Consumption Responses to Financial Liberalization: evidence from survey data*

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Abstract

The Permanent Income Theory predicts that the consumption path of unconstrained homeowners responds to the interest rate, while the consumption path of credit constrained homeowners is determined by the size and timing of payments (mortgage maturity). We exploit the rapid expansion of mortgage markets between 1998 and 2007 in Spain and a detailed survey on household finances between 2002 and 2011 to estimate group-specific consumption responses to changes in the credit conditions. Our estimates suggest that the consumption of households headed by an individuals who could benefit from higher income growth late in life respond strongly to mortgage maturity increases. The consumption of the rest of indebted households is insensitive to loan maturity, but does react to interest rates. Those results are confirmed when we instrument loan maturity exploiting the fact that banks are reluctant to offer contracts with age at maturity above 65. An interpretation of our results is that households headed by individuals expecting high income growth late in life, 8% of our sample, behave as credit constrained.

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1 Introduction

Do the initial mortgage conditions when a house is purchased have a lasting impact on the consumption path of home-owners? If so, which particular components of credit developments matter? The answer to those questions is crucial to understand the consequences of likely future changes in the access to mortgage loans and to assess to what extent credit constraints affect consumption. Our study uses a very complete data set of household finances and the episode of the development of mortgage markets during the last decade in Spain to estimate the medium-term consequences of relaxation of mortgage conditions on household consumption. Using a simple model of consumption, we argue that the response of household consumption to initial loan maturity and to interest rates is informative about the prevalence of credit constraints in the economy.

An interesting literature has examined the contemporaneous impact of particular aspects of credit market developments on household consumption. Leth Petersen (2006) analyzed the heterogeneity in the consumption responses to the possibility of borrowing against home equity. In particular, he studied a reform of the market of credit in Denmark that enabled house owners to use housing equity as a collateral in consumption loans, finding that younger households react much more to access to credit than other (presumably, not liquidity constrained) households. Other studies focus on the marginal propensity of consumption out of housing wealth. Mian and Sufi (2013) use administrative information about house prices and expenditure to explain how zip-code variation in the drop in housing values during the recent economic crises affected consumption. Campbell and Cocco (2006) estimate that increases in the value of the house increase the consumption of older home-owners. Those papers emphasize the role of the possibility to borrow on the value of the house -see Mian and Sufi, 2011. However, the possibility of taking home equity loans is much less obvious in economies other than the US and the UK, where the marginal propensity to consume out of wealth is also important -see Disney et al (2010) or Bover (2008), suggesting that there may be other drivers of the link
between wealth and consumption. Closer in spirit to our paper is Besley et al (2008), who estimate the response of aggregate and cohort-specific consumption to changes in interest rates charged to new mortgages. We emphasize instead heterogeneity in the response of consumption to various credit conditions.

In particular, our study uses the theoretical insights from Attanasio et al. (2008) to argue that, in the presence of credit constraints, different dimensions of the development of credit markets can have a lasting impact on the consumption of different groups of home owners over the life of a mortgage. In particular, the consumption of households with unrestricted access to credit is determined by the discounted stream of payments, and reacts mostly to changes in the interest rate at which households can borrow. Conversely, the consumption path of credit constrained households reacts mostly to the size and timing of the debt repayment payments during the first years of the life of a mortgage (determined by loan maturity) and less to interest rates. Hence, examining only a particular dimension of credit market development (say, drops in interest rates) on contemporaneous expenditure may lead to an underestimation of the consumption response to changes in the access to credit. We examine if there is heterogeneity of the consumption response to mortgage conditions by households that are likely to differ in their access to credit.

Spain is an interesting case to examine for various reasons. First, between 1996 and 2008 access to mortgage credit became much easier. Average maturity increased from 18 to 25 years, the average interest rate spread fell by 110 bp, reducing the amount of the down payment of the households. Parallel to such changes in credit markets, there was a drop in the aggregate household saving rate that fell from 16% in 1995 to 11% in 2005.

The second reason is the possibility of using joint information on consumption and credit conditions in the 2002-2011 waves of the Spanish Survey of

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1Disney et al. (2010) stress the importance of unobserved expectations about future income. Using the fact that only unanticipated changes in the house value have an impact on consumption, they estimate that young households do not react differently than older households. Bover (2008), using the same dataset as we do, found that the marginal propensity to consume out of changes in the house value was heterogeneous across households, in particular were greater for prime age households, consistent with a precautionary saving motive.
Household Finances (EFF, by its Spanish initials). The survey contains information on actual consumption and a rich set of retrospective information on mortgage conditions. Hence, the EFF provides an unique setup to understand the impact on household consumption to changes in loan maturity and interest rates. Finally, the home ownership ratio exceeds 80% in Spain. Therefore, changes in the credit conditions can be an impact on aggregate consumption.

Linked to these advantages, there are several challenges. First, observed maturity and interest rates are the result of a matching between the demand for mortgages of the families and the supply of loans from the banks’ side. Therefore both maturity and interest rate variables are likely to be correlated with unobserved characteristics of the household. We argue that increases in loan maturity do not affect all potential purchasers equally because banks are reluctant to offer mortgages expiring when the loan applicant is older than 65. Secondly, banks typically offer mortgage maturities ending in round numbers -0 or 5. As we document below, both policies generate substantial discontinuities in granted maturity. For example, a person applying for a mortgage at the age of 40 is likely to get a maturity of 25 years, as the age at maturity is just retirement age. However, a borrower applying for a mortgage at the age 41 will be much less likely to be granted a 25 years maturity, (age at maturity would be 66), but would get a 20 years maturity instead. Hence, differences of one year in the age of applying for a mortgage may result in differences of about 5 years in the maturity granted. Following Besley et al. (2008) we instrument interest rates using averages within cells defined by education, age and year of purchase. A second challenge is selection; theory has predictions on the impact of credit conditions on the households that have a mortgage. We use survey information about credit rejections to identify a selection model and correct our estimates for selection bias.

Our results suggest that there is heterogeneity in the consumption responses to interest rates and mortgage maturity. An increase of one year in maturity increase the total consumption of house owners with a high school degree by 3-5% while a decrease of interest rates of 100 bp is not associated to significant
consumption responses. Nevertheless, the consumption of house owners with a college degree is insensitive to the size of mortgage installments. We find some evidence suggesting that the consumption of those households responds to changes in interest rates. Overall, those results together with differences in the income growth late in life and in the cost of borrowing across education groups suggest that households headed by an individual with high school are credit constrained and use maturity increases to finance higher consumption after the purchase of the house. Conversely, households headed by an individual with either college or basic schooling do not react to increases in the size of the installment. Further sample splits by household income suggest that consumption correlates negatively with interest rates only among households in the top income quartile, while it correlates positively with maturities for households in the mid quartiles of the income distribution. Importantly, we obtain those results including two waves of a severe recession (2008 and 2011), when few mortgages were granted. The fact that consumption reacts to mortgage maturities well after those loans were granted suggest that initial conditions at borrowing have relatively persistent consumption effects.

The paper is organized as follows. Section 2 provides a description of the evolution of the market of mortgages in Spain in the last two decades, and summarizes a model that motivates our strategy. Section 3 presents the data and the empirical strategy. Section 4 discusses the results and Section 5 concludes.

2 The evolution of credit market conditions in Spain

Access to credit and, specially, access to mortgage debt became easier in many countries between 1995 and 2007. Table 1 in the Appendix shows the evolution of mortgage conditions at purchase in Spain -as recollected by the reference person in the household. The percentage of fixed rate mortgages decreased between 1995 and 2007 by almost a half. The average loan to value ratio increased from 75% - for mortgages signed between 1991 and 1995- to 91% - mortgages
signed after 2003. Loan maturity increased on average from 18 to 23 years and
the interest rate spread from Spanish government bonds fell from 2% to 1.5%.
Together with those changes, the saving ratio fell to historical lows.

To give a sense of the magnitudes involved, assume a 90,000 euro loan signed
in 1995 at 4% interest rate, to be repaid in 15 years. Assuming constant in-
stallments, the yearly installment would be 7,772 euro. The same loan at a
loan maturity of 25 years would involve paying 5,631 euro per month. Using
the median level of gross household income of 31,000 euro and an income
tax of 25%, the reduction in the yearly installment would be about
\[(7,772 - 5,631) / (0.75 \times 31,000) = 9\% \) of yearly net earnings.

2.1 A model

We use a simple model of durable purchases to illustrate how variation in ac-
tess to credit among households results in different responses of consumption to
changes in the cost of borrowing (interest rates) and in installment size (mort-
gage maturities). We build on Attanasio et al. (2008).\footnote{That model
was originally intended to understand the loans in the market of cars. See
Alessie et al. (1997) for a similar set up. We extend some the insights in that
work to the housing market.}

Preferences. Agents live for three periods: the initial period when purchases
take place and two additional periods when the loan can be repaid. Agents
derive utility from the flow of non-durable consumption in each of the three
periods \((c_1, c_2, c_3)\) and from the stock of housing purchased \(h\). The utility func-
tion is time separable and isoelastic with \(\rho < 1\). The stock of housing cannot be
resold or augmented and does not depreciate over time.

Endowments: Individuals receive an exogenous stream of earnings \((y_1, y_2, y_3)\).
There is a set of agents who receive most of their lifetime earnings in the third
period of life -ie. for whom income growth is high relative to their intertemporal
discount rate.\footnote{The exact condition is
\[
\frac{\beta^2 (1 + r_b)^2}{1 + \eta^2 + \beta^2 (1 + r_b)^2 - 1} < \frac{y_3}{(1 + r_b)^2} \leq \frac{y_2}{1 + r_b} + \frac{y_1}{(1 + r_b)^2}\]
}
**Timing of purchases:** The agents choose the amount of housing consumed in the first period, as well as non-durable consumption in the rest of the periods. The price of housing is assumed to be 1.

**Credit markets:** There is a single asset and a single liability. The interest rate on the asset $r_a$ is smaller or equal than the cost of borrowing $r_b$. We assume that, for a set of agents - credit constrained households- interest rates on saving are strictly smaller than the cost of borrowing $r_b$. The only way to obtain credit in this economy for credit constrained households is by getting a mortgage during the first period. In particular, agents choose to borrow the amount $\phi h$, where $0 \leq \phi \leq 1$. $\phi = 1$ implies that the agent does not make a downpayment at the time of the purchase. Finally, loan maturities $M$ are exogenously set by banks as either 1 (the full amount is repaid in the second period) or 2 (the amount borrowed is repaid in the second and third periods).

The problem of the household is the following:

\[
\max_{\{c_1, c_2, c_3, h, \phi, P\}} \frac{(c_1)^{1-\rho}}{1-\rho} + \beta \frac{(c_2)^{1-\rho}}{1-\rho} + \beta^2 \frac{(c_3)^{1-\rho}}{1-\rho} + \eta \frac{h^{1-\rho}}{1-\rho}
\]

s.t.

\[
c_1 + h(1-\phi) \leq y_1
\]

\[
c_2 + P - (1+r_a)[y_1 - c_1 - h(1-\phi)] \leq y_2
\]

\[
c_3 + \phi h(1+r_b) - P[(1+r_b) - (1+r_a)](y_2 - c_2 - P) + (1+r_b)(y_1 - c_1 - h(1-\phi)) \leq y_3
\]

\[
0 \leq \phi \leq 1
\]

\[
0 \leq P \leq h(1+r_b)
\]

where $\beta$ is the intertemporal discount rate, $r_a$ is the cost of borrowing, $\eta$ the weight of housing in the utility function, $\rho$ the risk aversion parameter and $y_1, y_2, y_3$ the stream of earnings.
where $c_i$ is the consumption of non-housing goods for each period $i=1,2,3$ and $h$ is the value of the amount of housing purchased. $\beta$ is the intertemporal discount rate and $\eta$ is the weight of housing in the utility of the agent. $y_i$ is the amount of disposable income for each period, $P$ is the amount of the repayment on the mortgage. $\phi$ is the loan to value ratio, that is the proportion of the house value that is financed with a mortgage and $r_b$ and $r_a$ are the interest rates on loans and lending respectively.

The first constraint implies that the first period income must be at least as large as the sum of non-housing consumption and the amount of the downpayment for the purchase of a house. The second constraint implies that income in the second period plus any savings from the first period $(1+r_a)[y_1-c_1-h(1-\phi)]$ must finance consumption in the second period and the corresponding part of the mortgage installment. Finally, the third period restriction states that the final period income plus any remaining savings must be at least as large as the sum of final period consumption $c_3$ and the final installment of the mortgage $\phi h(1+r_b) - P(1+r_b)$.

A short (one period) mortgage maturity implies a contract in which $P = h(1+r_b)$. A two-period maturity implies a contract where the agent can choose the amount $P$ in the second period and the remained of the debt in the third one. In what follows, we discuss the implications of changes in mortgage length and interest rates. The analytical results are presented in Appendix 1.

The allocation of consumption and housing depends on the level of maturity set by the bank. We use the shorthand notation $c_1(m), c_2(m), h(m)$ and $\phi(m)$ when $m=1,2$ for the optimal consumption and borrowing stream with maturity equals 1 and 2, respectively. Result 1 compares both allocations.

**Result 1:** Under the previous assumptions, a consumer who is allowed to repay in mortgage during the second and third periods chooses a level of $c_1, c_2,$ and $h$ that is not lower than the optimal one if required to repay during one period.

When consumers can only obtain one-period mortgages and the income in the third period is high enough with respect to lifetime incomes (see Footnote
3), consumption in the first period \( c_1(1) \) equals.\(^4\)

\[
c_1(1) = \frac{1}{1 + \eta^1 + \beta^1 (1 + r_b)^{1-1} - 1} \left[ y_1 + \frac{y_2}{1 + r_b} \right]
\]

The corresponding expression for \( c_1(2) \), or the level of first-period consumption when maturity equals two periods is:

\[
c_1(2) = \frac{1}{1 + \eta^1 + \beta^2 (1 + r_b)^{1-1} + \beta^2 (1 + r_b)^{2-2} - 2} \left[ y_1 + \frac{y_2}{1 + r_b} + \frac{y_3}{(1 + r_b)^2} \right]
\]

When maturity equals 2, the level of consumption in the first period is proportional to the value of the stream of income in periods 1, 2 and 3, discounted at the interest rate \( r_b \). When maturity equals 1, and the consumer has preferences for consumption that result in zero wealth holdings at the end of the second period, first period non-housing consumption is a function of the discounted stream of earnings during the first two periods only. Hence, if income in the third period \( y_3 \) is large enough relative to income in the first two periods of life \( y_1 \) and \( y_2 \), allowing the consumer to repay in two rather than in one period only results in a higher level of consumption: \( c_1(2) \) is not lower than \( c_1(1) \). An additional repayment period allows a credit constrained consumer to increase first period consumption by borrowing against the whole future earnings stream rather than against the earnings during the first two periods. Clearly, the result hinges on two assumptions: income during the third period is relatively large and interest rates of borrowing exceed those of saving -that guarantees that some consumers end up with zero wealth in the second period of life.\(^5\)

\textit{Result 2: Credit constrained agents who are allowed to repay over two periods choose a higher level of } \( \phi \) \textit{than if required to pay during 1 period: } \( \phi(2) \geq \phi(1) \)

Using the first-period budget constraint, one notices that, holding interest rates and the discounted earnings stream constant the increase in the level of consumption in

\(^4\)The result arises if consumers end up period 2 with no assets. Given the assumption of \( r_a < r_b \), there will be a positive mass of those consumers.

\(^5\)Similarly, one can show that an expansion in maturity allows credit constrained consumers to expand the consumption of housing \( h - h(2) > h(1) \) and of second period non-housing expenditure \( c_2(2) > c_2(1) \)
non-housing consumption during period 1 must be financed by a higher level of borrowing during the first period of life of the mortgage. When allowed to repay the mortgage in two periods the credit-constrained consumer increases both $h$ and $c_1$, but the total outlay in housing expenses during the first period falls because $\phi(2) \geq \phi(1)$.

2.1.1 A benchmark: perfect access to credit markets

A natural benchmark to understand the impact of mortgage maturities on the allocation of consumption is to assume that agents can access credit markets perfectly, or $r_a = r_b$. Under the assumption of perfect access to credit markets at an interest rate that is the same for saving and borrowing, the main determinant of consumption is the sum of lifetime earnings discounted by the interest rate - for example, the unconstrained consumer could always borrow in period 2 against income in period 3. In that case, $\phi(2) = \phi(1)$ and $c^u_1 = c^u_1(2) = c^u_1(1)$

$$c^u_1 = \frac{1}{1 + \beta^\frac{1}{2} + \beta^\frac{1}{2}(1 + r_b)\frac{1}{2} - 1 + \beta^\frac{1}{2}(1 + r_b)\frac{1}{2} - 2}[y_1 + \frac{y_2}{1 + r_b} + \frac{y_3}{(1 + r_b)^2}]$$

Finally, after comparing $c^u_1$, $c_1(1)$ and $c_1(2)$ we obtain an additional testable result

Result 3: A fall in the interest rate increases relatively more the first-period non-housing consumption of non-credit constrained consumers than that of credit constrained consumers.

The result is proven in Appendix 1 and is driven by the larger wealth effect of an increase in interest rates when the whole lifetime earnings stream is discounted than when discounting applies only to the first two periods.

2.1.2 Testable implications

The discussion above highlights two testable implications. In the presence of credit constraints (i.e., $r_b > r_a$), the effects of changes in mortgage maturity and mortgage interest rates on consumption differ among consumers.
• For unconstrained households, increases in mortgage maturity have no impact on either the level of consumption of homeowners or the loan-to-value ratio. $\frac{\partial c_1}{\partial M} < 0, \frac{\partial c_1}{\partial M} = 0$

• Within the set of credit constrained home owners, those who have high income growth late in life react to increases in maturity by expanding the level of consumption. The consumption response of such subset of households to the interest rates is negative, but weaker in absolute value than that of unconstrained households: $|\frac{\partial c_1}{\partial r}| < |\frac{\partial c_1}{\partial M}|, \frac{\partial c_1}{\partial M} > 0^6$

3 Data and empirical strategy

This section describes the data used for the analysis and the empirical strategy.

3.1 Data

We use data from the four waves of the triennial Spanish Survey of Household Finances (EFF, by its Spanish initials): 2002, 2005, 2008 and 2011. The EFF is a tri-yearly survey of 5,143 households (in 2002), 5,962 households (in 2005) and 6192 households (in 2008) and 6107 (in 2011). We use information about the real assets held by the households and, in particular, the information about the mortgages that financed the purchase of real estate (either the main residence or a secondary one). The EFF collects information about up to 13 mortgages for four real estate properties of each household. For the first property the respondents are asked about the details of at most four mortgages. If they

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6Two notes are in order. We are not allowing for re-sale and we do not model the timing of the purchase decision. Nevertheless, credit conditions could potentially affect the timing of the purchase. In the empirical part, we discuss how we can control for selection into house purchase using a mortgage and thus obtain consumption responses conditional on purchase.

Second, we characterize credit-constrained consumers as those for whom $r_a$ is greater than $r_a$ (the rate at which one can save). But one may think of alternative definitions, like a constrain that imposes a maximum ratio of the debt service to current household earnings. While we have not proved the result analytically, we strongly suspect that such alternative modellign device would deliver the same testable predictions. The reason is that an increase in mortgage maturity would result in a reduction of the amount that must be paid during the early years of a loan, possibly leading those consumers who are close to the credit limit to expand consumption and to increase their leverage. Hence, the consumption of credit constrained households should still react more to changes in mortgage maturity than to changes in the interest rate.
purchased additional real estate properties using an outstanding loan, the EFF collects information on up to three mortgages per property.

*Consumption measures:* The EFF contains broad questions about food expenditures, non-durable consumption and about purchases (and holdings) of vehicles and housing equipment. Much of our study is devoted to analyzing how consumption responds to the higher current "cash-on-hand" resources associated to a larger maturity (that may result in smaller mortgage installments or a lower initial loan-to-value ratio). We also examine consumption components that may be specially sensitive to "cash-in-hand" like expenditure on vehicles and housing equipment over the last year.\(^7\)

*Credit conditions at purchase:* The EFF collects information about the year and purchase price of up to 4 real estate properties. For each mortgage, households are asked to report the initial value of the mortgage, its initial duration (or maturity), whether the interest rate is fixed or variable and its current level. Imputing the initial value of interest rates at the moment of purchase is straightforward when interest rates are fixed, as there is no renegotiation of mortgage contracts in fixed periods in Spain. For ARM -around 90% of loans originated during the latter part of the sample- we subtract from the current interest rate the average Euribor in the period of the interview and add the average one during the year of the purchase.

*Permanent income:* We proxy permanent income with an average of the income observations normalized to the age of 45 of the household head. Respondents report at least two measures of income: the sum of income components of all members during the year prior to the interview (2001 for the 2002 wave, 2004 for the 2005 wave and so on) as well as a measure of annual current income obtained by multiplying by 12 the current monthly income of all household members. For panel households we have up to four income observations. Appendix A.2. gives the details of how we standardize by age and household

\(^7\)An alternative to adding durable and non-durable expenditures is to derive the flow of durable expenditures using assumptions about the depreciation rate of the durable and adding it to non-durable consumption, as in Bover (2008). We experimented with such measures, but the results were unstable.
Sample selection: We use a sample of home owners who purchased their house of residence before the age of 65 and have at least one mortgage outstanding - we do not know the credit conditions if the loan is already repaid. To minimize possible sample selection biases arising because it is more likely to observe owners who purchased a house with long mortgages, we only consider observations on households that have purchased their home at most 10 years before the interview. The average maturity in the beginning of the nineties was about 15 years, so the restriction eliminates unusually long mortgages signed during periods when the typical maturity was short.\(^8\)

The average final sample size is 1,574 households in the OLS specification.\(^9\) The total number of buyers of the house of residence, including those without a mortgage, after 1991 is 3,207. Table 1 provides a description of the variables considered, separated by education group. As we discuss in the next section, education is the main sample split. The average age at purchase of the group with the lowest educational level is 33 years of age, while groups with high school or college purchased on average at 31 years. The interest rate charged also falls slightly with the education of the household head (4.47pp for basic schooling, 4.12 pp for college heads). In addition, indebted households have a very low non-durable consumption to (pre-tax) earnings ratio: the mean is about 23 percent for households headed by an individual with either low or medium education, and it is even lower among college head households (21 percent).

3.1.1 Whose consumption is most likely to respond to maturity increases?

The model in Section 2 provides indications about what groups of the population are most likely to be affected by changes in the maturity of a mortgage.\(^8\) We assume that the longest maturity mortgage has the largest impact on consumption.\(^9\) The EFF imputes the variables that households do not answer by multiple imputation, so there are five datasets for each wave. All the estimates shown below are the average of the estimates in each of the five different samples, with standard errors corrected for the uncertainty across replicates. As the imputed information varies across samples, some of the restrictions we apply to the data vary across samples. Thus, we document average sample sizes that may contain decimals. See http://www.bde.es/webbde/es/estadis/eff/usuario.pdf
Intuitively, an increase in mortgage maturity permits recent home owners to increase consumption by bringing to the present future earnings expected later in the life cycle. For example, for a borrower aged 30, a 10-year extension of mortgage maturity from 15 to 25 years permits consuming expected earnings between 45 and 55 years of age. For that reason, consumption responses to maturity increases should be largest among groups of the population with higher-than-average income growth late in life and pay higher interest rates on their loans than the rest of the population (because a differential in interest rates leads households to end up without assets at the end of the second period).

This section provides evidence that income growth and interest rates differ across education groups, providing the basis for our main sample split, although in forms that differ from that in other economies.\textsuperscript{10}

\textit{Income over the life-cycle: cross-cohort evidence}

Figure 1 uses data from the Spanish Budget Survey to construct the life-cycle income profile of cohorts born between 1935 and 1955. We select those cohorts because they would reach ages 45 - 55 during the expansion of mortgage maturity during the late nineties and information about their earnings could be used by young borrowers to infer the shape of their future earnings. We compute average household earnings of the whole population across cells defined by year of birth and time. As these are noisy, we take four-year averages across cohorts to smooth the distribution. Figure 1 shows the familiar concave growth in income over the life cycle. Households headed by an individual with a college degree experience high income growth in their twenties and thirties and their income becomes flatter at later ages. One the other hand, households headed by an individual with high schooling experienced much flatter profiles. Note however that for our purposes it is key to understand the income growth between 45 and 60 years of age. Income growth late in life departs significantly across

\textsuperscript{10}The literature has used partitions to examine the prevalence of credit constraints different from education, like current income or assets at the time of the purchase. We mainly have retrospective information and the EFF does not report what household income or assets were at the time when the mortgage was signed. We also experiment with additional cut-offs, like income.
schooling groups.

To focus on those ages, the top panel in Figure 2 shows the evolution of household income between the ages of 45-59 of the cohorts born between 1935 and 1944. The bottom panel shows the corresponding estimates for the cohorts born between 1945 and 1954. We normalize household income at age 40 to 1 for all cohorts and show household income growth thereafter. For both sets of cohorts, we observe that households with a high school degree experienced higher income growth than households headed by an individual with a college degree between the ages of 45 and 55. For example, the income of cohorts born between 1934 and 1944 whose head of household had a high school degree were about 20% larger on average than at their 40s. Instead, households headed by an individual with a college degree had at 55 an income level that was 10% higher than at their 40s. According to the simple permanent income model, an increase in maturity increases most the consumption of households for whom \( \frac{y_3}{(y_2 + y_3)} \) is largest. Proxying \( y_3 \) by earnings at age 55 and \( y_2 \) by earnings at age 40, we obtain that, among mid-school households \( \frac{y_2}{(y_2 + y_3)} \) is 60%, while among college households, the corresponding estimate is 50% only. According to those numbers, households with a high school degree could expect a higher amount of future resources to bring back to the present.\(^{11}\)

\(^{11}\)While it may seem odd that it is not college households whose income grow most over the life cycle, previous authors have documented a drop in the returns to schooling during those ages -see Bonhomme and Hospido (2016)
growth is higher among households with a head with college degree than among households headed by an individual with primary school (15 percent lower). Households headed by an individual with high school have also lower income growth than college head households (8 percent) but the difference is not statistically significant. Importantly for our purposes, the interaction between age of the head and high school is .0117 (standard error: .006), positive and statistically significant at the 6% confidence level. In other words, at later ages -or for earlier cohorts- income growth is higher among high school graduates than among college graduates.

Table A.1 Panel B column 1 shows the predicted income growth at age 55 for a household headed by a male and 2 adults. The estimated income growth between 2002 and 2005 for a household headed by a male individual aged 55 with low education was minus 15 percent (standard error: .067). Predicted income growth is also negative for households with a head with college (minus 9 percent, with an standard error of 5.2 percent). Nevertheless, households headed by an individual with high school experienced an income drop of 6 percent, statistically not different from zero. That evidence suggests that mature individuals with mid education levels were the only whose income did not fall between 2002 and 2005.12

Interest rates Table A.1, column 3 correlates interest rates charged on mortgages and education and demographics. The dependent variable is the household-specific average mortgage interest rate paid for all mortgages, weighted by loan size. We regress that household-specific rate on the age of the head, his or her education level, the level of current household income and household composition dummies (not shown). The results suggest that households headed by individuals with mid education levels pay 21 bp more than the rest of the educational groups.

Summarizing, the group of households headed by an individual with high school is the most likely to react to changes in mortgage maturity.

12There is other evidence from the EFF pointing at overall negative household income growth in a sample of "homogeneous" households -see Bover, 2008. There is also evidence suggesting declining returns to college in Spain after 1995 -see Izquierdo and Lacuesta, 2006.
3.2 The empirical strategy

We start by estimating education-specific regressions of household non-durable consumption on mortgage maturity and interest rates for a sample of households with an outstanding mortgage:

\[
\ln C_h = \alpha_0 + \sum_{g=1}^{g=3} M_{h,g} \beta_g + \sum_{g=1}^{g=3} R_{h,g} \gamma_g + D_t + \delta X_h + f(\text{age}_{purchase}) + \varepsilon_h \quad (4)
\]

where \(M_g\) is the maturity of the mortgage, \(R_g\) is the interest rate at the moment of purchase, \(D_t\) are seven dummies indicating the year of the interview and \(X_h\) is a set of covariates described below. Maturity and interest rates are interacted with education dummies. From the reference model, we expect \(\beta_g\) to be positive for households headed by an individual with high school. Conversely, \(\gamma_g\) ought to be negative for the rest of the households. While using logarithms is natural in a permanent income context models, we introduce non-linear terms in maturity. Non-linear terms account for possible reductions in income levels after age 55-for example, the longitudinal evidence in Table A.1 suggests a fall in household income at age 55 for some households. "Too large" maturity extensions may have a smaller impact on non-durable expenditure than weaker increases if they involve reaching moments in the life cycle when income is actually falling. To facilitate interpretation, we subtract 15 from maturity (the original level in the late nineties). Hence, the linear term in maturity can be interpreted as the local effect on expenditure of one year maturity extension from 15 to 16 years.

\(X_h\) includes a set of controls aimed at capturing demographic expenditure shifters as well as proxies of lifetime resources and credit conditions. The first is a set of variables aimed to pick up the life-cycle pattern of consumption. It contains the gender of the reference person, its marital status, 5 dummies indicating the size of the household and the number of adults. The second set contains indicators for current resources: the current job situation of the reference household and of the spouse and the household’s current income. Finally, we condition on other credit conditions at purchase, like the year of purchase.
of the house (one dummy for each year of purchase, the reference group being purchases in 1991) and whether or not the loan was fixed-rate. Year of house purchase and year of interview are included to capture the aggregate interest rate, thus guaranteeing that $R_{h,g}$ picks up cross-sectional variation in spreads. We also include the age of the head at the time of the purchase of the house. Now, controlling for year of purchase, age at purchase and current year precludes us from estimating life-cycle effects on consumption associated to the age of the household head. To capture such life-cycle effects, we construct a variable that takes the age of the spouse for married households and age of the head for other households.

Two main problems that arise when estimating equation (1): the endogeneity of mortgage maturity and interest rates, and sample selection into the sample of indebted buyers. We discuss each issue now.

### 3.2.1 Selection and two step strategy

Equation (1) is computed on the selected sample of house buyers with an outstanding mortgage. Within the 80% of households who own their house of residence, a significant fraction of home owners purchased their home of residence without borrowing in the credit market. To estimate consumption responses that control for selection into borrowing, we need to hold tastes constant and identify variation in mortgage access that comes from bank lending practices. We use information about credit rejections to identify households who wanted to have credit but could not have credit because of bank decisions (see Jappelli, 1990 for a similar reasoning). The EFF asks individuals whether or not they had applied for a loan during the last two years, the reason not to apply and whether or not some of the loan applications were totally or partially rejected - the latter being the case if banks gave a lower amount than that requested by the household.

We estimate first a selection model using a sample of home owners, distinguishing whether or not they have a mortgage on their house. We impute the interest rate and maturities at the time of the purchase using mean interest
rates at the time of purchase among broad education and age groups. The rest of the regressors is the set of covariates $X_h$, as well as three variables to control for selection. The first identifies potential demand for credit and is an indicator of whether the individual applied for a loan during the last two years or did not because of fear of being rejected. This variable is also included in the consumption equation. The second is an indicator of either actual rejections (some of the loans requested were rejected) or anticipated rejections (did not ask for a loan because felt that would be rejected). The third is an indicator of partial rejections (the applicant was given less credit than asked for). Using the results from that Probit, we construct a Mills ratio that is subsequently included in (4) as a selectivity correction term. Our identifying assumption is that, conditional of loan application and the covariates we use, the consumption of owners with and without mortgages would have been the same if all their loan applications had been accepted.

### 3.3 Endogeneity

An additional problem is that both mortgage maturity and the interest rate are likely to be correlated with unobservable factors that also affect consumption.\(^\text{13}\) To obtain exogenous variation in mortgage maturity, we exploit the fact that banks are reluctant to award a maturity at origin such that the household head must still repay the mortgage above the age 65 -the statutory retirement age. After age 65 income is expected to fall (due to retirement) and, in addition, mortality (and the bank expected loss) increases. Secondly, and crucially for our purposes, banks tend to offer mortgage maturities that are often rounded to a 0-5 multiple.\(^\text{14}\) Both rules generate arguably exogenous variation in mortgage maturity at origination.

\(^\text{13}\)Credit conditions are the result of a match between banks and customers. Households that are better at financial planning could spend more time looking for better deals and sustain a higher level of consumption. On the other hand, banks screen customers using characteristics that we do not observe in the data, but that positively correlate with consumption, such as the assets held by the household at the moment of the signing the mortgage.

\(^\text{14}\)Using the administrative data from the Instituto Nacional de Estadística (INE) for year 2003, we plot the number of all the mortgages signed in Spain in that year, and their maturities. Graph 3 shows that there is considerable accumulation at durations like 5, 10, 15, 20 years.
Figure 3 illustrates the source of variation we exploit. There we show the predicted fraction of mortgages that had a maturity at origin above 25 years by each age at purchase of the reference person in the household. This prediction is obtained from a regression of all mortgage maturities originated in the survey between 1999 and 2012 on dummies for each age at purchase and a full set of year dummies. 75% of mortgages granted to households below 40 years of age at maturity were above 25 years. However, among households purchasing the household at 41 years of age, only 52% of mortgages are granted above 25 years. That is consistent with the simple rule we have described: at age 40, a 25 year maturity involves age at termination of 65 years of age, right before retirement. However, granting a household applying at 41 years of age a 25 year maturity implies finishing payments by age 66. As Spanish banks do not offer mortgages with 24 years maturity, most likely that consumer will be granted a 20 year maturity mortgage. Similar considerations occur at age 45 or 50, when the fraction of maturities offered above 25 years falls to 35% and 30%, respectively.

Our instrument for mortgage maturity at origination is then a variable that rounds to the closest 5-multiple of the distance from 65 years the age at which the household purchased the house. Hence, we use as an additional identifying source of variation the age at purchase plus variation that is due to the fact that if a household who purchases a house at an age that is a multiple of 5 is likely to obtain in a maturity longer than another household whose age at purchase is slightly higher. The "rounded" variable has an advantage over an alternative instrument that equals "65-age at purchase": the latter is very similar to year-specific linear age effect. Furthermore, that variable captures the large difference in granted maturities associated to small age differences. Note that identification is obtained through changes in the age profile of maturities according to the year of purchase (the 65 age at mortgage maturity rule was not implemented prior to 1999). Thus, in the second stage, we can control for age and year of purchase separately, as the parameters are identified by the interaction between both variables. The model we estimate is
\[
\ln C_h = \alpha_0 + \sum_{g=1}^{3} M_{h,g} \beta_g + \sum_{g=1}^{3} R_{h,g} \gamma_g + D_t + f(\text{age}_{purchase}) + X_h \delta + \varepsilon_h \quad (5)
\]

\[
M_h = \theta_0 + \theta_1 |65 - \text{age}_p| \ast \text{POST98}_h + \theta_2 \text{POST98}_h + \theta_3 |65 - \text{age}_p| + \delta X_h + D_t + X_h \delta_1 + u_h \quad (6)
\]

\(|65 - \text{age}_p|\) is a variable that rounds the distance to 65 to the smallest multiple of 5. \text{POST98} is a dummy that takes value 1 if the house was purchased after 1998. The use of 1998 as the dividing year is based on the observation that mortgage maturities increased after that year. \(D_t\) is the year of purchase and \(X_h\) contains the rest of covariates detailed above.

Instrumenting interest rates. Interest rates are also potentially affected by endogeneity biases. We use as an instrument the average interest rate spread by year of purchase (4-year periods) age of purchase (below or above 45) and education category (3 education groups). For each cell identified with these variables, we imputed the average spread computed in the same way as described in Section 3.1, assuming therefore that the spread was exogenously determined from the market and not driven by the household choices.\(^{15}\)

4 Results

This section provides the results for different estimation strategies. First, we assume that interest rates and loan maturity are exogenous and that the sample of house owners with a mortgage is random. We relax each of those assumptions by controlling for selection first and instrumenting maturities and interest rates secondly. Finally, we examine different specifications to understand who affected

\(^{15}\)A related issue is that in order to check for the heterogeneity in the responses of credit constraints household in equation (1) we would have to interact maturity and interest rates with education dummies. As these interactions are themselves endogenous variables, a natural instrument for these variables would be the interaction of the proposed instrument, distance from 65 and the interaction with purchase years, with education dummies. However, our sample is too small to estimate all those moments reliably, and this version mainly presents intention-to-treat models where we regress the outcome variable on the instrument directly.
households are, and also focus on the loan to value channel that is an important aspect of consumption.\textsuperscript{16}

4.1 The impact of maturity and interest rates on consumption assuming exogeneity

Table 3, column 1, rows 1-3 presents the impact of maturity and interest rates on the log of non-durable expenditure for households with different education levels. The estimation method is OLS and there is no control for sample selection into borrowing. Standard errors are corrected for heteroscedasticity. For the whole population, the impact of interest rates on expenditure is -2.1 percent (standard error: 1.8 percent), negative and not statistically different from zero. Evaluated at the sample mean of 15 years of maturity, one extra year of maturity increases consumption by 1.5 percentage points (standard error: .0069). Interestingly, those impacts vary substantially across schooling groups.

The impact of interest rate on the non-durable expenditure of households whose head has high school education group is shown in Table 3, column 1, row 3 and amounts to 0.045 (standard error of 0.034), statistically not different from zero. Conversely, maturity has a positive effect on the consumption of that group: the coefficient in Table 3, row 3 column 2 suggests that an additional year of mortgage maturity increases the log of non-durable consumption by .0244 (standard error of 0.0116).

Turning to the set of households with a head with basic schooling, we find that their non-durable expenditure does not vary much to mortgage maturity: each additional year of maturity at origination increases consumption by about 1 percentage points .009 (standard error: .017). In addition, the non-durable expenditure of households headed by an individual with basic school responds not to interest rates: an increase of 1\% in the interest rate increases the level of consumption by 1.4 percentage points, but the standard error is large. Row 4 shows the consumption response to interest rates and maturity among college

\textsuperscript{16}Namely, the standard errors are the average of the 5 standard errors computed in each replication plus a term that reflects the variability of estimates across implicates.
graduates. The expenditure of that group reacts not to mortgage length, but it is sensitive to interest rates: an increase of 100 basis points diminishes consumption by 4.9 log points. The qualitatively similar pattern of the response of consumption to interest rate and maturities among college households (the most educated ones) and basic school households (the least educated) suggests that issues about financial literacy may not explain our results - because financial literacy and the ability of understand interest rates is lowest among low schooling households).

Overall, the evidence in Table 3 suggests that the responses of consumption to mortgage maturities and interest rates differ among groups of the population. The size of the mortgage installments increases expenditure among households headed by a person with high school and that group does not consume more in response of better financing rates. That behavior is consistent with the idea that credit constraints bind for that group, who use maturity extensions to finance higher consumption in the early years after having purchased a home. The determinants of consumption within the group with a college degree are those of unconstrained households: consumption is lower among households with higher interest rates, but it is insensitive to the fall in the size of the yearly installment that is associated to a longer maturity.

4.2 Controlling for selection

The estimates in Table 3 do not account for the fact that in times of a credit market boom -like the period spanning the late nineties until the beginning of the great recession- the set of individuals becoming home owners changes quickly over time. For example, home owners who obtained a mortgage at the beginning of the housing boom may have borrowed at more stringent conditions than those who obtained a mortgage afterwards. Hence, consumers accepting those stringent credit conditions may have stronger preferences for current consumption than the sample of applicants when credit conditions have become softer. Hence, we control for selection into borrowing by using information about credit rejections of households who wanted to borrow but could not because banks re-
jected their applications.\textsuperscript{17} The idea is that consumers whose applications are rejected have similar preferences for consumption than those who are accepted, as both sets of consumers applied for loans and were willing to accept credit conditions, so that variable predicts selection into borrowing without indicating differential preferences for expenditure. Table 4A shows the results of a Probit that identifies mortgage borrowing among a sample of 3,701 house owners using the covariates in Table 3. As we do not observe the credit conditions of home owners who did not obtain a mortgage, we use the average credit conditions (interest rate and mortgage maturity).

The first row in Table 4A confirms that conditional on having applying for a loan, households who were rejected had a lower chance of having purchased their house of residence with a mortgage. Table 4B reports the OLS estimates of the impact on consumption of maturity and interest rates on consumption, further introducing a Mills ratio to control for selection. Those results basically confirm the patterns in Table 3. We document a negative correlation between interest rates and consumption only among households whose head has a college degree. Conversely, the only group whose consumption responds to mortgage maturity is that headed by a person with a high school degree.

\section*{4.3 Endogeneity.}

The following step is to account for the endogeneity of maturity and interest rates. At this stage, we use intention-to-treat estimates by regressing the outcome variable on the instruments for maturity and interest rates. We start by verifying that those instruments have predictive power.

\subsection*{4.3.1 The first stages: relevance of the instruments}

Table 5 illustrates the results for the first stage regression of maturity (column 1) and interest rates (column 5) on the exogenous variables and the instruments. Column 1 shows the determinants of mortgage maturity. The first row of Table

\footnote{The survey asks about credit rejections during the last two years only, not about rejections at the time of purchase. We assume that the reasons that lead a bank to reject a credit application are likely to stay over time.}
5 shows the OLS coefficient of the interaction of "rounded distance to 65 at purchase" and "purchase after 1998" in a regression with maturity in the left-hand-side. The magnitude of the interaction is 0.146 (with a s.e. of 0.037), suggesting that an extra year of purchase reduces average maturity by around 1.8 months. Interestingly, "rounded distance to 65" does not correlate with maturity for purchases prior to 1998: the coefficient is .0428, with standard error of .0515. Finally, the average interest rate seems not to be related with higher maturity, reassuring us that what identifies variation in maturity is the age at purchase and not other credit market conditions. The F-test of "rounded age to 65" times "post 98" is 15.57, suggesting that the instrument for mortgage maturity is reasonably strong.

Table 5, column 3 displays the regression of the interest rate variable on the instruments. The coefficient of the average interest rate spread by education, age and year of purchase groups is .926 (standard error: .05). The estimate is not statistically different from 1, and -not surprisingly- it is rather precise.

4.3.2 The causal impact of mortgage initial conditions on consumption

The impact of the instrument of mortgage maturity on non-durable consumption of households whose head has a high school degree is shown in row 2 of Table 6 and it is .0077 (standard error: .0036). The expenditure of households headed by an individual with a college degree are basically unaffected by increases in the bank’s incentive to increase maturity by one year, it is .003, less than half that for households headed by an individual with high school education (standard error: .005). On the other hand, a lower interest rate when the mortgage is originated diminishes the non-durable expenditure of households headed by an individual with a high school degree: the estimated coefficients is shown in row 3 of Table 6 and equals -.025 (a 2.5 percent response of non-durable consumption to an increase of 100 basis points).

Finally, households headed by an individual with basic schooling react neither to interest rates or maturity increases. In principle, the notion that the
consumption of low-educated households does not respond to maturity increases is consistent with the idea that groups that have small earnings growth later in life are not credit constrained. As discussed earlier, that result is also hard to reconcile with the idea that the behavior of less educated -or less financially sophisticated households- are more sensitive to more "visible" loan characteristics, like the loan installment size.

Panel B of Table 6 shows the impact of interest rates and our instrument for maturity non-durable expenditure using a quantile regression model. The estimates are very similar to the OLS ones, and we do not discuss them in detail.

Magnitude of the estimates We next assess how large the response of consumption to maturity is among households headed by an individual with high school. In Section 2, we provide a rough computation suggesting that an increase in mortgage maturity of 10 years diminishes yearly payments by about 10% of the earnings of the average household. We reran the model in Table 6 column 1 but using the logarithm of the ratio of nondurable goods over earnings. The coefficient of that regression indicates the impact of mortgage credit conditions on consumption as a fraction of current income. The coefficient of maturity interacted with high school head is .025 (standard error: .024). We then predicted for each household the (log of the) consumption income ratio with a maturity of 15 years and with a maturity of 25 years. The exponential of the average difference is 10%, slightly above the 9% reduction in payments. Hence, the magnitude suggests that the whole reduction in installments is consumed by house owners -plus possibly, a fraction financed by a higher loan to value.

4.4 Robustness checks

The loan to value channel: The model suggests that credit constrained households use higher loan-to-value ratios to finance consumption during the early period of house ownership. Hence, we expect loan to values to respond more to mortgage maturity among credit constrained households than among the rest. Table 8 presents Tobit estimates of the impact of mortgage maturity and inter-
est rates on the loan-to-value ratios across education groups. While the results may be affected by endogeneity biases - for example, interest rates seem to be orthogonal to loan-to-value ratios, which is not very intuitive - the response of loan-to-values is higher among households headed by a high school individual than among the rest of households. That result is broadly consistent with the idea that the "high school group" of house-owners finance their consumption by borrowing a higher share of the purchased house value against a longer period of remaining earnings.

Credit constraints vs financial literacy An alternative explanation of our results is that households with a high school degree have limited financial education and thus are unlikely to understand what an interest rate is (see Lusardi and Tufano, 2009) Hence, their consumption would not respond to interest rates, as that concept is not part of their information set. While of course problems with financial literacy are widespread and the issue merits further investigation we have strong doubts that a lack of financial literacy explains our findings. First, were financial literacy driving our results, the changes in the size and timing of installments would affect the consumption level of the least financially able: households with a basic schooling head. Nevertheless, the consumption of the least educated is insensitive to mortgage maturity in any of the specifications in the paper. Second, Lusardi and Tufano show that financial literacy is correlated with overindebtedness. In our sample, the loan-to-value ratio among the group with the lowest education level is as sensitive to the size of mortgage installments as that of the most educated (college heads, see Table 8 Panel B). Third, the TSLS specification does not rule out consumption responses to interest rates among the least likely to be financially able: the low educated. Fourth, the evidence from income growth in the later part of life fits more naturally with a credit constraint story than with a lack of financial sophistication.
5 Concluding remarks

The Permanent Income Theory predicts that changes in mortgage market conditions, like longer periods to repay or lower interest rates have a heterogeneous impact on the consumption of home owners, and that such heterogeneity in the responses is informative about the share of liquidity constrained households among house owners. In particular, the consumption of groups of the population who are exposed to higher borrowing rates and who expect higher income growth late in life should be specially responsive to mortgage maturity. Alternatively, the consumption of other, unconstrained, groups should react mainly to changes in interest rates and is unrelated to the size of mortgage installments.

In this study, we use the 2002-2011 waves of the EFF, a Spanish Survey with retrospective information about mortgage conditions, to estimate the response of household consumption to cross-sectional changes in maturity and in the spread of the interest rate over the Euribor.

We document that the consumption response to interest rates and maturities is rather heterogeneous across groups of house owners defined by their income and education. The level of consumption seems to be related negatively to interest rates only among the college educated. The consumption of groups with high school attainment responds mainly to mortgage maturity. The evidence is robust to the endogeneity of interest rates and maturity and for controls for selection into borrowing. One interpretation of those findings is that households whose head has a high school degree are credit constrained. Alternative sample splits using household income suggest that consumption responses to changes in the interest rate are confined among home owners in the top income quartile. We find some evidence of a response of consumption to mortgage maturity only among house owners in the central quartiles of the income distribution.

One way to assess the magnitude of our estimates is to compute a share of credit constrained households in Spain. The share of households headed by a person with a high school degree as a fraction of the set households that bought the house with a mortgage in the period 1992-2011 is 32%. Hence, credit
constrained households would be about 32% of relatively recent house owners or 8% of the total population. Both estimates are above what one would get using credit rejection questions - around 3% of indebted households in our sample.

Do the patterns of consumption response to mortgage conditions hold in thinner mortgage markets, like the Italian one? Take the alternative case of the US, where loan refinancing is much more prevalent than in Spain. Do initial mortgage conditions determine there the level of household consumption? We plan to address those issues by estimating the link between consumption and credit market conditions using datasets from other economies.

References


6 Appendix 1

This appendix gives details about the results in Section 2.
6.1 Consumption when mortgage maturity equals 1.

We focus on the case that the consumer ends the second period with no saving. In that case,

\[ c_1(1) = \frac{1}{1 + \eta^{\frac{1}{p}} + \beta^{\frac{1}{p}}(1 + r_b)^{\frac{1}{p}-1}}[y_1 + \frac{y_2}{1 + r_b}] \]

\[ h(1) = \frac{\eta^{\frac{1}{p}}}{1 + \eta^{\frac{1}{p}} + \beta^{\frac{1}{p}}(1 + r_b)^{\frac{1}{p}-1}}[y_1 + \frac{y_2}{1 + r_b}] \]

and

\[ c_2(1) = \frac{\beta^{\frac{1}{p}}(1 + r_b)^{\frac{1}{p}}}{1 + \eta^{\frac{1}{p}} + \beta^{\frac{1}{p}}(1 + r_b)^{\frac{1}{p}-1}}[y_1 + \frac{y_2}{1 + r_b}] \]

while \( c_3(1) = y_3 \). In such allocation, one can show the following results:

**Lemma 1** \( \frac{\partial c_1}{\partial (1 + r_b)} < 0 \) if \( \rho < 1 \) and \( \frac{y_2 - y_1}{y_1} \) is sufficiently large

Taking derivatives with respect to \( 1 + r_b \), one can obtain

\[ \frac{\partial c_1}{\partial (1 + r_b)} = -\frac{1}{\Omega(r_b)^2} \frac{y_2}{(1 + r_b)^2} - \frac{\Omega'(r_b)}{[\Omega(r_b)]^2} \left[ \frac{y_2}{1 + r_b} \right] \]

Where \( \Omega(r_b) = 1 + \eta^{\frac{1}{p}} + \beta^{\frac{1}{p}}(1 + r_b)^{\frac{1}{p}-1} \). Operating, we get

\[ \frac{\partial c_1}{\partial (1 + r_b)} < 0 \] if

\[ \frac{1}{\Omega(r_b)^2} \frac{y_2}{(1 + r_b)^2} > \frac{-\Omega'(r_b)}{[\Omega(r_b)]^2} \left[ \frac{y_2}{1 + r_b} \right] \]

Dividing both sides of the inequality by \( [y_1 + \frac{y_2}{1 + r_b}] \) and rearranging, one obtains that \( \frac{\partial c_1}{\partial (1 + r_b)} < 0 \) whenever parameters satisfy (C1)

\[ \frac{1 + \Delta y}{2 + \Delta y + r_b} > \frac{1}{\rho} \frac{\beta^{\frac{1}{p}}(1 + r_b)^{\frac{1}{p}-1}(\rho - 1)}{1 + \eta^{\frac{1}{p}} + \beta^{\frac{1}{p}}(1 + r_b)^{\frac{1}{p}-1}} \] (7)

Where \( \Delta y = \frac{y_2 - y_1}{y_1} \). The left hand side of (7) is 1 at most, increases with second period income and falls with the borrowing rate \( r_b \). The RHS of (7) is the product of two terms, \( \frac{1}{\rho} \), and a second term that increases with \( \rho \). Thus, an
increase in $r_b$ diminishes consumption in the first period if $\Delta y$ is sufficiently large.

**Lemma 2** An increase in interest rates makes $\phi(1)$ fall.

Using the first period budget constraint, one can recover the expression for the optimal loan-to-value $\phi_1$

$$\frac{[\eta \beta + 1]y_2 - \beta \beta \beta (1 + r_b)\beta y_1}{\eta \beta [y_1(1 + r_b) + y_2]} = \phi(1)$$

Taking differences with respect to $(1 + r_b)$ one obtains

$$\frac{-\beta \beta \beta (1 + r_b)\beta - 1}{\eta \beta [y_1(1 + r_b) + y_2]} - \phi_1 \frac{\beta \beta \beta y_1}{\eta \beta [y_1(1 + r_b) + y_2]} = \frac{\partial \phi(1)}{\partial (1 + r_b)}$$

Both terms are negative. Hence, an increase in $1 + r_b$ leads to a drop in both housing and non-housing consumption among buyers both through income and substitution effects if $\rho < 1$ and the income profile sufficiently steep. Still, as the fraction of housing financed through a mortgage drops unambiguously with the interest rate a home buyer still needs to spend more on housing upfront $(1 - \phi)h$, thus consuming less on the rest of (non-housing) goods.

**6.2 Case 2: Consumption when mortgage maturity equals 2.**

With two periods to repay the loan, the allocations of non-housing consumption $-c_1(2), c_2(2)$ and $c_3(2)-$ and housing $-h(2)-$ can be written as follows

$$c_1(2) = \frac{1}{1 + \eta \beta \beta \beta (1 + r_b)\beta - 1 + \beta \beta \beta (1 + r_b)\beta - 2} \left[ y_1 + \frac{y_2}{1 + r_b} + \frac{y_3}{(1 + r_b)^2} \right]$$

$$c_2(2) = \frac{\beta \beta \beta (1 + r_b)\beta}{1 + \eta \beta \beta \beta (1 + r_b)\beta - 1 + \beta \beta \beta (1 + r_b)\beta - 2} \left[ y_1 + \frac{y_2}{1 + r_b} + \frac{y_3}{(1 + r_b)^2} \right]$$
\[c_3(2) = \frac{\beta \hat{r} (1 + r_b)^{\hat{r} - 2}}{1 + \eta^{\hat{r}} + \beta \hat{r} (1 + r_b)^{\hat{r} - 1} + \beta \hat{r} (1 + r_b)^{\hat{r} - 2}} [y_1 + \frac{y_2}{1 + r_b} + \frac{y_3}{(1 + r_b)^2}]\]

\[h(2) = \frac{\eta^{\hat{r}}}{1 + \eta^{\hat{r}} + \beta \hat{r} (1 + r_b)^{\hat{r} - 1} + \beta \hat{r} (1 + r_b)^{\hat{r} - 2}} [y_1 + \frac{y_2}{1 + r_b} + \frac{y_3}{(1 + r_b)^2}]\]

**Lemma 3** Maturity extensions increase \(c_3(2)\) relative to \(c_3(1)\) and \(c_2(2)\) relative to \(c_2(1)\) when \(y_3\) sufficiently large relative to the borrowing rate \(r_b\).

\[c_3(2) = \frac{1}{1 + \eta^{\hat{r}} + \beta \hat{r} (1 + r_b)^{\hat{r} - 1} + \beta \hat{r} (1 + r_b)^{\hat{r} - 2}} [y_1 + \frac{y_2}{1 + r_b} + \frac{y_3}{(1 + r_b)^2}] = \Omega_2(r_b) E_3(r_b)\]

Where we have used the notation \(\Omega_2(r_b) = \frac{1}{1 + \eta^{\hat{r}} + \beta \hat{r} (1 + r_b)^{\hat{r} - 1} + \beta \hat{r} (1 + r_b)^{\hat{r} - 2}}\) and \(E_3(r_b) = [y_1 + \frac{y_2}{1 + r_b} + \frac{y_3}{(1 + r_b)^2}]\)

\[c_1(1) = \frac{1}{1 + \eta^{\hat{r}} + \beta \hat{r} (1 + r_b)^{\hat{r} - 1}} [y_1 + \frac{y_2}{1 + r_b}] = \Omega_1(r_b) E_2(r_b)\]

To establish the result, one needs to prove that \(\frac{c_1(1)}{c_1(2)} < 1\), or \(\frac{\Omega_1(r_b) y_2(r_b)}{\Omega_2(r_b) y_3(r_b)} < 1\).

A similar condition is that \(\frac{\Omega_2(r_b)}{\Omega_1(r_b)} < \frac{y_2(r_b)}{y_3(r_b)}\) (8)

Expression C2 can be expressed in terms of parameters as follows:

\[\frac{\Omega_2(r_b)}{\Omega_1(r_b)} = 1 + \frac{\beta \hat{r} (1 + r_b)^{\hat{r} - 2}}{1 + \eta^{\hat{r}} + \beta \hat{r} (1 + r_b)^{\hat{r} - 1}}\]

\[\frac{y_2(r_b)}{y_3(r_b)} = \frac{1}{1 + \frac{y_3}{(1 + r_b)^2} + \frac{y_3}{(1 + r_b)^2}}\]

Hence, \(\frac{c_1(1)}{c_1(2)} < 1\) if

\[\frac{\beta \hat{r} (1 + r_b)^{\hat{r} - 2}}{1 + \eta^{\hat{r}} + \beta \hat{r} (1 + r_b)^{\hat{r} - 1}} < \frac{y_3}{(1 + r_b)^2} + \frac{y_3}{(1 + r_b)^2}\]

This condition is more likely to hold when \(y_3\) sufficiently large relative to the interest rate \(r_b\). The condition also guarantees that \(\frac{c_2(1)}{c_2(2)} < 1\).
Lemma 4 An extension in maturity increases the loan-to-value ratio of homeowners.

The loan-to-value ratio can be obtained from the first-period budget constraint:

\[(1 - \phi(2))h = y_1 - c_1(2)\]

Evaluating the expression at \(h(2)\) and \(h(1)\), one gets the result.

\[1 - \phi(2) = \frac{y_1}{h(2)} - \frac{(1 + r_b)^{\frac{1}{2}}}{\eta^2}\]

\[1 - \phi(1) = \frac{y_1}{h(1)} - \frac{(1 + r_b)^{\frac{1}{2}}}{\eta^2}\]

The fact that an increase in mortgage maturity leads to an increase of both the expenditure in housing and non-housing goods together with the fact that the budget constrained must be satisfied implies that \(1 - \phi_2 < 1 - \phi_1\), or \(\phi_1 < \phi_2\): The higher level of non-housing consumption is financed with a higher loan-to-value ratio.

Lemma 5 The response of consumption to the interest rate is higher among non-constrained households than among constrained holds

\[|\frac{\partial c_1(1)}{\partial (1 + r_b)}| < |\frac{\partial c_1(2)}{\partial (1 + r_b)}|\]

\[c_1(1) = \frac{1}{1 + \eta^{\frac{1}{2}} + (1 + r_b)^{\frac{1}{2}} - 1} [y_1 + \frac{y_2}{1 + r_b}]\]

\[c_1(2) = \frac{1}{1 + \eta^{\frac{1}{2}} + (1 + r_b)^{\frac{1}{2}} - 1} [y_1 + \frac{y_2}{1 + r_b} + \frac{y_3}{(1 + r_b)^2}]\]

The responses are:

\[\frac{\partial c_1(1)}{\partial (1 + r_b)} = -\frac{(1 - \phi)(1 + r_b)^{\frac{1}{2}} - 2}{[1 + \eta^{\frac{1}{2}} + (1 + r_b)^{\frac{1}{2}} - 1]^2} [y_1 + \frac{y_2}{1 + r_b}] - \frac{1}{1 + \eta^{\frac{1}{2}} + (1 + r_b)^{\frac{1}{2}} - 1} [\frac{y_2}{(1 + r_b)^2}]\]

a negative number. \(\frac{\partial c_1(2)}{\partial (1 + r_b)}\) equals
\[ \frac{\partial c_1(2)}{\partial (1+r_b)} = -\frac{(\frac{1}{\rho} - 1)\beta^2(1+r_b)^{\frac{3}{2}-2}[1 + 2\beta^2(1+r_b)^{\frac{3}{2}-2}]}{\left(\frac{1}{1+\eta} + \beta(1+r_b)^{\frac{5}{2}-1} + \beta(1+r_b)^{\frac{3}{2}-2}\right)^2} \left[ y_1 + \frac{y_2}{1+r_b} + \frac{y_3}{(1+r_b)} \right] \\
- \frac{1}{\left(\frac{1}{1+\eta} + \beta(1+r_b)^{\frac{5}{2}-1} + \beta(1+r_b)^{\frac{3}{2}-2}\right)^2} \left[ \frac{y_1}{(1+r_b)^2} + \frac{y_2}{(1+r_b)^3} \right] \]

If \( \rho < 1 \) and condition C1 holds, \( | \frac{\partial c_1(1)}{\partial (1+r_b)} | < | \frac{\partial c_1(2)}{\partial (1+r_b)} | \)

7 Appendix 2: The construction of permanent income

The measure of permanent income we use is an average of total income during the years we observe the household, normalized for a household composed by 3 adult members whose head is 45 years of age as of 2002. For 55% of households we have two consecutive yearly observations. The first is the report during the fiscal year of 2001 for the EFF2002 and that for 2004 for EFF2005. The second is an imputation of monthly household income during the period of the interview, based on direct questions on current income to all household members. We multiply by 12 that report. For panel households, we have two extra data points -two similar measures for the 2002 or 2005 wave. We use the sample of households whose head is at most 70.

To normalize permanent income, we regress current earnings on a 4th order polynomial of age of the household head, education, and indicators of marital status, the number of adults in the household and the number of children. The point of including schooling is that there is substantial cross-cohort variation in earnings. We make the hypothesis that education captures part of the variation in the intercepts of those cohort profiles, so including them as regressors permits us to identify the coefficients of the age polynomial as measuring an average life-cycle income profile.

\[
\log y_{ht} = \delta_0 + f(\text{age} - 45) + \sum_{i=1}^{3} \delta_{1+i} \text{School}_{\text{head}} + \delta_4 X + \sum_{t=2006}^{t-2003} \text{Year} + u_h + \varepsilon_{ht}
\]
where the error component has two elements: one that does not vary over time and a second one that we assume to be iid. The measure of permanent income is the following:

\[ Y_h = \exp(\delta_0 + \delta_1 School_{head} + u_h) \]
Table 1: Evolution of credit conditions in Spain 1991-2011

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed Rate Mortgages</td>
<td>22</td>
<td>14</td>
<td>17</td>
</tr>
<tr>
<td>Loan-to-Value (median)</td>
<td>.78</td>
<td>.92</td>
<td>.96</td>
</tr>
<tr>
<td>Spread over Euribor (if adjustable)</td>
<td>170</td>
<td>106</td>
<td>89</td>
</tr>
<tr>
<td>Maturity at origination</td>
<td>18</td>
<td>23.8</td>
<td>28.8</td>
</tr>
<tr>
<td>Sample size</td>
<td>491</td>
<td>649</td>
<td>416</td>
</tr>
</tbody>
</table>

Source: EFF 2002-2011. Sample of 1556 home owners with outstanding loans and who have acquired their homes at most 10 years before the interview (between 1991 and 2012). Information reflects conditions at purchase, that are asked retrospectively to all individuals with outstanding loans. We use 1 of the 5 implicates. All statistics are weighted to be representative.
Table 1B: Who can be affected by increases in mortgage maturity?

<table>
<thead>
<tr>
<th></th>
<th>OLS</th>
<th>QR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Predicted household income growth and interest rates</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Male head, age 52-55</td>
<td>Male head, age 45</td>
</tr>
<tr>
<td>Basic school</td>
<td>-.126 (.071)*</td>
<td>3.85 (.22)</td>
</tr>
<tr>
<td>High school</td>
<td>-.099 (.077)</td>
<td>3.90 (.19)</td>
</tr>
<tr>
<td>College</td>
<td>-.14 (.08)*</td>
<td>3.68 (.19)</td>
</tr>
</tbody>
</table>

Sample size:
- Column (1): fitted values of a regression of household income growth on age-45, education and interactions between both variables
- Column (2): Fitted values of a regression of mortgage interest rates on regressors above plus household income, debt, and hhold composition.
Table 2B: Descriptive statistics, mortgaged owners of HoR (EFF2002-EFF2011)

<table>
<thead>
<tr>
<th></th>
<th>Basic school</th>
<th>High school</th>
<th>College</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current interest rate</td>
<td>4.47</td>
<td>4.19</td>
<td>4.12</td>
</tr>
<tr>
<td>Maturity at origin</td>
<td>22.8</td>
<td>23.2</td>
<td>23.1</td>
</tr>
<tr>
<td>Age at purchase (ref. person)</td>
<td>33</td>
<td>31.3</td>
<td>32.7</td>
</tr>
<tr>
<td>Loan to Value, origination</td>
<td>.93</td>
<td>.95</td>
<td>.80</td>
</tr>
<tr>
<td>FRM</td>
<td>.22</td>
<td>.16</td>
<td>.14</td>
</tr>
<tr>
<td>Household income (2009 eur)</td>
<td>28,256</td>
<td>34,536</td>
<td>51,450</td>
</tr>
<tr>
<td>Current age (ref. person)</td>
<td>38.5</td>
<td>36.6</td>
<td>37.9</td>
</tr>
<tr>
<td>Non-durable/income</td>
<td>.23</td>
<td>.26</td>
<td>.21</td>
</tr>
<tr>
<td>Applied for loan</td>
<td>.38</td>
<td>.44</td>
<td>.39</td>
</tr>
<tr>
<td>Rejected</td>
<td>.07</td>
<td>.06</td>
<td>.03</td>
</tr>
<tr>
<td>Wave 2002</td>
<td>.35</td>
<td>.26</td>
<td>.38</td>
</tr>
<tr>
<td>Wave 2005</td>
<td>.26</td>
<td>.36</td>
<td>.28</td>
</tr>
<tr>
<td>Wave 2008</td>
<td>.24</td>
<td>.22</td>
<td>.17</td>
</tr>
<tr>
<td>Wave 2011</td>
<td>.15</td>
<td>.17</td>
<td>.17</td>
</tr>
<tr>
<td>Sample size</td>
<td>209</td>
<td>544</td>
<td>821</td>
</tr>
</tbody>
</table>
Table 3: OLS impacts of interest rates and maturity on non-durable consumption

<table>
<thead>
<tr>
<th>Panel A: Average impact</th>
<th>Impact of a 100 bp increase in R</th>
<th>Maturity, linear (diff from 15)</th>
<th>Maturity (squared)</th>
<th>Sample size</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.Total effect</td>
<td>-.0209 (.0177)</td>
<td>.015 (.0069)**</td>
<td>-.0008 (.00035)**</td>
<td>1,574</td>
</tr>
</tbody>
</table>

Panel C: By schooling of hhold head

2. Basic schooling       | .0138 (.0478)                   | .0116 (.0193)                | .0007 (.0009)     | 209         |
3. High school           | .045 (.034)                     | .0244 (.0116)**              | -.0012 (.0056)**  | 544         |
4. College               | -.049 (.026)*                   | .008 (.009)                  | .0006 (.0005)     | 821         |

2. Estimation method: group-specific OLS. Maturity at origin included as squared, impacts evaluated at 15. Heteroscedasticity-robust errors in parentheses. R-squared: .38 (basic school), .18 (high school) .17 (college)
3. Regressors not shown: 4 dummies with family size, log of current and permanent income, 3 dummies with marital status and 3 dummies with working status of head. Additional regressors: fixed rate, type of lending institution, 15 dummies with year mortgage awarded, 7 year dummies and age at purchase in 5-year bands.
### Table 4A: Probability of being a home owner with a mortgage

Estimation method: Probit (1 if owner occupier with mortgage, 0 otherwise)

<table>
<thead>
<tr>
<th>Regressor excluded from consumption model</th>
<th>Model I (no interactions)</th>
<th>Model II (interactions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loan rejected/given less/ feared rejection</td>
<td>-.234 (.127)*</td>
<td>-.233 (.127)*</td>
</tr>
<tr>
<td><strong>Regressor included in consumption model</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Applied for loan, last two years</td>
<td>.296 (.0578)**</td>
<td>.295 (.0557)**</td>
</tr>
<tr>
<td>Average maturity at origin</td>
<td>.119 (.0399)**</td>
<td>.104 (.051)**</td>
</tr>
<tr>
<td>(year of purchase, age, education group)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average maturity at origin x basic school</td>
<td>--</td>
<td>.015 (.035)</td>
</tr>
<tr>
<td>Average maturity at origin x high school</td>
<td>--</td>
<td>-.033 (.044)</td>
</tr>
<tr>
<td>Average interest rate</td>
<td>-.255 (.188)</td>
<td>-.317 (.319)</td>
</tr>
<tr>
<td>(year of purchase, age, education group)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average interest rate x basic school</td>
<td>--</td>
<td>-.158 (.333)</td>
</tr>
<tr>
<td>Average interest rate x high school</td>
<td>--</td>
<td>-.185 (.484)</td>
</tr>
</tbody>
</table>

Sample size (mean dep var) 3701 (.51)

Table 4B: Selection-adjusted impacts of R and M on non-durable consumption

<table>
<thead>
<tr>
<th>Panel A: Average impact</th>
<th>Impact of a 100 bp increase in R (1)</th>
<th>Maturity, linear (diff from 15) (2)</th>
<th>Maturity (squared)</th>
<th>Mills ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Total effect</td>
<td>-.014</td>
<td>.013</td>
<td>-.0007</td>
<td>.027</td>
</tr>
<tr>
<td></td>
<td>(.017)</td>
<td>(.0067)**</td>
<td>(.0003)**</td>
<td>(.029)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Panel C: By schooling of hhold head</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Basic schooling</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>3. High school</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>4. College</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Sample of 1547 house owners observed in 2002-2011 who acquired their house with a mortgage between 1991 and 2010.
Same regressors as in former table plus a dummy for "applied for a loan, last two years" and a selectivity correction term that contains as an excluded covariate "credit rejected" or "given less credit than asked for".
Table 5: The 1st stage: The instruments of M and R

<table>
<thead>
<tr>
<th>Dependent variable:</th>
<th>Loan maturity</th>
<th>Interest rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Round 65* (Post 1998)</td>
<td>.146</td>
<td>(.037)</td>
</tr>
<tr>
<td>Average R</td>
<td>-.37</td>
<td>(.17)*</td>
</tr>
<tr>
<td>Round 65</td>
<td>.041</td>
<td>(.047)</td>
</tr>
<tr>
<td>Round 65* (Basic)</td>
<td>-.007</td>
<td>(.042)</td>
</tr>
<tr>
<td>Round 65* (College)</td>
<td>.024</td>
<td>(.036)</td>
</tr>
</tbody>
</table>

F-test          | 15.35         | 343           |
Mean R-squared  | .268          | .66           |
Sample size:    | 1554          |

Regressors not shown: schooling, household size, number of children, female head, current income of the household and permanent income, a dummy for not working spouse, survey year and year of purchase dummies.
Mortgage characteristics: Mode of rate fixation (dummy for FRM)
Table 6: Impacts of interest rates and instrument for maturity on non-durable consumption

<table>
<thead>
<tr>
<th>Panel A: Average impact</th>
<th>Impact of a 100 bp increase in R</th>
<th>Age at purchase rounded* Mortgage issued after 1998</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>1. Basic schooling</td>
<td>.0111 (.0399)</td>
<td>.002 (.0093)</td>
</tr>
<tr>
<td>2. High school</td>
<td>.017 (.015)</td>
<td>.0077 (.0036)**</td>
</tr>
<tr>
<td>3. College</td>
<td>-.037 (.022)*</td>
<td>.003 (.005)</td>
</tr>
</tbody>
</table>


2. Estimation method: group-specific OLS. Heteroscedasticity-robust errors in parentheses. R-squared: .38 (basic school), .18 (high school) .17 (college)

3. Regressors not shown: 4 dummies with family size, log of current and permanent income, 3 dummies with marital status and 3 dummies with working status of head. Additional regressors: fixed rate, type of lending institution, 15 dummies with year mortgage awarded, 7 year dummies and age at purchase in 5-year bands.
### Table 7A: TSLS impacts of interest rates and mortgage maturity on non-durables

<table>
<thead>
<tr>
<th>Panel</th>
<th>Average impact</th>
<th>Impact of a 100 bp increase in R</th>
<th>Impact of a year increase in M</th>
<th>Income growth 50-65 years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td></td>
</tr>
<tr>
<td>Panel A: Average impact</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Total effect</td>
<td>$-0.014$</td>
<td>$0.000$</td>
<td>$0.000$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$(0.012)$</td>
<td></td>
<td>$(0.028)$</td>
<td></td>
</tr>
<tr>
<td>Panel C: By schooling of hhold head</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Basic schooling</td>
<td>$-0.024$</td>
<td>$0.002$</td>
<td>$-0.126$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$(0.027)$</td>
<td></td>
<td>$(0.031)$</td>
<td></td>
</tr>
<tr>
<td>3. High school</td>
<td>$0.062$</td>
<td>$0.041$</td>
<td>$-0.099$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$(0.032)^*$</td>
<td></td>
<td>$(0.024)^*$</td>
<td></td>
</tr>
<tr>
<td>4. College</td>
<td>$-0.053$</td>
<td>$-0.023$</td>
<td>$-0.14$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$(0.016)^{**}$</td>
<td></td>
<td>$(0.023)$</td>
<td></td>
</tr>
</tbody>
</table>

(relative to previous Tables, drop the condition that age of the mortgage is at most 14)
Table 7B: TSLS impacts of R and M on non-durables + durable exp

<table>
<thead>
<tr>
<th>Panel A: Average impact</th>
<th>Impact of a 100 bp increase in R</th>
<th>Impact of a year increase in M</th>
<th>Income growth 50-65 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Total effect</td>
<td>-.018</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(.019)</td>
<td>(.028)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Panel C: By schooling of hhold head</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Basic schooling</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>3. High school</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>4. College</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Table 8: The impact of R and M on non-durable consumption, by household income

<table>
<thead>
<tr>
<th>Panel B: By income group</th>
<th>A 100 bp increase in R (1)</th>
<th>One year increase in M (2)</th>
<th>Sample size</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Current income below median</td>
<td>.0046 (.042)</td>
<td>-.003 (.014)</td>
<td>454.2</td>
</tr>
<tr>
<td>2. 50th &lt; Y &lt; 75th centile</td>
<td>-.028 (.035)</td>
<td>.025 (.012)**</td>
<td>615.2</td>
</tr>
<tr>
<td>3. Top income quartile</td>
<td>-.066 (.039)*</td>
<td>.013 (.01)</td>
<td>785.4</td>
</tr>
</tbody>
</table>

1. Estimation method: group -specific OLS. Robust standard errors in parentheses. Maturity enters as quadratic, estimates evaluated at 15 year maturity.
3. Other Xs: permanent income (evaluated at 50), age at purchase, year of purchase, fixed-rate mortgage, revaluation of house value, family size, savings bank dummy, 4 dummies with current age of spouse.
Table 9: The response of loan-to-value to R and M

<table>
<thead>
<tr>
<th></th>
<th>Increase of 100 bp R</th>
<th>One year increase Maturity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic education</td>
<td>.022</td>
<td>.0215</td>
</tr>
<tr>
<td></td>
<td>(.029)</td>
<td>(.009)**</td>
</tr>
<tr>
<td>High school</td>
<td>.0317</td>
<td>.044</td>
</tr>
<tr>
<td></td>
<td>(.0127)**</td>
<td>(.006)**</td>
</tr>
<tr>
<td>College</td>
<td>.045</td>
<td>.033</td>
</tr>
<tr>
<td></td>
<td>(.014)**</td>
<td>(.004)**</td>
</tr>
</tbody>
</table>

1. EFF02-EFF11 waves. Sample of 1547 home owners with a mortgage, education-specific Tobits censored at 100% (25% cases). Sample sizes: 209 (basic), 544 (high school) and 821 (college)
2. Interest rates and maturity enter as quadratic, impact evaluated at 15 year mortgage and 4% rate
3. Additional controls: female head, family size, marital status of head (3 dummies)
Current and permanent income and labor status of head. Fixed rate mortgage, savings bank dummy
Table A1: Who is likely to be affected by increases in mortgage maturity?

Panel A: Household income growth and interest rates on mortgage, by education group

<table>
<thead>
<tr>
<th>Dependent variable:</th>
<th>Income growth 2002-2005</th>
<th>Interest rate on mortgages</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OLS</td>
<td>WLS</td>
</tr>
<tr>
<td></td>
<td>Coeff. (1)</td>
<td>St. Error (2)</td>
</tr>
<tr>
<td>Age of head minus 45</td>
<td>-0.079</td>
<td>0.048*</td>
</tr>
<tr>
<td>Age head minus 45 * Primary</td>
<td>0.0091</td>
<td>0.0064</td>
</tr>
<tr>
<td>Age head minus 45 * High school</td>
<td>0.0117</td>
<td>0.061*</td>
</tr>
<tr>
<td>Primary school</td>
<td>-0.149</td>
<td>0.0069*</td>
</tr>
<tr>
<td>High school</td>
<td>-0.0880</td>
<td>0.061</td>
</tr>
<tr>
<td>Constant</td>
<td>-0.017</td>
<td>0.041</td>
</tr>
</tbody>
</table>

Panel B: Predicted household income growth and interest rates

<table>
<thead>
<tr>
<th>Predicted income growth</th>
<th>Interest rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unweighted</td>
</tr>
<tr>
<td>Low educated</td>
<td>-0.150</td>
</tr>
<tr>
<td>High school</td>
<td>-0.064</td>
</tr>
<tr>
<td>College</td>
<td>-0.0922</td>
</tr>
</tbody>
</table>

Sample size: 1013

Notes:
1. EFF 2002 and 2005 waves
2. The sample used in columns 1 and 2 is a panel of 1,013 households where the number of adults stayed constant between 2002 and 2005 and where the head is between 18 and 65 years of age. Standard errors are corrected for heteroscedasticity.
3. The sample used in Column 3 contains households with a mortgage and a head between 18 and 65 years of age. The estimates are not corrected for selection. Standard errors in parentheses are corrected for heteroscedasticity.
Figure 1: Income profiles by schooling level: synthetic cohorts 1985-1996

Each dot is a 4-year moving average of mean net income in education x cohort x age cells
Figure 2B: Household net income at age t/ income at age 44, 1945-54 cohorts

- Basic
- High school
- College
Source: Spanish survey of Household Finances (EFF 2002-2011)
Each dot is the predicted fraction of mortgages with maturity at origin exceeding 25 years, obtained from a regression with dummies of age at purchase and year of purchase dummies.