



The anatomy of an informal financial market: Rosca participation in Taiwan

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Abstract

Little is known about informal financial markets in developing countries. This paper analyzes participation in rotating savings and credit associations using a national household survey from Taiwan. We find that participation is highest among high-income households. There is some evidence that income stability may play a role as well. Life cycle differences suggest a role in funding durables purchases. Our evidence indicates that roscas may be an alternative savings device to the formal financial sector.

JEL classification: O16

Keywords: Finance; Taiwan

1. Introduction

It is well-known that informal finance is an important source of access to credit and savings opportunities in low-income countries. However, little is known at a quantitative level about the decision to participate in this sector. In a country like Taiwan, this gap in our understanding is particularly acute given the relative importance of informal finance in most accounts of the development process. In our earlier paper (Besley and Levenson, 1996) we argued that the pattern of durables accumulation was consistent with a model where access to informal finance speeds up the accumulation process. This paper takes a closer look at the ability and/or desire of household members to participate in informal finance.

Our focus here is on the *hui*, which is the prominent type of rotating savings and credit association (rosca) in Taiwan. In a typical year, at least one-fifth of all

households in Taiwan participate in roscas. Roscas are found world-wide, traveling under many different names and different rules of operation. The basic idea is that a group of individuals meet together on a regular basis, placing money in a pot, which is then allocated to a particular group member. The meetings continue, with a different member of the group being selected for the pot at each date, until everyone has received it once. In Taiwan, the majority of roscas work on a bidding system, where individuals order the receipt of the pot according to the amount that individuals bid at rosca meetings. Early recipients of the pot pay higher implicit interest rates, while those who wait until the end of the cycle are interest recipients. Roscas can bring borrowers and savers together, with early recipients of the pot being borrowers, and late ones savers.

In this paper, we analyze the characteristics of rosca participants in Taiwan. Given the relative lack of a quantitative picture of the importance of informal finance for almost any country, this exercise is valuable. Our data are particularly suited to analyzing the market for rosca participation at a national level. The bulk of research on informal financial markets to date has been limited in scope to small-scale, unrepresentative data sets that focus on isolated sub-groups of an economy. This limits the extent to which inferences can be drawn about the functioning of these markets outside of the particular group analyzed in each study. By contrast, the data used in this paper are from a representative national survey of households. This enables us to examine the characteristics of rosca participants for the entire Taiwanese economy.

Taiwan's remarkable growth has occurred in the shadow of a formal financial system that is widely viewed as underdeveloped.¹ What is instructive about Taiwan's experience for other developing countries is that lack of formal financial sector development has not been a serious impediment to growth. Roscas are an important part of the informal financial sector which has played a key role in financial intermediation, particularly for those who do not have access to formal financial sector opportunities. Indeed, this is an implication of the results from our earlier paper (Besley and Levenson, 1996) where we showed that durables accumulation appeared to be higher among those who participate in roscas.

Our analysis yields a number of interesting findings. Among these, we show that rosca participation increases with income, underlying their importance as savings receptors for higher income households. We also relate rosca participation to occupation, finding that relatively more stable occupations (particularly those in the public sector) tend to have greater participation. We further analyze life cycle and generational differences in rosca participation.

The extent of rosca participation in Taiwan may be driven, in part, by the relatively tight rein on credit maintained by government policy. In spite of this,

¹ (Lundberg (1979); Shea (1984); Cheng (1986); Fry (1988); Wade (1990)). South Korea also has an underdeveloped formal financial system and a thriving curb market, of which roscas (*kye*) form a component.

Taiwan has prospered, aided in part by the resilience of the informal sector. This is potentially significant for other countries where the informal financial sector is prevalent. Roscas play a role in many developing countries in the Americas, including Bolivia, the Dominican Republic, Jamaica and Mexico.² Perhaps Taiwan's experience can support the idea that an active informal sector can play an important role, even in the absence of financial liberalization. While answering this question lies beyond the scope of this paper, the results in this and our earlier paper suggest that the informal sector should be studied in detail in financially unliberalized economies. Cross-country comparison of the role of roscas in development is an important issue for future research.

The remainder of this paper is structured as follows. The next section provides a discussion of the issues that determine both access to roscas and the desire to participate in them. The following section presents the empirical analysis. The final section concludes with a summary of the findings.

2. Theoretical concerns

Roscas are an intrinsically non-anonymous type of financial intermediation. The anthropological literature, beginning with Ardener (1964), emphasizes the fact that group sanctions are central to their effective functioning. Those who take the pot early are in debt to the other members of the group and many of the same issues that arise in enforcing loan repayment also arise in the case of roscas. Ardener cites the following as social groupings around which roscas have been formed: gender, age, kinship, ethnic affiliation, locality, occupation, status, and religion.

Differences between individuals who do and do not participate in the *hui* could reflect either their access or desire to do so. Under desire, we include all manner of things that affect demand for credit and savings, such as life-cycle needs. This will also reflect their outside opportunities as savers or borrowers. Ability to participate may be indicative of the type of social interactions that individuals have available—roscas are frequently sustained by informal sanctions. Members of certain occupational groups, for example, may be better placed to join a rosca if they desire to do so.

While access to roscas may depend on the extent to which one is a member of a social or occupational group in which a rosca can function, participation also depends upon the *desire* to participate (conditional on access). We can model the decision of individual or household i to participate in a rosca as represented by the following functional relationship:

$$P_i = f(D_i | A_i), \quad (1)$$

where P_i is participation (a zero-one variable), D_i is desire, and A_i is access.

² Ardener (1964), Kurtz (1978), Adams and Canavesi (1992), Mansell-Carstens (1995).

In practice, D_i and A_i are not directly measurable. Moreover, it is not generally possible to judge whether any particular variable affects D_i or A_i . We do not have a variable for social grouping, although we do include occupational group, which ought primarily to affect A_i . We analyze rosca participation along a number of different dimensions.³

Two main things determine the desire to participate from an economic point of view. First, there must be a (possibly latent) desire by some individuals for the funds that are obtained by winning the pot in a rosca. This might be derived from some productive opportunity such as a commercial investment. It might also be some form of household capital accumulation. For example, Besley et al. (1993, 1994) consider a model with indivisible durable consumption goods. We find empirical evidence for this in Taiwan in our earlier paper (Besley and Levenson, 1996). In this case roscas allow a group of liquidity-constrained individuals to pool their money and take turns purchasing the desired goods earlier than would be possible if they were to save on their own. We would typically expect that the individuals who turn to roscas for this reason face high costs of borrowing from the formal financial sector.

A second motive for rosca participation comes from individuals who have no interest *per se* in the loan that can be obtained by winning the pot early on. These people receive interest payments from the individuals who are borrowers in roscas, and may wish to join solely to earn a higher return to saving than they could in other sectors of the economy. Interest rates available in roscas do typically exceed those in the formal financial markets in Taiwan. Even though there may be a higher risk of default, the risk-adjusted rate of return may be higher for roscas.⁴ In addition, high income individuals/households may use roscas as a way to evade paying taxes on interest income. Indeed, this an abiding concern of the Central Bank.

There are many possible roles for income in determining both access to and desire to participate in roscas. Stability of income enables individuals to sustain regular payments to the rosca, thereby avoiding default. This gives another reason why occupational variables should be important in determining access to roscas.⁵

³ Since our data measure rosca participation and not access, a degree of care has to be used in interpreting the results as indicating anything about the determinants of access to roscas on the basis of these characteristics. As an example, there may be perfect segregation of roscas along gender lines, with men participating in all-male roscas and women participating in all-female roscas. If the rate of rosca formation were the same for both groups, however, then there would be no difference in the degree of access between the sexes even in the presence of complete gender segregation.

⁴ The social ties that bind rosca members together probably provide an informational advantage to roscas over formal sector intermediaries.

⁵ Stability of income can be viewed as directly influencing both access and the desire to participate: Someone might not want to commit to rosca membership unless he is certain he will not default on any payments. In this context the threshold amount of income stability necessary to participate is equal to the maximum of what the individual requires of himself, and what his prospective rosca co-members require of him.

The level of income also may be important, particularly in influencing the desire to participate in roscas. First, the lowest income individuals/households spend a larger fraction of their incomes on subsistence consumption, so their demand for durable goods—and therefore roscas, too—should be lower. Second, higher income individuals/households have higher levels of saving so their demand for roscas as a savings vehicle should be higher.

Many of the "social groupings" such as age and occupation may in fact influence rosca participation solely through their effect on income.⁶ We test this implication by controlling for income when analyzing the importance of social groupings. Similarly, the relationship between rosca participation and age may reflect more than just access related to stable social groupings. Younger individuals seeking to establish a home may well find rosca finance most attractive, while older individuals could value the high returns on their savings in roscas gained by lending to that group. Younger generations also may feel more comfortable in exploiting formal financial market opportunities for savings and credit.

More generally, there is the ebb and flow of confidence in the formal and informal financial sectors. There have been significant changes in the aggregate fraction of the population participating in informal financial institutions in Taiwan, reflecting government regulations and other episodes which have had an important effect on rosca participation. In particular, there was a significant decrease in rosca participation between the first and last years in these data. These issues are covered in the next section.

3. Empirical analysis

3.1. Data and empirical framework

Our data are drawn from the 1977–1991 Personal Income Distribution Surveys, a series of cross-section data sets. We limit the sample to those households with heads aged 25–65. After eliminating households with invalid values,⁷ the sample we analyze consists of 212 046 households. Households with heads younger than 25 or older than 65 were excluded because of sample selection problems (Deaton and Paxson, 1994).

Since our data are at the household level, the analysis is framed in terms of household characteristics. Rosca information in these data is limited to summary measures of the total amount paid into and withdrawn from active roscas at the beginning and end of the survey year. There is no information on how many roscas the household used during the survey year, nor on the structure of the

⁶ Status, in particular, may be indistinguishable from income in many settings.

⁷ This is a tiny fraction of the entire sample.

individual roscas (such as who in the household participated, the number of members, contribution requirements, etc.). We count the household as participating if any of the rosca variables are nonzero.

Rosca participation is quite high as measured in these data: 20.5% of all households participate during the survey year. This is quite remarkable given Taiwan's level of development. As a newly industrialized economy, it is probably surprising to find such widespread participation in the informal financial markets. We view this number, however, as a *lower* bound on the extent of rosca participation for two reasons. First, Mao (1985, p.141) cites an estimate by Wen Li Chung that "total Hui membership approximates 85% of the island's population." This quite likely indicates membership over an extended period as opposed to active participation at a given point in time. Second, Liu (1987) re-surveyed a subset of the households from this data set in 1982 and found a volume of rosca funds twice that reported in the larger sample. Some of the discrepancy is most likely due to underreporting of rosca participation in our data.⁸ In light of this it is probably the case that more than one-fifth of Taiwanese households participate in roscas in a given year.

In conducting the analysis, we focus on a number of key characteristics that have been identified as possible determinants of rosca participation: income, occupation, and gender. We also distinguish the role of occupation further between public versus private sector employment. In order to identify life cycle effects, we analyze differences in participation based on the age of the household head. To identify the evolving importance of roscas for different generations of households, we further analyze participation based on the year in which the household head was born.

Our approach to studying rosca participation is not reliant on any structural model of behavior. Our aim is to get as complete a picture as possible of what the data tell us about patterns of participation broken down in different ways. We will attempt to tie this into a theoretical framework. For the most part, however, we will speak of pure correlations rather than trying to isolate specific causal factors.

In order to capture the "true" correlation between household rosca participation and each of these factors, our analyses are based on regressions that control for all the factors at the same time. The following equation forms the basis for the estimation:

$$R_{it} = \beta^Y Y^{it} + \beta^O OCC^{it} + \beta_w WOM_{it} + \beta^A AGE^{it} + \beta^T TIME^{it} + \epsilon_{it}, \quad (3.1)$$

where Y_{it} is a vector of dummy variables for the household's position in the income distribution in the survey year, OCC^{it} is a vector of dummy variables for

⁸ Though a significant portion is undoubtedly due to underreporting of rosca payments and withdrawals conditional on participation.

whether anyone in the household works in certain occupations, WOM_{it} is a dummy variable for whether there are any adult (age fifteen and older) women in the household, AGE^{it} is a vector of variables for the age of the household head,⁹ and $TIME^{it}$ is a vector of dummy variables for the year of the observation.¹⁰ In addition, full sets of dummy variables for the numbers of children and adults in the household are included in all regressions. For the second stage of the analysis, each occupation dummy was interacted with a dummy for whether anyone in the household working in that occupation was employed in the public sector. For the occupation and gender variables, we experimented with alternate specifications.¹¹ Because the conclusions were qualitatively the same regardless of the specification, we decided to only report the results from Equation 3.1 in the interest of clarity and brevity.

We used the percentile rank of the household's income in place of actual income to mitigate the trends in growth in the economy. There was phenomenal growth in Taiwan between 1977 and 1991, which increased the level of income for all households throughout the income distribution. This means that a middle-income household in 1977 in real terms fell in the bottom of the 1991 income distribution.¹² When pooling households across such a long period of time, using the level of income would confound shifts in the distribution of income over time with cross-sectional differences in income. Using the rank of the household's income within the income distribution for the survey year allows us to focus the analysis on how income is related to cross-sectional differences in rosca participation.

The regressions underlying the calculations in the tables and figures are in the Appendix. The tables and figures report the average participation for a typical household as it varies with the characteristic of interest in each case. We take as a "typical" household, one observed in 1991 with two children, two adults, at least one adult female, someone employed in the (private) manufacturing sector only, a household head who is age 45, and household income in the 60–65 percentile range of the income distribution. In each table and figure we take the predicted level of participation for this household and calculate how varying a particular characteristic alters the level of rosca participation. This traces out the marginal correlation of that characteristic with rosca participation, holding other character-

⁹ The head is the person who makes the most money, typically the husband.

¹⁰ Below, we also report regression results where the cohort (i.e. birth year) of the household head is included instead of the current age.

¹¹ One specification used a count of the number of people in each category. Another used a full set of dummies for the number of people in each occupation and for the number of women in the household.

¹² The income of a household at the median of the 1977 income distribution in real terms was equal to the income of a household in about the fifth percentile of the 1991 income distribution. The ninetieth percentile income for 1977 equated to about the twenty-fifth percentile income for 1991.

Table 1
ROSCA participation by household gender composition

Households with at least one woman	32.8
Households without any women	29.3
Difference between households with and without women	3.5 ** (5.95)

T-statistic in parenthesis. ** Significant, using Schwarz criterion.

istics constant. Because we have such a large sample, in the tables we use the Schwarz criterion to determine statistical significance (Schwarz, 1978).¹³

Since we do not take a firm stance on a structural model, it is possible that some of the right hand side variables in Equation 3.1 are jointly determined with rosca participation. This might be the case if individuals choose their occupations in order to join rosca's, or if rosca's give access to profitable opportunities which increase their incomes. Again, this reinforces the interpretation of our results essentially as correlations, with possible causal interpretations. However, in no sense are the latter proven by what we do.

3.2. Gender

There is ample evidence from the anthropological literature on rosca's that they provide an important source of access to finance for women in a number of countries (Ardener, 1964, pp. 203–208). Whether this is true for Taiwan is explored in Table 1. There it is shown that, all else equal, households with women (age fifteen and over) have higher levels of participation by about four percentage points.¹⁴ Viewing this difference as representative of differential access, it may be that women's social networks are stronger than men's, leading to more viable enforcement mechanisms for rosca participation. The alternate perspective from which to view this gender differential is that women's demand for rosca participation may be greater. This squares with the idea that women face fewer opportunities than men in formal financial markets.

3.3. Occupation

The results for occupation are reported in Table 2.¹⁵ The calculations in the first column are from a regression that combines all workers within each occupation. The remaining columns are from a regression that breaks down each occupation by public versus private sector employment. The bottom row of the

¹³ The Schwarz criterion critical value for the *t* test is given by $\sqrt{\ln N}$, where *N* is the sample size.

¹⁴ Sensitivity analysis using separate dummy variables for the numbers of women in different-sized households showed that the level of participation is roughly the same, conditional on having at least one woman in the household.

¹⁵ Sensitivity analysis using count variables and separate dummy variables for the numbers of workers in each occupation in the household yielded similar results.

Table 2
ROSCA participation by occupation

Mean participation by whether anyone in the household works in the following occupation:	All sectors	Public sector	Private sector	Public–private sector
Professional or technical	31.5	33.9	27.8	6.1 ** (11.2)
Administrative or managerial	26.9	25.1	27.2	–2.1 (1.81)
Clerical	31.5	33.3	29.8	3.4 ** (9.15)
Sales	30.8	33.2	30.7	2.5 (1.39)
Service	31.6	33.2	30.7	2.6 ** (4.52)
Production	32.8	35.2	32.5	2.7 ** (5.23)
Transportation equipment operator	32.7	33.7	32.3	1.4 (1.53)
Laborer	29.2	30.0	28.9	1.1 (0.87)
Agricultural, forestry, or fishery	28.6	34.3	28.2	6.0 (3.45)
Military	29.3	29.2	—	—
None	29.7	—	29.3	—

T-statistics in parentheses. ** Significant, using the Schwarz criterion.

table, first column, reports the average participation for households with no working members, which is 29.7%. This figure should be interpreted with some caution, as we have no information on the occupational history of the household prior to the survey year. The remaining rows report the average participation for a household with at least one member working in that occupation (and no other occupation).

Because the calculations hold income constant, the differences between occupations seem likely to reflect the influence of income/job stability on rosca participation. There are two principal reasons to expect income stability to be important. First, a more stable income stream means a greater ability to meet the obligations of a rosca. Second, more stable occupations leave people with more time to develop the social ties necessary to evaluate each other's worthiness as potential rosca members.

The results from the first column (not differentiating by public versus private sector) are broadly consistent with these hypotheses. As might be expected, households whose working members consist only of laborers or people working in agriculture/forestry/fishing have relatively low rates of participation. These are archetypically unstable occupations. Income seasonality and covariate risk may also serve as impediments to rosca formation in these sectors. Among farmers,

there may also be access to more formal sources of credit. The results for the administrative/managerial occupation are puzzling. *A priori*, one might expect that this would be a relatively stable occupation; yet the participation rate for households with someone employed only in this occupation is the lowest among all occupations (and is statistically significantly different from the other occupations).

The estimates in the remaining columns show that the differences exhibited in the first column partly mask a significant difference in participation between private and public sector workers. Most notably, professional/technical workers as a group have above average participation rates (column one). However, this is principally due to higher rates of participation among public sector workers in that occupation (column two). It is the *private sector* professional/technical workers who actually have one of the lowest rates of participation (column three). It is possible that, in light of their occupations, they are favored in getting access to formal financial institutions. Interestingly, the second column also shows that the two private sector occupations with the highest rates of rosca participation are production workers and transportation equipment operators. Average tenure for these workers is relatively low, so it is doubtful that greater stability is the reason these occupations have greater rosca participation.¹⁶

Stability does, however, seem to be an important factor in explaining the public–private sector differences. The final column shows that, for all occupations but one, rosca participation for households with public sector workers is higher than their private sector counterparts. For four of the nine occupations the difference is statistically significant. Public sector jobs in Taiwan, as in most countries, are more secure than private sectors jobs. We view this as evidence that, controlling for the level of income (as all of these results do), income stability is important for rosca participation. However, the difference between the public and private sectors does seem to be much more important than differences between occupations within each sector.

3.4. Income

Fig. 1 graphs the difference in rosca participation for the "typical" household as a function of its position in the income distribution. Clearly, rosca participation is a normal good: The rate for each income bracket (five percentile group) is roughly 1.5–2.0 percentage points higher than the one below it.

It is possible for income-based differences in rosca participation to be driven entirely by differential access rates. First, households with higher incomes are less

¹⁶ Published summary data from the Manpower Utilization Surveys (Republic of China, various years) show that average tenure for the combined category of production workers, transportation equipment operators, and laborers is lower than for all other occupations. It is doubtful that this is entirely an artifact of the inclusion of laborers—a casual occupation with high turnover—in the calculation.

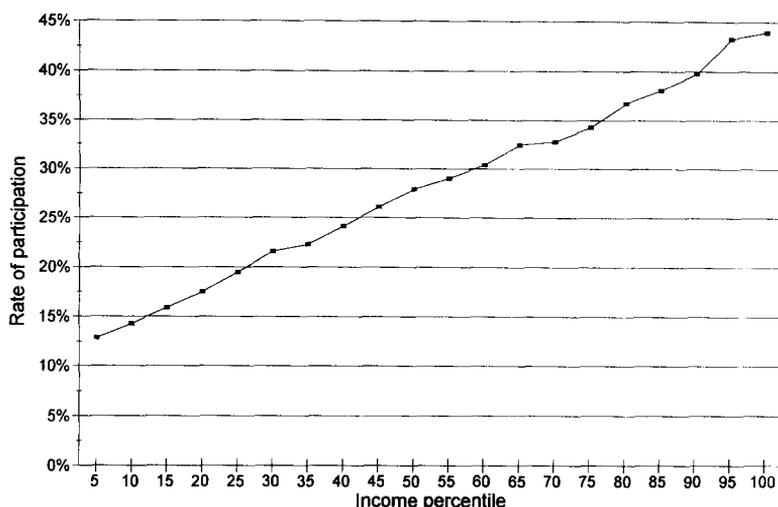


Fig. 1. Participation by income percentile.

likely to default if they are more easily able to absorb shocks to their incomes or health: the trade-off between meeting a rosca obligation and buying food to eat is less acute. Second, it appears likely that higher income households have more accumulated assets, which also makes them more reliable as contributors to rosca.

On the demand side, the lowest-income households tend to spend larger fractions of their incomes on subsistence consumption. The demand for durable goods—and for rosca participation, too—should increase with income. Savings, for any given interest rate, should also be a normal good. This again will tend to make rosca participation increase with income.

3.5. Life cycle effects

There are a number of different factors that could cause rosca participation to vary over the life cycle. Older individuals tend to be less mobile and have had potential to develop more long-standing relationships with other people. Thus their access to rosca may be greater than it is for younger people. In addition, their demand for rosca as a savings vehicle may be higher. On the other hand, their demand for participation to fund durables purchase may be lower.

Fig. 2 shows that rosca participation is highest at young ages. (Here we define the age of the household by the age of the household head.) Participation is relatively constant in the late 20s into the early 30s, where it starts to drop off steadily. It is at young ages when many households are formed, leading to high demand for durables. In light of our earlier results showing a link between rosca participation and durables purchase (Besley and Levenson, 1996), we interpret this as consistent with such households being at the peak ages of durables acquisition. Roscas may also be commonly used as a savings device for housing purchases

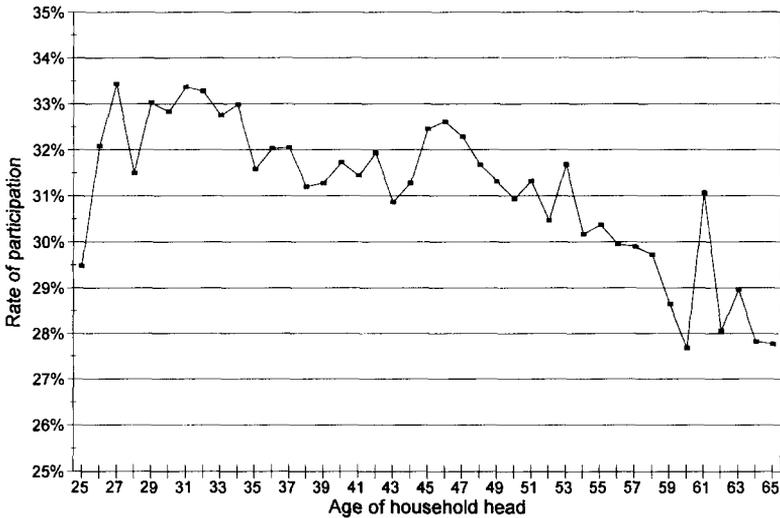


Fig. 2. Life cycle differences.

(particularly for down payments). We would expect rosca demand to fall off throughout the life cycle as more and more people acquired their own homes.¹⁷ Roscas might also be used to earn high returns for old age savers. The fall in participation at older ages suggests, however, that rosca may not be used primarily as a savings source in this regard. Even though older households have higher levels of savings (Deaton and Paxson, 1994), Taiwanese families are still fairly reliant on traditional methods of old age support.

3.6. Generational differences

There has been significant modernization in the Taiwanese economy in recent decades. Roscas are a traditional institution, and it is instructive to examine the generational pattern of participation. This can provide some insight on the rate at which younger households may be switching to other forms of financial intermediation. One might suspect that rosca are a kind of social capital which belongs predominantly to older, more traditional households. This view appears, however, to be contrary to the evidence.

A comparison of cohort differences suggests that it is the younger generations

¹⁷ Since the time frame for rosca is relatively short (usually no more than a couple of years in Taiwan), and the amount of money needed to purchase a house is quite large, it might seem doubtful that rosca would be used for this purpose. A private communication with a rosca participant revealed this motivation, however. The participant used multiple successive rosca as a savings device until she had accumulated enough funds to buy an apartment.

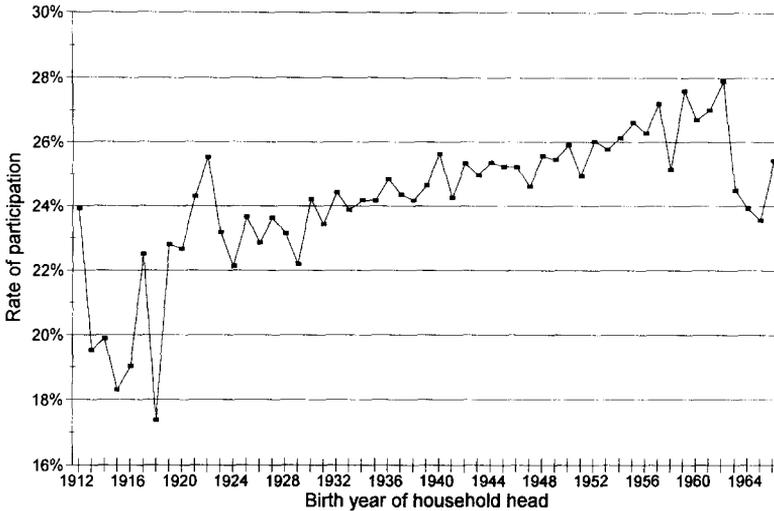


Fig. 3. Generational differences.

who are somewhat keener on rosca participation. This is illustrated in Fig. 3.¹⁸ From Fig. 3 it is apparent that rosca participation is higher for the younger cohorts: The youngest cohorts have a participation rate about four percentage points higher than the oldest cohorts.

One possible explanation for this counter-intuitive result is based on the demand for rosca participation. Younger generations are typically quicker to embrace life-styles that include new consumer durables. They might join roscas in order to lower the cost of saving up for these. A second explanation is that this pattern might represent generational differences in savings behavior, with younger generations saving more than older ones. Indeed, savings rates (measured as the difference between current income and consumption) are highest for the youngest cohorts (Deaton and Paxson, 1994).

A final explanation for the generational differences may be related to permanent income. Income growth in Taiwan has been quite rapid in recent years. All of our calculations were done using current income. In a rapidly growing economy, current income will systematically understate permanent income, and more so for younger generations. Thus the generational differences in Fig. 3 may partly reflect the relationship between (permanent) income and participation. We believe that all three of these factors are relevant for explaining inter-generational differences in rosca participation.

¹⁸ Here the "typical" household is the same as above with respect to the characteristics held constant. The estimates in Fig. 3 were derived by substituting cohort for age dummies in Equation 3.1. Since $cohort = time - age$, not all three effects can be estimated at the same time. Substituting cohort for age, however, has virtually no effect on the other coefficient estimates.

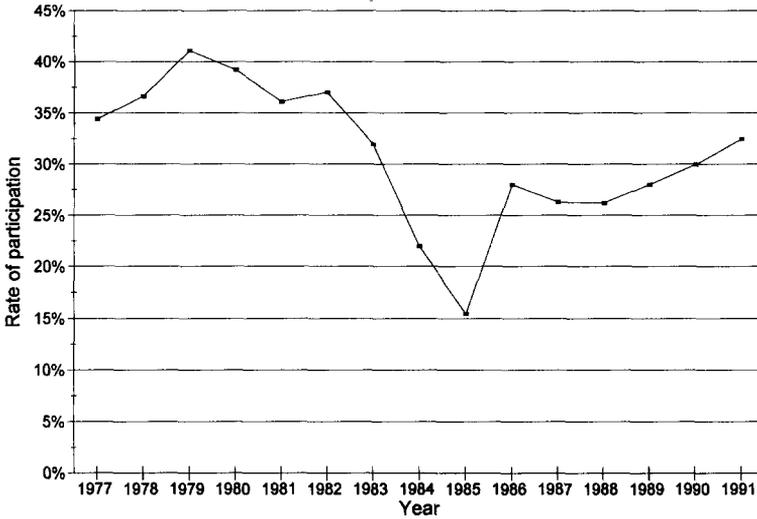


Fig. 4. Rosca participation over time.

3.7. Changes over time

Fig. 4 shows the distinct pattern of rosca participation over time in Taiwan.¹⁹ Particularly striking is the sharp drop in participation during 1984–1985, and subsequent quick recovery in 1986. There were a couple of large-scale failures in the informal financial markets during this time. The first event happened in November 1983, when there was a huge collapse in the rosca market (Mao, 1985). The second event was the February 1985 failure of the Tenth Credit Cooperative, Taiwan's largest credit union at the time. As discussed in our earlier paper (Besley and Levenson, 1996), these events contributed to general informal sector market instability and calls for government regulation. In the end, such regulation never materialized. By 1991, the level of rosca participation had recovered to the point where it stood only slightly below that seen in 1977.

Concerned by the pronounced time pattern in rosca participation, we tested the robustness of the rosca participation regression before 1983 and after 1985. Of primary concern is that—comparing 1977–1982 with 1986–1991—there appears to have been a discrete jump down in participation. The vast majority of the demographic patterns detailed above were robust to splitting the sample this way. One important exception, however, was the relationship between income and rosca participation. Fig. 5 contains the graphs of participation by income percentile for

¹⁹ The estimates in Fig. 4—and for the remainder of the paper—are based on the regressions including age effects. Substituting cohort for age effects does not alter the conclusions.

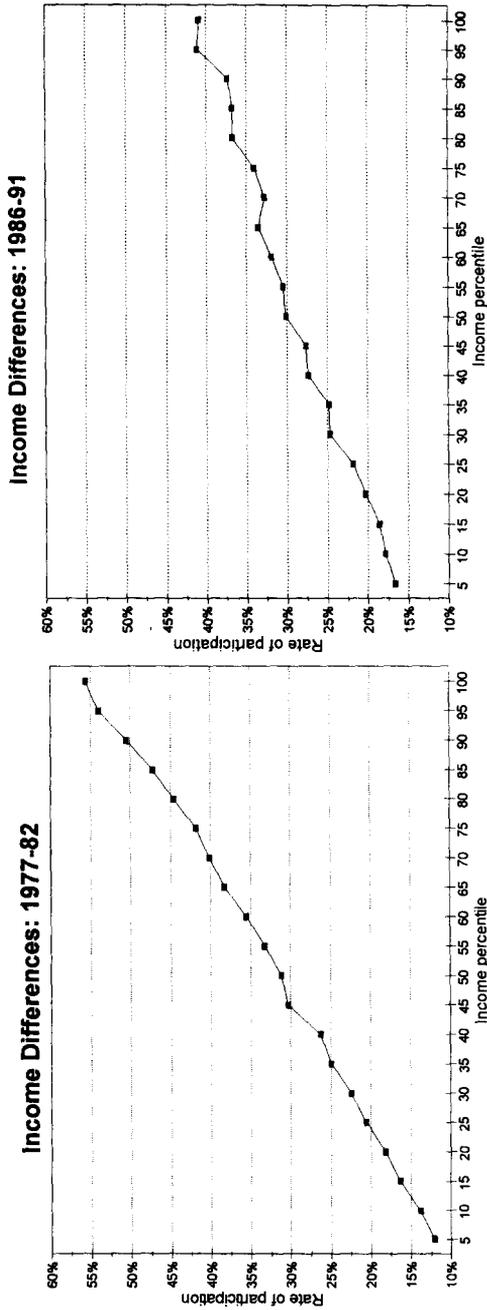


Fig. 5. The change in Rosca participation by income: 1977–1982 versus 1986–1991.

the two different periods.²⁰ Note that participation among higher-income households is much more pronounced in the early period. In particular, participation at the low end of the income distribution was relatively unchanged.

One interesting feature of the informal financial sector collapses is that they may have engendered a large—though perhaps temporary—shift of funds into the formal banking sector. Particularly noteworthy is the following account:

"According to a survey by a unit of the London-based brokerage house Vickers da Costa (Holdings) PLC, new deposits at Taiwan's post offices rose to about \$ 300 million in the two weeks after Tenth Credit's collapse from a previous average of \$ 125 million. The underground banks, however, have fought back by raising their interest rates." (Wall Street Journal, 1985)

Roscas are only one part of the informal financial sector in Taiwan (underground finance companies and post-dated checks are two other integral components), so it is impossible to determine definitively whether such funds came from rosca participants. It does, however, seem quite likely that at least part of the inflow of funds into the banking system represented rosca disintermediation. The collapses in 1983–1985 might have caused people who used roscas as a savings vehicle to revise upward their estimates of the risk involved. Faced with a lower risk-adjusted rate of return, they would then have shifted part or all of their portfolios to the safer, government-run banks. Viewed this way, the lower participation in 1986–1991 on the part of higher-income households may represent a portfolio shift from the informal to the formal sector.

4. Conclusions

The informal financial sector is such an important part of many economies, that it cannot be ignored. Yet, we know very little about how it operates in many countries. This paper provides a picture of participation in an informal financial market using a nationally representative household sample for Taiwan. The aim has been mainly to assemble some basic facts concerning who participates in roscas and how this changes over time and with age. While we have not proposed a specific theoretical model of rosca participation, a good deal of the evidence is consistent with sensible theoretical precepts.

Perhaps most surprising in our study is the fact that participation increases with income. It is therefore not correct to view this market as an enclave for the economically disadvantaged, but rather as a rational response to failings (perhaps owing to heavy handed government regulation) of the formal sector. We cannot rule out, however, the possibility that tax evasion and rosca participation are intimately linked. Either way, this finding is of interest and is of potential policy significance.

²⁰ In the early period, the year of observation for the "typical" household is 1982; for the later period it is 1991.

Acknowledgements

We would like to thank Catherine Mansell-Carstens and Elaine Reardon for helpful comments. Gina Franco, Selin Yalcindag and Cynthia Zoghi provided impeccable research assistance. Other than that, all blame lies with us.

Appendix

Table A.1

Regression results using age and time dummies, all years

Variable	No public sector interactions		With public sector interactions	
	Coef.	T-stat.	Coef.	T-stat.
<i>Income percentile:</i>				
5– 9	0.015	2.76	0.14	2.61
10– 14	0.032	5.75	0.030 **	5.48
15– 19	0.048 **	8.56	0.046 **	8.23
20– 24	0.069 **	12.1	0.066 **	11.7
25– 29	0.090 **	15.7	0.087 **	15.3
30– 34	0.097 **	16.9	0.095 **	16.5
35– 39	0.116 **	20.1	0.113 **	19.6
40– 44	0.136 **	23.5	0.133 **	23.0
45– 49	0.154 **	26.5	0.151 **	25.9
50– 54	0.165 **	28.3	0.162 **	27.7
55– 59	0.179 **	30.7	0.176 **	30.0
60– 64	0.200 **	34.0	0.196 **	33.3
70– 74	0.218 **	36.8	0.214 **	36.0
75– 79	0.244 **	40.7	0.239 **	39.8
80– 84	0.258 **	42.7	0.252 **	41.7
85– 89	0.276 **	45.2	0.269 **	44.0
90– 94	0.312 **	50.2	0.304 **	48.8
95–100	0.318 **	49.8	0.311 **	48.6
<i>Number of children:</i>				
1	0.011 **	4.26	0.011 **	4.06
2	0.019 **	7.31	0.018 **	6.96
3	0.018 **	5.99	0.018 **	5.88
4	-0.002	-0.49	-0.002	-0.45
5	-0.023	-3.17	-0.022	-3.10
6	-0.013	-0.95	-0.012	-0.90
7	0.033	1.30	0.033	1.28
8 or more	-0.050	-1.54	-0.051	-1.57
<i>Number of adults:</i>				
2	0.004	0.70	0.003	0.60
3	-0.027 **	-4.71	-0.027 **	-4.72
4	-0.049 **	-8.11	-0.048 **	-8.06
5	-0.072 **	-11.3	-0.070 **	-11.0
6	-0.088 **	-12.6	-0.086 **	-12.2
7	-0.109 **	-12.6	-0.106 **	-12.2
8	-0.117 **	-9.79	-0.114 **	-9.49
9 or more	-0.130 **	-8.10	-0.125 **	-7.81
Any women in household	0.035 **	5.95	0.035 **	5.98
<i>Any worker employed as:</i>				
Professional or technical	0.018 **	5.39	-0.015	-3.29
In public sector	—	—	0.061 **	11.2
Administrative or managerial	-0.028 **	-6.73	-0.021 **	-4.71

In public sector	—	—	-0.021	-1.81
Clerical	0.018 **	7.12	0.005	1.71
In public sector	—	—	0.034 **	9.15
Sales	0.011 **	4.19	0.014 **	5.34
In public sector	—	—	0.025	1.39
Service	0.019 **	6.45	0.014 **	4.18
In public sector	—	—	0.026 **	4.52
Production	0.031 **	14.4	0.031 **	14.4
In public sector	—	—	0.027 **	5.23
Transportation equipment operator	0.029 **	8.11	0.030 **	7.75
In public sector	—	—	0.014	1.53
Laborer	-0.005	-1.27	-0.004	-0.89
In public sector	—	—	0.011	0.87
Agricultural, forestry, or fishery	-0.011 **	-4.75	-0.011 **	-4.42
In public sector	—	—	0.060	3.45
Military	-0.004	-0.65	-0.002	-0.027
Other/ unclassified occupation	-0.048	-0.55	-0.043	-0.50
<i>Year:</i>				
1978	0.023 **	4.29	0.023 **	4.21
1979	0.067 **	12.5	0.067 **	12.5
1980	0.048 **	9.15	0.048 **	9.15
1981	0.017	3.33	0.017	3.29
1982	0.026 **	4.97	0.026 **	5.05
1983	-0.025 **	-4.83	-0.024 **	-4.73
1984	-0.125 **	-24.0	-0.124 **	-23.9
1985	-0.190 **	-36.7	-0.189 **	-36.5
1986	-0.065 **	-12.6	-0.064 **	-12.3
1987	-0.083 **	-15.9	-0.081 **	-15.6
1988	-0.083 **	-16.0	-0.082 **	-15.7
1989	-0.066 **	-12.6	-0.064 **	-12.2
1990	-0.047 **	-8.91	-0.044 **	-8.51
1991	-0.022 **	-4.11	-0.019 **	-3.70
<i>Age of household head:</i>				
26	0.007	0.84	0.007	0.78
27	0.020	2.43	0.020	2.44
28	0.001	0.17	0.001	0.11
29	0.017	2.15	0.016	2.03
30	0.015	1.92	0.014	1.81
31	0.021	2.68	0.020	2.52
32	0.020	2.62	0.019	2.39
33	0.015	1.93	0.013	1.72
34	0.017	2.23	0.016	2.01
35	0.004	0.46	0.002	0.22
36	0.008	1.05	0.006	0.79
37	0.008	1.05	0.006	0.80
38	0.000	0.01	-0.002	-0.27
39	0.001	0.17	-0.001	-0.17
40	0.006	0.72	0.003	0.39
41	0.003	0.35	0.000	0.04
42	0.008	1.00	0.005	0.65
43	-0.002	-0.29	-0.005	-0.66
44	0.002	0.20	-0.001	-0.16
45	0.013	1.62	0.010	1.27
46	0.015	1.84	0.012	1.46
47	0.012	1.43	0.009	1.06
48	0.009	1.14	0.006	0.75
49	0.002	0.28	-0.001	-0.12

50	-0.002	-0.19	-0.005	-0.57
51	0.002	0.28	-0.001	-0.11
52	-0.006	-0.71	-0.009	-1.11
53	0.006	0.72	0.003	0.31
54	-0.009	-1.02	-0.012	-1.42
55	-0.006	-0.72	-0.010	-1.17
56	-0.011	-1.21	-0.015	-1.63
57	-0.010	-1.14	-0.015	-1.67
58	-0.013	-1.36	-0.017	-1.83
59	-0.024	-2.49	-0.028	-2.92
60	-0.033	-3.42	-0.037 **	-3.82
61	-0.000	-0.04	-0.004	-0.35
62	-0.030	-2.94	-0.034	-3.24
63	-0.022	-2.05	-0.025	-2.31
64	-0.033	-2.97	-0.036	-3.26
65	-0.035	-2.99	-0.036	-3.10
Constant	0.047 **	5.17	0.049 **	5.35
Adjusted R ²	0.086		0.088	

** Significant using Schwarz criterion (critical value = 3.5). Each regression has 212,046 observations.

Table A.2
Regression results using cohort and time dummies, all years

Variable	Coef.	T-stat.
<i>Income percentile:</i>		
5– 9	0.015	2.77
10– 14	0.032 **	5.75
15– 19	0.048 **	8.48
20– 24	0.068 **	12.0
25– 29	0.089 **	15.6
30– 34	0.096 **	16.8
35– 39	0.115 **	19.9
40– 44	0.135 **	23.3
45– 49	0.152 **	26.3
50– 54	0.164 **	28.1
55– 59	0.177 **	30.4
60– 64	0.198 **	33.7
65– 69	0.201 **	34.1
70– 74	0.216 **	36.4
75– 79	0.240 **	40.2
80– 84	0.254 **	42.0
85– 89	0.271 **	44.3
90– 94	0.305 **	49.1
95–100	0.312 **	48.8
<i>Number of children:</i>		
1	0.011 **	4.29
2	0.019 **	7.34
3	0.018 **	6.23
4	-0.002	-0.52
5	-0.023	-3.23
6	-0.014	-1.00
7	0.032	1.25
8 or more	-0.052	-1.62
<i>Number of adults:</i>		
2	0.003	0.56
3	-0.027 **	-4.69
4	-0.047 **	-7.91
5	-0.068 **	-10.8
6	-0.084 **	-12.0

7	-0.104 **	-12.1
8	-0.112 **	-9.37
9 or more	-0.123 **	-7.72
Any women in household	0.036 **	6.13
<i>Any worker employed as:</i>		
Professional or technical	-0.015	-3.32
In public sector	0.062 **	11.3
Administrative or managerial	-0.020 **	-4.63
In public sector	-0.022	-1.85
Clerical	0.005	1.69
In public sector	0.034 **	9.12
Sales	0.014 **	5.37
In public sector	0.025	1.40
Service	0.014 **	4.17
In public sector	0.026 **	4.51
Production	0.032 **	14.5
In public sector	0.027 **	5.23
Transportation equipment operator	0.030 **	7.75
In public sector	0.014	1.60
Laborer	-0.004	-0.82
In public sector	0.010	0.83
Agricultural, forestry, or fishery	-0.011 **	-4.37
In public sector	0.060	3.47
Military	-0.000	-0.05
Other/ unclassified occupation	-0.046	-0.54
<i>Year:</i>		
1978	0.021 **	4.00
1979	0.065 **	12.1
1980	0.045 **	8.42
1981	0.013	2.39
1982	0.020 **	3.84
1983	-0.031 **	-6.01
1984	-0.132 **	-25.2
1985	-0.199 **	-37.8
1986	-0.075 **	-14.1
1987	-0.093 **	-17.5
1988	-0.094 **	-17.6
1989	-0.077 **	-14.3
1990	-0.058 **	-10.7
1991	-0.033 **	-6.13
<i>Birth year of household head:</i>		
1913	-0.019	-0.59
1914	-0.015	-0.50
1915	-0.009	-0.32
1916	0.025	0.88
1917	0.016	0.57
1918	0.013	0.46
1919	0.022	0.79
1920	-0.003	-0.11
1921	0.018	0.65
1922	0.009	0.32
1923	0.012	0.44
1924	0.007	0.26

1925	0.003	0.13
1926	0.006	0.22
1927	-0.005	-0.18
1928	0.005	0.18
1929	0.000	0.01
1930	0.001	0.05
1931	-0.008	-0.30
1932	-0.002	-0.08
1933	-0.002	-0.07
1934	-0.001	-0.03
1935	-0.005	-0.17
1936	-0.001	-0.04
1937	-0.012	-0.43
1938	0.002	0.07
1939	-0.008	-0.29
1940	-0.012	-0.46
1941	-0.011	-0.39
1942	-0.006	-0.22
1943	-0.013	-0.46
1944	-0.013	-0.46
1945	-0.015	-0.57
1946	-0.010	-0.37
1947	-0.020	-0.74
1948	-0.012	-0.45
1949	-0.032	-1.19
1950	-0.023	-0.84
1951	-0.018	-0.66
1952	-0.026	-0.94
1953	-0.018	-0.65
1954	-0.033	-1.19
1955	-0.023	-0.81
1956	0.001	0.03
1957	-0.011	-0.40
1958	-0.028	-0.96
1959	-0.026	-0.89
1960	-0.081	-2.66
1961	-0.029	-0.95
1962	-0.064	-1.96
1963	-0.071	-2.08
1964	-0.056	-1.44
1965	-0.059	-1.34
1966	-0.015	-0.24
Constant	0.061	2.22
Adjusted R ²	0.087	

** Significant using Schwarz criterion (critical value = 3.5). Each regression has 212046 observations.

Table A.3
Regression results using age and time dummies, 1977–1982, and 1986–1991

Variable	1977–1982		1986–1991	
	Coef.	T-stat.	Coef.	T-stat.
<i>Income percentile:</i>				
5– 9	0.018	1.77	0.012	1.44
10– 14	0.042 **	4.20	0.019	2.29
15– 19	0.061 **	5.99	0.037 **	4.27
20– 24	0.085 **	8.27	0.052 **	6.01
25– 29	0.104 **	10.0	0.081 **	9.30
30– 34	0.129 **	12.4	0.082 **	9.34
35– 39	0.142 **	13.6	0.107 **	12.2
40– 44	0.182 **	17.5	0.110 **	12.5

45– 49	0.190 **	18.2	0.135 **	15.2
50– 54	0.211 **	20.1	0.138 **	15.5
55– 59	0.234 **	22.1	0.152 **	17.1
60– 64	0.262 **	24.7	0.169 **	18.8
65– 69	0.281 **	26.3	0.161 **	17.9
70– 74	0.297 **	27.7	0.174 **	19.2
75– 79	0.325 **	30.1	0.200 **	21.9
80– 84	0.351 **	32.2	0.201 **	21.8
85– 89	0.385 **	34.8	0.207 **	22.1
90– 94	0.419 **	37.3	0.245 **	25.8
95–100	0.435 **	37.4	0.242 **	24.9
<i>Number of children:</i>				
1	0.009	1.94	0.014 **	3.65
2	0.011	2.32	0.030 **	7.69
3	0.001	0.27	0.040 **	8.58
4	-0.021	-3.17	0.032 **	4.53
5	-0.033	-3.10	-0.003	-0.19
6	-0.020	-1.00	-0.009	-0.32
7	0.005	0.11	0.110	2.40
8 or more	-0.136	-2.97	0.095	1.32
<i>Number of adults:</i>				
2	-0.001	-0.13	0.002	0.22
3	-0.034	-3.00	-0.030 **	-3.66
4	-0.065 **	-5.58	-0.048 **	-5.67
5	-0.089 **	-7.24	-0.071 **	-7.72
6	-0.113 **	-8.44	-0.081 **	-7.84
7	-0.139 **	-8.91	-0.116 **	-8.56
8	-1.45 **	-7.03	-0.099 **	-4.94
9 or more	-0.155 *	-6.06	-0.126 **	-4.23
Any women in household	0.045 **	3.95	0.033 **	3.93
<i>Any worker employed as:</i>				
Professional or technical	-0.002	-0.22	-0.010	-1.60
In public sector	0.051 **	5.02	0.070 **	8.57
Administrative or managerial	-0.004	-0.50	-0.021	-3.21
In public sector	-0.038	-1.83	-0.025	-1.40
Clerical	0.022 **	3.81	0.007	1.57
In public sector	0.028 **	4.06	0.041 **	7.25
Sales	0.023 **	4.69	0.019 **	5.04
In public sector	0.063	1.88	0.027	1.03
Service	0.022 **	3.39	0.019 **	4.11
In public sector	0.025	2.36	0.027	3.19
Production	0.029 **	7.14	0.049 **	14.8
In public sector	0.030	3.33	0.034 **	4.18
Transportation equipment operator	0.041 **	5.58	0.025 **	4.40
In public sector	0.025	1.60	0.012	0.86
Laborer	0.020	2.54	-0.024 **	-3.66
In public sector	0.008	0.38	0.004	0.19
Agricultural, forestry, or fishery	-0.020 **	-4.57	0.012	3.29
In public sector	0.099 **	3.75	0.023	0.69
Military	-0.016	-1.68	0.021	2.06
Other/ unclassified occupation	-0.013	-0.08	-0.162	-0.74
<i>Year:</i>				
1978	0.021 **	3.63	—	—

1979	0.066 **	11.3	—	—
1980	0.047 **	8.11	—	—
1981	0.016	2.78	—	—
1982	0.025 **	4.43	—	—
1987	—	—	-0.016 **	-3.72
1988	—	—	-0.016 **	-3.74
1989	—	—	0.002	0.48
1990	—	—	0.022 **	5.05
1991	—	—	0.048 **	10.9
<i>Age of household head:</i>				
26	0.011	0.73	-0.000	-0.02
27	0.012	0.82	0.026	1.93
28	-0.010	-0.75	0.000	0.03
29	0.001	0.05	0.026	2.02
30	0.006	0.45	0.019	1.55
31	0.001	0.08	0.025	2.08
32	0.026	1.88	0.012	0.99
33	0.009	0.63	0.013	1.10
34	0.002	0.12	0.025	2.10
35	-0.013	-0.94	0.005	0.40
36	0.010	0.70	0.004	0.34
37	0.020	1.37	-0.001	-0.08
38	0.002	0.13	-0.007	-0.53
39	-0.021	-1.46	0.014	1.16
40	-0.000	-0.03	0.002	0.19
41	0.007	0.45	-0.008	-0.60
42	-0.000	-0.03	-0.001	-0.05
43	-0.015	-1.01	0.004	0.27
44	-0.015	-1.03	0.010	0.78
45	0.006	0.39	0.017	1.31
46	0.002	0.12	0.021	1.63
47	0.009	0.65	0.006	0.46
48	0.003	0.18	0.015	1.09
49	-0.020	-1.37	0.020	1.50
50	-0.015	-1.03	0.002	0.14
51	-0.014	-0.93	0.013	0.95
52	-0.027	-1.85	-0.000	-0.02
53	-0.005	-0.34	0.015	1.10
54	-0.015	-1.01	-0.008	-0.53
55	-0.016	-1.04	-0.003	-0.20
56	-0.031	-1.93	-0.015	-1.05
57	-0.031	-1.89	-0.009	-0.64
58	-0.020	-1.17	-0.026	-1.81
59	-0.031	-1.76	-0.030	-2.06
60	-0.036	-1.95	-0.044	-2.96
61	-0.011	-0.55	-0.009	-0.60
62	-0.049	-2.45	-0.030	-1.98
63	-0.059	-2.80	-0.019	-1.20
64	-0.073 **	-3.35	-0.030	-1.89
65	-0.074	-3.15	-0.033	-2.00
Constant	0.006	0.40	-0.013	-0.96
Adjusted R^2	0.098		0.053	

** Significant using Schwarz criterion, critical levels are 3.35 for the 1977–1982 regression, and 3.38 for the 1986–1991 regression. The 1977–1982 regression has 76496 observations, and the 1986–1991 regression has 90042 observations.

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