PUEY UNGPHAKORN INSTITUTE
FOR ECONOMIC RESEARCH

Gauging Households' Debt Tolerance: Evidence from Thailand

by

Athiphat Muthitacharoen

December 2015

Discussion Paper

No. 12

Gauging Households' Debt Tolerance: Evidence from Thailand

Athiphat Muthitacharoen

Faculty of Economics, Chulalongkorn University

ABSTRACT

Understanding households' debt tolerance has direct implications on policies addressing high household debt in many Asian economies. This study examines the determinants of debt tolerance and assesses the tolerance level among different household segments. It defines the debt tolerance as the ability to cope with debt without suffering from anxiety and provides empirical evidence based on a survey on Thai households in 2013. Using the IV probit model, the findings indicate that factors important to the debt tolerance include not only debt burden and financial cushion but also income security, financial history, and financial discipline. This suggests that addressing the debt tolerance issue requires a multi-faceted approach. It also highlights the relatively low debt tolerance among households in precarious jobs including farmers, general workers and business owners. The results are robust to a number of alternative specifications.

Key words: Household debt sustainability, debt tolerance, household finance

JEL classifications: D14, E21, C25

Corresponding Author: Athiphat Muthitacharoen, PhD

Faculty of Economics, Chulalongkorn University

Phyathai road Patumwan Bangkok 10330, Thailand

Phone: +6686-509-8889

Email: athiphat.m@chula.ac.th

I. Introduction

Debt that once boosted many Asian economies now burdens its households. Understanding households' tolerance to their debt burden is critical in assessing the macroeconomic risks associated with the high household leverage as well as ensuring that households can digest high debt burdens without experiencing severe adversity. This study defines debt tolerance as the ability to cope with debt without suffering from anxiety. Such anxiety is pivotal as it indicates a household's financial vulnerabilities which could lead to delinquency as well as consumption cutbacks.

This study provides an empirical evidence using a survey of Thai households in 2013. Thailand's household debt experiences a sharp acceleration from 2010 to 2013. At the end of that surge in 2013, its household debt-to-GDP ratio is at 83%—a level similar to Malaysia, South Korea and many advanced economies. The survey employed in this study contains information needed to assess the level of households' debt tolerance. Specifically it consists of questions about financial conditions, demographics as well as characteristics related to financial discipline.

The objective of this study is two-fold. It first examines the determinants of debt tolerance. Those determinants are directly related to debt-servicing ability. The second objective is to gauge the debt tolerance levels among different segments of Thai households. Specifically it investigates whether there is a threshold of debt-servicing ratio (DSR) beyond which the probability of experiencing debt-servicing anxiety rises significantly.[1] This study refers to that threshold as the critical DSR threshold.

The study also addresses an important econometric concern. It is likely that the DSR variable is correlated with unobserved factors related to households' financial vulnerability and the debt-servicing anxiety. To account for this possible endogeneity problem, I employ an IV probit procedure using the amount of debt and the presence of car loan as instruments.

The findings indicate that the anxiety is, as expected, positively associated with the debt burden. A percentage-point increase in the DSR raises the anxiety probability by 0.4 percentage point on average. It also reveals that factors related to personal finance characteristics, such as income security, financial history and financial discipline, play important roles as determinants of the debt tolerance. The marginal effects of

[1] The debt-servicing ratio (DSR) is defined as debt servicing expenditure divided by income. It, therefore, measures how large debt burden is relative to income.

those factors on the anxiety propensity are, generally, more pronounced for households with larger DSR. The study also shows that households in professional occupation have significantly higher debt tolerance than those in occupations with less income security such as farmers, business owners and general workers. While a higher debt-servicing ratio (DSR) does not significantly raise the anxiety probability until it exceeds 40% for the professionals, the critical DSR threshold appears to be noticeably lower for those in other occupations. The results are robust to a number of alternative specifications.

This paper complements a growing literature on the household debt sustainability. There are two major themes in the literature. The first theme focuses on the possibility of decline in debt repayment capacity across scenarios. Examples include Karasulu (2008), Kim, Lee, Son and Son (2014), Muthitacharoen, Nuntramas, and Chotewattanakul (2015), and Bilston, Johnson and Read (2015). The studies in this theme typically perform stress tests to assess households' debt sustainability.

The second theme involves examination of factors that determine households' financial vulnerability and, in some cases, identify the threshold beyond which further increase in debt undermines financial solvency or stability. For example, May and Tudela (2005) studies the determinants of British households' ability to service their secured debt and finds that the important determinants include past experience of payment problems, employment status, and financial discipline. Lee and Him (2015) assesses the debt sustainablity of Korean households by their income groups. Its main findings indicate the need for urgent debt restructure among the low-income households—they are not only heavily exposed to rollover and default risks but also have the least room for taking on more debt without harming their sustainability.

In the context of Thai households, studies that look into the debt-servicing ability include Thaicharoen, Ariyapruchya and Chucherd (2004), Ariyapruchya, Sinswat and Chutchotitham (2007), Subhanij (2009) and Muthitacharoen et al. (2015). In particular, Muthitacharoen et al. (2015), using the same dataset as this study, investigate factors causing households to experience anxiety over their debt payment capacity. One of their main findings is that households exhibit sharp increases in their anxiety probability when their DSR levels exceed 40%. They, however, ignore the possible endogeneity of the DSR variable and, therefore, could underestimate the effect of the debt burden.

This study follows the second theme and improves on Muthitacharoen et al. (2014) by 1) addressing the endogeneity concern, 2) refining the regression analysis, and 3) assessing the debt tolerance for households with different financial profiles.

The remainder of this paper is organized as follows. The next section illustrates concept and empirical model employed in this study. Section 3 describes the dataset. The results and their robustness are shown in Section 4. Section 5 uses the model estimates to assess the debt tolerance among different household segments. Section 6 presents the conclusion.

II. Concept and Model

A household can be anxious over their ability to service its next debt payment for a number of different reasons. Factors related to debt burden, income security, asset cushion as well as financial history play important roles in whether a household has debt-servicing anxiety.

The regression analysis includes variable to account for these effects. The estimating equations can be written as

$$y_i^* = \beta dsr_i + x_i'\alpha + u_i \quad (1)$$

$$dsr_i = x_i'\gamma_1 + z_i'\gamma_2 + v_i \quad (2)$$

where $i = 1,...,N$ denotes households, y_i^* is a latent indicator indicating an underlying propensity to have the debt-servicing anxiety, dsr_i is debt-service ratio variable, x_i is a vector of exogenous regressors and z_i is a vector of instrumental variables that affect dsr_i but do not directly affect y_i^*. The variable y_i^* is not directly observed. Instead the dummy variable y_i for being anxious is observed with $y_i = 1$ if $y_i^* > 0$ and $y_i = 0$ if $y_i^* \le 0$.

DSR is necessarily correlated with the unobserved household-specific determinants of income such as ability, ambition and intelligence. Households able to generate higher income on average would be less inclined to feel anxious about its debt payment capacity, and would also tend to have lower levels of DSR. This correlation between DSR and the unobserved household-specific features, if not properly accounted for, could generate a bias in the estimated effect of DSR. Consequently I use two instruments: the amount of debt and the dummy variable for having a car loan. Both instruments are highly correlated with DSR but do not directly affect the probability of being anxious over servicing the next debt payment.

The control variables include DSR, variables reflecting financial resources (income security, asset size, ratio of liquid assets) and variables reflecting demographic characteristics (age, household size, region and education). In order to account for households' financial history and discipline, I include dummy

variables indicating past debt payment problem, past loan request denial and financial planning. A dummy variable indicating whether a household views its economic prospect over the next year as being worse than normal is also included because such economic perception is likely to affect the anxiety propensity.

This study employs an IV probit model which accounts for the binary nature of the anxiety dummy variable and controls for the potential endogeneity of the DSR variable. It assumes that the error terms (u_i, v_i) in equations (1) and (2) are jointly normally distributed, i.e., $(u_i, v_i) \sim N(0, \Sigma), \text{ where } \Sigma = (\sigma_{ij}) \text{ and } \sigma_{11} = 1$. This approach, hence, relies greatly on the distributional assumptions. Consistent estimation requires both normality and homoscedasticity of the errors u_i and v_i. To address this concern, I re-estimate this model in the sensitivity analyses using an alternative approach which requires weaker assumptions.

Finally I divide households into 5 groups based on their main occupations and use the model estimates to compute debt-servicing anxiety probabilities at informative locations in the DSR distribution. The computed probabilities reveal magnitude and variation of the effects of DSR. These results are then used to assess the debt tolerance for households with different profiles.

III. Data

I use household-level data from the biennial Socioeconomic Survey (SES) collected by the National Statistical Office during the first quarter of 2013, and the Bank of Thailand's supplemental survey on the SES households during the same time period. While the SES surveys have well-known limitations about coverage of high-income households, they are best available resources on income and debt for middle- and low-income households. The BOT's supplemental survey contains information about households' financial history and discipline. It also has a question concerning the debt-servicing anxiety. Specifically, it asks whether the household is anxious about its ability to service its next debt payment. The household then provides a yes or no answer. That question forms a central part of this study.

The focus of this study is on households' debt tolerance. Consequently I restrict the sample to indebted households. In addition, I drop households who report negative monetary income and those who

have DSR over 150%. These two restrictions result in 188 observations being dropped. In total, the sample includes 5,160 households.[2]

The empirical analysis includes various control variables. I construct DSR as debt-servicing expenditure divided by monetary income. For asset size, the logarithm form is used to eliminate its skewing distribution. Liquid assets include cash, bank accounts, bonds, mutual funds and stocks.

Table 1 present descriptive statistics of the variables used in the study. There is very little difference between weighted and unweighted means. Approximately a quarter of indebted households have debt-servicing anxiety. The average DSR is around 29%. Around 60% of all indebted households perceive their income as secure, while 22% of them have achieved university education. The average value of assets is around 1.8 million baht (in 2013 baht). On average, about 11% of total assets are liquid. About 14% of all indebted households have experienced a debt payment problem in the past 12 months, whereas 6% of them have ever had a loan request denied by a financial institution.

[2] It is important that a survey respondent understands its household's personal finance situation. In the sample, approximately 93% of all survey respondents is responsible for managing their households' personal finance.

Table 1: Descriptive statistics of variables used in the model

Variables	Weighted mean	Weighted s.d.	Unweighted mean
Having debt-servicing anxiety (d)	0.26	0.44	0.24
DSR (%)	28.66	26.43	27.91
Have secure income (d)	0.59	0.49	0.61
Total assets	1,803,922	3,520,406	1,882,868
Ratio of liquid assets (%)	11.12	15.24	12.50
Total debt	352,485	874,936	365,461
Have car loan (d)	0.29	0.45	0.30
Age	47.38	12.22	47.47
Household size	3.54	1.56	3.43
Northeast (d)	0.39	0.49	0.31
Have university education (d)	0.22	0.41	0.24
Occupation: skilled professionals (d)	0.16	0.36	0.18
Occupation: general non-agri workers (d)	0.22	0.41	0.22
Occupation: agriculture (d)	0.30	0.46	0.26
Occupation: non-agri business owners (d)	0.20	0.40	0.22
Occupation: retirees (d)	0.13	0.33	0.12
Past loan request denial (d)	0.06	0.24	0.06
Past payment problem (d)	0.14	0.34	0.13
Personal finance planning (d)	0.08	0.27	0.08
Expect bad economy (d)	0.13	0.33	0.12
Respondent responsible for personal finance (d)	0.93	0.25	0.93

Note: (d) indicates dummy variable.

Source: Author's calculation

IV. Results and Robustness

Table 2 presents estimates of an IV probit model describing the debt-servicing anxiety propensity as a function of DSR, financial resources, demographics and characteristics related to personal finance. For each regressor, I report average marginal effects (AMEs) which can be interpreted as average size of the effect in the sample. Standard errors of the AMEs are computed using the delta method as

suggested by Wooldridge (2010). The Wald test rejects the null hypothesis of exogeneity. Consequently, the point estimates from a regular probit model are biased and an IV probit procedure is required.[3]

Table 2: Base Model: IV Probit (Dependent = Having debt-servicing anxiety)

	Avg. Marginal Effect	Standard Error
DSR	0.004***	0.001
Have secure income	-0.038***	0.011
log(Total assets)	-0.043***	0.004
Ratio of liquid assets	-0.002***	0.000
Age	0.000	0.000
Household size	0.013***	0.003
Northeast	0.031***	0.012
University education	-0.035***	0.013
Past loan request denial	0.023***	3.790
Past delinquency	0.426***	0.024
Personal finance planning	-0.034*	0.019
Expect bad economy	0.142***	0.018
Number of observations	5,160	
Wald Test of exogeneity	Chi2(1) = 15.98 (p-value = 0.00)	

Notes: 1) Standard errors are computed using delta method. Data are unweighted.
2) ***, ** and * indicate statistically significant change at the 0.01, 0.05 and 0.1 levels respectively.

Source: Author's calculation

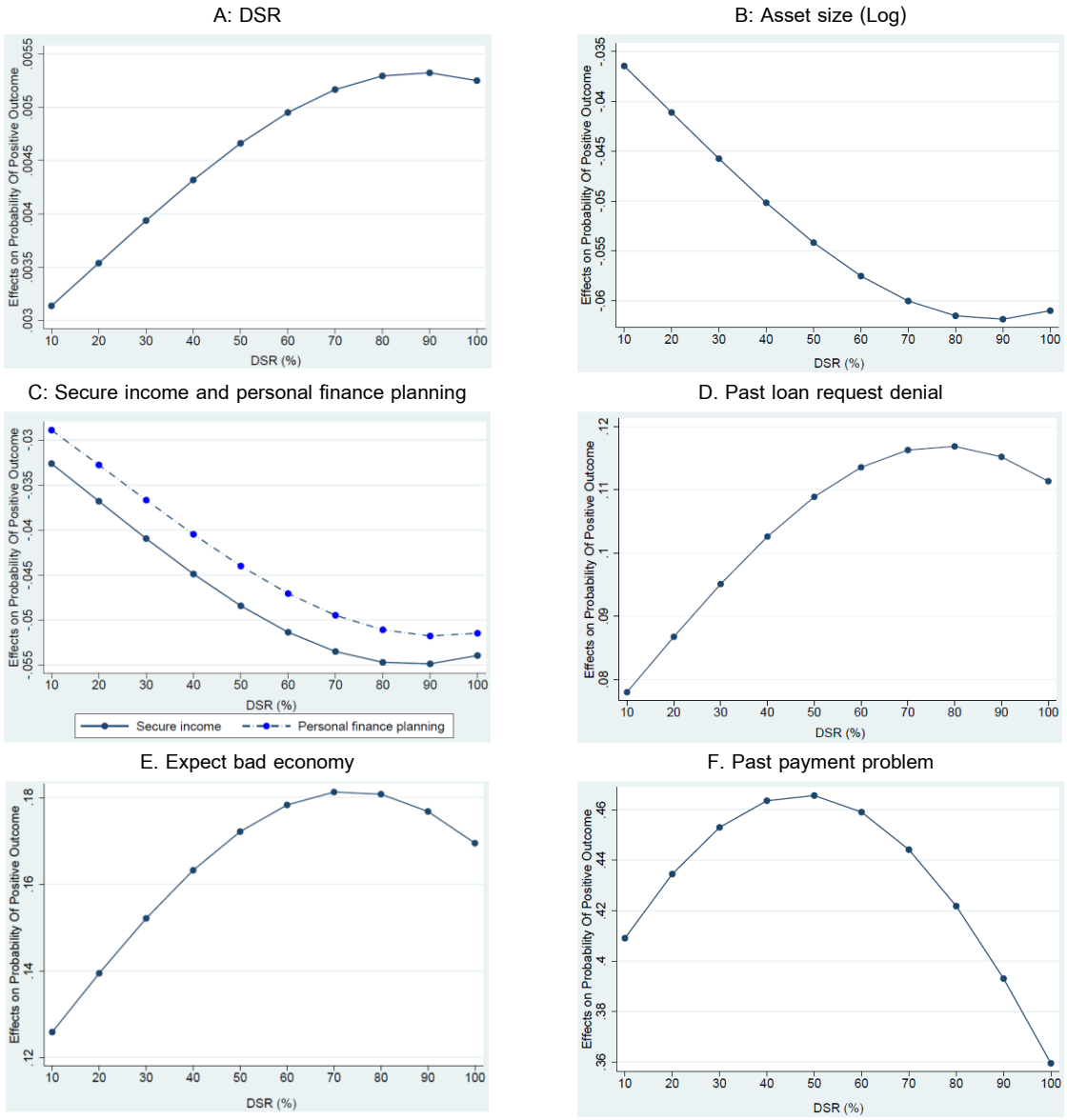
The marginal effect of DSR constitutes the main focus point of my analysis. Holding other variables at their observed values, a percentage-point increase in DSR raises the anxiety probability by 0.4 percentage point on average.[4] The effect is statistically significant at the 0.01 level ($p<0.01$). Panel A of Figure 1 provides insight into the magnitude and variation of the effects of an increase in DSR along the DSR

[3] I also for the strength of the instruments by regressing DSR on all exogenous regressors including the instruments. The coefficients on the instruments are statistically significant and the joint hypothesis that the coefficients of all instruments are zero has been overwhelmingly rejected by the data (the F-statistic is 377.6). The regression results are available upon request.

[4] The marginal effect for a continuous variable measures the instantaneous rate of change and provides an approximation to the change in probability associated with a unit change in the continuous variable (The marginal and unit discrete changes will be similar if the probability curve is nearly linear for a unitary change).

distribution. The average marginal effect of DSR ranges from 0.3 percentage point for households with moderate debt burden to over 0.5 percentage point for those with excessive DSR.

Figure 1: Distribution of average marginal effects of selected regressors by DSR



Source: Author's calculation

Coefficients on the other control variables generally conform to expectations. Having greater financial cushion significantly lowers the anxiety probability. On average, a percent increase in total assets lowers the probability by approximately 4.3 percentage point ($p<0.01$). Having secure income also lowers the anxiety probability by 3.8 percentage point ($p<0.01$).

Not surprisingly the experience of debt payment problems in the past 12 months has strong effect on the probability that the household becomes anxious. On average, having experienced a payment problem increases the probability by 42.6 percentage point ($p<0.01$). To some extent, this large effect may reflect lingering anxiety and unobserved financial vulnerability but it also provides an important precaution against allowing households to miss their payments. This suggests that policies preventing first-time delinquency can have long-lasting effects on the debt tolerance. This finding is consistent with the finding by May and Tudela (2005).

Figure 1 also shows that, for most variables, the marginal effects on the anxiety probability are more pronounced for households with larger DSR. However, the effect of past debt payment problem is increasing with DSR up to 50% before declining thereafter (Panel F of Figure 1). One possible explanation is that, among highly indebted households (DSR over 50%), the experience of past delinquency could lessen any stigma attached to payment difficulties.

Robustness tests

I explore the sensitivity of my results to a number of alternative model assumptions and specifications. Table 3 shows the robustness tests of my choice of variables. Table 4 shows the robustness tests of four alternative assumptions/specifications: regular probit model, weighted estimate, adding occupation dummies and 2SLS regression.

Choice of variables

Table 3 reports AMEs from three model specifications where groups of regressors are cumulatively added to the model. In Column 1, only debt and financial resources variables are included in the model. Demographics and financial history/discipline variables are cumulatively added in Columns 2 and 3, respectively.

In each of the three specifications, the AME of DSR is positive ($p<0.01$) and does not vary much. This indicates the robustness of our results to changes in the set of regressors. All other AMEs have signs that are consistent with expectation.

Table 3: Robustness test on choice of variables (IV Probit Model)

	(1)	(2)	(3) Base
	(1) Debt and financial resources	(1)+Demographics	(2)+Financial history/discipline
	AME	AME	AME
DSR	0.005***	0.005***	0.004***
Have secure income	-0.079***	-0.064***	-0.038***
log(Total assets)	-0.070***	-0.070***	-0.043***
Ratio of liquid assets	-0.004***	-0.003***	-0.002***
Age		0.001**	0.000
Household size		0.020***	0.013***
Northeast		0.011	0.031***
University education		-0.043***	-0.035***
Past loan request denial			0.023***
Past delinquency			0.426***
Personal finance planning			-0.034*
Expect bad economy			0.142***
Number of observations	5,160		

Notes: 1) Standard errors are computed using delta method. Data are unweighted.

2) ***, ** and * indicate statistically significant change at the 0.01, 0.05 and 0.1 levels respectively.

Source: Author's calculation

Ignoring endogeneity

As indicated earlier, the Wald test rejects the null hypothesis that the DSR variable is exogenous and a regular probit produces biased estimates. Nevertheless it is worthwhile to understand the sensitivity to of the results to ignoring the endogeneity problem. To that end, Column1 of Table 4 reports the AME from the probit model at 0.001. Neglecting endogeneity thus leads to a marked underestimate of the effect of DSR.

Weighted estimates

Deaton (1997) and Solon, Haider, and Wooldridge (2015) recommend reporting both unweighted and weighted estimates since a dramatic difference between the two estimates serves as a useful indicator of model specification and misunderstanding of the sampling process. As shown in Column 2 of

Table 4, weighted estimates are consistent with the base result. This suggests that model misspecification and endogenous sample stratification are less of an issue in this study.

Table 4: Robustness test of model specifications

	(1) Probit Model	(2) Weighted (IV Probit)	(3) Adding Occupation	(4) 2SLS
	AME	AME	AME	Coeff
DSR	0.001***	0.003***	0.003***	0.004***
Have secure income	-0.043***	-0.025*	-0.040***	-0.044***
log(Total assets)	-0.038***	-0.046***	-0.043***	-0.043***
Ratio of liquid assets	-0.003***	-0.003***	-0.002***	-0.002***
Age	0.000	0.001	0.001	0.001*
Household size	0.010***	0.019***	0.013***	0.013***
Northeast	0.045***	0.047***	0.033***	0.036***
University education	-0.044***	-0.045***	-0.037***	-0.029***
Past loan request denial	0.024***	0.035**	0.024***	0.025***
Past delinquency	0.467***	0.457***	0.430***	0.481***
Personal finance planning	-0.036**	-0.029	-0.038**	-0.028*
Expect bad economy	0.158***	0.162***	0.143***	0.157***
General workers			0.000	
Agricultural			-0.009	
SMEs			0.021	
Retirees			-0.004	
Number of observations	5,160			

Notes: 1) S.E. for AMEs are computed using delta method. Robust S.E. is used for 2SLS model. Data are unweighted except in Column (2).

2) ***, ** and * indicate statistically significant change at the 0.01, 0.05 and 0.1 levels respectively.

Source: Author's calculation

Adding occupation dummies

I include occupation dummies to test for the possibility of omitted variable bias in the base result. As expected, this experiment creates severe collinearity and the coefficients of the four occupation dummies become statistically insignificant. The AME of DSR, however, remains similar (Column 3 of Table 4).

2SLS regression

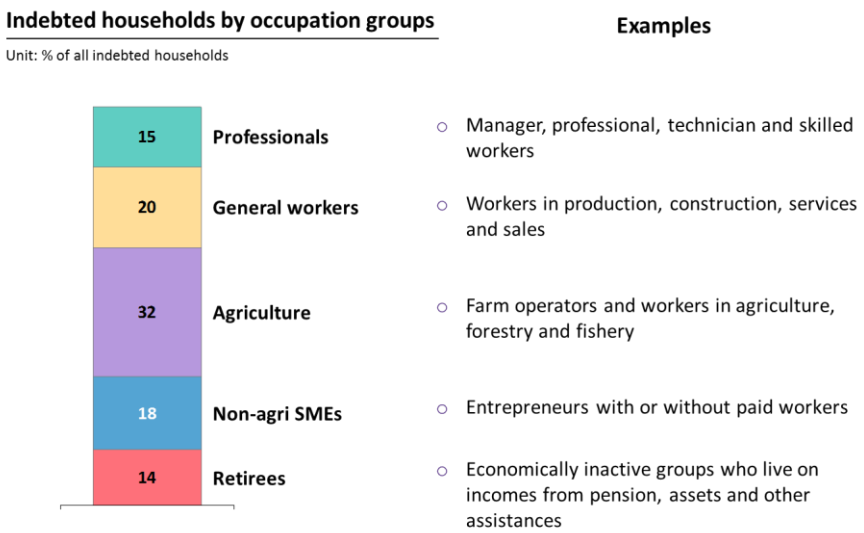
Consistent estimation of an IV probit model requires fairly restrictive assumptions of the errors. To address this concern, I re-estimate this model with 2SLS regression and use robust standard error. The 2SLS approach ignores the binary nature of the dependent variable but do not require the error term to be multivariate normal and homoskedastic. This method yields the DSR coefficient estimate of -0.004 which is similar to the average marginal effect from the IV probit model (Column 4 of Table 4).

V. Discussion and Policy Implications

The model estimates provide an important insight into the debt tolerance of households with different financial profiles. An interesting policy question is, at which level of DSR, do households feel that their indebtedness become a financial burden. Differing levels of debt tolerance could imply different critical DSR threshold for various household groups.

I answer that question by computing the debt-servicing anxiety probability at informative locations in the DSR distribution. First I group households into 5 groups based on their main occupations: professional, general worker, agriculture, SMEs and retirees. Figure 2 lists detailed household classification.

Figure 2: Occupation breakdowns of indebted households



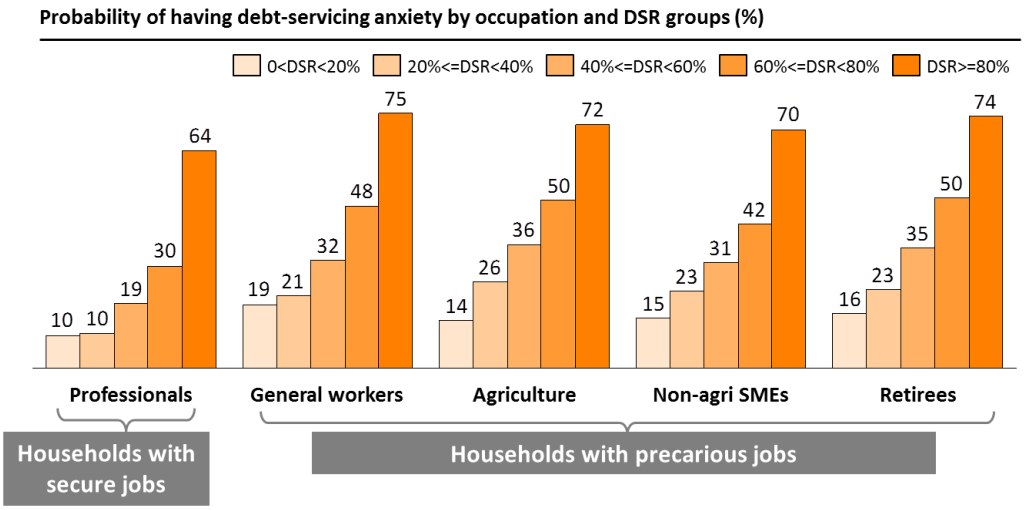
Source: Author's calculation

For each occupation, I construct 5 hypothetical households that are representative of the following DSR groups: 0-20%, 20-40%, 40-60%, 60-80%, and >80%. Each representative household is assigned values of regressors at the means of their respective DSR group. By using local means, each representative household resembles key characteristics of households in its group. I then compute the anxiety probability using estimates from the base model.

This approach of constructing representative households is particularly illustrative for interpretation in this case where variables are substantially correlated. For example, it is reasonable to assume that levels of education and income security would be higher for professional households than for agricultural households. Also those households with higher DSR would be more likely to have loan request denied or experience a payment problem at some point in the past year.

The findings suggest that households in professional occupations, who are on relatively secure jobs, have higher debt tolerance than households in all other occupations. Figure 3 shows that professional households have markedly lower anxiety probability than households in other occupations over the entire DSR distribution. For example, in the lowest DSR group (0-20%), the anxiety probability for the professionals is 10%, while the probabilities for those in other occupations range from 14% to 19%. For the highest DSR group (>80%), the anxiety probability for the professionals is 64%, while the probabilities for all others range from 70% to 75%.

Figure 3: Probability of having debt-servicing anxiety by occupations and DSR groups



Source: Author's calculation

Next, I compute the changes in predicted probabilities between DSR groups and test their statistical significance (see Table 5). For professionals, the anxiety probabilities associated with the 0<DSR<=20% and 20%<DSR<=40% groups are both about 10% and are not statistically different from each other. The increase in the probability then becomes statistically significant when comparing between the 20%<DSR<=40% and 40%<DSR<=60% groups. This finding is in contrast to that of all other occupation groups. For general worker, agriculture, SMEs and retirees, the changes in their anxiety probabilities are statistically significant between the two lowest DSR groups.

Recall that I identify the critical DSR threshold as the value of DSR beyond which the probability of experiencing debt-servicing anxiety rises significantly. These findings suggest that, while the critical DSR threshold is around 40% for the professionals, that threshold appears to be noticably lower for those in other occupations.

Table 5: Change in debt-servicing anxiety probability by occupation groups (in percentage point)

DSR groups	Professionals	General workers	Agriculture	SMEs	Retirees	All
20-40 vs. 0-20	0.4	2.4**	11.3***	7.9***	7.0***	5.1***
40-60 vs. 20-40	9.0***	10.4***	10.8***	8.6***	12.3***	10.9***
60-80 vs. 40-60	10.8***	15.9***	13.2***	11.3***	14.6***	13.6***
>=80 vs. 60-80	34.2***	27.4***	22.0***	27.7***	24.2***	27.2***

Notes: 1) ***, ** and * indicate statistically significant change at the 0.01, 0.05 and 0.1 levels respectively.

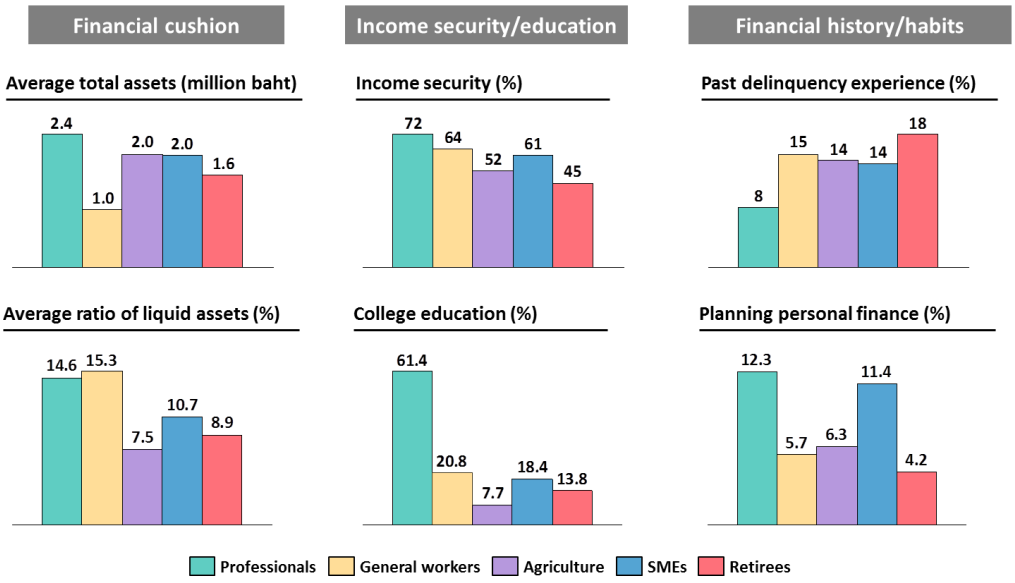
2) Y vs. X refers to the difference in the probability for a representative household of group Y from that of group X. [Pr(Y) - Pr(X)]

Source: Author's calculation

The question that follows is what distinguishes the professionals from all other households. Figure 4 shows that professional households have larger financial cushion, higher permanent income and better financial history than those in other occupations. For example, the professionals, on average, have 2.4 million baht in total assets, while the average assets for other groups range from 1.0 to 2.0 million baht. In addition, only 8% of the professionals have experienced a delinquency in the past. This is in sharp contrast to the other

households, of which the proportion with past delinquency ranges from 14% to 18%.

Figure 4: Characteristics of households by occupation groups



Source: Author's calculation

VI. Conclusion

This study examines the determinants of households' debt tolerance and assesses the debt tolerance level among different household segments. The findings suggest that enhancing the debt tolerance of households requires policymakers to be multifaceted. Important determinants of the tolerance are not limited to debt burden and financial resources but they also include financial history as well as financial habits. The study also reveals the relatively low debt tolerance among households who are likely to be on precarious jobs. These households account for 85% of all indebted households and include general workers, farmers, SMEs and retirees. This finding provides an important implication for future policies aiming at expanding credit access among low-income households. It is essential that policymakers understand households' debt tolerance in order to ensure that they can cope with their debt burden.

Acknowledgements

I would like to thank the participants at the Bank of Thailand Symposium (October 2014), the Bank of Thailand Economic Seminar (March 2015), the Nanyang Technological University research workshop (April 2015), and the Singapore Economic Review Conference (August 2015) for their helpful comments and suggestions.

Reference

Ariyapruchya, K., Sinswat, W., & Chutchotitham, N. (2007). The Wealth and Debt of Thai Household: Risk Management and Financial Access. *Bank of Thailand Symposium 2007.* Retrieved from https://ideas.repec.org/p/bth/wpaper/2007-04.html

Bilston, T., Johnson, R., & Read, M. (2015). Stress Testing the Australian Household Sector Using the HILDA Survey. *Reserve Bank of Australia Research Discussion Paper, 2015-01*. Retrieved from http://melbourneinstitute.com/downloads/hilda/Bibliography/Working_Discussion_Research_Papers/2015/Bilston_etal_Stress_testing_Australian_household_rdp2015-01.pdf

Deaton, A. (1997). *The Analysis of Household Surveys: A Microeconometric Approach to Development Policy*. Baltimore, MD: Johns Hopkins University Press.

Karasulu, M. (2008). Stress Testing Household Debt in Korea. *IMF Working Paper, 08-255*. doi.10.5089/9781451871135.001

Kim, H., Lee, D., Son, J., & Son, M. (2014). Household Indebtedness in Korea: Its Causes and Sustainability. *Japan and the World Economy, 29*, 59-76. doi.10.1016/j.japwor.2013.12.001

Lee, D., & Lim, H. (2015). Is Household Debt Sustainable in Korea? *Journal of the Asia Pacific Economy, 20(2)*, 224-242. doi.10.1080/13547860.2014.940760

May, O., & Tudela, M. (2005). When is Mortgage Indebtedness a Financial Burden to British Households: A Dynamic Probit Approach. *Bank of England Working Paper, 277*. doi.10.2139/ssrn.872688

Muthitacharoen, A., Nuntramas, P., & Chotewattanakul, P. (2015). Rising Household Debt: Implications for Economic Stability. *Thammasat Economic Journal*, Forthcoming.

Solon, G., Haider, S. J., & Wooldridge, J. M. (2015). What Are We Weighting For?. *Journal of Human Resources*, 50(2), 301-316. doi.10.3386/w18859

Thaicharoen, Y., Ariyapruchya, K., & Chucherd, T. (2004). Rising Thai Household Debt: Assessing Risks and Policy Implications. *Bank of Thailand Symposium 2004*. Retrieved from https://www.bot.or.th/Thai/MonetaryPolicy/ArticleAndResearch/SymposiumDocument/paper1_2547.pdf

Subhanij, T. (2009). Household Sector and Monetary Policy Implications: Thailand's Recent Experience. *BIS Paper, 46*, 136-161. Retrieved from http://www.bis.org/publ/bppdf/bispap46o.pdf

Wooldridge, J. M. (2010). *Econometric Analysis of Cross Section and Panel Data* (2nd ed.). Cambridge, MA: MIT Press.