How credit markets affect homeownership: an explanation based on differences among Italian regions

Serena Trucchi*

May 10, 2009

Abstract

This paper focuses on housing tenure choices of Italian households and the extent they can be explained by liquidity constraints. When borrowing and lending rates differ from each other and from the implicit rate of interest paid by real assets, the structure of those rates influences the decision to buy a house. The empirical analysis is based on the Bank of Italy's Survey of Household Income and Wealth (SHIW) and exploits regional heterogeneity in financial markets to asses their effect on households' behavior. Empirical results find strong evidence that the interest rate spread interacts with the time path of resources and alters the desired age profile of housing tenure by discouraging or postponing the dwelling purchase by households with steeper resources time path.

JEL classification: D1, G21, R21.

Key words: housing tenure, liquidity constraints, interest rates spread.

1 Introduction and motivations

Housing wealth is an important component of households portfolio and housing services represent a large fraction of their total expenditure. Aggregate data on Italy (Bartiloro et al., 2007) show that in 1995 non-financial assets were 3.95 times gross disposable income (this ratio rose up to 4.99 in 2005).

*University of Turin and CeRP-Collegio Carlo Alberto. Email address: serena.trucchi@unito.it. I thank Giuseppe Bertola, Elsa Fornero, Alessandro Sembenelli, Margherita Borella and Giovanni Mastrobuoni for useful comments and suggestions. All remaining errors are mine.

Residential houses are the main item among non-financial assets: according to Cannari et al. (2007) the housing stock of Italian households in 2002 is estimated at 3,033 billion euro, equal to almost 80% of total real assets. Looking at micro-data, table 1 shows that on average the dwelling home represents 84% of total net wealth for Italian homowners; this percentage increases up to 93% if households older than 50 are excluded.
A characterizing feature of the dwelling house is that it is also a consumption good: according to SHIW data housing services are a quarter of total households' consumption (table 2) and absorb a relevant fraction of their income: on average tenants spend almost 20% of their earnings for rents[1]. The decision to buy the house has therefore relevant implications on consumption life-cycle profiles and portfolio choices as well as on aggregate savings.

Table 1: Incidence of dwelling home over total net wealth

	Own. rate*	Mean	Std. Dev.
All	66.22%	55.92%	1.28
Aged 25-50	59.57%	54.95%	1.90
Owners		84.85%	1.5
Owners 25-50		92.63%	2.38

Source: elaboration on SHIW data (1993-2002).
*: weighted data.

Table 2: Incidence of expenditure for housing services on:

	total consumption[a]		income[b]	
	Mean	Std. Dev.	Mean	Std. Dev.
All	25.01%	0.12	24.88 %	0.17
Renters	19.70%	0.11	18.63 %	0.14
Aged 25-50	24.29%	0.11	23.10 %	0.15
Renters 25-50	19.93%	0.11	18.87 %	0.14

Source: elaboration on SHIW data (1993-2002).
Notes: households with rental payment higher than income are excluded.
a: ratio between rental payments and non durable consumption(included rent).
b: ratio between rental payments and annual household labor income.

[1]Individual guess about rental payment for their dwelling evaluated at market price is used to measure housing consumption by homeowners.

Table 3: Incidence of debt for homeowners

		25-50	25-37	38-50
Homeownership rate		61.89%	52.32%	67.30%
Homeowners with debt		32.58%	38.24%	30.34%
Mortgage value	Owners	9801	13036	8518
	Owners with debt	30197	34196	28198
Mortgage/house value	Owners	7.35%	10.60%	6.06%
	Owners with debt	22.62%	27.81%	20.03%

Source: SHIW 1993-2002.
Mortgage value: debt for house purchase or renovation (also on real estate different from the dwelling house). Mortgage/house value=real estate debt/dwelling house value.

Homeownership does not necessarily have to be preferable to renting: individuals may prefer not to carry risks and costs related to owning their homes and may choose more flexible living arrangements, more compatible with labor mobility or migration. Nevertheless in many countries it is identified as the preferred form of tenure and represents the main source of financial security and income during retirement: in analyzing several European countries, Diaz-Serrano (2006) argues that, when compared to other forms of living arrangements, homeownership brings higher housing satisfaction across individuals.
Several factors drive the decision to buy or rent the home. In a perfect market framework, tenure is determined by the cost of owning relative to renting and by personal preferences: homeownership diffusion can be driven by frictions in the rental market that make owning preferable to renting. When individuals are liquidity constrained, the house purchase depends not only on the level of permanent income but also on the amount of cash-on-hand held by young households: the timing of resources is indeed a crucial explanators for housing tenure decisions. Jaffee and Stiglitz (1990) define credit rationing as a situation in which there exists an excess of demand for loans at the current interest rates. A strict interpretation identify liquidity constrained individuals as agents who face quantity restrictions to the amount they can borrow, while, according to a weaker interpretation, this definition also includes consumers for whom interest rates depend on their asset position (the former interpretation is a special case of the second one, if the borrowing rate goes to infinity at the borrowing limit.) (Attanasio et al. (2000)).
A contribution of this work consists in the use of a broad definition of bor-

rowing constraints. While previous literature centred on homeownership choices mainly focuses on quantity restrictions to the mortgage value (the loan-to-value ratio), liquidity constraints assume here the form of a spread between borrowing and lending rates[2].

Even if it is almost natural to think that credit constraints affect homeownership, this need not to be the case. Family networks can circumvent credit constraints (down payment requirement or higher interest on loans), since intergenerational transfers can weaken their effect. Moreover if young households expect to receive a house as a bequest, they might choose to rent and wait for receive it[3]. Thus the effect of imperfect credit markets is not *a priori* obvious, which makes the empirical analysis more interesting and informative. This is particularly relevant in Italy, characterized by high ownership rates among the young and by low mortgages take-up rates, as pointed out by Bicakova and Sierminska (2007) and Bartiloro et al. (2007) and shown in table 3.

This paper exploits the within-region variability in local financial market's conditions to explore housing tenure choices by Italian households. Individual country analysis have the great advantage of keeping institutional factors constant, like the tax treatment of owning and renting or the rental market regulation. Focusing on Italy allows to exploit the wide heterogeneity in the economic setting that characterizes its regions, as documented by Guiso et al. (2004) and Guiso et al. (2007) and exploited by Bertola et al. (2005), Casolaro et al. (2006) and Benfratello et al. (2008). Furthermore, even if drawn in a within country framework, the main results of this analysis can be generalized and extended to broader settings and contribute to a deeper understanding of the role of credit markets in explaining cross-countries heterogeneity in homeownership rates.

A further implication concerns consumption and welfare inequality. Financial markets can reduce consumption inequality among people endowed with different resources at the beginning of their life (see Bicakova and Sierminska (2007) and Bertola and Koeniger (2007)): *ceteris paribus* agents with lower initial wealth will benefit more of weaker liquidity constraints that allows them to buy their dwelling, thus reducing homeownership inequality

[2]The aim of this paper is to analyze the effect of borrowing constraints on a particular consumption choice, the house purchase. Credit rationing can be driven by several factors like financial underdevelopment (Guiso et al. (2004)), imperfect information (Jaffee and Stiglitz (1990)) and risk of default in repayment; the investigation of the determinants of this situation goes however beyond the object of this work and is not addressed here.

[3]As a consequence of population aging this happen later in life and, therefore, the role of bequest in weakening borrowing constraints is lessening.

among the young.

The structure of this paper is as follows: after a brief review of related literature (Section 2), Section 3 provides a description of the theoretical framework and Section 4 describes the data. The core part of this work is however the empirical analysis, developed in Section 5; Section 6 provides a short summary and concluding remarks.

2 Related literature

This work contributes to the broad literature on the effect of liquidity constraints on consumption focusing on a particular consumption and investment decision, the house purchase. Many studies analyze the effects of imperfections in financial markets on consumption and saving decisions (Bertola and Hochguertel (2007); Pissarides (1978), Browning and Lusardi (1995), Eberly (1994), Garcia et al. (1997), Zeldes (1989)) and some of them focus on their impact on durable consumption, like Alessie et al. (1997) and Attanasio et al. (2000). But the extensive literature on constrained consumers' behavior mainly rely on quantity restrictions on loans; some exception are indeed Attanasio (1995), Bertola et al. (2005) and Hintermaier and Koeniger (2007).

Homeownership decisions have been the object of several investigations within the framework of the life cycle-permanent income hypothesis[4]. Moving from the assumption that owning is always preferred to renting, Artle and Varaya (1978) demonstrate that imperfect financial markets can lead agents with low initial resources or high intertemporal discount rate to optimally choose to be tenant. Indeed down payment for the house purchase would require high saving at the beginning of the lifetime that would lead to sub-optimal life-cycle consumption paths[5]. Some years later Henderson and Ioannides (1983) extended the model by Artle and Varaya (1978) by relaxing the assumption of dominance of owning to renting: an externality is associated to renting and it is shown to be responsible for the relative attractiveness of owning[6].

[4]For instance Martin (2003) focuses on the illiquidity of the house and investigates the effect of transaction costs on the house purchase.

[5]A different approach is followed by Ortalo-Magne and Rady (1999). They implement an equilibrium model of the housing market to explain co-movement of house prices and homeownership rates for different age classes in response to income and credit market shocks.

[6]A further extension has been implemented by Ben-Shahar (1998), who analyzes the optimal share of wealth invested in real estate, in a setting characterized by transaction

Empirical analysis on the effect of credit rationing on homeownership have been carried out mainly by performing cross-country simulations (see Barakova et al. (2003) and Feldman (2002) for a review). A different approach has been adopted by Sedo and Kossoudji (2004), who explore differences in homeownership between genders and family types in the U.S. and by Bostic and Surette (2000), who analyze the determinants of the rise in homeownership rates that occurred in the U.S. during the Nineties and find a more favorable economic climate to boost up homeownership, especially among low-income households. Di and Liu (2004) focus on the role of income and wealth in determining homeownership and address the questions whether the effect of these variables is greater for minorities and changes over time; their results for the U.S. show that higher wealth and income boost up homeownership, with a stronger impact on minorities. Finally Guiso and Jappelli (2002) use a selection model to evaluate the impact of transfers on the saving time before the house purchase and on the house value. Their results on Italian data indicate that transfers shorten saving time and are associated to higher house value.
Chiuri and Jappelli (2003) and Bicakova and Sierminska (2007) are the papers closest to this work. They investigate the role played by institutional factors in shaping cross-countries variability in homeownership rates of young households and find a negative effect of credit rationing, measured by quantity limits in the amount that can be borrowed, as percentage of the house value (loan-to-value ratio).

The empirical strategy I adopt relies on time and region specific variability in local markets' indicators. Italian regions are characterized by a wide heterogeneity that concerns several institutions and economic aspects, like labor markets, productive structure and local financial market's conditions (Casolaro et al. (2006)). This geographical variability has been exploited by several works to analyze the relationship between institutional factors and different real outputs. Guiso et al. (2004) investigate the effect of regional financial market development on growth and Benfratello et al. (2008) exploit provincial variability to evaluate the role played by banking sector's development in fostering innovation by firms. Casolaro et al. (2006) rely on regional data to show how the endowment of social capital and the working of the judicial system are factor of prime importance in explaining heterogeneity in the size of the household loan markets. Finally Bertola et al. (2005) analyze dealer pricing of consumer credit by exploiting regional spreads between rate of returns on banking deposits and loans.

costs related to house purchase and rental risk.

3 A model for housing tenure

In this section I develop a two periods model to describe mechanisms and relationships that underlie housing tenure choices. In the first period households choose the optimal level of non housing consumption (C) and whether to own or rent their home. In this stylized economy there is only one kind of house (the house size is normalized to unit), i.e. housing consumption is constant independently from tenure. The house value is H and rental payments are $R = r_h H$, where the parameter r_h represents the implicit rate of return payed by real assets. House price volatility is ruled out, i.e. specific risk and capital gains on real assets are not considered, and maintenance costs, except what due to waste, are fully charged to tenants (it can either be assumed that, except for waste, there are no maintenance costs or that rental payments R are net of them).
In a world with perfect information and without frictions interest rates on assets (r_a) and liabilities (r_d) coincides and are equal to the real estate one: $r_a = r_d = r_h$. In this framework agents are indifferent between owning and renting. Housing rental and financial markets are however not frictionless. First, in order to get rental payments, landlords bear the cost of collecting rents and the risk that tenants will spoil the house (the expected total cost is c)[7]. In order to let landlords buy houses, rental payment must be equal to the opportunity cost of investing in financial assets (r_a) plus the value of c: $r_h H = (r_a + c)H$ and then $r_h > r_a$[8]. It follows that the cost of housing services for tenants (rental payments) is higher than for homeowners (the opportunity cost of holding housing wealth, i.e. $r_a H$): if there are no liquidity constraints homeownership will always be preferred to renting[9].

[7] An interesting interpretation of c is given by Henderson and Ioannides (1983). According to their model, an externality is associated to renting and it is shown to be responsible of the relative attractiveness of owning. In particular housing services are function of the stock and the rate of utilization of the house. The landlord can however collect from the tenant only a part of the utilization costs, i.e. breakdowns caused by higher rate of utilization cannot be fully charged to the renter. This situation determines an over-utilization of the house by tenants since they do not face the social marginal cost of their utilization. In order to let landlords buy real estate, financial and real asset must offer the same return: rental payments must be equal to the financial opportunity cost plus the costs of utilization not directly recovered from the tenant, i.e. financial returns are higher than real estate ones and this difference comes from the presence of the externality described above.

[8] A similar assumption is in Campbell and Cocco (2007).

[9] The difference between interest paid by financial and real estate assets is positive only for the dwelling house. The net interest paid by other properties is r_a, since the cost c must be effectively paid by the landlord to get the rent. It follows that, apart for the

However borrowing through mortgages is allowed[10] but the interest charged on debt is higher than that paid by financial assets: $r_a < r_h < r_d$. Households' budget constraint is then discontinuous, and steeper if households borrow in the first period. Quantity limits to borrowing are a special case of this constraint: a value of r_d that goes to infinite simply means that access to credit is denied.
Furthermore real assets are illiquid: at purchase a fraction τ of the house value H is charged for taxes, real estate agency and notary fees (for simplicity selling is assumed to be costless). Even if interest paid by financial assets is lower than real estate one, transaction costs τ makes owning less profitable than renting whether the length of staying in the house is not long enough and then makes the expected stay a relevant variable for tenure choices.

The prediction of this simple model is that people with high initial resources at the beginning of their life (because of higher savings, current income or received gifts/bequest) optimally choose to buy the dwelling home. *Ceteris paribus*, as initial resources decrease, a greater fraction of the house value must be financed by loans and the net interest paid by real estate investment decreases. Households with initial resources lower than a given threshold optimally choose to remain tenant. The level of this threshold W^* depends on individual factors and expectations (personal preferences, expected length of staying), economic environment (interest rates spread, level of transaction costs, house price) and their interaction (for instance the effect of the spread between lending and borrowing interest rates differs according to the level of available resources and future income). Independently on preferences, households that live where renting is easy and borrowing is costly are more likely to be tenants; the effect of such environmental variables is expected to be greater for households with low resources or steeper income profile.

The goal of this stylized model is to describe the economic process that underlie the decision to buy the dwelling house and to point out the mechanisms that guide this choice. Several economic aspects are however left out. First housing consumption is exogenous and uncertainty about future labor income and volatility in house prices, rental payments and labor income are

dwelling, agents are indifferent about investing in real estate or financial markets: some of them will then invest in real assets and become landlords.

[10]Consumer credit is not allowed. This simplification does not cause any loss of generality, since the purpose of the model is not to investigate the general relationship between credit market and consumption but just to focus on a particular aspect of consumption, the house purchase.

not allowed. Decisions about household formation are not modeled and are assumed to be exogenously determined. However, since household formation is an endogenous choice for the youngest (Fogli (2004); Chiuri and Del Boca (2008)), households aged less than 25 are excluded from the sample.
Initial resources, consisting of inherited endowment and accrued savings, are assumed to be exogenous as well. This simplification is quite restrictive since households that are going to buy their dwelling might behave differently in order to reduce their exposure to liquidity constraints. On one hand they might increase their resources by saving more and, on the other hand, they might raise their disposable income through labor market participation of wives, as pointed out by Del Boca and Lusardi (2003). The issue of endogeneity of wealth is addressed in the empirical analysis and results are shown to be robust.
Moreover households might save less when they expect to receive gift or bequest: the possibility to behave differently according to expectations on future gift is not allowed in this theoretical setting. Another reason to buy the dwelling house is that it can be used as a collateral to obtain consumption credit (Bridges et al. (2006)); this channel is not investigated. Finally, life-cycle theory predicts dissaving of wealth by the elderly: moving and transaction costs that make it more difficult or costly might therefore affect accumulation of housing wealth by discouraging the house purchase. This issue goes beyond the object of this work and is not addressed here.

The maximization problem for owners and renters is presented hereafter. In order to decide whether to buy or rent the house, agents compare indirect utility than can be reached in either cases and choose the better alternative. Utility is assumed to be logarithmic, i.e. increasing and concave both in current non housing consumption (C) and in funds available for future consumption (A). Agents solve:

$$\max_{C} \log C + \log A \tag{1}$$

where housing consumption is not a choice variable since only one kind of house is available and the intertemporal discount rate is assumed to be zero (allowing for discounting of future utility would imply more complex but qualitatively similar relationships and results).
The budget constraint for the two options is therefore:

$$A = Y + \begin{cases} (W - C_R)(1 + r_a) - R & \text{if renter,} \\ (1 - \tau q)H + (W - C - (1 + \tau)H)(1 + r_a) & \text{if owner and } W > H(1 + \tau) + C, \\ (1 - \tau q)H + (W - C - (1 + \tau)H)(1 + r_d) & \text{if owner and } W \leq H(1 + \tau) + C \end{cases} \tag{2}$$

where Y is the amount of purchasing power that will become available (with certainty) in the future and W is the current cash on hand. For simplicity rental payment R is timed in the second period; r_a and r_d denote the interest rates respectively on assets and debt; τ is the fraction of the house value H that must be paid for transaction costs and q is the probability of residential moving in the second period. If moving occurs in the second period, homeowners must pay the transaction cost τH in order to buy a new house[11] while renters are not charged any additional cost. Given that households will move with probability q, the expected value of the dwelling house in the second period (net of the transaction cost paid to buy the new house) is $q(1-\tau)+1(1-q)=1-\tau q$. Two additional constraints hold: consumer credit is not allowed ($C \leq W$) and future resources cannot be negative ($A > 0$).

Households solve the optimization problem for each alternative and compare pair-wise the indirect utilities obtained. They decide to buy the house whether utility that can be achieved by owning is greater than indirect utility obtained by renting. Agents maximize the utility function in order to decide the optimal level of consumption C^*. C^* is characterized by the equality between its marginal utility in the first period ($\log C$) and its marginal cost in terms of reduced available resources for future consumption ($-\log A$):

$$\frac{\partial \log C}{\partial C} = -\frac{\partial \log A}{\partial C}$$

i.e. :

$$\frac{1}{C} = \frac{1+r_i}{A},\ i = a, d. \tag{3}$$

Solution of equation 3 for tenants gives the optimal level of C_R^* that is:

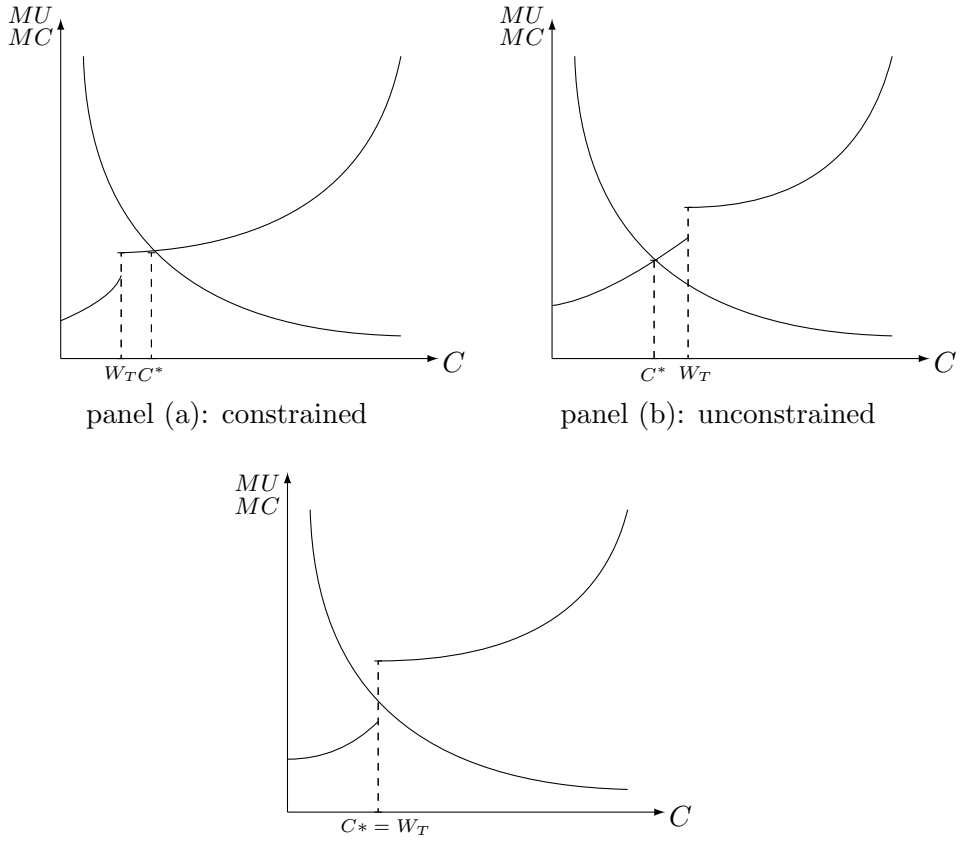
$$C_R^* = \frac{1}{2}\left(\frac{Y}{1+r_a} + W - \frac{R}{1+r_a}\right).$$

A slightly more complex solution characterizes homeowners. Their budget constraint is convex and its slope changes according to their net asset position. The optimality condition for homeowners is plotted in figure 1 for different combinations of initial endowment and house prices. The LHS of equation 3 is depicted by downward-sloping curves in the three panels of the figure, while the RHS is represented by the upward sloping segmented curve. In particular the budget constraint in equation 2

[11] Without loss of generality the possibility of changing tenure from owning to renting is ruled out.

shows that if $C < W - (1+\tau)H \equiv W_T$, the marginal utility of $\log A$ is $(1+r_a)/[Y-((1+r_a)(1+\tau)+(1-\tau q))H+(W-C)(1+r_a)]$ (the lower curve in figure 1) while it is $(1+r_d)/[Y-((1+r_d)(1+\tau)+(1-\tau q))H+(W-C)(1+r_d)]$ when $C > W_T$. Utility is maximized by homeowners when the two curves

Figure 1: Optimal consumption for homeowners



panel (a): constrained

panel (b): unconstrained

panel (c): corner solution

intersect. Panel (a) in figure 1 represent the case of liquidity constrained agents: the optimal level of consumption is:

$$C^*_{OD} = \frac{1}{2}\left[W + \frac{Y}{1+r_d} + \left(\frac{1-\tau q}{1+r_d} - (1+\tau)\right)H\right]$$

and saving is negative: a fraction of the house price is financed through

mortgage. Panel (b) illustrates the opposite case, when $W > (1+\tau)H + C$, where optimal consumption is C^*_{OW} is:

$$C^*_{OW} = \frac{1}{2}\left[W + \frac{Y}{1+r_a} + \left(\frac{1-\tau q}{1+r_a} - (1+\tau)\right)H\right].$$

Discontinuity in the budget constraint determines the existence of a corner solution when the derivative of the budget constraint is undefined, i.e. when $W = C + (1+\tau)H$. This situation is represented in panel (c) of figure 1. There is a corner solution when $W \in [(1+\tau)H + C^*_{OD}\ ;\ (1+\tau)H + C^*_{OW}]$. Indirect utilities derived from the maximization problems are respectively[12]:

$$U^*_R = \log(1+r_a) + 2\log\frac{1}{2}\left[W + \frac{Y}{(1+r_a)} - \frac{R}{(1+r_a)}\right] \tag{4}$$

$$U^*_{OW} = \log(1+r_a) + 2\log\frac{1}{2}\left[W + \frac{Y}{1+r_a} + \left(\frac{1-\tau q}{1+r_a} - (1+\tau)\right)H\right] \tag{5}$$

$$U^*_{OD} = \log(1+r_d) + 2\log\frac{1}{2}\left[W + \frac{Y}{1+r_d} + \left(\frac{1-\tau q}{1+r_d} - (1+\tau)\right)H\right] \tag{6}$$

The pair-wise comparison of indirect utility achieved by owning and renting by households with $W > H(1+\tau) + C^*_{OD}$ leads to the standard condition for purchase:

$$\frac{1+r_h}{1+r_a} > 1 + \tau + \frac{\tau q}{1+r_a} \tag{7}$$

If households are not credit constrained the purchase occurs whenever the present value of the revenue from real asset $\left(\frac{1+r_h}{1+r_a}\right)$ is greater than the cost of purchase $(1+\tau)$. If the probability of moving is positive a greater rate of return on real assets is required to buy the house: this effect is captured by the term $\frac{\tau q}{1+r_a}$ on the RHS of equation 7; this probability is relevant for tenure choice only because real estate are illiquid, i.e. transaction costs are different from zero. Another way to interpret equation 7 is to consider it as the condition for purchase when credit is not rationed ($r_d = r_a$). In that case agents choose to be owner or tenants according to the expected value of q: households with lower expected probability of residential moving (because of family situation, job characteristics or individual attitudes) buy their house and the others rent.

[12] I do not explicitly consider the special case of agents with $W \in [(1+\tau)H + C^*_{OD}\ ;\ (1+\tau)H + C^*_{OW}]$ (panel (c) in figure 1). It will be show that they will be homeowners since their endowment is greater than W^* in equation 10.

When resources are not enough and a share of the house value must be borrowed ($W < H(1+\tau) + C^*_{OD}$) the purchase condition is $U^*_{OD} > U^*_R$, i.e.:

$$(U^*_{OD} - U^*_R) = -[log(1+r_d) - log(1+r_a)] + 2\log[Y + W(1+r_d) + ((1-\tau q) - (1+r_d)(1+\tau))H] - 2\log[Y - R + W(1+r_a)] > 0 \quad (8)$$

or, equivalently:

$$\sqrt{1+r_d}(\sqrt{1+r_d} - \sqrt{1+r_a})W - \frac{1}{\sqrt{1+r_a}}\left(\sqrt{1+r_d} - \sqrt{1+r_a}\right)Y + \left(1 + r_h\frac{\sqrt{1+r_d}}{\sqrt{1+r_a}} - \tau q - (1+r_d)(1+\tau)\right)H > 0 \quad (9)$$

Equation 8 is satisfied whenever:

$$W > W^* \equiv \frac{1}{\sqrt{1+r_d}(\sqrt{1+r_d} - \sqrt{1+r_a})}[\left(\frac{\sqrt{1+r_d}}{\sqrt{1+r_a}} - 1\right)Y - \left(1 + r_h\frac{\sqrt{1+r_d}}{\sqrt{1+r_a}}\right)H + (\tau q + (1+r_d)(1+\tau))H] \quad (10)$$

Equation 10 implies that house is bought only by agents with a sufficiently high level of current resources ($W > W^*$) [13]. This condition summarizes the effect of liquidity constraints: even if in a frictionless framework everyone would choose to be homeowner (equation 9 is always satisfied when $r_d = r_a$), the existence of a gap between interest rates on asset and loans leads people with initial endowment lower than the threshold W^* to remain tenants.
The effect of individual and environmental variables on $U^*_{OD} - U^*_R$ is summarized by equations 11 - 17. A positive partial derivative of $U^*_{OD} - U^*_R$ means that, *ceteris paribus*, a marginal increase in that variable makes housing purchase more attractive. Such variation leads some of the tenants to become owner; in other words, more favorable environmental conditions will lead a larger number of households to be owner.

$$\frac{\partial(U^*_{OD} - U^*_R)}{\partial W} = \sqrt{1+r_d}(\sqrt{1+r_d} - \sqrt{1+r_a}) > 0 \quad (11)$$

$$\frac{\partial(U^*_{OD} - U^*_R)}{\partial Y} = -\frac{1}{\sqrt{1+r_a}}\left(\sqrt{1+r_d} - \sqrt{1+r_a}\right) < 0 \quad (12)$$

[13] The value of W^* is lower than the threshold in the budget constraint ($H(1+\tau)+C^*_{OD}$) if r_h is sufficiently high to make house purchase profitable even if a part of its value is borrowed, i.e. $r_h > (1+\tau)(1+r_a) + \frac{(\sqrt{1+r_d}-\sqrt{1+r_a})^2}{1+r_d}\frac{Y}{H} + \frac{\sqrt{1+r_a}}{\sqrt{1+r_d}}\left(\frac{\sqrt{1+r_a}}{\sqrt{1+r_d}} - 2\right)(1-\tau q)$. In this case a share of constrained households optimally decide to buy their dwelling. Far from unexpected this lower threshold for r_h is increasing with r_a, r_d and the ratio Y/H. Moreover, numerical examples show that this limitation is not very restrictive if compared to the condition for purchase in equation 7.

$$\frac{\partial(U^*_{OD} - U^*_R)}{\partial H} = r_h \frac{\sqrt{1+r_d}}{\sqrt{1+r_a}} - (1+\tau)(1+r_d) + (1-\tau q) \tag{13}$$

$$\frac{\partial(U^*_{OD} - U^*_R)}{\partial \tau} = -(1+r_d+q)H < 0 \tag{14}$$

$$\frac{\partial(U^*_{OD} - U^*_R)}{\partial r_h} = \frac{\sqrt{1+r_d}}{\sqrt{1+r_a}} H > 0 \tag{15}$$

$$\frac{\partial(U^*_{OD} - U^*_R)}{\partial r_d} = 2\frac{(1+\tau)H - W}{W(1+r_d) + Y - ((1+\tau)(1+r_d) + (1-\tau q))H} - \frac{1}{1+r_d} < 0 \tag{16}$$

$$\frac{\partial(U^*_{OD} - U^*_R)}{\partial q} = -\tau H < 0 \tag{17}$$

Equations 11 and 12 illustrate how the timing of earnings and resources is crucial for homeownership when credit is rationed. An increase in W has two main effects: it boosts up permanent income and it reduces the shape of the time path of resources. What matters for the optimal tenure is the reduction in the steepness of the time path of resources. Higher initial endowment reduces the share of H that must be borrowed and weaken the effect of liquidity constraints (equation 11): the derivative of $U^*_{OD} - U^*_R$ with respect to W is then positive; moreover its value depends on the interest rate spread and is equal to zero if $r_d = r_a$.On the other hand, households with a steeper time path of earnings (higher Y) are more constrained (equation 12). Consumption smoothing implies that present consumption is a positive function of lifetime resources: *ceteris paribus* a lower fraction of available resources W is then saved in the first period by households with higher Y (and permanent income) and less resources are available for house purchase. Agents with steeper resources profile optimally choose to borrow a larger fraction of H and are then more constrained by the higher rate r_d; the magnitude of this effect is proportional to the interest rate spread and is absent if $r_d = r_a$.

Equation 13 shows that a marginal increase in the house price has two effect on tenure decision: on one hand it pushes up rental payments and makes ownership more attractive; on the other hand, it reduces the value of $U^*_{OD} - U^*_R$ by boosting up the expected cost of moving in the future (τq) and the amount that must be borrowed (and then the cost of the mortgage). The second effect dominates and the overall effect of H on $U^*_{OD} - U^*_R$ is negative when $r_h < \frac{\sqrt{1+r_a}}{\sqrt{1+r_d}}((1+\tau)(1+r_d) - (1-\tau q))$. Only whether the value of r_h (and then marginal utility of $\log A^*$) is higher than this threshold indirect

utility of renting decreases more then utility of owning and house purchase becomes more attractive. Far from unexpected, $U^*_{OD} - U^*_R$ is decreasing in transaction costs (14), since they reduce the profitability of real assets. In the opposite direction an increase in the real estate interest rate r_h boosts up the relative profitability of housing investment (equation 15).
The partial derivative of $U^*_{OD} - U^*_R$ with respect to r_d is negative for constrained households[14]: higher interest on debt boosts up the threshold of W that makes house purchase optimal. Equation 17 describes the effect of the probability of moving on $U^*_{OD} - U^*_R$: it is always negative and its absolute value increase with transaction cost and house price.

4 Data and descriptive statistics

Household data. The Bank of Italy's Survey of Household Income and Wealth (SHIW) collects detailed data on demographics, households consumption, income and balance sheet items since mid-1960s.
Each wave surveys a representative sample of the Italian resident population and covers about 8000 households. Sampling occurs in two stages, first at municipality level and then at household level. Municipalities are divided into 51 strata defined by 17 regions and 3 classes of population size (more than 40,000, 20,000 to 40,000, less than 20,000). Households are randomly selected from registry office records. They are defined as groups of individuals related by blood, marriage or adoption and sharing the same dwelling. The head of the household is conventionally identified with the husband, if present[15]. The net response rate (ratio of responses to households contacted net of ineligible units) was 34,3 percent in the 2002 wave. Brandolini and Cannari (1994) present a detailed discussion of sample design, attrition, and other measurement issues and compare the SHIW variables with the corresponding aggregate quantities. Furthermore SHIW dataset has a panel component: since 1989 part of the sample has comprised households that were interviewed in previous surveys. In each wave these households are about half of the sample (approximately 4000 households).

This analysis is based on data from waves 1993, 1995, 1998, 2000 and 2002. The unit of analysis is the household and the demographic characteristics are that of the head of household. Sample is restricted to households

[14] Equation 16 is negative when $W < (1+\tau)H + \frac{1}{2(1+r_d)}(Y + W(1+r_d) - (1+\tau)(1+r_d)H + (1-\tau q)H)$, i.e. when $W < (1+\tau)H + C_{OD}$.

[15] If instead the person who would usually be considered the head of the household works abroad or was absent at the time of the interview, the head of the household is taken to be the person responsible for managing the households resources.

aged between 25 and 50[16]. Households younger than 25 are excluded since there should be some form of selection in the choice of household formation: in Italy young working adults with independent living arrangement tend to be wealthier or low educated than the average, because most of the young adults live with their parents. On the other hand, housing tenure choices taken by agents older than 50 are likely to be driven by several factors related to retirement and/or health and family shocks. Finally homeowners who received their dwelling as bequest or gift are dropped out from the sample, since they do not face the choice of buy or rent their house. Some descriptive statistics for the whole sample and for the homeowners are reported in tables 3 and 4.

The spread. Identification of the econometric model exploits time and region specific variability in credit markets' features. Table 5 documents pronounced regional heterogeneity in terms of financial market indicators: it reports the level of borrowing and lending rates and their difference. These statistics are based on measures of financial rates applicable to relationships between the banking sector and the private sector, that are collected and provided by the Bank of Italy on provincial basis. Interest rates refer to the overall types of loans and to short run interest rates. Even if these rates are not directly relevant to consumers financial environment, their level and the spread are related, over time and across regions, to those applicable to households' loans and deposits.

Two main objections can be moved against the use of the interest rate spread as measure for local financial market's conditions. The first one is that if individuals can tap markets other than the local one, local market conditions become irrelevant[17]. A growing body of literature documents the importance of distance for the provision of funds from small firms (see Guiso et al. (2004)): since searching costs are even greater for individuals, we expect distance to matter also for households.
The second objection is that the interest rate spread can be driven by region and time specific heterogeneity in the households default rate or in other features of credit demand. Different spread can be the optimal response by financial institutions to differences in average individual characteristics that make somebody a good or a bad borrower or to specific shocks that affect uncertainty in local labor markets and, in turn, the expected default rate.

[16] In order to check sensibility of results to this age restriction, estimates are performed on different subsamples.

[17] In Italy legal restrictions on lending across geographical areas have been removed in 1990.

Table 4: Summary statistics

	All		Tenants		Homeowners	
Variable	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Owner	62.23%	0.48				
Age	40.40	6.58	39.12	6.80	41.17	6.33
Male	76.50%	0.42	73.21%	0.44	78.50%	0.41
Family size	3.37	1.23	3.22	1.34	3.46	1.15
Couple	79.85%	0.40	72.52%	0.45	84.30%	0.36
No education	1.12%	0.11	2.18%	0.15	0.47%	0.07
Compulsory education	49.78%	0.50	59.44%	0.49	43.92%	0.50
College	38.11%	0.49	30.56%	0.46	42.69%	0.49
Degree or more	10.99%	0.31	7.82%	0.27	12.92%	0.34
Years of education	10.41	3.97	9.51	3.91	10.95	3.90
Employee	67.94%	0.47	68.11%	0.47	67.83%	0.47
Self-employed	19.68%	0.40	16.03%	0.37	21.90%	0.41
Private sector	66.17%	0.47	68.73%	0.46	64.62%	0.48
Income	24.28	16.10	19.42	13.69	27.23	16.73
Wealth	129.47	180.56	19.81	60.55	196.03	196.05
Small city (< 20 000)	22.79%	0.42	17.98%	0.38	25.70%	0.44
Large city (>500 000)	11.06%	0.31	14.39%	0.35	9.04%	0.29
House surface	101.94	52.13	81.34	29.76	114.44	58.43
House value	130.74	99.74	92.90	64.63	153.19	109.64
House price (sqm)	1.29	0.71	1.15	0.70	1.38	0.70
Rent per sqm	0.05	0.03	3.15	2.40	5.82	3.76
Observations	11515		4349		7166	

Source: SHIW 1993-2002.

Notes: income, wealth, price, rent and house value are in thousand euro 2002.

Table 5: Financial indexes

Variable		Mean	Std. Dev.
Interest rate on debt	overall	0.1093	0.0344
	between		0.0096
	within		0.0331
Interest rate on deposits	overall	0.0467	0.0250
	between		0.0016
	within		0.0250
Spread	overall	0.0626	0.0134
	between		0.0103
	within		0.0088

Source: elaboration on Bank of Italy data. Years 1993-2002. 100 observations (20 regions observed 5 times).

The bid-ask spread is however highly correlated to alternative indicators that have been used in the literature as measure for lending supply and financial development, like the branch density (see Benfratello et al. (2008)) and the index for easiness of access to the credit market built by Guiso et al. (2004). The correlation of spread with branch density is -0.7920 and 0.638 with the index by Guiso et al. (2004): these high and significant correlations strongly support the suitability of the spread index as measure for borrowing constraints. A further confirmation comes from the regression of this index on variables that describe provincial structure of financial markets in 1936, year of the introduction of a new banking law that frozen the credit market (see Guiso et al. (2007) for further details on this reform.). The OLS regression of regional interest rate spread on these variables[18] has an R^2 of 46.32%, meaning that a huge fraction of total spread variability is explained by these variables and, therefore, that supply factors are crucial determinats of the interest rate spread.

[18]They include the number of total branches in each region in 1936 and the share of branches owned by local versus national banks, since the former had more flexibility to grow. Moreover, since among the local banks saving banks had more flexibility than cooperative ones, I use also the number of cooperative and saving banks per million habitants.

5 The empirical specification

5.1 Basic model: probit on pooled sample

In order to decide whether to buy the dwelling house, households compare the level of indirect utilities and own their dwelling when the utility reached by owning is greater then the utility achieved by renting.
The model I estimate is:

$$y_{it}^* = x_{it}\beta + v_{it} \tag{18}$$

$$y_{it} = 1[y_{it}^* > 0] \tag{19}$$

where y_{it}^* is the latent dependent variable, i.e. $U_{it}^O - U_{it}^R$ and the vector x_{it} includes explanatory variables. Since information about households features and economic environment at house purchase are not provided by SHIW data, the empirical analysis focuses on the tenure status as latent variable: the dependent variable y is the probability of being owner. The error term v_{it} is assumed to be normally distributed[19]:

$$v_{it}|x_{it} \sim N(0,1). \tag{20}$$

The log-likelihood function that is maximized is then:

$$L(x_{it};\beta) = \sum_{t=1}^{T}\sum_{i=1}^{N}[(1-y_{it})\log(1-\Phi(x_{it}\beta)) + y_{it}\log\Phi(x_{it}\beta)] \tag{21}$$

Explanatory variables. According to theoretical predictions homeownership is determined by institutional and personal factors and by their interactions. As for market variables, the index used to measure local financial market's conditions is the interest rates spread described in section 4[20]. The cost of renting and the level of house prices are captured by the average regional level of rental payments and house value per squared meter computed

[19] An alternative way to interpret v_{it} is by decomposing it into unobserved heterogeneity (c_i) and an idiosyncratic error component u_{it}. Contemporaneous strict exogeneity assumptions, i.e $u_{it}|x_{it} \sim N(0,1)$ and $c_i|x_{it} \sim N(0,\sigma_c^2)$, implies $v_{it}|x_{it} \sim N(0,\sigma^2)$, where $\sigma^2 = 1+\sigma_c^2$. MLE of this model provides a consistent estimator of $\beta^c = \frac{\beta}{\sigma}$ that allows to consistently estimate the average partial effect across c_i. Actually, as shown by Wooldridge (2001), the average partial effect of variable x_j is equal to $APE = \phi(x_0\beta^c)\beta_j^c$.

[20] The index used refers to the year of the interview. One can argue that the most suitable index would refer to the moment of purchase, indeed the contemporaneous interest rate spread influences the probability of being owner conditional on being renter in the previous period and, in turn, also the unconditional probability would be affected.

from each wave of SHIW data[21]. This choice is motivated by the potential endogeneity of the price at the individual level. The house price depends not only on local market's conditions but also on housing features that are chosen by the household, like the city area or the type of building. For this reason house prices differ also because households choose dwellings with different characteristics according to their preferences: house-specific price is indeed correlated to unobservable tastes. One can wonder about the closeness of self-reported values to market price and rent: Cannari and Faiella (2007) show that SHIW estimates for 2002 turn out to be very close to market values computed resorting other data sources[22].

A possible objection against the use of market-specific indicators (both for credit and housing market) is that they can be endogenous with respect to the likelihood of homeownership (e.g. because of common shocks). Since they are time and region specific, I can control for some potential sources of endogeneity by including in the regression time and regional dummies that would capture, respectively, national macro shocks and region-specific features.

As for transaction costs related to housing turnover, they include duties on purchase, notary and real estate agency fees. While the former are geographically homogeneous, the level of fees can differ across region and years[23]; time-varying measures for these costs are however not available.

The tax code has a substantial impact not only on transaction costs but also on the relative profitability of owning with respect to renting and on the cost of loans. Some aspects of the tax system are decided at the central level and are homogeneous across regions (for instance imputed rents of dwelling house are not taxed); the main tax charged on real estate properties (Imposta Comunale sugli Immobili, ICI) is however determined at the municipal level[24]. Even if it is a potential determinant of homeownership,

[21] Both informations are available for owners and renters: households interviewed report the market price of the house where they live; moreover tenants declare the amount of rental payment and homeowners the amount they would collect by renting their dwelling.

[22] The main dataset they use are gathered by Consulente Immobiliare and Osservatorio Mercato Immobiliare dellAgenzia del Territorio (OMI). The reasons why I do not rely on these datasets are that first one collects information only on a small sample of municipalities, while the second one is available only from 2002.

[23] The maximum and minimum thresholds for notary fees are decided at the state level but -within this range - their observed level is determined by the local Notary Council. As for real estate agency, an indicator for charged fees is not available and factors like tax evasion make its measure difficult.

[24] Each commune autonomously decides the enforced tax rate that is levied on officially recorded rent. Moreover a deduction is provided for each dwelling home; the amount of this deduction is 103.29 euro but it can be raised by local administration. This tax has

its limited heterogeneity make it less powerful. The mean value of the I.C.I. tax rate was indeed 5.20% in 2006 with a standard deviation of 0.76; 72% of Italian councils enforced a tax rate between 4.5 and 5.5%[25]. A homegeneous and quantitatively relevant deduction make the net tax rate even less widespread across councils (and less heterogeneous then financial market indicators). Moreover the tax is computed on the basis of the officially recorded rent ('rendita catastale'), that is often not updated and not informative about the house market value.
Tenure choices can also be influenced by policies implemented at local level to support homeownership by young households. These actions are targeted at youngest households: I will check the robustness of findings by excluding from the sample the youngest in some of the specifications.

According to theoretical predictions, individual variables that are expected to influence homeownership are those related to available resources, future income and to the probability of moving in the future. Resources are measured by the stock of total net wealth independently on how it has been invested, i.e real estate and financial assets net of liabilities. The level of future earnings is proxied by education, i.e. years of schooling: more educated agents are expected to have higher level of permanent income and steeper labor income profiles (Borella (2004)). Other variables that can influence the income profile, i.e. occupation and sector of employment, are added as controls. Finally, expectations about future mobility might be related to couple stability and job characteristics, i.e. marital status, age and employment sector (private vs public).
Additional controls that are likely to affect both tastes and the level of consumption are also included: sex, family size, and council size.

Results. Regression results are reported in table 6. The simplest specification is in the first column, where the effect of the spread index is not allowed to depend on any other variable; the interactions of spread with current resources and education are added in column 2. Robustness to the addition of other controls is addressed in the last column.
Looking at the first specification, the likelihood of homeownership increases with available resources and goes down with education. Estimated coefficients of market-level variables have the expected sign as well: house prices and rental payments have respectively a negative and positive impact on

been removed for the dwelling house in 2008.

[25]Elaboration on IFEL (Istituto per la Finanza e l'Economia Locale) data. Results are similar across regions.

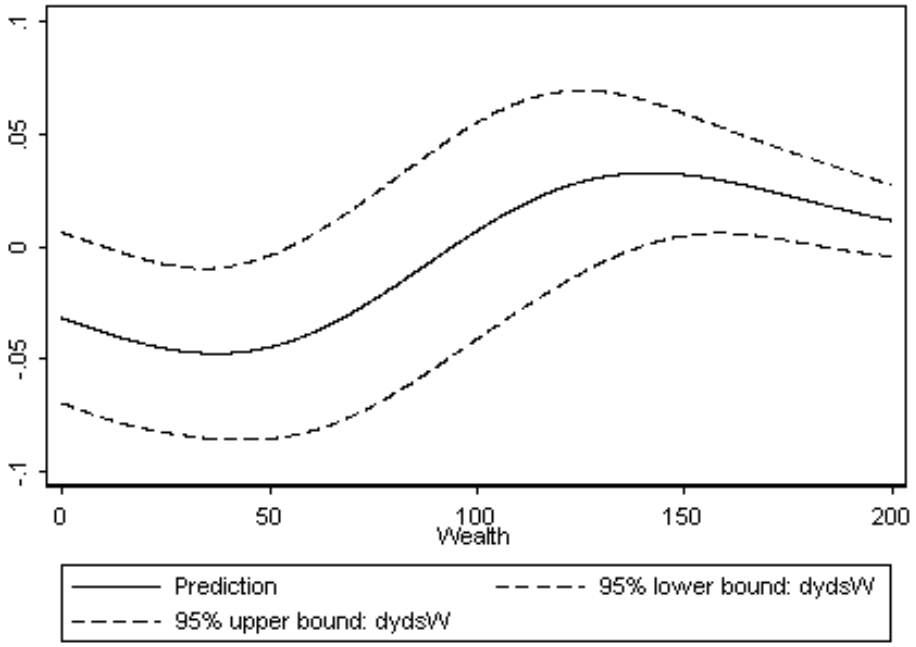
the dependent variable. Quite surprisingly, the coefficient of interest rate spread is not statistically significant. But results change whether its impact is allowed to differ according to households characteristics (column 2). Allowing its effect to depend on households wealth and education, interest rate spread becomes a relevant explanator: its effect is negative, and the magnitude is lower for households that are less constrained, i.e. agents with greater wealth and/or lower education. Coefficients for house price and rent do not change, while the effect of wealth and education is not significant yet. These results are in line with theoretical predictions: households characteristics do not affect tenure choice whether credit markets are frictionless; their impact is instead significant when the interest rate spread is positive. These findings are robust to the addition of other controls (third column). The only difference concerns schooling, whose effect becomes significantly positive. Educational choice might be correlated with different intertemporal preferences: more educated agents are expected to discount future earnings at a lower rate: they consume less and are less constrained. As for occupation, employees are more likely to be owner with respect to a non participant (the reference category) and to self-employed (coefficient not different from zero), characterized by steeper income profiles. The estimated coefficients for city size are significant as well. Homeownership is less likely in big cities because of differences in the probability of moving (that is on average higher in large cities, with higher incidence of temporary workers) or because of lower average house prices in small towns. Finally, longer expected length of staying makes couples more likely to be owner. Sector of employment, age and sex of the household head are not significant.

The marginal effects reported in the table are computed at the sample mean of the regressors; they are however not sufficient to pin down the overall impact of explanators that are interacted with other variables. Figure 2 plots the marginal effect of the interest rate spread as function of total wealth for a couple with a male household head that is aged 35 and has a high school diploma[26]. This graph demonstrates that an increase in the interest rate spread by one percentage point reduces the probability of homeownership by 4-5 percent for households endowed with less than 50 thousand euro; the negative effect slowly decreases with wealth and becomes zero when wealth reaches the threshold of 95000 euros[27]. This graph is consistent with the claim that liquidity constraints hamper homeownership and

[26]The household head is employee and lives in a medium-size council in Lombardia in 1998; the other variables are at the median value.

[27]However the null hypothesis that the marginal effect of spread is zero cannot be rejected for resources higher than 62000 euros.

Figure 2: Marginal effects of interest rate on debt



Notes: Marginal effects are computed for couple with male household's head aged 35 who has a high school degree, is employee and live in a medium-size council in Lombardia in 1998; the other variables are at the median value. Spread is expressed in percentage points.

that their effect is lower for richer households; households richer than 95000 (or 62000) are found to be not constrained, i.e. their housing tenure decision is not influenced by credit market's conditions.

5.2 Robustness checks

Robustness with respect to different age restrictions is shown in table 8. In general, sign and significance of the coefficients are confirmed; the effect of the main variables is greater for younger households. Moreover I partially control for the effect of local policies to sustain homeownership, that are generally targeted at the youngest households, by excluding agents younger than 35. Estimate in the last column demonstrate robustness of the main findings.

Results in table 6 are based on the whole sample, that includes both constrained and unconstrained households. Credit market's features are expected to be relevant only for liquidity constrained households. In order to address this issue, I estimate the model in equations 18-19 for different subsamples of households that are more likely to be liquidity constrained, i.e. households with wealth lower than the third quartile or lower than the mean (column 2 and 3 in table 7). Coefficients of the interactions of spread with wealth and education are still significant and have the expected sign while estimated beta for spread is not significant anymore; the magnitude of the impact of house prices, rents and city size is greater when the richest are excluded.

Finally, I estimate the model for the probability of *becoming* homeowner on the sample of households that buy their house in the two year before the interview[28]. Two main drawbacks reduce the explanatory power of this regression. First the sample size is cut by more than half and the observed purchases are only 226 over 4534 observations. Furthermore the most appropriate model would be a duration one, that allow to estimate the probability of purchase conditioned on the fact that the household has not yet bought the house[29] (the negative coefficient for age might be driven by this shortcoming: the probability of purchase is higher for the youngest because the elderly are already owners). Despite these pitfalls the majority of the estimated coefficients (table 9) keep the same sign with a lower level of significance; moreover marital status, city size, spread and its interaction with wealth are significant at conventional level. Results of the estimated probability of housing purchase support results in previous columns: the direction of the effect of the main explanatory variables is basically confirmed and, among them, spread and its interaction with wealth are found to be especially powerful.

[28]The dependent variable is a dycotomic variable that assumes value one if the household buys the house during the period before the interview and zero if rents. In order to build this variable I use the panel dimension of the sample (the dependent is one if the household was tenant in the previous interview and becomes owner) and the answer about the year of purchase of the house where the household lives, implicitly assuming that renting up to that moment.

[29]Indeed it is not implementable because of sample characteristics: few observation and only some of them are observed more than once

5.3 Addressing endogeneity of wealth: a control function approach

Up to this point available wealth at the moment of the interview is assumed to be exogenously determined (equation 20). But households that are willing to buy their dwelling might save more or increase household labor supply (mainly through labor force participation of women) in order to reduce the amount of money they must borrow. In this case both the probability of owning and the level of wealth are driven by preferences for homeownership or by heterogeneous intertemporal discount rates that are unobservable and so they are captured by the error term. The level of resources is therefore correlated to the error term and the endogeneity of wealth might bias the results.

In order to address this issue I follow a control function procedure (Rivers and Vuong (1988)). The level of wealth is regressed on exogenous regressors and on some parents' characteristics that affect homeownership. The residual of this equation is then added to the equation for homeownership (eq. 18), that is estimated by maximum likelihood. The t-statistic on the coefficient of the fitted residual provides a valid test for the endogeneity of local financial market's conditions [30].

Results are reported in table 10. The first column replicates results of table 6, estimates of the likelihood of ownership and the OLS estimate for wealth are shown in the other columns.

Parental variables I use along with exogenous regressors to estimate wealth are two dummies that capture whether at least one parent of each partner is (or was) self employed. Parents' self-employment is expected to be positively related to their income[31] or can capture the effect of family network in boosting up initial income of children. As expected, all the dummy variables have a positive effect on the stock of wealth (column 3).

Column 2 shows the results of the probit estimates when accounting for

[30] Total net wealth is modeled as $w_{it} = x_{wit}\beta_w + d_{it}\gamma + u_{it}$ where x_{wit} is the vector of exogenous variables and w_{it} is wealth; $d_{it}\gamma$ is the vector of parental variables used as "instruments". v_{it} in equation 18 can be rewritten as $v_{it} = \theta u_{it} + e_{it}$. Wealth is an endogenous variable in equation 18 whether the error term of that equation (v_{it}) and the error term in the model for wealth (u_{it}) are correlated, i.e. if θ is different from zero. Substituting the expression for v_{it} in equation 18 the latent becomes $y^*_{it} = x_{it}\beta + \theta u_{it} + e_{it}$. The equation for wealth is estimated by OLS and fitted residuals $\hat{u}_{it}$ are substituted into the expression for v_{it}. Under the assumption of joint normality of (u_{it}, v_{it}), also e_{it} is normally distributed; this allow the likelihood of homeownership to be estimated by maximum likelihood.

[31] Information about parents' wealth and income are not provided by SHIW data.

endogeneity of wealth. The significance of the estimated coefficient of the fitted residual indicates that there is a correlation between the error term in the model for wealth and the error term in equation 18. The main insight of previous section are however not radically modified: the sign and the significance of coefficients estimated under the hypothesis of exogeneity (first column in table 10) and the corrected ones remain basically unchanged. The main exceptions are house price, that is not yet statistically different from zero, and age and household size that become indeed significant.

The main drawback of the control function approach are that consistency of the estimates depends upon the model for the endogenous variable being correctly specified, while this requirement does not apply to the IV estimate of the linear probability model. In order to check the robustness of results in table 10, I therefore estimate a linear probability models by two-step GMM. Results are reported in table 11. The first column shows OLS estimate of the probability of homeownership and the second one reports results of two-step GMM estimate; the first step regressions for wealth and its interaction with spread are in the last columns of the table. The instrumental variables for the endogenous ones are the same used in the control function approach. In general, coefficients estimated both by OLS and efficient GMM are less significant with respect to probit models[32]; however results in the first column are in general confirmed by the GMM estimate, even if less precise and efficient. Furthermore the two-step GMM allows to test the validity of the instruments used: the F test on excluded instruments rejects their weakness (last rows)[33].

5.4 Controlling for individual unobserved heterogeneity: random effect and fixed effect models

In previous section I controlled for endogeneity between accrued wealth and the likelihood of homeownership. More general source of endogeneity might

[32]This is mainly due to the fact that linear probability is not the suitable model. Moreover the sample size decreases as consequence of the use of instruments; if we estimate OLS model on the whole sample results slightly improve their quality.

[33]The two instruments I used so far does not allows to test for their validity, since the model is just-identified. Therefore I estimate the same two-step GMM model by adding a further instrument, i.e. a dummy that captures whether at least one parent the partner is still alive. If parents are still alive, they might increase children's resources with intergenerational transfers or by helping them in childcare and foster labor market participation of wives; moreover wealth is correlated with longevity: parents who live longer are more likely to be rich. The model is now over-identified and J test can be implemented: the null hypothesis of validity exogeneity of the instruments cannot be rejected (the p-value is 0.4612) and the main results are confirmed.

arise: individual specific unobservables, like ability, tastes, intertemporal discount rates or preferences for homeownership, might indeed be correlated with some of the explanatory variables. In order to address this issue I exploit the panel dimension of part of the sample and allow for some form of correlation between regressors and the unobserved heterogeneity.
The model for homeownership can be written as:

$$y_{it}^* = x_{it}\beta + \underbrace{c_i + u_{it}}_{v_{it}} \tag{22}$$

$$y_{it} = 1[y_{it}^* > 0] \tag{23}$$

where c_i is the individual unobserved heterogeneity and u_{it} the idiosyncratic component of the error term.
A solution *à* la Chamberlain (as illustrated in Wooldridge (2001)) is the natural starting point. An arbitrary correlation between c_i and x_{it} is allowed by assuming that:

$$c_i = \mu + \bar{x}_i\xi + a_i$$

where $\bar{x}_i$ is a generic function of regressors, here the mean of wealth and family size. Unconditional exogeneity assumption (equation 20) can then be relaxed and the model in equations 22 and 23 can be estimated under the weaker assumptions that only the residual component of the individual effect (a_i) is independent of regressors, i.e.:

$$u_{it}|X_i, a_i \sim N(0,1)$$

$$a_i|X_i \sim N(0, \sigma_a^2).$$

A conditional logit model is then estimated in order to strengthen the validity of the conclusions. This model is indeed based on the assumption of exogeneity conditional on unobserved heterogeneity, i.e.:

$$u_{it}|X_i, c_i \sim L(0,1).$$

Regressors are assumed to be exogenous with respect to the idyosincratic shock but without any additional requirement of orthogonality between individual heterogeneity and explanators.
The main drawback of these approaches is that it is based on a smaller sample. Random effect probit requires households to be observed at least in two waves, that reduces the sample size by one half; an even smaller sample is used for conditional logit estimate, since only households that appear in

multiple surveys and switch across states contribute to the likelihood function.
Despite this shortcoming, the main findings of previous sections are confirmed (table 12). Only the interaction between spread and years of education is not still significant; however this result might be driven by the reduced sample size (note that the same coefficient is significant only at 10% also in pooled probit estimate). An interesting point to underline is the significance of the mean wealth in random effect model (column 2) estimate, that confirms the correlation between wealth and unobserved heterogeneity.

6 Conclusions

This paper contribute to the literature on the effects of liquidity constraints on consumption and saving by investigating their effect on homeownership decisions.
In cross country studies it is difficult to disentangle the effect of credit markets from other institutional factors, like rental market regulation or the tax code. The main contribution of this paper is to exploit within-region heterogeneity in local financial markets to asses their role in shaping homeownership, keeping other institutional factors constant. Furthermore I rely on a broad definition of liquidity constrained consumers, that includes not only agents who face quantity limit to the amount they can borrow but also households for whom interest rates on borrowing and lending are different.

When decide to buy or rent their home, households act according to their preferences and the expected length of staying in the same house and take into account the relative cost of owning with respect to renting and the cost of borrowing. Credit rationing, in the form of interest rate spread, are expected to deter households from buying the house and their effect is would be grater for households with steeper resources profile, that are indeed more constrained.

I used SHIW and Bank of Italy's data to estimate a probability model for the likelihood of being homeowners. Results basically confirm expectations: credit rationing has a negative impact on homeownership, but its effect is lower for richer and less educated households, that have a flatter income profile and are therefore less constrained. A rise in the interest rate spread by one percentage point is estimated to reduce the probability of homeownership by 4-5 percent for medium-educated households; the impact of financial market imperfections on housing tenure decisions weaken with wealth and is zero for (medium-educated) households endowed with more

than 92 thousand euros.
A potential pitfall of this analysis is the existence of some form of endogeneity of regressors. Households that are willing to buy their dwelling might save more or increase household labor supply (mainly through labor force participation of women) in order to reduce the amount of money they must borrow. I address this issue through a control function approach that show how endogeneity cannot be rejected but does not change the main findings. More general source of endogeneity can arise: individual specific unobservables might indeed be correlated with some of the explanatory variables. Therefore I exploit the panel dimension of part of the sample and I account for individual unobserved heterogeneity. I estimate a Chamberlain probit model and a conditional fixed effect logit: even if evaluated on smaller sample these estimate basically confirms previous findings.

In conclusion results of this analysis are in line with previous cross-country studies (Chiuri and Jappelli (2003); Bicakova and Sierminska (2007)) that find an significant effect of credit market conditions on homeownership rates. Even if drawn in a within country framework, these conclusions can be generalized and extended to broader settings and contribute to asses the crucial role played by financial markets in shaping cross-countries heterogeneity in homeownership rates.

Table 6: Probit regression on the probability of being owner: basic model on pooled sample.

	a0	a1	a3
Wealth	0.014***	-0.004	-0.004
	(0.001)	(0.004)	(0.004)
	[0.004]	[-0.001]	[-0.001]
Spread	-3.218	-13.512**	-12.750*
	(5.180)	(6.847)	(6.903)
	[-0.800]	[-3.367]	[-3.204]
Years of education	-0.018***	0.044	0.057**
	(0.005)	(0.029)	(0.029)
	[-0.004]	[0.011]	[0.014]
House price per sqm.	-0.925***	-0.961***	-0.883***
	(0.234)	(0.246)	(0.247)
	[-0.230]	[-0.240]	[-0.222]
Rent per sqm.	20.418***	27.843***	26.801***
	(6.009)	(6.447)	(6.462)
	[5.074]	[6.938]	[6.735]
Household size	0.057***	0.064***	0.017
	(0.015)	(0.016)	(0.019)
	[0.014]	[0.016]	[0.004]
Age	0.002	0.001	0.001
	(0.003)	(0.003)	(0.003)
	[0.000]	[0.000]	[0.000]
Spread*wealth		0.317***	0.316***
		(0.061)	(0.060)
		[0.079]	[0.079]
Spread*years of education		-1.095**	-1.309***
		(0.475)	(0.477)
		[-0.273]	[-0.329]
Employee			0.092*
			(0.051)
			[0.024]
Self-employed			-0.029
			(0.073)
			[-0.007]
Male			0.021
			(0.048)
			[0.005]
Couple			0.220***
			(0.058)
			[0.059]
Small city (< 20 000)			0.189***
			(0.050)
			[0.045]
Large city (> 500 000)			-0.230***
			(0.069)
			[-0.063]
Private sector			-0.060
			(0.043)
			[-0.015]
Observations	11515	11515	11515
r2_p	0.495	0.499	0.503
chi2	803.217	854.375	921.313

Notes: $^{*}p < 0.1, ^{**}p < 0.05, ^{***}p < 0.01$ All regressions include a constant, time and regional dummies. Standard errors are in brackets, marginal effects computed at the mean of independent variables are in square brackets. Standard errors are robust to heteroskedasticity and to correlation within repeated observations of the same household. Monetary variables are expressed in thousand euro 2002.

Table 7: Probit on pooled sample: constrained households

	all	wealth<75%	wealth< mean
Wealth	-0.004	0.023***	0.031***
	(0.004)	(0.004)	(0.005)
	[-0.001]	[0.009]	[0.012]
Spread*wealth	0.316***	0.156**	0.155**
	(0.060)	(0.065)	(0.077)
	[0.079]	[0.061]	[0.059]
Spread	-12.750*	-12.732	-8.824
	(6.903)	(9.193)	(10.026)
	[-3.204]	[-4.981]	[-3.361]
Years of education	0.057**	0.002	0.026
	(0.029)	(0.032)	(0.036)
	[0.014]	[0.001]	[0.010]
Spread*years of education	-1.309***	-0.932*	-1.358**
	(0.477)	(0.519)	(0.571)
	[-0.329]	[-0.365]	[-0.517]
House price per sqm.	-0.883***	-1.093***	-1.233***
	(0.247)	(0.355)	(0.417)
	[-0.222]	[-0.427]	[-0.470]
Rent per sqm.	26.801***	36.278***	33.425***
	(6.462)	(9.305)	(10.424)
	[6.735]	[14.192]	[12.732]
Employee	0.092*	0.016	-0.026
	(0.051)	(0.062)	(0.068)
	[0.024]	[0.006]	[-0.010]
Self-employed	-0.029	-0.100	-0.134
	(0.073)	(0.092)	(0.100)
	[-0.007]	[-0.039]	[-0.050]
Age	0.001	-0.010***	-0.010**
	(0.003)	(0.004)	(0.004)
	[0.000]	[-0.004]	[-0.004]
Male	0.021	-0.049	-0.020
	(0.048)	(0.068)	(0.079)
	[0.005]	[-0.019]	[-0.008]
Couple	0.220***	0.098	0.136
	(0.058)	(0.076)	(0.085)
	[0.059]	[0.038]	[0.051]
Household size	0.017	0.009	-0.013
	(0.019)	(0.023)	(0.027)
	[0.004]	[0.004]	[-0.005]
Private sector	-0.060	0.010	0.030
	(0.043)	(0.058)	(0.067)
	[-0.015]	[0.004]	[0.012]
Small city (< 20 000)	0.189***	0.245***	0.247***
	(0.050)	(0.062)	(0.072)
	[0.045]	[0.094]	[0.096]
Large city (>500 000)	-0.230***	-0.296***	-0.355***
	(0.069)	(0.091)	(0.104)
	[-0.063]	[-0.117]	[-0.128]
Observations	11515	8636	7216
Log likelihood	-3792.461	-2127.906	-1683.154
r2_p	0.503	0.644	0.657
chi2	921.313	1523.488	1686.716

Notes: $^{*}p < 0.1, ^{**}p < 0.05, ^{***}p < 0.01$ All regressions include a constant, time and regional dummies. Standard errors are in brackets, marginal effects computed at the mean of independent variables are in square brackets. Standard errors are robust to heteroskedasticity and to correlation within repeated observations of the same household. Monetary variables are expressed in thousand euro 2002.

Table 8: Probit model for different age restrictions.

	25-50	40-50	25-40	25-60	35-50
Wealth	-0.004	-0.001	-0.008	-0.002	-0.003
	(0.004)	(0.004)	(0.006)	(0.002)	(0.004)
	[-0.001]	[-0.000]	[-0.003]	[-0.000]	[-0.001]
Spread*wealth	0.316***	0.234***	0.442***	0.249***	0.284***
	(0.061)	(0.071)	(0.102)	(0.038)	(0.064)
	[0.079]	[0.047]	[0.140]	[0.050]	[0.063]
Spread	-12.750*	-12.429	-7.245	-14.174***	-6.169
	(6.641)	(8.663)	(9.003)	(5.249)	(7.649)
	[-3.204]	[-2.477]	[-2.303]	[-2.834]	[-1.360]
Years of education	0.057**	0.043	0.078*	0.035*	0.065**
	(0.027)	(0.034)	(0.043)	(0.020)	(0.031)
	[0.014]	[0.009]	[0.025]	[0.007]	[0.014]
Spread*years of education	-1.309***	-1.102**	-1.668**	-1.063***	-1.458***
	(0.443)	(0.540)	(0.724)	(0.323)	(0.501)
	[-0.329]	[-0.220]	[-0.530]	[-0.213]	[-0.321]
House price per sqm.	-0.883***	-1.321***	-0.409	-0.725***	-1.067***
	(0.246)	(0.324)	(0.363)	(0.178)	(0.280)
	[-0.222]	[-0.263]	[-0.130]	[-0.145]	[-0.235]
Rent per sqm.	26.801***	31.381***	25.314**	17.215***	31.022***
	(6.502)	(8.189)	(9.915)	(5.004)	(7.263)
	[6.735]	[6.254]	[8.047]	[3.442]	[6.841]
Employee	0.092**	0.088	0.143**	0.030	0.095
	(0.047)	(0.062)	(0.071)	(0.036)	(0.060)
	[0.024]	[0.018]	[0.046]	[0.006]	[0.021]
Self-employed	-0.029	-0.026	-0.012	-0.090	-0.026
	(0.064)	(0.087)	(0.089)	(0.056)	(0.083)
	[-0.007]	[-0.005]	[-0.004]	[-0.019]	[-0.006]
Age	0.001	-0.000	-0.002	0.004**	0.003
	(0.003)	(0.007)	(0.005)	(0.002)	(0.004)
	[0.000]	[-0.000]	[-0.001]	[0.001]	[0.001]
Male	0.021	0.012	-0.011	0.011	-0.004
	(0.042)	(0.060)	(0.056)	(0.040)	(0.058)
	[0.005]	[0.002]	[-0.004]	[0.002]	[-0.001]
Couple	0.220***	0.259***	0.245***	0.253***	0.239***
	(0.049)	(0.066)	(0.066)	(0.047)	(0.069)
	[0.059]	[0.057]	[0.081]	[0.055]	[0.057]
Household size	0.017	0.009	0.007	-0.017	0.009
	(0.015)	(0.020)	(0.023)	(0.014)	(0.021)
	[0.004]	[0.002]	[0.002]	[-0.003]	[0.002]
Private sector	-0.060	-0.098**	0.002	-0.079**	-0.070
	(0.038)	(0.049)	(0.055)	(0.034)	(0.049)
	[-0.015]	[-0.019]	[0.001]	[-0.015]	[-0.015]
Small city (< 20 000)	0.189***	0.256***	0.144**	0.246***	0.249***
	(0.040)	(0.052)	(0.058)	(0.039)	(0.057)
	[0.045]	[0.047]	[0.045]	[0.046]	[0.051]
Large city (>500 000)	-0.230***	-0.260***	-0.220***	-0.342***	-0.234***
	(0.060)	(0.075)	(0.077)	(0.058)	(0.076)
	[-0.063]	[-0.058]	[-0.074]	[-0.079]	[-0.057]
Observations	11515	6635	5449	17947	9047
Log likelihood	-3792.461	-2154.877	-1768.056	-5982.581	-2944.832
r2_p	0.503	0.484	0.527	0.477	0.495
chi2	1213.824	800.844	692.506	1446.544	782.830

Notes: $^{*}p < 0.1, ^{**}p < 0.05, ^{***}p < 0.01$ Standard errors are in brackets, marginal effects computed at the mean of independent variables are in square brackets. Standard errors are robust to heteroskedasticity and to correlation within repeated observations of the same household. Monetary variables are expressed in thousand euro 2002.

Table 9: Probit regression on the probability of buying the house.

	a3
Wealth	0.001
	(0.003)
	[0.000]
Spread	-58.403***
	(10.760)
	[-2.271]
Years of education	-0.040
	(0.052)
	[-0.002]
House price per sqm.	-0.678
	(0.536)
	[-0.026]
Rent per sqm.	8.629
	(13.758)
	[0.336]
Household size	0.053
	(0.036)
	[0.002]
Age	-0.010*
	(0.006)
	[-0.000]
Spread*wealth	0.097*
	(0.057)
	[0.004]
Spread*years of education	0.735
	(0.894)
	[0.029]
Employee	0.165
	(0.130)
	[0.006]
Self-employed	0.051
	(0.172)
	[0.002]
Male	0.134
	(0.118)
	[0.005]
Couple	0.638***
	(0.153)
	[0.019]
Private sector	-0.134
	(0.094)
	[-0.006]
Small city (< 20 000)	0.069
	(0.106)
	[0.003]
Large city (> 500 000)	-0.412**
	(0.163)
	[-0.012]
Observations	4534
Log likelihood	-591.894
r2_p	0.341
chi2	272.199

Notes: $^{*}p < 0.1, ^{**}p < 0.05, ^{***}p < 0.01$ All regressions include a constant, time and regional dummies. Standard errors are in brackets, marginal effects computed at the mean of independent variables are in square brackets. Standard errors are robust to heteroskedasticity and to correlation within repeated observations of the same household. Monetary variables are expressed in thousand euro 2002.

Table 10: Addressing endogeneity of wealth: control function approach

	Basic	Second step	First step
Wealth	-0.006*	-0.010*	
	(0.003)	(0.005)	
	[-0.002]	[-0.002]	
Spread*wealth	0.354***	0.354***	
	(0.057)	(0.094)	
	[0.087]	[0.087]	
Spread	-14.990**	-12.514	564.091
	(7.094)	(7.996)	(718.460)
	[-3.704]	[-3.090]	
Years of education	0.052*	0.112***	15.765***
	(0.029)	(0.033)	(2.691)
	[0.013]	[0.028]	
Spread*years of education	-1.301***	-1.558***	-60.095
	(0.480)	(0.510)	(40.607)
	[-0.322]	[-0.385]	
House price per sqm.	-0.773***	-0.329	122.915***
	(0.254)	(0.266)	(24.395)
	[-0.191]	[-0.081]	
Rent per sqm.	28.750***	30.847***	618.966
	(6.929)	(7.378)	(638.936)
	[7.105]	[7.617]	
Employee	0.083	0.018	-18.006**
	(0.054)	(0.052)	(7.012)
	[0.021]	[0.005]	
Self-employed	-0.051	0.115	42.732***
	(0.076)	(0.085)	(8.314)
	[-0.013]	[0.027]	
Age	0.002	0.017***	4.125***
	(0.003)	(0.005)	(0.305)
	[0.000]	[0.004]	
Male	0.030	0.067	10.662**
	(0.051)	(0.045)	(5.416)
	[0.008]	[0.017]	
Couple	0.228***	0.302***	18.690***
	(0.061)	(0.059)	(7.081)
	[0.060]	[0.081]	
Household size	0.007	0.045**	10.637***
	(0.020)	(0.019)	(2.290)
	[0.002]	[0.011]	
Private sector	-0.045	-0.066	-6.300
	(0.044)	(0.044)	(4.380)
	[-0.011]	[-0.016]	
Small city (¡ 20 000)	0.186***	0.235***	12.888**
	(0.052)	(0.041)	(5.605)
	[0.044]	[0.054]	
Large city (¿500 000)	-0.182***	-0.157**	7.652
	(0.068)	(0.064)	(6.268)
	[-0.048]	[-0.041]	
Residual		0.004***	
		(0.001)	
		[0.001]	
Parent hh head self-employed			35.445***
			(5.084)
Parent partner self-employed			14.436***
			(5.018)
Observations	10658	10658	10658
ll	-3512.563	-3506.091	-69598.397
r2_p	0.501	0.502	
chi2	881.992	2069.187	

Notes: $^{*}p < 0.1, ^{**}p < 0.05, ^{***}p < 0.01$ All regressions include a constant, time and regional dummies. Bootstrapped standard errors (100 replications) in brackets; marginal effects computed at the mean of independent variables are in square brackets. Standard errors are robust to correlation within repeated observations of the same household. Monetary variables are expressed in thousand euro 2002.

Table 11: Addressing endogeneity of wealth: linear 2step GMM

	OLS	2 step GMM	1 step wealth	1 step wealth*spread
Wealth	0.000	-0.018		
	(0.000)	(0.020)		
Spread*wealth	0.015*	0.322		
	(0.009)	(0.358)		
Spread	-2.268	-0.238	564.091	26.469
	(1.738)	(4.282)	(718.460)	(44.591)
Years of education	0.007	0.200	15.765***	0.291**
	(0.007)	(0.219)	(2.691)	(0.144)
Spread*years of education	-0.004	-3.227	-60.095	6.993***
	(0.118)	(3.759)	(40.607)	(2.394)
House price per sqm.	-0.104*	0.219	122.915***	6.108***
	(0.061)	(0.359)	(24.395)	(1.363)
Rent per sqm.	5.218***	19.573	618.966	-10.670
	(1.794)	(16.846)	(638.936)	(40.193)
Employee	0.056***	-0.047	-18.006**	-0.710*
	(0.016)	(0.118)	(7.012)	(0.377)
Self-employed	0.048**	-0.050	42.732***	2.818***
	(0.020)	(0.140)	(8.314)	(0.472)
Age	0.005***	0.004	4.125***	0.244***
	(0.001)	(0.004)	(0.305)	(0.018)
Male	0.006	0.030	10.662**	0.540*
	(0.013)	(0.034)	(5.416)	(0.303)
Couple	0.124***	0.195**	18.690***	0.843**
	(0.016)	(0.082)	(7.081)	(0.412)
Household size	0.004	-0.001	10.637***	0.635***
	(0.005)	(0.014)	(2.290)	(0.138)
Private sector	-0.023*	-0.002	-6.300	-0.434*
	(0.012)	(0.035)	(4.380)	(0.256)
Small city (< 20 000)	0.055***	0.043	12.888**	0.787**
	(0.013)	(0.035)	(5.605)	(0.332)
Large city (> 500 000)	-0.069***	-0.103**	7.652	0.557
	(0.018)	(0.049)	(6.268)	(0.384)
Parent hh head self-employed			14.436***	0.886***
			(5.018)	(0.301)
Parent partner self-employed			35.445***	1.995***
			(5.084)	(0.304)
Observations	10658	10658	10658	10658
F-test on excluded instruments			34.12	31.74
(p-value)			0.0000	0.0000

Notes: $^{*}p < 0.1, ^{**}p < 0.05, ^{***}p < 0.01$ All regressions include a constant, time and regional dummies. Standard errors are in brackets. Standard errors are robust to heteroskedasticity and to correlation within repeated observations of the same household. Monetary variables are expressed in thousand euro 2002.

Table 12: Exploiting panel dimension: random effect probit and conditional logit

	Pooled	RE probit	FE logit
Wealth	-0.000	0.004	-0.018
	(0.005)	(0.005)	(0.031)
Spread*wealth	0.268***	0.419***	1.249**
	(0.086)	(0.077)	(0.557)
Spread	-11.477	-6.486	97.598
	(10.237)	(32.473)	(122.528)
Years of education	0.040	0.027	0.503
	(0.044)	(0.123)	(0.681)
Spread*years of education	-1.382*	-2.742	-10.849
	(0.751)	(1.964)	(11.077)
House price per sqm.	-1.210***	-2.732**	-8.368*
	(0.391)	(1.251)	(4.641)
Rent per sqm.	23.307**	57.380*	218.032*
	(9.354)	(31.490)	(114.449)
Employee	0.074	0.135	-0.526
	(0.079)	(0.298)	(1.135)
Self-employed	-0.141	-0.490	-2.113
	(0.118)	(0.402)	(2.049)
Age	-0.002	0.017	0.141
	(0.005)	(0.019)	(0.258)
Male	0.074	0.163	
	(0.083)	(0.290)	
Couple	0.154	0.678*	9.840
	(0.101)	(0.354)	(10.319)
Household size	-0.003	0.307	0.415
	(0.033)	(0.206)	(0.500)
Private sector	-0.022	-0.192	0.417
	(0.071)	(0.228)	(0.872)
Small city (< 20 000)	0.060	0.287	
	(0.093)	(0.313)	
Large city (>500 000)	-0.178	-1.001*	
	(0.116)	(0.523)	
Mean wealth		0.032***	
		(0.003)	
Mean hh size		-0.315	
		(0.236)	
Observations	5311	5311	535
Log likelihood	-1634.437	-1109.218	-39.359
r2_p	0.527		0.804
chi2	439.657	1436.901	322.918

Notes: $^{*}p < 0.1, ^{**}p < 0.05, ^{***}p < 0.01$ Constant term, time and regional dummies are included. Standard errors are in brackets. Monetary variables are expressed in thousand euro 2002.

References

Alessie, R., M. P. Devereux, and G. Weber (1997). Intertemporal consumption, durables and liquidity constraints: A cohort analysis. *European Economic Review 41*(1), 37–59.

Artle, R. and P. Varaya (1978). Life cycle consumption and homeownership. *Journal of Economic Theory 18*, 38–58.

Attanasio, O. (1995). The intertemporal allocation of consumption: Theory and evidence. Carnegie-Rochester Conference Series on Public Policy 42.

Attanasio, O., P. Goldberg, and E. Kyriazidou (2000). Credit constraints in the market for consumer durables: Evidence from micro data on car loans. NBER Working Paper 7694.

Barakova, I., R. Bostic, P. Calem, and S. Wachter (2003). Does credit quality matter for homeownership? Zell/Lurie Center Working Papers 410, Wharton School Samuel Zell and Robert Lurie Real Estate Center, University of Pennsylvania.

Bartiloro, L., M. Coletta, and R. De Bonis (2007). Italian household wealth in a cross-country perspective. Presented at the conference 'Household Wealth in Italy', Banca d'Italia, Perugia 16-17 October 2007.

Ben-Shahar, D. (1998). On the optimality of the hybrid tenure mode. *Journal of Housing Economics 7*(1), 69–92.

Benfratello, L., F. Schiantarelli, and A. Sembenelli (2008). Banks and innovation: microeconometric evidence on Italian firms. *Journal of Financial Economics 90*.

Bertola, G. and S. Hochguertel (2007). Household debt and credit: econimic issues and data problems.

Bertola, G., S. Hochguertel, and W. Koeniger (2005). Dealer pricing of consumer credit. *International Economic Review 46*(4).

Bertola, G. and W. Koeniger (2007). Consumption smoothing and income redistribution. *European Economic Review 51*(8), 1941–1958.

Bicakova, A. and E. Sierminska (2007). Homeownership inequality and the access to credit markets (can credit availability explain cross-country differences in the inequality of homeownership across income of young households?). Working Paper 5, Luxembourg Wealth Study.

Borella, M. (2004). The distributional impact of pension system reforms: an application to the Italian case. *Fiscal Studies 25*(4).

Bostic, R. and B. J. Surette (2000). Have the doors opened wider? trends in homeownership rates by race and income. Finance and Economics Discussion Series 2000-31, Board of Governors of the Federal Reserve System (U.S.).

Brandolini, A. and L. Cannari (1994). Methodological appendix: the bank of italy survey of household income and wealth. In A. Ando, L. Guiso, and I. Visco (Eds.), *Saving and the Accumulation of Wealth*. Cambridge University Press.

Bridges, S., R. Disney, and A. Henley (2006). Housing wealth and the accumulation of financial debt: evidence from U.K. households. In G. Bertola, R. Disney, and C. Grant (Eds.), *The economics of consumer credit*. The MIT Press.

Browning, M. and A. Lusardi (1995). Household saving: Micro theories and micro facts. *Journal of Economic Literature 34*.

Campbell, J. Y. and J. F. Cocco (2007). How do house prices affect consumption? Evidence from micro data. *Journal of Monetary Economics 54*(3), 591–621.

Cannari, L. and I. Faiella (2007). Housing prices and housing wealth in Italy. Presented at the conference 'Household Wealth in Italy', Banca d'Italia, Perugia 16-17 October 2007.

Cannari, L., I. Faiella, G. Marchese, and A. Neri (2007). The real assets of Italian households. Presented at the conference 'Household Wealth in Italy', Banca d'Italia, Perugia 16-17 October 2007.

Casolaro, L., L. Gambacorta, and L. Guiso (2006). Regulation, formal and informal enforcement, and the development of the household loan market: lesson from Italy. In G. Bertola, R. Disney, and C. Grant (Eds.), *The economics of consumer credit*. The MIT Press.

Chiuri, M. C. and D. Del Boca (2008). Household membership decisions of adult children. IZA Discussion Papers 3546, Institute for the Study of Labor (IZA).

Chiuri, M. C. and T. Jappelli (2003). Financial markets imperfections and home ownership: a comparative study. *European Economic Review 47*.

Del Boca, D. and A. Lusardi (2003). Credit market constraints and labor market decisions. *Labour Economics 10*(6).

Di, Z. X. and X. Liu (2004). The importance of wealth and income in the transition to homeownership. Economic Development Publications 39047, HUD USER, Economic Development.

Diaz-Serrano, L. (2006). Housing satisfaction, homeownership and housing mobility: A panel data analysis for twelve EU countries. IZA Discussion Papers 2318, Institute for the Study of Labor IZA.

Eberly, J. (1994). Adjustments of consumers durable stocks: evidence from automobile purchases. *Journal of Political Economy 103*.

Feldman, R. (2002). Mortgage rates, homeownership rates, and government-sponsored enterprises. *Annual Report*, 4–23.

Fogli, A. (2004). Endogenous labor market rigidities and family ties.

Garcia, R., A. Lusardi, and S. Ng (1997). Excess sensitivities and asymmetries in consumption: an empirical investigation. *Journal of Money, Credit and Banking 29*.

Guiso, L. and T. Jappelli (2002). Private transfers, borrowing constraints and the timing of homeownership. *Journal of Money, Credit and Banking 34*(2), 315–39.

Guiso, L., P. Sapienza, and L. Zingales (2004). Does local financial development matter? *The Quarterly Journal of Economics 119*(3).

Guiso, L., P. Sapienza, and L. Zingales (2007). The cost of banking regulation.

Henderson, J. V. and Y. M. Ioannides (1983). A model of housing tenure choice. *American Economic Review 73*(1).

Hintermaier, T. and W. Koeniger (2007). Financial market imperfections and durable consumption.

Jaffee, D. and J. Stiglitz (1990). Credit rationing. In B. M. Friedman and H. F. H. (Eds.), *Handbook of Monetary Economics*, Volume 2. Amsterdam: North Holland.

Martin, R. F. (2003). Consumption, durable goods, and transaction costs. International Finance Discussion Papers 756, Board of Governors of the Federal Reserve System (U.S.).

Ortalo-Magne, F. and S. Rady (1999). Boom in, bust out: Young households and the housing price cycle. *European Economic Review 43*(4-6), 755–766.

Pissarides, C. A. (1978). Liquidity considerations in the theory of consumption. *The Quarterly Journal of Economics 92*(2).

Rivers, D. and Q. H. Vuong (1988). Limited information estimators and exogeneity tests for simultaneous probit models. *Journal of Econometrics 39*(3), 347–366.

Sedo, S. A. and S. A. Kossoudji (2004). Rooms of one's own: Gender, race and home ownership as wealth accumulation in the United States. IZA Discussion Papers 1397, Institute for the Study of Labor (IZA).

Wooldridge, J. M. (2001). *Econometric Analysis of Cross Section and Panel Data*. Cambridge, Massachusetts: Te MIT Press.

Zeldes, S. (1989). Consumption and liquidity constraints: an empirical investigation. *Journal of Political Economy 97*.