

Newman, Carol; Tarp, Finn; Van Den Broeck, Katleen

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Social Capital, Network Effects and Savings in Rural Vietnam

Carol Newman¹, Finn Tarp² and
Katleen Van Den Broeck³

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Abstract

Information failures are a major barrier to formal financial saving in low income countries. Households in rural communities often lack the information necessary to set up formal deposit accounts or are uncertain about the returns to saving formally. In this paper, we explore the extent to which social networks in rural Vietnam can play a role in increasing formal savings where knowledge gaps exist. Networks are defined as active membership of women's unions and the quality of networks is measured by the level of formal savings observed among group members. We find that membership of high quality networks leads to higher levels of saving in formal financial institutions .../

Keywords: household savings, social capital, information failure, women's unions, Vietnam

JEL classification: D14, D71, D83, O12

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¹ Department of Economics, Trinity College Dublin, Ireland (cnewman@tcd.ie), ² Department of Economics, University of Copenhagen, Denmark and UNU-WIDER (Finn.Tarp@econ.ku.dk) and ³ Department of Economics, University of Copenhagen, Denmark.

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and to higher levels of saving for productive investments as compared with other precautionary or lifecycle motives. Our results suggest that transmitting financial information through formal networks could be effective in increasing formal savings at grassroots level. We also conclude that ensuring information disseminated by networks is both accurate and desirable as well as important given that behavioural effects are also found in low-quality networks.

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UNU World Institute for Development Economics Research (UNU-WIDER)

Katajanokanlaituri 6 B, 00160 Helsinki, Finland

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1 Introduction

In this paper we examine the role that social capital can play in correcting for financial market failures in rural communities in Vietnam. Such failures may lead to sub-optimal behaviour as households choose either not to save or to save in a low-yielding form, for example, cash held at home. In particular, we explore the role of social networks in the form of women's group membership in correcting for information failures whereby savings choices are informed by group members.

We are motivated by two separate considerations. First, household savings, whether formal or informal, are an important determinant of welfare.¹ Second, a key challenge for developing countries is to increase the share of savings that are held formally. For low-income households there are many barriers to accessing savings accounts in formal financial institutions. Poor households are therefore more likely to save money as cash held at home (Banerjee and Duflo 2007). This is an insecure form of saving that does not yield a return which is sub-optimal.

Arguably, one of the most difficult challenges in increasing formal savings is correcting for information failures.² In some cases, these can be effectively eliminated at local level rather than requiring costly state-wide policies; it is well established in the literature that risk-sharing among social groups through a system of transfers and loans is an important mechanism for risk coping among the rural poor (Coate and Ravallion 1993; Townsend 1994; Udry 1994; Foster and Rosenzweig 2001; Ligon et al. 2002).³ However, information transmission mechanisms such as social networks aimed at facilitating formal savings are much less understood.⁴

Informal networks may act as a substitute for formal institutions where the latter are weak.⁵ In particular, they can facilitate information sharing and efficient exchanges by

¹ For example, savings act as an important buffer against income shocks and facilitates consumption smoothing (Deaton 1992; Wainwright and Newman 2011).

² Physical distance to savings institutions is another important barrier. For example, Rosenzweig (2001) finds that the proximity of formal financial institutions crowds out other informal insurance arrangements. Other barriers include high opening balance requirements and minimum deposit amounts, complicated and unclear procedures, costs associated with travelling to the institution and impersonal or unfriendly service (ILO 2007).

³ For example, through either establishing informal savings and credit groups to substitute for the formal market, through the effective operation of local insurance and credit markets where savings are primarily precautionary, or through the sharing of information and expertise on the merits of formal saving and the process involved in setting up a savings account.

⁴ Some recent studies include Guiso et al. (2004) who find that in high social capital areas households are more likely to invest more in stock than in cash. Ballinger et al. (2003) using experimental methods find that social learning improves individuals' ability to solve life cycle precautionary savings models. Cole et al. (2009) using a randomized field experiment in two rural regions of India find that trust and information are important in financial market participation. Most of the empirical literature identifies interpersonal relationships amongst members within villages or communities through conducting detailed surveys (see for example, Conley and Udry [2001], Fafchamps and Lund [2003] and Fafchamps and Gubert [2007] amongst others).

⁵ See Fafchamps (2006) for an overview of the role of social capital in the development process.

eliminating information asymmetries. Bowles and Gintis (2002) also highlight the fact that communities possess private information, which neither the market nor the state has access to, that may allow them to more effectively correct for local market failures. They also suggest that for community governance to work effectively a formal institutional structure that allows the state, markets and communities to collectively govern and interact is required.

Vietnam provides a compelling case study for exploring the role of *formal* social networks in influencing savings behaviour. We hypothesize that membership of women's groups in rural Vietnam is associated with access to information on the merits of formal saving. Accordingly, we analyse the choice of different types of saving, formal versus informal, and how the composition of the portfolio is affected by group membership.

In Vietnam, the state continues to play a dominant role in the functioning of the economy. Under the umbrella of the Communist Party, a variety of socio-political organizations exist that play an important role, both socially and economically, in local communities. These groups follow a hierarchical structure with official leaders at the central, province, district and commune level, managing the activities of the organization and working with members. Since these groups operate under the umbrella of the state, their activities complement government strategies and policies. Women's unions are one of the most prominent of these groups and, along with addressing many social issues locally, such as providing information on family planning and health, they are mandated to work towards facilitating savings and credit teams.⁶

Women's groups are formed on the basis of socio-political ideals and the duties and responsibilities of the members range from fulfilling the duties of a citizen, actively participating in community meetings and mutually supporting the work of the community and the sharing of information. As such, the nature of the organizational structure of these groups suggests that active members at grassroots level are more likely to possess the information necessary to behave in an optimal way, particularly in the case of savings behaviour. Active members regularly interact at meetings and so women's groups are likely to serve as an important information channel, whether through the sharing of information or demonstration effects (social norms).⁷

To test our hypothesis we use a unique and carefully developed dataset for Vietnam. We find that high levels of overall formal saving by women's union members induces other group members to save formally and increases the likelihood that they save for productive purposes. We conclude that these groups serve as an important source of information on the merits of formal saving.

⁶ The Vietnamese Women's Federation has established agreements with the two main state banks in Vietnam (The Vietnam Bank for Social Policy [VBSP] and the Vietnamese Bank for Agriculture and Rural Development [VBARD]) to support savings and credit groups in local communities.

⁷ The literature on network effects suggests that group behaviour can influence individual behaviour through two mechanisms: i) information, where an individual experiences information spillovers as a result of effective group behaviour (Banerjee 1992; Bikhchandani et al. 1992; Foster and Rosenzweig 1995); or ii) social norms, where an individual's preferences are influenced by the behaviour of the group either through directly affecting tastes or through social pressures (Akerlof 1980; Borjas 1995; Bertrand et al. 2000).

The theoretical framework is presented in section 2, followed by the empirical approach in section 3. The data are described in section 4 and the empirical results in section 5. Section 6 concludes.

2 Theoretical framework

The theoretical motivations for household or individual savings have been extensively explored in the literature (see, for example, Gersovitz [1988]⁸ and Browning and Lusardi [1996]). Precautionary motives are particularly relevant in developing countries where income is volatile and other consumption smoothing mechanisms are limited.⁹ Our starting point for analysing precautionary savings follows most of the literature modelling savings behaviour under uncertainty in using a standard inter-temporal allocation model where in each time period the household must decide how much to consume and how much to invest in accumulating assets (including savings) which will act as a buffer against unexpected income shocks (see for example, Deaton [1991, 1992], Fafchamps et al. [1998] and Wainwright and Newman [2011]).

A household's discounted expected utility function is given by

$$U_i = E_t \left[\sum_{t=1}^T \delta^t U_i(C_{it}) \right] \quad (1)$$

where δ is the rate of time preference and $U_i(C_{it})$ is the utility function. We assume that households are risk averse, i.e. $U_i''(C_{it}) < 0$, and have precautionary savings, i.e. $U_i'''(C_{it}) > 0$.¹⁰

In each time period, each household randomly receives income $y_{it}(s_{it})$ which depends on the state of nature s_{it} facing the household in time period t . The state of nature includes all exogenous shocks to income that can affect the whole community (such as a natural disaster) or the individual households (such as the death of the main income earner). Since households are risk averse they accumulate liquid wealth (or precautionary savings) to act as a buffer against such income shocks. Total wealth (liquid) of the household at time t is given by A_{it} which yields a return r_{it} . The

⁸ Gersovitz (1988) groups savings as follows: (1) Life cycle savings, where households consider the relationship between age and income as a savings motive, especially to secure welfare after retirement; (2) Precautionary savings, where households save to protect themselves in the event of shocks; (3) Investment saving, where the saving household is motivated by rates of return or investment opportunities; and (4) Bequest savings, where households save for the future benefit of other persons related to them.

⁹ Fafchamps and Pender (1997) find that while poor households save for both precautionary reasons and to finance investment, particularly where credit is not available, low returns on saving prevent them from investing in profitable investments, in particular, non-divisible larger investments. As such, in most cases precautionary motives prevail as households remain in a poverty trap.

¹⁰ The former is required to ensure that the utility function is concave so households are risk averse, and the latter ensures that the marginal utility function is convex so uncertainty induces precautionary saving.

Bellman equation corresponding to the household's decision problem takes the usual form:

$$V_i(X_{it}, s_{it}) = \max_{A_{it+1}} U_i(X_{it} - A_{it+1}) + \delta_i EV_i[y_i(s_{it+1}) + (1 + r_{it+1})A_{it+1} | s_{it+1}] \quad (2)$$

where $X_{it} = A_t + y_t$ is 'cash-in-hand' and $A_{it+1} \geq 0$, i.e. no borrowing. This model allows for the accumulation and selling of assets to act as a buffer against income shocks.

Following Fafchamps et al. (1998), the distribution of the returns to accumulating assets will depend on the level and composition of A_{it} . We assume that the only way households can insure against income losses due to such shocks is to accumulate savings. Since we are pursuing here the aggregate decision to save and not the decision to choose savings over other forms of insurance against shocks we assume that purchasing formal insurance, borrowing, or accumulating other liquid assets are not possible. We allow for savings of different forms and so the household's wealth portfolio can include cash, gold and jewellery held at home, informal savings held with local rotating credit groups or money lenders, or formal savings held in state and private owned banks.

We extend the model given in (2) to allow for two assets: cash held at home (W_{it}) and formal savings in a financial institution which we call deposits (D_{it}). We assume that the return to holding cash at home is negative ($-\theta$) given the risk of theft.¹¹ For simplicity we assume that this risk is constant across all households. We assume that the perceived return to saving in the form of deposits is a function of the information available to the household at time t , i.e. $\gamma_i(I_{it}) = \gamma_{it}$, where $\gamma_i'(I_{it}) > 0$. This will vary across households depending on how certain or uncertain they are regarding future returns. We assume that the level of certainty depends on how good the information available is. Information can be transmitted to households through social networks, either through the sharing of information or demonstration effects.

Saving in the form of deposits comes at a cost, η_i , which is also a function of the information available to the household, i.e. $\eta_i(I_{it}) = \eta_i$ and $\eta_i(I_{it}) < 0$. These costs include travel costs but could also include the cost of learning how to apply for a savings account or how different types of financial products work (for example, fixed term deposits vs. flexible term deposits). Membership of a social network could reduce these costs by providing households with the relevant information. The combined returns to holding cash at home and deposit savings are given by:

$$(1 + r_{it+1})A_{it+1} = (1 - \theta)(A_{it+1} - D_{it+1}) + (1 + \gamma_{it+1})D_{it+1} - \eta_i D_{it+1} \quad (3)$$

¹¹ The real value of cash held at home can also potentially be eroded from one year to the next due to inflation, and potentially significantly so in typically high inflation developing economies. However, since we also consider holding gold and jewelry as a form of home-saving, and they are often held as a hedge against inflation, this is not likely to be the case for all forms of home-saving considered.

In this setting, savings in the form of deposits are considered more costly than home-saving if $\gamma_{it} - \eta_i < \theta$. As such, information can play an important role in changing the perceived relative risk associated with different forms of saving through providing information on the returns and in reducing the costs associated with saving.

The revised Bellman equation can be written as:

$$V_i(X_{it}, s_{it}) = \max_{D_{it+1}} U_i(X_{it} - W_{it+1} - D_{it+1}) + \delta_i EV_i[y_i(s_{it+1}) + (1 - \theta)(A_{it+1} - D_{it+1}) + (1 + \gamma_{it+1})D_{it+1} - \eta_i D_{it+1} | s_{it+1}] \quad (4)$$

As before no borrowing is allowed so $A_{it+1} \geq D_{it+1} \geq 0$.

As our focus is the choice between saving in the form of cash held at home and deposit saving for a return we solve this optimization problem to derive an expression for the level of deposit saving. Following Fafchamps et al. (1998), we assume a negative exponential utility function and a normal distribution for future consumption. We take a mean variance approximation of the expected value function, so households will choose D_{it+1} in order to (approximately):

$$\max_{D_{it+1}} \left\{ \begin{array}{l} \bar{y}_i(s_{it}) + (1 - \theta)W_{it+1} + (\theta + \bar{\gamma}_i(I_{it}) - \bar{\eta}_i(I_{it}))D_{it+1} \\ - \frac{1}{2}R_i \left[\sigma_{y_i}^2(s_{it}) + \sigma_{D_i}^2(I_{it})D_{it+1}^2 \right. \\ \left. + 2\rho_{iyD}(s_{it})\sigma_y(s_{it})\sigma_D(I_{it})D_{it+1} \right] \end{array} \right\} \quad (5)$$

where: R_i is the Arrow-Pratt absolute risk aversion coefficient, which for the exponential utility function exhibits constant absolute risk aversion.¹² We define the expected value of income as $E[y_i(s_{it+1} | s_{it})] = \bar{y}_i(s_{it})$, its variance as $V[y_i(s_{it+1} | s_{it})] = \sigma_{y_i}^2(s_{it})$, the expected value of returns to deposit saving as $E[1 + \gamma_i(I_{it+1} | I_{it}) - \eta_i(I_{it+1} | I_{it})] = 1 + \bar{\gamma}_i(I_{it}) - \bar{\eta}_i(I_{it})$, and its variance as $V[1 + \gamma_i(I_{it+1} | I_{it})] = \sigma_{\gamma_i}^2(I_{it})$, where $\sigma_{\gamma_i}'(I_{it}) < 0$ implying that information reduces the perceived variance in the return to saving and assuming that the cost of saving does not affect the variance in returns. $\rho_{iyD}(s_{it})$ is the correlation between income and the returns to saving. Assuming that returns are independent of income shocks this correlation will be zero.

Solving the optimization problem yields:

$$D_{it+1}^* = \frac{\theta + \bar{\gamma}_i(I_{it}) - \bar{\eta}_i(I_{it})}{R_i \sigma_{\gamma_i}^2(I_{it})} \quad (6)$$

¹² That is, $R_i = -[U_i''(C_{it})/U_i'(C_{it})] = \delta$, which implies that as wealth increases households hold the same level of wealth in the form of risky (or in this case perceived to be risky) assets.

The model predicts that the level of deposit saving, D_{it+1}^* , will be an increasing function of the return to saving, $\bar{\gamma}_i(I_{it})$ and losses to cash held at home, θ , and a decreasing function of the cost of saving $\bar{\eta}_i(I_{it})$. D_{it+1}^* will also be a decreasing function of the variance in the return to saving $\sigma_{D_i}^2(I_{it})$ and the level of risk aversion R_i .¹³ In this model, information plays an important role in determining the level of deposit saving. We hypothesize that formal groups transmit information to households on how to save formally and on the various ways in which they can save to yield a return thus filling an information gap. According to our model, this information reduces the cost of saving in formal financial institutions, $\bar{\eta}_i(I_{it})$, increases the perceived return $\bar{\gamma}_i(I_{it})$ and reduces the perceived variance in returns $\sigma_{\gamma_i}^2(I_{it})$. Each mechanism will lead to an increase in the level of saving held in the form of deposits.

3 Empirical considerations

Following from the theoretical model, the baseline reduced form savings equation is given by:

$$D_{it} = \alpha_i + \beta_1 DS_{it-1} + \beta_2 CS_{it-1} + \beta_3 \mathbf{Z}_{it} + \beta_4 s_{it} + v_{it} \quad (7)$$

where: D_{it} is the level of formal savings of household i at time t ; DS_{it-1} is the stock of formal savings at the beginning of the period; CS_{it-1} is a vector including the stock of informal savings and cash held at home at the beginning of the period; \mathbf{Z}_{it} is a vector of household and regional characteristics that proxy the cost of savings; s_{it} are losses to household income as a result of external shocks; and α_i are household fixed effects to control for unobserved household heterogeneity. The stocks of savings variables are included as a measure of household wealth at the beginning of the period.

Information is transmitted through women's unions and we proxy the 'quality' of the information using the observed savings behaviour of group members. We extend the reduced form to include the average stock of formal savings of other group members within the commune (computed excluding household i) and use two lags to ensure that the behaviour of the group is exogenous to the behaviour of members in period t ($DS_{n-i,t-2}$). Networks with a greater level of formal savings are considered higher quality networks. Since it is also possible that networks contain poor quality information we also include the average stock of informal savings of group members to

¹³ R_i represents the coefficient of relative risk aversion and since the model is restricted by the assumption of a negative exponential utility function the coefficient of relative risk aversion will be increasing in wealth, that is, $R_i = \delta \bar{A}_i$ where $\delta > 0$.

proxy lower quality networks ($IS_{n-i,t-2}$).¹⁴ The revised reduced form is given by equation (8).

$$D_{it} = \alpha_i + \lambda_1 DS_{n-i,t-2} + \lambda_2 IS_{n-i,t-2} + \beta_1 DS_{it-1} + \beta_2 CS_{it-1} + \beta_3 Z_{it} + \beta_4 s_{it} + v_{it} \quad (8)$$

According to our theoretical predictions we would expect: $\lambda_1 > 0$ (members of high quality networks have higher levels of formal savings); $\lambda_2 \leq 0$ (members of low-quality networks have lower levels of formal savings or are no different in terms of their level of formal savings), $\beta_1 > 0$ (households that already hold a high stock of formal saving will have greater certainty about the returns and so will save more in this form), $\beta_2 > 0$ (households with a greater stock of other savings types are more uncertain about formal savings and so wealthier households will save less in this form).

The key challenge in estimating this model is controlling for omitted variables that are potentially correlated with the network effect.¹⁵ First, there may be self-selection into formal groups.¹⁶ The consequence for the empirical model would be that the unobserved factors that determine the level of formal savings may be the same as those that determine the probability that they are members of the group. To control for these factors we use fixed effects estimation to eliminate any unobserved household specific effects that may influence both the level of formal savings and the probability that the household is a group member. We are interested in group behaviour and not selection into groups and so estimate the model only for group members. We run tests for sample selection bias using Wooldridge's (1995) approach.¹⁷

Second, there may be simultaneity between individual behaviour and group behaviour, also referred to as Manski's (1993) reflection problem. We correct for reflexivity by defining the network variable as the average stock of deposit savings by group members at time $t-2$, excluding the stock of saving held by household i , $DS_{n-i,t-2}$.¹⁸

Third, the network effect may also be confounded with correlated effects such as behavioural changes due to common exogenous shocks. To control for these effects we include the average level of savings within the commune in period t (computed excluding the savings level of household i), the average stock of savings in the district

¹⁴ This does not imply that informal savings are undesirable but is sub-optimal from the perspective of encouraging formal financial participation.

¹⁵ For discussion see also Manski, (1993, 2000), Brock and Durlauf (2001), and Aizer and Currie (2004).

¹⁶ Membership of women's unions in Vietnam is based on signing up to a set of socio-political ideals rather than on availing of facilities offered by the group such as financial advice or savings facilities, nevertheless it may be that there are unobserved characteristics of members that are correlated with membership and savings behaviour.

¹⁷ Unlike some informal women's groups in other developing countries where group membership is conditional on joining a ROSCA (Rotating Savings and Credit Association) or some other similar fund, the fee for joining a women's union in Vietnam is nominal and members are not required to contribute to a joint or a pooled savings account. Nevertheless we include a control for the membership fee in the selection equation.

¹⁸ Aizer and Currie (2004) use a similar approach.

at the beginning of period t and other time varying commune characteristics such as the number of banks and the proportion of poor households.

A fourth and final consideration is the possibility that the network effect might be driven by the density of the group. The size of the network may affect the degree of learning of network members. A measure of the density of the group is therefore included in the model to control for this possibility.

In addition to network effects and in accordance with our theoretical framework, we also consider how other factors may affect the level of formal savings. We include the stock of saving in different forms held at the beginning of each year as well as wealth quintiles constructed using information on the dwellings of the household.¹⁹ To control for income shocks we include household income and a variable capturing the number of natural disasters experienced within the commune.²⁰ We also include household size and whether households receive transfers from children living outside of the home as controls.

4 Data

Data are taken from the Vietnam Access to Resources Household Survey (VARHS) implemented in 2006, 2008, and 2010 in twelve provinces in Vietnam.²¹ The households for which a full panel is available are spread over 456 communes, 131 districts and total approximately 2,200 households for which panel data are available. Along with detailed demographic information on household members, the survey includes sections on financial behaviour, in particular in relation to savings and borrowing. Due to the absence of total expenditure data we cannot use the standard 'income minus expenditure' measure of saving. Instead, we focus our investigation on self-reported levels of saving.

The supply of institutional saving services for rural households is estimated to cover 65 per cent of the poorest quarter of the population (ILO 2007).²² This is also evident from our data which cover the more rural and remote provinces in Vietnam. In 2006, 36 per cent of communes included in the sample had a state bank located in their commune

¹⁹ Details available from the authors.

²⁰ If savings are precautionary we expect households to dis-save in the event of a shock and it is also likely that they are not able to save in the immediate aftermath. Empirical evidence to support the hypothesis that households dis-save when confronted with a negative income shock is provided by for example by Udry (1995) using a sample of 200 farmers households in northern Nigeria and Wainwright and Newman (2011) in the case of rural Vietnam.

²¹ The survey was developed in collaboration between the Development Economics Research Group (DERG), Department of Economics, University of Copenhagen and the Central Institute of Economic Management (CIEM), the Institute for Labour Studies and Social Affairs (ILSSA) and the Institute of Policy and Strategy for Agriculture and Rural Development (IPSARD), Hanoi, Vietnam.

²² Saving services are offered by five state-owned commercial banks, one social policy bank, one post office savings company, 37 joint stock commercial banks, 31 foreign owned bank branches, five joint venture banks, 934 People's Credit Funds (PCFs) and 58 microfinance institutions (ILO 2007: 85).

while 19 per cent had access to other types of credit organizations.²³ However, 93 per cent of communes report having access to formal savings deposits through institutions located outside of the commune. In 2008, access within communes increased with 57 per cent of communes having a state bank and 27 per cent having access to other forms of credit organization. Further increases were observed in 2010 with 67 per cent of communes having a state bank and 38 per cent having some other form of credit organization.

Table 1 provides a description of the savings behaviour of households in our sample. Our measure of savings includes formal savings (i.e. postal savings, savings in state owned commercial banks, private banks and credit organizations), informal savings (i.e. ROSCAs²⁴ and saving through private money lenders), and home-saving in the form of cash, gold and jewellery kept at home. The dominant form of saving is cash, gold and jewellery held at home (44 per cent of households in 2006, 37 per cent in 2008 and 52 per cent in 2010). The proportion of households with savings in formal financial institutions is very small at around 5 per cent each year, despite the extensive coverage of formal financial institutions in these rural areas.

Table 1: Household savings behaviour

	Total Savings	Formal	Informal	Home
% hhs who save (2006)	53.85	4.86	12.91	43.39
% hhs who save (2008)	43.02	3.99	5.29	36.69
% hhs who save (2010)	60.67	5.70	10.51	52.38
<i>For saving households:</i>	VND	of which %		
Average (2006)	11,465	7.32	19.37	73.31
Average (2008)	17,062	7.98	10.24	81.78
Average (2010)	14,085	7.69	13.01	79.30
<i>For saving households:</i>				
Savings/income (2006)	12.12	1.91	3.65	6.56
Savings/income (2008)	19.93	2.47	2.17	15.29
Savings/income (2010)	17.06	2.78	2.33	11.95

Source: Computed by authors from VARHS data sets.

Note: All value figures are adjusted for inflation and are expressed in 2010 VND.

We define the network on the basis of whether individuals within households are *active* members of women's unions within communes. Active members are those that participate in meetings on a regular basis. An active organization is present in almost all communes. Table 2 describes the savings behaviour of group members. Group members

²³ Other credit organizations include People's Credit Funds and International Organisations.

²⁴ ROSCAs are very widespread and very popular with low income households. They are small, operate locally, accept contributions in-kind (e.g. rice ROSCAs) as well as in cash and some have a mutual assistance mechanism.

are more likely to save than other households in all years (see Table 1 for comparison). The composition of savings of members is, on average, different to that of non-members, suggesting that members and non-members do behave differently. These differences also vary over time suggesting that the portfolio of savings of active members of women's unions is more changeable than the average behaviour of households in the sample.

Table 2: Women's union membership and savings

	Women's union		
	2006	2008	2010
% hhs active members	53.68	52.95	56.08
% members who save	55.97	46.93	63.22
% members formal savings	5.85	3.69	5.56
% members informal savings	13.95	5.08	13.66
% members home savings	44.83	40.70	53.30
<i>For saving households:</i>			
Average savings	12,437	15,640	12,989
Proportion formal savings	8.53	6.51	6.82
Proportion informal savings	19.76	9.30	16.53
Proportion home savings	71.71	84.19	76.65

Source: Computed by authors from VARHS data sets.

A description of all variables included in the model is presented in Table A1 of the Appendix together with summary statistics. Since two lags are required for the construction of the network variable only data from 2008 and 2010 are used in the models.

5 Results

5.1 Empirical results

Our theoretical model demonstrates that one mechanism through which formal groups can impact on the financial decision-making of households is through correcting for information asymmetries that prevent households from either accessing, or understanding the merits, of depositing their savings with formal financial institutions. Peer effects or social norms may lead group members to behave in a similar way. Regardless of which mechanism is at work, we hypothesize that group behaviour will have an impact on the behaviour of its members. If so, there is a role for disseminating information on formal savings to group members.

We estimate the model given in equation (8) to ascertain the relationship between the 'quality' of the network, in terms of its potential for disseminating information regarding (or demonstrating the advantages of) formal savings behaviour, and the savings levels of its members. The baseline model is presented in Table A2 of the Appendix and all results are as expected, although most are not statistically

significant.²⁵ As discussed in sections 3 and 4, the network variables are measured as the average stock of formal savings (with respect to high quality networks), and informal savings (with respect to low-quality networks), of households in each group two years previously, where the group is defined as households who have active group members within the commune. For group members, their own stock of savings is excluded from the computation of the average stock measure. We control for differences in the density of groups and estimate the model for group members only. Results are presented in Table 3.

Table 3: Women's unions network effects on level and type of savings of group members

Saving form	Total		Formal		Informal		Home	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Network (formal)	0.190** (0.086)	0.147* (0.084)	0.059** (0.030)	0.028 (0.028)	0.007 (0.007)	-0.028*** (0.010)	0.125* (0.073)	0.149** (0.069)
Network (informal)	0.002 (0.171)	-0.087 (0.441)	-0.038 (0.056)	-0.266* (0.161)	-0.018 (0.017)	-0.025 (0.037)	0.059 (0.147)	0.205 (0.348)
Density	-0.172 (0.166)	-0.350 (0.331)	-0.061 (0.135)	-0.200 (0.268)	-0.118* (0.070)	-0.262*** (0.072)	0.214 (0.105)	0.113 (0.174)
Network (formal) x density		0.002 (0.003)		0.002 (0.002)		0.002*** (0.001)		-0.001 (0.001)
Network (informal) x density		0.006 (0.020)		0.015* (0.008)		0.001 (0.002)		-0.010 (0.017)
Household FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R ² within	0.128	0.130	0.122	0.126	0.123	0.157	0.171	0.173
R ² between	0.087	0.085	0.021	0.017	0.130	0.128	0.124	0.125
R ² overall	0.111	0.109	0.046	0.043	0.117	0.117	0.140	0.141
Households	1,564	1,564	1,564	1,564	1,564	1,564	1,564	1,564
Observations	2,350	2,350	2,350	2,350	2,350	2,350	2,350	2,350

Source: Computed by authors from VARHS data sets.

Note: Standard errors are clustered at the household level and are given in parenthesis, *** denotes significance at the 1 per cent level, ** denotes significance at the 5 per cent level, * denotes significance at the 10 per cent level. All baseline controls are included along with time dummies. The density variable is scaled by 100 for ease of illustration.

Column (1) reveals that being a member of a high quality network has a positive and significant effect on the savings level of individual members. This result is robust to the inclusion of the interaction terms between the density of the group and the network variables (column 2). In this model we control for household fixed effects, commune level characteristics, the average savings behaviour in the commune and time varying household characteristics. Moreover, given our focus on group members the identification of the network effect comes from the variation within households, and consequently within groups, over time. This result therefore provides support for the hypothesis that the savings behaviour of households is influenced by that of other group

²⁵ All variables expressed in Vietnamese Dong (VND) are scaled by 1,000 before inclusion in the model.

members. The coefficient of 0.19 implies that for every VND1 million increase in the stock of group formal savings (excluding household member i), savings of household member i increase by VND190,000 on average. We find no evidence that households in low-quality groups are induced to save less.

Disaggregating by type of saving we find that being in a high quality group has a positive and significant effect on *formal* household savings (column 3) further supporting our hypothesis. In this case, however, the result is not robust to the inclusion of the interaction terms between group density and the network variables (column 4). Once interaction terms are included, being in a low-quality group has a significant negative effect on formal saving. This suggests that network effects matter for households' choice of savings but also that the quality of network is an important factor.

While we are less concerned here about the influence that networks have on informal and home savings, column (6) implies a negative marginal effect of high quality networks on informal saving at the mean (-0.003).²⁶ Although small in magnitude, this suggests that in high quality networks households save less informally (as one might expect), particularly in networks with fewer members. This provides further support for the hypothesis that good information on the merits of formal savings or good behaviour can be transmitted through high quality networks. In columns (7) and (8) we find that members of good quality networks also save more in the form of cash held at home suggesting that there may be complementarities in saving types.

Overall, we find that in high quality networks members save more formally. Saving formally yields an interest rate and is less risky than informal savings or saving in the form of cash held at home. Another indicator of how productive savings are is what the household is actually saving for. As a check on the validity of our results we consider the extent to which the behaviour of the network impacts on households' reported reasons for saving.

In the VARHS, households report two reasons for saving.²⁷ These are condensed into five categories: risk coping, investment, education, retirement and consumption. We estimate fixed effects linear probability models for each category for group members, including the same set of variables as in our core model. Results are presented in Table 4.

²⁶ The average density of the network is 12.405 for the sample included in the estimation of this model.

²⁷ The options given are: 1. Protect against bad harvest and other natural disasters; 2. Health care expenses; 3. Cost of education; 4. Buy agricultural inputs; 5. Provide for old age; 6. Accumulation for other big expenditures; 7. Profit-making investment; 8. Other.

Table 4: Women's unions network effects on savings purpose of group members

	Risk	Invst	Ed.	Retire.	Cons.
	(1)	(2)	(3)	(4)	(5)
Network (formal)	0.003 (0.002)	0.005*** (0.002)	0.001 (0.002)	-0.002 (0.002)	-0.002 (0.002)
Network (informal)	0.002 (0.008)	0.005 (0.007)	-0.002 (0.008)	-0.005 (0.005)	0.006 (0.010)
Density	0.006 (0.006)	0.0004 (0.005)	0.009** (0.004)	0.005 (0.003)	-0.012*** (0.004)
Network (formal) x density	-0.0001** (0.00005)	-0.00004 (0.00004)	-0.00003 (0.00003)	-0.00003 (0.00003)	0.0001*** (0.00004)
Network (informal) x density	-0.0001 (0.0004)	-0.0003 (0.0003)	0.0001 (0.0004)	0.0003 (0.0003)	0.0005 (0.0005)
Household fixed effects	Yes	Yes	Yes	Yes	Yes
R ² within	0.064	0.096	0.109	0.046	0.294
R ² between	0.014	0.023	0.021	0.001	0.098
R ² overall	0.019	0.040	0.034	0.004	0.137
Households	1,433	1,433	1,433	1,433	1,433
Observations	2,011	2,011	2,011	2,011	2,011

Source: Computed by authors from VARHS data sets.

Note: Standard errors are clustered at the household level and are given in parenthesis, *** denotes significance at the 1 per cent level, ** denotes significance at the 5 per cent level, * denotes significance at the 10 per cent level. All baseline controls are included along with time dummies. The density variable is scaled by 100 for ease of illustration.

The quality of the network is not found to have any effect on household savings for risk-coping, education or retirement suggesting that precautionary and lifecycle savings are not influenced by the behaviour of groups. We find, however, that members of high quality networks are more likely to save for productive investment purposes. This provides further support for our hypothesis that informed group behaviour can have a positive effect on the behaviour of group members encouraging them to save formally and for productive purposes.

5.2 Robustness checks

Given the empirical challenges in identifying the network effects (see discussion in section 3) we perform a range of robustness checks. First, we rule out the possibility that the result is driven by sample selection into group membership, that is, the possibility that it is the characteristics of group membership that drive the positive relationship between formal group savings and household savings and not the flow of information and peer group effects.

Table 5 presents the results of Wooldridge's (1995) sample selection test for use with panel data. In the first stage, probit models of group membership are estimated separately for 2008 and 2009 including all households that could potentially be active

women's union members (i.e. all households that contain at least one adult female).²⁸ The results of the first stage models are presented in Table A3 of the Appendix. The estimates are used to construct an inverse Mills ratio for each observation in each year and this is included as an additional regressor in the fixed effects savings model. If the inverse Mills ratio is found to be statistically significant then sample selection cannot be ruled out. As revealed in Table 5, in all but one case the inverse Mills ratio is not statistically significant.²⁹ Furthermore, all of our results hold.³⁰

Table 5: Women's unions network effects on level and type of savings of group members – robustness check testing for sample selection bias

Saving form	Total		Formal		Informal		Home	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Inverse Mills ratio	-3.633 (5.799)	-6.315 (6.951)	-2.933 (2.413)	-4.770 (3.590)	-0.256 (1.263)	-2.169* (1.201)	-0.444 (5.222)	0.623 (5.702)
Network (formal)	0.199** (0.087)	0.143 (0.093)	0.064** (0.031)	0.023 (0.040)	0.007 (0.007)	-0.032*** (0.011)	0.127** (0.073)	0.152** (0.076)
Network (informal)	0.002 (0.203)	-0.081 (0.536)	-0.035 (0.065)	-0.285 (0.185)	-0.018 (0.020)	-0.023 (0.043)	0.056 (0.173)	0.226 (0.448)
Density	-0.215 (0.185)	-0.493 (0.406)	-0.098 (0.157)	-0.314 (0.338)	-0.118 (0.080)	-0.309*** (0.087)	0.001 (0.106)	0.130 (0.197)
Network (formal) x density		0.003 (0.003)		0.003 (0.003)		0.002*** (0.001)		-0.002 (0.002)
Network (informal) x density		0.006 (0.023)		0.015* (0.009)		0.001 (0.002)		-0.011 (0.019)
Household FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R ² within	0.131	0.134	0.127	0.132	0.131	0.161	0.177	0.178
R ² between	0.080	0.078	0.018	0.012	0.254	0.266	0.121	0.123
R ² overall	0.106	0.103	0.043	0.038	0.197	0.211	0.138	0.140
Households	1,495	1,495	1,495	1,495	1,495	1,495	1,495	1,495
Observations	2,251	2,251	2,251	2,251	2,251	2,251	2,251	2,251

Source: Computed by authors from VARHS data sets

Note: Standard errors are clustered at the household level and are given in parenthesis, *** denotes significance at the 1 per cent level, ** denotes significance at the 5 per cent level, * denotes significance at the 10 per cent level. All baseline controls are included along with time dummies. The density variable is scaled by 100 for ease of illustration. First stage results for the sample selection models are presented in Table A3 of the Appendix.

²⁸ The determinants of group membership include household characteristics, commune characteristics and group characteristics. For identification we also include an indicator of whether or not the household has personal friends in office or in trusted positions within the commune. In both first stage models this variable is statistically significant.

²⁹ We find that the inverse Mills ratio is statistical significant at the 10 per cent level in column (6) but this has no impact on the results.

³⁰ The results for the impact of network quality on the type of savings are also robust to the inclusion of controls for potential sample selection bias.

A second empirical concern relates to Manski's (1993) reflection problem. To overcome this problem we measure the quality of the network as the average stock of savings two years prior to the year under consideration. This is computed excluding information on the household in question. However, as an additional robustness check we estimate the model for a reduced sample of households who became active women's union members in either 2008 or 2010 on the basis that they could not have any influence on the group's behaviour two years previously. Table 6 reveals that the main result holds, even though the sample size is greatly reduced.³¹

Table 6: Women's unions network effects on level and type of savings of group members – robustness check including only household who became group members over the sample period

Saving form	Total		Formal		Informal		Home	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Network (formal)	0.181** (0.088)	0.138 (0.122)	0.131** (0.058)	0.125 (0.086)	0.018* (0.011)	0.027 (0.018)	0.032 (0.050)	-0.013 (0.071)
Network (informal)	-0.340 (0.271)	-0.824 (0.672)	-0.162 (0.153)	-0.547 (0.383)	-0.019 (0.019)	-0.040 (0.049)	-0.158 (0.136)	-0.237 (0.353)
Density	0.140 (0.306)	-0.016 (0.304)	0.093 (0.253)	0.004 (0.240)	0.040 (0.053)	0.047 (0.070)	0.006 (0.128)	-0.067 (0.137)
Network (formal) x density		0.006 (0.011)		0.002 (0.008)		-0.001 (0.002)		0.005 (0.005)
Network (informal) x density		0.039 (0.034)		0.031* (0.019)		0.002 (0.003)		0.006 (0.020)
Household FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R ² within	0.450	0.452	0.579	0.580	0.504	0.505	0.134	0.135
R ² between	0.057	0.052	0.241	0.232	0.458	0.459	0.004	0.004
R ² overall	0.132	0.126	0.382	0.373	0.307	0.307	0.007	0.007
Households	498	498	498	498	498	498	498	498
Observations	690	690	690	690	690	690	690	690

Source: Computed by authors from VARHS data sets.

Note: Standard errors are clustered at the household level and are given in parenthesis, *** denotes significance at the 1 per cent level, ** denotes significance at the 5 per cent level, * denotes significance at the 10 per cent level. All baseline controls are included along with time dummies. The density variable is scaled by 100 for ease of illustration.

Third, if the observed effect is truly a within group effect then the quality of the local network should not have any effect on the savings behaviour of non-members. We estimate the model for non-member households, only including households that could potentially be members (i.e. have at least one adult female member). The results are presented in Table 7 and reveal that high quality networks within a commune have no effect on the formal savings behaviour of non-member households. Moreover, in communes with low-quality networks (i.e. a greater level of informal savings) non-

³¹ Being in a higher quality network impacts on overall savings levels (see column (1)) and level of formal savings (see column (3)) and in the case of formal savings is of an even greater magnitude.

member households save less formally. This is not surprising given that informal savings arrangements between members of women’s groups are unlikely to be exclusive within communes leading to higher levels of informal savings, and consequently lower levels of formal saving, in the commune as a whole.

Table 7: Women’s unions network effects on level and type of savings of non-group members – robustness check

Saving form	Total		Formal		Informal		Home	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Network (formal)	-0.077 (0.075)	0.048 (0.165)	0.009 (0.058)	-0.026 (0.163)	0.006 (0.008)	0.005 (0.012)	-0.093 (0.064)	0.069 (0.071)
Network (informal)	-0.010 (0.020)	-0.001 (0.044)	-0.029** (0.014)	-0.032 (0.031)	-0.004 (0.010)	0.013 (0.013)	0.024 (0.018)	0.019 (0.030)
Density	0.043 (0.308)	0.266 (0.328)	0.243 (0.247)	0.181 (0.227)	0.021 (0.044)	0.043 (0.057)	-0.221 (0.210)	0.042 (0.240)
Network (formal) x density		-0.010 (0.010)		0.003 (0.010)		0.0002 (0.001)		-0.014*** (0.005)
Network (informal) x density		-0.002 (0.007)		0.0005 (0.005)		-0.002 (0.002)		0.0002 (0.004)
Household FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R ² within	0.251	0.257	0.187	0.188	0.523	0.524	0.183	0.200
R ² between	0.345	0.345	0.253	0.255	0.516	0.516	0.134	0.132
R ² overall	0.335	0.334	0.235	0.236	0.470	0.470	0.137	0.135
Households	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123
Observations	1,538	1,538	1,538	1,538	1,538	1,538	1,538	1,538

Source: Computed by authors from VARHS data sets.

Note: Standard errors are clustered at the household level and are given in parenthesis, *** denotes significance at the 1 per cent level, ** denotes significance at the 5 per cent level, * denotes significance at the 10 per cent level. All baseline controls are included along with time dummies. The density variable is scaled by 100 for ease of illustration.

Fourth, we examine the possibility that high quality behaviour within communes by non-members (i.e. higher levels of formal savings) could equally have an effect on the savings of network members. This is conducted to rule out the possibility that the network effect we observe is simply due to changes in general market conditions or other exogenous factors affecting all households that are not controlled for in the model. The quality of the non-member network is measured as the average stock of formal savings of non-members two years previous to the year of analysis. As revealed in Table 8 there is no evidence to suggest that high quality non-member networks have any influence on the savings behaviour of member households.³²

³² In contrast, we do find some spillover effects where non-member networks are of lower quality (i.e. are characterized by a higher stock of informal savings). This is consistent with our previous point that informal savings networks are likely to extend beyond group boundaries.

Table 8: Non-member network effects on level and type of savings of group members – robustness check

Saving form	Total		Formal		Informal		Home	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Network (formal)	0.100 (0.111)	-0.307 (0.440)	0.046 (0.081)	-0.228 (0.388)	0.012 (0.020)	0.031 (0.048)	0.042 (0.065)	-0.110 (0.231)
Network (informal)	0.009 (0.088)	0.173 (0.350)	-0.073* (0.038)	-0.260 (0.158)	-0.024* (0.013)	0.0004 (0.050)	0.106 (0.070)	0.433* (0.258)
Density	-0.197 (0.398)	-0.467 (0.479)	0.190 (0.292)	0.003 (0.003)	-0.084 (0.103)	-0.071 (0.117)	-0.303 (0.264)	-0.399 (0.349)
Network (formal) x density		0.018 (0.018)		0.012 (0.017)		-0.001 (0.001)		0.006 (0.008)
Network (informal) x density		-0.006 (0.011)		0.007 (0.005)		-0.001 (0.001)		-0.012 (0.008)
Household FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R ² within	0.133	0.136	0.155	0.161	0.279	0.279	0.247	0.250
R ² between	0.008	0.003	0.140	0.108	0.135	0.136	0.064	0.059
R ² overall	0.030	0.021	0.042	0.037	0.144	0.145	0.115	0.108
Households	1,278	1,278	1,278	1,278	1,278	1,278	1,278	1,278
Observations	1,804	1,804	1,804	1,804	1,804	1,804	1,804	1,804

Source: Computed by authors from VARHS data sets.

Note: Standard errors are clustered at the household level and are given in parenthesis, *** denotes significance at the 1 per cent level, ** denotes significance at the 5 per cent level, * denotes significance at the 10 per cent level. All baseline controls are included along with time dummies. The density variable is scaled by 100 for ease of illustration.

6 Conclusion

Savings at the household level in rural communities in developing countries are hindered by the fact that financial markets are not particularly well developed and many households either do not possess the information required to set up formal deposit accounts or are uncertain about the returns to saving formally. As a result, households often opt to hold their savings in the form of cash held at home, an insecure form of saving that does not yield a return. This is sub-optimal; formal savings are an important means of financing productive investment.

In this paper, we have explored the extent to which social networks in the form of active membership of women's unions in rural Vietnam can play a role in increasing formal savings where potential knowledge gaps exist. Accordingly, our aim was to provide evidence of a potentially important impact of social capital in economic decision-making where information failures prevent economic agents from behaving in an optimal way.

Our theoretical model predicts that by disseminating information through networks, or through demonstrating good savings behaviour, women's groups can fill an information

gap on the merits of saving formally. This is achieved by reducing uncertainties about the riskiness of returns and reducing the costs associated with opening a savings account. The empirical evidence presented supports this prediction. In particular, our analysis revealed that membership of high ‘quality’ women’s groups leads to higher levels of formal savings and higher levels of savings for productive purposes. These findings are also robust to a range of alternative specifications, samples and tests that address the many empirical issues which arise in identifying network effects. They include selection into group membership and reflexivity between household and group behaviour, amongst others.

More generally, our results suggest that formal networks, such as women’s groups, can at least to some extent fill the role of formal institutions in enhancing the knowledge of individuals at local level.³³ Targeting information on the benefits of saving in financial institutions through networks of this kind would be effective in increasing formal savings at grassroots level. At the same time, ensuring that the information disseminated by these groups is both accurate and desirable is important given that behavioural effects are also found in low-quality networks.

To conclude, we found strong evidence that network effects matter for household savings behaviour and we made every effort in our analysis to control for unobserved factors that may influence the savings behaviour of households and networks simultaneously. We acknowledge there may still be unobserved time varying factors that were not captured as is always the case with observational data. Moreover, with observational data we cannot uncover the mechanism through which the network effect operates. Future research will address both of these issues through the use of a carefully designed experiment and randomized control trial techniques.

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³³ See Hardin (2009) for a full discussion of the role of institutions in spreading both *institutional* and *ordinary* knowledge.

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Appendix

Table A1: Description of variables and descriptive statistics

Description		2008	2010
<i>Dependent variables</i>			
Total saving	Level of total saving during the year ('000 VND)	7,340 (31,222)	8,545 (34,465)
Formal saving	Level of formal saving during the year ('000 VND)	1,886 (21,354)	2,640 (26,969)
Informal saving	Level of informal saving during the year ('000 VND)	810 (8,230)	1,111 (7,953)
Home saving	Level of home saving during the year ('000 VND)	4,643 (20,530)	4,794 (18,074)
<i>Network variables</i>			
Network (formal)	Stock of formal saving of WU members 2 years previous ('000 VND)	2,643 (10,342)	2,924 (15,136)
Network (informal)	Stock of informal saving of WU members 2 years previous ('000 VND)	1,594 (4,687)	1,049 (4,865)
Density	Number of active members of WUs in commune*	1,009 (656)	1,117 (984)
<i>Control variables</i>			
Stock (formal)	Stock of formal savings at the beginning of the year ('000 VND)	2,754 (20,555)	5,626 (36,910)
Stock (informal)	Stock of informal savings at the beginning of the year ('000 VND)	1,699 (24,204)	1,536 (18,257)
Stock (home)	Stock of home savings at the beginning of the year ('000 VND)	5,068 (19,983)	7,698 (20,598)
Income	Annual household income ('000 VND)	56,967 (93,082)	65,863 (116,006)
Household size	Number of household members	4.54 (1.80)	4.32 (1.75)
Children support	Dummy = 1 if household receives financial support from children	14.31% (35.02)	24.19% (42.83)
Wealth quintile	Quintile of wealth distribution based on characteristics of dwelling		
Commune saving	Average level of saving in the commune (VND)	2.55 (15.49)	3.95 (25.33)
Number of banks	Number of banks in the commune	0.77 (0.79)	0.90 (0.77)
Number of shocks	Number of shocks suffered in the commune	3.33 (1.96)	3.68 (1.98)
Proportion poor	Proportion of households classified as poor in the commune	21.17% (35.36)	14.58% (13.53)
District stock of saving	Average stock of saving in the district (VND)	3.95 (6.85)	6.53 (13.44)

Source: Computed by authors from VARHS data sets.

Note: All value figures are adjusted for inflation and are expressed in 2010 VND. Standard deviations are in parentheses.

* To compute the density of the network we take the proportion of active women's union members in each commune in our sample as being representative of women's union activity in that commune and multiply this proportion by the number of households in the commune to compute the density of the network.

Table A2: Household savings model - baseline

Dependent variable	Total savings	Formal savings	Informal savings	Home savings
Constant	7.558** (3.381)	3.972 (2.792)	0.616 (0.910)	2.969 (2.263)
Stock (formal)	0.008 (0.064)	0.051 (0.058)	0.005 (0.011)	-0.048* (0.028)
Stock (informal)	0.035 (0.076)	-0.045 (0.033)	0.157** (0.061)	-0.076*** (0.021)
Stock (home)	0.177** (0.087)	-0.074 (0.060)	0.004 (0.012)	0.248*** (0.061)
Income	0.079** (0.034)	0.058* (0.033)	0.002 (0.005)	0.019** (0.008)
Household size	-1.358* (0.780)	-1.125** (0.567)	0.152 (0.169)	-0.385 (0.573)
Children support	-2.375 (2.436)	-1.124 (1.898)	-0.208 (0.251)	-1.043 (1.492)
Wealth quintile 2	1.691 (1,748)	1.807 (1.385)	-0.344 (0.464)	0.229 (1.106)
Wealth quintile 3	0.386 (1.524)	1.323 (1.096)	-0.375 (0.449)	-0.562 (1.031)
Wealth quintile 4	0.092 (1.339)	1.414 (0.978)	-0.396 (0.403)	-0.926 (0.893)
Wealth quintile 5	3.076 (2.241)	0.427 (1.487)	-0.019 (0.673)	2.668* (1.594)
Member of WU	1.431 (1.695)	-0.919 (0.881)	-0.100 (0.620)	2.541* (1.418)
Commune saving	-0.038 (0.100)	0.022 (0.058)	-0.016 (0.016)	-0.045 (0.064)
Number of banks in commune	-0.444 (0.385)	-0.079 (0.729)	-0.156 (0.309)	-0.199 (0.717)
Number of natural disasters in commune	-0.444 (0.385)	-0.066 (0.278)	-0.003 (0.086)	-0.375 (0.263)
Proportion poor in commune	2.007 (0.865)	0.526 (0.277)	0.146 (0.175)	1.334** (0.554)
District stock of saving	0.044 (0.120)	-0.067 (0.069)	-0.020 (0.014)	0.131 (0.100)
Year 2008	0.135 (0.687)	-0.055 (0.396)	-0.293* (0.167)	0.483 (0.560)
HH fixed effects	Yes	Yes	Yes	Yes
Households	2,292	2,292	2,292	2,292
Observations	4,333	4,333	4,333	4,333

Source: Computed by authors from VARHS data sets.

Note: Standard errors clustered at the household level are given in parenthesis, *** denotes significance at the 1 per cent level, ** denotes significance at the 5 per cent level, * denotes significance at the 10 per cent level.

Table A3: Selection equation – determinants of active participation in women's unions

	2008	2010
Constant	0.797*	-0.192
<i>HH characteristics</i>		
Friends with connections	-0.344***	0.178**
Stock of saving	0.0003	-0.002**
Income	-0.001**	-0.000
Household size	-0.071**	-0.117***
Children support	-0.258**	-0.027
Wealth quintile 2	0.110	-0.050
Wealth quintile 3	0.068	0.010
Wealth quintile 4	0.031	0.114
Wealth quintile 5	-0.073	-0.366*
Female HoH	-0.107	-0.197
Married HoH	0.164	0.374***
Age HoH	-0.028***	-0.028***
Ed2	0.134	0.116
Ed3	0.231*	0.089
Ed4	0.246*	0.335**
Ed5	0.105	0.138
Ed6	0.041	0.063
No. of active hh members	0.156***	0.181***
<i>Commune characteristics</i>		
Number of banks	0.015	0.054
Number of nat disasters	0.020	0.036*
Prop poor households	-0.119**	1.109***
<i>Group characteristics</i>		
Network (formal)	-0.002*	-0.0004
Network (informal)	-0.002	-0.005**
Density	0.075***	0.085***
Annual fee	0.000	0.0001
Diversity (family)	0.162	0.082
Diversity (occupation)	-0.139	-0.094
Perceived econ benefits	0.090	0.158
Perceived access to credit	0.156	-0.058
Province fixed effects	Yes	Yes
Observations	1,861	1,855

Source: Computed by authors from VARHS data sets.

Note: Standard errors clustered at the commune level are given in parenthesis, *** denotes significance at the 1 per cent level, ** denotes significance at the 5 per cent level, * denotes significance at the 10 per cent level.