The Interrelated Dynamics of Multiple Borrowing and Over-indebtedness among Rural Households in Thailand and Vietnam

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Abstract

Does multiple borrowing lead micro-borrowers into over-indebtedness? Do over-indebted micro-borrowers take loans to refinance existing loans that are ultimately unpayable and get trapped in a vicious circle of debt? Using a longitudinal household survey data, this study addresses such questions by examining the dynamic interdependency between over-indebtedness and multiple borrowing in the context of micro-borrowers in Thailand and Vietnam. Specifically, the trues state dependence and cross-state dependence effects of over-indebtedness and multiple borrowing are tested using the dynamic random effect bivariate probit model while controlling for observed and unobserved household heterogeneity. Results suggest that taking multiple borrowing simultaneously does positively influence household's risk of becoming over-indebted in Thailand, while in Vietnam it has no significant influence on household's risk of over-indebtedness. Although households reported of taking multiple loans to repay old debts, the empirical results do not support the premises that over-indebtedness reinforces households to refinance ultimately unpayable debts and trap households into a perpetual debt cycle.

1. Introduction

In the last three decades, the microfinance industry has witnessed a substantial growth accompanied by a high incidence of multiple borrowing among its clients in developing and emerging market economies. On one hand, multiple borrowing, simply defined as taking multiple loans from multiple sources simultaneously, is considered to be a common and optimal cash flow management strategy of low-income households in developing countries. Low-income households take multiple loans from multiple sources to (1) smoothen their cash flow on regular bases (2) acquire larger loans than a micro-lender offers when creditworthy, (3) manage inflexible loan repayment schedules of microfinance institutions when faced with unexpected adverse shocks (Chen et al., 2010; Schicks and Rosenberg, 2011; Guérin, 2012 and Wampfler et. al., 2014). On the other hand, multiple borrowing is becoming increasingly perceived as a symptom of household's over-indebtedness. Through multiple borrowing, households can (1) increase the amount of loan that they can borrow and accumulate more debt than they can repay, (2) simply refinance or turn-over existing loans that are ultimately unpayable and enter into a vicious circle of debt and dependency, (3) easily default on a loan from one micro-lender while still keeping their borrowing relationship with other micro-lenders and meeting their financial needs elsewhere (Chen et al., 2010 and Schicks and Rosenberg, 2011).

The empirical evidence on the relationship between multiple borrowing and over-indebtedness has also been conflicting. Some studies find a positive correlation between multiple borrowing and over-indebtedness (Vogelgesang, 2003 and Mpogole et al., 2012), while others do not observe any relation (Krishnaswamy, 2007; Gonzalez, 2008 and Schicks, 2014). Furthermore, as most of the studies are exploratory research based on cross-section and qualitative data, they have merely established an evidence of the correlation between multiple borrowing and over-indebtedness than an unambiguous causal relationship. Although cross-section data is useful for many purposes, such data is insufficient to analyze the dynamics of over-indebtedness and its dynamic interdependency with multiple borrowing, as the latter is likely to be an endogenous factor of over-indebtedness.

Therefore, this research aims at understanding the dynamic interdependency between multiple borrowing and households' over-indebtedness in the context of developing countries microcredit market by posing the following key questions: Do households who previously take multiple loans become over-indebted in the future? Do over-indebted households take on more loans to repay back other debts? Is the positive correlation between over-indebtedness and multiple borrowing found in the exploratory research due to genuine interdependence or due to spurious correlation?

Using a four wave panel data for around 1600 rural households from two provinces in Thailand and Vietnam, we analyze the dynamic interdependency between multiple borrowing and household's over-indebtedness using the dynamic bivariate probit model which controls for unobserved household heterogeneity and the endogeneity of initial conditions. Results suggest that, in overheated microcredit markets such as Thailand, taking multiple loans from several sources does increase households' likelihood of experiencing over-indebtedness in the future. Hence, policy makers and industry stakeholders should give more attention to multiple borrowing and also take stapes to protect microcredit borrowers from taking on multiple loans and accumulating more debt than they can repay.

2. Literature Review

The increasing incidence of multiple borrowing and over-indebtedness among microcredit borrowers of developing countries has attracted a growing interest among academics and come to be a major concern for industry stakeholders. Unfortunately, however, empirical literature that looks to assess the actual impact of multiple borrowing from the perspective of borrowers and literature covering the theoretical framework for multiple borrowing and over-indebtedness remain very limited. Most of the academic literature has mainly focused on assessing the impact of microcredit on borrowers' wellbeing (Morvant-Roux et al., 2014) leaving the subject of multiple borrowing and its impact on over-indebtedness nearly untouched and limited to a few case studies (Vogelgesang, 2003; McIntosh et al., 2005; Krishnaswamy, 2007; Chen et al., 2010; Schicks and Rosenberg, 2011 and Khandker et al., 2013). In what follows, we review the theoretical literature on the impact of competition among microfinance institutions on repayment performance and default in the context of microcredit markets of developing countries to indirectly infer the effect of multiple borrowing on over-indebtedness and motivate our study theoretically.

A growing theoretical literature on microfinance competition shows that competition among micro-lenders leads to an increase in borrowers' over-indebtedness and default. One mechanism through which competition increases over-indebtedness and the default risk of borrowers is through multiple borrowing (Vogelgesang, 2003; McIntosh and Wydick, 2005; Casini, 2010 and Guha and Chowdhury, 2013). In competitive microcredit markets where there is a problem of information asymmetry, borrowers can easily take multiple loans concealing their actual level of indebtedness. This makes proper risk assessment and pricing of uncollateralized lending difficult for lenders and ultimately lead to borrowers over-indebtedness and default (Casini, 2010 and Guha and Chowdhury, 2013).

In microcredit markets where the poor are provided with uncollateralized loans, information asymmetry over borrowers' credit history is an important factor which influences enforcement costs, reputation effects, multiple borrowing and repayment performance (Hoff and Stiglitz, 1998 and McIntosh et al., 2005). Lenders overcome the problem of asymmetric information, simply defined as a situation where lenders lack both *positive* (information on total indebtedness of borrowers including whether borrowers have debts from other sources) and *negative* (information on defaulters) information on borrowers (McIntosh et al., 2005), and its effect on repayment performance by relying on inside reputation mechanisms (Vogelgesang, 2003) and dynamic incentives (McIntosh and Wydick, 2005) emanating from a reciprocal borrower-lender relationships (Casini, 2010 and Chen et al., 2010). On the borrower's side, the expected future benefit of a continued access to credit from a lender creates a dynamic incentive and makes them repay their loan even when it is collateral-free (Hoff and Stiglitz, 1998). This also creates an inside reputation mechanism where borrowers who repay on time and keep a long-term relationship with a lender get a better condition for their loans. At the same time, lenders also depend on borrowers' timely repayment to avoid losses. This mutual interdependent borrower-lender relationship that ensures both parties discipline in the markets can, however, be gradually undermined as the levels of multiple borrowing increases in a competitive and crowded market (Casini, 2010 and Chen et al., 2010). Such instances allow borrowers to increase their level of indebtedness and also default on a loan with one micro-lender while still keeping their borrowing relationship with other micro-lenders and meeting their financial needs elsewhere (Chen et al., 2010).

Hoff and Stiglitz (1998) highlight this limitation of the reputation effect in their theoretical model. Borrowers' incentive to default on a loan increases with increasing number of lenders in a market as one lender's reputation effect alone does not generate dynamic repayment incentives when borrowers have the choice to switch from one lender to another in a market where there is no negative borrower information sharing. In general, their results suggest that a system of negative borrower information sharing should be in place to strengthen the dynamic incentives effect and prevent multiple borrowing. However, a system of negative borrower information sharing alone is not enough to strengthen dynamic incentives and reduce the incentives for multiple borrowing and default. The strength of the dynamic incentive effect on repayment and multiple borrowing is also influenced by borrowers' present value of the continued future access to credit form a lender and positive borrower information asymmetry (McIntosh and Wydick, 2005).

According to the theoretical model of McIntosh and Wydick (2005), dynamic incentives or in other words borrowers' present value of the continued access to credit form a lender in the future are

negatively related to borrowers' rate of time preference. Impatient borrowers with high rate of time preference take multiple loans to get a larger loan size. They increase their loan size by borrowing multiple loans from different sources while lowering their overall borrowing cost by taking smaller loans separately and creating a false impression for lenders that they are borrowing only a fraction of their actual total borrowings (McIntosh and Wydick, 2005). Since in this case money is fungible, multiple loans could be used for a more risky investment (Casini, 2010) or a consumption purpose (Guha and Chowdhury, 2013) without lenders awareness. In general, when there is an information asymmetry over borrowers' indebtedness among competing lenders, such instances of multiple borrowing lead to an increase in total borrowing and indebtedness and ultimately raise borrowers expected default rate for the following reasons. Firstly, since multiple borrowing reduces overall borrowing costs of borrowers, total borrowing and indebtedness increases. Secondly, borrowers' risk of default on a loan increases because the true probability of repayment no longer depends only on one lender's own lending but also on other unknown amount of loan borrowed from elsewhere (McIntosh and Wydick, 2005). An important implication of their result is the need for a central system of information sharing for both positive and negative borrowers' credit history.

Contrary to the theoretical reductive conceptualization of multiple borrowing as problem that results in over-indebtedness due to information asymmetry in microcredit markets, a recent theoretical study by Guha and Chowdhury (2014) shows that multiple borrowing does not necessarily reflect increased indebtedness and identified a positive aspect of multiple borrowing. Households take multiple borrowing for various reasons that are not related to over-indebtedness. For instance, households may take multiple loans to access a range of complementary credit products (Chen et al., 2010; Guérin, 2012 and Wampfler et. al., 2014), to expand and diversify their social networks and reduce dependency on one credit source while maintaining creditworthiness with several credit sources (Guérin, 2012) or to cover expenses when faced with unexpected shocks (Schicks and Rosenberg, 2011). Guha and Chowdhury's (2014) theoretical framework shows this complex reality of poor households financial management strategy using an example where poor borrowers take multiple loans from different sources without increasing overall borrowers indebtedness. Additionally, their results shows the potential positive effect of multiple borrowing where due to scarce fund available to micro-lenders leads them to coordinate and provide complementary credit products that are conditional on having a credit contract with another lender to fill in the large capital needed for a technological intensive project of the poor. In this case, with the presence of multiple borrowing, competition among micro-lenders will have a positive effect on borrower targeting and encourage lending to the poor.

Empirical studies which have looked at multiple borrowing and its effect on over-indebtedness also find evidences for both of the alternative views reflected in the theoretical literature. Although the endogeneity problem of multiple borrowing is not addressed in these empirical studies, few of them have found a positive correlation between multiple borrowing and over-indebtedness. For instance, a qualitative exploratory study of the incidence of multiple borrowing in Bangladesh by Chaudhury and Matin, (2002) found a high level of multiple borrowing affecting all income groups equally while in terms of repayment performance households in the low income group were doing worse than the high income groups. This study also found that multiple borrowing was mainly distress driven even if some households also took loans in response to opportunities to invest in businesses. This indicates that the additional loans which are not used for productive purposes can potentially result in repayment problems. By the same token, a study by Vogelgesang (2003) which analyzes the effect of rapidly growing supply of microcredit and increasing competition in Bolivia affirmed that higher levels of indebtedness where many micro-borrowers simultaneously take multiple loans from several sources, corresponds with increasing competition and supply. Borrowers that took multiple loans from several sources at the same time were also found to be more likely to default than others. Moreover, late payments on a previous loan or on a prior instalment of a current loan were found to be highly significant predictors of defaulting on a loan in the future.

Supporting the alternative view of multiple borrowing, other empirical studies have found that multiple borrowing does not necessarily reflect households' struggle with debt repayment or over-indebtedness. For instance, an empirical study by Gonzalez (2008) on households' over-indebtedness in the portfolios of microfinance institutions found that over-indebtedness in Bolivia was not associated with multiple borrowing and that households can become over-indebted just with one loan. Similarly, a study of micro-borrowers in Ghana showed that a high level of over-indebtedness occurred in an environment with a low level of multiple borrowing contradicting the notion of preventing over-indebtedness by reducing multiple borrowing and using credit bureaus (Schicks, 2014). Finally, using a longitudinal household survey data from Bangladesh, Khandker et al. (2013) found that while multiple borrowing increased over-indebtedness in the short run, it reduced over-indebtedness in the long run by influencing the debt to asset ratio favorably. This reflects that multiple borrowing helped borrowers in Bangladesh to increase their assets more than their debt in the long run.

In sum, this study aims at illuminating this ambiguity surrounding the effect of multiple borrowing on households' over-indebtedness by empirically testing the assumption that taking multiple loans

from several sources simultaneously leads households to accumulate excessive amount of debt and eventually become over-indebted.

3. Data Description and Indicators

We use data of 1582 rural households in two provinces in Thailand and Vietnam from the "Vulnerability in Southeast Asia" - project funded by the German Research Foundation (DFG) collected in 2007, 2008, 2010 and 2011. The provinces Ubon Ratchathani in Thailand and Thua Thien Hue in Vietnam, were purposively selected targeting rural households who were poor or at risk of falling into poverty. Within the provinces, subdistricts (Thailand) or communes (Vietnam) were selected using a systematic random sampling based on a probability proportional to the size of the population. Within each subdistrict (commune) two villages were selected at random and at village level 10 households were selected using systematic random sample with equal probability from household lists ordered by household size (Hardeweg, et al., 2012). Hence, the sample of households in the dataset can be considered to be representative of rural households in the three provinces.

For our analysis, we restrict our sample to the 1582 households which were observed in each of the four waves, specifically 914 households from Ubon Ratchathani and 668 households from Thua Thien Hue, as the econometric model used in this study requires the panel to be balanced. Hence, we have a dataset with a total sample size of 6328 observation in two countries. Our data contain detailed information on households borrowing, loan defaults and arrears along with a full set of household level data such as households demographics, social and economic characteristics that is common in standard household surveys. This detailed data on financial situation of households allows us to quantify most of the common objective indicators of over-indebtedness used in the existing literature and indicators of multiple borrowing discussed below.

As regards indicators of multiple borrowing we start with a simple definition, namely the practice of borrowing from different sources simultaneously (CGAP, 2012). A more sophisticated definition is from Wampfler et. al. (2014), i.e. households take multiple loans from one financial institution, several financial institutions or both formal and informal credit sources simultaneously. Households could take different microcredit products such as investment loans, education loans, working capital loans and the like from the same financial institution. Alternatively, they may take a loan from one lender to repay other outstanding loan from a different lender. Finally, households may also take multiple loans from both formal and informal credit sources either as a substitution strategy for expensive sources, to overcome limitations of the formal credit supply or to serve different needs of households, for example using informal sources for household expenditure while using the formal

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sources for investment purposes (Chen et al., 2010 and Wampfler et. al., 2014). Taking all of these possibilities into account, *a household is identified as a multiple borrower if the household has multiple active loans outstanding simultaneously regardless of the source of the loan.*

For defining over-indebtedness we note the fact that there is still no conceptual consensus on what constitutes over-indebtedness and how it ought to be measured. For instance, May and Tudela (2005), who use financial difficulty to refer to over-indebtedness define it as a situation where "*households' flow of income is insufficient to meet their mortgage payments without placing excessive burden on the household*". Haas (2006), interprets over-indebtedness as a situation where insufficient income makes household unable to repay back their debt in spite of reducing their living standard. Del Rio and Young (2008), use the subjective perception of households to define over-indebtedness, i.e. households who consider their unsecured debt to be a sign of over-indebtedness. Disney et al., (2008) uses a household's current arrear as an indicator, and hence classifies a household as over-indebted "*when they fall into arrears on at least one credit commitment*". (Giarda, 2013) calls a household over-indebted when its net wealth is just slightly positive. Finally, Schicks (2014), defines over-indebtedness as a situation where a household "*is continuously struggling to meet repayment deadlines and structurally has to make unduly high sacrifices related to his/her loan obligations*".

Summarizing the indicators used to measure over-indebtedness both in a developed and a developing country context they can be categorized into three models: (1) the administrative model, (2) the objective model and (3) the subjective model (Betti et al., 2007). The administrative model considers legally bankrupt households as over-indebted relying on official or legal procedures of bankruptcy that is specific to a country. The objective model uses quantitative indicators such as debt-to-income ratio, debt-service-cost ratio and debt-to-asset ratio. Finally, the subjective indicators base over-indebtedness on subjective data which reflects household's perception of either their debt situation or their sacrifice related to their debt commitments.

However, all of the over-indebtedness indicators mentioned above have certain limitations. The administrative indicators are limited by the fact that they only consider households who actually go through bankruptcy and default but not those who face sever debt burden and still manage to pay their debt by taking extreme measures. Additionally, its dependency on the judicial system of each country limits its usefulness for comparative studies such us ours. The objective indicators, especially the debt-ratio indicators' major limitation relates to the difficulty of determining the critical level or threshold of indebtedness above which a household will be identified as over-indebted. The difficulty arises due to the fact that the optimal level of indebtedness varies based on

the household's stage of the life cycle and household specific characteristics. As a result, there can be no single optimal level of indebtedness and, therefore, a threshold which can be used to identify household's over-indebtedness. Finally, as the subjective indicators are based on subjective data their limitation relates to the fact that what each household perceives as being excessive may be due to biases (Betti et al., 2007; Schicks and Rosenberg, 2011 and Giovanni and Iezzi, 2013). Hence, their usefulness in the context of comparing household over-indebtedness in between countries is limited.

Considering these limitations of the indicators mentioned above, finding a single optimal measure that captures every aspect of over-indebtedness is not possible (Betti et al., 2007; Schicks and Rosenburg, 2011 and Giovanni and Iezzi, 2013). However, at least one can see a tendency in recent studies to converge on a common set of indicators with the debt-servicing-cost ratio as a major one (Giovanni and Iezzi, 2013). This indicator identifies households as over-indebted when they surpass a critical level on debt repayments relative to their income (Giovanni and Iezzi, 2013). In this study, we set the threshold for the debt-service-cost indicator at 50 percent which is commonly used in several recent studies in developed countries (Disney et al., 2008 and Giovanni and Iezzi, 2013). Taking into consideration that Thailand and Vietnam are emerging market economies, the 50 percent threshold can also be taken as a good indicator for household over-indebtedness in both countries.

4. The Relationship between Multiple Borrowing and Over-indebtedness in Thailand and Vietnam: Descriptive Results

Based on the indicators discussed above, table 1 presents the distribution of multiple borrowing and over-indebted households in Ubon Ratchathani in Thailand and Thua Thien Hue in Vietnam over the five years period. The table reveals a high level of incidence of indebtedness in both countries, whereby 80 to 89 percent of the Thai households and 63 to 76 percent of the Vietnamese households had at least taken one loan in our sample over the four waves. From the indebted households, 76% of the Thai households and 42% of the Vietnamese households had multiple borrowing while around 40% of the Thai households and 17% of the Vietnamese households were over-indebted on average over the period of 2007 to 2011. Taking both formal and informal sources of loan into consideration, around 62% of the Thai households and 32% of the Vietnamese households were cross-indebted among the indebted households. Over the five years period, the trends of both multiple borrowing and over-indebtedness initially increase and decline in 2010 from a relatively higher incidence in the previous periods and then again increase to a higher level in 2011 in Thailand, while in Vietnam the incidence of over-indebtedness declined and multiple

borrowing increased more steadily and reached to a highest level in 2011. Comparing the extent of multiple borrowing and over-indebtedness between Thailand and Vietnam, table 1 suggests a higher level of over-indebtedness and multiple borrowing among Thai households than Vietnamese households. Concurrent

(Insert Table 1 here)

Focusing on the degree of multiple borrowing, we found that households had parallel credit contracts ranging from 2 to 14 in Thailand and 2 to 9 in Vietnam. On average, indebted households were repaying on 2.94 and 1.68 credit contracts in Thailand and Vietnam respectively. Furthermore, having more than 3 credit contracts was very common that around 42% of the households in Thailand and 11% of the households in Vietnam had 3 or more active loans on average over the four waves (see figure 1). As can be seen from figure 2, it is also evident that the problem of over-indebtedness is more frequent among multiple borrowing households. The percentage of over-indebted households increases with higher number of loans. For instance, among Thai households with a single loan, only 19% are over-indebted compared to 74% of those who have six or more loans. Similarly, out of the Vietnamese households with a single loan, only 12% are over-indebted compared to 43% of those who have six or more loans. Such results have lead few recent studies to suggest using multiple borrowing as a proxy or an objective indicator for over-indebtedness (Disney et al., 2008, Giovanni and Iezzi, 2013 and Schicks, 2014).

(Insert Figure 2 & 3 here)

However, as can be seen in table 2, we find that the degree of overlap between multiple borrowing and over-indebtedness is quite imperfect both in Thailand and Vietnam over the period of 2007 to 2011. Out of the total households who had multiple borrowing, only 46% and 24% of them were over-indebted in Thailand and Vietnam. And from the over-indebted households, 89% and 61% of them had multiple borrowing in Thailand and Vietnam. This finding is however not surprising since households could also be over-indebted with a single loan or since taking multiple loans could be a perfectly manageable cash flow management strategy of households (Schicks and Rosenburg, 2011). Nevertheless, it is important to disprove the notion that multiple borrowing is just another way of measuring over-indebtedness before we begin to investigate their interdependency.

(Insert Table 2 here)

According to Devicienti and Poggi (2010), one way of doing that is to use a nonlinear Wald proportionality test on the coefficients of two separate probit models, one for over-indebtedness

using the debt-service-cost indicator and the other for multiple borrowing. If the two indicators are measuring the same underlying concept, then the coefficients of the two models will be the scaled versions of each other. Following Devicienti and Poggi (2010), we run two separate static probit models for multiple borrowing and over-indebtedness for each year and each country and carried out a nonlinear Wald test. The models included such explanatory variables as gender, age, education and marital status of the household head, household size, income quintile groups, type of occupation and shocks. In each case, the nonlinear Wald test rejected the null hypothesis that multiple borrowing is an alternative way of measuring over-indebtedness at least at the 5% level of statistical significance.

Having disproved the notion that multiple borrowing and over-indebtedness are simply alternative ways of measuring the same underlying concept, one important question that remains to be answered is whether the probability of experiencing over-indebtedness in period t positively correlates with the probability of experiencing over-indebtedness in period $t + 1$ and having multiple borrowing $t + 1$? To answer such questions and examine households' dynamic experience of over-indebtedness and multiple borrowing and the transition and cross-transitions probabilities from the two states, we shift our emphasis to the panel dimension of our dataset. Using the indicators discussed in the previous section, table 3 and 4, provide information on the persistency of over-indebtedness and multiple borrowing in the Thailand and Vietnam. In conformity with the literature, the percentage of households in both countries who experience over-indebtedness and have multiple borrowing in at least one year over the four waves are higher than the cross-sectional incidence of over-indebtedness and multiple borrowing. In particular, 78% of Thai households and 34% of Vietnamese households in our sample were over-indebted in at least one year as compared to an average of 40% and 17% over the four years. And in the case of multiple borrowing, around 86% of Thai households and 60% of Vietnamese households in our sample had taken multiple loans simultaneously in at least one year as compared to an average of 62% and 32% over the four years. Considering all of the four waves, while around 6% and 39% of the Thai households were always over-indebted and had multiple borrowing respectively, only one household was always over-indebted and around 5% of the Vietnamese households had multiple borrowing over the four periods. These raw results suggest that over-indebtedness and multiple borrowing are more persistent for the Thai households than for the Vietnamese households. Nevertheless, it is evident that there is a steady entry into and out of the state of over-indebtedness and multiple borrowing so that the same households do not face over-indebtedness and multiple borrowing continuously in both countries.

(Insert Table 3 here)

Although households do not face over-indebtedness and multiple borrowing continuously over the four periods, households who experience over-indebtedness or have multiple borrowing in the past seem to be more likely of experiencing over-indebtedness in the next period both in Thailand and Vietnam. As can be seen in table 4 under columns 4 and 6, the conditional probability of being over-indebted in the current period for a Thai household given that the household was not over-indebted in the previous period is 23% as compared to a 48% conditional probability of being over-indebted in the current period given that the household was over-indebted in the previous period. Similarly, for a Vietnamese household the conditional probability of being over-indebted in the current year is 9% if the household was not over-indebted in the previous period, but the conditional probability will increase to 22% for those who were over-indebted in the previous period. The conditional probability of having multiple borrowing also shows a possible state dependence for both Thai and Vietnamese households with a higher jump (from 36% to 80% for Thailand and from 22% to 61% for Vietnam) in the probability of having multiple borrowing for the households who had multiple borrowing in the previous period.

(Insert Table 4 here)

In terms of the cross-state dependence between over-indebtedness and multiple borrowing, table 4 also shows a positive relationship between the previous states of multiple borrowing and over-indebtedness and the current state of the other. Specifically, while the probability of being over-indebted in the current year is 17% for the Thai households who did not have multiple borrowing in the previous period, it increases to 40% for those who had multiple borrowing in the previous period. For the Vietnamese households it follows the same pattern in that the conditional probability of being over-indebted is as twice as likely for the households who had multiple borrowing in the previous period. Likewise, the conditional probability of having multiple borrowing simultaneously in the current year is higher for households who were over-indebted in the previous period compared to those who were not for both Thai and Vietnamese households. These results suggest that there is likely to be a positive cross-state dependence effect between multiple borrowing and over-indebtedness.

However, the observed persistence of over-indebtedness showed in table 4 could be to some degree or even entirely due to household heterogeneity. For instance, the fourth row in table 5 shows that the (unconditional) probability of being over-indebted is higher for those with a younger, male, married and more educated household heads and who are among the poorest income quintile groups

in Thailand. Similarly, the (unconditional) probability of being over-indebted is higher for Vietnamese households with a younger, male and married household heads and for those who are among the poorest income quintile groups. Therefore, even if over-indebtedness is truly not structurally persistent for both of the Thai and Vietnamese households in our sample, these observed heterogeneities would cause the group of households that were over-indebted in the previous period to have a higher aggregate probability of being over-indebted at the current period than those who were not over-indebted.

(Insert Table 5 and 6 here)

Furthermore, taking the various characteristics of households into consideration, table 5 and 6 present the over-indebtedness probabilities, both unconditional and conditional on being over-indebted and having multiple borrowing in the previous period for Thai and Vietnamese households in our sample. Comparing the conditional probabilities in column 5 and 6 of table 5 and 6 revel that there is a difference between the probabilities of being over-indebted conditional on the status of over-indebtedness in the previous period within all subgroups. For instance, the conditional probability of being over-indebted for both Thai and Vietnamese households that were over-indebted in the previous period are as twice as likely to be over-indebted compared to the those who were not over-indebted in the previous period (70% as compared to 37% for Thai households and 46% as compared to 20% for Vietnam households). Likewise, the aggregate cross-persistency that we saw in table 4 is also confirmed for all of the subgroups of households in Thailand and Vietnam where each subgroup is at least twice as likely to be over-indebted if they had a multiple borrowing in the previous period compared to those who did not have multiple borrowing previously.

Conditional probabilities, however, cannot be taken at face value because the observed persistency of over-indebtedness and multiple borrowing in both countries could also be driven by the unobserved heterogeneity of households which are not controlled for in the conditional probability matrixes instead of a genuine state dependence effect. Therefore, we use the dynamic random effects bivariate probit model, which will be explained in the following section, to distinguish between these two effects by including a number of explanatory variables to control for households heterogeneity.

5. An Econometric Model for the Interdependent Dynamics of Multiple Borrowing and Over-indebtedness

To study the described relationship between multiple borrowing and being over-indebted among Thai and Vietnamese households, we use a dynamic random-effect bivariate probit model that

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allows a spillover effect between the two states. This model was selected because it allows us to test whether each of the states have a true influence on future values of the outcomes — e.g. being a multiple borrower in the past having an effect on current over-indebtedness. As a first-order Markov chain model, it allows the state dependence of multiple borrowing and over-indebtedness and the cross-state dependence effects between the two states while allowing for correlated unobserved heterogeneity and accounting for the initial conditions.

In the next subsection, we first focus on the model specification. Most of the discussion on the model follows Devicienti and Poggi (2010), Alessie et al. (2004) and Stewart (2007). We adopt Devicienti and Poggi's (2010) model specification for poverty and social exclusion which follows the approach proposed by Wooldridge (2005) in treating the initial conditions problem and formulate our dynamic random effect bivariate probit model for interrelated dynamics of multiple borrowing and over-indebtedness as follows.

5.1 Dynamic random-effect bivariate probit model

For a household i, the propensity to be over-indebted at time t is expressed in terms of latent variable y_{1it}^* as specified in equation (1), while the propensity to have multiple borrowing at time t is expressed in terms of latent variable y_{2it}^* as specified in equation (2).

$$y_{1it}^* = x_{1it}'\beta_1 + y_{1it-1}\gamma_{11} + y_{2it-1}\gamma_{12} + c_{1i} + u_{1it} \tag{1}$$

$$y_{2it}^* = x_{2it}'\beta_2 + y_{1it-1}\gamma_{21} + y_{2it-1}\gamma_{22} + c_{2i} + u_{2it} \tag{2}$$

$$y_{jit} = 1[y_{jit}^* > 0]\, j = 1,2\ t = 2,\dots,T \tag{3}$$

The two binary dependent variables indicate a specific state a household is at, y_{1it} equal to one if the household is over-indebted in t, and zero otherwise; y_{2it} equal to one if household i has multiple borrowing in t, and zero otherwise. In equation (1) and (2), the vector x includes the observed explanatory variables such as household's socio-demographic and economic characteristics that are assumed to be strictly exogenous and are kept the same in both equations. The vectors β_1 and β_2 are the analogous parameters to be estimated showing for instance how economic factors such as households level of income and shocks influence the probability of becoming over-indebted or taking multiple loans. We assume here that, the error terms u_{1it} and u_{2it} are serially independent and follow a bivariate normal distribution, with zero means, unit variances and cross-equation covariance ρ. c_{1i} and c_{2i} represent the unobserved time-invariant household specific random effects which are assumed also to be bivariate normal with variances σ_{c1}^2 and σ_{c2}^2 and covariance $\sigma_{c1}\sigma_{c2}\rho_c$. c_{1i} and c_{2i} capture unobserved households characteristics that remain constant over time, like financial literacy, debt perception, time preference or household's

ability. We also assume that (c_{1i}, c_{2i}), $(u_{1it}, u_{2it}; t = 1, \ldots, T)$ and $(x_{it}; t = 1, \ldots, T)$ are independent (implying that x_{it} is strictly exogenous).

An important aspect of the dynamic random effects bivariate probit model is that it explicitly accounts for the effect of being at a specific state in year $t - 1$ and the dependence of each state on the previous outcome of the other state, specifically the state dependence and cross-state dependence effects, by including the lag of the dependent variables, y_{1it-1} and y_{2it-1}, as specified in equation (1) and (2). Hence, the model allows us to establish the casual effect of having multiple borrowing in the past on current multiple borrowings and over-indebtedness of households and vice versa after accounting for the effect of household's unobserved heterogeneity using the bivariate model specified above. If the unobserved households' heterogeneity is not controlled for, the true state dependence would be overestimated due to the spurious state dependence effect.

To account for the cross-state dependence effect between borrowing from multiple sources and over-indebtedness, the model includes cross-lagged variables among the explanatory variables: lagged multiple borrowing y_{2it-1} is included in the over-indebtedness equation and lagged over-indebtedness y_{1it-1} is included in the multiple borrowing equation. This allows as to determine whether the observed correlation between borrowing from multiple sources and being over-indebted is due to spurious state dependence, i.e. correlated unobserved heterogeneity ($\rho_c \neq 0$), or a true cross-state dependence where γ_{12} and γ_{21} are not equal to zero given the unobserved heterogeneity.

However, there are special cases where one would not need the bivariate models specified above to identify the interdependency between the two outcomes (Alessie et al., 2004 and Stewart, 2007). If $\gamma_{12} = 0$, equation (1) for household's over-indebtedness would exclude the lagged dummy for multiple borrowing. Then, equation (1) can be considered by itself and the rest of the parameters can be estimated consistently using the standard univariate random-effect dynamic probit model (Stewart, 2007 and Devicienti and Poggi, 2010). Another special case where equation (1) can be considered by itself is when $\gamma_{12} \neq 0$, but the error terms and the random effects of equation (1) and (2) are independent ($\rho = \rho_c = 0$). In which case, the standard univariate random-effect dynamic probit model can again estimate the parameters consistently treating y_{2it-1} as a weakly exogenous regressor (Stewart, 2007 and Devicienti and Poggi, 2010). With the exception of such special cases, the joint estimation of the first three models is necessary to get consistent estimates of the parameters.

5.2 Initial conditions and estimation

One important issue in estimating the dynamic random effect bivariate probit model which is well established in the literature is the treatment of the initial conditions. The problem of the initial conditions arises because the beginning of the observation period does not usually coincide with the period where households begin to experience the outcome, in this case multiple borrowing and over-indebtedness (Heckman, 1981a). Therefore, to consistently estimate such a model, we need to make additional assumptions concerning the relationship of the initial observations, y_{1i1} and y_{2i1}, and the unobserved time-invariant household effect. We could either assume that the initial conditions are exogenous or correlated with unobserved household-specific effect, c_{1i} and c_{2i}. The exogeneity assumption is valid only if the stochastic process that generates the outcomes is serially independent and if a truly new process is observed at the beginning of the sample (Hsiao, 2003). In that case, the standard random effects bivariate probit model can be used by splitting up the likelihood into four factors and maximizing the joint probability for t=2,…,T without taking the first year into account. However, here the process of household over-indebtedness and multiple borrowing are most likely not observed for each household from the beginning. Therefore, the initial observations y_{1i1} and y_{2i1} are more likely to be endogenous and correlated with the unobserved time-invariant household effects, c_{1i} and c_{2i}. Hence, the estimation of simple models such as the standard random effects bivariate probit model will overestimate the state dependence.

To address the problem of initial conditions and estimate the model, we adopt the strategy suggested by Devicienti and Poggi (2010) which extends the simple approach proposed by Wooldridge (2005) to the bivariate case. That is, a Conditional Maximum Likelihood (CLM) estimator which consider the distribution conditional on the initial values and the observed history of strictly exogenous explanatory variables (Wooldrige, 2005). In the case of the bivariate probit model, Devicienti and Poggi (2010) specify the individual specific effects c_{1i} and c_{2i} given the initial conditions, which in our case are the over-indebtedness initial condition y_{1i1} and the multiple borrowing initial condition y_{2i1}, and the time-constant explanatory variables $\bar{x}_i$, as follows:

$$c_{1i} = a_{10} + a_{11}y_{1i1} + a_{12}y_{2i1} + \bar{x}_i a_{13} + \alpha_{1i} \tag{4}$$

$$c_{2i} = a_{20} + a_{21}y_{2i1} + a_{22}y_{2i1} + \bar{x}_i a_{23} + \alpha_{2i} \tag{5}$$

where a_{j0}, a_{j1}, a_{j2} and a_{j3} $(j = 1, 2)$ are parameters to be estimated, $(\alpha_{1i}, \alpha_{2i})$ are normally distributed with covariance matrix Σ_α:

$$\Sigma_\alpha = \begin{pmatrix} \sigma_{\alpha 1}^2 & \sigma_{\alpha 1}^2 \sigma_{\alpha 2}^2 \rho_c \\ . & \sigma_{\alpha 2}^2 \end{pmatrix}$$

Inserting equation (4) and (5) in model (1) and (2) gives us:

$$y_{1it}^* = x_{1it}'\beta_1 + y_{1it-1}\gamma_{11} + y_{2it-1}\gamma_{12} + a_{10} + a_{11}y_{1i1} + a_{12}y_{2i1} + \bar{x}_i a_{13} + \alpha_{1i} + u_{1it} \tag{6}$$

$$y_{2it}^* = x_{2it}'\beta_2 + y_{1it-1}\gamma_{21} + y_{2it-1}\gamma_{22} + a_{20} + a_{21}y_{2i1} + a_{22}y_{2i1} + \overline{x}_i a_{23} + \alpha_{2i} + u_{2it} \tag{7}$$

Following Devicienti and Poggi (2010), the model parameters are consistently estimated using Conditional Maximum Simulated Likelihood methods where a household i's contribution to the likelihood can be specified as follows:

$$L^w = \int_{-\infty}^{+\infty} \int_{-\infty}^{+\infty} \prod_{t=1}^{T} \Phi_2\left(\tilde{y}_{1it}\mu_{1it}, \tilde{y}_{2it}\mu_{2it}, \tilde{y}_{1it}\,\tilde{y}_{2it}\,\rho\big|y_{1t-1}, y_{2t-1} \dots x_{it}, \overline{x}_i\right) g(\alpha_1, \alpha_2, \Sigma_\alpha) d\alpha_{1i} d\alpha_{2i} \tag{8}$$

Where μ_{1it} and μ_{2it} are the right hand side of equations (6) and (7) without the error terms u_{1it} and u_{2it}, $\tilde{y}_{jit} = 2y_{jit} - 1$ for $j = 1,2$ and g(.) represents the bivariate normal density.

Lastly, as the model of Devicienti's and Poggi's (2010) treatment of the initial conditions follows the approach proposed by Wooldridge (2005), their bivariate model also needs to be estimated using a balanced panel data. This usually raises the question of potentially increasing the attrition and sample selection bias in the data. However, Devicienti and Poggi (2010) argue that the approach of Wooldridge (2005) rather has an advantage in handling attrition and selection problems. Specifically, Wooldridge's approach allows attrition and selection to depend on the initial conditions. Hence, households with different initial over-indebtedness and multiple borrowing statuses are allowed to have different probabilities for missing data. Accordingly, their model also accounts for selection and attrition problem without directly modeling them as a function of the initial conditions. In any case, attrition bias is not much of a concern in our dataset as the attrition over the four waves was 5.9 percent.

6. Empirical Results

In table 7, we present the estimation results of the dynamic random effects bivariate probit model for the dynamic interdependency between over-indebtedness and multiple borrowing which controls for both observed and unobserved household heterogeneity both for Thai and Vietnamese households. Using the indicator of multiple borrowing and over-indebtedness discussed in section 3, we run separate models for Thailand and Vietnam including the same set of explanatory variables for both countries in each model in addition to the previous period and initial period status of the two dependent variables. The explanatory variables include basic set of household level variables including age (household head aged below 34, 34 - 44, 44 - 54, 54 - 65, 65 and above), gender, household head level of education (primary, secondary and higher education), marital status, number of children, household size, main occupation of household head (inactive, agricultural, off-farm employed and self-employed), income quintiles and type of shock experienced households experienced (unexpected shock to expenses, expected shocks to expenses and unexpected shocks to

income). Longitudinal averages are also included in the model to allow for the correlation between household specific effects and the time-varying variables, specifically number of children and household size (See table 1 in the appendix for descriptive statistics on the explanatory variables). Additionally, year dummies are included in each equation to control for macro-economic shocks and time trends. While there are other factors that drive household over-indebtedness and multiple borrowing, we only control for these set of explanatory variables in order to not further complicate the model estimation which is already computationally demanding. Furthermore, the focus of the study mainly lies on the interrelated dynamics of multiple borrowing and over-indebtedness and not on the explanatory variables included in the model. Nevertheless, as the model controls for both correlated and uncorrelated household heterogeneity, omitted variable bias will not be an issue in the estimation (Devicienti and Poggi, 2010).

In the next section, we first present the results of the true state dependence and cross-state dependences effects of multiple borrowing and over-indebtedness which are indicated by the estimates of the lagged indicators of over-indebtedness and multiple borrowing. The discussion on the cross-state dependence effect between multiple borrowing and over-indebtedness will provide an evidence for whether multiple borrowing enables households to accumulate excessive amount of debt and lead them to over-indebtedness in the future or whether over-indebted households take additional loan to repay back old debts and fall into debt trap. Finally, we will briefly discuss the results of the unobserved household heterogeneity and its correlations.

6.1 Over-indebtedness

Columns (1) and (5) in table 7 present results of the over-indebtedness equations. As expected, the results reveal that taking multiple borrowing in the past is strongly associated with the risk of becoming over-indebted in the future for Thai households as indicated by the positive significant effect of the cross lagged multiple borrowing status at $t - 1$ after controlling for (correlated) unobserved heterogeneity. Similarly, being over-indebted in the previous period positively increases household's likelihood of becoming over-indebted in the future for Thai households as indicated by the positive significant effect of over-indebtedness status at $t - 1$. To assess the magnitude of these effects, the transition probabilities of household's over-indebtedness and the associated average partial effect (APE) and predicted probability ratio (PPR) have been calculated for over-indebtedness by conditioning on the multiple borrowing status at $t - 1$ and the over-indebtedness status at $t - 1$ for both estimations presented in table 7. First, the transition probabilities of over-indebtedness were calculated for each household in the sample based on estimates of counterfactual outcome probabilities taking the multiple borrowing status at $t - 1$ and the over-indebtedness status

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at $t-1$ as fixed at 0 and fixed at 1 and then averaging each probability over all households. Secondly, the associated average partial effect was calculated by taking the difference between these two probabilities (APE $= \hat{p}_1 - \hat{p}_0$), while the predicted probability ratio was calculated by taking their ratio ($PPR = \hat{p}_1/\hat{p}_0$) (Stewart, 2007).

(Insert Table 7 here)

According to the APE of having multiple borrowing at $t-1$, Thai households that had multiple borrowing at $t-1$ face a risk of becoming over-indebted in the future by around 14 percentage points higher than the households that did not have multiple borrowing at $t-1$. Evidently, controlling for observed and unobserved household heterogeneity in the estimation reduced the conditional probabilities of experiencing over-indebtedness by about a half compared to the raw probabilities reported in the descriptive section for Thai households. According to the PPRs, Thai households that did not take multiple borrowings at $t-1$ would be around 2 times more likely to be over-indebted at t had they taken multiple loans from several sources at the same time at $t-1$ according to the predicted probability ratio. This positive dynamic spillover effect of multiple borrowing suggests that regardless of the purpose of taking a multiple loan, be it in response to a distress or opportunity, having multiple borrowings at the same time makes households more likely to face the risk of over-indebtedness. Similarly, the state dependence effect of over-indebtedness explains an increase in the over-indebtedness risk of 4 percentage points for Thai households. Given their observed and unobserved set of characteristics, Thai households that were not over-indebted at $t-1$ would be 1.2 times more likely to be over-indebted in period t had they been over-indebted at $t-1$ given their observed and unobserved set of characteristics.

In contrast to the findings for Thailand, estimates of the corresponding dynamic random-effects bivariate probit model for Vietnamese households' reveals that having multiple borrowing at $t-1$ or being over-indebted at $t-1$ does not significantly affect households' probability of becoming over-indebted in the future. This result is, however, not so surprising as these two countries differ on the level of financial depth, credit outreach and the number of credit programs introduced in rural areas. While the Vietnamese government began to introduce and support formal financial intermediaries in rural areas such as Vietnam Bank for Agriculture and Rural Development (VBARD) and Vietnam Bank for Social Policy (VBSP) around the early 1990s (Dufhues et al., 2004), the Thai government introduced such financial institutions as early as mid-1970s by supporting homegrown non-bank financial institutions and promoting the Bank for Agriculture and Agricultural Cooperatives (BAAC) into rural development bank (Menkhoff and Suwanaporn, 2007 and Menkhoff and

Rungruxsirivorn, 2009). The institutions introduced by Thai government have enhanced access to financial services particularly for households in the non-municipal areas of Thailand. Some argue that such government interventions in Thailand have shifted poor households' attitudes towards indebtedness. For instance, Siripanyawat et al. (2010) reports that some households have begun to perceive being indebted as a norm and deem not paying back their loan on time acceptable as it was funded by the government. In contrast, Vietnam's rural credit market shows a better performance in terms of high level of loan repayment. For instance, the ratio of loans in arrears to total outstanding loans to farmers was 0.98 percent for VBARD in Vietnam, while it was 13.5 percent for BAAC in Thailand in 2001 (Okae, 2009). The sound performance of the Vietnam's rural financial institutions and the low level of default have been explained by the strong reliance of the financial institutions on the customary rules of behavior in rural communities. Especially, the fact that the whole rural community participates in social activities together and assume the role of a loan monitoring system, puts pressure on households to repay their debt on time in order to avoid economic and social sanctions from others (Okae, 2009). Therefore, one can expect household over-indebtedness and multiple borrowing to be a bigger problem among Thai households than among Vietnamese households.

Finally, as for the control variables, we find that for Thai households having a male and higher educated household head and belonging to lower income groups influences their propensity to become over-indebted. While in Vietnam, the risk of facing over-indebtedness is influenced by marital and educational status of household head, major source of income and households level of income.

6.2 Multiple borrowing

As can be seen, from the results of the multiple borrowing equations presented in Columns (2) and (6) in table 7, we find a positive significant true state dependence effect of multiple borrowing for both Thai and Vietnamese households as expected. In terms of the APE estimated by the model as explained in the previous section, both Thai and Vietnamese households who had taken multiple loans at $t-1$ were more likely to take multiple loans in the future by around 28 and 20 percentage points, respectively, than those households that did not have multiple borrowing at $t-1$. Households that did not take multiple borrowing would be around 2 times more likely to take multiple borrowing in period t had they had multiple borrowing at $t-1$ in both Thailand and Vietnam. This could mean that certain households in Thailand and Vietnam are either persistently engaged in juggling debt from several sources as a way of managing their finances or are cote up in

cyclical debt trap where they are simply refinancing or turning-over existing loans that are ultimately unpayable.

Regarding the cross-state dependence effect of over-indebtedness on multiple borrowing, we find that being over-indebted in the previous period does not influences households probability of taking multiple loans simultaneously in both Thailand and Vietnam. While households both in Thailand and Vietnam report of taking additional loans to pay back old debts, the result suggests no significant spillover effect from multiple borrowing to over-indebtedness. This result reflects that microlenders in Thailand and Vietnam are able to effectively screen over-indebted borrowers that have passed the point where they cannot meet their debt repayments without serious difficulty and prevent them from taking additional loans.

As for the control variables, we find that for Thai households having a male, middle aged and higher educated household head and belonging to the higher income groups and facing unexpected shocks to income influences their propensity to take multiple borrowing. While in Vietnam, household's probability of taking multiple borrowing is influenced by the age and marital status of household head and household's level of income and facing expected shocks to expenses.

To sum up, the results so far suggest that both multiple borrowing and over-indebtedness to be persistent and dynamically interrelated for Thai households but not for Vietnamese households. Furthermore, the estimates of the state dependence and cross-state dependence effect of both outcomes from the dynamic random effect bivariate model have shown that observed raw conditional probabilities and positive correlations between over-indebtedness and multiple borrowing is not entirely explained by a true state dependence effect after controlling observed and unobserved households heterogeneity. The next step is to look at the persistency of over-indebtedness and multiple borrowing that is unexplained by observed households characteristics and true state dependence effect.

6.3 Spurious state dependence effect on the persistency of multiple borrowing and over-indebtedness

The estimated standard deviations of time-invariant household specific random effects and the correlations between the time-invariant household specific effects and the error terms of the two outcome equations are presented at the bottom of table 7. Confirming the significance of controlling for unobserved household heterogeneity in our analysis, we find that the standard deviations of the household specific random effects are statistically significant at a 5 percent significance level in both models for Thailand and Vietnam. For both Thai and Vietnamese households, we find that

variance of household's unobserved heterogeneity significantly explains both household's probability of becoming over-indebted and household's propensity to take multiple loans simultaneously. This shows that such unobserved households characteristics as financial literacy, debt perception or time preference might influences either household's propensity to become over-indebted or take multiple loans at the same time and therefore should be controlled for.

Furthermore, we find that these unobserved factors that drive multiple borrowing and over-indebtedness and the error terms are significantly correlated. Unobserved factors that drive multiple borrowing are positively associated with those that drive over-indebtedness in both Thailand and Vietnam. Similarly, the error terms of the two equations are positively significantly correlated with an estimated coefficient of about 0.5 for Thailand and 0.46 for Vietnam. As discussed in section 5, the significance of these correlations implies that multiple borrowing and over-indebtedness should be jointly estimated. Regarding the exogeneity of the initial conditions, the results indicate that the initial conditions of both over-indebtedness and multiple borrowing are positively correlated with the unobserved heterogeneity and therefore, the exogeneity assumptions of the initial conditions can be rejected for both outcomes in both countries' models.

7. Summary and Conclusions

This paper studies over-indebtedness of rural households and the role of multiple borrowing. To uncover the true dynamic interdependency between multiple borrowing and over-indebtedness, the dynamic random effect bivariate probit model that controls for unobserved heterogeneity and initial conditions is estimated considering the potential endogeneity of multiple borrowing and over-indebtedness by allowing for cross-state dependency effects and correlation of random effects across multiple borrowing and over-indebtedness.

Results indicate that adopting multiple borrowing practices concurrently increases household's likelihood of experiencing over-indebtedness by about 14 percentage points for Thai households. Given their observed and unobserved set of characteristics, Thai households that did not take multiple borrowings previously would be around 2 times more likely to be over-indebted had they taken multiple loans concurrently. By contrast, we find that this effect is not significant for Vietnamese households. Moreover, we do not find a significant true cross-state dependence effect of over-indebtedness on multiple borrowing, i.e. being over-indebted in the past does not raise the likelihood that household borrow multiple loans from several lenders simultaneously. This suggests that while multiple borrowing causes households to accumulate excessive amounts of debt beyond their repayment capacity, over-indebtedness does not lead households to take multiple loans to refinance or recycle ultimately unpayable debts and trap households in perpetual debt. The findings

also suggest over-indebtedness and multiple borrowing to be more of a persistent problem for both households in Thailand and Vietnam which are explained in part by true state dependence effects. Finally, unobserved household heterogeneity was also found to be empirically significant, explaining about half of the unsystematic variation in the model and signifying that it should be controlled for. The significant positive correlation between the unobserved factors driving multiple borrowing and over-indebtedness further showed the need for the joint estimation of the two processes.

Turning to the main policy implication of the study, the result on the spillover effect of multiple borrowing on household's risk of over-indebtedness in Thailand suggests that industry stakeholders and policy makers should give more emphasis to the problem of multiple borrowing and take measures to protect micro-borrowers from taking multiple loans and ultimately becoming over-indebted. To this end, potential measures include cautiously lending to households with multiple borrowing, increasing information sharing among financial institutions on credit history and repayment performance of borrowers, improving financial education of households and financial advice to borrowers of the potential risk of multiple borrowing and over-indebtedness. Furthermore, the dynamic interdependency between multiple borrowing and over-indebtedness indicates that preventive measures aimed at multiple borrowing can also reduce the problem of over-indebtedness in the future. Finally, the finding that households take multiple borrowing in response to shocks in both countries suggests that providing households with additional risk coping mechanisms such as micro-insurance may prevent from them taking multiple loans and avoid over-indebtedness.

8. References

Alessie, R., Hochguertel, S., Soest, A. V., 2004. Ownership of Stocks and Mutual Funds: A Panel Data Analysis. *Review of Economics and Statistics, 86*(3), 783–796.

Assefa, E., Hermes, N., Meesters, A., 2013. Competition and the performance of microfinance institutions. *Applied Financial Economics, 23*(9), 767-782.

Bateman, M., Chang, H. J., 2012. Microfinance and the Illusion of Development: from Hubris to Nemesis in Thirty Years. *World Economic Review, 1*(1), 13-36.

Betti, G., Dourmashkin, N., Rossi, M., Yin, Y. P., 2007. Consumer over-indebtedness in the EU: measurement and characteristics. *Journal of Economic Studies, 34*(2), 136-156.

Casini, P., 2010. *Competitive Microcredit Markets: Differentiation and ex-ante Incentives for Multiple Borrowing.* LICOS Discussion Paper No. 26610. LICOS - Centre for Institutions and Economic Performance, KU Leuven.

CGAP, 2012. Multiple Borrowing – Definition, Concepts and Reasons. CGAP- Consultative Group to Assist the Poor. Retrieved from: http://www.cgap.org/events/understanding-multiple-borrowing-and-avoiding-over-indebtedness-among-clients

Chaudhury, I. A., Matin, I., 2002. Dimensions and dynamics of microfinance membership overlap–a micro study from Bangladesh. *Small Enterprise Development, 13*(2), 46–55.

Chen, G., Rasmussen, S., Reille, X., 2010. Growth and vulnerabilities in microfinance. Focus Note, 61.

Del Rio, A., Young, G., 2008. The impact of unsecured debt on financial pressure among British households. *Applied financial economics, 18*(15), 1209-1220.

Devicienti, F., Poggi, A., 2010. Poverty and social exclusion: two sides of the same coin or dynamically interrelated processes? *Applied Economics, 43*(25), 3549–3571.

Disney, R., Bridges, S., Gathergood, J., 2008. Drivers of over-indebtedness: report to the Department for Business, Enterprise and Regulatory Reform. *Center for Policy Evaluation, University of Nottingham.*

Dufhues, T., Heidhues, F., Buchenrieder, G., 2004. Participatory product design by using Conjoint Analysis in the rural financial market of Northern Vietnam. *Asian Economic Journal, 18*(1), 81-114.

Giarda, E., 2013. Persistency of financial distress amongst Italian households: Evidence from dynamic models for binary panel data. *Journal of Banking & Finance, 37*(9), 3425–3434.

Giovanni, D. A., Iezzi, S., 2013. *Household over-indebtedness: definition and measurement with Italian data* (No. 149). Bank of Italy, Economic Research and International Relations Area.

Gonzalez, A., 2008. *Microfinance, Incentives to Repay, and Overindebtedness: Evidence from a Household Survey in Bolivia*. Doctoral thesis. Ohio State University, Ohio.

Guha, B., Chowdhury, P. R., 2013. Micro-finance competition: Motivated micro-lenders, double-dipping and default. *Journal of Development Economics, 105*, 86–102.

Guha, B., Chowdhury, P. R., 2014. Borrower Targeting under Microfinance Competition with Motivated Microfinance Institutions and Strategic Complementarity. *The Developing Economies, 52*(3), 211–240

Guérin, I., 2012. *Households' over-indebtedness and the fallacy of financial education: insights from economic anthropology*. Microfinance in Crisis Working Papers Series (No. 1). UMR 201 Développement et Sociétés (Paris I Sorbonne/IRD), Paris.

Haas, O. J., 2006. Overindebtedness in Germany. Employment Section, Social Finance Program

Working Paper n.º 44. International Labour Office, Geneva.

Hardeweg, B., Klasen, S., Waibel, H., 2012. Establishing a database for vulnerability assessment, in S. Klasen & H. Waibel, eds., *Vulnerability to Poverty-Theory, Measurement, and Determinants* (pp. 50–79). Basingstoke, Hampshire: Palgrave Macmillan.

Heckman, J., 1981a. Heterogeneity and state dependence. *In Studies in labor markets* (pp. 91-140). University of Chicago Press.

Hoff, K., Stiglitz, J. E., 1997. Moneylenders and bankers: price-increasing subsidies in a monopolistically competitive market. *Journal of Development Economics, 52*(2), 429–462.

Hsiao, C., 2003. Analysis of Panel Data. Cambridge University Press, Cambridge.

Khandker, S. R., Faruqee, R., and Samad, H. A., 2013. Are Microcredit Borrowers in Bangladesh Over-Indebted? *World Bank Policy Research Working Paper No. 6574*. World Bank Development Research Group, Washington.

Krishnaswamy, K., 2007. Competition and multiple borrowing in the Indian microfinance sector. Working Paper. *Chennai: Institute for Financial Management and Research, Centre for Microfinance*, Chennai.

Lützenkirchen, C., Weistroffer, C., 2012. Microfinance in Evolution. An industry between crisis and advancement. *Deutsche Bank Research,* Frankfurt am Main.

May, O., Tudela, M., 2005. *When is mortgage indebtedness a financial burden to British households? A dynamic probit approach*. Working Paper 277. Bank of England, London.

McIntosh, C., Wydick, B., 2005. Competition and microfinance. *Journal of Development Economics, 78*(2), 271–298.

McIntosh, C., de Janvry, A., Sadoulet, E., 2005. How Rising Competition Among Microfinance Institutions Affects Incumbent Lenders*. *The Economic Journal, 115*(506), 987–1004.

Menkhoff, L., Rungruxsirivorn, O., 2009. Village funds in the rural credit market of Thailand. *Proceedings of the German Development Economics Conference*, Frankfurt a.M. 2009 45, Verein für Socialpolitik, Research Committee Development Economics.

Menkhoff, L., Suwanaporn, C., 2007. 10 Years after the crisis: Thailand's financial system reform. *Journal of Asian Economics, 18*(1), 4–20.

Mohan, L., Potnis, D., Mattoo, N., 2013. A pan-India footprint of over-indebtedness of microfinance borrowers from an exploratory survey. *Enterprise Development and Microfinance, 24*(1), 55–71.

Mpogole, H., Mwaungulu, I., Mlasu, S., Lubawa, G., 2012. Multiple Borrowing and Loan Repayment: A Study of Microfinance Clients at Iringa, Tanzania. *Global Journal of Business & Management Research, 12*(4).

Okae, T., 2009. Rural credit and community relationships in a Northern Vietnamese village. 東南アジア研究, *47*(1), 3–30.

Schicks, J., Rosenberg, R., 2011. Too Much Microcredit? A Survey of Issues and Evidence on Over-Indebtedness among Micro-Borrowers. *CGAP Focus Note 61*, Washington D.C.

Schicks, J., 2014. Over-Indebtedness in Microfinance – An Empirical Analysis of Related Factors on the Borrower Level. *World Development, 54*, 301–324.

Siripanyawat, S., Sawangngoenyuang, W., Thungkasemvathana, P., 2010. Household Indebtedness and Its Implications for Financial Stability in Thailand. In D. Nakornthab, eds., *Household Indebtedness and Its Implications for Financial Stability,* The South East Asian Central Banks, Kuala Lumpu.

Stewart, M. B., 2007. The interrelated dynamics of unemployment and low-wage employment. *Journal of Applied Econometrics, 22*(3), 511–531.

Vogelgesang, U., 2003. Microfinance in times of crisis: the effects of competition, rising indebtedness, and economic crisis on repayment behavior. *World Development, 31*(12), 2085-2114.

Wampfler, B., Bouquet, E., Ralison, E., 2014. Does juggling mean struggling? Insights into the financial practices of rural households in Madagascar. in I. Guérin, S. Morvant-Roux, & M. Villarreal, eds., *Microfinance, Debt and Over-Indebtedness: Juggling with Money*. (pp. 211-231). NY: Routledge, New York.

Wooldridge, J. M., 2005. Simple solutions to the initial conditions problem in dynamic, nonlinear panel data models with unobserved heterogeneity. *Journal of Applied Econometrics*, *20*(1), 39–54.

Table 1: The extent of indebtedness, over-indebtedness and multiple borrowing among households in Thailand and Vietnam from 2007 to 2011

Country and Wave ID		Indebted households (percent)	Over-indebted, multiple borrowing and cross-indebted households (Percentage to total households)			Over-indebted multiple borrowing and cross-indebted household (Percentage to indebted households)		
			Over-indebted	Multiple borrowing	Cross-indebted	Over-indebted	Multiple borrowing	Cross-indebted
Thailand (914 HH)	2007	86	40	65	59	46	75	69
	2008	89	48	79	65	54	88	72
	2010	79	18	50	40	23	64	50
	2011	84	30	65	49	35	78	58
Vietnam (668 HH)	2007	63	16	24	19	25	38	29
	2008	68	11	25	20	17	37	29
	2010	70	09	26	19	12	37	28
	2011	76	12	44	33	15	58	43

Table 2: The degree of overlap between over-indebtedness and multiple borrowing over the period of five years (2007 to 2011)

Country			Multiple borrowing		Over-indebtedness	
			No	Yes	No	Yes
Thailand	Over-indebtedness	No	89	54	-	-
		Yes	11	46	-	-
	Multiple borrowing	No	-	-	48	11
		Yes	-	-	52	89
Vietnam	Over-indebtedness	No	93	76	-	-
		Yes	7	24	-	-
	Multiple borrowing	No	-	-	75	39
		Yes	-	-	25	61

Table 3: Number of years in over-indebtedness and multiple borrowing

Country	Number of Years	Over-indebted	Multiple borrowing
Thailand	0	32	14
	1	26	11
	2	23	16
	3	13	20
	4	6	39
Vietnam	0	66	40
	1	23	25
	2	9	17
	3	2	13
	4	0	5

Table 4: Probability of experiencing over-indebtedness in current year, conditional on household's past experience of over-indebtedness and multiple borrowing status

Indicators	Year $t-1$	Year t			
		Thailand		Vietnam	
		No	Yes	No	Yes
Over-indebted (Over-indebted $t-1$)	No	77	23	91	9
	Yes	52	48	78	22
Multiple borrowing (Multiple borrowing $t-1$)	No	67	36	78	22
	Yes	20	80	39	61
Over-indebted (Multiple borrowing $t-1$)	No	83	17	92	8
	Yes	60	40	81	19
Multiple borrowing (Over-indebted $t-1$)	No	43	57	71	29
	Yes	22	78	52	48

Table 5: Unconditional and conditional probabilities of over-indebtedness for Thai households from 2008 to 2011

		Households (percent)	Unconditional	Not over-indebted at $t-1$	Over-indebted at $t-1$	Not a multiple borrower at $t-1$	Multiple borrower at $t-1$
All		100	31.87	23.20	47.83	16.77	40.17
Age of HH head group	Below 35	1	37.29	20.59	60	20.83	48.57
	35 - 45	15	34.89	25.72	50	15.63	42.77
	45 - 55	27	34.75	25.66	48.66	18.14	40.91
	55 - 65	29	33.02	22.93	50.36	19.55	40.55
	Above 65	28	25.47	20.22	39.70	14	35.82
Female headed HH	Male	78	33.12	24.98	47.30	19.10	40.08

(%)	Female	32	29.17	19.55	49.11	12.61	40.39
Married HH head	Single	21	28.18	18.05	50.27	12.24	39.76
	Married	79	32.87	24.69	47.25	18.29	40.27
Education of HH head groups	Illiterate and primary education	86	30.90	21.99	47.48	15.94	39.52
	Secondary education	11	33.92	27.32	45.63	18.67	39.34
	Higher Education	3	56.34	50	65.52	40	65.22
	In-active	15	33.59	24.74	48.30	16.96	41.46
Occupation of HHH	Agricultural	56	31.37	20.69	50.52	13.58	38.95
	Off-farm	10	31.46	23.03	47.93	19.05	39.03
	Self-employed	19	26.11	19.73	42.86	15.34	35.48
Income quintile	Quintile 1	14	49.61	37.04	70.83	23.94	67.66
	Quintile 2	18	38.77	30.51	53.16	18.13	50.91
	Quintile 3	20	31.50	25.17	42.19	13.30	41.06
	Quintile 4	23	20.07	12.34	36.41	9.84	25.26
	Quintile 5	25	22.01	13.76	37.02	17.84	23.94

Table 6: Unconditional and conditional probabilities of over-indebtedness for Vietnamese households from 2008 to 2011

		Households (percent)	Unconditional	Not over-indebted at $t-1$	Over-indebted at $t-1$	Not a multiple borrower at $t-1$	Multiple borrower at $t-1$
All		100	10.48	8.94	21.94	7.70	18.91
Age of HH head group	Below 35	9	10.46	8.78	20.59	7.43	27.03
	35 - 45	25	11.95	9.85	25.71	7.92	21.12
	45 - 55	29	9.56	8.15	22.64	7.35	14.72
	55 - 65	16	14.57	12.30	26	9.95	27.16
	Above 65	21	6.63	6.63	6.67	6.53	7.27
Female headed HH (%)	Male	79	10.75	9.24	21.65	7.81	18.82
	Female	21	9.42	7.82	23.26	7.31	19.44
Married HH head	Single	17	8.96	7.74	19.44	6.60	20.69
	Married	83	10.80	9.20	22.39	7.96	18.68
Education of HH head groups	Illiterate	18	7.89	6.21	24.24	15.94	39.52
	Primary education	43	11.81	10.41	21.90	18.67	39.34
	Secondary and Higher education	39	10.19	8.60	21.21	40	65.22
Occupation of HHH	In-active	7	11.08	9.52	21.79	8.43	19.21
	Agricultural	60	12	8.99	36.36	7.19	22.95
	Off-farm	10	8.57	7.60	17.02	5.31	18.10
	Self-employed	23	9.02	8.18	16.64	9.62	5.56
Income quintile	Quintile 1	14	23.40	20.34	46.15	18.91	46.30
	Quintile 2	17	14.29	12.58	23.73	9.76	27.55
	Quintile 3	18	8.31	6.94	18.37	5.03	19.78
	Quintile 4	22	5.63	4.72	13.33	3.62	10.66
	Quintile 5	29	4.40	3.66	11.11	2.79	8.33

Table 7: Dynamic random effects bivariate probit model for Thai and Vietnamese households probability of being over-indebted and having multiple borrowing (Wooldrige's estimator)

	Thailand				Vietnam			
	Over-indebtedness		Multiple borrowing		Over-indebtedness		Multiple borrowing	
	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE
Multiple borrowing at $(t-1)$	0.507**	0.111	0.944**	0.083	0.151	0.104	0.521**	0.0976
Over-indebted at $(t-1)$	0.147*	0.092	0.0244	0.096	0.0653	0.127	-0.0098	0.113
Multiple borrowing status initial year $(t=1)$	0.472**	0.106	0.963**	0.083	0.367**	0.106	0.495**	0.0977
Over-indebted status initial year $(t=1)$	0.577**	0.091	0.219**	0.075	0.448**	0.116	0.339**	0.107
Age of HH head below 35	-0.145	0.234	-0.646**	0.226	-0.229	0.181	-0.206	0.158
Age of HH head 45-54	-0.0968	0.118	-0.262**	0.113	-0.0889	0.164	0.0852	0.135
age of HH head 55-64	-0.0223	0.098	-0.440**	0.089	0.146	0.153	-0.0453	0.124
age of HH head above 65	-0.196	0.094	-0.631**	0.085	-0.299	0.158	-0.382**	0.132
Female HH head	-0.180*	0.083	-0.223**	0.075	0.0729	0.152	-0.00815	0.127
married HH head	-0.0212	0.099	-0.207**	0.088	0.413**	0.170	0.312*	0.144
No of Children (0-14)	-0.00703	0.090	0.0359	0.089	0.150	0.116	0.0102	0.089
Household size	0.0304	0.074	0.0264	0.071	-0.0557	0.078	0.0162	0.056
Ilitrate and primary education	-1.329**	0.198	0.339	0.186	-0.510**	0.222	-0.286	0.188
Secondary education	-1.041**	0.209	0.412*	0.202	-0.432*	0.217	-0.380*	0.183

Agricultural HH	0.0940	0.109	0.119	0.104	-0.379**	0.150	0.105	0.127
Off-farm employed HH	0.00569	0.123	-0.0569	0.117	-0.397**	0.161	0.135	0.135
Inactive HH	0.136	0.142	0.0951	0.132	-0.102	0.231	0.00423	0.204
Income quintile 1	1.336**	0.119	-0.197*	0.100	1.686**	0.160	-0.226	0.130
Income quintile 2	0.845**	0.107	0.00529	0.097	1.078**	0.154	0.0766	0.116
Income quintile 3	0.599**	0.103	0.110	0.094	1.078**	0.153	-0.00220	0.108
Income quintile 4	0.0688	0.100	0.0664	0.091	0.651**	0.154	0.104	0.102
Unexpected shocks to expenses	0.0151	0.063	-0.00805	0.061	0.100	0.086	0.0861	0.071
Expected shocks to expenses	0.0540	0.101	-0.166	0.101	0.174	0.143	0.312**	0.118
Unexpected shocks to income	0.0990	0.066	0.185**	0.064	-0.0516	0.095	0.108	0.077
Longitudinal average of children (0-14)	0.0136	0.103	-0.0443	0.101	0.146	0.127	0.0715	0.099
Longitudinal average of household size	-0.127	0.079	0.0419	0.075	-0.217	0.085	-0.0183	0.063
2008	0.486**	0.086	0.573**	0.087	-0.221*	0.112	-0.712**	0.093
2010	-0.708**	0.086	-0.939**	0.085	-0.254**	0.105	-0.675**	0.083
Constant	-0.911**	0.270	2.00	0.247	-2.227**	0.339	-0.41	0.284
ρ	0.502**	0.073			0.462**	0.073		
σ_{c1}	0.694**	0.096			0.499**	0.114		
σ_{c2}	0.533**	0.118			0.684**	0.083		
ρ_c	0.762**	2.323			1.544*	0.222		
Log likelihood	-2454.22				-1528.74			
APE of multiple borrowing at $(t-1)$: $\hat{p}_1 - \hat{p}_0$	14		28		1.51		20	
PPR multiple borrowing at $(t-1)$: $\hat{p}_1/\hat{p}_0$	1.86		1.53		1.40		2.16	
APE of over-indebtedness at $(t-1)$: $\hat{p}_1 - \hat{p}_0$	4		0.55		0.64		-0.32	
PPR over-indebtedness at $(t-1)$: $\hat{p}_1/\hat{p}_0$	1.18		1.01		1.15		0.98	
No. of Observations	2742		2742		2004		2004	

*** 1%, ** 5%, * 10% levels of significance

Notes:
1. Robust standard errors in parentheses.
2. $\hat{p}_0$, $\hat{p}_1$: predicted probabilities of household's over-indebtedness and multiple borrowing at t given over-indebtedness status at t- 1, respectively.
3. APE: average partial effect; PPR: predicted probability ratio.

Figure 1: Multiple borrowings: percentage of households by the number of credit contracts in Thailand and Vietnam from 2007 to 2011
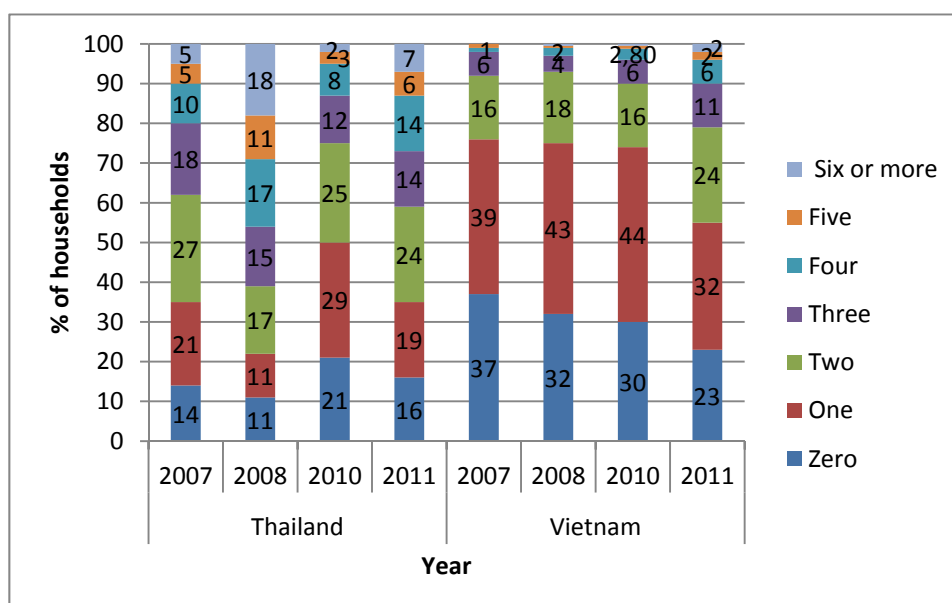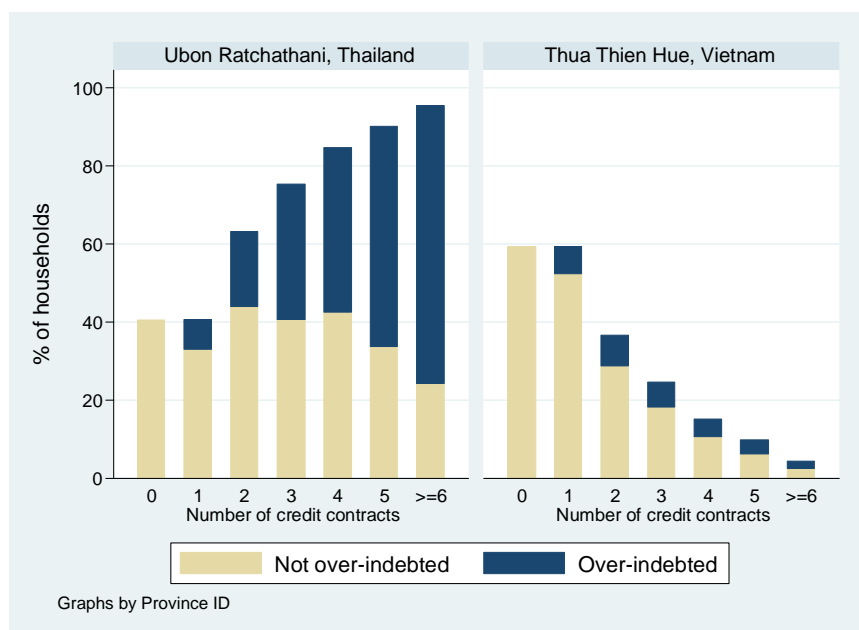
Figure 2: Multiple borrowing and over-indebtedness in Thailand and Vietnam

Graphs by Province ID

9. Appendix

Table 1: Descriptive statistics of the Thai and Vietnamese sample using the latest data (2011)

Variables		Thailand (914 HHs)	Vietnam (668 HHs)
Age of HH head group	Below 35	1	9
	35 - 45	15	25
	45 - 55	27	29
	55 - 65	29	16
	Above 65	28	21
Female HH headed (%)		32	21
Married HH heads (%)		79	82
No of Children (0-14)		1.03	1.26
HH size		5.6	5.6
Education of HH head groups	Illiterate and primary education	86	61
	Secondary education	11	35
	Higher Education	3	4
Occupation of HHH	In-active	15	7
	Agricultural	56	60
	Off-farm	10	10
	Self-employed	19	23
Income quintile	Quintile 1	14	14
	Quintile 2	18	17
	Quintile 3	20	18
	Quintile 4	23	22
	Quintile 5	25	29
Shocks	Unexpected shock to expenses	55	55
	Expected shocks to expenses	13	9
	Unexpected Shocks to income	69	66
Land size Owned (ha)		3.5	1.2
Total income (US$ in PPP (2005))		10,500	6,278
Consumption (US$ in PPP (2005))		6,876	5,363
Outstanding debt (US$ in PPP (2005))		6,089	1,979