***	0.137	0.746***	0.145	0.761***
	(0.153)	(0.215)	(0.213)	(0.225)	(0.214)
z^2	-0.352**	-0.0754	-0.611***	-0.0485	-0.668***
	(0.169)	(0.238)	(0.230)	(0.243)	(0.235)
Less patient=1	0.0634**	0.0871**	0.0374	0.0581	0.0496
	(0.0260)	(0.0371)	(0.0375)	(0.0377)	(0.0364)
More patient=1	0.0484*	0.0622	0.0395	0.0473	0.0373
	(0.0261)	(0.0442)	(0.0311)	(0.0472)	(0.0328)
Partner in Rosca=1	0.186***	0.224***	0.0869	0.216***	0.134*
	(0.0405)	(0.0649)	(0.0752)	(0.0678)	(0.0758)
Couple income	-0.0578	0.0274	-0.109**	-0.0192	-0.0817*
	(0.0348)	(0.0554)	(0.0418)	(0.0540)	(0.0450)
Bartik type wage and employment	Yes	Yes	Yes	Yes	Yes
Observations	1,029	520	509	502	495
Clusters	90	85	88	86	88
$H_o: \hat{\beta}_1 = 0 \quad H_a: \hat{\beta}_1 > 0$	0.002***	0.263	0.000***	0.261	0.000***
$H_o: \hat{\beta}_2 = 0 \quad H_a: \hat{\beta}_2 < 0$	0.020**	0.376	0.005***	0.421	0.003***
$H_o: \hat{\beta}_1^{(1)} = \hat{\beta}_1^{(j)} \quad H_a: \neq$		0.058*	0.059*	0.062*	0.078*
$H_o: \hat{\beta}_2^{(1)} = \hat{\beta}_2^{(j)} \quad H_a: \neq$		0.159	0.108	0.087*	0.099*
$H_o: \hat{\beta}_1^{Below} = \hat{\beta}_1^{Above} \quad H_a: \neq$			0.045**		0.057*
$H_o: \hat{\beta}_2^{Below} = \hat{\beta}_2^{Above} \quad H_a: \neq$			0.114		0.078*
$\hat{z}_{max}: \hat{\beta}_1 + 2\hat{\beta}_2 = 0$					
$\hat{z}_{max}$	0.64		0.61		0.57
[95% CI]	[0.40 0.88]		[0.45 0.77]		[0.42 0.72]
$H_o: \hat{z}_{max} = 1 \quad H_a: \hat{z}_{max} < 1$	0.002***		0.000***		0.000***
Participation at $\hat{z}_{max}$					
$\hat{y}$	0.20		0.26		0.25
[95% CI]	[0.12 0.29]		[0.14 0.37]		[0.13 0.37]

Heteroskedasticity robust errors clustered at the municipality level in brackets. *** p<0.01, ** p<0.05, * p<0.10. Regressions use neither survey nor municipality weights.

All equations include time-fixed effects (quarterly from 2005 to 2012) and a dummy for whether the sample is from the wave 2009/12. Bartik wages and employment are twelve indicators at the municipality level: two sets (wages and employment), two categories (female and male), and three sectors (export-intensive manufacturing, other manufacturing, and non-manufacturing)

The sample consists of females in which both members of the couple, and in both waves, were: living in the same municipality and with the same partner; being at working-age (15-65 years of age); reporting income if they work; and living in a municipality that had export-manufacturing jobs in 2005.

The hypothesis test for $\hat{z}_{max}$ uses the non-linear combination of estimators $\hat{\beta}_1$ and $\hat{\beta}_2$ in which a concave function of the form $y = \hat{\beta}_1 z + \hat{\beta}_1 z^2$ reaches its maximum. The estimate $\hat{y}$ is the predicted probability of participation at $\hat{z}_{max}$. Confidence intervals use standard errors estimated using the delta method.

Hypothesis tests that compare estimates for β_1 and β_2 rely on seemingly unrelated regressions (SUR).

Owing to missing information, the number of observations in columns (4) and (5) add to 997 and not to 1029.

Table 7: Effect on Estimates of Adding Municipality Level Variables
Linear Probability Model of Use of a Rosca. First-Differences
z=Relative Earnings Rate

	z		z^2		Excluded instrument			Maximum y at z:		$H_o : \hat{z}_{max} = 1$
	Coef.	SE	Coef.	SE	Coef.	SE	F Stat.	$\hat{z}_{max}$	95% CI	$H_a : \hat{z}_{max} < 1$
Benchmark (column 2, table 3	0.446***	(0.154)	-0.330*	(0.168)				0.68	[0.39 0.97]	0.015**
(column 4, table 3)	0.377*	(0.216)	-0.330*	(0.169)	-0.0487***	(0.0128)	14.40	0.57	[0.02 1.13]	0.065*
Preferred specification (column 5, table 4)	0.449***	(0.153)	-0.352**	(0.169)				0.64	[0.40 0.88]	0.002***
(column 6, table 4)	0.357*	(0.211)	-0.352**	(0.169)	-0.0474***	(0.0129)	13.55	0.51	[0.01 1.00]	0.026**
Preferred specification (Non-winzorised variables)	0.461***	(0.152)	-0.362**	(0.168)				0.64	[0.41 0.87]	0.001***
	0.366*	(0.210)	-0.362**	(0.168)	-0.0475***	(0.0128)	13.71	0.50	[0.03 0.98]	0.021**
Preferred specification adding municipality variables										
a) [1] Poverty [Marginality Index]	0.446***	(0.152)	-0.350**	(0.168)				0.64	[0.40 0.88]	0.002***
	0.368*	(0.210)	-0.350**	(0.168)	-0.0487***	(0.0129)	14.17	0.53	[0.03 1.02]	0.031**
b) [2] Branches per person per km^2	0.445***	(0.154)	-0.347**	(0.170)				0.64	[0.40 0.89]	0.002***
	0.359*	(0.211)	-0.347**	(0.170)	-0.0475***	(0.0129)	13.49	0.52	[0.01 1.03]	0.032**
c) [2] and [3] Formal credit per person	0.444***	(0.155)	-0.346**	(0.171)				0.64	[0.39 0.89]	0.002***
	0.346	(0.213)	-0.346**	(0.171)	-0.0474***	(0.0130)	13.40	0.50	[-0.01 1.01]	0.028**
d) [2], [3], and [4] Formal savings per person	0.444***	(0.155)	-0.346**	(0.171)				0.64	[0.39 0.89]	0.002***
	0.347	(0.214)	-0.346**	(0.171)	-0.0472***	(0.0129)	13.27	0.50	[-0.02 1.02]	0.030**
e) [5] Male and [6] female population	0.451***	(0.154)	-0.355**	(0.169)				0.64	[0.40 0.87]	0.001***
	0.364*	(0.213)	-0.355**	(0.170)	-0.0477***	(0.0129)	13.65	0.51	[0.02 1.00]	0.026**
f) [7] Male and [8] female years of education	0.451***	(0.152)	-0.352**	(0.167)				0.64	[0.40 0.88]	0.002***
	0.381*	(0.214)	-0.352**	(0.167)	-0.0472***	(0.0131)	13.05	0.54	[0.03 1.05]	0.040**
g) [1], [2], [3], [4]	0.441***	(0.153)	-0.344**	(0.170)				0.64	[0.39 0.89]	0.002***
	0.360*	(0.214)	-0.344**	(0.170)	-0.0486***	(0.0130)	14.04	0.52	[0.00 1.05]	0.037**
h) [1], [2], [3], [4], [5], [6]	0.445***	(0.155)	-0.349**	(0.171)				0.64	[0.40 0.88]	0.002***
	0.366*	(0.215)	-0.349**	(0.171)	-0.0486***	(0.0130)	14.08	0.52	[0.01 1.04]	0.036**
i) [1], [2], [3], [4], [5], [6], [7], [8]	0.448***	(0.153)	-0.349**	(0.170)				0.64	[0.40 0.89]	0.002***
	0.377*	(0.217)	-0.349**	(0.170)	-0.0486***	(0.0132)	13.58	0.54	[0.02 1.07]	0.043**

Definitions: 1) Marginality index is a principal component index estimated by the Mexican government. 2) Savings and credit amounts in banks at the municipality at the end of the quarter (Constant pesos). 3) Savings: Balance of all deposits in commercial or development banks. 4) Credit: Outstanding commercial credit balance of micro-firms or entrepreneurs.

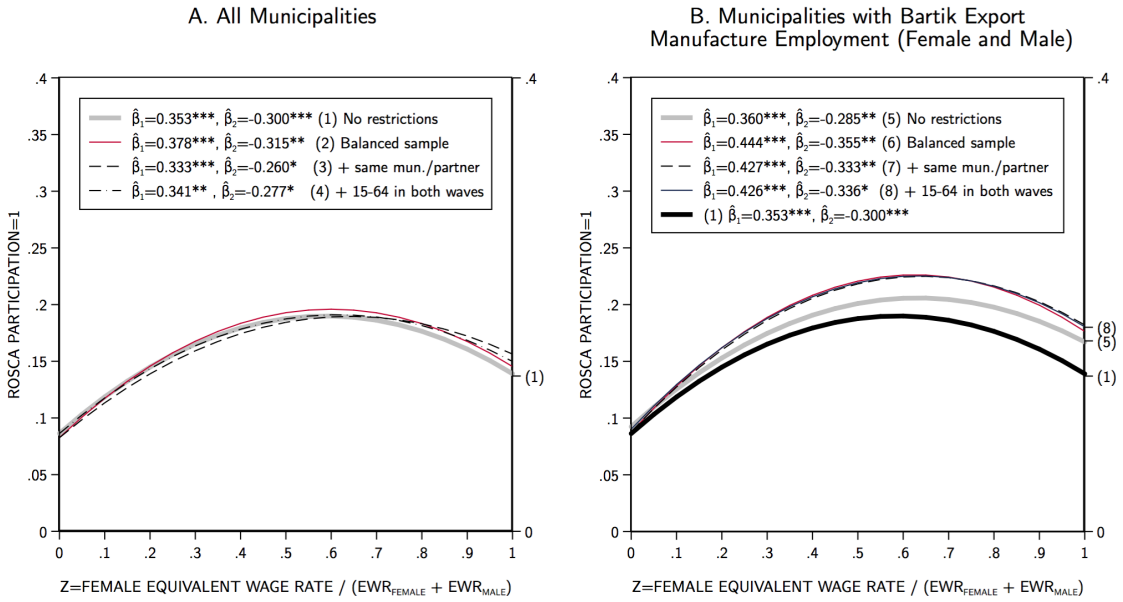
Source: Population and education levels are from the Population Count 2005 and the Census 2010. Savings and credit indicators are from Mexico's Municipalities Savings and Intermediation (MSI dataset).

Table 8: Effect on Estimates of Removing Variables
Linear Probability Model of Use of a Rosca. First-Differences
z=Relative Earnings Rate

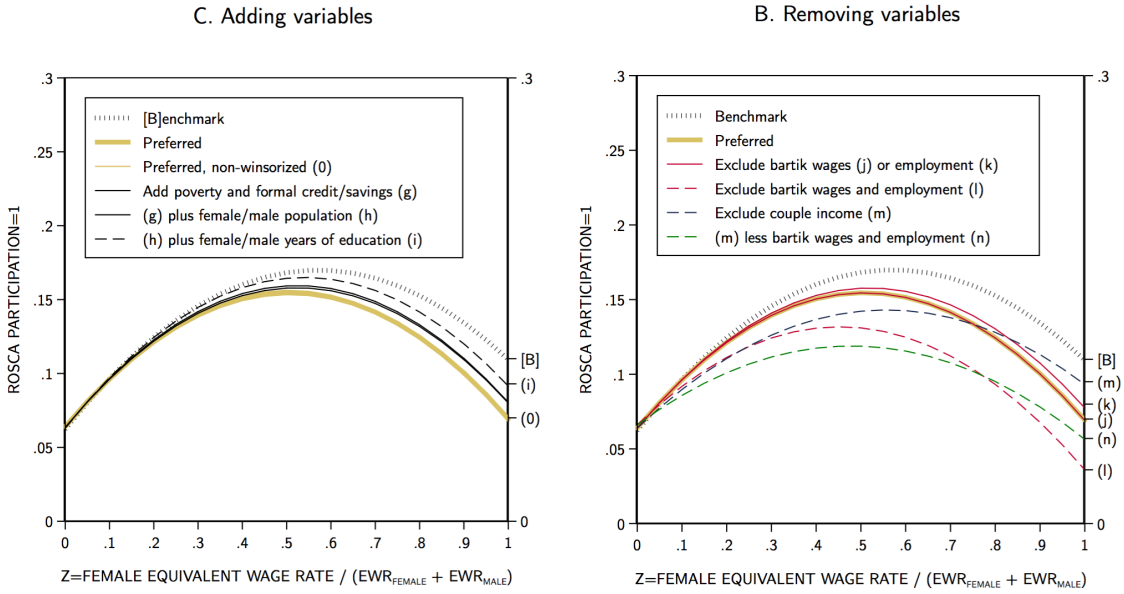
	z		z^2		Excluded instrument			Maximum y at z:		$H_o : \hat{z}_{max} = 1$
	Coef.	SE	Coef.	SE	Coef.	SE	F Stat.	$\hat{z}_{max}$	95% CI	$H_a : \hat{z}_{max} < 1$
Preferred specification	0.449***	(0.153)	-0.352**	(0.169)				0.64	[0.40 0.88]	0.002***
	0.357*	(0.211)	-0.352**	(0.169)	-0.0474***	(0.0129)	13.55	0.51	[0.01 1.00]	0.026**
Exclude from the specification:										
j) $\sum_{j=1}^{j=3}\left(\hat{w}_{mt}^{Female,sector:\,j}+\hat{w}_{mt}^{Male,sector:\,j}\right)$	0.444***	(0.155)	-0.348**	(0.170)				0.64	[0.40 0.88]	0.002***
	0.362	(0.219)	-0.348**	(0.171)	-0.0463***	(0.0131)	12.52	0.52	[-0.02 1.06]	0.040**
k) $\sum_{j=1}^{j=3}\left(\hat{l}_{mt}^{Female,sector:\,j}+\hat{l}_{mt}^{Male,sector:\,j}\right)$	0.426***	(0.159)	-0.324*	(0.173)				0.66	[0.38 0.93]	0.007***
	0.263	(0.211)	-0.324*	(0.174)	-0.0473***	(0.0126)	14.19	0.41	[-0.10 0.92]	0.011**
l) $\sum_{B\in\hat{w},\hat{l}}\sum_{j=1}^{j=3}\left(B_{mt}^{Female,sector:\,j}+B_{mt}^{Male,sector:\,j}\right)$	0.420**	(0.162)	-0.320*	(0.175)				0.66	[0.38 0.94]	0.008***
	0.290	(0.222)	-0.320*	(0.176)	-0.0459***	(0.0130)	12.41	0.45	[-0.13 1.04]	0.033**
m) $cinc_{imt}$	0.358**	(0.140)	-0.255	(0.157)				0.70	[0.31 1.09]	0.067*
	0.284	(0.212)	-0.255	(0.157)	-0.0468***	(0.0124)	14.31	0.56	[-0.18 1.29]	0.120
n) $cinc_{imt}+\sum_{B\in\hat{w},\hat{l}}\sum_{j=1}^{j=3}\left(B_{mt}^{Female,sector:\,j}+B_{mt}^{Male,sector:\,j}\right)$	0.336**	(0.149)	-0.231	(0.165)				0.73	[0.26 1.20]	0.128
	0.288	(0.223)	-0.320*	(0.176)	-0.0453***	(0.0125)	13.04	0.45	[-0.14 1.04]	0.034**

Figure 7: Robustness Checks: Predicted Probabilities
Linear Probability Model of Use of a Rosca. First-Differences
z=Relative Earnings Rate

Effect of Sample Restrictions, POLS using MxFLS 2005/06



Effect of Adding or Removing Variables, FD-IV



7 Concluding Remarks

When members of a couple disagree on what to consume and on when to consume, the conflict prompts them to try to nudge the couple towards her or his preferences. Set out to impose their will, they resort to strategic behavior. Using a nationally representive sample of couples in Mexico, I find that use of the strategies that protect savings reaches its maximum at mid-levels of female bargaining power. The finding supports the prediction of a model in which conflict stems from disagreements on what to consume. I also find that females who are less or who are more patience than their parter use the strategies more. The finding supports the prediction of a model in which conflict stems from disagreements on when to consume.

Commitment savings strategies help people to save. And savings help people to buy assets, to smooth consumption, and to make profitable investments. If people use savings to invest; for example, in their children, the welfare benefits of savings compound. Females have a high preference for investing on their children. Increasing their bargaining power will likely increase their use of commitment savings strategies. By using them, they nudge the couple towards their preferences, compounding the positive effect of savings.

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A.1 Appendix

A.2 The Anderson and Baland (2002) Model: Description and Extension.

A.2.1 Model Set-up

The Anderson and Baland (2002) model stylizes how a couple decides whether to buy an indivisible good. In the model two individuals, male (m) and female (f), maximize across two periods without time discounting the utility function of the couple. Utility functions of each individual consist of consumption (c) and of an indivisible good ($D = 1$ if the couple buys it) with price normalized to be 1. Intra-household conflict stems because the female derives utility (δ) from the good but the male does not:

$$u^f = u(c_1) + u(c_2) + \delta D. \qquad u^m = u(c_1) + u(c_2). \tag{A.1}$$

The couple decides how much to save and consume each period. How they decide follows the collective framework (Chiappori, 1988). In the framework the pareto weight (μ) summarizes the bargaining power of the female. Bounded between 0 and 1, the weight allots how much the utility of the female matters in the utility function of the couple (U)

$$U = \mu \times u^f + (1 - \mu) \times u^m, \tag{A.2}$$

and maximizing the utility function is subject to:

$$s \geq 0, \quad Y \geq c_1 + s, \quad Y + s \geq c_2 + D, \quad u(Y - 1) + u(Y) + \delta \leq u(Y) + u(Y). \tag{A.3}$$

where Y represents the income of the couple on each period, and they can only use savings (s) to purchase the indivisible good (no credit is available.) The last constraint forces the couple to save—buying the indivisible good in the first period provides at most the same utility not buying it does.

Because the good costs 1, and given no time-discounting, the optimal savings rate on each period is $s = 1/2$. If she has to save $1/2$ per period, she wants to buy it

$$u^f : \ \ u(Y) + u(Y) < u(Y - 1/2) + u(Y - 1/2) + \delta, \tag{A.4}$$

but the couple will only buy it if the weighted sum of the individual utility functions satisfy:

$$U: \quad u(Y) + u(Y) < u(Y - 1/2) + u(Y - 1/2) + (\mu \times \delta). \tag{A.5}$$

By condition A.5 the couple will not buy the good when female bargaining power is low (e.g. μ is low).

The model then allows a commitment savings strategy. The simple strategy locks away for the two periods the savings of the female but it has a fixed cost T, which is low enough to not discourage using the strategy at the optimal savings rate[27]

$$u^f: \quad u(Y) + u(Y) < u(Y - 1/2) + u(Y - 1/2) + \delta - T. \tag{A.6}$$

Equating the strategy to joining a Rosca, Anderson and Baland (2002) note that the female can choose how much to save per period by joining the Rosca with the required number of members and contributions. She will contribute s^R each of the two periods and receive the pot in the second period. In a sub-game perfect equilibrium solution, females join a Rosca at $t = 0$ if at $t = 2$:

$$U: \quad u(Y + 1/2) - T \leq u(Y - 1/2) + (\mu \times \delta) - T \; ; \; t = 2. \tag{A.7}$$

Anderson and Baland (2002) show a female will use a commitment savings strategy (e.g. join a Rosca) at intermediate values of the pareto weight because at high values she has no need and at low values she has no desire. They consider three thresholds. The first threshold (μ_1) satisfies equation A.5 with equality. When the pareto weight is in the range $\mu \in [\mu_1, 1]$, the couple buys the good. Because the commitment savings strategy entails a cost T, she has no need to use it. Lower than the first, the second threshold (μ_2) satisfies equation A.7 with equality. The female will foresee at $t = 0$ the need to use the strategy when pareto weights are within the range $\mu \in [\mu_2, \mu_1)$. In a third, lower threshold (μ_3) she also foreeses the need but saving at the optimal rate $s^R = 1/2$ is not enough to ensure that the couple will buy the good. But the couple will buy it given two conditions. First, savings per period need to increase[28] so that in the second period:

$$U: \quad u(Y + s^R) - T \leq u(Y + s^R - 1) + (\mu \times \delta) - T \; ; \; t = 2. \tag{A.8}$$

[27] For example, joining a Rosca entails time and monetary costs of attending the meetings.

[28] Higher savings rates than optimal allow couples to also increase consumption, from which males derive utility in the same way as females do. For example, with $s^R = 3/4$ the couple can either consume an additional 3/2 units or consume an additional 1/2 unit and also buy the good.

Second, the increase must be low enough that females still would prefer to buy the good:

$$u^f: \ u(Y) + u(Y) \leq u(Y - s^R) + u(Y + s^R - 1) + \delta - T. \tag{A.9}$$

when pareto weights are in the range $\mu \in [\mu_3, \mu_2)$, the female will save (e.g. join a Rosca) so that savings per period ($s^R > 1/2$) satisfies both conditions. Finally, at low values of the pareto weight in the range $\mu \in [0, \mu_3)$, the savings required are high enough that she prefers consumption to saving and buying he good—she has no desire to use a commitment savings strategy.

A.2.2 Allowing For Self-control Problems

Ambec and Treich (2007) develop a model in which people join a Rosca to cope with self-control problems. As Anderson and Baland (2002) do, they model a Rosca as a simple commitment savings strategy. In their model people want to avoid spending money in superfluous goods. Because using a Rosca forces people to contribute fixed amounts at regular dates, using it allows people to do so. Their model predicts that take-up of a commitment savings strategy increases with income. To embed the model of Ambec and Treich (2007) within the Anderson and Baland (2002) framework, consider no time-discounting and only two periods:

$$u^f : [u(Y - I_t \times m) + I_t\phi] + [u(Y - I_{t+1} \times m) + \tilde{\beta}^S \times I_{t+1}\phi], \tag{A.10}$$

where m is the cost of an indivisible superfluous good that provides utility ϕ and $I_t = 1$ when the female buys it. Preference for the superfluous good is time-inconsistent and present-biased through the parameter β^S, and females are partially or fully sophisticated.[29]

Buying the superfluous good at $t = 1$, when $[u(Y - I_t \times m) + \phi] > u(Y)$, is optimal. But it might not be from the perspective of her present-self at $t = 0$

$$u^f : u(Y - I_{t+1} \times m) + \tilde{\beta}^S[I_{t+1}\phi] + u(Y - I_{t+2} \times m) + \tilde{\beta}^S[I_{t+2}\phi], \tag{A.11}$$

for example in the extreme case when $\beta^S = 0$ is never optimal because $[u(Y - I_t \times m)] + 0 < u(Y)$. A partially or fully sophisticated present-biased female ($\tilde{\beta}^S \simeq 0$) wants to avoid spending money in superfluous goods. At $t = 0$ she will seek a commitment saving strategy to debar her future-selves from buying them.

[29] Their belief, $\tilde{\beta}^S$, about their time-inconsistency—which they use to maximize their utility—is close to their actual time-inconsistency (β^S: $\tilde{\beta}^S \simeq \beta^S < 1$).

Now consider the simplest scenario, a utility function of a couple with a pareto weight μ equal to one. The utility maximized is the one of the female (equation A.4) and the couple is already saving $s = 1/2$ per-period. But she will join the Rosca with cost T in which the fixed contribution equals the cost of the superfluous good ($s^r = m$) if:

$$\begin{aligned} u^f :& u(Y - I_{t+1} \times m) + \tilde{\beta}^S[I_{t+1}\phi] + u(Y - I_{t+2} \times m) + \tilde{\beta}^S[I_{t+2}\phi] < \\ & u(Y - s) + u(Y - s) + \delta - T, \end{aligned} \tag{A.12}$$

where $s \leq 1/2 + s^R$ and $s^R = m$. If she is either time-consistent or present-biased and naïve, she will not join a Rosca. If she is present-biased and sophisticated, she will.

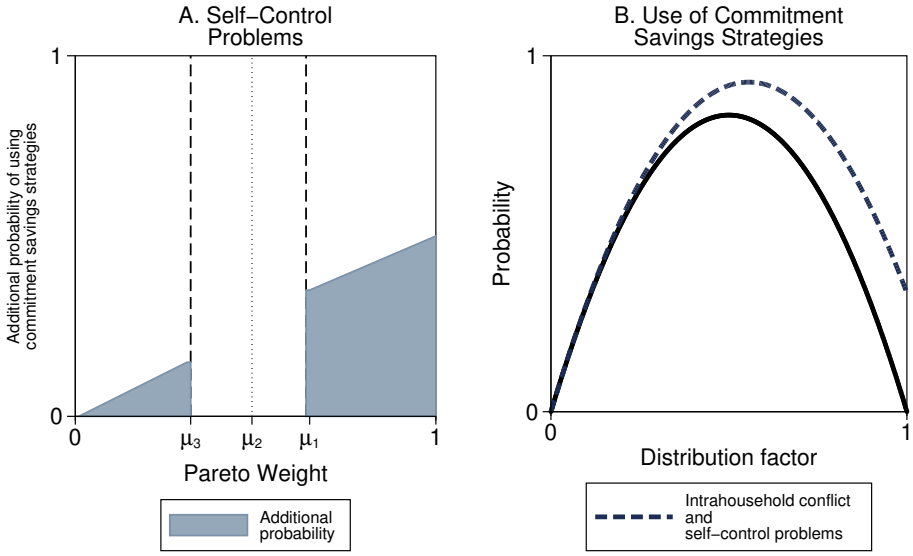
Panel a in figure A.1 summarizes take-up owing to self-control problems. When her bargaining power is low, $\mu \in [\mu_0, \mu_3)$, she could use commitment saving strategies to avoid spending money in superfluous goods. The probability, however, will be low, specially if low income implies low Pareto weight. In a next range, $\mu \in [\mu_3, \mu_1)$, she already uses them. When her bargaining power is high, $\mu \in [\mu_1, 1]$, she will use them if she is at least partially-sophisticated. Use in this range will increase if bargaining power and income have a positive correlation. Panel b shows how take-up would look like in the non-instrumented specification (dashed lined). Relative to the predictions of the Anderson and Baland (2002) model (solid line), at higher levels of bargaining power, use of Roscas is higher.

Deducting across ranges of pareto weights whether she will participate requires a critical assumption: relative to females in couples with lower pareto weight, females in couples with high pareto weight ought to have a higher or similar income. Start with the lowest pareto weight range. In the range $\mu \in [0, \mu_3)$, she prefers consumption to joining a Rosca. She could use participation to avoid purchasing the superfluous good but the probability will be low if females in couples with pareto weight below μ_3 have a low income. In the next range, $\mu \in [\mu_3, \mu_1)$, she already joined a Rosca.[30]. In the highest range, $\mu \in [\mu_1, 1)$, she only joins to cope with self-control problems. The probability that she joins will be increasing according to the pareto weight. But if correlation between income and pareto weight is strong, it might decrease at high values.[31]

[30] If the condition in equation A.12 holds, the contribution could fully cover the cost m of the superfluous good, otherwise she will chose one with a higher contribution so that $s^R = s^{R:Intra\ household} + m$. If not, she will buy the superfluous good but will still join a Rosca. For this to hold, not buying the superfluous comes second to buying the indivisible good that all her selves value in the same way.

[31] In Ambec and Treich (2007) model high-income individuals are less likely to join.

Figure A.1: Allowing Self-control Problems in the Model:
Females with High Bargaining Power Are
More Likely to Use Commitment Savings Strategies



A.3 Additional Tables and Figures

Table B.1: Export to Output Ratio, Manufactures 1986–2000

isic3rev2	Description	1986	1987	1998	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Mean (1986-00)	Atkin (2016)	Own
314	Tobacco	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.03	0.04	0.05	0.05	0.04	0.03	0.02		
311	Food products	0.07	0.10	0.11	0.08	0.07	0.07	0.07	0.08	0.04	0.08	0.08	0.08	0.09	0.08	0.07	0.08		
313	Beverages	0.07	0.11	0.08	0.07	0.06	0.05	0.05	0.05	0.05	0.10	0.10	0.11	0.12	0.11	0.13	0.08		
352	Other chemicals	0.07	0.07	0.07	0.07	0.07	0.08	0.09	0.10	0.08	0.16	0.15	0.15	0.17	0.16	0.17	0.11		
341	Paper and products	0.12	0.10	0.12	0.10	0.07	0.05	0.21	0.19	0.08	0.14	0.13	0.14	0.14	0.14	0.12	0.12		
369	Other non-metallic mineral products	0.13	0.14	0.13	0.15	0.10	0.08	0.08	0.09	0.06	0.17	0.18	0.18	0.15	0.14	0.12	0.13		
354	Miscellaneous petroleum and coal products	0.01	0.01	0.02	0.02	0.01	0.03	0.01	0.02	0.05	0.20	0.28	0.34	0.40	0.45	0.34	0.15		
355	Rubber products	0.05	0.01	0.05	0.08	0.04	0.03	0.07	0.12	0.13	0.28	0.26	0.26	0.26	0.33	0.38	0.16		
371	Iron and steel	0.11	0.10	0.11	0.14	0.11	0.11	0.12	0.15	0.18	0.36	0.27	0.27	0.25	0.19	0.18	0.18		
342	Printing and publishing	0.19	0.14	0.11	0.11	0.12	0.18	0.39	0.48	0.08	0.19	0.25	0.27	0.28	0.22	0.22	0.22		
356	Plastic products	0.21	0.08	0.09	0.16	0.09	0.12	0.56	0.74	0.27	0.37	0.39	0.39	0.41	0.43	0.46	0.32		
362	Glass and products	0.30	0.28	0.26	0.24	0.23	0.24	0.33	0.31	0.32	0.42	0.39	0.39	0.42	0.46	0.52	0.34		
351	Industrial chemicals	0.23	0.27	0.29	0.29	0.33	0.34	0.39	0.43	0.39	0.52	0.43	0.42	0.43	0.40	0.42	0.37		
324	Footwear except rubber or plastic	0.09	0.21	0.19	0.17	0.19	0.27	0.55	0.54	0.20	0.45	0.55	0.60	0.62	0.50	0.45	0.37	1	
321	Textiles	0.24	0.20	0.20	0.20	0.19	0.19	0.49	0.56	0.27	0.52	0.51	0.51	0.54	0.53	0.55	0.38		
372	Non-ferrous metals	0.37	0.37	0.41	0.46	0.45	0.41	0.53	0.66	0.39	0.68	0.53	0.45	0.49	0.41	0.41	0.47		
381	Fabricated metal products	0.25	0.15	0.17	0.22	0.17	0.22	0.51	0.74	0.56	0.83	0.96	1.04	1.13	1.03	1.13	0.61	1	1
384	Transport equipment	0.47	0.57	0.43	0.39	0.41	0.41	0.42	0.56	0.54	0.96	0.88	0.79	0.83	0.82	0.77	0.62	1	1
361	Pottery china earthenware	0.30	0.27	0.23	0.22	0.18	0.19	0.37	0.41	0.84	1.30	1.14	1.09	1.16	1.20	1.12	0.67		1
353	Petroleum refineries									0.60	0.91	0.89	0.98	0.80	1.02	1.25	0.92	1	1
323	Leather products									0.63	1.33	1.25	1.29	1.34	1.31	1.48	1.23	1	1
382	Machinery except electrical	0.99	0.82	0.83	0.84	0.94	1.04	1.84	2.19	1.00	1.57	1.40	1.27	1.40	1.55	1.65	1.29	1	1
331	Wood products except furniture	0.72	0.71	0.92	1.17	0.94	1.14	2.62	3.22	0.77	1.29	1.36	1.27	1.26	1.18	1.19	1.32	1	1
332	Furniture except metal	0.62	0.28	0.29	0.22	0.18	0.28	1.88	2.43	0.83	1.67	2.22	2.14	2.14	2.27	3.13	1.37		1
322	Wearing apparel except footwear	0.49	0.34	0.25	0.13	0.17	0.19	1.38	1.82	0.54	3.20	3.64	4.82	5.61	5.32	5.18	2.21	1	1
383	Machinery electric	1.03	0.17	0.18	0.26	0.21	0.24	3.26	4.30	3.93	6.83	6.59	6.60	6.75	7.08	7.72	3.68	1	1
385	Professional and scientific equipment	1.70	1.22	0.75	0.46	0.63	0.47	3.40	2.58	4.65	7.16	6.87	6.50	7.02	7.25	6.28	3.80	1	1
390	Other manufactured products	2.17	1.07	1.30	1.25	1.64	1.44	4.60	5.08	3.55	6.77	6.20	5.57	5.86	4.68	4.04	3.68		

Source: Own calculations based on Nicita and Olarreaga (2007) data on export and outputs. Output represents the value of goods produced in a year, whether sold or stocked. Export represents the value of exports of the reporting country. Export and Output values are reported in thousand dollars.

Export manufacture definitions:

- Atkin (2016). Exports represent more than 50% of output in at least half the sample years from 1986 to 2000.
- Own definition. Exports represent more than 50% of output in all years from 1994 to 2000.

Table B.2: Descriptive Statistics

	N	Mean	Std.Dev.	Min	Max
Rosca participation=1	2,061	0.14	0.35	0.00	1.00
z=Bargaining power indicators					
Using winsorised individual labor and non-labor income					
Share of couple income	2,064	0.12	0.24	0.00	1.00
Relative equivalent wage rate	2,064	0.14	0.28	0.00	1.00
Not using winsorized income					
Share of couple income	2,064	0.12	0.24	0.00	1.00
Relative equivalent wage rate	2,064	0.14	0.28	0.00	1.00
Income (Constant USD per month)					
Using winsorised individual labor and non-labor income					
Couple income (1000s)	2,064	0.67	0.57	9.68E-05	5.47
Labor income (winsorized 99% per wave)	2,064	117.55	299.79	0.00	2650.84
Non-labor income (winsorized 99% per wave)	2,064	2.72	20.00	0.00	209.67
Partner's income (Labor + Non-Labor)	2,064	553.78	435.84	0.00	2817.47
Not using winsorized income					
Couple income (1000s)	2,064	0.71	0.80	9.68E-05	14.93
Labor income	2,064	120.22	322.47	0.00	4446.68
Non-labor income	2,064	2.91	52.86	0.00	1466.89
Partner's income (Labor + Non-Labor)	2,064	589.35	690.58	0.00	14087.35
Municipality Bartik Employment					
Export manufacture (Per capita 2005, 15+ Males)	2,064	0.04	0.04	1.97E-04	0.17
Export manufacture (Per capita 2005, 15+ Females)	2,064	0.02	0.02	1.18E-05	0.09
Other manufacture (Per capita 2005, 15+)	2,064	0.15	0.10	1.23E-03	0.47
Other sector (Per capita 2005, 15+)	2,064	0.02	0.03	7.72E-05	0.20
Municipality Bartik Wage (Constant USD)					
Export manufacture (Males)	2,064	17.77	4.08	5.54	36.58
Export manufacture (Females)	2,064	12.84	2.11	0.36	20.77
Non-export manufacture	2,064	19.18	3.08	9.41	34.39
Other sector	2,064	18.05	2.43	8.07	24.46

All monetary values are expressed in constant terms using the national price index (Dec-2010=1). Constant Mexican pesos are expressed in USD using the December of 2010 exchange rate of 12.35 pesos per USD.

Both labor and non-labor income are winsorized at the top 99% for each wave without distinguishing gender and before making any sample restriction.

Table B.3: Linear Probability Model of Use of Roscas
Distribution factor (z): Share of Couple Income

	POLS	FD	FD-IV	FD-IV
	(1)	(2)	(3)	(4)
z	0.376***	0.474***	0.355	0.376
	(0.121)	(0.146)	(0.359)	(0.321)
z^2	-0.317**	-0.305*	-0.307*	-0.306*
	(0.148)	(0.161)	(0.161)	(0.160)
Couple income	0.0444**	-0.0408	-0.0354	-0.0364
	(0.0171)	(0.0366)	(0.0398)	(0.0396)
Predicted residuals			0.123	0.101
			(0.336)	(0.273)
Bartik Wage and Employment	Yes	Yes	Yes	Yes
First Stage. Dep. var: z				
Excluded instrument				
(a) Worked in Manufactures (2005)			-0.260**	
Couple: Fem=1 Male=0 × wave=2009/12			(0.110)	
(b) Excluded instrument interacted				-0.0324**
with female years educ. in 2005				(0.0136)
Underidentification test				
Kleibergen-Paap statistic			2.86	2.27
p-value			0.091*	0.132
F Statistic of excluded instrument			5.59	5.68
Observations	2,056	1,029	1,029	1,029
Clusters	90	90	90	90
$H_o: \hat{\beta}_1 = 0 \quad H_a: \hat{\beta}_1 > 0$	0.001***	0.001***	0.163	0.122
$H_o: \hat{\beta}_2 = 0 \quad H_a: \hat{\beta}_2 < 0$	0.018**	0.030**	0.030**	0.030**
$\hat{z}_{max}: \hat{\beta}_1 + 2\hat{\beta}_2 = 0$				
$\hat{z}_{max}$	0.59	0.78	0.58	0.61
[95% CI]	[0.38 0.81]	[0.37 1.18]	[-0.48 1.64]	[-0.25 1.47]
$H_o: \hat{z}_{max} = 1 \quad H_a: \hat{z}_{max} < 1$	0.000***	0.138	0.218	0.189
Participation at $\hat{z}_{max}$				
$\hat{y}$	0.23	0.24	0.17	0.18
[95% CI]	[0.18 0.29]	[0.15 0.33]	[-0.20 0.53]	[-0.15 0.51]

Heteroskedasticity robust errors clustered at the municipality level in brackets. *** p<0.01, ** p<0.05, * p<0.10. Regressions use neither survey nor municipality weights.

All equations include time-fixed effects (quarterly from 2005 to 2012) and a dummy for whether the sample is from the wave 2009/12. Bartik wages and employment are twelve indicators at the municipality level: two sets (wages and employment), two categories (female and male), and three sectors (export-intensive manufacturing, other manufacturing, and non-manufacturing)

The sample consists of females in which both members of the couple, and in both waves, were: living in the same municipality and with the same partner; being at working-age (15-65 years of age); reporting income if they work; and living in a municipality that had export-manufacturing jobs in 2005.

The hypothesis test for $\hat{z}_{max}$ uses the non-linear combination of estimators $\hat{\beta}_1$ and $\hat{\beta}_2$ in which a concave function of the form $y = \hat{\beta}_1 z + \hat{\beta}_1 z^2$ reaches its maximum. The estimate $\hat{y}$ is the predicted probability of participation at $\hat{z}_{max}$. Confidence intervals use standard errors estimated using the delta method.