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The Drivers of Household Indebtedness: Evidence from Thailand

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Abstract

This paper explores the nature of and the dangers posed by household indebtedness in Thailand. It utilises three levels of models to characterise savings and consumption behavior—first, the n eoclassical m odels o f the Life-Cycle Hypothesis and the Permanent Income Hypothesis; second, the asymmetric information models of credit rationing; and, finally, the behavioral finance models, which suggest that at least some consumers will act in non-rational ways. We find that the neoclassical models are supported by the evidence from Thailand. Secured income and sufficient saving allow households to improve their debt performance and reduce their chances of being over-indebted; whereas a higher level of dependency on finance can lead to a higher probability of being over-indebted. We also find that, for some borrowers, credit constraints are binding in the formal market for loans, which leads those borrowers to enter the gray market. Finally, we find that higher financial literacy is also correlated with superior debt performance. This raises issues about improving the level of financial literacy for Thai households.

Keywords: Household Indebtedness, Subjective Over-indebtedness, Objective Over-indebtedness

1. Introduction: Development in household debt in Asian countries and its implications for the macroeconomy

The level of household debt has grown rapidly in most countries over the past three decades. The reasons for the rapid rise in household debt include the record low interest rates and the abundant liquidity in global financial markets (Debelle, 2004; Barba & Pivetti, 2009; Davies, 2009). The effects of high household debt on the economy remain to be rigorously researched, however.

The theoretical literature provides several reasons why households may hold large debts. The permanent income hypothesis, for example, states that households facing a temporary decline in their income will borrow to smooth out their current consumption with a view to repaying this debt when incomes recover (Friedman, 1957; Modigliani, 1966). Such smoothing of consumption has a stabilizing effect on demand and therefore the economy as a whole (Barba & Pivetti, 2009). In addition to the above reason for the growth of household debt, improved access to credit such as that arising from liberalization of financial markets can also raise the level of household debt (Debelle, 2004; Kang & Ma, 2009).

The effects of a rise in household debt on the macroeocnomy may vary depending on the context. Most of the extant literature argues that rising household debt can increase financial fragility leading to adverse economic consequences. In the case where household debt increases fragility of the financial sector, the effects on the economy can be negative (Barnes & Young, 2003; Debelle, 2004; Cecchetti et al., 2011). A rise in household debt can make the household sector more vulnerable to interest-rate shocks and income shocks (Debelle, 2004; Endut & Hua, 2009). Moreover, according to the United Kingdom and the United States' experiences, a high level of household leverage can lead to an economic downturn in subsequent periods through a drop in household consumption and saving (Debelle, 2004; Barba & Pivetti, 2009). Martin (2011) also claims that in the case of the United States, the sub-prime mortgage boom during 2001 to 2006 led to the bubble in house prices and the subsequent global financial crisis in the next two years. This financial crisis caused broad-and-serious adverse effects on the real economy

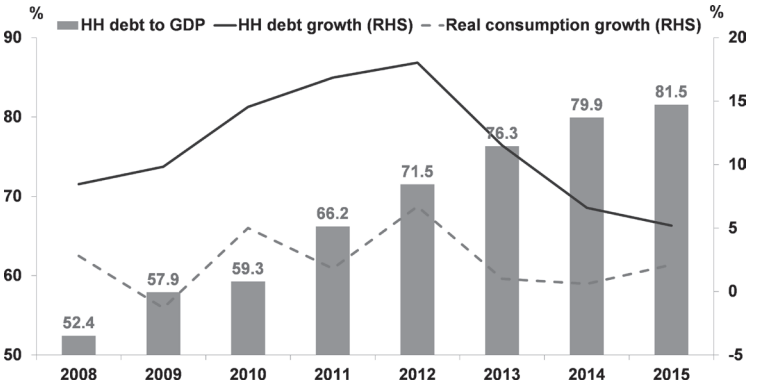
and financial markets (i.e. economic downturn and more volatility in financial markets) in both advanced and emerging countries (Claessens et al., 2010; Longstaff, 2010; Aloui et al., 2011).

In developing countries, particularly in Southeast Asia, regulators have tried to cope with high levels of household debt. In Malaysia, for example, financial institutions' loans have been increasingly concentrated in the household sector after the Asian financial crisis in 1997, and Bank Negara Malaysia has taken into account the impact of an increase in the policy interest rate on household debt servicing ability and consumption (Endut & Hua, 2009). In the case of Philippines, a higher amount of non-performing loans for consumer loans during 2005 – 2007 led to the tightening of credit standard by the authorities (Tan, 2009).

As one of developing countries in Southeast Asia, Thailand is an interesting case study on the phenomenon of a rapid rise in household debt. From 2009 to 2013, outstanding loans from the formal financial sector by households nearly doubled: from 5.1 trillion Baht at the end of 2008 to 9.8 trillion Baht at the end of 2013; meaning that household debt-to-GDP ratio increased from 52.4% in 2008 to 76.3% by 2013, along with a low consumption growth (figure 1).

It is useful to compare Thailand's performance with the countries in the Asia-Oceania region. The long time series on total credit and domestic bank credit to private non-financial sector collected by Bank for International Settlements (BIS) show the average annual growth rate of Thailand's household loans from other depository corporations (ODCs) of 14% during 2009 to 2013. This figure was smaller than only Indonesia and China, whose growth rates were 21% and 28% respectively. Moreover, from 1999 to 2013, Thailand had an upward trend growth in consumer credit (figure 2). From figure 3, we see that Thailand had been one Asian country that has the sharpest increase in household loans.

Figure 1. Household Debt[1/] and Consumption in Thailand

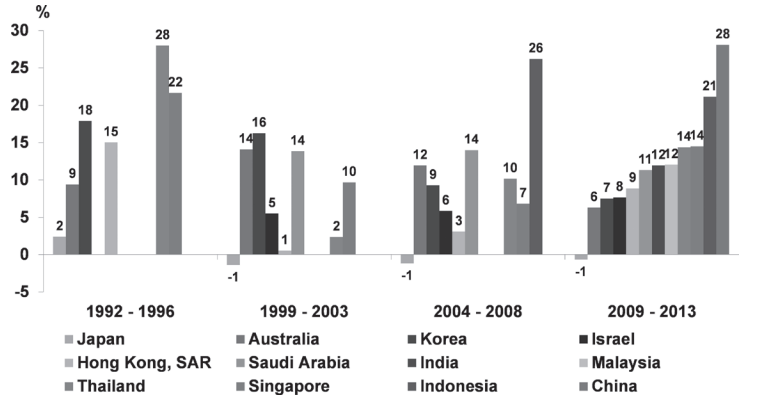


Notes: 1/ Household loans from all financial institutions.

Source: The Office of the National Economic and Social Development Board and the Bank of Thailand

Authors' calculations.

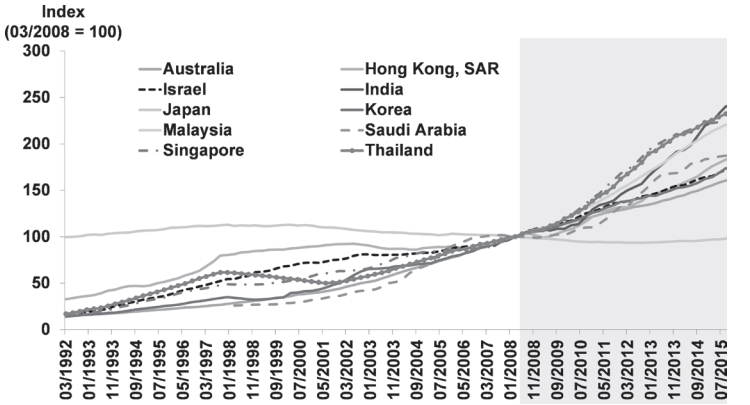
Figure 2. ODCs'[1/] Household Loans by Country (Average Growth[2/])



Notes: 1/ Other depository corporations include commercial banks, depository specialized financial institutions, saving cooperatives, finance companies and credit foncier companies. 2/ Average annual growth (geometric mean).

Source: The Long series on total credit and domestic bank credit to the private non-financial sector, Bank for International Settlements.

Figure 3. ODCs' Household Loans by Country (Outstanding: Local Currency)



Source: The Long series on total credit and domestic bank credit to the private non-financial sector, Bank for International Settlements.

This paper explains the household debt situation in Thailand and also tries to determine the factors which can affect Thai households' indebtedness by using micro data from the official household surveys. This is the first time that such data has been used to investigate the household characteristics that are the drivers of household indebtedness in Thailand by applying both subjective and objective measurements. We have found that all three related theories, which are (i) neoclassic economic theory, (ii) the theory of credit rationing, and (iii) behavioral finance theory, are important for explaining Thai households' indebtedness.

The paper is divided into six sections. Section I summarizes the development in household debt in Asian countries and its implications for the macroeconomy. The related literature is reviewed in Section II. In Section III, the primary data and descriptive statistics on household indebtedness in Thailand are described. Section IV clarifies the econometric models, which will be used for the study of the drivers of household indebtedness, using Thailand's official household survey. The results of the econometric analysis are shown in Section V. Section VI summarizes the empirical findings and discusses policy implications.

2. Literature review

2.1 Hypotheses of household indebtedness

There are three main related hypotheses that explain household indebtedness: neoclassical economic theory, the theory of credit rationing, and behavioral finance theory. Firstly, regarding two neoclassical economic theories: the Permanent Income Hypothesis (PIH), the Life-Cycle Hypothesis (LCH), Friedman (1957) and Modigliani (1966) explain that individuals can build wealth when they spend less than earnings, and then invest the savings for growth over their lifetime. According to the LCH, given three stages of life: young age, working age and old age, individuals have to manage their income and expenditure over their lifetime. For example, individuals cannot earn income prior to reaching working age, so they sometimes borrow some money for spending (Modigliani, 1966). At the same time, the PIH states that individuals prefer stable to volatile consumption. However, achieving this with volatile income may require savings and dis-savings over the lifetime subject to the budget constraint that net savings over the entire life are nil (Friedman, 1957).

Secondly, in the case of credit rationing and liquidity constraints, Flemming (1973) argues that the imperfection in financial markets can affect the borrower's debt service burden. According to the literature on asymmetric information in credit markets, such as Stiglitz & Weiss (1981), the interest rate alone is not an optimal instrument for determining credit allocation. Higher interest rates may encourage moral hazard and/or adverse selection and lower, rather than raise, loan margins. Individuals, who have a good credit profile, may be not interested in loans with high interest rates. Conversely, individuals, who need some money to finance themselves, want to get some loans even though they know they cannot pay it back. Consequently, non-price instruments are needed to optimally allocate loans. For this reason, banks utilize such measures as credit histories as an instrument in rationing credit, and this has implications for individuals who are allowed to have access to the credit market.

Lastly, focusing on behavioral finance, some researchers also believe that financial imprudence is one of the main drivers of household indebtedness

(Disney & Gathergood, 2012; Anderloni & Vandone, 2010). Financial imprudence results from low financial literacy and leads to poor financial management (e.g. some households cannot perceive the actual cost of borrowing). People with low financial literacy are more prone to hyperbolic discounting behavior. Hyperbolic discounters are households who have self-control problems and heavily discount their future consumption (they have a high present time preference for consumption). Moreover, they persistently underestimate the cost of debt repayment in terms of forgone future consumption. Consequently, hyperbolic discounters, who bring their consumption forward by borrowing, may have less saving and face debt repayment problems because they are 'caught by surprise' in the future by the amount they have to repay (Laibson, 1997; Gathergood, 2012).

The accumulation of debt by an increasing share of the population has a bearing on the risks of financial crisis, an issue explained later. Next, we explain the quantification of household indebtedness.

2.2 Household indebtedness measurement

There are both continuous and dichotomous indicators for household indebtedness measurement (Keese, 2009). Focusing on the continuous indicators, Keese (2009) examines the measure of household debt performance that can be a gauge of financial fragility. The ratio of income after debt service payments to non-discretionary income (Keese, 2009), and the debt to asset ratio (Betti et al., 2007; Gumy, 2007) can be applied in this sense. DeVaney (1994) also defines household insolvency as "the failure to submit the timely repayment of debts as they mature" which can be reflected from the negative net worth by using the debt to asset ratio (DAR = Stock of debt/Stock of assets).

Moving on to the dichotomous indicators, many researchers have attempted to define a certain level of indebtedness as over-indebtedness, but there is no consensus on how to do this (Anderloni & Vandone, 2008; Keese, 2009; European Commission, 2010). Measures used to signal over-indebtedness are both subjective and objective (Keese, 2009). Subjective over-indebtedness is often reported by the borrowers' perceptions of difficulties in their debt service payments (Anderloni & Vandone, 2008; D'Alessio & Iezzi, 2013).

One of the most popular primary data sources for this approach is the household survey (European Commission, 2010; Liv ,2013), which draws on data collected from a representative sample of households for the population (Anderloni & Vandone, 2008).

In contrast, objective over-indebtedness is measured using data drawn from the households' financial statements and balance sheets. Both macro-data (Haas, 2006; European Commission, 2010) and micro-data (Betti et al., 2007; Keese 2009; Gathergood, 2012; D'Alessio & Iezzi, 2013) can be collected with accounting statistics. By using quantitative models, over-indebted households are households with the inability to repay their debt corresponded to the threshold levels of indebtedness (Betti et al., 2007). For dichotomous indicators, households with income after debt service payment less than non-discretionary income (Keese, 2009) or the living standard (Haas, 2006) can be defined as being over-indebted. Additionally, D'Alessio and Iezzi (2013) select over-indebted households by using two criteria: 1) households with a ratio of monthly debt service payments to monthly income of more than 30 percent (i.e. debt service ratio: DSR = Monthly debt service payment/ Monthly income > 0.3) or 2) households with monthly income after debt service payments less than their poverty line ([Monthly income – Monthly debt service payment] < [Poverty line x Household size]). Commonly, the poverty line reflects the minimum expenditure for essential goods and services for life.

2.3 Research on the drivers of household indebtedness

Many empirical studies on the drivers of both household debt performance and over-indebtedness have been based on the Permanent Income Hypothesis and the Life-Cycle Hypothesis, and many scholars affirm that these hypotheses hold (Betti et al., 2007; Vante, 2006; Anderloni & Vandone, 2008; Keese, 2009). For example, some scholars report the evidence that young individuals with low income tend to be over-indebted (Betti et al., 2007; Vante, 2006). Additionally, Keese (2009), who employs Germany's panel household survey, argues that income level may not be the only driver of household debt difficulties, but childbirth or family breakdown with attendant income shocks can also cause the severe situations of indebtedness.

This latter finding from Germany leads to other significant factors such as the number of children in family and head of household's marital status, which are also used by the other researchers (Xiao and Yao 2014).

With regards to the effects of liquidity constraints, Betti et al. (2007) prove that lack of access to a formal source of funds when consumption behavior is myopic can result in household being objectively over-indebted. Thus the proxies of credit constraints, coupled with the "hand-to-mouth" type consumer are mentioned as significant drivers of consumer indebtedness in EU countries. Moreover, persistent unemployment can amplify the effect of income shocks on household debt performance because of the interaction of the lack of income coupled with lesser chances of obtaining more credit (Anderloni & Vandone, 2008; Keese, 2009).

In addition, some researchers use types of loans e.g. mortgage loans (Keese, 2009), credit card and education loans as the other factors to explain household debt performance. These type of loans are claimed as the causes of having poor debt performance. In the case of mortgage loans, Keese (2009) opines that although homeowners can earn the benefit from asset accumulation, they may be unable to manage their housing service burden, which is lumpy, compared to another type of loans.

Finally, regarding behavioral finance, some researchers try to find the relationship between households' financial literacy and their credit status (Lusardi & Tufano, 2009; Disney & Gathergood, 2012). Lusardi & Tufano (2009) claim that, in the case of the United States, household's debt literacy is strongly related to the probability of becoming over-indebted. They also assert that households with low debt literacy do not perceive the real cost of the charges and fees of credit cards and also cannot assess their financial position. In addition, in the case of the United Kingdom, households with poor financial literacy tend to have a higher cost of credit financing (Disney & Gathergood, 2012).

In addition to the issues of financial literacy, there are some issues of financial management. According to the extant literature, there are a few preliminary results of the positive relationship between poor financial management and the likelihood of being over-indebted (Anderloni & Vandone,

2008; Lusardi & Tufano, 2009). Although financial management depends on the household's attitude which is related to psychological aspects, these unsound financial decisions can make households become over-indebted (Anderloni & Vandone, 2008; Gathergood, 2012). Poor financial management includes hyperbolic discounting and impulsive spending behaviors (Gathergood, 2012).

2.4 Research on household indebtedness in Thailand

In the case of Thailand, some researchers have investigated the threshold of household's debt service burden and the effect of high debt service burdens on household debt sustainability (Muthitacharoen et al., 2015). Household debt sustainability is the circumstance that households can repay their debt without hurting their minimum standard of living (Betti et al., 2007). Muthitacharoen et al. (2015) apply subjective over-indebtedness measurement to indicate the threshold for household's debt service ratio (DSR). Thailand's Household Socio-Economic Survey (conducted by National Statistical Office) and the Bank of Thailand's supplement household survey in 2013 are used as Thailand's official household surveys. They estimate probit regression by using the perception of having a concern about the next debt repayment as the measure of subjective over-indebtedness. After controlling for the head of household's age, household's social class and region, they illustrate that DSR at around 40 percent causes the higher possibility of having difficulties on debt repayment to be significant, and it can signify a heavy debt service burden. In addition, according to Muthitacharoen et al. (2015), a higher household debt service burden not only corresponds to a higher probability of financial difficulties, but also obstructs future consumption growth. With Thailand's Household Socio-Economic Surveys in 2009 to 2013 (which are not the panel surveys), households are grouped into 776 districts and run a linear regression of a change in consumption under the assumption of 10-percentage-point changes in income. Finally, they find that households in the top tritile of a change in DSR during 2009 to 2011 (27 percent) had the lowest consumption growth in 2013 at 5.7 percent. By using micro-simulation, they also identify that households in the bottom income quintile are more sensitive to interest rate shocks than the others because of the higher proportion of variable-rate debt.

With regards to financial prudence in Thailand, the same official household surveys in 2013, along with macro data of household financial status are used by the Kenan Institute Asia. Kenan Institute Asia (2015) concludes that household debt in Thailand has increased significantly, whereas household saving has tended to decline over the past five years. Poor financial literacy and management, including a lack of adequate financial access, can make households more vulnerable by weakening their financial standing. The most vulnerable household groups, who have a great chance of facing financial difficulties, are agricultural households and blue-collar workers (Kenan Institute Asia, 2015).

The conclusions of this literature survey are as follows. In the case of Thailand, a study on the drivers of household indebtedness can lead to significant policy implications for lending practices and household financial sustainability. Literature suggests three groups of variables can be investigated in the case of Thailand. These three groups are motivated by three main theories: neoclassical economics (the Life-Cycle Hypothesis and the Permanent Income Hypothesis), credit rationing, and behavioral finance. Moreover, a study of household indebtedness by using micro data can clarify the different characteristics between each household, especially in developing countries where there are more heterogeneities in each group of households. Both subjective and objective measurements can be applied as robustness check to confirm the findings.

3. Data and overview of household indebtedness in Thailand

3.1 Data

In this study, quantitative analysis will be applied. Firstly, descriptive statistics will be generated for the empirical overview of household indebtedness in Thailand. Secondly, econometric models will be employed for the technical analysis. Thailand's official household surveys (Household Socio-Economic Surveys) of the first quarter of 2013 will be used, along with the Bank of Thailand's supplement survey for the completeness of the data set. Household Socio-Economic Surveys (SES) are administered by the National Statistical Office. For SES of the first quarter of 2013 (SES 2013Q1), 10,661 households are representative of the whole household population from all of 77 provinces

in Thailand. These representative households are selected by stratified random sampling from every district in all provinces regarding geography and household's characteristics.

For the SES, households can be identified by the following criteria:

- Geography: Province, region, municipal/ non-municipal area
- Head of household's characteristic: Gender, age, marital status, education
- Social class: household member's occupation which generates the highest proportion of income of household

Household's financial status (household unit) also can be collected from SES in terms of flows and stocks.

Flows:

- Inflows: monthly income, including type of income (wage, salary, profit from business, pension, transferred income)
- Outflows: monthly expenditure, including type of expenditure (Food, beverages, tobacco, other consumption, non-consumption), and monthly debt service payment

Stocks:

- Physical assets: Dwelling, vehicles
- Debt, including type of loans (Mortgage, agricultural business, non-agricultural business, education, personal consumption)

For SES 2013Q1, some other indicators of financial difficulties are used namely: the problems with other financial commitments (rent and utility bills) and credit access (in the case of emergency and working purposes).

In addition, for the analysis of the drivers of household debt performance and over-indebtedness, the Bank of Thailand (BOT)'s supplement household survey is also used because of the additional information of household's financial behavior and financial literacy. This BOT-survey is collected in the first quarter of 2013 (BOT 2013Q1) with the same 10,661 households as SES 2013Q1. Four parts of this survey are used for the information of household's perception of financial status, financial discipline, financial literacy and credit constraints. These four parts have the details as the following:

(i) *Household's perception of financial situation:*
- Concern about the next debt repayment (have/do not have the finances to meet the obligations)
- Current situation and expectation of household's economic status (worse, no change, better)
- Current situation and expectation of household's debt level (decrease, no change, increase)
- Current situation and expectation of household's debt service burden (decrease, no change, increase)
- Credit profile over the past 12 months (meet/cannot meet the due date)
- Current situation and expectation on government help for credit default

(ii) *Financial discipline:*
- Doing income-and-expenditure accounts
- Saving behavior (saving plan), including the period that saving can be used in the case of income shock
- Composition of financial assets

(iii) *Financial literacy (based on Organization for Economic Co-operation and Development (OECD)'s survey of financial literacy[1]):*
- Knowledge score (the questions about interest rate and inflation)
- Behavior score (the questions about saving and spending behaviors)
- Attitude score (the questions about hyperbolic discounting behavior)

(iv) *Financial constraints (credit rejection from formal sector)*

[1] Measuring Financial Literacy: Questionnaire and Guidance Notes for Conducting and Internationally Comparable Survey of Financial Literacy

Lastly, a regional poverty line from National Statistical Office (the cost or expense of the individual in the acquisition of food and basic services essential to life: calculated by the Development Indicators database and social NESDB, Office of The National Economic and Social Development Board.) will be applied for five regions in Thailand: Bangkok (capital city), Central (exclude Bangkok), North, Northeast and South as the below.

Table 1. Poverty Line (Baht/ Person/ Month)

	Region				
Year	**Bangkok (BKK)**	**Central (excl. BKK)**	**North**	**Northeast**	**South**
2008	2,694	2,390	1,936	1,882	2,219
2009	2,676	2,382	1,938	1,883	2,239
2010	2,756	2,490	2,040	2,005	2,344
2011	2,901	2,610	2,160	2,130	2,492
2012	2,994	2,696	2,226	2,188	2,577
2013	3,047	2,775	2,314	2,273	2,651
2014	3,133	2,832	2,387	2,355	2,735

Source: National Statistical Office

To clean this data, the total 10,661 representatives of the whole household population are filtered step by step as the below.

- 34 households with income less than or equal to zero are dropped.
- 4 households with debt service ratio more than 1,000 percent are dropped as the unreasonable observations.

Finally, 10,623 households are kept as the sample of this analysis.

The number of households by three main common categories: social class, region and head of household's marital status can be summarised as table 2.

Table 2. Number of Observations

Social Class	No. of households	Region	No. of households	Household head's marital status	No. of households
Agricultural	1,930	Bangkok (BKK)	607	Single	1,131
Non-agricultural	2,101	Central (excl. BKK)	3,070	Married-couple	6,990
Professional	1,140	North	2,598	Married-widowed/ separated/ divorced	2,497
Worker	3,226	Northeast	2,814	N/A	5
Retired	2,226	South	1,534		

Source: Household Socio-economic Surveys of 2013Q1, National Statistical Office.

3.2 Overview descriptive statistics

For overview statistics on household indebtedness in Thailand, firstly, the changes in the financial status of indebted households will be figured out by income group. Secondly, the proportion of over-indebted households will be calculated by social class, region and head of household's marital status. Thirdly, household debt performance will be analyzed by the same categories of households. This paper apply the proxy of debt performance by Keese (2009), which is the ratio of household's monthly income after debt service payments to household's poverty line ([Monthly income – Monthly debt service payment]/[Poverty line x Household size]). Lastly, the proportion of both subjectively and objectively over-indebted households will be shown.

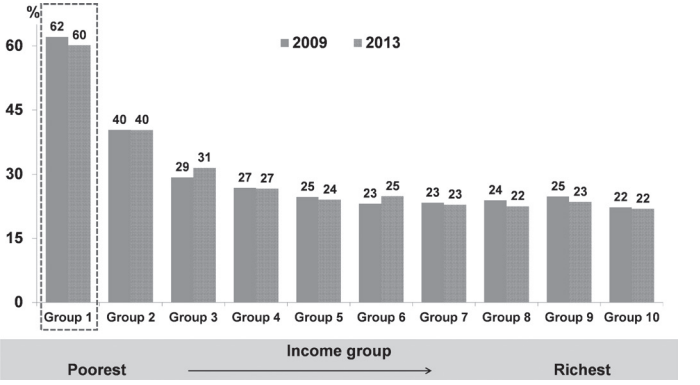
3.2.1 Indebted households' changes in financial status

By using Thailand's official household surveys from 2009 to 2013, the average annual growth of monthly income, debt, and debt service payment are 6.7 percent, 7.7 percent and 5.7 percent respectively. The higher debt growth than income growth led to an increase in debt to annual income ratio from 78.7 percent in 2009 to 81.6 percent in 2013. However, there was a slower increase in the debt service burden than income because of a decline in

the average effective lending rate from 8.6 per annum in 2009 to 7.8 per annum in 2013. Therefore, household's debt service ratio (monthly debt service payment to monthly income ratio) decreased negligibly from 28.1 percent in 2009 to 27.4 percent in 2013.

Focusing on debt service ratio by income group, income deciles are generated, and figure 4 shows that households with heavy debt service burdens were concentrated in the lowest 30 percent of household by income. Furthermore, for the lowest income group, which has household's monthly income less than 6,000 Baht (table 3), households spend more than a half of their income on debt servicing (figure 4). Their debt to annual income ratio is also the highest one at more than 120 percent (figure 5). In addition, the lowest income group's agricultural business loans and personal consumption loans—which are unsecure loans— accounted for more than 80 percent of their total debt (figure 6). The heavy debt service burden and the high proportion of unsecure loans for low-income households causes a concern about income inequality and a poverty trap, which leads to debt unsustainability in Thailand. The high level of leverage and the heavy debt service burden raise questions about a proportion of over-indebted households and the drivers of indebtedness, which will be investigated later.

Figure 4. Debt Service Ratio by Income Group



Note: Using population weight

Source: Household Socio-economic Surveys, National Statistical Office. Authors' calculations

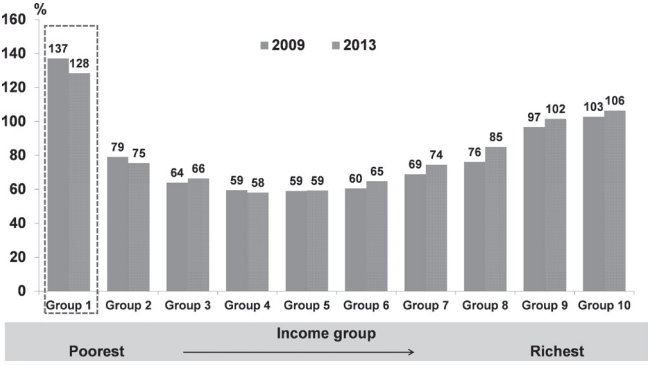
Table 3. Household's Income in 2013 by Income Group (Baht/ Month)

	Min	**Max**
Group 1 (Poorest)	10	6,333
Group 2	6,335	8,772
Group 3	8,773	11,147
Group 4	11,148	13,730
Group 5	13,731	16,786
Group 6	16,788	20,715
Group 7	20,719	25,601
Group 8	25,604	33,116
Group 9	33,119	49,250
Group 10 (Richest)	49,257	8,820,684

Note: Using population weight

Source: Household Socio-economic Surveys of 2013, National Statistical Office. Authors' calculations.

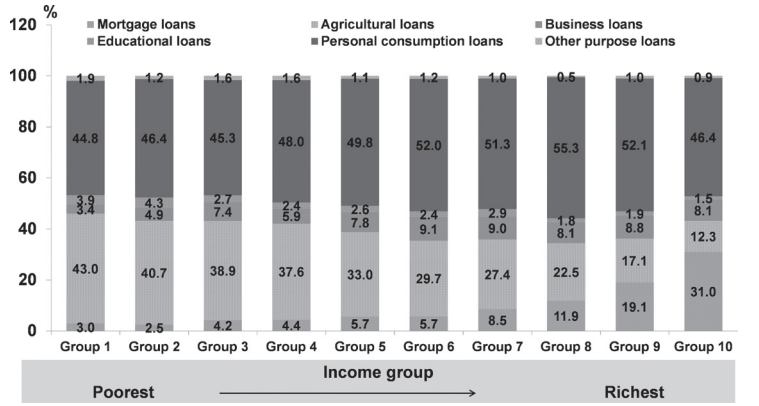
Figure 5. Debt to Annual Income Ratio by Income Group



Note: Using population weight

Source: Household Socio-economic Surveys, National Statistical Office. Authors' calculations.

Figure 6. Average Composition of Debt by Income Group



Note: Using population weight

Source: Household Socio-economic Surveys of 2013, National Statistical Office. Authors' calculations

3.2.2 Proportion of indebted households

By social class, region and head of household's marital status, table 4 shows that agricultural households, households in the north-eastern part and households with married-couple household head have the highest proportion of indebted households at 72.9, 67.9 and 63 percent respectively. Whereas households who have a retired household head, households in Bangkok and households with a single household head have the lowest proportion of indebted households at 36.7, 37 and 29.2 percent respectively.

3.2.3 Household debt performance in Thailand[2]

Table 5 shows that households with the poorest performance are agricultural households, households in the north-eastern part of Thailand and single-adult households and widows particularly. In fact, widows drawing the bulk of their income from agriculture from Northeast are most prone to be in debt-stress.

[2] (Monthly income – Monthly debt service payment)/(Poverty line x Household size)

Table 4. Proportion of Indebted Households

Social Class	%	Region	%	Household head's marital status	%
Agricultural	72.9	Bangkok (BKK)	37.0	Single	29.2
Non-agricultural	61.4	Central (excl. BKK)	48.3	Married-couple	63.0
Professional	59.1	North	57.8	Married-widowed/ separated/ divorced	43.8
Worker	51.8	Northeast	67.9		
Retired	36.7	South	48.7		

Note: Using population weight

Source: Household Socio-economic Surveys of 2013Q1, National Statistical Office. Authors' calculations.

Table 5. Household Debt Performance

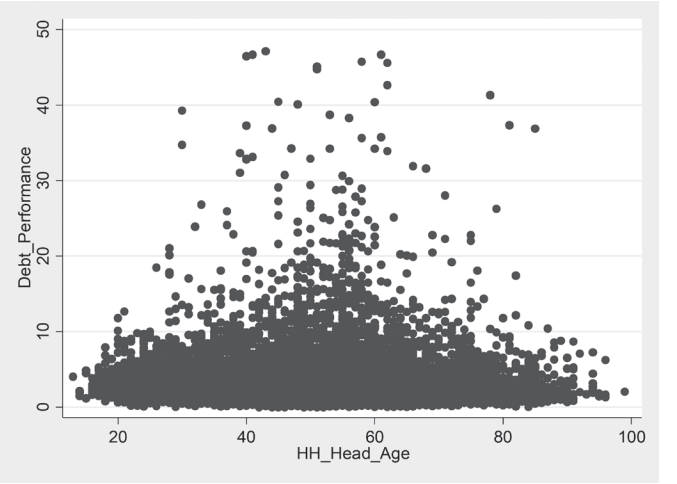
Social Class	Times	Region	Times	Household head's marital status	Times
Agricultural	2.3	Bangkok (BKK)	5.7	Single	4.9
Non-agricultural	3.6	Central (excl. BKK)	3.6	Married-couple	3.1
Professional	7.0	North	3.0	Married-widowed/ separated/ divorced	3.0
Worker	2.7	Northeast	2.3		
Retired	2.9	South	3.7		

Note: Using population weight

Source: Household Socio-economic Surveys of 2013Q1, National Statistical Office. Authors' calculations.

In addition, figure 7 shows a scatter plot, which indicates a non-linear relationship between debt performance and head of households' age. Therefore, a squared term of this variable could be used for the estimations. In addition, this non-linear relationship is aligned with the Life-Cycle Hypothesis.

Figure 7. Debt Performance by Household Head's Age



Note: Only households with positive debt performance and debt performance less than 50 times.

Source: Household Socio-economic Surveys of 2013Q1, National Statistical Office. Authors' calculations.

3.2.4 Proportion of over-indebted households

Subjectively over-indebted households are households with a concern about the next debt repayment, while objectively over-indebted households are households with the ratio of income after debt service payment to poverty line less than one ([Monthly income – Monthly debt service payment]/ [Poverty line x Household size] < 1). Table 6 shows the similar orders of the proportion of subjective and objective over-indebted households. By social class, agricultural households have the highest proportion of subjective and objective over-indebted households at 21.5 and 26.8 percent respectively. By region, households in the north-eastern part of Thailand have the highest

proportion (23–25 percent) of both subjective and objective over-indebted households. Lastly, by the head of household's marital status, around 14-17 percent of households with both married-couple and married (widowed, separated, divorced) head of household are over-indebted.

Table 6. Proportion of Over-indebted Households

Social Class	Sub. (%)	Obj. (%)	Region	Sub. (%)	Obj. (%)	Household head's marital status	Sub. (%)	Obj. (%)
Agricultural	21.5	26.8	Bangkok (BKK)	7.0	2.6	Single	4.2	3.9
Non-agricultural	17.1	10.6	Central (excl. BKK)	10.9	9.4	Married-couple	17.1	16.8
Professional	5.6	3.0	North	15.2	14.4	Married-widowed/ separated/ divorced	14.5	14.4
Worker	15.8	11.4	Northeast	22.8	25.0			
Retired	11.7	18.2	South	12.1	11.6			

Note: Using population weight

Source: Household Socio-economic Surveys of 2013Q1, National Statistical Office. Authors' calculations.

4. Methodology

This analysis employs both continuous and dichotomous terms of indebtedness. The analysis with continuous terms will be called 'household debt performance analysis', whereas the analysis with dichotomous terms will be called 'household over-indebtedness analysis'. Firstly, for the household debt performance analysis, ordinary least squares (OLS, using robust standard errors) will be estimated corresponding to the continuous dependent variable, which is the ratio of household's monthly income after debt service payments to household's poverty line. This ratio can reflect the distance between income after debt service payments and subsistent level of income (Keese, 2009). Moreover, this proxy of debt performance will be linked to the measure of objective over-indebtedness, which will be explained next.

Secondly, focusing on the household over-indebtedness analysis, logit models (using robust standard errors) will be estimated for both subjective and objective measurements. A dummy variable for households with a concern about the next debt repayment (0 = N, 1 = Y) will be used as a dependent variable for the subjective over-indebtedness estimation. In contrast, a dummy variable for households with the ratio of income after debt service payment to household's poverty line less than one (0 = N, 1 = Y) will be used as a dependent variable for the objective over-indebtedness estimation.

According to literature, the list of explanatory variables of household indebtedness will be collected as the table below.

Table 7. List of Explanatory Variables

Variable	Term
Perception of having secure income (regular income)	Dummy (0 = N, 1 = Y)
Expenditure to income ratio	Level
Doing income-and-expenditure accounts	Dummy (0 = N, 1 = Y)
Having problems with other financial commitments over the past 12 months (rent or utility bills)	Dummy (0 = N, 1 = Y)
Insufficient savings in case of income shocks (saving can fund monthly expenditure less than 3 months)	Dummy (0 = N, 1 = Y)
Main source of fund (Bank for Agricultural and Agricultural Cooperatives: BAAC)	Dummy (0 = N, 1 = Y)
Main source of fund (Government Housing Bank and Government Saving Bank: GHB and GSB)	Dummy (0 = N, 1 = Y)
Main source of fund (non-banks)	Dummy (0 = N, 1 = Y)
Main source of fund (cooperatives)	Dummy (0 = N, 1 = Y)
Main source of fund (informal source)	Dummy (0 = N, 1 = Y)
Financial literacy score (total)	Level
Financial literacy score (knowledge)	Level
Financial literacy score (interest rate)	Level
Financial literacy score (behavior)	Level
Hyperbolic discounting behavior ("I am happy with spending now more than saving for the future.")	Dummy (0 = N, 1 = Y)
Credit constraint (in the case of emergency)	Dummy (0 = N, 1 = Y)
Credit constraint (in case of working purposes)	Dummy (0 = N, 1 = Y)
Credit constraint (rejection from formal sector)	Dummy (0 = N, 1 = Y)

Table 7. List of Explanatory Variables (cont.)

Variable	**Term**
Variable	Term
Dependency ratio	Level
Age	Level
Mortgage loans to annual income ratio	Level
Agricultural business loans to annual income ratio	Level
Non-agricultural business loans to annual income ratio	Level
Education loans to annual income ratio	Level
Personal consumption loans to annual income ratio	Level
Other purpose loans to annual income ratio	Level

Table 8 shows the list of control variables.

Table 8. List of Control Variables

Dummy variable for social class (using professional as a benchmark)	
Variable	**Term**
Agricultural business	Dummy (0 = N, 1 = Y)
Non-agricultural business	Dummy (0 = N, 1 = Y)
Worker	Dummy (0 = N, 1 = Y)
Retired	Dummy (0 = N, 1 = Y)
Dummy variable for region (using Bangkok as a benchmark)	
Variable	Term
Central (exclude Bangkok)	Dummy (0 = N, 1 = Y)
North	Dummy (0 = N, 1 = Y)
Northeast	Dummy (0 = N, 1 = Y)
South	Dummy (0 = N, 1 = Y)
Dummy variable for household head's marital status (using single as a benchmark)	
Variable	Term
Married (couple)	Dummy (0 = N, 1 = Y)
Married (widowed/ separated/ divorced)	Dummy (0 = N, 1 = Y)

5. Empirical results

Table 9 provides the results from ordinary least squares (OLS) regarding the household debt performance analysis. It shows that the perception of having secure income has a positive relationship with household debt performance, while insufficient savings (in case of income shocks) and the dependency ratio are negatively correlated with debt performance. These results mean that households with secure income have better debt performance than households with no secure income, while having insufficient savings and a higher dependency ratio can lead to the poorer debt performance. These empirical findings support the Life-Cycle Hypothesis (LCH) and the Permanent Income Hypothesis (PIH).

Moreover, in the case of Thailand, the results from OLS suggest that the turning point of age terms (level and squared term) is within the age-bracket of 45-55 years. This finding can be explained that households who have household heads with working age between 21 and 60 years old have a higher proportion of households with expectation of better households' economic situation compared to the others (figure 8). On average, these households expect to earn more income during working age, which can lead to the better debt performance.

Regarding credit constraints, the limited access to formal business-loans plays an important role in deteriorating debt performance. For the effects of loans by type, agricultural loans have the largest effect on debt performance. The size of the effect of mortgage loans is smaller than the others, while the effect of non-agricultural business loans is not significant. To explain the effect of mortgage loans, the effect is small because mortgage loans are secure loans with collateral, and the effective lending rate (annual interest payment/ debt outstanding) is lower than the others (figure 9). Moreover, for behavioral finance, households with poor financial literacy, especially interest rate calculation, and households with unsound financial behaviors (saving and spending behaviors) have weaker debt performance.

Table 9. Debt Performance Models (OLS)

Variable	Model1	Model2	Model3	Model4
Perception of having secure income (dummy)	0.583***	0.520***	0.531***	0.627***
Expenditure to income ratio (level)	-0.24	-0.24	-0.209	-0.214
Expenditure to income ratio (squared term)	0.0004	0.0004	0.0003	0.0004
Doing income-and-expenditure accounts	1.162***	1.116***		1.516***
Having problems with other financial commitments (dummy)	-0.690***	-0.570***		-0.576***
Insufficient savings (dummy)		-0.660***		-0.763***
Financial literacy score (total)	0.241***	0.219***		
Financial literacy score (knowledge)			0.326***	
Financial literacy score (behavior)			0.300***	
Financial literacy score (attitude)			-0.019	
Financial literacy (interest rate)				0.503***
Hyperbolic discounting behavior				0.021
Main source of fund (BAAC)			-1.099***	-1.031***
Main source of fund (GHB and GSB)			-0.163	-0.032
Main source of fund (non-banks)			-0.853***	-0.686***
Main source of fund (cooperatives)			1.207***	1.309***
Main source of fund (village fund)			-1.485***	-1.355***
Main source of fund (informal source)			-0.905***	-0.904***
Credit constraint (in case of working purposes)			-0.347***	-0.372***
Credit constraint (in case of emergency)	-0.385***	-0.327***		
Dependency ratio (level)	-2.521***	-2.618***	-2.690***	-2.637***
Age (level)	0.039**	-0.004	0.041**	0.063***
Age (squared term)	-0.0004**	5.15E-06	-0.0004**	-0.001***
Mortgage loans to annual income ratio			-0.178**	-0.146*
Agricultural business loans to annual income ratio			-0.746***	-0.726***
Non-agricultural business loans to annual income ratio			-0.103	-0.095
Education loans to annual income ratio			-0.498***	-0.555***
Personal consumption loans to annual income ratio			-0.580***	-0.541***
Other purpose loans to annual income ratio			-0.454**	-0.507**
Dummy variable for social class (using professional as a benchmark)				
Agricultural business	-4.105***	-4.196***	-3.549***	-3.723***
Non-agricultural business	-2.946***	-2.973***	-2.801***	-2.911***
Worker	-3.756***	-3.739***	-3.625***	-3.772***
Retired	-1.981***	-1.849***	-1.736***	-1.993***

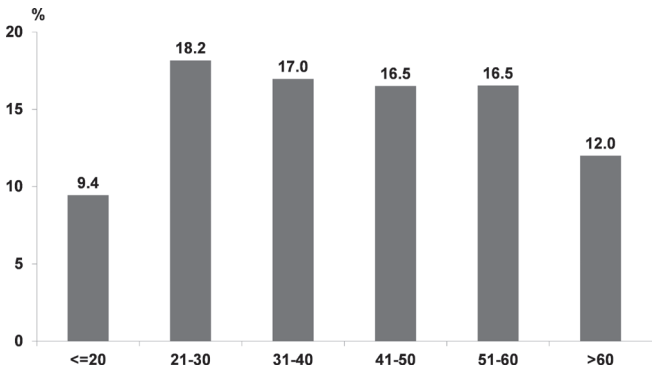
Table 9. Debt Performance Models (OLS)

Variable	Model1	Model2	Model3	Model4
Dummy variable for region (using Bangkok as a benchmark)				
Central (exclude Bangkok)	-1.592***	-1.624***	-1.469***	-1.499***
North	-1.811***	-1.839***	-1.548***	-1.510***
Northeast	-2.205***	-2.235***	-1.841***	-1.798***
South	-1.209**	-1.241**	-1.293**	-1.181**
Dummy variable for household head's marital status (using single as a benchmark)				
Married (couple)	-0.945***			-0.564***
Married (widowed/ separated/ divorced)	-0.420**			-0.216
Constant	5.693***	6.692***	5.448***	7.817***
N	9,430	9,430	9,430	9,430
Adjusted R2	0.134	0.134	0.148	0.144

Notes: Households with respondent, who is not the household head or household head's spouse, are dropped.

*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

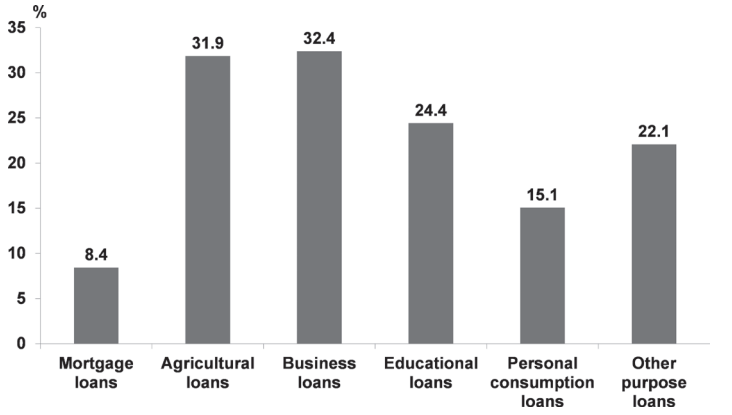
Figure 8. Proportion of Households With Expectation of Better Households' Economic Situation (by Household Head's age group)



Note: Using population weight.

Source: Household Socio-economic Surveys of 2013Q1, National Statistical Office. Authors' calculations.

Figure 9. Effective Lending Rate by Type of Loan



Note: Effective lending rate = (Annual interest payment/Debt outstanding) x100. Using population weight.

Source: Household Socio-economic Surveys of 2013Q1, National Statistical Office. Authors' calculations.

For household over-indebtedness analysis, the results from logit models (table 10-11)[3] also support the LCH and the PIH. They are consistent with the findings by Betti et al. (2007), Vante (2006), Anderloni & Vandone (2008) and Keese (2009). The turning point of age terms is within the same age-bracket of 45-55 years. To explain this finding, although these households have better average debt performance, there are the higher proportions of over-indebted households by head count because this age group has the ability to borrow more money compared to the other groups (figure 10 and table 12). The highest proportion is in the group of household heads with age between 51-60 years old.

[3] For model specifications, see appendix A.

Table 10. Marginal Effects on Probability of Being Subjectively Over-indebted

Variable	Marginal Effect
Perception of having secure income (dummy)	-0.031***
Expenditure to income ratio (level)	0.019**
Expenditure to income ratio (squared term)	-0.002***
Doing income-and-expenditure accounts	-0.043***
Having problems with other financial commitments (dummy)	0.104***
Insufficient savings (dummy)	0.062***
Main source of fund (BAAC)	0.283***
Main source of fund (GHB and GSB)	0.197***
Main source of fund (non-banks)	0.239***
Main source of fund (cooperatives)	0.212***
Main source of fund (village fund)	0.244***
Main source of fund (informal source)	0.331***
Financial literacy (interest rate)	-0.004
Hyperbolic discounting behavior	0.004
Credit constraint (in case of working purposes)	0.04***
Dependency ratio (level)	0.019*
Age (level)	0.004**
Age (squared term)	-4E-05**
Mortgage loans to annual income ratio	0.025***
Agricultural business loans to annual income ratio	0.028***
Non-agricultural business loans to annual income ratio	0.035***
Education loans to annual income ratio	0.071***
Personal consumption loans to annual income ratio	0.018***
Other purpose loans to annual income ratio	0.035
Dummy variable for social class (using professional as a benchmark)	
Agricultural business	0.055***
Non-agricultural business	0.081***
Worker	0.075***
Retired	0.044**
Dummy variable for region (using Bangkok as a benchmark)	
Central (exclude Bangkok)	0.006
North	0.008
Northeast	0.023
South	0.024
Dummy variable for household head's marital status (using single as a benchmark)	
Married (couple)	0.028
Married (widowed/ separated/ divorced)	0.043**

Notes: Households with respondent, who is not the household head or household head's spouse, are dropped.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

Table 11. Marginal Effects on Probability of Being Objectively Over-indebted

Variable	Marginal Effect
Perception of having secure income (dummy)	-0.027***
Expenditure to income ratio (level)	0.18***
Expenditure to income ratio (squared term)	0***
Doing income-and-expenditure accounts	-0.039**
Having problems with other financial commitments (dummy)	0.06***
Insufficient savings (dummy)	0.039***
Main source of fund (BAAC)	0.07***
Main source of fund (GHB and GSB)	0.007
Main source of fund (non-banks)	0.019*
Main source of fund (cooperatives)	0.025
Main source of fund (village fund)	0.066***
Main source of fund (informal source)	0.049***
Financial literacy (interest rate)	-0.024***
Hyperbolic discounting behavior	0.004*
Credit constraint (in case of working purposes)	0.019***
Dependency ratio (level)	0.14***
Age (level)	0.004***
Age (squared term)	-4E-05***
Mortgage loans to annual income ratio	0.01*
Agricultural business loans to annual income ratio	0.058***
Non-agricultural business loans to annual income ratio	0.043***
Education loans to annual income ratio	-0.06***
Personal consumption loans to annual income ratio	0.017***
Other purpose loans to annual income ratio	0.03
Dummy variable for social class (using professional as a benchmark)	
Agricultural business	0.12***
Non-agricultural business	0.038**
Worker	0.053***
Retired	0.039**
Dummy variable for region (using Bangkok as a benchmark)	
Central (exclude Bangkok)	0.149***
North	0.176***
Northeast	0.184***
South	0.157***
Dummy variable for household head's marital status (using single as a benchmark)	
Married (couple)	0.112***
Married (widowed/ separated/ divorced)	0.073***

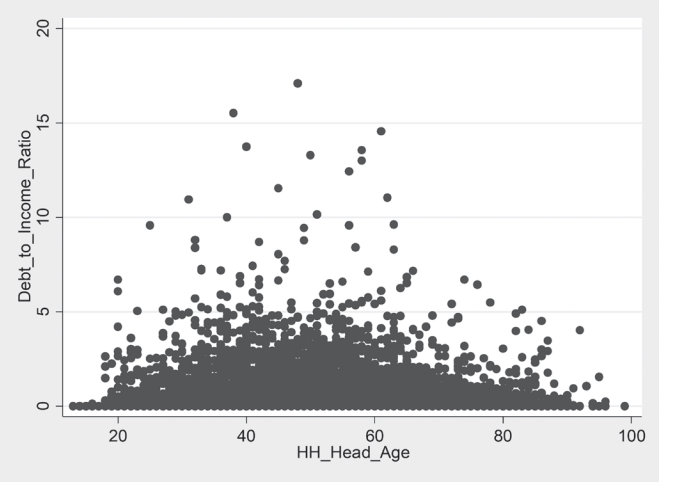
Notes: Households with respondent, who is not the household head or household head's spouse, are dropped.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

Figure 10. Debt to Annual Income Ratio by Household Head's age



Note: Only households with debt to annual income ratio less than 20 times.

Source: Household Socio-economic Surveys of 2013Q1, National Statistical Office. Authors' calculations.

Table 12. Proportion of Over-indebted Households by Household Head's age

Age (years)	Subjective over-indebted households (%)	Objective over-indebted households (%)
<= 20	3.8	1.6
21–30	9.8	6.3
31–40	13.3	14.8
41–50	17.3	15.8
51–60	18.5	16.5
> 60	13.9	15.9

Note: Using population weight

Source: Household Socio-economic Survey, National Statistical Office. Authors' calculations.

Focusing on the effects of loans by type, according to the marginal effect summary from the logit models, education loans have the largest effect on the probability of being subjectively over-indebted, while agricultural loans have the largest effect on the probability of being objectively over-indebted. The marginal effect of mortgage loans is still lower than the others. For behavioral finance issues, households with poor financial literacy and hyperbolic discounters have a higher chance of being objectively over-indebted.

6. Conclusions and policy implications

This paper identifies the drivers of household indebtedness, using official household level survey data from Thailand. Thailand is an interesting case study on the determinants of indebtedness for three reasons at least: (i) Thailand has experienced a high level of household debt over the past five years; (ii) there is little research on this issue in the case of developing countries; and (iii) micro data from official household surveys are available.

With regards to the analysis of the drivers of household indebtedness, there are three main points of view: neoclassical theories (the life cycle hypothesis and the permanent income hypothesis), credit rationing, and behavioral finance. We find that all theories play a role in accounting for indebtedness in Thailand.

First of all, the empirical results support the Life Cycle and Permanent Income Hypothesis, which confirms the findings of the literature (Betti et al., 2007; Vante, 2006; Anderloni & Vandone, 2008; Keese, 2009). In the case of Thailand, households that are 'rational' in the neoclassical sense—as evidenced by their doing income-and-expenditure accounts—and who perceive themselves to have secure income are more likely to have superior debt performance and are less likely to be both subjectively and objectively over-indebted.

With regards to the household head's age, although household heads with working age (21-60 years old) have a better debt performance, these household groups have a greater percentage of both subjectively and objectively over-indebted households. In addition, the greater the number of children or retirees in these households, the worse is their performance; which is to say that the dependency ratio has a significant impact on both debt performance

and over-indebtedness for households whose head is in this age bracket. The overall conclusion is that households whose head is of working age perform better, on average, than other groups, but they have greater risks of falling into underperformance.

With regards to households more generally, we see that having insufficient savings to deal with income shocks, combined with having problems with other financial commitments (such as rent and utility bills) are significantly correlated with both debt performance and over-indebtedness. The significance of this latter finding is that it provides a useful indicator for banks and authorities to anticipate which kinds of households are likely to default on their debts—namely, those who are falling behind in meeting their basic household running costs. Although this finding is not surprising, it is still a useful implication of the analysis we have conducted. We discuss it further below.

Secondly, focusing on credit rationing, households which cannot obtain loans from the formal sector have a higher probability of being over-indebted. This result is aligned with the previous study (Betti et al., 2007) which states that the credit constraint has a positive relationship with over-indebtedness. This is the first time this result has been statistically confirmed for Thailand.

With regards to the type of loans, agricultural business loans have the greatest effect on debt performance and objective over-indebtedness. This reflects the inherent poverty of those in the agricultural sector combined with the fact that loans of that type are unsecure by collateral. Lenders' credit rules then imply higher interest rates for such loans, combined with rationing. This limits households' ability to deal with income shocks. This finding also explains why the Thai government intervenes in the agricultural sector by way of subsidies, which have the effect of stabilizing incomes and ameliorating the impacts of the capital market in that sector. We discuss this matter further below.

Educational loans—another form of non-collateralized loan—have the greatest positive effect on the chance of being subjectively over-indebted. However, such loans have a negative impact on the likelihood of being objectively over-indebted. This pair of facts implies that there is likely to be

some degree of welfare loss to the Thai economy as a result of the imperfection in the educational loans market—borrowers who anticipate themselves to be subjectively worse off as a result of taking out such a loan, overestimate the likelihood of actually (i.e., objectively) being over-indebted. Consequently, individuals collectively under-invest in education. In light of the externality benefits of education on the Thai economy, our evidence suggests that a wedge is driven between subjectively motivated educational choices of individuals and the level of educational loans which is optimal for Thailand. This is a significant matter for future research.

Mortgage loans, which are collateralized, predictably have a smaller effect than the other kinds of loans. Overall, we find that the relationship between each type of loan and the degree of household over-indebtedness confirms the literature in the case of developed countries (Keese, 2009; Xiao & Yao, 2014).

Thirdly, moving on to the point of behavioral finance, financial literacy and hyperbolic discounting behavior have impacts on debt performance and objective over-indebtedness. With regards to financial literacy, our results affirm the previous findings of the literature (Lusardi & Tufano, 2009; Disney & Gathergood, 2012) which claim that households with poor financial literacy have higher costs of borrowing, and also have a higher chance of being over-indebted. The result about hyperbolic discounting behavior is also aligned with the literature (Gathergood, 2012), which points out the positive relationship between self-control problems (hyperbolic discounters and impulsive spenders) and over-indebtedness.

These findings from the study on the drivers of household indebtedness lead to four policy implications. The first implication is that a better income safety net can lead to better household economic well-being. Authorities can promote policies that make households feel that their income is secure. For agricultural households, which face fluctuating agricultural product prices and an uncertainty in weather, the Thai government might introduce a long-term rice insurance scheme instead of the short-term rice subsidy scheme that it currently employs. This finding thus contributes to the current debate on this issue in Thailand (for an analysis of the pros and cons of a government rice subsidy scheme, see Permani & Vanzetti, 2016).

The second implication is the importance of promoting good financial discipline and financial literacy. To mitigate this issue, policy makers might embark on a programme of public education on the benefits of households having good financial discipline—such as having sufficient savings to deal with income shocks, and regularly doing income-and-expenditure accounts. In addition, sharpening households' financial literacy might be expected to improve financial service channels and households' financial status, respectively.

The third implication is the utilization of a leading indicator that can signal impending default risk. Having problems with rent and utility bills (e.g. late payment) can be used as a leading indicator of debt default, and also can be added in credit scoring applications. People, who miss their rent or utility bills, have a higher chance of debt default. This additional information will be useful for financial institutions.

Lastly, we have the finding that credit constraints operate in the formal sector of the economy and drive households to borrow in the 'grey' or informal market. Moreover, the amount of informal loans is highly correlated with poor debt performance. Consequently, one policy implication is that authorities can aim to increase both the width and depth of financial markets by encouraging the development of new financial products and more types of formal financial institutions. They might also aim to promote campaigns that increase household's awareness of a variety of financial products and financial institutions. If all households can secure adequate financial resources from the formal market, they will be better able to smooth their consumption by managing their income and expenditure at the market rates.

Further research is needed to clarify the different characters between subjectively and objectively over-indebted households in Thailand. The study of this issue can help extend the knowledge of household heterogeneity in developing countries. Therefore, the appropriate policies can be considered to cope with both subjective and objective over-indebtedness problems.

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Appendix A

Table A1—Model Specification for Subjective Over-indebtedness Model (Logit Model)

Variable	Model1	Model2	Model3	Model4
Perception of having secure income (dummy)	-0.260***	-0.209***	-0.351***	-0.354***
Expenditure to income ratio (level)	0.470***	0.423***	0.251***	0.215**
Expenditure to income ratio (squared term)	-0.030***	-0.025***	-0.025***	-0.023***
Doing income-and-expenditure accounts	-0.354**	-0.312**		-0.494***
Having problems with other financial commitments (dummy)	1.296***	1.205***		1.194***
Insufficient savings (dummy)		0.636***		0.714***
Financial literacy score (total)	-0.048***	-0.030***		
Financial literacy score (knowledge)			0.018	
Financial literacy score (behavior)			-0.282***	
Financial literacy score (attitude)			-0.05	
Financial literacy (interest rate)				-0.046
Hyperbolic discounting behavior				0.044
Main source of fund (BAAC)			3.196***	3.233***
Main source of fund (GHB and GSB)			2.308***	2.259***
Main source of fund (non-banks)			2.832***	2.738***
Main source of fund (cooperatives)			2.430***	2.427***
Main source of fund (village fund)			2.915***	2.795***
Main source of fund (informal source)			3.898***	3.784***
Credit constraint (in case of working purposes)			0.553***	0.454***
Credit constraint (in case of emergency)	0.465***	0.401***		
Dependency ratio (level)	-0.033	0.068	0.324**	0.222*
Age (level)	0.108***	0.145***	0.045**	0.046**
Age (squared term)	-0.001***	-0.001***	-0.0004**	-0.0004**
Mortgage loans to annual income ratio			0.302***	0.282***
Agricultural business loans to annual income ratio			0.330***	0.316***
Non-agricultural business loans to annual income ratio			0.400***	0.402***
Education loans to annual income ratio			0.711***	0.809***
Personal consumption loans to annual income ratio			0.216***	0.208***
Other purpose loans to annual income ratio			0.442	0.397
Dummy variable for social class (using professional as a benchmark)				
Agricultural business	0.830***	0.857***	0.622***	0.630***
Non-agricultural business	0.716***	0.705***	0.991***	0.925***
Worker	0.620***	0.558***	0.905***	0.861***
Retired	0.222	0.106	0.471**	0.500**

Table A1—Model Specification for Subjective Over-indebtedness Model (Logit Model) (cont.)

Variable	Model1	Model2	Model3	Model4
Dummy variable for region (using Bangkok as a benchmark)				
Central (exclude Bangkok)	0.567***	0.596***	0.03	0.064
North	0.741***	0.773***	0.166	0.093
Northeast	1.058***	1.092***	0.368	0.259
South	0.604***	0.635***	0.399	0.271
Dummy variable for household head's marital status (using single as a benchmark)				
Married (couple)	1.014***			0.323
Married (widowed/ separated/ divorced)	0.870***			0.494**
Constant	-6.298***	-6.881***	-4.708***	-7.014***
N	9430	9430	9430	9430
Wald Chi^2	705.740	786.790	1315.443	1341.828
Pseudo R^2 (McFadden's)	0.102	0.107	0.283	0.294

Notes: Households with respondent, who is not the household head or household head's spouse, are dropped.

***, **, * Significant at the 1, 5, and 10 percent level respectively.

Table A2—Model Specification for Objective Over-indebtedness Model (Logit Model)

Variable	Model1	Model2	Model3	Model4
Perception of having secure income (dummy)	-0.297***	-0.245***	-0.293***	-0.341***
Expenditure to income ratio (level)	2.250***	2.168***	2.215***	2.259***
Expenditure to income ratio (squared term)	-0.004***	-0.004***	-0.004***	-0.004***
Doing income-and-expenditure accounts	-0.187	-0.108		-0.485**
Having problems with other financial commitments (dummy)	0.769***	0.696***		0.749***
Insufficient savings (dummy)		0.406***		0.494***
Financial literacy score (total)	-0.131***	-0.111***		
Financial literacy score (knowledge)			-0.185***	
Financial literacy score (behavior)			-0.137***	
Financial literacy score (attitude)			-0.039	
Financial literacy (interest rate)				-0.304***
Hyperbolic discounting behavior				0.056*
Main source of fund (BAAC)			0.991***	0.875***
Main source of fund (GHB and GSB)			0.242	0.085
Main source of fund (non-banks)			0.432***	0.236*

Table A2—Model Specification for Objective Over-indebtedness Model (Logit Model) (cont.)

Variable	Model1	Model2	Model3	Model4
Main source of fund (cooperatives)			0.458*	0.318
Main source of fund (village fund)			0.996***	0.822***
Main source of fund (informal source)			0.742***	0.611***
Credit constraint (in case of working purposes)			0.309***	0.242***
Credit constraint (in case of emergency)	0.167*	0.115		
Dependency ratio (level)	1.433***	1.466***	1.773***	1.749***
Age (level)	0.087***	0.147***	0.090***	0.053***
Age (squared term)	-0.001***	-0.001***	-0.001***	-0.0005***
Mortgage loans to annual income ratio			0.161**	0.119*
Agricultural business loans to annual income ratio			0.754***	0.729***
Non-agricultural business loans to annual income ratio			0.554***	0.544***
Education loans to annual income ratio			-0.846***	-0.755***
Personal consumption loans to annual income ratio			0.244***	0.210***
Other purpose loans to annual income ratio			0.422*	0.378
Dummy variable for social class (using professional as a benchmark)				
Agricultural business	1.736***	1.765***	1.479***	1.504***
Non-agricultural business	0.471**	0.466**	0.529**	0.477**
Worker	0.636***	0.604***	0.691***	0.664***
Retired	0.483**	0.255	0.315	0.488**
Dummy variable for region (using Bangkok as a benchmark)				
Central (exclude Bangkok)	1.880***	1.927***	1.818***	1.866***
North	2.374***	2.415***	2.164***	2.205***
Northeast	2.570***	2.637***	2.309***	2.309***
South	1.939***	2.024***	2.033***	1.963***
Dummy variable for household head's marital status (using single as a benchmark)				
Married (couple)	1.859***			1.402***
Married (widowed/ separated/ divorced)	1.231***			0.909***
Constant	-9.865***	-10.195***	-8.916***	-10.743***
N	9430	9430	9430	9430
Wald Chi^2	941.506	1030.569	1076.452	1038.479
Pseudo R^2 (McFadden's)	0.278	0.266	0.303	0.313

Notes: Households with respondent, who is not the household head or household head's spouse, are dropped.

***, **, * Significant at the 1, 5, and 10 percent level respectively.