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**Impacts of Savings and Credit Union Programs
on Household Welfare in Laos: Case Study of the
Vientiane Vicinity during the mid-2000s**

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**Impacts of Savings and Credit Union Programs
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<Abstract>

Based on original household survey on the six villages in Vientiane vicinity in 2005, the paper investigates the impact of Savings and Credit Union (SCU) programs on household income, expenditure and asset, applying the methodology of Coleman's (1999) study on Thailand to address placement bias and endogeneity problem. The results revealed that SCU programs brought certain changes; SCUs boosted educational expenditures implying activation of human capital formation, increased the house asset suggesting villagers' investment reflected by possible business activation, and brought a possible shift in income sources from traditional agriculture to livestock raising. The paper interprets these results different from Coleman's (1999) in two possible ways; First the Laotian case is to an extent, free from a bias associated with seed capital allocation, therefore is more suitable to capture the effect than Thailand, and second it is since the stage of financial accessibility in Laos is far less developed than in Thailand.

1. Introduction

Since the late 1980s, the Laotian government has regarded microfinance and improved access to finance in rural areas as major tools for alleviating poverty. The government advanced microfinance as a priority program for agricultural and forestry under the National Growth and Poverty Eradication Strategy in 2004. Since 1987, the government or foreign donors have implemented broad microfinance initiatives under numerous development projects.

In reality, however, microfinance in Lao PDR remains shallow despite donors having significantly invested in microfinance programs during the 2000s. According to the Microfinance Capacity Building and Research Programme (2005), one million economically active Laotians potentially need formal or semi-formal financial services, but only one-quarter gained access to them. For the estimated 300,000 Laotians who accessed loans and savings services, accessibility to formal financial services remains limited: 21% received microcredit from formal sources, 33% from semi-formal financing sources and project initiatives, and 46% from informal sources.

Since the early 2000s, however, one source of microfinance—savings and credit unions (SCUs), also called Savings Groups or Village Banks—has spread around urban locales such as Vientiane or Luang Phabang. Usually established in villages, SCUs mobilize savings from member households to provide loans. SCUs typically operate under a cooperative system to improve members' lives and extract them from poverty. Most SCUs around Vientiane receive technical support from the Small and Rural Development Project for Women and the Capacity Building Project for Women and Community, co-organized by the Central Lao Women's Union, the Foundation for Integrated Agricultural Management (FIAM), and the Community Organizations Development Institute: Thailand (CODI).

This paper evaluates whether Laotian SCU programs during the mid-2000s meet their primary objective of alleviating poverty. Most of the poor and lower-income Laotians join microfinance programs seeking opportunities to save and borrow at rates more reasonable than those charged by informal moneylenders. Our study expects and hypothesizes that longstanding members of SCUs may improve their living in terms of wealth, income, and expenses.

This paper is organized as follows. Section 2 discusses earlier studies and the observation target of our analysis. Section 3 explains our survey design, and Section 4 demonstrates our estimation methodology. Section 5 examines the general picture with descriptive statistics. Section 6 examines the estimation results are. Section 7 concludes.

2. Overview and Object

Few empirical studies have examined data for individual persons, households, communities, or institutions to assess whether microfinance is reducing poverty in Laos. Further, studies that have investigated the poverty-reducing impact of microfinance programs in Bangladesh or Thailand suffer from selection bias and endogeneity (Pitt and Khandker, 1996, 1998; Pitt et al., 1999; Coleman, 1999, 2002; Khandker, 2003; Khandker et al., 1998; McKernan, 2002; Morduch, 1998). In their pioneering study, Pitt and Khandker (1996, 1998) attempt to correct those two statistical problems in a study of Grameen Bank and two other group lending programs in Bangladesh. Their quasi-experimental household survey of 87 villages randomly sampled SCU members and non-members from villages with microfinance programs, and it randomly sampled households from villages without such programs. Their studies evidenced a major problem in estimation methodology: When a dummy for credit program availability was applied as an identifying variable, endogeneity from program placement may have caused systematic variation between the two types of villages. To address that problem, their estimation considers village fixed effects to control for unobserved variation between villages. Nonetheless, their sampling of villages with SCU programs may have include households ineligible for them,¹ causing collinearity among village-specific dummy variables (or fixed-effect dummy variables) and program availability.

Khandker (2003) addressed the problem by expanding the dataset into panel data via a follow-up survey of the same households he surveyed in 1998–99. He controlled self-selection bias using the criteria of eligibility for SCU membership at the earliest period sample. Per Coleman (1999), however, such criteria are ambiguous in practice, and this method faces serious limitations.

¹ Many programs excluded households that owned more than 0.5 acres of land.

Coleman (1999) sought to evade selection bias without exogenous membership criteria by creating a unique data-collecting survey methodology that applies straightforward estimation techniques. His survey was conducted among SCU members and non-members in 14 villages in Northeast Thailand in 1995–96. Six of those villages that received NGO support to run SCUs for less than one year were identified as “control” villages. There, a self-selection process arose on whether to join SCUs, while the impact of the program was not realized. The remaining eight villages where SCUs had operated for more than two years were defined as “treatment” villages.² A comparison between members of “old” SCUs in treatment villages and “new” members in control villages could be undertaken. To estimate SCUs’ impact, Coleman used variations in the length of time programs that were available in the treatment villages. Based on empirical evidence, it concludes that most studies endorsing positive impact of microfinance found in Northeast Thailand may be merely seeming identifications occurred from selection bias or endogenous program replacement.

We follow Coleman’s (1999) methodology for two reasons. First, it is the most suitable for considering the two bias problems, given the data available for the vicinity surrounding Vientiane.³ Second, SCU programs we observed closely resembled those in Coleman (1999). SCU programs in our study were initiated by the same NGO as in Coleman (1999). a NGO, FIAM in Thailand organized SCUs in rural Northeast Thailand during the 1990s. Together with another NGO, CODI, the practice was exported to villages in the Vientiane vicinity in the 2000s.

Practices of SCUs in Northeast Thailand and Laos slightly differ. According to Ohno and Lapanun (2009) and the chapter 2 of this special edition, FIAM usually introduced its programs to existing SCUs instead of establishing new institutions, and it gave them seed money to strengthen their savings functions. Because seed money was allocated based on the number of SCUs’ members regardless of mobilized savings

² Among the eight villages, one is an exception because its bank began operating immediately after the first survey.

³ The location was selected because most of Laos’s 357 savings groups are in and around Vientiane (Microfinance Capacity Building and Research Project, 2003, cited in Chaleunsinh, 2004:7).

amounts, the impact of seed money may vary among SCUs villages. Accordingly, the distinction between new and old SCUs villages in Northeast Thailand is vague. In addition, while the program contains function as pure credit providers similar to Grameen Bank type microfinance, its effect is possibly intermingled with that from SCUs' own saving resources. In contrast, NGOs generally started Laotian SCUs without seed money, and SCUs gradually accumulated lendable funds from members' savings. Considering the differences in the two cases, Coleman's (1999) methodology is better suited to Laos. We expect to capture clearer evidence using his methodology even though it did not present compelling evidence concerning Northeast Thailand.

We surveyed 251 households in six villages in a semi-urban area of the Naxaithong District 16 kilometers from Vientiane. The six villages contained old SCUs that had operated for more than one year or new SCUs established more recently. In all six, villagers self-selected to become SCU members; the survey sampled members and non-members. Members were classified into a "treatment" group who had obtained credit or received dividends from their SCU and a "control" group of members who had received no such benefits. The effects upon SCU members in the treatment group can be compared with SCU members in the control group. We used the period of membership as basic information in the impact estimation. Finally, using non-member households in all six villages as samples, we implemented fixed-effects village estimations to control for endogeneity from program placement. This survey design facilitates straightforward assessment of how SCU programs influence household welfare.

3. Interview Survey

During the period of our survey in 2005–06, 357 SCUs operated throughout Lao PDR, primarily in and around the capital, assisted and monitored by one of seven agencies.⁴ A significant number of SCUs operated in Vientiane. We conducted interviews concerning the microfinance project launched by the Women and

⁴ The District Lao Women's Union, District Lao Youth's Union, District Planning Office, District Social Welfare Office, District Finance Office, District Agriculture and Forestry Office, and branches of the Agriculture Promotion Bank (Chaleunsinh, 2004).

Community's Empowering Project in three semi-urban districts of the capital. From these three districts we selected villages in the Naxaithong District for observation.

A survey was conducted in September 2005 of 251 households in six villages that had their own SCUs. Three villages had recently established new SCUs, two had SCUs that had been organized three months earlier, and one village's SCU had operated only for one month. Three villages had "old" SCUs that had operated from slightly more than one year to almost three years. These surveyed villages were selected from the list provided by project administrators. Three "new" SCUs were selected based on the distance condition in a way that the three old SCUs were located not far, within 15 kilometers, from the three new SCUs.

Table 1 summarizes the sampled SCUs-villages. The percentage of member households varies between 40%–89% and is seemingly unrelated to whether the SCUs were old or new. We assured that our survey randomly sampled one-quarter of all households (24.4%). Old and new SCUs have members who have benefitted by obtaining credit or receiving dividends and those who have not received financial benefits from SCUs. Following Coleman (1999), we defined the first set as the treatment group and second as the control group for empirical analysis.

Our three-part survey questionnaires followed Hulme and Mosley (1996)⁵ with slight modifications to fit purposes of our study. The first part pertained to member and non-member households in the six villages. It contained questions about household characteristics, including assets, income, expenditures, deposits, and borrowing. Some questions about assets, income, and expenditures inquired into households' financial situations during two periods: on the survey date in September 2005 and five years earlier. For each member and non-member household, we interviewed an adult or head of household at home concerning household finances.⁶

⁵ Sichathongthip (2004) conducted a similar study of Laotian microfinance in Saithani. It was reproduced in Mosley's (2001) study of microfinance and poverty in Bolivia.

⁶ Most interviewees were females (wives) because, per Laotian custom, wives generally oversee household income and expenses. As Sheck-Sandbergen and Choulamany-Khampoui (1995:91) noted about Laotian females, "Women are generally good at financial management and accounting because of

The second part of the questionnaire sought village-specific information such as schools or prices of goods. We interviewed the head of the village and members of each village SCU's committee.

The third part of the questionnaire gathered general information about SCUs. It included questions regarding the number of members, sources of funds, SCUs' deposit balances, deposit and credit methods, and resolving bad debts.

Third-year students in economics and business management at the National University of Laos conducted the household surveys. They were trained and supervised by one of the authors in September 2005. One of the authors conducted the village surveys and in-depth interviews with the SCU group committees. In addition, a follow-up survey in March 2006 with the chief of the Lao Women's Union for the Naxaithong District collected supplementary data about villages' and SCUs' characteristics. Secondary data from summary reports, progress reports, and savings group manuals were obtained from the project, municipal arms of the Lao Women's Union, and SCU group committees.

4. Estimation Model

This paper examines the impact of microfinance program with economic and social indicators. This section discusses the model specifications and methodology with which we tested the hypothesis that long-term SCU members enjoy a higher quality of life as measured by asset, income, and expenses.

4.1 Model specification

As discussed in Pitt and Khandker (1996) and Coleman (1999), the presiding difficulties in estimating the impact of microfinance programs arise from selection bias and endogenous placement of the program. Consider the following estimation specification:

their social and economic experience in managing the household finances and the local economy: they are the sellers, buyers, traders, middle-women and entrepreneurs" (in Kunkel and Seibel, 1997:116).

$$C_{ij} = X_{ij}\beta_c + V_j\gamma_c\pi + \varepsilon_{ij}^c \quad (1)$$

$$Y_{ij} = X_{ij}\beta_y + V_j\gamma_y + C_{ij}\delta + \varepsilon_{ij}^y, \quad (2)$$

where

C_{ij} : the level of SCU program participation,

X_{ij} : a vector of household characteristics (e.g., age and education of household head),

V_j : a vector of village characteristics (e.g., prices and community infrastructure).

Traditional estimation of Equation (2) usually yields biased parameter estimates because ε_{ij}^y and ε_{ij}^c are correlated. As Coleman (1999) illustrated, the correlation between ε_{ij}^y and ε_{ij}^c arises through selection bias because households with attributes X_{ij} and V_j were motivated to join SCUs, whereas others were not. For example, if many entrepreneurial households join SCUs, then the unmeasured factor “entrepreneurship” affects their decision to join and measures their income, expenditures, and assets. In addition, ε_{ij}^y and ε_{ij}^c may be correlated across villages if SCU program placement is not random. As Coleman (1999) highlighted, ε_{ij}^y and ε_{ij}^c can be correlated if program placement is affected by villages’ socio-economic factors such as conditions more suited to entrepreneurship, civic organization, dynamic leadership, or poverty-provoking situations (e.g., living in flood planes or drought-prone areas).

Better ways to cope with the statistical problem may include using a panel sample set or proper instrument variables. However, both methods are infeasible, and even a panel dataset does not resolve bias completely, so Coleman (1999) proposed a primitive but interesting alternative, which we basically adopted. To collect an appropriate sample of households that are long-time SCU members, households that recently joined SCUs, and households that have not joined SCUs, we surveyed two types of villages: those where SCUs have operated for a long period and those where SCUs were recently established. The survey identified three types of households associated with SCUs.

- 1) Treatment Group: SCU member households in villages where SCUs have operated for one to three years.

- 2) Control Group: SCU member households in villages where SCUs were recently established.
- 3) Non-Members: SCU non-members in sampled villages with both old and new SCUs.

In the estimation process, combining a dummy variable for SCU membership (M), isolates non-members, and a dummy for members who benefitted from SCU membership eliminates the self-selection and endogenous placement biases, as follows.

$$Y_{ij} = X_{ij}\alpha + V_j\beta + M_{ij}\gamma + T_{ij}\delta + v_{ij}, \quad (3)$$

where

M_{ij} : a membership dummy equal to 1 if household ij self-selected SCU membership and 0 otherwise.

T_{ij} : a dummy variable equal to 1 if a self-selecting household previously benefitted from SCU membership⁷ and 0 otherwise.

δ : measures the average impact of SCUs on Y_{ij} .

In practice, our sample gives a better proxy for T_{ij} . The empirical model in Equation (3) can be improved by recognizing that some treatment members have benefitted longer than others from SCU membership. Our survey design captured SCUs that operated in the six villages from one month to three years. In these six villages, some households belonged to relatively old SCUs, and their span of membership varied with the age of the SCUs. Taking into account that the cumulative effect that a member can utilize credit and receive dividend from their saving, grows over the life of the SCU, one would expect to see greater impact in villages with older SCUs. The empirical model can be rewritten as

$$Y_{ij} = X_{ij}\alpha + V_j\beta + M_{ij}\gamma + MAMT_{ij}\delta + \mu_{ij}, \quad (4)$$

⁷ This differs slightly from Coleman's (1999), who used access to program credit to distinguish control from treatment villages. This study uses benefits from participating in SCUs by obtaining credit or receiving dividends as the distinguishing proxy.

where the treatment dummy T_{ij} is replaced by $MAMT_{ij}$, the number of months that the SCU has operated in the village. In other words, $MAMT_{ij}$ can be construed as the number of months participants have benefitted from SCU membership. Now, δ measures the impact per month of program availability. If the order of program placement, however, is not random with respect to unobservable village characteristics, then correlation between $MAMT_{ij}$ and ε_{ij}^y can be eliminated with village fixed effects. According to Coleman (1999), this specification in Equation (4) is considerably easier to estimate (if Y_{ij} is uncensored, OLS is appropriate). If the order of program placement is random with respect to unobservable village characteristics, we can obtain efficient and unbiased estimates with V_j as a vector of specific village characteristics.

To carefully examine estimated impacts and possible biases, we compared the results of four types of estimations, following Coleman (1999).

- 1) The “Super-naïve” model: estimation without considering control variables for self-selection and non-random placement.
- 2) The “Naïve” model: estimation with a traditional variable controlling for self-selection. Here, the variable “land value owned by the household five years before this survey” is expected to absorb the participation incentive.

Our survey design enables us to employ the SCU membership dummy to control self-selection bias, since we prepare measures for the length of time respondents belonged to SCUs (months of membership) besides the dummy. Because we must consider the possibility of non-random placement, we prepared two types of estimations.

- 3) A “Non-fixed-effects” model: if program placement is random, the model with non-fixed-effects for village attribute generates efficient and consistent estimators.
- 4) A “Fixed efficient” model: if program placement is not random, estimations by the non-fixed-effects model can be inconsistent. Using a fixed-effects model associated with village attributes, we gain consistent (though possibly inefficient) estimators.

4.2. Estimation Methodology

Assuming that dependent variables (household outcomes) are uncensored, we applied ordinary least squares (OLS) for estimating Equation (4). Moreover, we applied the White test for heteroskedasticity, which leads to unbiased estimators of OLS. Then we used generalized least squares estimation to correct heteroskedasticity (weighted least squares estimations per Wooldridge, 2003: 268–276).

5. Descriptive Observation

5.1. Sample villages

Table 2 summarizes basic information for sampled villages. The initial survey did not necessarily collect details about SCUs villages, as its objective was to collect household-level data about expenditures, income, and assets. As an alternative, we used data from Mieno and Chaleunsinh (2014), who surveyed about 80 SCUs around Vientiane, including all six of our surveyed villages, in September 2008. Note that Table 4 shows data for 2008, three years after our 2005 survey period. Table 2 suggests no notable distinction in primary source of livelihoods between old and new villages. Dong Luang appears to be an exception among all six villages because non-agricultural activities are its primary livelihood; the remaining five villages are essentially rice-producing communities with some secondary income sources.

The bottom half of Table 2 indicates the purposes for SCU loans, and the non-agricultural nature of Dong Luang indicates no clear differences about the comparison among Consumption, Durables and Production; for example, purposes for borrowing in Dong Luang parallel those in Nakountay, a typical rice-producing village. Data under the column Ground Average show little difference from that of 80 Sample Average.⁸ Remarkable differences in loan purposes appear between old and new SCUs. The column Old SCUs Average indicates that 84.2% of loans were for production purposes during the surveyed period. Among the new SCUs, 51.7% of loans were for production purposes and 37.0% for consumption. Among components of consumption lending by new SCUs, average percentages for education (7.2%) and medical services (7.7%) are strikingly higher than for old SCUs (0.2% and 0.4%, respectively). Among new SCUs,

⁸ It is the sample average of SCUs surveyed in 2008 and the same as Table 5 in Mieno and Chaleunsinh (2014).

46% of loans were for agricultural production versus 26.9% among old SCUs, but old SCUs issued a greater percentage of loans for business purposes (41.3% versus 10.7% for new SCUs).

Data in Table 2 suggest that SCUs lend to support members' consumption during their early stages and shift to production lending as they age. Agricultural lending dominates lending for production during SCUs' early stages and shifts to business purposes. Table 2 shows the picture three years after our 2005 survey, when the three old SCUs had operated one-and-a-half to three years. Thus, we presume that SCUs which were old in 2005 were in a stage similar to new SCUs during the 2008 period shown in Table 2. That is, relatively young SCUs mainly granted credit for such consumption purposes as education or medical care.

5.2. Independent Variables and Characteristics of the Sample Households

Table 3 summarizes variables representing household and village characteristics. The sample contains 251 households: 131 (52%) in the treatment group, 52 (21%) in the control group, and 68 (27%) non-members. Variables in Table 3 are generally utilized as independent variables in the estimation. They are classified into four categories. Section I.1 shows household SCU membership scaled by month. The mean is 15 months for the treatment group and by definition 0 for the control group and non-members.

Section I.2 shows household characteristics. Data in I2-3 and I2-4 indicates that, household heads are males in more than 90% of cases, whereas responders to the interview (i.e., SCU members) are households headed mostly by females. The mean education year is 4.9 years for the whole sample, 4.69 years for the treatment group, 5.27 years for the control group, and 5.01 years for non-members. Table 3 suggests that internal networks influence participation in SCUs as follows. For the whole sample, villagers have an average of 2.42 relatives in the village; the average number of relatives is 2.27 for villagers in the treatment group, 2.21 in the control group, and slightly higher at 2.87 for non-members. The average number of civil servants per household is 0.27 for the whole sample, 0.28 for the treatment group, 0.37 for the control group, and 0.16 among non-members.

Sections I.3 and I.4 report village characteristics and price factors, respectively. Data show that 40%–50% of villages enjoy access to water. Only 19% of villages have irrigation systems. Two-thirds (66%) have a primary school, but only 10% have a secondary school.

5.3. Observation on the Dependent Variables

Table 4 presents three general categories of indices for household welfare as dependent variables: (A) Expenditures, (B) Assets, and (C) Income. Household expenditures consist of (A1) Food and (A2) Non-Food expenditures. The latter contains seven subcategories, including Transportation, Education, and Medical expenditures. Assets include (B1) House, (B2) Land, and (B3) Other. Other contains five subsets, including Agricultural assets, Livestock, and Savings. Household income includes (C1) Self-employment and (C2) Employment Income, subdivided into seven and five categories, respectively. In total, we prepared 34 dependent variables.

Table 4 compares the mean values of dependent variables classified by treatment, control, and non-member groups. The difference between mean values of the control group and non-members shows the possibility of participation bias. That mean values for the treatment group exceed those for the control group in all three categories—Expenditures, Assets, and Income—suggest that SCUs’ lending programs sponsor positive welfare effects.

Among Expenditures, the notable relationships are for Non-food Expenditures and in subcomponents such as Education, Clothing, and Medical. Among Assets, the noteworthy relationships are House and Land. Among Income, on the other hand, SCUs’ positive effect is suggested by wide ranges in Self-employment and Employment income.

A comparison between control groups and non-members suggests household membership in SCUs. Mean values for control groups are larger for Household Total Expenditures and most of its subcomponents, suggesting that households with higher expenditures have a larger tendency to be SCU members. The gap between Food and Non-food Expenditures is more remarkable for non-members, suggesting the necessity for non-food expenditures is an incentive to join SCUs.

Regarding Assets, however, wealthier households appear inactive to join membership. In particular, the gap in the subcomponent of Land seems large (KIP 66,232 for non-members and KIP 22,100 for the control group), suggesting that those richer in land asset are notably inactive to join SCU activities. In fact, this tendency is overwritten by the independent variable Value of Household-Owned Land 5 Years Ago (Table 3, I2-2). Similarly, Household Total Income and all its subcomponents suggest that wealthier households generally appear inactive to join SCU membership.

6. Empirical Results

Equation (4) estimated the effect of SCU membership duration, the SCU membership dummy, ex ante household assets,⁹ and other independent variables on all 34 dependent variables associated with household expenditures, assets, and income (Table 4).

In a comparable setting with data for similar SCUs in Northeast Thailand, Coleman (1999) insists that the effect of SCU membership is scarcely evident in any welfare indices after considering selection and placement biases. Although the influence of the SCU participation on welfare could not be found in most dependent variable cases, we found five dependent variables influenced by it covering assets, income, and expenditures. Examining assets, we found a positive and significant result for (1) Household-owned House. With regard to income, we found correlations among subcomponents of self-employment income from (2) Livestock (positive) and (3) Agriculture (negative). Among Expenditures, we found correlations in variables for (4) Rental and (5) Education.

We now analyze estimation results for these five cases (Table 5). For all five, the effect of SCU membership duration is significant—positive for four dependent variables and negative for agricultural income. Data for (1) House Asset suggests that SCU credit has an improvement effect directly or indirectly. Positive results for income from (2) Livestock and negative results for (3) Agricultural income may suggest that SCU members borrow to raise livestock and that lending for that purpose promotes a shift

⁹ This value stands for the value of house with land (not empty land or land for rice fields and crops).

Barnes (1996:4) cited houses as one of the physical assets representing household wealth.

from traditional farming. The result for (4) Rental expenditures suggests that SCU lending enables members to activate the livelihood activities in agriculture or non-agriculture. The result under (5) Education suggests that SCU lending enables members to pursue education.

In Table 5, estimation results for Value of Household-owned Land 5 Years Ago, the variable for absorbing selection bias between the Super Naïve model and others, are significant only for agricultural income, but the effect of SCU membership duration remains positive after controlling for it. Some household characteristics are significant as control variables, but others are not. Variables representing village characteristics and wage/price variables are seldom significant.

6.1. Impact on Assets: Household House Asset

Among the category Household Assets in Table 4, estimation results confirm that Household-owned House is a primary component (36.6%) of total household assets. In Table 6, F-statistics for all four model specifications are strongly significant. In all four specification regressions, the coefficient of Months as SCU Member is positive and significant. A large proportion of coefficients in both the Naïve and Super-naïve models show significant impact. In the fixed-effect and non-fixed-effect models, which control possible placement bias, the coefficient of Months as SCU Member is lower, but significant at 5% and 10%, respectively. These results sharply contrast with those in Coleman (1999, 2002), which shows insignificant effects of SCU membership on house value.

The coefficient for Value of Household-owned Land 5 Years Ago (Table 6) is positive, but statistically insignificant in three specifications, implying that selection bias in a form that the initial wealth affects the house asset at observation period is trivial and can be ignored¹⁰.

The coefficient of SCU Member Dummy with respect to house asset value is insignificant, consistent with Coleman (1999, 2002), indicating that unobservable differences between members and non-members (such as entrepreneurship and preferences) make no difference. Therefore, in the fixed- and non-fixed effects models,

¹⁰This result also contrasts with those in Coleman (1999), who finds the coefficient of 'female-owned land value 5 years ago' to be positive and statistically significant with regard to women's wealth.

Table 6 indicates no correlation between Member Dummy and house asset value, also suggesting no selection bias caused by unobservables.

Comparing the fixed- and non-fixed-effects models in Table 6, the effect of Months as SCU Member is inconsequential; the statistical significance is slightly weak in the non-fixed-effects model, and coefficients are almost identical. For the explanatory variables to control village attributes in the non-fixed-effects, Naïve, and Super-naïve models, and the factor for paved roads is negative and statistically significant. The result roughly shows that the fixed-effects model sufficiently absorbs differences among villages and any effect of endogenous program placement is unclear.

Estimation results show significant influence of several household characteristics on house asset. Although the Sex of Household Head (female) dummy in Table 3 is insignificant, at least at the 10% level, the dummy for Gender of Individuals (Table 3) shows a positive and significant relation to house value in all four estimation models. Education of Individuals is highly significant in all four estimation models at the 5% level, which indicates that human and physical capital are complements in production (Coleman, 1999:120). Age of Individuals, Number of Months Doing Business, Number of Relatives in Village, and SCU Committee Member Dummy are significant and positive in most specifications.

6.2. Impact on Income: Income from Livestock and Agriculture

Unlike the examination of assets, we could hardly find the evidence of the overall impact for improvement by the SCU membership in the income side. Results for regressions involving self-employment and employment income are insignificant. However, evidence of a certain change in composition of household livelihoods was suggested in the estimations: participation in SCUs decreases the composition of agricultural income and slightly increases that of livestock income.

In Table 7, the effect of SCU membership on income from livestock is positive in all four specifications: coefficients for Months as SCU Member are positive and significant in the fixed-effects and non-fixed-effects models (at 10% significance), instead of the rest, implying that SCU participation increases livestock production. On the other hand, in all four specification models, agriculture income (Table 8) correlates

significantly and negatively with months of SCU membership. Results are significant at 1% in all models, suggesting the negative correlation is stable.

The member dummy is significant for agricultural income, implying that unobservable differences between members and non-members matter in estimation results, whereas they are insignificant for livestock income. Although estimations for agriculture income find correlations with many explanatory variables for household characteristics such as household size (positive) or education (negative), only a few explanatory variables influence livestock income. Village characteristics seldom influence the condition.

As summarized in Table 4, agricultural income averages 16.9% of total income in the whole sample, and livestock income averages 11.0%. Both are major income sources for village households. Our finding shows that membership in SCUs is associated with a progression in village livelihoods from agriculture to livestock production. These results contrasted with results for Northeast Thailand. Coleman (1999) discovered nothing about the impact of SCU membership on income and income structure. Our finding, however, is unclear. The positive correlation of SCU membership with livestock income is significant only at 10%, and such substitution relation does not necessarily appear consistent with the descriptive observation in Table 4 (Column C11 and C12).

6.3. Impact on Expenditure: Education and Rental Expenditure

We found no clear overall impact of SCU membership on total expenditures (Table 4). But the clear and positive correlation between SCU membership and educational expenditures is a noteworthy finding. Education expenditures average 13.6% of total expenditures, the second-largest component of Non-food Expenditure. SCU members borrow for education—that is for human capital formation.

Table 9 shows the impact of SCU membership on education expenditures with the four specifications. Months as SCU Member relates positively at 5% significance in all specifications except in the Super-naïve model. Per results in the fixed-effects model, belonging to an SCU for one more month could raise educational expenditures by KIP 5,670, for example.

As for the comparison among four specifications in Table 9, the SCU Membership Dummy and Value of Household-owned Land 5 Years Ago are insignificant, suggesting negligible bias from unobservables. Among variables for village characteristics, Villages with a Primary School up to Grade 5 correlates positively and significantly with educational expenditures.

As a supplemental finding, we note a clear but substantially weak correlation between SCU membership and rental expenditures. Table 10 shows the regression results on rental expenditures for all specifications. The coefficient is significant at 1% for the Super-naïve model and 5% for the remaining specifications. This result could be evidence that SCU membership facilitates self-employment in raising livestock and fish or in non-agricultural activities. At 0.8% of total expenditures, the effect of Rental expenditures is, however, limited. For rental expenditures, the explanatory variable of education level is positive and significant at the 5% level in all four estimation models. This result may imply that better-educated Laotians launch or expand new business by acquiring physical capital through SCU credit.

6.4. Interpretation

Our finding suggests that SCU programs around Vientiane generally encourage diversification on household livelihoods. First, SCUs' strong positive contribution to educational expenditures is apparent and confirmed in the fixed- and non-fixed-effects models, the strictest forms of estimation. The apparent difference in mean values for the amount and share of educational expenditures between the treatment group and others (control group and non-members) in Table 4 underwrites the estimation results. As Table 2 shows, education loans are one of the largest components of lending among young SCUs, suggesting that increase of educational expenditures is realized through loosened cash constraint by SCU loan as a direct effect. Supporting human capital formation beyond short-term income generation is the most vital service SCUs provide during their early stages.

Second, we find that SCU microfinance is associated with an increase in house values. There are two ways to interpret this finding. As a direct way, it can be realized by investment for a particular purpose such as starting or expanding a business; as an indirect way it can be a result of income generation. Table 2 indicates that loans for

durables, including house repair, are a somewhat higher percentage of loans among young SCUs, suggesting existence of the direct effect; investment in housing is activated by improved access to credit.

Third, results for increased livestock income and decreased agricultural income imply that households gravitate toward livestock raising beyond their traditional agricultural pursuits. However, the result is not necessarily consistent with the descriptive observation. In Table 4, income from livestock among the treatment group is somewhat less than among the control group, and non-members (although it is consistent in income from agriculture). Also, Table 2 suggests that lending for agricultural purposes is relatively robust among young SCUs. Any effect SCUs have in changing household income sources from traditional agriculture to more diversified livelihoods remains vague.

Finally, the impact on rental expenditures gives side evidence that SCUs encourage entrepreneurship. However, the share of rental income among total income is low (0.6% in Table 4), so the effect is trivial and caution is warranted in interpreting this result.

Although this study's primary contribution is fact-finding relevant to Laos, several factors distinguish Laos from Thailand in Coleman (1999). From a methodological perspective, characteristics of SCUs differ, as Ohno and Lapanun (2009) and the chapter 2 in this special edition indicate. Since NGO programs in Northeast Thailand started by supporting existing SCUs, information about members of new groups (membership dummy = 1 and duration = 0 months) may not provide pure signals of the control group. In addition, since programs distributed seed money regardless of SCUs' mobilized saving size, seed money may be significant for some SCUs and trivial for others, resulting that the impact for the treatment group contained such serious disturbance factors.

In this sense, the methodology may better fit the Laotian case. Since NGOs began SCUs in Laos the new SCUs-villages are truly new. Seed money, a serious disturbing factor in analyzing Thailand's case, is rarely distributed among programs in the Vientiane area. In a socio-economic context, the stage of the village economy may offer an explanation. Thailand's rural economy was well developed and diversified even in the mid-1990s, and a degree of formal credit had reached even into rural areas.

However, only about three-quarters of Lao PDR's one million working population can access formal or semi-formal financial services. Moreover, only 6% of credit-eligible borrowers could benefit from reasonable interest rates, and 4% of them deposit money in formal financial institutions (Microfinance Capacity Building and Research Programme, 2005).¹¹ Given this situation, SCUs were a vital and nearly the sole (except for informal finance) providers of financial services during mid-2000s, even in the semi-urban area surrounding Vientiane.

7. Conclusion

Coleman (1999) raised the possibility of selection bias and endogenous placement of program in pioneering studies such as Pitt and Khandker (1996, 1998) and Khandker (2003). He tackled the problem with a unique sample design in examining SCUs in Northeast Thailand. He found that many apparent correlations were caused by biases between the program and welfare factors, and warned that earlier studies may overestimate the impact of microfinance.

Following Coleman's (1999) survey design and estimation methodology, we found that SCU microfinance bolsters household income, expenditures, and wealth in Laos. We estimated the influence of SCUs on 34 welfare indices, about half the number (72) in the benchmark study. Although Coleman (1999) universally denied any causal impact in all of his observations, our estimations indicate an impact in five index cases on assets, income, and expenditures.

We found that SCUs boost educational expenditures as a major function. We also found an increase in assets (house asset), suggesting villagers' investment (purchase of durables and house repair) reflected by possible business activation or agricultural diversification. Although a convincing interpretation is difficult, our estimations suggest that SCU microfinance prompts a shift in income sources from traditional agriculture to livestock raising, and an increase in rental income.

Our findings are basically consistent to the argument on the function of SCUs in Vientiane areas discussed in the other chapters, and strongly support the existence of the benefit of the SCU practice in Laos. Our findings also endorse the Laotian

¹¹ Agricultural Promotion Bank, the largest policy-based bank.

government's current policies regarding SCUs. Future scholarship needs to examine whether our findings can be generalized to situations in Laos beyond Vientiane's socio-economic context.

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Table 1: Sample

No.	Savings groups	Vintage		No. of HH in village	No. of Member HH		No. of non-member HH	Sample size by:			Sample size	
		Established in	Vintage at Sep-2005		No.	% to Total		treatment group	control group	Non-member	Total of sample	Sample Coverage
I. Old savings group in:												
1	Nakountay village	Oct-2002	37 months	215	186	86.5%	29	39	3	19	61	28.4%
2	Huannamyene village	Jun-2003	27 months	353	217	61.5%	136	34	1	13	48	13.6%
3	Dongluang village	Apr-2004	17 months	184	75	40.8%	109	16	0	8	24	13.0%
	<i>Sub-total</i>			752	478		274	89	4	40	133	17.7%
II. New savings group in:												
4	Phonekeo village	Jun-2005	3 months	95	80	84.2%	15	8	19	6	33	34.7%
5	Phonesavanh village	Jun-2005	3 months	123	56	45.5%	67	19	9	17	45	36.6%
6	Sisavard village	Aug-2005	1 month	59	53	89.8%	6	15	20	5	40	67.8%
	<i>Sub-total</i>			277	189		88	42	48	28	118	42.6%
	Grand total			1,029	667		362	131	52	68	251	24.4%

Source: Author's survey data, September 2005 and March 2006.

Table 2 Livelihood and SCU Operation of Six Sample Villages

	1	2	3	I	4	5	6	II		
	Nakountay village	Huannamyene village	Dongluang village	Old SCUs Average	Phonekeo village	Phonesavanh village	Sisavard village	New SCUs Average	Ground Average	80 Sample Average*
Major Livelihood (First)	Rice Production	Rice Production	Office Work		Rice Production	Rice Production	Rice Production			
Major Livelihood (Second)	Handcraft Making	Other Plantation	Trading		Other Plantation	Handcraft Making	Raising Livestock			
Major Livelihood (Third)	Raising Livestock	Raising Livestock	Construction Labor		Trading	Raising Livestock	Construction Labor			
Saving / Member (Kip)	610,383	371,637	993,270	658,430	543,923	119,287	136,228	266,479	462,455	641,413
Total Loan (Thousand Kip)	542,150	941,200	359,985	614,445	336,450	162,000	65,000	187,817	401,131	23,081,000
Loan Purpose (Percentage)										
Consumption	0.0%	25.2%	1.2%	8.8%	10.8%	61.7%	38.5%	37.0%	22.9%	20.8%
General Consumption	0.0%	23.4%	0.1%	7.8%	7.9%	37.0%	15.4%	20.1%	13.9%	16.9%
Education	0.0%	0.7%	0.0%	0.2%	3.0%	18.5%	0.0%	7.2%	3.7%	2.0%
Medical Service	0.0%	1.1%	0.0%	0.4%	0.0%	0.0%	23.1%	7.7%	4.0%	0.2%
Emergency Loan	0.0%	0.0%	1.1%	0.4%	0.0%	6.2%	0.0%	2.1%	1.2%	1.8%
Durables	0.0%	21.2%	0.0%	7.1%	3.0%	30.9%	0.0%	11.3%	9.2%	8.0%
Housing, House Repairing	0.0%	5.3%	0.0%	1.8%	0.0%	6.2%	0.0%	2.1%	1.9%	2.7%
Motorcycle	0.0%	5.3%	0.0%	1.8%	3.0%	6.2%	0.0%	3.0%	2.4%	1.6%
Automobile	0.0%	10.6%	0.0%	3.5%	0.0%	18.5%	0.0%	6.2%	4.8%	3.6%
Production	100.0%	53.6%	98.8%	84.2%	86.2%	7.4%	61.5%	51.7%	67.9%	71.2%
Business	15.3%	37.4%	71.1%	41.3%	3.0%	6.2%	23.1%	10.7%	26.0%	31.4%
Agriculture	41.5%	15.6%	23.6%	26.9%	83.2%	0.0%	38.5%	40.6%	33.7%	34.5%
Livestock	15.3%	0.7%	4.2%	6.7%	0.0%	1.2%	0.0%	0.4%	3.6%	1.0%
Handcraft	27.8%	0.0%	0.0%	9.3%	0.0%	0.0%	0.0%	0.0%	4.6%	4.3%

Note. Calculated from the survey for the chapter by Mieno and Chaleunsinh (2014) at September, 2008

Table 3 Descriptive Statistics for Independent Variable

Sample Group		Whole		Treatment Group	Control Group	Non-Member
Number of Sample		251		131	52	68
		Mean	Std. Dev.	Mean	Mean	Mean
I.1	I-1 Months as VSG member (duration as SCU member)	8.08	12.00	15.00	0.00	
I.2 Household Characteristics	I2-1 Member Dummy	0.73	0.45	1.00	1.00	
	I2-2 Value of household owned land 5 years ago	29,043	82,224	25,346	36,662	30,338
	I2-3 Sex of household head (female=1)	0.10	0.30	0.09	0.13	0.09
	I2-4 Gender of individuals (female=1)	0.89	0.32	0.92	0.88	0.82
	I2-5 Education of individuals (years)	4.90	3.00	4.69	5.27	5.01
	I2-6 Household size	5.51	2.00	5.65	5.54	5.24
	I2-7 Age of individuals (years)	41.0	12.0	42.3	38.6	41.0
	I2-8 Number of months doing business	161	146	155	161	172.0
	I2-9 Number of generations of family in village	0.50	1.00	0.50	0.50	0.51
	I2-10 Number of relatives in village	2.42	4.00	2.27	2.21	2.87
	I2-11 SCU committee member dummy	0.06	0.24	0.08	0.10	0
	I2-12 Number of civil servant in household	0.27	0.56	0.28	0.37	0.16
	I2-13 Number of wage employment in Household	1.08	1.19	1.18	1.10	0.88
	I2-14 Number of school age children in Household	1.57	1.26	1.67	1.83	1.19
	I2-15 Number of dependent on your income in Household	2.64	1.67	2.66	2.65	2.59
I.3 Village Characteristics	I3-1 Village is near river (0/1)	0.43	0.5	0.56	0.08	0.47
	I3-2 Village has big pond which has water throughout the year (0/1)	0.38	0.48	0.36	0.42	0.37
	I3-3 Dummy for villages with a big pond or river access (0/1)	0.57	0.50	0.62	0.44	0.56
	I3-4 Village is located in district capital (0/1)	0.10	0.29	0.12	0.00	0.12
	I3-5 Dummy for villages with paved road or closeness to main road (0/1)	0.29	0.45	0.38	0.02	0.31
	I3-6 Village has irrigation (0/1)	0.19	0.39	0.26	0.02	0.19
	I3-7 Dummy for villages with secondary school	0.10	0.29	0.12	0.00	0.12
	I3-8 Dummy for villages with primary school up to grade 5	0.66	0.47	0.74	0.44	0.68
	I3-9 Distance from village to main markets (km)	22	6.84	23	24	20.97
I.4 Village Characteristics (Price and Wage)	I4-1 Price of one cattle (1,000 kip)	1,610	233	1,574	1,679	1,629
	I4-2 Price of one buffalo (1,000 kip)	3,261	524	3,271	3,135	3,338
	I4-3 Price of pig per Kg	14,596	5,097	15,485	11,484	15,262
	I4-4 Price of duck per Kg	14,572	617	14,668	14,356	14,551
	I4-5 Price of traditional chicken (Gailard) per Kg	18,857	896	18,985	18,288	19,044
	I4-6 Daily wage for harvesting rice	18,307	9,339	18,168	15,769	20,515
	I4-7 Daily wage for planting rice	27,875	18,081	32,664	11,913	30,853
	I4-8 Daily wage for construction	24,243	2,043	23,798	25,769	23,934

Table 4. Descriptive Statistics of Dependent Variables

A. Household Monthly Expenditure

Sample Group	Whole			Treatment Group		Control Group		Nonmember	
Number of Sample	251			131		52		68	
	Mean	%	Std. Dev.	Mean	%	Mean	%	Mean	%
A Household total expenditure	1,234,800		1,152,860	1,340,880		1,283,097		993,507	
A1 Food expenditure	417,481	33.8%	329,570	429,160	32.0%	435,058	33.9%	381,539	38.4%
A2 Non-food expenditure	817,319	66.2%	998,698	911,720	68.0%	848,039	66.1%	611,968	61.6%
A21 Rental	10,267	0.8%	84,549	2,061	0.2%	39,396	3.1%	3,799	0.4%
A22 Transportation	210,553	17.1%	432,975	209,551	15.6%	311,404	24.3%	135,363	13.6%
A23 Educationation	167,807	13.6%	333,357	201,508	15.0%	129,619	10.1%	132,086	13.3%
A24 Clothing	136,084	11.0%	184,019	161,304	12.0%	95,556	7.4%	118,490	11.9%
A25 Medical	105,106	8.5%	234,065	119,523	8.9%	88,875	6.9%	89,745	9.0%
A26 Utensil	95,754	7.8%	222,659	98,393	7.3%	104,131	8.1%	84,265	8.5%
A27 Other major expenditures	91,748	7.4%	316,805	119,380	8.9%	79,058	6.2%	48,221	4.9%

Note. Unit: Kip, monthly expenditure

B. Household Asset

Sample Group	Whole			52.2% Treatment Group		20.7% Control Group		27.1% Nonmember	
Number of Sample	251			131		52		68	
	Mean	%	Std. Dev.	Mean	%	Mean	%	Mean	%
B Value of household owned total asset	92,679		45,450	94,156		69,466		108,000	
B1 Household owned house	33,965	36.6%	45,450	36,757	39.0%	33,009	47.5%	29,316	27.1%
B2 Household owned land	45,479	49.1%		43,987	46.7%	22,100	31.8%	66,232	61.3%
B3 Household owned other assets	13,235	14.3%	33,073	13,412	14.2%	14,356	20.7%	12,037	11.1%
B31 Agriculture asset	2,525	2.7%	7,607	2,703	2.9%	3,156	4.5%	1,699	1.6%
B32 Livestock asset	5,550	6.0%	19,242	4,907	5.2%	8,011	11.5%	4,907	4.5%
B33 Other enterprise asset	460	0.5%	2,229	413	0.4%	727	1.0%	346	0.3%
B34 Savings at house	1,242	1.3%	7,491	1,078	1.1%	575	0.8%	2,069	1.9%
B35 Other asset	3,459	3.7%	14,567	4,312	4.6%	1,887	2.7%	3,017	2.8%

Note. Unit: 1000 Kip

C. Household Income

Sample Group	Whole			Treatment Group		Control Group		Nonmember	
Number of Sample	251			131		52		68	
	Mean	%	Std. Dev.	Mean	%	Mean	%	Mean	%
C Household total income	14,346,752			14,439,282		11,932,355		16,014,800	
C1 Household total self-employment income	11,592,111	80.8%	25,294,651	11,487,380	79.6%	9,626,000	80.7%	13,297,368	83.0%
C11 from agriculture	2,419,044	16.9%	5,979,001	2,537,023	17.6%	2,370,000	19.9%	2,229,265	13.9%
C12 from livestock	1,578,175	11.0%	3,486,485	1,466,794	10.2%	1,580,385	13.2%	1,791,059	11.2%
C13 from handicraft & textile	1,888,122	13.2%	3,243,976	2,134,983	14.8%	1,703,500	14.3%	1,553,735	9.7%
C14 from trading	3,376,932	23.5%	18,386,628	2,664,695	18.5%	3,952,885	33.1%	4,308,603	26.9%
C15 from repairing& fixing service	379,482	2.6%	2,459,819	552,672	3.8%	0	0.0%	336,029	2.1%
C16 from rice mill & construction	1,648,562	11.5%	15,460,301	1,703,733	11.8%	19,231	0.2%	2,788,235	17.4%
C17 from vehicle service	301,793	2.1%	2,944,454	427,481	3.0%	0	0.0%	290,441	1.8%
C2 Household total employemend income	3,601,356	25.1%	13,979,828	2,951,902	20.4%	2,306,355	19.3%	2,717,432	17.0%
C21 wage & salary income	2,205,797	15.4%	3,799,600	2,327,977	16.1%	1,870,000	15.7%	2,227,206	13.9%
C22 from remittance	407,822	2.8%	1,704,379	448,352	3.1%	249,816	2.1%	450,569	2.8%
C23 rental income	79,084	0.6%	738,221	102,290	0.7%	113,462	1.0%	8,088	0.1%
C24 monetary items income	40,425	0.3%		45,802	0.3%	38,462	0.3%	31,569	0.2%
C25 other income	21,514	0.1%	253,644	27,481	0.2%	34,615	0.3%	0	0.0%

Note. Unit: Kip, yearly income

Table 5 Summary of the Estimation Result

Independent variable	Table 5	Table 6	Table 7	Table 8	Table 9
	Asset	Income		Expenditure	
	House Asset	Livestock	Agriculture	Education	Rental
Months as SCU member (duration as SCU member)	** +	* +	*** -	** +	** +
SCU Member Dummy			* +		
Value of household owned land 5 years ago			*** +		
Sex of household head (female=1)			*** -		
Gender of individuals (female=1)	** +				
Education of individuals (years)	** +		** -		** +
Household size		*** +	*** +	*** +	
Age of individuals (years)	** +				*** +
Number of months doing business	*** +		*** +	** +	** +
Number of generations of family in village			** +	** -	*** +
Number of relatives in village	*** +				** +
SCU committee member dummy	*** +	*** +			** +
Number of civil servant in household		* +			** +
Dummy for villages with a big pond or river access				* +	
Dummy for villages with paved road or closeness to main road	** +				
Dummy for villages with primary school up to grade 5				* +	
Distance from village to main markets			*** +		
Price of traditional chicken (Gailard) per Kg					
Daily wage for construction					

Note: based on Nonfixed effect model. the superscripts ***, ** and * denote that coefficient is significant at 1 %, 5 % and 10 % criteria.

Table 6: Impact of savings group on household house value - GLS.

Independent variable	Fixed effects model		Nonfixed effects model		“Naïve” model		“Super-naïve” model	
	Coefficient	Std. Error						
Months as SCU member (duration as SCU member)	292,097	147,784 **	292,097	149,683 *	335,021	122,254 ***	358,260	123,456 ***
SCU Member Dummy	1,481,225	3,606,033	1,481,225	3,652,365				
Value of household owned land 5 years ago	7.E-02	5.E-02	7.E-02	5.E-02	7.E-02	5.E-02		
Sex of household head (female=1)	-8,395,409	6,494,524	-8,395,409	6,577,969	-8,192,279	6,446,844	-8,324,504	6,502,591
Gender of individuals (female=1)	14,021,407	6,760,261 **	14,021,407	6,847,120 **	14,277,586	6,841,554 **	10,800,449	6,236,708 *
Education of individuals (years)	854,694	422,396 **	854,694	427,823 **	875,203	4,152,112 **	912,698	405,066 **
Household size	1,037,618	752,418	1,037,618	762,086	1,031,433	761,675	1,141,685	753,676
Age of individuals (years)	312,418	136,471 **	312,418	138,225 **	317,848	136,362 **	347,865	137,941 ***
Number of months doing business	29,502	11,177 ***	29,502	11,321 ***	29,811	11,347 ***	33,317	11,108 ***
Number of generations of family in village	843,836	1,191,177	843,836	1,206,481	796,147	1,209,852	542,343	1,190,404
Number of relatives in village	1,552,376	387,633 ***	1,552,376	392,613 ***	1,548,088	392,040 ***	1,544,427	381,940 ***
SCU committee member dummy	12,703,787	4,169,217 ***	12,703,787	4,222,785 ***	12,597,429	4,225,101 ***	12,995,561	4,189,169 ***
Number of civil servant in household	5,058,192	3,566,208	5,058,192	3,612,029	5,216,180	3,483,950	5,351,551	3,463,556
Dummy for villages with a big pond or river access			-44,768,692	36,726,790	-45,892,240	36,782,065	-47,125,621	36,182,599
Dummy for villages with paved road or closeness to main road			-17,908,249	7,655,365 **	-18,358,229	7,784,479 **	-18,674,677	7,906,479 **
Dummy for villages with primary school up to grade 5			45,390,649	38,241,483	46,212,441	38,344,587	47,538,868	37,641,126
Distance from village to main markets			583,219	424,715	599,591	416,257	585,607	424,001
Price of traditional chicken (Gailard) per Kg			-258	1,783	-429	1,846	-171	1,841
Daily wage for construction			-1,018	1,542	-886	1,613	-977	1,613
	F-statistic= 2.858314		F-statistic=2.858314		F-statistic=3.044732		F-statistic=2.911104	
	Prob(F-statistic)= 0.000149		Prob(F-statistic)= 0.000149		Prob(F-statistic)= 0.000080		Prob(F-statistic)= 0.000217	
	R-squared=0.181513		R-squared=0.181513		R-squared=0.181768		R-squared=0.166006	

Note: the superscripts ***, ** and * denote that coefficient is significant at 1 %, 5 % and 10 % criteria.

Table 7: Impact of savings group on self-employment income from livestock - GLS.

Independent variable	Fixed effects model		Nonfixed effects model		“Naïve” model		“Super-naive” model	
	Coefficient	Std. Error						
Months as SCU member (duration as SCU member)	19,962	10,589 *	19,962	10,725 *	5,374	6,546	5,948	6,388
SCU Member Dummy	-557,276	358,369	-557,276	362,974				
Value of household owned land 5 years ago	2.E-03	3.E-03	2.E-03	3.E-03	2.E-03	3.E-03		
Sex of household head (female=1)	-300,623	207,914	-300,623	210,585	-368,213	204,348 *	-371,531	202,203 *
Gender of individuals (female=1)	80,203	845,785	80,203	856,652	-6,467	855,017	-84,635	861,953
Education of individuals (years)	12,190	33,842	12,190	34,277	2,017	33,190	4,484	33,169
Household size	318,013	97,539 ***	318,013	98,792 ***	306,585	95,545 ***	310,764	95,568 ***
Age of individuals (years)	4,370	10,151	4,370	10,281	1,298	9,339	2,549	9,296
Number of months doing business	-809	818	-809	828	-761	806	-689	792
Number of generations of family in village	107,168	83,641	107,168	84,716	110,511	78,823	110,934	78,738
Number of relatives in village	46,844	32,868	46,844	33,290	48,340	31,638	49,922	32,272
SCU committee member dummy	1,378,544	483,964 ***	1,378,544	490,183 ***	1,413,605	473,251 ***	1,445,757	479,883 ***
Number of civil servant in household	413,843	249,041 *	413,843	252,241	389,296	246,407	395,150	244,608
Dummy for villages with a big pond or river access			-3,014,492	2,745,199	-2,626,708	2,695,507	-2,669,113	2,678,944
Dummy for villages with paved road or closeness to main road			-654,752	684,148	-481,329	656,940	-493,312	659,751
Dummy for villages with primary school up to grade 5			2,453,660	2,861,017	2,144,790	2,823,562	2,186,486	2,806,690
Distance from village to main markets			-16,485	54,007	-21,839	53,026	-22,598	52,962
Price of traditional chicken (Gailard) per Kg			-99.92	117	-39	99	-31.38	100
Daily wage for construction			83	69	39	56	35	56
	F-statistic= 2.296443		F-statistic=2.296443		F-statistic=2.281757		F-statistic=2.388660	
	Prob(F-statistic)= 0.002577		Prob(F-statistic)= 0.002577		Prob(F-statistic)= 0.003352		Prob(F-statistic)= 0.002513	
	R-squared=0.151228		R-squared=0.151228		R-squared=0.142720		R-squared=0.140397	

Note: the superscripts ***, ** and * denote that coefficient is significant at 1 %, 5 % and 10 % criteria.

Table 8: Impact of savings group on household self-employment income from agriculture - GLS.

Independent variable	Fixed effects model		Nonfixed effects model		“Naive” model		“Super-naive” model	
	Coefficient	Std. Error						
Months as SCU member (duration as SCU member)	-28,207	9,287 ***	-28,207	9,406 ***	-19,530	7,505 ***	-20,080	7,382 ***
SCU Member Dummy	286,831	163,582 *	286,831	165,684 *				
Value of household owned land 5 years ago	1.E-03	4.E-04 ***	1.E-03	4.E-04 ***	1.E-03	4.E-04 ***		
Sex of household head (female=1)	-541,902	108,493 ***	-541,902	109,887 ***	-512,509	107,430 ***	-486,574	107,728 ***
Gender of individuals (female=1)	72,762	129,788	72,762	131,456	103,555	128,713	74,531	127,055
Education of individuals (years)	-41,018	19,609 **	-41,018	19,861 **	-39,570	19,779 **	-28,726	17,799
Household size	74,184	25,956 ***	74,184	26,290 ***	74,259	25,928 ***	80,356	25,993 ***
Age of individuals (years)	6,792	4,806	6,792	4,868	5,988	4,768	7,609	4,585 *
Number of months doing business	2,310	573 ***	2,310	581 ***	2,347	580 ***	2,376	572 ***
Number of generations of family in village	137,676	58,041 **	137,676	58,786 **	138,985	57,809 **	127,146	56,916 **
Number of relatives in village	11,848	21,677	11,848	21,956	11,319	22,153	11,530	22,209
SCU committee member dummy	536,174	563,871	536,174	571,116	506,895	569,193	507,812	567,530
Number of civil servant in household	82,783	118,974	82,783	120,503	107,798	115,762	158,546	105,499
Dummy for villages with a big pond or river access			-1,348,716	5,157,754	-1,576,873	5,166,868	-1,521,957	5,156,553
Dummy for villages with paved road or closeness to main road			-1,464,704	3,444,240	-1,550,032	3,444,890	-1,536,444	3,437,276
Dummy for villages with primary school up to grade 5			4,407,984	8,395,579	4,576,076	8,394,287	4,510,155	8,377,608
Distance from village to main markets			-118,734	59,640 **	-116,338	59,163 **	-116,370	59,045 **
Price of traditional chicken (Gailard) per Kg			-697.26	999	-724.56	999	-720.7	997
Daily wage for construction			638	792	663.61	793	656.64	791
	F-statistic= 1.492664		F-statistic= 1.492664		F-statistic=1.537622		F-statistic=1.607735	
	Prob(F-statistic)= 0.093412		Prob(F-statistic)= 0.093412		Prob(F-statistic)= 0.082866		Prob(F-statistic)= 0.067655	
	R-squared= 0.103790		R-squared= 0.103790		R-squared=0.100871		R-squared=0.099043	

Note: the superscripts ***, ** and * denote that coefficient is significant at 1 %, 5 % and 10 % criteria.

Table 9: Impact of savings group on household educational expenditure - GLS.

Independent variable	Fixed effects model		Nonfixed effects model		“Naïve” model		“Super-naive” model	
	Coefficient	Std. Error						
Months as SCU member (duration as SCU member)	5,670	2,768 **	5,670	2,804 **	5,961	2,329 **	5,976	2,324 **
SCU Member Dummy	7,080	29,520	7,080	29,899				
Value of household owned land 5 years ago	-8.E-05	1.E-04	-8.E-05	1.E-04	-8.E-05	9.E-05		
Sex of household head (female=1)	-73,347	49,734	-73,347	50,373	-71,354	49,885	-71,424	49,473
Gender of individuals (female=1)	-21,040	29,964	-21,040	30,349	-20,435	28,796	-16,809	28,283
Education of individuals (years)	6,287	3,931	6,287	3,981	6,319	3,875	6,306	3,879
Household size	20,530	5,013 ***	20,530	5,077 ***	20,846	4,978 ***	20,764	4,938 ***
Age of individuals (years)	1,592	1,142	1,592	1,157	1,550	1,129	1,464	1,108
Number of months doing business	-210	98 **	-210	99 **	-202	100 **	-207	97 **
Number of generations of family in village	-19,404	8,779 **	-19,404	8,891 **	-19,901	8,926 **	-19,118	8,493 **
Number of relatives in village	-136	1,293	-136	1,309	-186	1,232	-243	1,242
SCU committee member dummy	-19,448	76,585	-19,448	77,569	-23,656	73,922	-24,937	73,713
Number of civil servant in household	11,324	21,117	11,324	21,389	12,310	19,502	11,545	19,684
Dummy for villages with a big pond or river access			-321,773	166,553 *	-328,548	155,381 **	-327,368	154,915 **
Dummy for villages with paved road or closeness to main road			-142,432	98,763	-144,618	93,386	-144,249	93,205
Dummy for villages with primary school up to grade 5			408,506	223,863 *	413,289	214,579 *	411,673	214,080 *
Distance from village to main markets			1,380	1,976	1,477	2,101	1,454	2,093
Price of traditional chicken (Gailard) per Kg			-27.08	27	-28.12	25	-28.35	25
Daily wage for construction			17	21	17.75	20	17.94	20
	F-statistic= 1.670459		F-statistic=1.670459		F-statistic= 1.835944		F-statistic=1.952906	
	Prob(F-statistic)= 0.045622		Prob(F-statistic)= 0.045622		Prob(F-statistic)= 0.024821		Prob(F-statistic)= 0.017032	
	R-squared=0.114734		R-squared=0.114734		R-squared=0.118129		R-squared=0.117802	

Note: the superscripts ***, ** and * denote that coefficient is significant at 1 %, 5 % and 10 % criteria.

Table 10: Impact of savings group on household rental expenditure - GLS.

Independent variable	Fixed effects model		Nonfixed effects model		“Naïve” model		“Super-naive” model	
	Coefficient	Std. Error						
Months as SCU member (duration as SCU member)	139	61 **	139	62 **	144	46 **	144	46 ***
SCU Member Dummy	176	1,355	176	1,372				
Value of household owned land 5 years ago	3.E-06	4.E-06	3.E-06	4.E-06	3.E-06	4.E-06		
Sex of household head (female=1)	2,153	1,313	2,153	1,330	2,127	1,358	2,121	1,352
Gender of individuals (female=1)	514	1,036	514	1,050	460	1,025	367	1,024
Education of individuals (years)	483	205 **	483	207 **	489	207 **	499	209 **
Household size	-164	440	-164	445	-164	440	-155	439
Age of individuals (years)	-343	125 ***	-343	126 ***	-346	123 ***	-343	122 ***
Number of months doing business	-9	4 **	-9	4 **	-9	4 **	-9	4 **
Number of generations of family in village	8,346	2,666 ***	8,346	2,700 ***	8,418	2,626 ***	8,413	2,617 ***
Number of relatives in village	-325	134 **	-325	135 **	-336	131 ***	-333	130 ***
SCU committee member dummy	-2,927	1,212 **	-2,927	1,228 **	-2,960	1,218 **	-2,912	1,204 **
Number of civil servant in household	-1,736	891 **	-1,736	903 **	-1,734	837 **	-1,685	824 **
Dummy for villages with a big pond or river access			-46,765	83,437	-46,848	84,101	-46,845	83,916
Dummy for villages with paved road or closeness to main road			-30,659	55,918	-30,707	56,154	-30,714	56,031
Dummy for villages with primary school up to grade 5			78,514	137,373	78,574	137,836	78,567	137,533
Distance from village to main markets			-899	942	-898	932	-898	930
Price of traditional chicken (Gailard) per Kg			-9.975	16	-9.984	16	-9.98	16
Daily wage for construction			9	13	8.73	13	8.72	13
	F-statistic= 2.851135		F-statistic=2.851135		F-statistic=3.099860		F-statistic=3.309186	
	Prob(F-statistic)= 0.000155		Prob(F-statistic)= 0.000155		Prob(F-statistic)= 0.000060		Prob(F-statistic)= 0.000032	
	R-squared=0.181139		R-squared=0.181139		R-squared=0.184452		R-squared=0.184518	

Note: the superscripts ***, ** and * denote that coefficient is significant at 1 %, 5 % and 10 % criteria.