

# Household Debt and Delinquency over the Life Cycle

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This paper uses loan-level data from Thailand's National Credit Bureau to study household debt over the life cycle of borrowers. We decompose two aggregate and commonly used measures of debt—debt per capita and delinquency rate—into components that unveil the extensive and intensive margins of household indebtedness. We find a striking inverted-U life-cycle pattern of indebtedness as predicted by economic theories. However, peaks are reached at different ages for different loan products and different lenders. We also find that debt has expanded over time for all age groups. Younger cohorts seem to originate debt earlier in their lives than older generations. Meanwhile, older borrowers remain indebted well past their retirement age. Finally, we find a downward pattern of delinquency over the life cycle. Our findings have important policy implications on financial access and distress of households as well as on economic development and financial stability of the economy.

*Keywords:* delinquency, demography, financial development, household debt, life cycle

*JEL codes:* D14, D30, G20, J26, O16

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*[R]esearch on household debt has lagged behind its sister literatures  
on the asset side of the household balance sheet.  
—Jonathan Zinman (2015)*

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## I. Introduction

Household debt is a crucial component of the financial system. It helps finance household consumption and investment as well as the operation of informal business enterprises. Some debt instruments such as credit cards also serve as a means of payment in the economy. However, high and rapidly rising household debt can lead to debt burden and financial vulnerability of households, which in turn raise serious concerns over the stability of the financial system. In addition, a high level of debt may inhibit a household's spending and consumption, a symptom known as debt overhang, which in turn affects long-term growth of the aggregate economy. This concern is of particular relevance today as we observe rising household debt in many countries across the world—including a number of countries in Asia, a region long known for its frugality.<sup>1</sup> However, understanding household debt and its implications on the economy is complicated. For one thing, households are diverse, so we need to understand the heterogeneous nature of debt across borrowers. The goal of this paper is to contribute to this understanding by dissecting one aspect of household debt, namely, indebtedness and delinquency over the life cycle. In particular, this paper aims to answer two questions. First, does household debt follow a life-cycle profile predicted by economic theories and, if so, when does deleveraging start? Second, does the life-cycle pattern change over time across cohorts?

Aggregate data show that household debt has increased in recent decades in many countries. For example, credit to households as a share of total credit increased from 27% in 1980 to 58% percent in 2000 in the Republic of Korea (Beck et al. 2008). More recently, total bank credit to the household sector in the Asia and Pacific region more than doubled relative to gross domestic product (GDP) between 1995 and 2015 (Schularick and Shim 2017). The expansion is observed in high-income economies such as Australia, New Zealand, the Republic of Korea, and Singapore, as well as in middle-income countries such as Malaysia and Thailand.<sup>2</sup> In 2017, Thailand's household debt, at 69% of GDP, was the highest among developing Asian economies; the only Asian country with higher household debt was the Republic of Korea (94%). Other Asian economies with similar household debt were Hong Kong, China (69%) and Malaysia (68%), while Singapore and Indonesia experienced lower household debt than Thailand (57% and 17%, respectively).

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<sup>1</sup>See, for example, *The Economist* (2017).

<sup>2</sup>The Appendix presents household debt-to-GDP ratios of selected economies in the Asia and Pacific region based on data from the Bank for International Settlements (BIS). The only Asia and Pacific economy in the BIS data that did not experience an increase in household debt to GDP is India (10.6% in 2007 and 9.4% in 2014). Also, although household debt in advanced economies has declined or remained stable after the global financial crisis, the level of debt is still much larger than decades ago.

Growing household debt is not necessarily a bad thing. If borrowers are capable of servicing the debt, then it does not pose serious concerns on the vulnerability of the borrowers and the stability of the financial system. However, if debt accumulation comes from new loans with lower quality that result in subsequent delinquency, then measures to curb its adverse impacts must be implemented. In order to understand the underlying risk of household debt, we need to go beyond aggregate statistics and examine the distributional aspect, in particular, who the debt holders are and where the delinquencies are. Several studies have identified various characteristics of borrowers that are related to debt holding and delinquency such as income, occupation, and location. This paper focuses on another characteristic, namely, a borrower's age. More precisely, we examine the distribution of indebtedness and delinquency over the life cycle of debt holders. The rationales behind our study are twofold. First, although there are extensive studies of household portfolios, most have focused on savings and investment, that is, the asset side of the household's balance sheet; fewer studies have looked at debt, that is, the liability side. Second, many of the economies that experience rising household debt are also confronting a looming challenge from an aging society. Understanding how debt and delinquency evolve over the life cycle of borrowers therefore provides insights for relevant policy implications.

Despite its importance, the understanding of household debt across a borrower's lifetime at a granular level has been limited, partly due to the lack of data. Existing literature that uses microdata usually relies on household surveys, which have the advantage of covering all types of household debt in the formal, semiformal, and informal financial sectors. However, the data are prone to inaccuracy, as households may have incentives to underclaim or overclaim their debt situation. Household surveys are also often small and far from being representative of the entire household sector of the country.

To overcome some of these problems, this paper uses granular administrative debt data at the account level from Thailand's National Credit Bureau (NCB) from 2009 to 2016. Thailand serves as an ideal country for this study for several reasons. First, based on data from the Bank for International Settlements (BIS), Thailand is one of the countries with rapidly rising household debt in recent decades, from 40.2% of GDP in 1994 to 69.5% in 2014. Furthermore, the country is currently experiencing a disruptive penetration of financial technology, or "fintech," that has the potential to significantly accelerate the process of credit expansion, both to existing debtors and to new borrowers. Meanwhile, a growing middle-class population has been accompanied by rising consumerism among the population. Finally, the country is experiencing a speedy change in demographic structure, becoming an aging society. Specifically, the percentage of Thailand's population age 65 and above will increase from 13% in 2020 to 26% in 2040, which would make the country one of the world's most rapidly aging economies (UN DESA 2015). Understanding the age profiles of debt and delinquency is therefore important for Thailand and other countries that are facing similar challenges.

Our data cover the majority of formal loans to individuals in the country. More precisely, the data consist of over 60 million accounts from almost 20 million borrowers, representing 87% of the total household debt in the system in 2016. The wide coverage and the granularity of the data allow us to decompose debt per capita and delinquency rate, which are aggregate and commonly used measures of debt, into components that unveil the extensive and intensive margins of household indebtedness. This decomposition allows us to analyze debt holding, debt portfolio, and delinquency for each age and cohort.<sup>3</sup>

We find a striking inverted-U life-cycle pattern of indebtedness as predicted by economic theories. However, the peaks are reached at different ages for different loan products and different lenders. We also find that debt has expanded over time for all age groups. In particular, the younger cohorts seem to originate debt earlier in their lives than the older generations. Meanwhile, older borrowers remain indebted well past their retirement age. Finally, we find a downward pattern of delinquency over the life cycle. Our findings have important policy implications on financial access and distress of households as well as on economic development and financial stability of the economy. These are especially relevant for economies with aging populations.

The rest of the paper proceeds as follows. Section II discusses related literature on household debt and delinquency over the life cycle. It also presents evidence on how rising household debt over time is related to the life-cycle pattern. Section III gives a background on credit markets in Thailand. Section IV provides narratives on the data as well as descriptive statistics. Section V presents empirical findings on debt holding, debt portfolio, and delinquency over the life cycle and also presents a cohort analysis of debt and delinquency. The paper concludes in section VI with policy implications for households and the aggregate economy.

## II. Related Literature

This study is related to two strands of literature. The first is related to consumption, savings, and hence indebtedness of households over the life cycle. The second is on rising household debt over time.

### A. Debt over the Life Cycle

The benchmark conceptual framework commonly used in the study of debt over the life cycle is based on the classic Modigliani life-cycle hypothesis

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<sup>3</sup>Recent availability of credit bureau data in some countries allows researchers to use the data to study various aspects of debt and default of households. See, for example, Mian and Sufi (2015) for a study on the United States (US) during 2000–2010. To our best knowledge, our paper is one of the first that uses loan-level credit bureau data to analyze debt and default in an emerging economy.

(Modigliani 1966). Given that a person generally prefers smooth rather than fluctuating consumption over time while his income usually has a hump-shaped profile over the life cycle, he is likely to accumulate debt during the early years of his life when his income is insufficient for his consumption. As he approaches middle age and earns higher income, the need to borrow declines. He then begins to pay down his debt, which is eventually paid off toward the end of his life. In other words, there is a leveraging–deleveraging dynamic over an individual’s life cycle, implying an inverted-U pattern between age and indebtedness. In an economy where individuals face debt constraints, especially those at a young age (due to a lack of collateral and credit history) and those at an old age (due to costly liquidation of debt outstanding at the time of death), the inverted-U pattern will be more humped and less flat.

Empirical evidence supports the life-cycle hypothesis, which shows that debt level and its composition change substantially over the life cycle. One of the earlier studies is by Cox and Jappelli (1993), which uses the 1983 Survey of Consumer Finance (SCF) in the United States (US) and finds that the desire for debt increases until the age of the household head reaches mid-30s and then declines. Crook (2001) uses the 1995 SCF and finds a decrease in demand for debt for household heads older than 55 years old. Yilmazer and DeVaney (2005) analyze the 2001 SCF and show that the likelihood of debt holding, and the amount of debt compared to total assets decrease with the age of household heads.

More recently, Crawford and Faruqui (2012) analyze household-level data from the Canadian Financial Monitor and find an inverted-U pattern between the age of the household head and the mean level of household debt in each year of the data during 1999–2010. For 2010, indebtedness peaks at age 31–35 before gradually declining. Using data from the Equifax/New York Fed Consumer Credit Panel, Fulford and Schuh (2015) document similar strong life-cycle patterns of various types of debts. First, credit card debt begins to increase earlier in the life cycle until age 50 and starts falling after age 60. Second, few young people have mortgage, but mortgage headcount increases with age until they turn 40 and then begins to decline after age 60. Third, individuals start having auto loans at a younger age, and by 30 years old, almost 40% of individuals have auto loans. After that, the auto loan headcount gradually declines and then sharply drops after age 60. Finally, student loans present a distinct downward trend with age as individuals take this type of loan early in life and repay over time as they age. Another debt product used heavily by younger people is overdraft, as reported in a study by the US Consumer Financial Protection Bureau. The propensity to overdraw on a bank account declines with account holder age: 10.7% of the 18–25 age group have more than 10 overdrafts per year, compared to 2.8% for those age 62 and over.

Finally, unlike the literature on the life cycle of indebtedness, there are very few studies on delinquency over the life cycle. An exception is Xiao and Yao (2014) who analyze multiple datasets that are nationally representative of American

families and document delinquency pattern by age and other demographic characteristics. They find that younger households are more financially distressed than their older counterparts and the presence of children increases the likelihood of delinquency. Their finding suggests that younger households may experience more financial difficulties that result in a higher likelihood of delinquency.

## **B. Rising Household Debt**

The second strand of related research is on rising household debt. This literature has identified at least two major trends that contribute to rising household debt in recent decades: an increase in financial access and an increase in consumerism of households.<sup>4</sup> The first trend, including an increase in access to credit by households, has been observed throughout the world—in developed, emerging, and underdeveloped economies. Deregulation of financial systems in several countries brings about new financial institutions and competition, allowing more people to have access to credit and existing borrowers to expand their loans. Innovations in financial products provide new ways of consumer debt financing. Various development initiatives implemented by government, especially those through specialized financial institutions (SFIs), help underserved households to gain access to loans. The advent of microfinance institutions results in financial inclusion of households that would otherwise be left out. Enhanced financial literacy facilitates households' participation in credit markets. The creation of credit bureaus reduces asymmetric information problems, which are one of the most important frictions in financial markets. More recently, advances in digital technology have further accelerated households' access to financial products, created new financial products that better serve households, and further reduced transaction costs. Altogether, these developments have resulted in the rising household debt we have observed worldwide. Literature on the expansion of financial access and its impacts on the economy is extensive. Dynan (2009) and Karlan and Morduch (2009) provide a survey of studies on this issue.

The second trend, an increase in consumerism, has been widely documented by researchers focusing on consumer behaviors, including marketing and other social sciences outside economics.<sup>5</sup> Within economics, the idea about social status and conspicuous consumption dates back at least to the century-old “keeping up with the Joneses” argument by Veblen (1899). Alternative mechanisms analyzed in recent studies include expenditure cascades (Frank, Levine, and Dijk 2014)

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<sup>4</sup>This argument does not consider short- and medium-term fluctuations. For example, in the medium term, Justiniano, Primiceri, and Tambalotti (2013) argue that the rapid rise and fall of US household debt between 2000 and 2007 cannot be explained by financial liberalization and subsequent tightening. They further argue that the credit cycle was more likely accounted for by factors that impacted house prices through a collateral channel.

<sup>5</sup>See examples in an edited volume by Goodwin, Ackerman, and Kiron (1997).

and status goods (Bursztyn et al. 2017). However, most studies that link the role of relative standing in society to household behaviors focus on the effects on consumption and assets, while the studies on the effects on liabilities and financing attract less attention.<sup>6</sup>

The pervasiveness of the consumer society and the stagnant income of the middle and lower social classes imply a higher demand for consumer goods and consumer durables by households that do not have sufficient income to finance such purchases, resulting in the origination and accumulation of credit card, personal, auto, and mortgage debts. A few studies that examine the relationship between social status and debt include Georganakos, Haliassos, and Pasini (2014) who analyze data from the Dutch National Bank Household Survey. They find that, everything else equal, a higher average income in the social circle, as perceived by a household, increases a household's tendency to borrow and the likelihood of future financial distress, as reflected in the debt service ratio and the loan-to-value ratio of households. In another study, Bricker, Ramcharan, and Krimmel (2014) link household financial decision data from SCF with neighborhood data from the American Community Survey and find that a household's position in the income distribution relative to its close neighbors is positively associated with its expenditure on high-status cars, its level of indebtedness, and the riskiness of its portfolio. Finally, a study of Singaporean households by Lee, Mori, and Qian (2017) provides more evidence. All else equal, households residing in condominiums (those who are more likely to care more about social status) spend substantially more on conspicuous goods, have more credit card debt, and have more delinquent debt on their credit cards than their counterparts living in subsidized public housing. They find no difference in spending on inconspicuous consumption of these two groups.<sup>7</sup>

### C. Implications of Rising Household Debt on the Life Cycle

Although the two major trends discussed above are likely to be responsible for rising household debt across all ages, in theory they may have heterogeneous impacts across age groups, resulting in a changing debt profile over the life cycle. Compared to middle-age individuals, younger consumers are likely to face more financial constraints (Attanasio and Weber 2010). For example, they have shorter or

<sup>6</sup>One of the reasons is that many households are willing to display their consumption and assets while keeping their indebtedness private.

<sup>7</sup>The relationship between consumerism and indebtedness is also related to inequality since growing income inequality has a potential to further exacerbate the mismatch between a household's conspicuous wants and its own funds. However, the relationship between inequality and indebtedness is challenged by Coibion et al. (2016). The authors use household-level debt data during 2000–2012 from the Equifax/New York Fed Consumer Credit Panel and show that low-income households in high-inequality areas accumulated less debt relative to their income than low-income households in lower-inequality regions. They also show that the price of credit is higher and access to credit is harder for low-income households in high-inequality regions.



nonexistent credit history and fewer collateralizable assets, making it difficult for them to qualify for loans. Financial development that helps reduce this information barrier will result in a disproportionate increase in credit to the younger generation as compared to their older counterparts when they were at the same age. Likewise, the elderly also experience credit constraints because they have a shorter remaining life expectancy than working-age individuals, hence a shorter time to pay back loans. Financial innovations such as reverse mortgages allow them to gain access to loans that people their age generations ago would otherwise not have had access to. Similarly, increasing longevity and a later retirement age contribute to individuals remaining indebted much later in their lives.

Likewise, an upward trend in consumerism can also have impacts on debt profile over the life cycle of borrowers. These effects could be magnified by other factors such as psychological or cognitive biases. For example, a recent survey shows that younger consumers are more likely to make compulsive purchases (El Issa 2017).

Empirical studies have confirmed these predictions. For example, Crawford and Faruqui (2012) find that mean debt levels of Canadian households are systematically greater for those with household heads born in a later year or a younger cohort. Studies also show that there is an expansion in indebtedness distribution at both ends of the age spectrum over time, that is, the youth and the elderly. For young adults, Houle (2014) uses data from four waves of the US National Longitudinal Surveys of Youth and analyzes indebtedness of three cohorts of young adults in the 1970s, 1980s, and 2000s. He finds that the most recent cohort began accumulating debt earlier than previous cohorts. In addition, there is a shift in the debt portfolio toward noncollateralized loans, including student loans over time. Finally, young adults from a lower social class background have disproportionately taken on more unsecured debt over time, compared to their more advantaged counterparts. Similarly, Hodson and Dwyer (2014) study the 1997 wave of the National Longitudinal Surveys of Youth and the SCF to investigate indebtedness of millennials (defined as those born around 1982 or after). They find that, compared to an earlier generation (Gen X), millennials took on greater amounts of debt at an earlier age. Their debt increased sharply once they reached 18 years old. By their mid-20s, more than 20% had student loan debt and more than 30% had auto and credit card debts. Millennials also had historically high rates of homeownership in their early 20s compared to previous generations. Finally, Lee, Mori, and Qian (2017) find that the relationship between conspicuous consumption and credit card debt in Singapore is concentrated among younger, male, single individuals.

For the elderly, Lusardi and Mitchell (2013) use data from the Health and Retirement Study and the National Financial Capability Study and examine three different cohorts of Americans age 56–61 in different time periods: 1992, 2002, and 2008. They find that more recent cohorts have taken on more debt and face more financial insecurity, mostly because they purchased more expensive homes



with smaller down payments.<sup>8</sup> Similarly, Kuhn, Schularick, and Steins (2017) study the oldest data from the SCF and find that those born between 1945 and 1964 experience rising debt-to-income ratios as they age. Kim (2015) analyzes the distributions of household debt in the Republic of Korea and the US and finds that the proportion of household debt held by older households has increased.

This paper contributes to the literature on household debt over the life cycle in various ways. First, most existing studies rely on data at the household level and analyze the distribution of debt based on the age of household heads. Given that each household consists of members with different ages, a household is not an appropriate unit of observation for the study of debt over the life cycle. In contrast, this study uses granular data at the account level that allow us to better study indebtedness of each individual, including the portfolio of his or her debt. In particular, granular data allow us to decompose the aggregate, commonly used measures of debt per capita and delinquency rate into components that unveil the extensive and intensive margins of household indebtedness. This decomposition in turn allows us to analyze debt holding, debt portfolio, and delinquency for each age and cohort. Second, while other studies only analyze debt holdings, this paper also examines the number of loan accounts and financial institutions, hence providing insights on both extensive and intensive margins of indebtedness. This paper also studies loan performance over the life cycle, exploring the relationship between age and delinquency and hence providing new insights on the quality of loans across age groups. Finally, unlike existing studies that use data from developed countries, ours is one of the first that examines this issue in the context of an emerging economy.

### III. Background on Credit Markets in Thailand

The financial system in Thailand represents what we typically observe in developing economies, where both formal and informal sectors coexist. This is also the case for credit markets where loans are made. At one end, formal credit providers include (domestic and foreign) commercial banks, special financial institutions (Government Savings Bank, Government Housing Bank, Export-Import Bank, Small and Medium Enterprise Development Bank, Islamic Bank, and Bank for Agriculture and Agricultural Cooperatives), and other nonbank financial institutions (such as credit card, personal loan, insurance, and hire purchase or leasing companies). At the other end, informal credit providers include friends and relatives as well as moneylenders in rural villages. Between these two ends lie semiformal credit providers such as cooperatives, production groups, and village funds.

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<sup>8</sup>Related to growing indebtedness of the elderly, Higgs et al. (2009) use nine rounds of data from the United Kingdom Family Expenditure Survey collected between 1968 and 2005 and study consumption expenditure by retired households. Their findings show a growing extent of ownership of key goods in retired households.

With developments in the financial sector in recent decades, the formal financial sector is becoming more important in Thailand, while the informal sector has been in decline. Specifically, in 2016, one in three of the Thai population has debt from the formal financial sector. Meanwhile, the percentage of households with debt in the informal sector quickly declined from 20% in 2007 to under 10% in 2013.<sup>9</sup>

However, household debt is concentrated among a small group of borrowers. Specifically, the top 10% of borrowers account for over 62% of total formal debt. It is mostly concentrated among the following loan subcategories: personal and business loans, loans from commercial banks, loans held by borrowers outside the working-age group, loans in urban areas and in Bangkok and the vicinity. The top 10% of borrowers tend to be homeowners and live in urban areas and in Bangkok and its vicinity. As expected, the bottom group has fewer accounts and fewer distinct products than the middle group, which in turn has fewer accounts and products than the top group. Personal loans are highly prevalent, while housing loans appear very limited. Specifically, 17% of the Thai population have personal loans, followed by auto and credit card loans at 9% each. Meanwhile, only 4% of the population have housing loans.

In terms of credit providers, among the formal lenders, loans from special financial institutions are less prevalent relative to those of commercial banks and other institutions with a larger outreach, but their average loan size is larger when compared to other types of lenders. Specifically, the number of borrowers from special financial institutions is only one-third of the number of borrowers from commercial banks, but the median debt per borrower is almost double that of commercial banks. This reflects the role of special financial institutions as state-owned enterprises, established with each specific law, so each one has its own mandate and offers certain types of loans, whereas commercial banks offer a wider range of loan products.

#### IV. Data

This paper uses account-level consumer loan data submitted to Thailand's NCB by its members from 2009 to 2016.<sup>10</sup> The data cover almost all loans from the formal financial sector to ordinary persons in Thailand.<sup>11</sup> The NCB data are suitable

<sup>9</sup>For details on household debt in Thailand, see Chantarot et al. (2017) and Suwanik, Chantarot, and Samphantharak (2018).

<sup>10</sup>The data are as of the end of each year, except for the data for 2016 which are at the end of July. There are 90 NCB members in total: (i) 19 banks—all 15 Thai commercial banks and four foreign bank branches; (ii) six specialized financial institutions (SFIs); and (iii) 65 nonbank financial institutions such as credit card, personal loan, insurance, and hire purchase or leasing companies.

<sup>11</sup>However, the data do not include loans from the Student Loan Fund, cooperatives, village funds, and loans from the informal financial sector, such as money lenders or community-based institutions. The data also do not include loans to juristic persons, which are maintained in a separate database at the bureau.

Table 1. Overview of Credit Bureau Data

Coverage	2009	2010	2011	2012	2013	2014	2015	July 2016
Number of financial institution members	68	69	75	78	78	80	86	90
Number of accounts (million)	32.63	33.93	37.86	41.99	46.63	47.63	48.47	60.51
Number of borrowers (million)	11.65	12.29	13.36	14.73	15.98	16.07	15.94	19.25
Total loan outstanding (trillion baht)	4.39	4.92	6.05	7.14	8.11	8.44	8.69	9.80
Less than 30 days past due	3.85	4.39	5.32	6.40	7.24	7.63	7.86	8.78
31–60 days past due	0.08	0.08	0.10	0.12	0.16	0.20	0.26	0.28
61–90 days past due	0.04	0.03	0.05	0.05	0.08	0.08	0.07	0.11
91–120 days past due	0.02	0.02	0.02	0.02	0.04	0.04	0.04	0.04
121–300 days past due	0.11	0.09	0.10	0.12	0.14	0.12	0.13	0.18
Greater than 300 days past due	0.30	0.31	0.45	0.44	0.44	0.37	0.32	0.42
Total delinquent loans <sup>a</sup> (trillion baht)	0.42	0.42	0.57	0.57	0.62	0.53	0.50	0.64
Number of credit review for new loans (million)	8.70	9.90	11.44	13.90	13.76	12.75	9.48	7.12
Number of credit review for existing loans (million)	5.27	6.95	9.00	7.63	17.66	30.04	24.61	23.76

<sup>a</sup>Delinquent loans are loans that are more than 90 days past due.

Source: Authors' calculations from National Credit Bureau data.

for our study for various reasons. First, unlike data collected from surveys that tend to miss certain groups, such as the very high-income households, the NCB data cover a wide range of the population, consisting of the majority of formal loans to individuals in the Thai economy. Second, the data contain account-level information that makes the analysis of household debt at a granular level possible and helps unveil the heterogeneity across households. Third, the coverage and granularity of the data together allow us to study loan portfolios of individuals when they borrow from multiple financial institutions. This analysis would not be possible with data from each lender separately.

Table 1 shows the coverage of the data. As of July 2016, there were 60.51 million active loan accounts from 19.25 million borrowers that contributed to a total loan outstanding of 9.8 trillion baht (B) or 87% of the total household debt in the system. The data also contain information on days past due for each loan account. This information allows us to study delinquent loans, which we define in this paper as loans that are more than 90 days past due. With this definition, the total value of delinquent loans was B0.64 trillion or 6.5% of the total loan outstanding.

The NCB data contain information that reflects four granular dimensions at the account level: (i) information on the borrower (age and postcode of mailing address); (ii) information on the loan product, which we group into six categories: housing, automobile, motorcycle, credit card, business loans,<sup>12</sup> and

<sup>12</sup>Business loans include commercial loans and loans for agriculture.

personal and other loans;<sup>13</sup> (iii) information on the lender, which we group into three broad categories: commercial banks,<sup>14</sup> SFIs,<sup>15</sup> and other (nonbank) financial institutions;<sup>16</sup> and (iv) quantitative information on credit line, loan outstanding, and days past due (and hence the utilization ratio and delinquency status) that we can use as outcome variables in our analysis.<sup>17</sup> In particular, we define delinquent loans as those that are more than 90 days past due. In other words, delinquency is an indicator of financial unhealthiness.<sup>18</sup>

Table 2 provides descriptive statistics about the borrowers. It shows that the median age of borrowers is 43 years old. The majority of borrowers live in Bangkok and its vicinity (29%). In fact, half of borrowers live in urban areas.<sup>19</sup> A median borrower holds two loan accounts, has one loan product, and borrows from one lender. The distributions of credit line and loan outstanding per borrower are very skewed, with the means as high as B0.77 and B0.51 million and the medians only at B0.28 and B0.15 million.<sup>20</sup> Similarly, the mean delinquent amount per borrower is B0.20 million, while the median is only B0.06 million. Approximately 7% of the borrowers are new clients. The utilization rate, defined as the ratio of current balance to credit line, averages at 0.65 per borrower.

Table 3 provides summary statistics of loans. The top panel presents the allocation of accounts, outstanding loans, and delinquency across products and lenders. Personal and other loans occupy the highest delinquency share among all loan products, while commercial banks account for the highest delinquency share among lenders. Personal and other loans raise concerns for the financial system as they occupy the largest share of accounts (35.5%), the second-largest share of debt (27.8%), and the largest share of delinquency (31.8%). Auto and housing loans also raise concerns for the financial system as they contribute to the second and the

<sup>13</sup>Personal loans include secured loans (e.g., car for cash, home for cash) and unsecured loans or clean loans (e.g., cash card, multipurpose loans). The majority of other loan products include overdraft and other hire purchase or leasing.

<sup>14</sup>A commercial bank is defined on a solo or stand-alone basis. That is, its subsidiaries such as credit card and hire purchase or leasing companies that are also members of NCB are categorized as separate entities under other financial institutions.

<sup>15</sup>Specialized financial institutions (SFIs) include Government Savings Bank, Government Housing Bank, Export-Import Bank, Small and Medium Enterprise Development Bank, Islamic Bank, and Bank for Agriculture and Agricultural Cooperatives.

<sup>16</sup>Other financial institutions are nonbank financial institutions such as credit card companies, hire purchase or leasing companies, insurance companies, and cooperatives. We thus refer to other financial institutions as nonbank financial institutions.

<sup>17</sup>A credit line from each borrower is computed as the aggregate of credit lines from all loan products held by the borrower. However, in the case of borrowers with multiple credit cards from the same financial institution, all credit cards are collectively under the same credit line.

<sup>18</sup>Our definition of delinquent loans is therefore more stringent than just loans with late payment, but less stringent than nonperforming loans. Specifically, the classification of nonperforming loans by the Bank of Thailand involves both loans that are more than 90 days past due and other qualitative assessments.

<sup>19</sup>Urban areas are defined by postcode, with more than 50% of its area classified as a municipality.

<sup>20</sup>The value of the Thai baht fluctuated between B29 and B36 per US dollar during 2009–2016. At the end of July 2016, the exchange rate was about B36 per US dollar.

Table 2. Descriptive Statistics of Borrowers, July 2016

	Mean	Median	SD	Min	Max	N
<b>Borrower characteristics</b>						
Age (years)	44.16	43.00	12.36	20	80	18,813,985
Region						
Bangkok and vicinity (=1)	0.29	na	na	0	1	16,039,856
Central (=1)	0.18	na	na	0	1	16,039,856
North (=1)	0.15	na	na	0	1	16,039,856
Northeast (=1)	0.25	na	na	0	1	16,039,856
South (=1)	0.11	na	na	0	1	16,039,856
Urban (=1) <sup>a</sup>	0.51	na	na	0	1	16,039,856
<b>Portfolio characteristics</b>						
Number of accounts	3.14	2.00	3.11	1	167	19,245,461
Number of distinct loan products	1.60	1.00	0.81	1	6	19,245,461
Number of financial institutions used	2.08	1.00	1.66	1	8	19,245,461
Total credit line (million baht)	0.77	0.28	3.84	0	4,220	19,245,461
Total loan outstanding (million baht)	0.51	0.15	3.07	0	8,990	19,245,461
Total delinquent loan (million baht)	0.20	0.06	1.10	0	973	3,189,527
<b>Credit history and utilization</b>						
Number of years in NCB data	5.02	5.00	2.73	1	8	19,245,461
New borrower (=1)	0.07	na	na	0	1	19,245,461
Have delinquent loan this year (=1)	0.17	na	na	0	1	19,245,461
Have delinquent loan in the past year (=1)	0.16	na	na	0	1	15,252,626
Utilization rate <sup>b</sup> (%)	0.65	0.71	0.36	0	1	19,245,461

N = number of observations, na = not available, NCB = National Credit Bureau, SD = standard deviation.

Note: Some data for age and location are missing, hence the smaller sample size with these identifiers.

<sup>a</sup>Postcode is defined as an urban area if more than 50% of the area belongs to municipalities.

<sup>b</sup>Utilization rate is defined as a ratio of current balance to credit line.

Source: Authors' calculations from National Credit Bureau data.

third-largest shares of delinquency even though housing loans account for only 5.4% of the total number of accounts, due to the large size of each loan.<sup>21</sup> In contrast, credit card debt occupies the second-largest share of accounts (30.7%), but they contribute much less to the total debt outstanding and delinquency due to their small sizes. By lender, commercial banks account for the largest share of debt outstanding and delinquency, while nonbank financial institutions account for the largest share of accounts. The bottom panel presents the allocation across borrower age groups and locations. The shares of borrowers, loans, and delinquencies are highest among borrowers in working-age groups (highest for those age 46–60 years, followed by 36–45 years and 25–35 years) and borrowers in Bangkok and the vicinity.

<sup>21</sup>For comparison, although housing debt accounts for the largest share of total loan outstanding at 33.2%, the number is still lower than that of every G7 economy where more than 50% of outstanding household debt in 2012 was in mortgages. Other debt products of the “Big Four” banks in the US were student loans, vehicle loans, and credit cards. See Zinman (2015).

Table 3. **Dissecting Aggregate Debt and Delinquency by Loan Product, Lender, and Borrower, July 2016**

<b>Loan Product and Lender</b>	<b>Share of Account (%)</b>	<b>Share of Loan Outstanding (%)</b>	<b>Share of Delinquent Loan (%)</b>
<b>Loan product</b>			
Housing	5.4	33.2	19.8
Auto	11.2	20.8	23.4
Motorcycle	2.2	0.5	2.7
Credit card	30.7	3.8	8.1
Personal loan and others	35.5	27.8	31.8
Loan for business	15.0	13.9	14.0
<b>Lender</b>			
Commercial banks	35.2	51.7	45.6
SFIs	26.6	33.9	29.4
Other financial institutions <sup>a</sup>	38.2	14.4	25.0
<b>Borrowers</b>	<b>Share of Borrowers (%)</b>	<b>Share of Loan Outstanding (%)</b>	<b>Share of Delinquent Loan (%)</b>
<b>Age</b>			
Younger than 25	3.2	1.1	1.3
From 25–35	27.6	22.6	24.8
From 36–45	27.9	33.0	34.2
From 46–60	32.2	36.1	34.0
Older than 60	9.1	7.2	5.7
<b>Region</b>			
Bangkok and vicinity	29.4	36.4	35.4
Central	18.3	17.2	18.1
North	15.4	13.7	13.7
Northeast	25.4	21.0	18.7
South	11.4	11.7	14.1
Urban	51.0	58.8	58.1

SFI = specialized financial institution.

<sup>a</sup>Other financial institutions include credit card companies, hire purchase companies, insurance companies, and cooperatives.

Source: Authors' calculations from National Credit Bureau data.

## V. Empirics

This section presents empirical findings on debt holding, debt portfolio, and delinquency over the life cycle. For each issue, we first present a simple plot of descriptive statistics by age. We then perform a regression analysis that allows us to control for macroeconomic and individual fixed effects. Finally, we end the section with a cohort analysis of debt and delinquency.

### A. Debt Holding over the Life Cycle

The granularity of the NCB data allows us to quantify the debt situation at the borrower level. We consider two measures. First, debt headcount is defined as the number of individuals with debt divided by the total population. It is a measure that

provides information on the prevalence of debt across individuals in the economy, that is, what fraction of the population is indebted.<sup>22</sup> Second, debt per borrower is defined as the average loan outstanding of each indebted individual. This measure indicates debt intensity that each indebted individual experiences. These two microlevel measures thus decompose the commonly used and aggregate measure of debt per capita into two parts: (i) debt prevalence at the extensive margin and (ii) debt intensity at the intensive margin.

$$\frac{\text{Total outstanding debt}}{\text{Population}} = \frac{\text{Number of borrowers}}{\text{Population}} \cdot \frac{\text{Total outstanding debt}}{\text{Number of borrowers}}$$

Debt per capita = Debt headcount · Debt per borrower

We first explore the age profile of debt prevalence and debt intensity, as shown in Figure 1. The top-left chart shows an inverted-U relationship between age and debt headcount: the headcount increases with age, peaks at 50% around an early age of 30 years old, remains at 40%–50% until reaching retirement age, and then declines sharply afterwards. This is consistent with young and old individuals facing more credit constraints. The top-right chart gives us additional information about debt over the life cycle from the perspective of debt intensity, that is, debt per borrower. Overall, we observe the expected debt accumulation when individuals are young and enter the labor force and then debt decumulation as borrowers retire. However, borrowers' debt intensity remains high, well past the retirement age, raising a concern over the indebtedness of an aging population.<sup>23</sup>

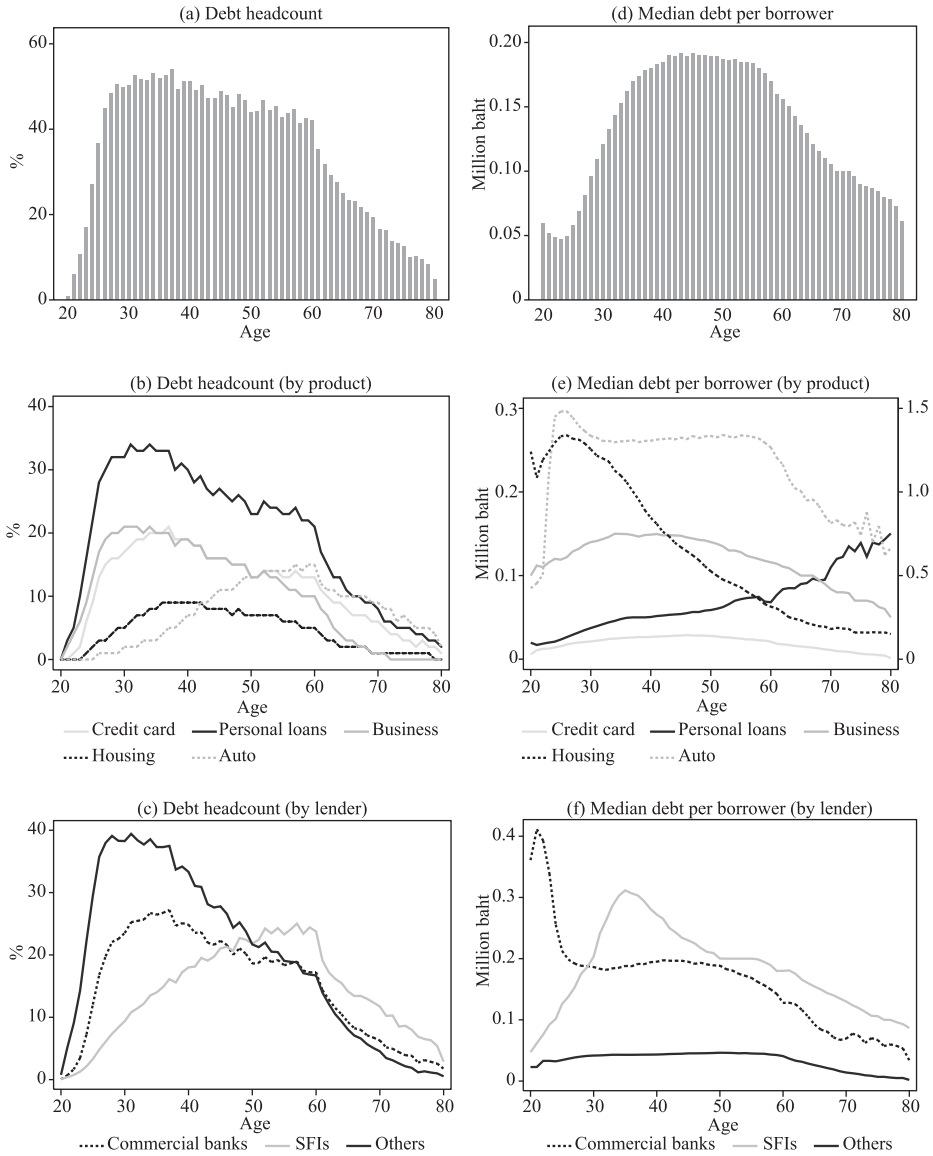
The center-left panel of Figure 1 further presents the age profiles of debt prevalence by loan product. Personal, auto, and credit card debt headcounts peak at 30%, 20%, and 20%, respectively, for borrowers in the young working-age group (around 28–35 years old). Individuals thus begin having credit card, auto, and especially personal loans at an early age. These patterns are consistent with large access to loans from nonbank institutions, which include several hire purchase or leasing and credit card companies. The pattern peaks at 40% among the young working-age group, as shown in the bottom-left panel of Figure 1. Similarly, the center-right panel of Figure 1 presents the age profiles of debt intensity by loan product and further shows a high intensity of housing and auto debts among the young working-age group. The median housing debt per borrower is high for very young borrowers and gradually declines for the older borrowers. This pattern likely reflects the repayment of mortgage for each individual as well as a general increase in housing price over time (i.e., younger homebuyers purchased their home at more recent, higher prices than the older generations who purchased their home a long

<sup>22</sup>In the household finance literature, this measure is also known as the penetration rate or the participation rate.

<sup>23</sup>The general retirement age for civil servants in Thailand is 60 years old.



Figure 1. Life Cycle of Debt Prevalence and Intensity



SFI = specialized financial institution.  
 Source: Authors' calculations.

time ago). The data show that individuals in Thailand start to have a high intensity of housing debt at a much younger age than those in the US where debt per borrower peaks later in the middle of working age (Fulford and Schuh 2015). Auto loans exhibit a different pattern, with a relatively stable median debt per borrower across

all working ages, although the median is higher for the young and declining for the old. Credit card and business loans, however, show the expected inverted-U patterns in which we find an increase in debt per borrower among young borrowers and a decrease for the elderly. The figure also shows that the prevalence of personal, credit card, and business loans among retirees remains quite high. The amount of personal loans per borrower also peaks after retirement age. The high debt prevalence and intensity of personal loans after retirement could also reflect the limited loan choices of the retirees. One possible explanation for the high headcount of credit card debt among the retirees could be the use of credit cards as a payment mechanism.

The age profiles of debt echo the limited housing debt—only one in 10 of the working-age population in their 40s have housing loans. This is considered very low relative to the US, where around 40% of borrowers in their 40s have a mortgage (Fulford and Schuh 2015).<sup>24</sup> Apart from housing loans, access to credit card also appears limited. Credit card debt prevalence peaks at 20%, which again is a lot lower than in the US where 63% of the population have at least one credit card (Consumer Financial Protection Bureau 2015).<sup>25</sup> Figure 1 further shows that access to business loans appears quite late and peaks among those in retirement age. Possible explanations include the difficulty of the young in setting up or expanding a business due to their lack of credit history and collateral as well as limited experience. Alternatively, another possible explanation is that formal sector jobs are easier to get for younger people and hence they have limited demand for business loans.

The age profile of debt intensity is vastly diverse across lenders, reflecting different roles of commercial banks, SFIs, and nonbank financial institutions in the economy. Individuals have access to loans from nonbank financial institutions at a younger age as these institutions focus on providing auto and credit card loans. The debt headcount from SFIs is higher for working-age individuals who are also close to retirement. The median debt per borrower of loans from commercial banks is much higher for very young borrowers, peaks at 21 years old, and declines afterwards. The median peaks later around the age of 35 for loans from SFIs.

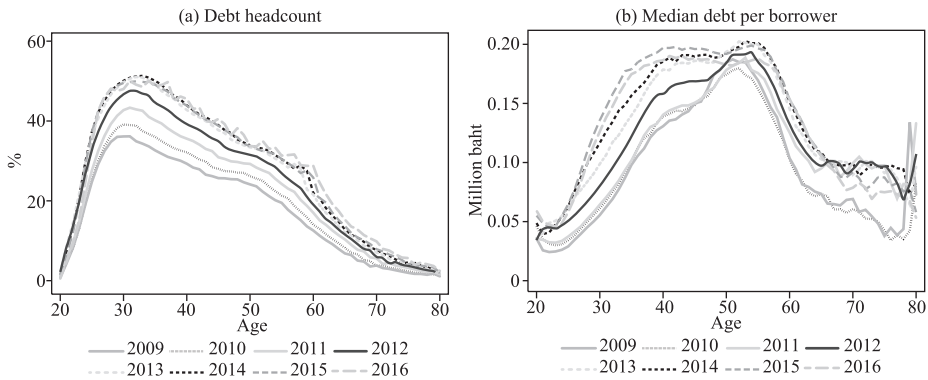
Next, we examine how debt profile over a person's life cycle has changed over time from 2009 to 2016. There are more borrowers (extensive margin) and debt per borrower is larger (intensive margin) at every age over time, especially among the younger generation. Figure 2 presents the age profiles of debt prevalence and debt

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<sup>24</sup>There are several factors that contribute to this finding. First, the finding is partly driven by the fact that a large portion of the Thai population live in rural areas with very limited access to mortgage loans. The debt headcount in urban areas is about 20% (Chantararat et al. 2018). Second, the land and housing markets in Thailand are less active than those in the US because Thailand has lower job mobility across cities. In addition, extended families remain widespread in Thailand where children live with their parents and inherit their land and house.

<sup>25</sup>Similarly, this finding is partly driven by the debt headcount in rural areas, which was very low (less than 10%). Considering only urban areas, the debt headcount is higher than 30% (Chantararat et al. 2019). In addition, the Thai economy remains largely cash based due to its large informal sector; the use of credit cards is not widespread.

Figure 2. Life Cycle of Debt Prevalence and Intensity over Time



Source: Authors' calculations.

intensity by year. Generally speaking, these age profiles are similar to what we see in Figure 1 for 2016. However, Figure 2 reveals additional insights. First, it shows that household debt in Thailand has expanded, as evident from the upward shift of the curve over time. Second, credit expansion is not uniform across age groups, with the younger borrowers experiencing the most expansion. More precisely, debt headcount and debt per borrower increase most for individuals around 30 years old. This descriptive finding suggests that the younger generations have accumulated debt earlier in their lives than the older ones. We return to a regression analysis with age and cohort fixed effects later in this section.

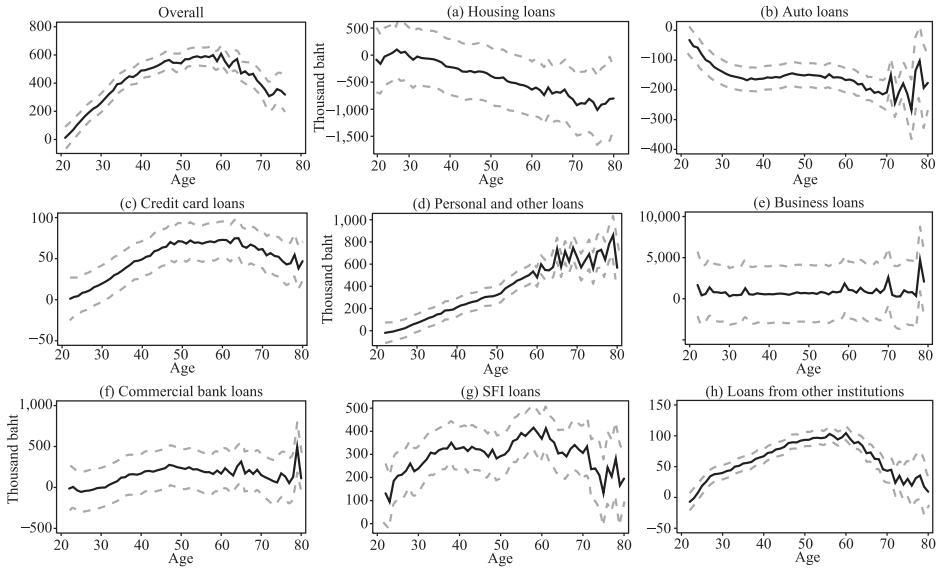
Looking across different types of loans, we observe heterogeneity in debt accumulation by loan category, with remarkable increases in debt headcounts of personal, auto, and credit card loans among the younger generation.<sup>26</sup> The expansion of debt headcount for auto loans takes place during 2011–2013.<sup>27</sup> Debt headcounts for housing and business loans increase over the period of our study, but the magnitudes are relatively small when compared to other loan products. The debt headcounts of loans from commercial banks and other (nonbank) financial institutions increase most for borrowers around 30 years old, while the headcount from SFIs expands most for those around 40 years old. For debt intensity, we find that debt per borrower for housing loans rises tremendously for young borrowers, while that for credit card loans increases most for individuals age 40–60.

To isolate the age effects from macroeconomic and individual fixed factors, we perform a regression analysis of debt per borrower, controlling for year fixed

<sup>26</sup>See Chantarat et al. (2018) for detail.

<sup>27</sup>This observation is likely due to the first-car buyer tax rebate scheme. See Muthitacharoen, Samphantharak, and Chantarat (2019) for the impact of the scheme on household debt in Thailand.

Figure 3. Age Regression Coefficients of Debt per Borrower (controlling for cohort effect)



SFI = specialized financial institution.

Note: Y-axis scaling varies across loan products and lenders to show the variation in life-cycle patterns for each loan.

Source: Authors' calculations.

effects, interactions between year and location (postcode) fixed effects, and location or individual fixed effects. Specifically, we run the following two regressions:

$$y_{i,a,j,t} = \alpha + \beta_a + \gamma_j + \delta_t + \kappa_{j,t} + \varepsilon_{i,a,j,t} \tag{1}$$

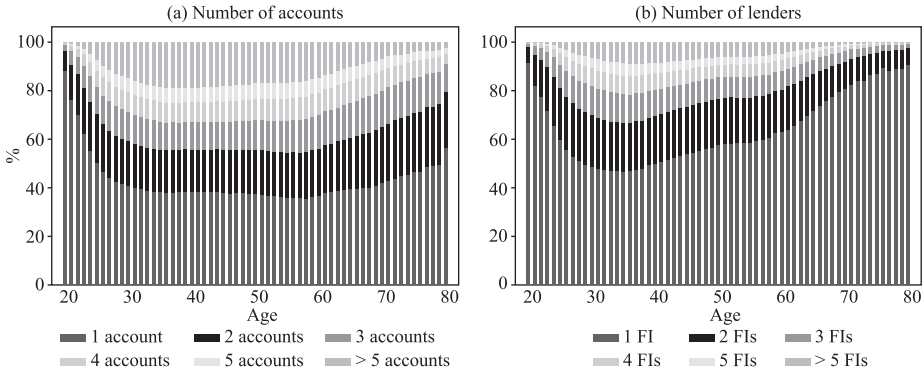
and

$$y_{i,a,j,t} = \alpha + \beta_a + \lambda_i + \delta_t + \kappa_{j,t} + \varepsilon_{i,a,j,t} \tag{2}$$

where  $y_{i,a,j,t}$  is debt per borrower,  $\alpha$  is the constant term,  $\beta_a$  is the age  $a$  fixed effect,  $\gamma_j$  is the location  $j$  fixed effect,  $\delta_t$  is the year  $t$  year fixed effect,  $\kappa_{j,t}$  is the location-year fixed effect for location  $j$  and year  $t$ ,  $\lambda_i$  is the individual borrower  $i$  fixed effect, and  $\varepsilon_{i,a,j,t}$  is the residual.

Figure 3 presents regression coefficients of age variables estimated by equation (2). Our results show that, after controlling for individual (hence cohort) and time-location fixed effects, the regression coefficients increase with age until approximately 60 years and then decline. The interpretation is that, for those below 60 years old, older individuals have higher debt than younger ones, implying debt accumulation over this age range. Likewise, for those above 60 years old, the finding implies debt decumulation. The overall pattern is similar to the narrative we discussed earlier. However, the regression analysis shows that the life-cycle pattern

Figure 4. Number of Accounts and Lenders



FI = financial institution.  
 Source: Authors' calculations.

of overall debt per borrower peaks at 60 years. In other words, borrowers keep accumulating debt until retirement age, and then begin to deleverage at retirement.<sup>28</sup>

In sum, our analysis of the life cycle of debt outstanding shows that there is an inverted-U pattern as predicted by the life-cycle hypothesis. The peak estimated by regression analyses is at 60 years, which is also the common retirement age in Thailand. However, the pattern is heterogeneous across loan products and lenders. In particular, the peaks for auto and credit card debts are achieved earlier when borrowers are still young; the patterns for lenders, with the earliest peak for nonbank financial institutions, mirror those for these loan products.

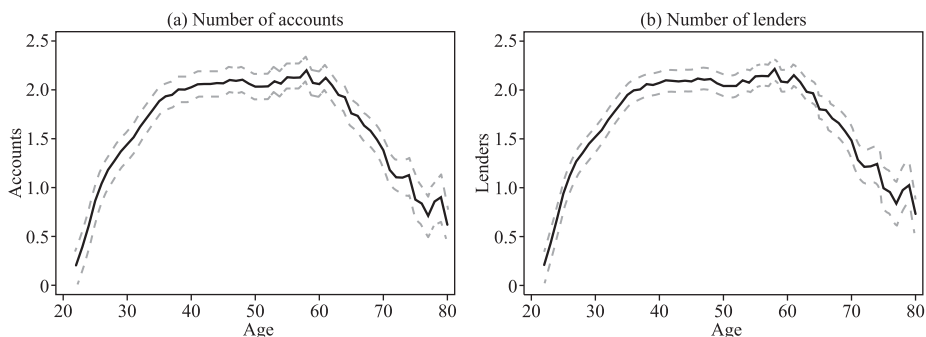
**B. The Life Cycle of a Loan Portfolio**

The granularity of the data allows us to study the life cycle of each individual's loan portfolio. Figure 4 presents the proportion of borrowers in each age group by the number of accounts and by the number of lenders. The figure reveals that the life cycle of the number of loan accounts held by each individual also follows a nonlinear pattern—the fraction of borrowers with multiple loan accounts increases with age for young groups, then remains relatively stable during the working age of 30–60, and finally decreases with age for retired borrowers. The age profile of the number of lenders delivers a similar pattern.

Similar to the analysis of debt over the life cycle, we perform a regression analysis to control for macroeconomic and individual fixed effects. Specifically, we estimate equation (2) by using the number of accounts and the number of lenders per borrower as the dependent variable,  $y_{i,a,j,t}$ . Figure 5 plots the regression coefficients

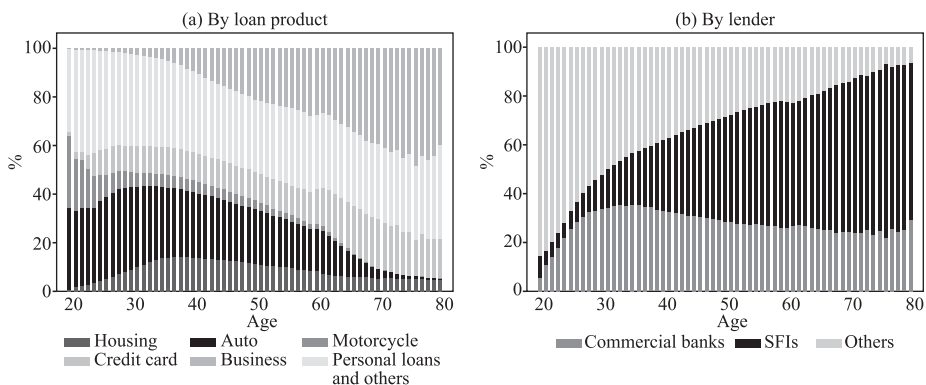
<sup>28</sup>For detailed regression results, see Tables A.2–A.4 in Chantarat et al. (2018).

Figure 5. Age Regression Coefficients of Number of Accounts and Lenders (controlling for cohort effect)



Source: Authors' calculations.

Figure 6. Life Cycle of a Loan Portfolio



SFI = specialized financial institution.  
Source: Authors' calculations.

by age. The overall pattern is similar to the narrative we discussed earlier, with the peak at 57 years for both regressions.<sup>29</sup>

Finally, Figure 6 illustrates the composition of loan portfolios. The left panel presents the portfolio of loan products for each borrower by age. It shows a striking life-cycle pattern. Auto loans account for a significant share of total loan outstanding for young borrowers but are almost nonexistent for older borrowers. Business loans show the opposite pattern. Personal loans, however, have constantly contributed a large portion of the portfolio throughout the life cycle while housing and credit card loans both accounted for relatively smaller portions. The right panel shows the portfolio of lenders for each borrower by age. Again, it shows a clear life-cycle pattern. Other (nonbank) financial institutions dominate the portfolio of

<sup>29</sup>For detailed regression results, see Table A.5 in Chantarat et al. (2019).

younger borrowers, while SFIs occupy the largest share of the portfolio of the older borrowers. The portfolio of lenders mirrors the life-cycle pattern in the portfolio of loan products.

In summary, our study confirms an inverted-U pattern that reflects the life-cycle profile of debt. Based on the regression analysis, the number of accounts and the number of lenders peak at 57 years, roughly consistent with the peak of debt per borrower found earlier, which is around the common retirement age in Thailand. Our findings also reiterate the role of nonbank financial institutions for lending to the young and SFIs for the old. Finally, we find that the younger generation seems to originate debt earlier in the life cycle than their older counterparts. Older borrowers also continue to be indebted well past their retirement age.

### C. Delinquency over the Life Cycle

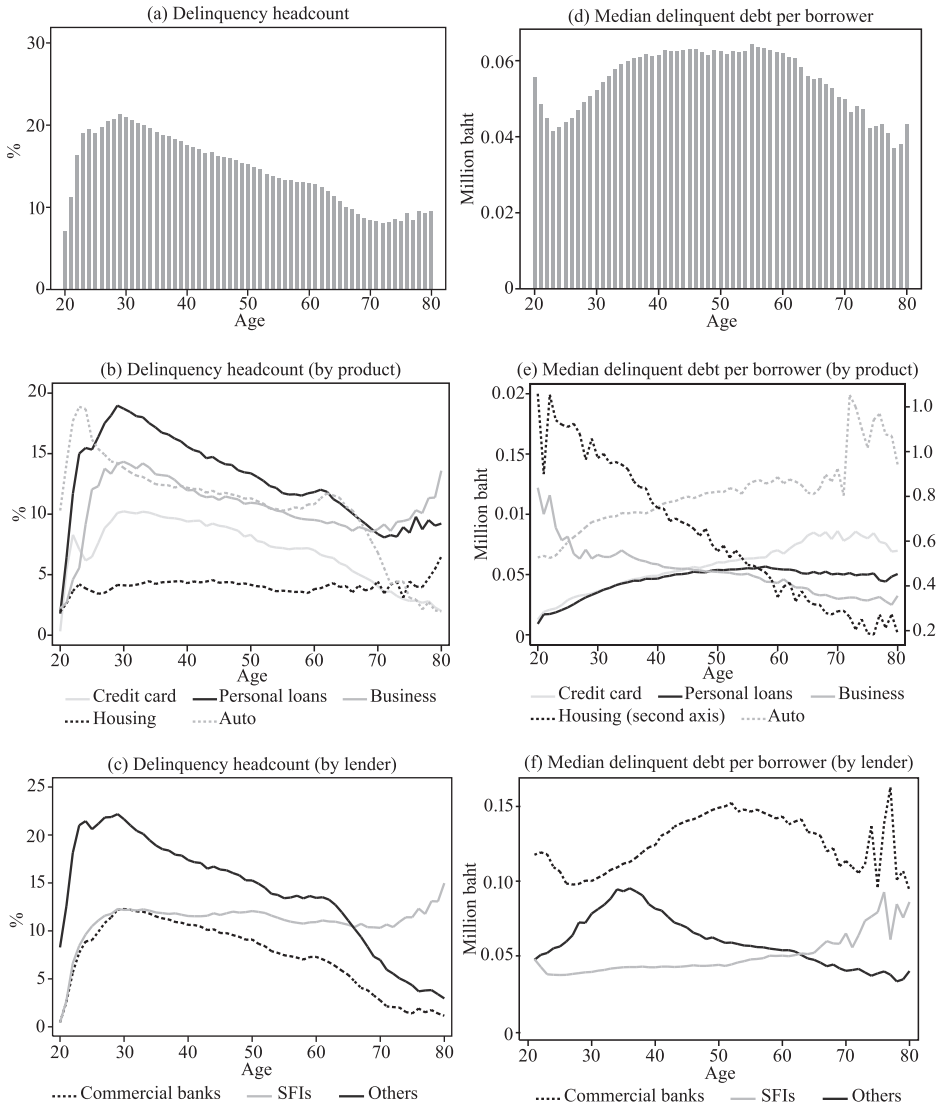
Parallel to debt, we study the life cycle of delinquency at the borrower level. Delinquency headcount is defined as the number of borrowers with delinquent loans divided by the total number of borrowers. This measure represents the prevalence of delinquency among borrowers. Delinquent debt per delinquent borrower is defined as the value of delinquent loans that each delinquent borrower has. This measure thus tells us about the intensity or severity of delinquency faced by delinquent borrowers. These microlevel measures give us information beyond what we get from the aggregate delinquency measure, the delinquency rate, defined as the percentage of loan outstanding in the economy that is delinquent, which provides us with no information on the distribution of delinquent loans and the burden on borrowers. Parallel to the decomposition of debt outstanding presented earlier, our measures of delinquency can be presented as components of the aggregate delinquency measure.

$$\begin{aligned} & \frac{\text{Total outstanding debt}}{\text{Number of borrowers}} \cdot \frac{\text{Total delinquent debt}}{\text{Total outstanding debt}} \\ &= \frac{\text{Number of delinquent borrowers}}{\text{Number of borrowers}} \cdot \frac{\text{Total delinquent debt}}{\text{Number of delinquent borrowers}} \\ & \text{Debt per borrower} \cdot \text{Delinquency rate} \\ &= \text{Delinquency headcount} \cdot \text{Delinquent debt per delinquent borrower} \end{aligned}$$

Figure 7 presents the age profiles of delinquency headcount and median delinquent debt per delinquent borrower. The top-left chart shows a downward-sloping profile, with the delinquency headcount highest at 21% for borrowers age 29 and declining as age increases. The top-right chart shows that, with the exception of high delinquent debt per delinquent borrower for very young borrowers, the overall delinquency intensity increases with age and remains relatively constant at around



Figure 7. Life Cycle of Delinquency Prevalence and Intensity



SFI = specialized financial institution.  
 Source: Authors' calculations.

B0.06 million for the working-age population and then declines for those older than 60 years old. This pattern mimics what we discussed earlier about the life cycle of debt intensity.

The age profiles of delinquency are heterogeneous across loan products. For personal, auto, credit card, and business loans, delinquency headcounts are high

for the younger borrowers and later decline, with the highest headcounts at around 30 years old for personal, credit card, and business loans and at 23 years old for auto loans. About 20% of the young working-age borrowers have delinquent personal loans. Overall, delinquency headcounts show a stable or downward trend as borrowers age for most loan products. A possible explanation is that older borrowers have a longer credit history and more collateral, allowing for better loan screening and lower incentive to default. Housing debt appears to have a low delinquency headcount and is uniform across ages, which is what we expect for secured loans.

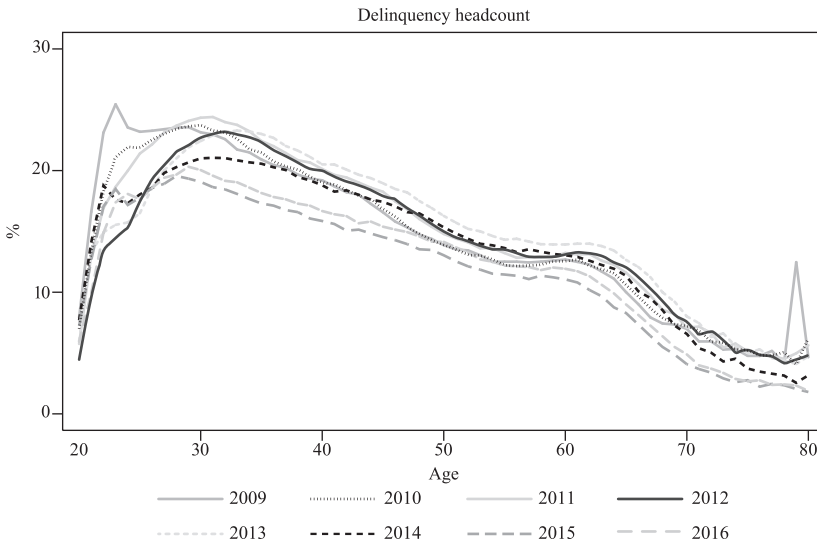
There are vastly mixed patterns of delinquency intensity in the age profiles of different loan products. Housing and business loans exhibit decreasing delinquent debt per delinquent borrower as age increases. This finding mirrors what we discussed earlier about debt intensity in Figure 1. In contrast, auto, credit card, and, to some extent, personal loans show the opposite pattern, that is, they are increasing with age. Delinquent debt per delinquent borrower for personal loans deserves special attention because the intensity increases with age and remains high after retirement, while the delinquency headcounts remain persistently high as well. Also, alarming is credit card debt—the delinquency intensity continues to stay high past the retirement age (although the decline in delinquency headcount makes the situation less worrisome than personal loans). These findings raise a concern about the debt burden of retirees. In the case of auto loans, we also find high delinquent debt per delinquent borrower for the elderly but a low delinquency headcount, implying that the defaults were likely on expensive cars.

Across lenders, we find large delinquency headcounts of loans from other (nonbank) financial institutions (which also peak among the young working-age group), while delinquency headcounts of loans from SFIs remain stable across all ages and do not decline after retirement. More explicitly, Figure 7 shows that the delinquency headcounts of debt from commercial banks and other (nonbank) financial institutions peak among borrowers age 30 (at around 12% and 20%, respectively), while the delinquent headcount of SFIs seems to be similar for all borrowers age 30 and above, around 10%–15%. Delinquent debt per delinquent borrower for nonbank financial institutions is also high among older borrowers, while the delinquency headcount declines with age. This finding is likely driven by the high delinquency intensity of credit card debt, which exhibits a similar pattern.

Figure 8 presents age profiles of delinquency headcounts over time and shows that the declining delinquency headcount is evident in every year during 2009–2016. Further analysis reveals heterogeneity in the profiles across loan products and lenders.<sup>30</sup> The drop is significant for housing, credit card, and personal loans. However, auto and business loans experience an increase in delinquency prevalence during the same period, especially among younger borrowers. If we

<sup>30</sup>See Chantarat et al. (2018) for detail.

Figure 8. Life Cycle of Delinquency Prevalence over Time



Source: Authors' calculations.

compare across lenders, we find that delinquency headcounts decrease over time for loans from nonbank financial institutions. Delinquency headcounts, however, increase over time for loans from commercial banks and SFIs among the young working-age population. They decline over time among the older population.

Similar to earlier analyses, we run probit regressions of equations (1) and (2) where the dependent variable,  $y_{i,a,j,t}$ , is an indicator variable that takes the value of 1 if an individual has at least one delinquent loan and 0 otherwise. Figure 9 plots the probit regression coefficients by age, controlling for macroeconomic and individual fixed effects. The overall pattern is similar to the narrative we discussed earlier.<sup>31</sup>

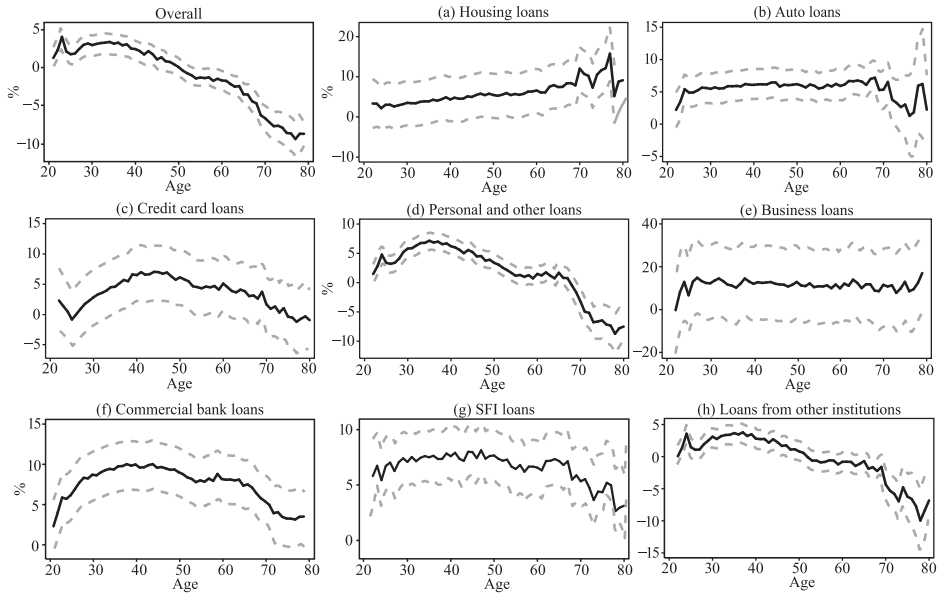
In summary, our analysis reveals an overall downward-sloping pattern of delinquency over the life cycle. This is consistent to the finding using US data by Xiao and Yao (2014). However, the pattern is heterogeneous across loan products and lenders. Business and credit card loans seem to experience an increasing delinquency headcount over time.

#### D. Cohort Analysis of Debt and Delinquency

Given the age of each borrower in the data, we can analyze debt and delinquency by birth cohort. The findings are displayed in Figure 10, where each of the lines represents a unique birth cohort of borrowers over different ages

<sup>31</sup>For detailed regression results, see Tables A.6–A.8 in Chantarat et al. (2019).

Figure 9. Age Regression Coefficients of Delinquency Probability (controlling for cohort effect)



SFI = specialized financial institution.

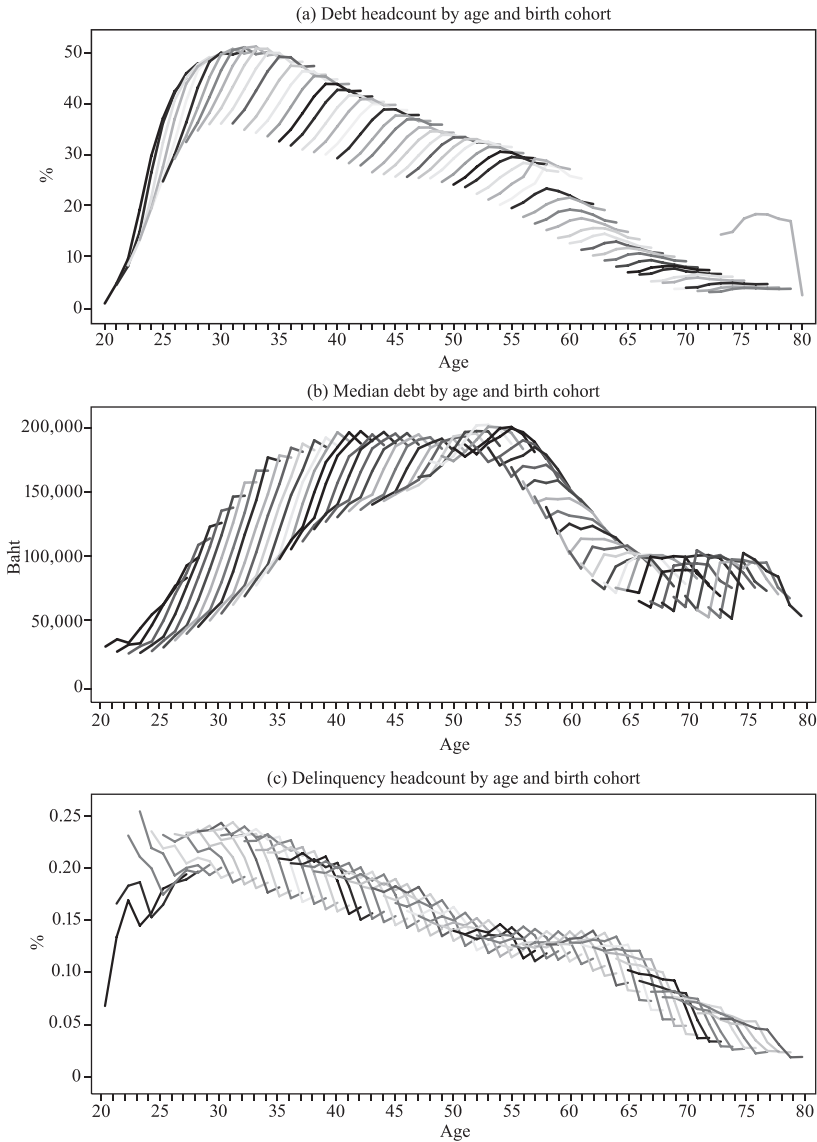
Note: Y-axis scaling varies across loan products and lenders to show the variation in life-cycle patterns for each loan.

Source: Authors' calculations.

during a period of 8 years from 2009 to 2016 in the data. The advantage of this cohort analysis is that it allows us to examine prevalence and intensity of debt and delinquency from two different approaches. First, for a given age, we can compare debt and delinquency across different cohorts or generations, while controlling for a particular position in their life cycle. Second, we can trace a given cohort over time and examine debt and delinquency over the life cycle of the same cohort, while controlling for cohort specific effects.

Figure 10 shows that debt accumulation implied by debt headcounts follows an inverted-U pattern, while over time, individuals who were born later start having debt earlier in their lives. First, for a given age, the top chart in Figure 10 shows that the debt headcount of the younger generation is uniformly above that of the older generation. For example, at the age of 30, the cohort born in 1985 has a debt headcount of almost 50%, while the cohort born in 1981 has a less than 40% headcount. This result suggests that the younger generations seem to have had more access to credit than the older ones when they were at the same age. Alternatively, for each level of debt headcount, we can see that the younger cohorts arrived at that debt level faster than the older cohorts. For example, the cohort born in 1975 reached the debt headcount of 40% when they were about 38 years old, while the

Figure 10. Life Cycle of Debt and Delinquency by Cohort



Source: Authors' calculations.

cohort born in 1980 and 1990 achieved that same level of debt headcount when they were only 31 and 25 years old, respectively.

Second, for a given cohort, the chart shows that the lines have positive slopes at younger ages and become negative for older ages. This finding suggests an inverted-U dynamic of leveraging and deleveraging over the life cycle. The chart

also shows that the peaks of debt headcounts appear at earlier ages and at higher levels for younger cohorts, further confirming that the younger generations had access to debt faster and earlier than the older generations. Finally, the chart reveals that the cohort age with the highest debt headcount in the data is the cohort of borrowers born in 1981 when they were 33 years old. More precisely, this cohort had the highest debt headcount in the entire data at over 50% in 2014.

We also find that debt accumulation and decumulation over the life cycle and over time implied by debt intensity mimic the pattern found in debt headcounts, but the highest debt intensity is reached later than the highest headcount. The middle chart of Figure 10 shows the median debt per borrower. Again, we see the overall inverted-U debt intensity dynamics over the life cycle. The younger cohorts seem to have a higher median debt per borrower than the older cohorts when they were at the same age, and the difference is highest at younger ages. Alternatively, the younger cohorts achieve a given median debt per borrower earlier in their lives than the older cohorts.

For delinquency, we find that delinquency headcounts decline with age over the life cycle. They also decline over time for all cohorts. These findings are shown in the bottom chart of Figure 10. For each cohort, we observe a general downward-sloping line, implying that delinquency headcounts decrease when borrowers become older. For each age, the delinquency headcounts of the younger cohorts are lower than the older ones, suggesting that delinquency headcounts have declined over time for all age groups.

We also perform a regression analysis for debt and delinquency by age and cohort. The results are consistent with our earlier narrative that younger cohorts seem to be more indebted than earlier cohorts, controlling for age-specific effects. Similarly, delinquency seems to be lower over time, with younger cohorts being less delinquent. This could reflect technology or knowledge that allow for better loan screening (less severe adverse selection) and better loan collection (less severe moral hazard).<sup>32</sup>

## VI. Conclusion and Policy Implications

This paper uses loan-level data to study the life cycle of household debt in Thailand. The wide coverage and the granularity of the data allow us to decompose the aggregate and commonly used measures of debt per capita and delinquency rate into components that unveil the extensive and intensive margins of debt and delinquency. This decomposition allows us to analyze prevalence, intensity, and distribution of indebtedness over the life cycle. We find striking life-cycle patterns of indebtedness, but they are heterogeneous across loan products and lenders. We

<sup>32</sup>For detailed results, see Table A.9 in Chantarat et al. (2018).

also find an expansion of debt over time, while delinquency has been in decline for most loan products. Finally, we find a downward pattern of delinquency over the life cycle. Our findings yield important implications on both individual households and the economy at large. We discuss them in this section.

### A. Implications for Households

Our findings show that Thai people have become indebted earlier in their lives. Delinquency headcounts are also highest among younger working-age borrowers. This raises a concern that these individuals may face difficulty in getting loans in the future. We also find that debt remains high for many borrowers after retirement. Policies that enhance access to necessary credit, such as for housing and for business investment, are thus critical, but such policies need to target individuals with potential to repay. In this respect, the “data revolution” and financial innovations have already opened up new opportunities in resolving information asymmetry and other inefficiencies in the credit market—a necessary step to unlock access to credit especially among the underbanked population.<sup>33</sup> Policies that promote access to savings in preparation for retirement are also critical, as well as policies that enhance access to necessary credit for high-potential retirees, such as reverse mortgage. These policies are crucial as the country is demographically aging and longevity of individuals is increasing. Financial literacy and planning programs that can effectively raise both financial awareness and discipline among households are especially critical. These programs should target the young population in school before they enter the labor and credit markets. Our study helps identify the groups of borrowers with delinquency vulnerability. In particular, we raise concerns over the young working-age population that have high delinquency headcount and intensity.

### B. Implications on the Economy

The high debt intensity among households, especially among the young working-age group which have a large propensity to spend, could lead to debt overhang and a prolonged sluggish consumption and investment spending, particularly among these young borrowers. This in turn could weaken domestic aggregate demand—one of the main growth engines of the economy. A high debt burden implies increasing vulnerability for households and thus to the overall financial system and economy if delinquency is positively correlated across households. These macroeconomic implications thus amplify the importance of policies that aim to balance financial access and financial stability.

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<sup>33</sup>The data revolution broadly includes the emergence of big data and the advancement in computing technology that allow complex analyses of borrowers and loans.



In conclusion, this study illustrates that debt is very heterogeneous in many dimensions. In order to understand the situation of household debt and design appropriate policies, aggregate data are not sufficient and granular data that cover the majority of the financial system are needed. This paper exemplifies the potential of credit bureau data in generating new knowledge about household debt. The key limitation of the data is the lack of informal and semiformal debts, for example, loans from cooperatives, educational loans from the Student Loan Fund, as well as borrower's income and savings data. Augmenting the data to cover this necessary information will open up new opportunities for researchers and policy makers in using this dataset to answer relevant policy questions necessary for effective policy design and targeting.<sup>34</sup>

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<sup>34</sup>We are also unable to study the impacts of wealth on the choice of debt products. Using data from the US Survey of Consumer Finance (SCF), Guiso and Sodini (2013) argue that different types of debt matter at different levels of wealth. Likewise, as Samphantharak and Townsend (2010) argue, in order to understand household finance, we need to consider assets, liabilities, and income of the households.

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## Appendix

**Household Debt to Gross Domestic Product of Selected Asia and the Pacific Economies (%)**

	1984	1994	2004	2014
Australia	39.9	51.5	95.8	118.3
New Zealand		41.9	75.5	88.8
Republic of Korea	26.1	47.3	62.6	84.3
Thailand		40.2	44.2	69.0
Malaysia			54.1 <sup>a</sup>	68.9
Japan	54.7	71.6	68.0	66.0
Hong Kong, China		38.6	57.7	65.6
Singapore		28.9	46.3	60.6
People's Republic of China			10.9 <sup>a</sup>	36.1
Indonesia			10.9	17.1

<sup>a</sup>Data for Malaysia and the People's Republic of China are for 2006.

Source: Bank for International Settlements. <https://www.bis.org/statistics/totcredit.htm> (accessed 16 October 2019).