The Effects of Credit Constraints on the Sensitivity of Household Debt to Interest Rate Changes

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1. Introduction

Evidence suggests that there are considerable differences in the proportions of the population that report that they are credit constrained between countries. For example Crook and Hochguertel (2008) find that in 2004 the proportion of credit applicants that report being rejected, conditional on application was 30.5%, 11.9% and 4.5% for the US, Italy and Holland respectively and in 2002 it was 5.1% for Spain. Although the periods over which the respondents were asked to assess the success of their applications differed, it is extremely unlikely to account for these differences in proportions. There are many definitions of being 'credit constrained' and a variety of approaches to explaining why a household is credit constrained. However there appears to be no empirical work that compares the interest rates elasticity of those who are credit constrained and those who are not. This is the aim of this paper.

2. Theory

There are many possible definitions of an individual being 'credit constrained'. Attonassio (1994) gives two theoretical definitions of liquidity constraints. A strong definition is when 'an individual or household is liquidity constrained if she is unable for whatever reason to borrow against future earnings beyond a certain limit which may be positive or zero. A weak definition is when the lending rate at which an individual or household can borrow at differs from the rate at which they can lend; in other words the interest rate they pay depends on their net asset position.

Stiglitz and Weiss (1981) propose that at the level of a market the supply of loans may be backward bending and may not intersect the demand curve at any endogenous interest rate, where the demand curve slope is due to less risky potential borrowers dropping out of the market at higher interest rates.

An individual's demand for debt is usually deduced from the PIH (ref). The individual allocates his lifetime's earnings to consumption in each period. Assuming intertemporal separability in utility and exponential discounting the individual aim to maximise the value function at age t

$$V_t = E_t[\sum_{s=t}^{T} \beta^{s-t} u(c_s)],$$

where E_t is the expectations operator given information at time t, u is instantaneous felicity. The term β is a subjective discount factor, $\beta = (1+\delta)^{-1}$ where δ is a subjective rate of time preference. The value function is subject to an asset constraint whereby assets evolve recursively between time periods following R=1+r where r is the borrowing and lending interest rate. Labour income is stochastic. Consumption is then chosen to fulfil the Euler equation

$$u'(c_t) = \beta R E_t u'(c_{t+1}),$$

The demand for debt is created by the desire to have consumption that causes assets to become negative; the value of debt being the difference between A and 0 when A<0. Without assumptions about the utility function or income processes or both closed form solutions are not possible.

If the first definitions of being credit constrained is adopted the demand for debt will be less sensitive to change sin the interest rate than the demand by an unconstrained person. This is because a constrained individual will be at a kink on his intertemporal budget constraint (see Juster and Shay 1964). If the individual cannot borrow at all at any interest rate then the same conclusion applies because a constrained individual will be o a particularly steep part of the constraint. If the weaker definition applies the borrower is able to borrow only less than he would wish if he was not constrained.

We can explain the difference in interest rate sensitivities if we make further assumptions and simulate the individual's consumption path over his life time.

We define an individual as being credit constrained if he is unable to gain the amount of debt he wishes at any given interest rate, the first of Attanasio's definitions. This can be represented as a lower bound on the value of is assets: $A \geq -B$ at t, where $B \geq 0$ is a borrowing limit. If $B = 0$ the individual cannot borrow at all. If $B > 0$ the individual can borrow against human capital if collateral is not available.

If a credit constraint is imposed the Euler equation becomes

$$u'(c_t) = \max\{u'(x_t), \beta R E_t u'(c_{t+1})$$

where $x_t = A_t + y_t$ is cash on hand (Deaton: 1991). Credit constraints break the Euler equation when they are binding and may also affect current saving or borrowing by being anticipated as likely in the future. For example Alessie et al (1988) and Weber (1993) makes the borrowing constraint endogenously dependent on assets and income? respectively and the Euler equation then contains a non-zero lagrange multiplier.

To simulate the consumption choices of the individual we restrict the utility function by assuming a CRRA function

$$u(c_t) = \frac{c_t^{1-\gamma}}{1-\gamma},$$

where γ measures relative risk aversion. This allows for the possibility that an individual will pursue precautionary saving (Carroll 1997) whereby if there is a non positive probability that labour income will fall to zero, he will save and will be less likely to borrow to avoid (in utility terms) catastrophic outcomes. We also assume an individual receives the current realization of permanent income and a transitory multiplicative income shock ε_t. If we model permanent income as an AR (1) process, it grows at rate G and is subject to a permanent shock η_t,

$$y_t = Y_t^p \varepsilon_t,$$

$$Y_t^p = G Y_{t-1}^p \eta_t,$$

and we assume $\varepsilon_t \sim \Lambda(-0.5\sigma_{\varepsilon_t}^2, \sigma_\varepsilon)$ and $\eta_t \sim \Lambda(-0.5\sigma_{\eta_t}^2, \sigma_\eta)$. Income drops to be a constant fraction of pre-retirement earnings, $y_t = \alpha y_{t_{g-1}}, t_g = 1..., T$ in retirement. The model is solved numerically by backward induction where the optimal consumption path is a function of cash on hand (see Deaton 1991).

The resulting consumption path for a base set of parameters is shown in Figure 1. The borrowing constraint prevents assets from dropping below –B and so constrains current consumption. If the interest rate decreases, the annuitised levels of Yp and C will increase and, with unchanged current income, the desired and ex-post stock of debt will increase. The solid line in the lower panel becomes lower. If a borrowing constraint exists then the realised increase in debt is constrained and the ex post volume of debt increases by a smaller amount.

There is very little empirical work that compares the sensitivity of the demand for debt to interest rates between a constrained sample and the sensitivity of the ex post volume of debt to interest rate changes for an unconstrained sample. Juster and Shay (1964) offered respondents a loan with alternative interest rates and maturities. Attanasio (1995) uses data from the CEX estimates demand functions for auto loans. He infers which households are liquidity constrained by assuming they are households of certain age ranges, or with certain levels of liquid assets, or certain levels of educational attainment or of certain races. But the results are not published because they were found to be ‘extremely imprecise’. In updated work Attanasio et al (1999) infers whether households are credit constrained by seeing if the interest rate is significantly related to finance share and if it is for certain groups then those groups are said the be constrained. He finds that those aged 35-55years had significantly negative interest rate parameters whilst other age groups did not, so the former are said to be constrained. A weakness of the Attanasio work is that he does not have an empirical indicator of whether a household is indeed liquidity constrained; he merely tries to infer this. In the following work we use self reported indicators of whether a household is credit constrained. In related work Chakrovarty and Scott (1999) investigate whether a borrower's mortgage rate is related to the existence of pervious defaults and find that it is, but they fail to take into account any of the possible sample selection effects.

3. Empirical Model

We wish to make inferences about two populations: those who are not credit constrained and those who are credit constrained. That is we wish to parameterise the equation

$$d_i^d = \mathbf{x}_i^T \boldsymbol{\beta}_1 + r_i \beta_2 + \varepsilon_{1i}$$

where d_i^d is a continuous random variable that denotes the demand for debt by household i, $\mathbf{x}_i$ denotes a vector of control covariates that explain the demand by household i, r denotes the interest rate paid and ε_{1i} denotes a random error.

For those unconstrained we observe the desired holding of debt and interest rates paid only when the holding is positive. We might expect the demand interest rate elasticity to differ between those who ex post have debt and those who do not so a selection model is appropriate. For those who are constrained we do not observe the ex ante desired stock of debt, merely the ex post constrained amount. When we think of elasticity with respect to interest rates it is the elasticity of the ex-post amount rather than of the ex ante amount of debt. In terms of an intertemporal consumption frontier where the lending rate increases wit the amount borrowed, an increase in the borrowing rate will shift the frontier outwards, result in more debt being desired, but conditional on being on the constrained frontier. Using a sample of constrained households we cannot estimate the elasticity of the ex ante unconstrained demand for this group because we cannot remove those who are unconstrained, by definition.

To correct for the selection bias that may be present in the estimation of elasticity for unconstrained households we adopt a Heckman model as follows,

$$d_i = \mathbf{x}_i^T \boldsymbol{\beta}_1 + r_i \beta_2 + \varepsilon_{1i}$$
$$l_i = \mathbf{z}_i^T \boldsymbol{\gamma} + \varepsilon_{2i}$$

where d_i denotes observed values of debt and $d_i = d_i^d$ if $l_i > 0$ and $d_i = 0$ if $l_i \leq 0$, l_i denotes whether a household has positive debt, $\mathbf{z}_i$ denotes a vector of covariates explaining whether a household has positive debt and $\varepsilon_{1i}, \varepsilon_{2i}$ denote random errors. We assume $\varepsilon_{1i}, \varepsilon_{2i} \sim \text{bivar}(0,0,\sigma_1,\sigma_2,\rho)$ where ρ denotes the bivariate correlation between ε_{1i} and ε_{2i}. ML estimators are available in Heckman (date).

Previous studies which have modelled the demand for debt for a whole population of households, Rosenthal and Duca (1993), Cox and Jappelli (1993), Crook (2001), Crook and Hochguertel (2008), estimate equation (1) together with equation (2) and a further selection equation that predicts whether or not a household is constrained. In this paper we are comparing two separate populations and not making inferences about the population of all households and so the constraint selection equation is not appropriate.

Turning to the constrained population, we make inferences from a sample of constrained households. Clearly to be a member of this group implies that debt is desired. Therefore the ex-post constrained volume debt is the quantity that is observed. There is no need to account for selection bias that might, with a different design, have arisen from some households desiring a negative or zero amount or for some households not applying nor for some not gaining the amount they desire (because none of the members of this set gain the amount they desire, by definition). We model the ex-post quantity using simple OLS estimators with the usual assumptions. The effect of an interest rate decrease is an increase in demand as the intertemporal budget line shifts outwards, but constrained to the volume that lenders are willing to lend at each the new rate profile.

The data comes from the Survey of Finance administered by the Federal Reserve Board. See XX for descriptive material for the survey. The SCF is a multi-stage area probability sample and an over sample of high wealth households in the US. It is not possible to identify the high wealth households. The former typically consist of around 2900 households and the latter 1400 households. All missing values are imputed five times. We use the first implicate. We use data for 1992, 1995, 1998, 2001, 2004, and 2007. We have pooled across all of these years. The variables relate to the year of the survey except for income which relates to the previous year. The head of a household is taken to be the male, if there are at least two adults of different gender in the household, and the oldest member if the household consists of individuals of the same gender.

The literature contains several methods for identifying whether a household is liquidity constrained (see Ferri and Simon 2002, and Gross and Souleles 1997 for examples). In this paper we use self-reported indications of whether a household is credit constrained. Specifically we consider two alternative indicators as follows.

> A household is credit constrained if it reports that in the previous five years
>
> I1 the head or his/her spouse (a) applied for credit of any type and was turned down or did not get as much as he/she asked for or (b) did not apply for credit but was discouraged from applying because they thought they would be turned down;
>
> I2 the head or his/her spouse applied for credit of any type and was turned down or did not gain as much credit as he/she asked for.

Compared to regarding the possession of high and low interest rate debt instruments as an indicator of being constrained, these definitions have the advantage of not assuming the borrower is well informed, acts rationally and pays no transactions costs.

To compute the interest rate for any type of loan we computed the weighted arithmetic mean rate across loans held within that category. The weights are the proportion of that type of debt that is outstanding for each category. The control covariates for the demand for debt equation are suggested by the LC model. Since the demand for debt depends on the expected changes in income we compute the (log of) difference between current income and permanent income where permanent income is computed using the method of King and Dicks-Nireaux (1982). If current income is above permanent income the household may expect it to decline and so would not wish to add to its stock of debt, if current income is below permanent income the household may believe its income will rise and would wish to increase it stock of debt. The income and age variables are linear splines. The coefficient on each variable of these variables represents the change in the value of the dependent variable due to a unit change in the variable within that range. To achieve a distribution of the dependent variable that is closer to a normal distribution we take the log of debt and to achieve a better fit we take a log transformation of income[1] and wealth. All monetary values are defaulted to be at 1992 prices.

The identification of the demand function for the unconstrained sample is achieved by including an attitude to credit variable that is assumed to explain whether a household has debt, but not the volume of demand. We include the interest rate in the demand function, but not in the selection equation arguing that the volume of debt varies with interest rate, but whether or not a household has a certain type of debt is independent of the rate. We treat the interest rate for each household as exogenous.

[1] We use the transformation: $x' = \ln(1+x)$ if $x \geq 0$ and $x' = -\ln(-x+1)$ if $x < 0$.

4. Empirical Results

We parameterised equation (1) for four types of debt separately: loans secured on property, credit card debt, vehicle debt and educational debt.

We start with the results for households in which the respondent or his/her spouse were, in the previous five years, either turned down for credit or did not gain as much as they wished or were discouraged from applying. Table 1 shows the marginal effects of the interest rate on the demand for each type of debt for unconstrained households and the marginal effects on the ex-post volume of debt for the constrained households. The marginal effects of the control variables are also shown. For mortgages and credit cards the interest rate effects are negative and the effects for the constrained households are less than those for the unconstrained households, exactly as the theory predicted. In the case of credit cards the effect of an interest rate change is three times larger for the non - constrained group than for the constrained group, where interest rate is not even significantly different from zero.

The effects of interest rates are very different for vehicle loans and for educational loans compared with mortgages and credit cards. None of the interest rates are significant (at 5%) for any group. Those who are unconstrained and pay higher interest rates do not wish less debt compared with those that pay lower rates. Those that are constrained and pay higher rates do not receive less debt than those who pay lower rates.

If we look at the control variables we see that wealthier households demand less credit card, vehicle or educational debt, but not mortgage debt. This is entirely plausible given that the mean interest rates for these types of loans are higher than the average for mortgages, and that vehicle, educational and credit card debts are much lower than mortgage debts. This pattern also holds for the constrained group. Income strongly affects the demand for mortgages within each income range and also affects the ex post volume of mortgage debt held by constrained households. Income has less of an affect on the demand for credit card debt, a step change in demand occurring at income band 4. For constrained borrowers income strongly affects the amount of credit card debt they possess. The demand and ex post volume for vehicle loans held is also strongly affected by income, the demand for educational loans less affected by income until we reach income decile four and for the constrained group income has a step effect at income band 3.

As expected age reduces the demand for mortgage debt but not the amount that constrained households have. The demand for credit card debt increases as the age of the head of household rises in the 20s and 30s as does the amount gained by constrained households. The self employed have a greater demand and great amount received of mortgages and vehicle loans, but not for credit card debt or educational loans, which is also intuitively plausible.

Table 2 shows that the effects of interest rates are robust to the exclusion of those who are discouraged from applying for debt within the constrained set.

A possible reason why the interest rates effects are not significantly different between the constrained and un-constrained groups for the vehicle or educational loans come to mind is that credit constrained households may not have been refused either of these types of loans. The SCF questions that allow us to identify credit constrained households do not ask which type of debt the household was referring to when it replied that it had been turned down or discouraged from applying (although it does ask what type of debt was applied for most recently when a rejection decision was received).

Conclusions

We have modelled the demand and ex-post volume of four types of household debt held by US households over the period 1992-2007. We find that, as predicted by theory, the demand for mortgage debt and for credit card debt is more sensitive to changes in interest rates than are the volumes of these types of debt held by credit constrained households. However we did not find this to be true for vehicle loans or for educational loans.

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Table 1a

Rejected or Turned Down or Discouraged
Marginal Effects

	Loans assoc with real estate		Credit Cards	
	Not Constrained	Constrained	Not Constrained	Constrained
ln(wealth)	0.0123b	0.0038	-0.0454a	-0.0373a
ln(income1)	-0.1021a	-0.1029	0.1568b	-0.0706
ln(income2)	0.7332a	0.8504a	0.5039b	-0.6528a
ln(income3)	0.5597a	0.6325a	0.1020	1.0093a
ln(income4)	0.5534a	0.9755a	0.5075a	0.7342a
ln(income5)	0.7579a	0.6911a	0.1264	0.5614a
ln(income6)	0.3213a	0.3956a	0.0618	-1.0405a
ln(inc-perm inc)	-0.0018	-0.0059c	-0.0023	-0.0184a
interest rate	-0.00085a	-0.00072a	-0.00018a	-0.000067
age1	0.0077	0.0042	0.0629b	0.0431a
age2	-0.0180a	0.0015	0.0240b	0.0247c
age3	-0.0140a	-0.0095	0.0076	-0.0040
age4	-0.0091a	0.0003	-0.0041	0.0186
age5	-0.0103c	0.0224	-0.0297a	-0.0235
edu3*	-0.3574b	0.2730	-0.2905	0.1332
edu4*	0.0222	0.3818c	-0.0597	-0.1191
edu5*	-0.0993	0.2878	-0.0885	-0.1022
edu6*	0.2095b	0.5255a	0.0756	0.0711
no of kids18	0.0506a	0.0198	0.0381	-0.0471
unemployed	0.1645c	0.1305	0.2570c	0.5288b
no paid job	-0.0047	0.0850	-0.1037	0.1307
retired	-0.0706	0.0283	-0.1831c	0.2340
disabled	-0.2823a	0.0489	-0.2768c	-0.1418
other job	-0.0092	0.3256	0.0613	0.0113
self empl	0.1572a	0.3218a	0.2818a	0.3601a
female	0.0030	0.0649	-0.0850	-0.3277b
single	0.0055	0.2820	-0.0632	0.1643
divorced/widow	0.0630	0.0723	0.0483	0.1018
single parent	0.0734	0.2112	0.0273	0.0238
white	-0.1292a	0.0455	0.1125b	0.3427a
years at job		-0.0027		0.0037
default		-0.0833		-0.0382
No of obs	16,599	1,850	12,894	2,113
No uncensored obs	8,538		4,240	
ρ (P>(χ^2(2)))	0.032(0.56)		-0.072(0.53)	
Adj R^2		0.41		0.15
F (P(F>F(36,1813))		37.02 (0.000)		11.71(0.000)

Table 1b

Rejected or turned Down or Discouraged
Marginal Effects

	Vehicle Instalment Loans		Educational Loans	
	Not Constrained	Constrained	Not Constrained	Constrained
ln(wealth)	-0.0210a	-0.0008	-0.0388a	-0.0667a
ln(income1)	-0.0168	0.0004	0.0370	-0.1225
ln(income2)	0.9490a	0.6092a	0.5919	0.5116
ln(income3)	0.6315a	0.2476	0.4182	0.8816b
ln(income4)	0.5703b	0.4535a	0.6867c	0.3794
ln(income5)	0.2872	0.2157a	0.8684b	0.6939a
ln(income6)	0.8089a	0.6332a	-1.9100	-0.1412
ln(inc-perm inc)	0.0008	-0.0018	-0.0217a	-0.0100
interest rate	0.00010c	-0.00006	0.00015	-0.000013
age1	0.0033	-0.0055	0.0419c	-0.0019
age2	-0.0044	-0.0147	-0.0055	-0.0163
age3	-0.0112	0.0027	-0.0017	0.0162
age4	0.0026	-0.0019	-0.0073	-0.0132
age5	0.0036	-0.0215b	0.1029	0.0149
edu3*	0.3252	-0.2861	-0.5913	-1.6522c
edu4*	0.4785b	0.0502	-0.1147	-0.7592
edu5*	-0.5230b	-0.0362	-0.1667	-0.6384
edu6*	-0.5644b	0.0598	0.4279	-0.4706
no of kids18	-0.0197	-0.0298	-0.1157b	-0.0638
unemployed	-0.2084	0.1367	-0.4916b	-0.0236
no paid job	0.0532	0.0308	0.7786b	0.8099a
retired	0.2242	0.1128	-0.2123	-1.1022a
disabled	-0.1512	0.0444	0.4569c	-0.3280
other job	0.035	0.5090	0.2814	-0.4105
self empl	0.3292a	0.2186a	0.1490	0.2542c
female	0,0402	-0.0307	0.1772	-0.0210
single	0.0279	-0.1566c	0.1000	-0.1807
divorced/widow	-0.0673	-0.1039	-0.3913c	-0.0196
single parent	-0.1578	0.0350	-0.2364	-0.1304
white	-0.0041	-0.0087	-0.0012	0.1213
years at job		0.0009		-0.0104c
default		-0.2485b		-0.3017
No of obs	4,552	4,489	3,561	872
No uncensored obs	1,843		655	
ρ (P>(χ^2(2)))	0.037(0.84)		-0.099(0.71)	
Adj R^2		0.16		0.20
F (P(F>F(36,1813))		24.79(0.000)		7.18(0.000)

a,b,c denote significance at 1%, 5% and 10%, respectively.
Dependent variable is ln(debt).
Not Constrained estimates use Heckman estimators. selection equation explains whether loans assoc with real estate are greater than zero or whether credit card debt is greater than zero. Covariates include ln(wealth) ln(income 1)..ln(income6), age, age squared, age cubed, education 3,4,5,6, self employed, female, single, attitude to taking credit in general, dummies for 1998, 2001, 2004, 2007, constant.
Samples are of those who either (a) applied for debt in the previous five years and were either turned down or got only part of the amount they applied for or (b) did not apply and were discouraged because they thought their application would be unsuccessful.

Constrained estimators are OLS. Ref: t23i.log

Table 2a

Rejected or Turned Down
Marginal Effects

	Loans assoc with real estate		Credit Cards	
	Not Constrained	Constrained	Not Constrained	Constrained
ln(wealth)	0.0132b	0.0024	-0.0459a	-0.0361a
ln(income1)	-0.1100a	-0.1231b	0.1378	-0.0673
ln(income2)	0.7613a	0.7934a	0.5359a	0.5697a
ln(income3)	0.5889a	0.5458a	0.1450	0.9494a
ln(income4)	0.5477a	1.0491a	0.4602a	0.9346a
ln(income5)	0.7520a	0.6969a	0.1416	0.5016a
ln(income6)	0.3196a	0.4004a	0.0557	-1.1191a
ln(inc-perm inc)	-0.0017	-0.0070	-0.0025	-0.0190a
interest rate	-0.00083a	-0.00076	-0.00017a	-0.000073
age1	0.0054	0.0162	0.0616a	0.0457b
age2	-0.0167a	0.0010	0.0250b	0.0225c
age3	-0.0139a	-0.0088	0.0077	-0.0017
age4	-0.0095a	0.0035	-0.0033	0.0140
age5	-0.0094c	0.0173	-0.0309a	-0.0045
edu3*	-0.3272b	0.1472	-0.2318	-0.0532
edu4*	0.0470	0.3367	-0.0348	-0.3367
edu5*	-0.0825	0.2627	-0.0502	-0.3424
edu6*	0.2375b	0.1982	0.1091	0.1713
no of kids18	0.0481a	0.0238	0.0336	-0.0433
unemployed	0.1819c	0.0805	0.2911	0.5070b
no paid job	-0.0302	0.1655	-0.0942	0.0998
retired	-0.0639	-0.0144	-0.1606	0.1824
disabled	-0.2764a	0.1040	-0.2388	-0.1956
other job	0.0034	0.2786	0.0877	-0.0240
self empl	0.1626a	0.2989a	0.2725a	0.3099a
female	0.0025	0.0599	-0.0970	-0.1293
single	-0.0063	0.0384	-0.0511	0.0932
divorced/widow	0.0580	0.0274	0.0501	0.1443
single parent	0.0848	0.2376	-0.0211	0.0246
white	-0.1152a	0.0459	0.1306b	0.3211a
years at job		-0.0041		0.0029
default		-0.1130		-0.0553
No of obs	17,420	1,746	13,497	1,984
No uncensored obs	8,642		4,340	
ρ (P>(χ^2(2)))	0.036(0.52)		-0.083(0.50)	
Adj R^2		0.41		0.14
F (P(F>F(36,1813))		34.73(0.000)		10.33(0.000)

Table 2b

Rejected or Turned Down
Marginal Effects

	Vehicle Instalment Loans		Educational Loans	
	Not Constrained	Constrained	Not Constrained	Constrained
ln(wealth)	-0.0197a	-0.0033	-0.0356a	-0.0664a
ln(income1)	-0.0198	-0.0005	0.0380	0.0365
ln(income2)	0.9624a	0.6234a	0.5102	0.4755
ln(income3)	0.6534a	0.2600c	0.4081	1.0710a
ln(income4)	0.5092b	0.4841a	0.6186	0.3488
ln(income5)	0.2791	0.2115a	0.7728c	0.7457a
ln(income6)	0.8196a	0.6354a	-1.2877	-0.1315
ln(inc-perm inc)	-0.0008	-0.0017	-0.0209a	-0.0126b
interest rate	0.000057	-0.00002	0.00015	0.000067
age1	-0.0046	0.0033	0.0404	0.0021
age2	-0.0033	-0.0138c	-0.0042	-0.0158
age3	-0.0102	-0.0020	-0.0062	0.0217
age4	-0.0014	-0.0012	-0.0110	-0.0233
age5	0.0104	-0.0211b	0.1072	0.0214
edu3*	-0.2505	-0.2742	-0.5684	-1.5176
edu4*	0.4001	-0.1079	0.0140	-0.8035
edu5*	-0.4346	-0.1002	-0.1189	-0.6639
edu6*	-0.4771c	-0.1175	0.5376	-0.4661
no of kids18	-0.0132	-0.0349c	-0.1078b	-0.0962b
unemployed	-0.1506	-0.1492	-0.5340b	-0.0566
no paid job	0.2497	-0.0779	0.7904b	0.7059b
retired	0.2793	0.1057	0.2656	-1.0715a
disabled	-0.1231	0.0288	0.5766b	-0.1439
other job	0.0369	0.4131	0.3222	0.0777
self empl	0.3283a	0.2215a	0.1783	0.2105c
female	0.0874	-0.0704	0.2069	-0.0331
single	-0.0266	-0.1037	-0.1353	-0.1075
divorced/widow	-0.0340	-0.1058	-0.4912b	0.0083
single parent	-0.0547	-0.0642	-0.1785	-0.1310
white	-0.0036	-0.0127	0.0262	0.1055
years at job		0.0009		-0.0119b
default		-0.2905a		-0.0937
No of obs	3,731	4,604	2,912	989
No uncensored obs	1,724		597	
ρ (P>(χ^2(2)))	0.048(0.78)		-0.099(0.72)	
Adj R^2		0.16		0.21
F (P(F>F(36,1813))		26.27(0.000)		8.65(0.000)

a,b,c denote significance at 1%, 5% and 10%, respectively.
Dependent variable is ln(debt).

Not Constrained estimates use Heckman estimators. selection equation explains whether loans assoc with real estate are greater then zero or whether credit card debt is greater than zero. Covariates include ln(wealth) ln(income 1)..ln(income6), age, age squared, age cubed, education 3,4,5,6, self employed, female, single, attitude to taking credit in general, dummies for 1998, 2001, 2004, 2007, constant.
Samples are of those who either applied for debt in the previous five years and were either turned down or got only part of the amount they applied for.

Constrained estimators are OLS. Ref: t22i.log