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Household debt over the life cycle

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Abstract

Using data from the 2001 Survey of Consumer Finances, this study examines how the holding of types and amounts of household debt changes over the life cycle. The results show that the likelihood of holding each type of debt and the amount of each type of debt compared to total assets decrease with age. Although the popular press has speculated that older households accumulate excessive amounts of mortgage debt and credit card balances, our results do not support this claim. However, there is evidence that it may be more difficult for poorer older households to pay off their credit card balances. © 2005 Academy of Financial Services. All rights reserved.

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Keywords: Household debt; Life cycle; Financial assets; Non-financial assets; Credit card balances

1. Introduction

Alarming stories of older Americans who are going deeper into debt have been featured in the popular press (Breckenridge & McGregor, 2003; Marmon, 2003). Unlike the elders of previous generations, today's seniors have been characterized as carrying high credit card balances and accumulating mortgage debt. Moreover, the data on U.S. family finances support this claim. According to the Survey of Consumer Finances (SCF), the proportion of older households holding installment debt and credit card balances increased from 4.2 and 11.2% to 9.5 and 18.4%, respectively, between 1998 and 2001 (Aizcorbe, Kennickell & Moore, 2003). Also, the increased problem with late debt payments for older households suggests that the debt holders among this group face credit-related financial problems. The percentage of older households with any debt payment 60 days or more past due has

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increased since 1995, while the percentage did not vary much for other age groups (Aizcorbe et al., 2003). Despite these observations, there has been little study of the relationship between the age of the household head and the amount and types of debt that the household holds.

Using detailed information on the level of household debt available in the 2001 SCF, this paper will investigate how both the likelihood of holding debt and the amount of debt compared to total household assets change over the life cycle for different types of household debt. For most households, their total debt consists of mortgage debt, outstanding credit card balance, and installment loans. Controlling for other household characteristics that change over the life cycle such as household assets, income, and size, this study will investigate whether the age of the household head has a significant impact on the likelihood of holding mortgage, credit card, installment, and other debt and the amount of these types of debt compared to total assets.

This study differs from previous literature in three significant ways. First, we focus on the determinants of different types of debt over the life cycle. Other studies have examined some types of debt (Bertaut & Haliassos, 2004; Castronova & Hagstrom, 2004; Kim & DeVaney, 2001) or credit constraint (Cox & Jappelli, 1993; Crook, 2001), but no one has conducted a comprehensive analysis of total debt and the major components of total debt over the life cycle. Because the total debt of a household consists of both secured (mortgage and some types of installment debt) and unsecured debt (credit card balances), it is important to understand the differences in determinants of holding each type of debt. In particular, certain characteristics of households, such as age, race, or marital status, might affect the amount of unsecured debt, while these characteristics might not have the same effect on the amount of secured debt.

Second, we examine the effect of financial and non-financial assets on debt over the life cycle. Although previous research has linked assets to debt, there might be differences in terms of the role of financial and non-financial assets on debt holdings. For example, as non-financial assets increase, the amount of secured debt that households hold is likely to increase. However, financial and non-financial assets might have different effects on the amount of unsecured debt.

Finally, we examine outstanding credit card balances to address the concern that older households are carrying too much debt. Previous research on credit cards has investigated the determinants of credit card balances and focused on the role of household characteristics as predictors of the likelihood of holding credit card balances (Bertaut & Haliassos, 2004; Bird, Hagstrom & Wild 1999; Castronova & Hagstrom, 2004; Kim & DeVaney, 2001). However, no one has investigated the determinants of the ratio of credit card balances compared to total assets, and we argue that this ratio plays a more important role in the financial well being of households than the amount of credit card balance. Also, our study explicitly examines the effect of age on the likelihood of holding credit card balances and the amount of credit card balances compared to total assets.

The results of this study will contribute to public policy. Throughout the 1990s, the financial industry has made certain types of loans, such as home-secured debt and vehicle loans, more affordable for consumers. As a consequence, the importance of these types of debt in household liability has increased (Aizcorbe et al., 2003). However, more accessible

credit and rising medical costs are cited as the reasons for today's older households maintaining high levels of debt (Marmon, 2003). For policy makers, the question is how these developments will affect personal and aggregate savings, and debt holding in the long run. The results of this study will provide insight on this question by analyzing the relationship between the age of the household head and the amount of different types of household debt. If our results are able to highlight a problem such as an increase in the amount of credit card balances compared to total assets in later life, this will be a contribution of our research to the overall understanding of family finances.

Understanding the determinants of debt holding over the life cycle is also important for household well-being. According to the 2001 SCF, holders of credit card balances had an average balance of $4,172, and the average interest rate for those holding credit card balances was around 13.2%. Assuming that a household makes payments in the amount of $200 each month to pay off this balance and does not have any additional purchases, the interest paid during the first year is $434. This means that the opportunity cost of holding a credit card balance is high, and this might affect amounts of household savings and retirement wealth. Consequently, insufficient savings for retirement lead to a lower level of economic well being during retirement. With increased life expectancy and rising medical costs, this is a major concern for policy makers as well as households. Furthermore, the types and the amount of debt that households have might affect important decisions that they make, such as the purchase of a home, age of retirement, and college education of children. If households have been unable to reduce their debt relative to assets at midlife, this could affect the age at which they opt to retire, their contribution to expenses for their children's education, and, perhaps, the type of college their children attend.

2. Literature review

The life cycle hypothesis of savings proposes that household savings and consumption reflect the life cycle stage of the household, and that consumption is a linear function of available cash and the discounted value of future income (Ando & Modigliani, 1963). Assuming that income will increase during working years and decline at retirement, households tend to borrow when they are young, save during middle age, and spend down during retirement. Although other factors are likely to influence saving and consumption, the age of the household head is expected to have an important impact on the amount of total debt that households maintain.

The age of the household head is also expected to have an important influence on the amount of different types of debt. During their life time, consumers are likely to incur two major types of debt: mortgage debt, which is usually carried for a period of 20 to 30 years, and consumer debt, which is the amount owed on short-term and intermediate-term loans (Garman & Forgue, 2003). Consumer debt is further categorized as installment loans and the amount owed on credit cards. Therefore, the different types of debt that households have are associated with changing needs of the household over the life cycle. For example, most households take on installment debt for the purchase of a car even before they buy a home or borrow for the college education of their children.

Researchers have considered debt from various perspectives. We review only a few studies here because they are pertinent to the focus of this research. Credit constraint was examined by Cox and Jappelli (1993). The demand for debt was examined by Crook (2001) and Livingstone and Lunt (1992). Credit card ownership and usage were studied by Bird et al. (1999), Bertaut and Haliassos (2004), Castronova and Hagstrom (2004), and Kim and DeVaney (2001). The determinants of installment debt were examined in Lee and DeVaney (2000). Results of these studies shed light on the use of debt by households as well as contributing to the selection of control variables for this study.

Using the 1983 SCF, Cox and Jappelli (1993) found that the desire for debt increased until the household head reached the mid-thirties and then it declined. The gap between desired debt and actual debt was highest for young households indicating that they were the most likely to be liquidity constrained. Crook (2001) examined data from the 1995 SCF and found that households headed by an individual over age 55 had a reduced demand for total debt (defined as mortgages, home equity loans, credit card and installment debt). Current income was positively related to the demand for debt, while income-squared was negatively related. In addition, risk aversion and net worth were negatively related to the demand for debt. Although family size was positively related to the demand for debt, gender and race were not significantly related. Crook also showed that households over age 55 were less likely to be credit constrained. However, households with lower levels of income and net worth, those who rented, and African-American households were more likely to be credit constrained. The probability of being credit constrained was not related to gender or marital status. Livingstone and Lunt (1992) found that, except for age, socioeconomic factors played a relatively minor role in personal debt and debt repayment. Their results showed that younger households were more likely to be in debt than other households were.

A strong increase in the use of credit cards across income groups was a major finding in a study by Bird et al. (1999), who reviewed SCF data from 1983, 1989, 1992, and 1995. The authors noted that the intensity of the growth in credit card debt among the poor was the most surprising result. Poor households seemed to use good economic periods to acquire new cards and to pay off large balances acquired during bad times when income was low. Castronova and Hagstrom (2004) examined data on credit cards from the 1998 SCF and concluded that consumers made decisions in two stages. First, consumers obtained credit card limits and then they chose what fraction of those limits to keep as a balance. Castronova and Hagstrom found that borrowing through credit cards by the self-employed was driven by the needs of small business, not by consumer and household finances. Also, being a large household seemed to induce more borrowing.

Kim and DeVaney (2001) found that there were some differences in the determinants of the likelihood of having an outstanding credit card balance and the amount of the balance. They examined data from the 1998 SCF and found that while education and income were negatively related to the probability of carrying a credit card balance, they were positively related to the amount of outstanding balance.

Using data from the SCF, Bertaut and Haliassos (2004) considered trends in ownership of bank-type credit cards. These types of credit cards were more likely to be held by household heads between age 35 and 64 than by older or younger household heads. However, card ownership almost doubled for household heads younger than 35 and for those older than 65

between 1983 and 2001. Younger households were much more likely to carry an outstanding credit card balance than older households. Bertaut and Haliassos found that in the earlier waves of the SCF, card-holding households in the lowest income groups were less likely to carry a credit card balance than the households in the higher income groups. This relationship was reversed in the later waves of the SCF. In the 1998 and 2001 surveys, a larger fraction of low-income cardholders revolved credit than did middle-income households.

Finally, Lee and DeVaney (2000) focused on installment loans with data from the 1998 SCF. They found that younger consumers and less educated consumers held larger installment loans. Net worth was positively related to the amount of the installment loan. However, household size did not influence the amount of the installment loan.

The studies we have reviewed reveal that age is a significant determinant of both the likelihood of holding debt and the amount of debt that households hold. In addition, other household characteristics such as total household assets, income, and education play an important role in regard to both of these decisions.

3. Empirical model

This paper investigates both (a) the likelihood of holding different types of debt and (b) the amount of debt compared to total assets over the life cycle. The amount of debt relative to household assets has more important consequences on household well being than the amount of debt itself. According to the life cycle theory and previous literature on debt holdings, we expect to find the following results with respect to (1) the age of the head of the household and (2) the amount of financial and non-financial assets:

H1a: As the head of household becomes older, the likelihood of holding any type of debt decreases.

H1b: As the head of the household becomes older, the amount of total debt compared to total assets decreases. However, the pattern might vary for different types of debt because the needs of the household change with the age of the household head.

H2a: As financial assets increase, the likelihood of holding any type of debt decreases. The negative effect of financial assets on the likelihood of holding debt increases (in absolute values) for some types of debt, such as credit card balances, as the household head gets older. On the other hand, the effect of non-financial assets on the likelihood of holding any type of debt might differ. As non-financial assets increase, we expect to find that the likelihood of holding secured debt such as mortgages, installments, and other debt increases.

H2b: As financial assets increase, the amount of debt relative to total assets decreases, but the effect of assets also depends on the age of the household head. We expect to find that the effect of financial assets on the amount of debt compared to total assets increases with the age of the household head for most types of debt, especially for credit card balances. The effect of non-financial assets on the ratio of debt compared to total assets depends on the type of debt.

We classify debt into four categories: mortgage debt, installment debt, outstanding credit card balance, and other debt. We use probit models to estimate the determinants of the

likelihood of holding each type of debt and tobit models to estimate the determinants of the amount of debt compared to household assets. Tobit analysis allows for censoring at zero when the household does not hold any debt.

We analyze the effect of the age of the household head on both aspects of the decision, controlling for other socioeconomic and demographic variables that might affect the likelihood and the amount of debt holdings. Both financial and non-financial assets are likely to have different effects at different ages of the household head. Therefore, we include interaction terms for financial and non-financial assets and the age of the household head in the estimation of our model.

4. Data

The data for this study are taken from the 2001 SCF, a cross-sectional survey sponsored by the Board of Governors of the Federal Reserve System (Kennickell, 2003). The sample used in this study consists of 4,261 households.[1] The SCF provides detailed information on household assets, liabilities, and other household characteristics. In particular, it asks respondents about the amount of each type of debt that the households have. This information is used to classify total debt into mortgage debt, outstanding credit card balance, installment debt, and other debt. Mortgage debt includes all home-secured mortgages. Credit card balance is the total amount owed on all credit cards after the most recent payments. Installment debt includes loans for vehicles, and consumer and educational loans. Other debt includes loans on insurance policies, loans for other residential and nonresidential property, loans for businesses, loans against pension plans, and other lines of credit.

4.1. Descriptive statistics of the sample

Table 1 presents the univariate statistics and the description of the variables used in the empirical estimation. The median household in our sample is headed by a 47-year-old, married, Caucasian male who is not willing to undertake financial risk for above average financial return. The median household income is $42,070, while median financial assets and non-financial assets are $26,800 and $106,400, respectively.

Table 2 shows the percentage of households holding each type of debt, classified by the age of the household head for poor (having assets below the sample median) and wealthier (having assets above the sample median) households. When the percentage of households holding each type of debt was compared by age, the distribution of those holding any type of debt, and especially those holding mortgage debt and credit card balances, was hump-shaped for both poor and wealthier households. The proportion holding installment debt declined with age for both groups. Although the distribution of those holding different types of debt by age was similar for poor and wealthier households, there were some differences in terms of the percentages of households holding debt in each age group. First, a lower percentage of households in the poor group held mortgage and other debt compared to wealthier households in the same age group. Second, the percentage of households that had outstanding credit card balance in each age group among poor households was higher than

Table 1
Variable description and univariate statistics

Variable name	Mean or frequency	Median	Description
AGE	49.4	47	Age of the household head
FINASSET	$199,701	$ 26,800	Financial assets including liquid assets, CDs, stocks, bonds, retirement accounts, mutual funds, and other financial assets
NONFIN	$279,257	$106,400	Non-financial assets including house, vehicles, other residential and non-residential property, business, and other non-financial assets
ASSET	$478,959	$151,800	Financial and non-financial assets
MORTGAGE	$ 43,661	0	Home-secured mortgage debt
CCBALANCE	$ 1,892	0	Outstanding credit card balances
INSTALLMENT	$ 6,861	0	Installment debt including loans for vehicles, consumer, and educational loans
OTHERD	$ 10,323	0	Other debt including loans on insurance policies, loans for other residential and non-residential property, loans for businesses, loans against pension plans, and other lines of credit
DEBT	$ 62,736	$ 18,160	Total debt including mortgage debt, credit card balances, installment debt, and other debt
INCOME	$ 71,984	$ 42,070	Household income earned from all sources
COLLEGE	0.353		= 1 if the household head is a college graduate; = 0 otherwise
MARRIED	0.622		= 1 if the household head is married; = 0 otherwise
FEMALE	0.252		= 1 if the household head is a single female; = 0 otherwise
WHITE	0.784		= 1 if the household head is Caucasian; = 0 otherwise
CHILDREN	0.719		The number of children living in the household
POORHEA	0.054		= 1 if the household head is in poor health; = 0 otherwise
RISKY	0.235		= 1 if the household head is willing to undertake financial risks for above average return; = 0 otherwise
SELFEMP	0.120		= 1 if the household head is self-employed; = 0 otherwise
RETIRED	0.182		= 1 if the household head is retired; = 0 otherwise

Note: Data are taken from the 2001 Survey of Consumer Finances. The sample includes 4,261 households. Both variable means and medians are calculated using the sample weights.

the wealthier households. For example, while 44.2 and 26.5% of poor households headed by persons between ages 60 and 69 and above age 70, respectively, had outstanding credit card balance, only 31.5 and 17.5% of wealthier households in the same age groups, respectively, had outstanding credit card balance. In general, the percentage of households with installment debt in the poor group was lower than the wealthier households except for those in the age 70 and above group.

Table 2
Likelihood of holding different types of debt by age and wealth, in percentage

	%HH	DEBT	MORTGAGE	CCBALANCE	INSTALLMENT	OTHERD
ALL HH	100.0	77.4	46.8	45.4	46.0	14.9
ASSET Below $151,800:						
Age below 30	10.8	82.8	19.6	53.7	65.0	10.8
30–39	10.9	84.4	35.0	55.2	60.6	13.0
40–49	10.5	81.2	33.9	55.4	51.9	9.2
50–59	6.0	74.4	32.0	54.1	44.5	11.9
60–69	4.7	71.9	27.4	44.2	32.2	10.1
70 and more	7.1	39.7	13.8	26.5	15.1	2.6
ASSET Above $151,800:						
Age below 30	1.8	93.8	82.5	34.7	69.3	21.1
30–39	8.0	97.8	87.2	54.7	67.5	22.4
40–49	13.8	94.7	85.5	51.5	52.6	21.4
50–59	10.8	87.3	71.8	43.6	42.5	25.0
60–69	6.8	71.4	51.3	31.5	34.4	16.8
70 and more	8.8	36.0	18.5	17.5	9.2	11.7
FINASSET						
Below $3,140	25.0	72.6	27.2	46.2	45.8	9.5
$3,140–26,800	25.0	82.0	44.8	54.4	53.2	12.4
$26,800–122,710	25.0	80.3	58.1	48.9	50.9	16.0
$122,710–397,400	15.0	77.0	59.6	37.0	39.4	19.5
Above $397,400	10.0	70.9	53.7	24.2	25.9	25.4
NONFIN						
Below $18,400	25.0	67.4	1.1	45.5	43.2	9.8
$18,400–106,400	25.0	77.8	46.6	51.1	50.4	9.8
$106,400–229,540	25.0	83.0	69.9	47.2	51.7	12.7
$229,540–463,700	15.0	80.1	69.8	39.4	40.6	21.5
Above $463,700	10.0	83.4	69.9	35.1	35.7	36.4

Note: Data are taken from the 2001 Survey of Consumer Finances. The sample includes 4,261 households. Variable means are calculated using the sample weights. Variables are described in Table 1.

Table 2 also provides the percentage of households holding debt by household financial and non-financial assets. In general, as the level of financial and non-financial assets increased, there was an increase in the likelihood of debt up to a certain level of assets for mortgage debt, credit card balances, and installment debt. However, the peak of the distribution varied for each type of debt. For example, households in the 25–50 percentile of financial assets distribution had the highest probability of holding credit card balances and installment debt. Overall, the likelihood of holding other debt increased with financial and non-financial assets.

The next step was to develop a debt/assets ratio for each type of debt and compare the ratio value (for each type of debt/assets) by age for poor (those who have assets below the sample median) and wealthier (those who have assets above the sample median) households. Table 3 provides debt/asset ratios for total debt, mortgage, credit card balances, installment, and other debt conditional on holding debt. From now on, we will refer to total debt compared to total assets as debt/assets, mortgage debt compared to total assets as mortgage/assets,

Table 3
Average debt ratios by age and wealth conditional on holding debt

	DEBT	MORTGAGE	CCBALANCE	INSTALLMENT	OTHERD
	ASSETS	ASSETS	ASSETS	ASSETS	ASSETS
ALL HH	0.421	0.319	0.101	0.243	0.125
ASSET Below $151,800:					
Age below 30	0.784	0.580	0.239	0.590	0.221
30–39	0.681	0.577	0.168	0.417	0.209
40–49	0.524	0.439	0.146	0.358	0.103
50–59	0.477	0.365	0.140	0.278	0.327
60–69	0.325	0.297	0.137	0.211	0.232
70 and more	0.335	0.416	0.151	0.183	0.302
ASSET Above $151,800:					
Age below 30	0.447	0.414	0.013	0.074	0.105
30–39	0.377	0.338	0.020	0.057	0.110
40–49	0.293	0.262	0.015	0.053	0.083
50–59	0.214	0.205	0.015	0.041	0.063
60–69	0.166	0.170	0.020	0.027	0.095
70 and more	0.089	0.123	0.007	0.029	0.046
FINASSET					
Below $3,140	0.736	0.472	0.264	0.553	0.319
$3,140–26,800	0.489	0.464	0.083	0.250	0.123
$26,800–122,710	0.313	0.301	0.029	0.097	0.085
$122,710–397,400	0.186	0.184	0.009	0.035	0.080
Above $397,400	0.102	0.094	0.004	0.022	0.058
NONFIN					
Below $18,400	0.689	0.418	0.309	0.667	0.320
$18,400–106,400	0.437	0.417	0.053	0.214	0.106
$106,400–229,540	0.367	0.353	0.024	0.072	0.071
$229,540–463,700	0.276	0.256	0.015	0.038	0.099
Above $463,700	0.182	0.161	0.008	0.025	0.076

Note: Data are taken from the 2001 Survey of Consumer Finances. The sample includes 4,261 households. Variable means are calculated using the sample weights. Variables are described in Table 1.

credit card balances compared to total assets as ccbalance/assets, installment debt compared to total assets as installment/assets, and other debt compared to total assets as otherd/assets.

Compared to wealthier households, the ratio values for all types of debt were much higher for poor households across age groups. For example, the ratio values for mortgage debt and credit card balances were 0.557 and 0.168, respectively, for the poor households in the age category 30 to 39, and 0.338 and 0.020, respectively, for the wealthier households in the same age category. The overall pattern for poor and wealthier households was that the ratio value for each type of debt decreased as age increased. However, ratio values for mortgage debt and credit card balances increased for the oldest group (age 70 and above) among poor households. When poor households with a head older than age 70 held mortgage debt and credit card balances, there was an increase in the ratio value compared to households with a head between age 60 and 69. Tables 2 and 3 show that older households were less likely to hold mortgage debt and credit card balances, whether poor or wealthier. However, for

those carrying these types of debt among poor households, the ratio of debt compared to total assets was higher than it was for the age category 60 to 69.

Table 3 also provides the ratio value of debt by the level of financial and non-financial assets. The findings show that the values of debt ratios declined as household financial and non-financial assets increased. This pattern of declining ratio value (of debt category/total assets) for increasing level of assets was consistent for total debt, mortgage debt, credit card balances, and installment debt. For example, households in the bottom 25th percentile of the financial wealth distribution had a high ratio for ccbalance/assets (0.264) and installment/asset (0.553). However, those in the top 10th percentile of the financial distribution had very small ccbalance/assets and installment/assets ratios, 0.004 and 0.022, respectively. Tables 2 and 3 show that while households in the upper wealth distribution held credit card balances or installment debt, the amount of credit card and installment debt compared to their total assets was very small.

Tables 2 and 3 show that there is a strong relationship between age, financial and non-financial assets, and (a) the likelihood of holding different types of debt, and (b) the amount of debt compared to total assets. The next step is to investigate the significance of this relationship and the significance of age and asset interaction terms, controlling for other household characteristics.

5. Results

5.1. Probability of holding debt

The determinants of holding any type of debt were estimated using probit models. The predictor variables consisted of age, age-squared, financial and non-financial assets, household income, education, marital status, gender, race, the number of children, health status, risk tolerance, and employment status. Interaction variables for age and level of financial and non-financial assets were also included in the estimation of the probit model to control for the impact of assets on the probability of holding each type of debt at different ages.

The results for each type of debt were examined separately. Table 4 presents the estimated coefficients and standard errors of the probit model of each type of debt. Estimated coefficients of the probit models provide information on the direction of the relationship between dependent and independent variables. We also calculated the marginal effects to provide information about change in the probability of holding each type of debt with respect to a given independent variable. This table also provides the marginal effects calculated at the sample mean values.[2] To investigate our hypothesis about the effect of age and financial and non-financial assets on the likelihood of holding debt over the lifecycle, the estimated coefficients of the probit models were used to calculate the marginal effects of age at different ages (30, 40, 50, 60, and 70) at the sample mean values of financial and non-financial assets and other dependent variables.[3] These results are presented in Table 5. In addition, Table 5 presents the marginal effects of financial and non-financial assets at different ages. In this section, we discuss the results presented in Tables 4 and 5 together. We

Table 4
Probit estimates for holding different types of debt

	DEBT		MORTGAGE		CCBALANCE		INSTALLMENT		OTHERD	
	Coeff	ME	Coeff	ME	Coeff	ME	Coeff	ME	Coeff	ME
CONSTANT	−0.1098		−8.2034***		0.3158		1.2533***		−2.6086***	
	0.3460		0.4903		0.3416		0.3479		0.4068	
AGE	0.0402***	−0.007	0.1720***	−0.009	0.0533***	−0.007	0.0033	−0.011	0.0113	−0.001
	0.0092		0.0118		0.0093		0.0094		0.0102	
AGE^2/100	−0.0368***		−0.0624***		−0.0404***		−0.0156		−0.0280***	
	0.0091		0.0102		0.0090		0.0096		0.0107	
ln (FINASSET)	0.0555**	−0.003	−0.0026	−0.012	0.0933***	−0.005	−0.0309	−0.016	0.0355	0.005
	0.0266		0.0321		0.0248		0.0261		0.0320	
ln (NONFIN)	0.1528***	0.025	0.9067***	0.163	0.0358*	0.006	0.1280***	0.029	0.0246	0.026
	0.0223		0.0523		0.0211		0.0239		0.0342	
Ln (FINASSET)*AGE	−0.0014***		−0.0005		−0.0022***		−0.0002		−0.0003	
	0.0005		0.0006		0.0005		0.0005		0.0006	
Ln (NONFIN)*AGE	−0.0011***		−0.0100***		−0.0004		−0.0011**		0.0014**	
	0.0004		0.0008		0.0004		0.0005		0.0007	
ln (INCOME)	−0.0977***	−0.025	−0.3015***	−0.119	-0.1769***	−0.068	−0.1449***	−0.056	0.0571**	0.016
	0.0245		0.0262		0.0250		0.0243		0.0257	
COLLEGE	0.0042	0.001	0.0951*	0.038	−0.1544***	−0.059	−0.0977**	−0.038	0.0002	0.000
	0.0553		0.0523		0.0486		0.0493		0.0535	
MARRIED	0.2884***	0.075	0.3463***	0.137	0.1854***	0.071	0.2111***	0.082	−0.1455**	−0.041
	0.0707		0.0729		0.0660		0.0667		0.0735	
FEMALE	0.0165	0.004	−0.1807**	−0.071	0.0323	0.012	−0.1657**	−0.064	−0.1305	−0.036
	0.0784		0.0847		0.0724		0.0748		0.0868	
WHITE	−0.0409	−0.011	−0.0158	−0.006	−0.1273**	−0.049	0.0284	0.011	0.0534	0.015
	0.0665		0.0645		0.0555		0.0574		0.0693	
CHILDREN	0.0087	0.002	0.0615***	0.024	−0.0452**	−0.017	-0.0165	−0.006	−0.0140	−0.004
	0.0251		0.0226		0.0201		0.0202		0.0225	
POORHEA	−0.1260	−0.033	−0.1323	−0.052	−0.2792***	−0.107	−0.3254***	−0.126	0.2596**	0.072
	0.1111		0.1199		0.1066		0.1127		0.1251	
RISKY	0.1475***	0.038	0.0923*	0.037	−0.0218	−0.008	0.0700	0.027	0.1418***	0.040
	0.0560		0.0515		0.0491		0.0489		0.0507	
SELFEMP	−0.1689***	−0.044	−0.4561***	−0.180	−0.2394***	−0.092	−0.3447***	−0.134	0.1236**	0.034
	0.0645		0.0610		0.0563		0.0561		0.0589	
RETIRED	−0.4032***	−0.105	−0.5324***	−0.211	−0.3347***	−0.128	−0.3221***	−0.125	−0.1875**	−0.052
	0.0806		0.0862		0.0880		0.0891		0.0924	
Log likelihood	−1936.3		−2128.8		−2508.9		−2441.6		−1989.1	
Pseudo R2	0.178		0.276		0.109		0.147		0.105	

Note: Coeff represents the coefficient estimates of the model. Standard errors are reported below the coefficients. ME represents the marginal effects calculated at the sample weighted means. See Notes 2 and 3 for the calculation of marginal effects. Variables are described in Table 1.

*** Significant at the 1% level; ** significant at the 5% level; * significant at 10% level.

Table 5
Marginal effects on probability of holding different types of debt

	DEBT		MORTGAGE		CCBALANCE		INSTALLMENT		OTHERD	
AGE										
AGE_30	−0.003	***	0.001		−0.001		−0.009	***	0.002	
AGE_40	−0.005	***	−0.004	***	−0.004	***	−0.010	***	0.001	
AGE_50	−0.007	***	−0.009	***	−0.007	***	−0.011	***	−0.001	
AGE_60	−0.009	***	−0.014	***	−0.010	***	−0.012	***	−0.003	***
AGE_70	−0.011	***	−0.019	***	−0.013	***	−0.013	***	−0.004	***
FINASSET										
AGE_30	−0.003		−0.007		0.011	**	−0.015	***	0.007	
AGE_40	0.000		−0.010	*	0.003		−0.016	***	0.006	*
AGE_50	−0.004		−0.012	***	−0.006		−0.016	***	0.005	
AGE_60	−0.007	**	−0.014	***	−0.014	***	−0.017	***	0.004	
AGE_70	−0.011	***	−0.016	***	−0.022	***	−0.018	***	0.004	
NONFIN										
AGE_30	0.031	***	0.240	***	0.009	**	0.037	***	0.018	***
AGE_40	0.028	***	0.200	***	0.007	**	0.033	***	0.022	***
AGE_50	0.025	***	0.161	***	0.005		0.029	***	0.026	***
AGE_60	0.022	***	0.121	***	0.004		0.025	***	0.030	***
AGE_70	0.019	***	0.081	***	0.002		0.020	***	0.034	***

Note: The marginal effect of AGE calculated at the weighted sample means (financial assets = $199,701 and non-financial assets = $279,257). Notes 2 and 3 explain how the marginal effects of AGE, FINASSET, and NONFIN are calculated. The marginal effects present the change in the likelihood of holding debt for a unit-change in AGE and 100% change in FINASSET and NONFIN.

*** Significant at the 1% level; ** significant at the 5% level; * significant at 10% level.

first discuss the effect of age and financial and non-financial assets on the probability of holding any type of debt and then discuss the effects of other independent variables.

5.1.1. The effect of age on total debt, mortgage debt, credit card balances, installment, and other debt

As shown in Table 5, the marginal effects demonstrate that the likelihood of holding all types of debt decreases with the age of the household head. The negative effect of age for all types of debt increases (in absolute value) as the age of the head of the household increases. The negative effect of age is largest for mortgage debt, credit card balances, and installment debt and is only significant for other debt for households with heads older than age 60.

5.1.2. The effect of financial assets on total debt, mortgage debt, credit card balances, installment, and other debt

Financial assets have a negative effect on the likelihood of holding any type of debt, mortgage debt, and installment debt. The negative effect of financial assets on the probability of holding these types of debt increases (in absolute value) with the age of the household head as financial assets increase. For credit card balances, financial assets have a positive effect below age 30 and a negative effect above age 60. For other debt, financial assets seem to have no effect on the likelihood of holding debt. See Table 5 for the marginal effect of financial assets.

5.1.3. The effect of non-financial assets on total debt, mortgage debt, credit card balances, installment, and other debt

Non-financial assets have a positive effect on the likelihood of holding any type of debt, mortgage, installment, and other debt. For credit card balances, non-financial assets have a positive effect below age 40 and no effect above age 40. Although the positive effect of non-financial assets on the likelihood of holding any type of debt, mortgage, and installment debt decreases with the age of the household head, the positive effect of non-financial assets on the likelihood of holding other debt increases with the age of the household head. See Table 5 for the marginal effect of non-financial assets.

5.1.4. Other independent variables

Having discussed the effect of age and financial and non-financial assets on the likelihood of holding different types of debt, we return to Table 4 to illustrate the effect of other independent variables. Household income is negatively associated with the probability of holding any type of debt, mortgage debt, credit card balances, and installment debt and positively associated with the probability of holding other debt. Compared to household heads without a college education, those with a college education are less likely to hold credit card balances and installment debt.

Marital status and gender have significant effects on the likelihood of holding debt. Married couples are more likely than single male heads of households to hold any type of debt, mortgage debt, credit card balances, and installment debt and less likely to hold other debt. Female heads of households, on the other hand, are less likely to hold mortgage and installment debt than single male heads of households. The number of children living in the household has a positive effect on the probability of holding mortgage debt and a negative effect on the probability of holding credit card balances.

White households are less likely to hold credit card balances than minority households. However, the race of the household head does not seem to affect the likelihood of holding other types of debt. Those that report poor health status are less likely to hold credit card balances and installment debt and more likely to hold other debt. The marginal effect of risk tolerance is positive for other debt. The probability of holding other debt increases for those willing to assume above average or substantial risk, all else equal. Self-employed household heads are less likely to hold mortgage debt, credit card balances, and installment debt and more likely to hold other debt. Finally, retired heads of a household are less likely to hold all types of debt.

In summary, the age of the household head has a strong effect on the probability of holding each type of debt. We hypothesized that the likelihood of holding debt decreases as the age of the household head increases. Our summary statistics in Tables 2 and 3 show that the likelihood of holding debt is hump-shaped with respect to age. However, after controlling for other household characteristics, our results show that the likelihood of holding debt decreases with the age of the household head for most types of debt.

Our results support our hypothesis that the likelihood of holding most types of debt is associated with lower financial assets. In terms of non-financial assets, our hypothesis was that there is a significant relationship between non-financial assets and the likelihood of holding debt. However, the sign of the relationship should depend on the type of the debt.

Our results show that the amount of non-financial assets held by households has a significant positive effect on the likelihood of holding secured debt. Furthermore, household demographics, especially income, education, marital status, being self-employed, and being retired have significant effects on the probability of holding both secured and unsecured debt. The final step was to examine the amount of different types of debt compared to total assets, using tobit models.

5.2. Results of the tobit models

The results from tobit models on the amount of each type of debt compared to total assets are presented in Table 6. The marginal effects of age, financial and non-financial assets, and other household characteristics on debt ratios for households that hold positive amounts of debt are calculated at the mean values and also presented in Table 6.[4] The marginal effects of varying age levels are calculated in Table 7.[5] In addition, Table 7 presents the marginal effects of financial and non-financial assets at different ages. We will simultaneously discuss the results presented in Tables 6 and 7.

5.2.1. The effect of age on debt/assets, mortgage/assets, ccbalance/assets, installment/assets, and otherd/assets

As shown in Table 7, age has a negative effect on all of the debt ratios except other/assets. Also, the negative effect in general increases (in absolute values) as the age of the household head increases.

5.2.2. The effect of financial assets on debt/assets, mortgage/assets, ccbalance/assets, installment/assets, and otherd/assets

The marginal effect of financial assets on debt/asset, mortgage/asset, ccbalance/assets, and installment/assets is significant and negative. However, this negative effect increases (in absolute values) for ccbalance/assets and decreases (in absolute values) for other types of debt as the age of the household head increases. Financial assets have no significant effect on the otherd/assets ratio. See Table 7 for the marginal effect of financial assets on debt ratios.

5.2.3. The effect of non-financial assets on debt/assets, mortgage/assets, ccbalance/assets, installment/assets, and otherd/assets

Non-financial assets have a large positive effect on mortgage/assets. The positive effect on mortgage/assets, however, declines with the age of the household head. Also, non-financial assets have a positive effect on the ratios of installment/assets and otherd/assets and a negative effect on the ccbalance/assets ratio. The marginal effects of non-financial assets on debt ratios are presented in Table 7.

5.2.4. Other independent variables

As shown in Table 6, household income has a significant negative effect on mortgage/assets, ccbalance/assets, and installment/assets. Households headed by persons with a college degree have higher amounts of debt/assets compared to those headed by persons without

Table 6
Tobit estimates of debt ratios

	DEBT ASSETS			MORTGAGE ASSETS			CCBALANCE ASSETS			INSTALLMENT ASSETS			OTHERD ASSETS		
	Coeff		ME	Coeff		ME	Coeff		ME	Coeff		ME	Coeff		ME
CONSTANT	1.1912	***		−1.6038	***		0.3252	***		1.1862	***		−0.4736	***	
	0.1222			0.1191			0.1007			0.1615			0.1093		
AGE	−0.0097	***	−0.004	0.0363	***	−0.002	0.0074	***	−0.001	−0.0141	***	−0.003	0.0024		−0.000
	0.0032			0.0030			0.0027			0.0042			0.0028		
AGE^2/100	−0.0054	*		−0.0123	***		−0.0100	***		−0.0028			−0.0073	**	
	0.0033			0.0026			0.0027			0.0045			0.0029		
ln (FINASSET)	−0.0799	***	−0.020	−0.0336	***	−0.009	0.0008		−0.003	−0.0683	***	−0.010	−0.0071		0.001
	0.0092			0.0077			0.0072			0.0116			0.0087		
ln (NONFIN)	0.0230	***	−0.015	0.2369	***	0.040	−0.0306	***	−0.006	0.0199	*	0.003	0.0141		0.004
	0.0082			0.0123			0.0059			0.0107			0.0090		
ln (FINASSET)*AGE	0.0006	***		0.0002			−0.0003	**		0.0006	**		0.0002		
	0.0002			0.0001			0.0001			0.0002			0.0002		
ln (NONFIN)*AGE	−0.0002			−0.0026	***		0.0002	**		−0.0001			0.0001		
	0.0002			0.0002			0.0001			0.0002			0.0002		
ln (INCOME)	−0.0048		−0.002	−0.0778	***	−0.029	−0.0189	**	−0.004	−0.0318	***	−0.008	0.0002		0.000
	0.0086			0.0065			0.0076			0.0118			0.0069		
COLLEGE	0.0452	**	0.019	0.0010		0.000	−0.0135		−0.003	0.0270		0.007	0.0010		0.000
	0.0179			0.0126			0.0140			0.0225			0.0147		
MARRIED	0.0316		0.013	0.0790	***	0.029	0.0209		0.005	0.0342		0.009	−0.0389	*	−0.008
	0.0244			0.0182			0.0190			0.0304			0.0201		
FEMALE	−0.0105		−0.004	−0.0347		−0.013	0.0032		0.001	−0.0392		−0.010	−0.0531	**	−0.011
	0.0274			0.0211			0.0207			0.0342			0.0239		
WHITE	0.0210		0.009	−0.0211		−0.008	0.0044		0.001	0.0132		0.003	0.0293		0.006
	0.0211			0.0153			0.0156			0.0256			0.0191		
CHILDREN	−0.0123	*	−0.005	0.0116	**	0.004	−0.0074		−0.002	−0.0330	***	−0.008	-0.0043		−0.001
	0.0074			0.0051			0.0058			0.0092			0.0062		
POORHEA	0.0252		0.011	−0.0233		−0.008	−0.0374		−0.009	−0.1100	**	−0.026	0.1519	***	0.036
	0.0402			0.0297			0.0307			0.0532			0.0327		
RISKY	0.0629	***	0.027	0.0114		0.004	0.0048		0.001	0.0557	**	0.014	0.0457	***	0.010
	0.0176			0.0122			0.0144			0.0224			0.0139		
SELFEMP	−0.0850	***	−0.034	−0.1692	***	−0.055	−0.0305	*	−0.007	−0.1157	***	−0.028	0.0391	**	0.008
	0.0204			0.0144			0.0167			0.0266			0.0161		
RETIRED	−0.1427	***	−0.057	−0.1539	***	−0.052	−0.0731	***	−0.017	−0.1234	***	−0.030	−0.0496	*	−0.010
	0.0313			0.0229			0.0268			0.0442			0.0255		
Sigma	0.469			0.291			0.314			0.508			0.288		
Log Likelihood	−2857.8			−1452.8			−1524.2			−2358.9			−1237.0		

Note: Coeff represents the coefficient estimates of the model. Standard errors are reported below the coefficients. ME represents the marginal effects calculated at the sample weighted means. See Notes 4 and 5 for the calculation of marginal effects. Variables are described in Table 1.
*** Significant at the 1% level; ** significant at the 5% level; * significant at 10% level.

Table 7
Marginal effects on debt ratios

	DEBT ASSETS		MORTGAGE ASSETS		CCBALANCE ASSET		INSTALLMENT ASSETS		OTHERD ASSETS	
AGE										
AGE_30	−0.003	***	−0.001		0.000		−0.003	***	0.000	
AGE_40	−0.004	***	−0.002	***	0.000	*	−0.003	***	0.000	
AGE_50	−0.004	***	−0.003	***	−0.001	***	−0.003	***	0.000	
AGE_60	−0.005	***	−0.003	***	−0.001	***	−0.003	***	−0.001	***
AGE_70	−0.005	***	−0.004	***	−0.002	***	−0.003	***	−0.001	***
FINASSET										
AGE_30	−0.026	***	−0.010	***	−0.002	**	−0.013	***	0.000	
AGE_40	−0.023	***	−0.010	***	−0.003	***	−0.012	***	0.000	
AGE_50	−0.020	***	−0.009	***	−0.004	***	−0.010	***	0.001	
AGE_60	−0.018	***	−0.008	***	−0.004	***	−0.009	***	0.001	
AGE_70	−0.015	***	−0.007	***	−0.005	***	−0.008	***	0.001	
NONFIN										
AGE_30	0.007	***	0.059	***	−0.006	***	0.004	***	0.004	***
AGE_40	0.007	***	0.049	***	−0.005	***	0.004	***	0.004	***
AGE_50	0.006	***	0.039	***	−0.004	***	0.003	***	0.004	***
AGE_60	0.005	***	0.029	***	−0.004	***	0.003	**	0.004	***
AGE_70	0.004	**	0.019	***	−0.003	***	0.003		0.005	***

Note: The marginal effect of AGE calculated at the weighted sample means (financial assets = $199,701 and non-financial assets = $279,257). Notes 2 and 3 explain how the marginal effects of AGE, FINASSET, and NONFIN are calculated. The marginal effects present the change in the debt/asset ratio for a one-unit change in AGE and a 100% change in FINASSET and NONFIN.

college education. College education does not significantly affect the other debt ratios. Like the results of the probit model for mortgage debt, the head of household's marital status and the number of children have significant positive effects on the amount of mortgage debt compared to total assets. Also, those with more children have lower amounts of installment/assets, and compared to single males, married couples and households headed by single females have lower amounts of otherd/asset.

The race of the household head does not significantly affect the amount of different types of debt compared to total assets. Being in poor health has a negative effect on the installment/assets and a positive effect on otherd/assets. Households headed by persons who are willing to take average and above average risks have higher installment and other debt ratios than their counterparts. Finally, self-employment and retirement have significant effects on the debt ratios. For example, those that are self-employed have a lower amount of mortgage/assets, ccbalance/assets, and installment/assets but a higher amount of otherd/assets. Households headed by retired persons have lower levels of each type of debt ratio.

We hypothesized that the amount of the total debt compared to total assets decreases with age. The pattern for different types of debt, however, should be different. Our results show that the debt ratios decrease with the age of the household head for most types of debt. We also expected to find that higher debt ratios are associated with lower financial assets, and our results support our hypothesis for most types of debt. In terms of the non-financial assets, our hypothesis was that the sign of the relationship between the debt ratios and the non-financial

assets should depend on the type of the debt. Our results confirm that the amount of non-financial assets held by households has a significant positive effect on the amount of secured debt compared to total assets and a negative effect on the amount of credit card balances compared to total assets. Furthermore, other household characteristics, such as income, marital status, willingness to take risk for higher financial returns, being self-employed, and being retired have significant effects on the debt ratios. However, household characteristics play a less important role on the credit card balance and installment debt ratios than the likelihood of holding these types of debt.

6. Conclusions

Using data from the 2001 SCF, this study has investigated the likelihood of holding each type of household debt and the amount of each type of debt compared to total assets over the life cycle. Another focus was the effect of financial and non-financial assets on both the likelihood of holding different types of household debt and the amount of debt compared to total assets over the life cycle. The results of the empirical estimation support the implications of the life cycle theory regarding the composition of household debt.

Our results show that both the likelihood of holding debt and the amount of debt compared to total assets decrease with the age of the household head for each type of debt. Our findings also show a negative effect for financial assets on both the likelihood of holding debt and the amount of debt compared to total assets. In terms of non-financial assets, our results show that the amount of non-financial assets held by households has a significant positive effect on both the likelihood of holding secured debt and the amount of secured debt compared to total assets. Although the amount of non-financial assets does not affect the likelihood of holding credit card balances for older households, it does have a negative effect on the credit card balances compared to total assets at all ages. In terms of the other household demographics, household income, being self-employed, and being retired have significant effects on the likelihood of holding both secured and unsecured debt and the amount of these types of debt compared to total assets. Other household characteristics such as marital status, race, education, and the number of children living in the household have a negative effect on the likelihood of holding unsecured debt, while they seem to have no significant effect on the amount of unsecured debt compared to total assets.

Although the popular press has speculated that older households accumulate excessive amounts of mortgage debt and credit balances, our results do not support this claim. Overall, households appear to reduce debt as they approach retirement, an adjustment that is consistent with the life cycle hypothesis of savings. We see a significant decline with age in the likelihood of holding debt and the amount of debt compared to total assets. This negative effect increases (in absolute values) with the age of the household head. However, the results of this paper show that the popular press is correct in predicting that poor older households will have a harder time paying off their credit card balances. The summary statistics show that the percentage of households that have outstanding credit card balance among poor older households is higher than wealthier older households. In addition, compared to poor households with a head between age 60 and 69, when poor households with heads older than age

70 hold mortgage debt and credit card balances, there is an increase in the ratio of balances compared to total assets. Our results also show that households that have accumulated financial assets are able to pay off their credit card balances easily as they get older. However, longitudinal data are needed to determine if older households are having difficulty paying their credit card balances or accumulating new debt. Another question of interest would be to determine what older households are using their credit cards for. For example, if older households are accumulating excessive debt for prescription drugs and medical expenses, this is an important point for policy makers to consider. It would be of interest to investigate the purposes for which older households use their credit cards. Unfortunately, the SCF does not collect information on how the borrowed funds are used.

Notes

1. The 2001 SCF includes 4,442 households. We imposed some sample restrictions to eliminate the outliers from our sample: 138 households that have zero wealth holdings or negative income are dropped from the sample. Also, 43 households that have total debt compared to total assets greater than 5 are excluded from the sample. The estimated coefficients and standard errors do not vary when these households that are considered to be outliers are not removed from our sample. However, the standard deviations of the error terms increase.
2. For example, to calculate the marginal effect of age, we first calculated the derivative of the probability with respect to age. The derivative is

   $$\{\beta_{age} + 2\beta_{age^2}AGE + \beta_{finasset*age}Ln(FINASSET) + \beta_{nonfin*age}Ln(NONFIN)\}*\phi(X\beta),$$

   where β_{age} and β_{age^2} are the coefficients of age and age-squared, respectively; $\beta_{finasset*age}$ and $\beta_{nonfin*age}$ are the coefficients of the interaction terms of the natural logarithm of financial and non-financial assets with age, respectively; $\phi()$ is the standard normal density; $X\beta$ is the probit index. We used the estimated coefficients of the probit model, and the mean values of age, financial and non-financial assets and other independent variables to calculate the marginal effect of age at the sample mean values. To calculate the marginal effect of financial and non-financial assets, we calculated the derivative of the probability with respect to financial and non-financial assets, respectively. The derivates with respect to financial and non-financial assets are

   $$((\beta_{finasset} + \beta_{finasset*age}AGE)/FINASSET)*\phi(X\beta)$$

   and $((\beta_{nonfin} + \beta_{nonfin*age}AGE)/NONFIN)*\phi(X\beta)$,

   where $\beta_{finasset}$ and β_{nonfin} are the coefficients of financial and non-financial assets, respectively. We used the mean values of age and other independent variables to calculate the marginal effect of a 100% change in financial and non-financial assets. See Greene (2003; pp. 674) for details of the calculation of marginal effects.

3. For example, to calculate the marginal effect of age at age 30, we replaced the AGE variable in the derivative of the probability described in Note 2 with 30 and evaluated the derivative at the sample mean values of other independent variables. Please note that although the coefficient of AGE is positive for most types of debt, the marginal effects of AGE presented in Tables 4 and 5 are negative. The total effect of AGE depends on the coefficients of AGE, AGE^2, ln(FINASSET)*AGE, and ln(NONFIN)*AGE. For example, for the probit model of total debt, the estimated coefficients of AGE, $AGE^2/100$, ln(FINASSET)*AGE, and ln(NONFIN)*AGE are 0.0402, −0.0368, −0.0014, −0.0011, respectively. The negative coefficients of ln(FINASSET)*AGE and ln(NONFIN)*AGE show that the negative effect of financial and non-financial assets on the likelihood of holding debt increases (in absolute values) with AGE. The derivative in Note 2, $\{\beta_{age} + 2\beta_{age^2}AGE + \beta_{finasset*age}Ln(FINASSET) + \beta_{nonfin*age}Ln(NONFIN)\}*\phi(X\beta)$, is equal to {0.0402 + 2* (−0.000368)*30 − 0.0014*ln(199,701) − 0.0011* ln(279,257)}* 0.26=−0.003, since $\phi(X\beta)$ evaluated at sample means is equal to 0.26 for the total debt model and the sample mean values of financial and non-financial assets are $199,701 and $279,257, respectively. We repeated the same calculation for ages 40, 50, 60, and 70. Similarly, to calculate the marginal effect of financial and non-financial assets at age 30, we replaced the AGE variable in the derivative of the probability with respect to financial and non-financial assets, respectively, with 30.
4. In tobit models, the marginal effects of independent variables are not just determined by the coefficient of the variable. For example, the marginal effect of AGE is the derivative of the equation with respect to age multiplied by a linear function $X\beta/\sigma$:

$$\{\beta_{age} + 2\beta_{age^2}AGE + \beta_{finasset*age}Ln(FINASSET)$$
$$+ \beta_{nonfin*age}Ln(NONFIN)\}*\{1-\lambda(X\beta/\sigma)[X\beta/\sigma + \lambda(X\beta/\sigma)]\},$$

where β_{age} and β_{age^2} are the coefficients of age and age-squared, respectively; $\beta_{finasset*age}$ and $\beta_{nonfin*age}$ are the coefficients of the interaction terms of natural logarithm of financial and non-financial assets with age, respectively; $\lambda=\phi()/\Phi()$, and σ are the standard deviation of u. We used the estimated coefficients of the tobit model and the mean values of age, financial and non-financial assets, and other independent variables to calculate the marginal effect of AGE at the sample mean values. The marginal effects of financial and non-financial assets are calculated in a similar way. See Greene (2003; pp. 766) for the details of the calculation.
5. For example, to calculate the marginal effect of age at age 30, we replaced the AGE variable in the derivative described in Note 4 with 30 and evaluated it at the sample mean values of other independent variables. Similarly, to calculate the marginal effect of financial and non-financial assets at age 30, we replaced the AGE variable with 30 in the derivative of the probability with respect to financial and non-financial assets, respectively. Please note that although the coefficient of AGE is positive for most types of debt, the marginal effects of AGE presented in Tables 6 and 7 are negative. Similar to the probit model, the total effect of AGE depends on the coefficients of AGE, AGE^2, ln(FINASSET)*AGE, and ln(NONFIN)*AGE. See Note 3.

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References

Ando, A., & Modigliani, F. (1963). The life cycle hypothesis of savings: aggregate implications and tests. *American Economic Review*, *53*, 55–84.

Aizcorbe A. M., Kennickell A. B., & Moore, K. B. (2003). Recent changes in U.S. family finances: evidence from the 1998 and 2001 Survey of Consumer Finances. *Federal Reserve Bulletin*, *89*, 1–32.

Bertaut, C. C., & Haliassos, M. (2004). Credit cards: facts and theories. Conference on the Microfoundations of Credit Contracts. Florence, Italy, May 21–22, 2004.

Bird, E. J., Hagstrom, P. A., & Wild, R. (1999). Credit card debts: high and rising. *Journal of Policy Analysis and Management*, *18*, 125–133.

Breckenridge S., & McGregor J. (2003). Loan rangers. *SmartMoney Magazine*, March 31, 2003.

Castronova, E., & Hagstrom, P. (2004). The demand for credit cards: evidence from the Survey of Consumer Finances. *Economic Inquiry*, *42*, 304–318.

Cox, D., & Jappelli, J. (1993). The effect of borrowing constraints on consumer liabilities. *Journal of Money, Credit, and Banking*, *25*, 197–213.

Crook, J. (2001). The demand for household debt in the USA: evidence from the 1995 Survey of Consumer Finance. *Applied Financial Economics*, *11*, 83–91.

Garman, E. T., & Forgue, R. E. (2003). *Personal finance* (7th ed.). Boston, MA: Houghton Mifflin Company.

Greene, W. H. (2003). *Econometric analysis* (5th ed.). Upper Saddle River, New Jersey: Prentice Hall.

Kennickell, A. B. (2003). *Codebook for 2001 Survey of Consumer Finances.* Washington, DC: Board of Governors of the Federal Reserve System.

Kim, H., & DeVaney, S. A. (2001). The determinants of outstanding balances among credit card revolvers. *Financial Counseling and Planning*, *12*, 67–77.

Lee, S., & DeVaney, S. A. (2000). The effects of consumer's ability, confidence and willingness to pay on the consumer installment borrowing decision. *Proceedings of the Association of Financial Counseling and Planning Education*, 99–107.

Livingstone, S. M., & Lunt, P. K. (1992). Predicting personal debt and debt repayment: psychological, social and economic determinants. *Journal of Economic Psychology*, *13*, 111–134.

Marmon L. (2003). Older Americans going deeper in debt. Available at: http://www.aarp.org/bulletin/yourmoney/Articles/a2003–06-25-olderamericans.html. Accessed June 30, 2003.