DELEVERAGING IN A HIGHLY INDEBTED PROPERTY MARKET: WHO DOES IT AND ARE THERE IMPLICATIONS FOR HOUSEHOLD CONSUMPTION?

BY YVONNE MCCARTHY*

Central Bank of Ireland

AND

KIERAN MCQUINN*

Economic and Social Research Institute

A distinguishing feature of the period preceding the 2007/2008 financial crisis was the sizeable increase in private sector debt observed across many countries. A key component of household liabilities is mortgage debt and with many countries experiencing persistent increases in house prices from the mid-1990s, a marked increase in this aspect of household leverage was observed. While aggregate statistics across countries confirm reductions in personal debt levels in recent years, relatively few sources of micro data are available to examine the nature of the deleveraging process at the household level. In this paper, using a unique dataset, we examine deleveraging amongst a representative sample of mortgaged Irish households. We identify the characteristics of households engaged in deleveraging and find that it is those households who can afford to deleverage who do. Furthermore we find some tentative evidence to suggest that the decision to deleverage has negative implications for household consumption.

1. INTRODUCTION

A distinguishing feature of the period preceding the 2007/2008 financial crisis was the sizeable increase in private sector debt observed across many countries. From the early 1990s the combination of greater credit provision amongst international financial systems and favourable macroeconomic conditions resulted in many household sectors becoming increasingly indebted. While non-mortgage finance grew strongly over this period, due, in the main, to the greater availability and use of credit cards, mortgage debt, in particular, witnessed a sizeable increase. The sustained rise in both house prices and activity levels experienced across much of the OECD resulted in an escalation in household leverage. Given the subsequent downturn in economic activity due to the financial crisis of 2007/2008 and

the associated correction in house prices experienced in some of these markets, aggregate statistics suggest that many households are currently engaged in deleveraging, i.e. reducing their personal debt levels. Such a course of action can, potentially, have serious implications for key economic variables; when households seek to pay down their debts, a reduction in consumption and/or an increase in savings levels is very often observed. At a time when economic growth rates across countries are still struggling to recover from the financial crisis, this could act as a further drag on economic activity.

While aggregate information across countries is indicative of a general reduction in debt levels, there is, however, a relative paucity of information at the micro-household level. Given the likely heterogeneous nature of households' balance sheets and both their capability and inclination to deleverage, obtaining an understanding of this issue at a micro level is highly advantageous. Certain key questions can be addressed with micro data such as what causes household debt levels to change and what is the nature of the relationship between debt levels and consumption? Typically, in understanding the implications of adverse financial shocks, it is assumed that changes in household debt occur endogenously due to wealth effects, i.e. if housing wealth declines, households may spend less and save more thereby resulting in a decline in borrowing to fund such spending. Therefore, debt levels change due to wealth effects.

However, there are a number of reasons why households may target or pay attention to the level of debt itself, independent of the wealth effect. Households may, for example, have a certain level of leverage which they aim to maintain. In property markets, such as the U.S. and Irish case, where the persistent fall in house prices between 2007 and 2012 will have caused increased leverage levels, households may reduce their spending and increase their debt repayments in order to re-establish their desired debt levels. Secondly, financial institutions are typically more reluctant to lend to highly indebted households, thereby potentially restricting a source of their consumption finance. House price falls are often associated with lower debt and, as Mian and Sufi (2011) illustrate, reduce the ability of households to engage in home-equity-based borrowing. Therefore, debt levels themselves may have a direct impact on consumption behaviour.

Understanding the specific role played by debt in this manner is very important as it has pressing implications for the way in which economists typically assess consumption behaviour. As Dynan (2012a) has noted, the empirical aggregate consumption function most often used by policy makers does not, generally, include debt or leverage as an explanatory variable. Balance sheet issues are mainly incorporated through an expression for aggregate net worth. However, if deleveraging itself has implications for consumption, then omitting debt levels from standard consumption frameworks, especially at the current juncture, could be quite misleading. Recent studies in the U.S. (Dynan (2012b) and Mian *et al.* (2013)), both using household level data, suggest that high debt levels have implications for consumption. Dynan (2012b), in particular, having controlled for wealth levels, concludes that elevated leverage levels appear to be associated with weak consumption growth.

In this paper, using a unique combination of regulatory and survey data, we assess the deleveraging decision amongst a representative sample of mortgaged Irish

households. In particular, we examine the impact of various socioeconomic and demographic variables on the deleveraging decision before assessing the effect of deleveraging on household consumption. To this aim, we use data from two unique micro-data sources. The first is mortgage loan-level data that is gathered on a regular basis for the three main Irish financial institutions, which account for around three quarters of the outstanding stock of mortgages in Ireland. This dataset includes administrative information on mortgage loans such as outstanding balances, repayment behaviour and collateral values. This dataset is supplemented by information from a representative household survey conducted in 2012/2013 on the mortgage books of the same institutions. Along with details such as the current consumption, income, expectations and labour market status of these households, respondents were also asked questions that capture deleveraging behaviour.

These combined datasets offer a number of advantages over existing studies. In particular, unlike the work of Dynan (2012b), we are in a position to directly observe deleveraging at the household level, rather than relying on household leverage ratios to proxy for such behaviour. Given the specific information we have on house prices, we are also able to control for housing wealth effects. Dynan (2012b) illustrates the importance of such a control and highlights the omission of such wealth effects from previous studies.

In terms of household deleveraging, the Irish market is of specific interest owing to the rapid increase in household indebtedness prior to 2007 vis-à-vis other western economies. In the three-year period 2005 to 2007, Cussen *et al.* (2012) estimate that, out of a sample of 24 European countries, Irish household debt had, as a percentage of disposable income, increased by more than any other country. By 2007, for example, the Irish household leverage ratio was 200 percent—the fourth highest amongst the countries concerned.

Our results suggest that it is the older, more affluent Irish households that are deleveraging. In particular, the probability of deleveraging is highest among those households with higher levels of income, with older or retired heads of household, and among those households where the head is relatively well educated. Furthermore, in a result that reinforces the importance of affordability in any deleveraging decision, we find that households are likely to reduce their deleveraging if they expect a deterioration in future financial conditions. Finally, we find some tentative evidence to suggest that deleveraging is negatively related to consumption.

Our results have an added policy relevance given the present distressed nature of the Irish mortgage market. Most of the increase in Irish household indebtedness was due to developments in the residential property market. Irish house price growth was, between 1995 and 2007, the largest across the OECD, while activity levels were also considerably elevated with 340,000 new mortgages alone being approved between 2004 and 2006 (out of a national stock of 800,000). However, since 2007, the over 50 percent fall in Irish house prices coupled with a sharp increase in unemployment has given rise to a considerable negative equity and mortgage arrears issue.[1] Owing to the scale of the problem, a number of

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[1]At end-June 2013, there were 97,874 (12.7 percent of the total book) private residential mortgage accounts for principal dwelling houses (PDH) in arrears of over 90 days, while internal Central Bank estimates suggest up to 400,000 mortgages (52 percent of the total) were in negative equity at the same time.
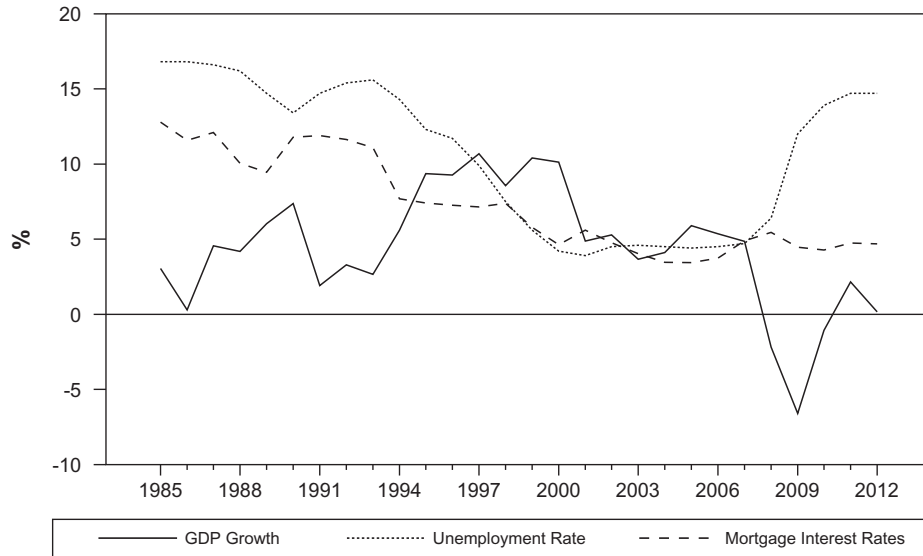
Figure 1. Key Irish Macroeconomic Variables: 1985–2012

Government initiatives have sought to address the problem.[2] Clearly, a greater understanding of households' capacity to redress their indebtedness positions is informative in tailoring effective and efficient policy responses to these difficulties.

The rest of this paper is structured as follows; in the next section we provide an overview of aggregate developments in Irish household indebtedness and deleveraging in recent years. In Section 3 we describe the datasets used and present a descriptive overview of the sample of interest. Section 4 examines the role of household socioeconomic and demographic characteristics in the deleveraging decision. In Section 5 we explore the impact of deleveraging on household consumption while a final Section discusses the policy implications from the results and offers some concluding comments.

2. Indebtedness Amongst Irish Households

Much of the increase in indebtedness experienced by Irish households is attributable to the Irish property boom of 1995 to 2007. Over this period, the growth in both Irish house prices and activity levels was amongst the largest across the OECD. The emergence of the so-called *Celtic Tiger* in the mid-1990s saw the size of the economy double over the period 1995 to 2005 with the total number of people employed in the economy increasing by almost 50 percent. Figure 1 plots key Irish macroeconomic data from 1985 to 2012. From the mid-1990s onwards, the sizeable increases in income combined with an accommodative monetary

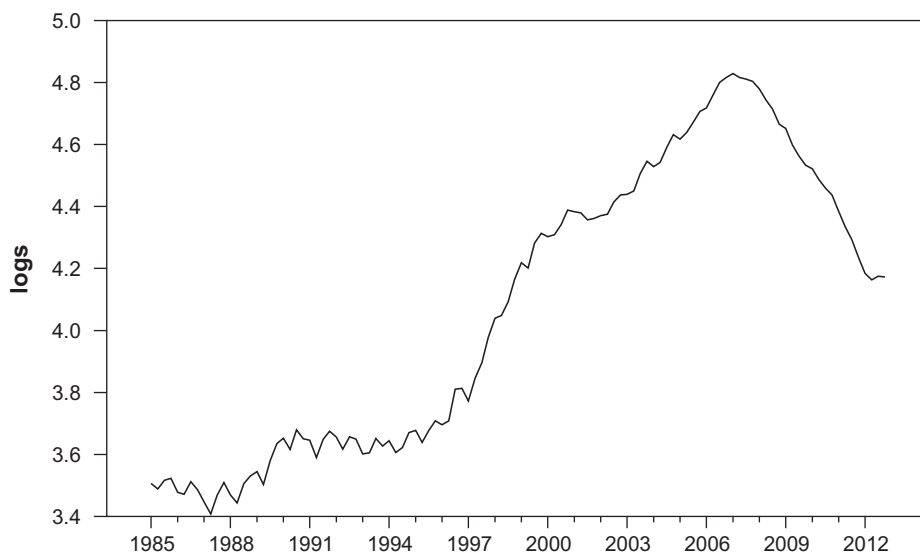[2]See Kelly *et al.* (2012) for more on this.

Figure 2. Real Irish House Prices

policy lead to sustained rises in affordability amongst a young prospective home-owning population. Inevitably, as can be seen from Figure 2, house prices began to rise sharply.[3]

An additional cause of increased housing market activity was the greater provision of mortgage credit in the Irish economy. Since the mid-1980s, the domestic credit market underwent a sustained period of financial liberalisation involving the removal of both credit and interest-rate controls.[4] While all of these changes culminated in significant credit expansion by Irish financial institutions, the most profound development in the provision of credit was the increased ability of Irish banks, from the early-2000s, to attract deposits from non-residents. Figure 3 details the source of funding for Irish resident credit institutions from 2001 onwards along with the difference between credit extended and the deposit base in the Irish financial system. The rapid increase in debt securities issued by Irish credit institutions post-2003 resulted in a marked expansion in total lending to the economy.

Therefore, the combined effect of financial liberalisation, in an Irish context, was to increase the elasticity of the supply of credit to the household sector. The effect can be observed from Figure 4, where a simple stylised example of the supply and demand for credit is presented. With the advent of international wholesale funding, a flatter supply curve for credit existed post-2003 in the Irish market. Credit institutions could now increase the amount lent to the household sector

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[3]There was a brief fall in the rate of Irish house price appreciation in 2001. This was due to the adoption by the Irish Government of certain taxation measures aimed at targeting property speculators. However these measures were rescinded a year later.

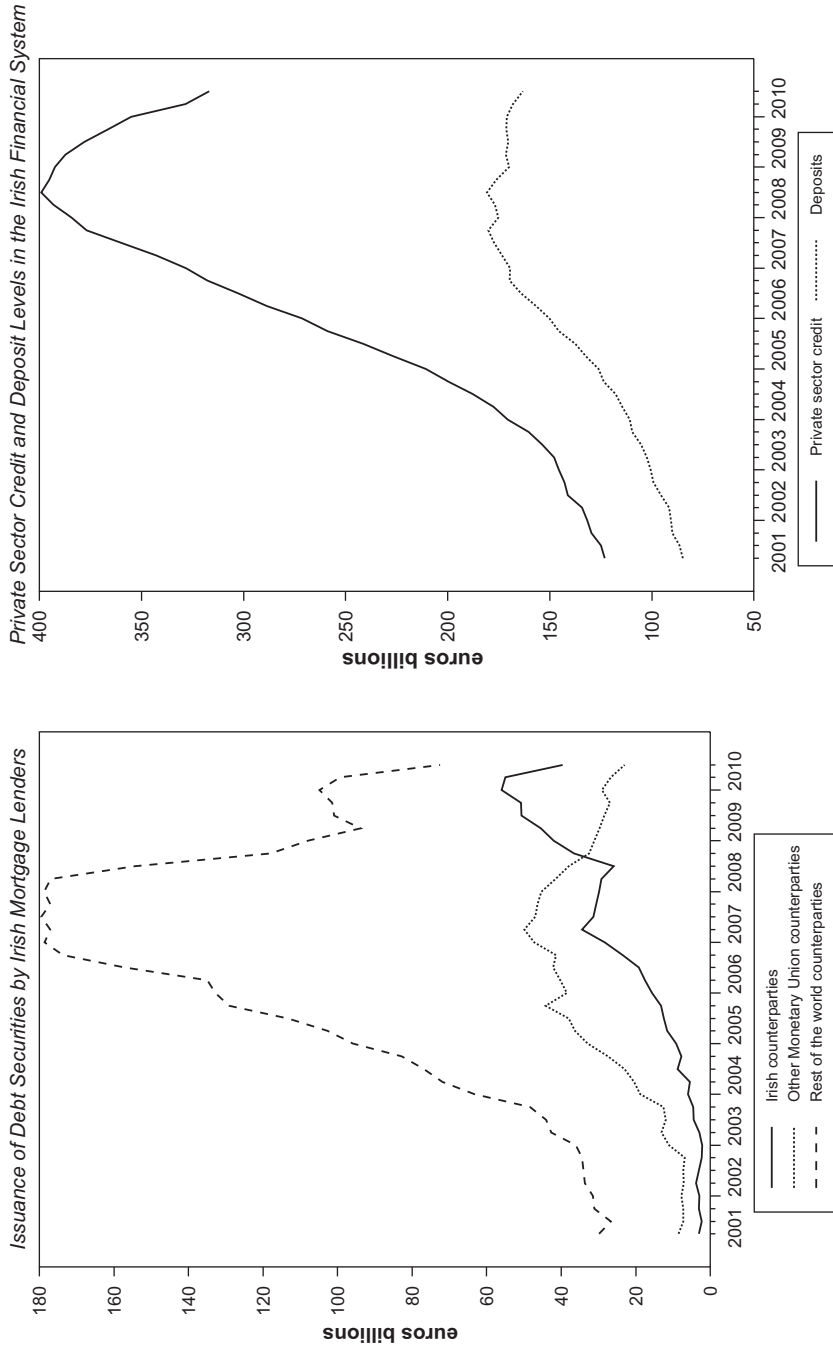[4]See McCarthy and McQuinn (2013a) for a detailed discussion of this.

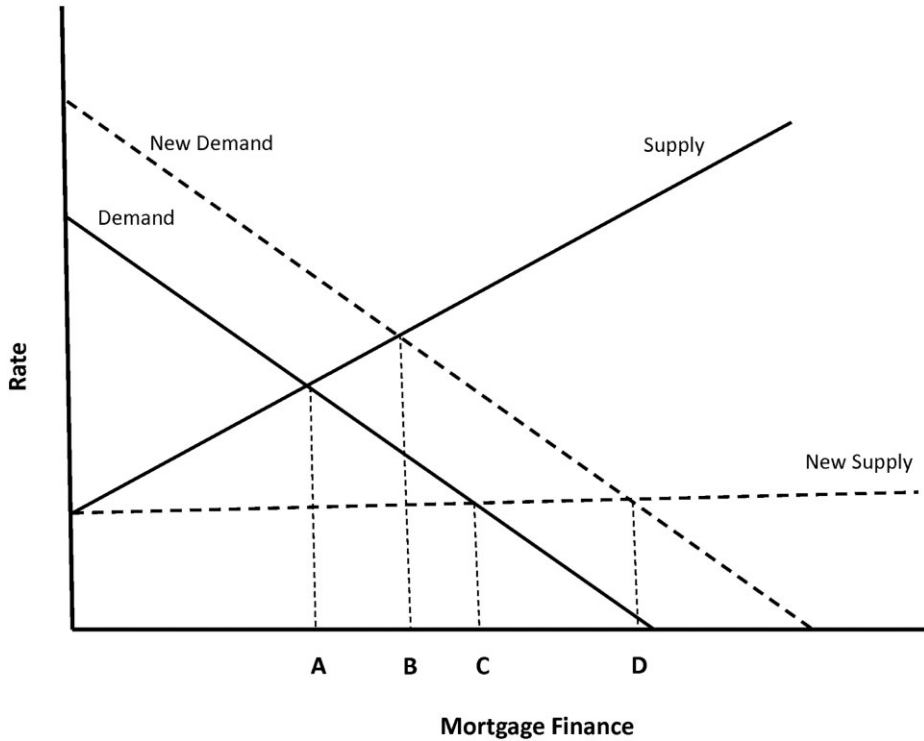Figure 3. Funding of Irish Financial Institutions: 2001–2010

Figure 4. Supply and Demand for Credit

with little upward pressure on interest rates. Consequently, this increase in supply resulted in elevated levels of debt (from equilibrium point *A* to *C*). The flatter supply curve also ensured that a given rise in demand lead to a larger surge in debt (moving from *C* to *D*, rather than *A* to *B*). Previously, such a change in demand would have caused a significant increase in mortgage interest rates which, in turn, could have acted as a brake on affordability and hence demand. Honohan and Leddin (2006), using a representative Taylor Rule, compute the optimal interest rate policy for the Irish economy between 1979 and 2004, given inflation and real economic conditions, and compare this with the actual rate over the period. For the sub-period 1998–2004, they find that the actual rate was 400 basis points *less* than the rate suggested by the Taylor rule.

   The resulting overall trend in Irish households' liabilities can be observed from Figure 5. Debt levels continued to rise, albeit at a slower pace, after the peak had been reached in the property market in 2007. However, liabilities started to decline from the end of 2008. Cussen and Phelan (2010) highlight the corresponding increase in household leverage which they measure using (i) a ratio of total liabilities to disposable income, and (ii) a ratio of total liabilities to total assets (financial and nonfinancial). These measures are replicated in Figure 6 and clearly
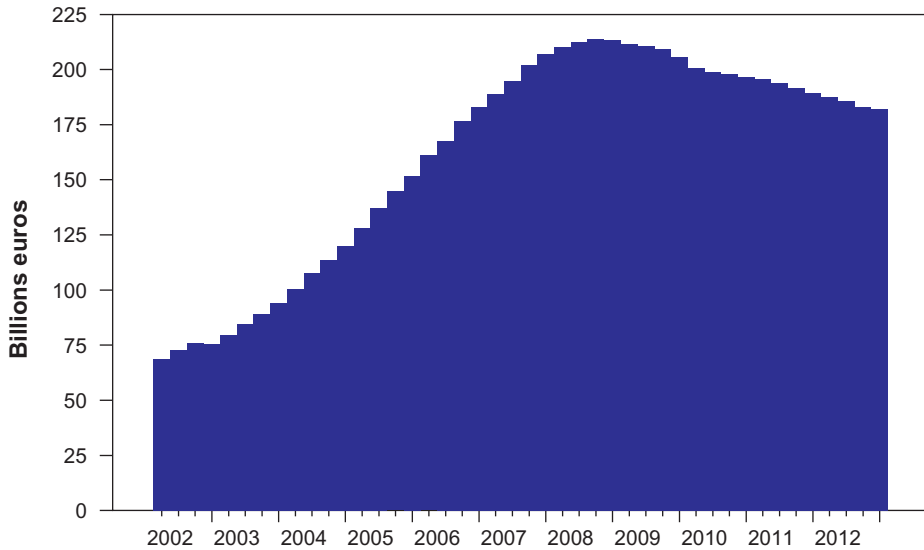
Figure 5. Irish Household Liabilities: 2002–2013
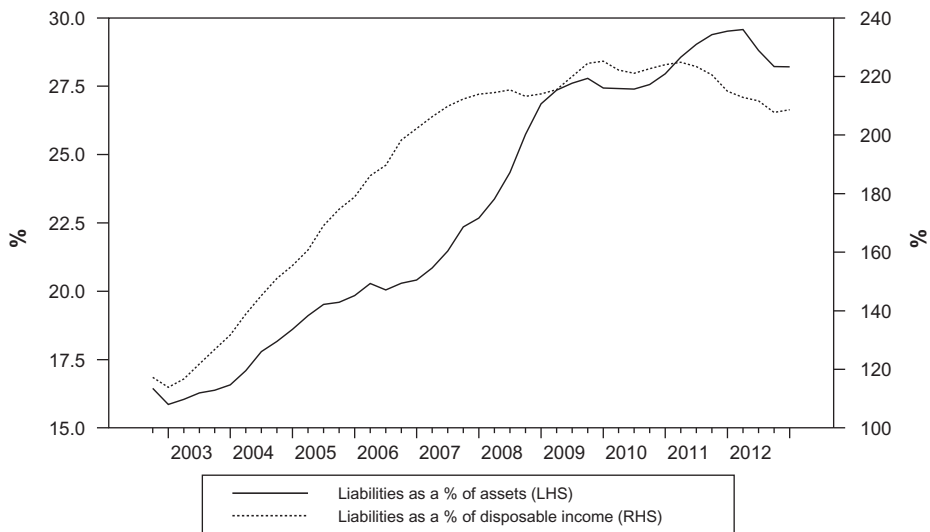
Figure 6. Irish Household Leverage Ratios: 2002–2013

illustrate the increasing financial pressure experienced by Irish households. The increase in the ratio of liabilities to income is arguably a more accurate measure as the alternative (liabilities to assets) can be ameliorated by the increasing house and equity prices experienced prior to 2007.

In principle, the decision to deleverage is achieved by paying off debts and/or writing down existing loans. In Figure 7 the quarter-on-quarter change in Irish
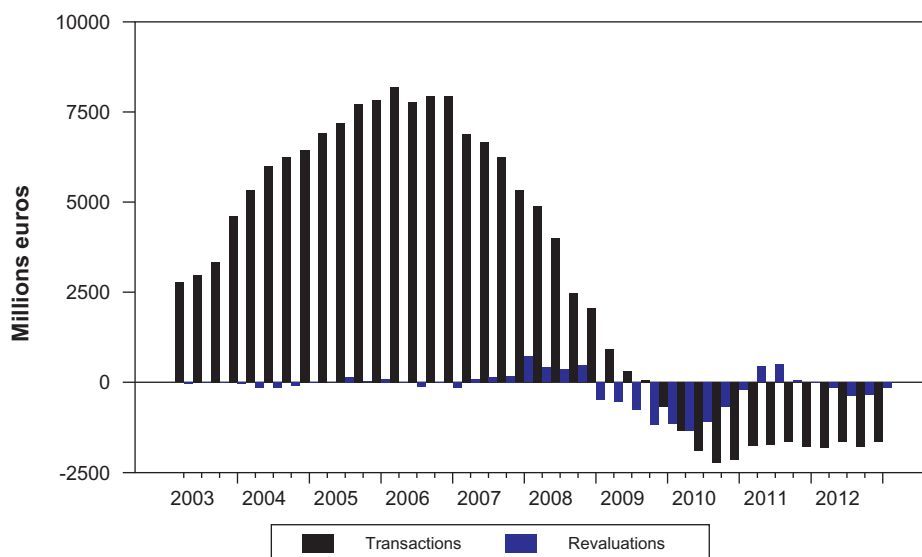
Figure 7. Quarter on Quarter Change in Irish Household Liabilities: 2003–2013

household liabilities is presented. In the aftermath of the financial crisis, the rate of increase in liabilities slowed significantly, while the increase in deleveraging is apparent from early 2009. As can be seen, in an aggregate sense, this has occurred through a combination of paying off debts (transactions) and writing-down of loans (revaluations).[5]

3. Overview of Data

While observing the aggregate trends in deleveraging is informative, from a policy perspective, micro household level information is clearly optimal. To that end, two sources of data are used in this paper. The first is a mortgage loan-level dataset collected by the Central Bank of Ireland as part of a prudential capital assessment review exercise of the Irish banking sector. Covering three Irish residential mortgage banks, which account for approximately 70 percent of the loans issued in the Irish market, the dataset includes a snapshot of the entire residential mortgage book at June 2012. The loan level dataset incorporates a broad array of information for each loan, including borrower and mortgage details from the point of loan origination, current information on the performance of the loan and information on the value of the property on which the mortgage is secured. Table A1 in the Appendix provides an overview of the contents of the dataset.

However, as with most loan-level datasets, credit institutions rarely update this type of data with current economic information on individual borrowers.

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[5]It may also however be the case that negative net changes in household debt are due not just to increases in repayments but rather to very little new debt being issued to offset repayments. We are grateful to an anonymous referee for pointing this out.

Given the extent of economic change experienced in Ireland in recent years, this information may have changed substantially since loan origination. Therefore, to complement the loan level data, the Central Bank of Ireland commissioned a custom designed household survey to capture the current economic circumstances of mortgage holders in Ireland. This survey is the second source of information used in the current study.

Full details of the sampling methodology and the contents of the household survey are available in the Appendix, but here we provide a brief overview. The household survey was designed to be representative of the entire mortgage market as captured in the loan-level dataset. As such, the sampling frame was designed along a number of dimensions, including, for example, the lender type, the borrower type, interest rate type, arrears and region of residence. Following a two-stage sampling approach, where representative clusters were formed in the first stage, individuals were chosen for interview at random in the second stage. The survey achieved a response rate of about 55 percent which is typical for household finance related questionnaires.[6]

The survey was administered to over 2,000 households, all of whom are included in the loan-level dataset. Crucially for the purposes of this study, the information from the survey could be linked back to the loan-level dataset for each household where the respondent provided permission for this linking to take place, which occurred in the majority of cases.[7] The survey was conducted over the period May 2012 to February 2013 and includes 97 questions asked of participants. While the survey mainly asked questions concerning relevant economic considerations such as consumption, income and employment status, participants were also asked about deleveraging activities. Before presenting an overview of the sample according to the deleveraging status of respondents, we first define a number of variables of interest to the current study.

3.1. Deleveraging

Survey participants were initially asked if they were concerned about their level of debt. The 55 percent, who reported they were either very concerned or fairly concerned, were then presented with the following question[8]:

> What actions, if any, are you taking to deal with your concerns about your current level of debt?

Respondents could answer from a list of options (e.g. taking no action, cutting back expenditure, etc.), or they could provide an answer in a free text field. We create a dummy variable to capture deleveraging, which equals one if a respondent reported that they were making overpayments to clear their debt more

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[6]For example, a recent large-scale household finance and consumption survey that was conducted by the national statistical agency in Ireland achieved a response rate of 51.5 percent (CSO, 2015).

[7]Almost 9 out of 10 respondents allowed for their survey information to be linked back to their loan-level data.

[8]Of course households who are not concerned with their debt levels may also decide to deleverage.

quickly or that they were using savings to supplement their payments.[9] Of the sample who were concerned with their debt, about 12 percent were involved in deleveraging activities. Having this relatively unique data on the actual deleveraging decision of the household is in contrast to previous studies in the area, such as Dynan (2012a, 2012b), which rely more on changes in household debt levels rather than an explicit deleveraging decision.

3.2. *Housing Wealth*

As discussed in the introduction, the dataset used in the current analysis allows us to control for housing wealth in assessing the impact of deleveraging on household consumption. Specifically, as is typical in the literature, we proxy for housing wealth with the current value of the household's property. To calculate this (P_t), we update the original purchase price of the household's property (as provided in the loan-level data) using the following formula:

$$(1) \qquad P_t = P_0 \cdot \frac{\bar{P}_t}{\bar{P}_0}$$

where P_0 is the latest valuation of the property, and $\frac{\bar{P}_t}{\bar{P}_0}$ is the change in the average value of "similar" properties between $t = 0$ (the valuation date) and $t = June\text{-}2012$.

For loans originating from 2005 onwards, we use the CSO property price index to calculate the change in house prices over time. We match "similar" properties on the basis of region (Dublin and non-Dublin) and type (house, apartment, other). For loans originating prior to 2005 we use the ptsb/ESRI house price index, which has a similar geographic breakdown as the CSO price index, but not a similar breakdown by property type. We therefore apply the ptsb/ESRI price index changes to all house-types.

3.3. *Housing Equity or the Current Loan-to-Value Ratio*

In the analysis that follows, we are also interested in assessing the impact of recent distress (mortgage arrears and negative equity) in the Irish housing market on the deleveraging activities of Irish households. While data on mortgage arrears is readily available in the loan-level dataset, we calculate the current loan-to-value ratio in order to capture the housing equity position of households in our sample, and in particular, to capture households experiencing negative equity. To capture housing equity for each property in the sample we need two pieces of information: the current value of the property (described above) and the loan outstanding on the property. In terms of the latter, we add up the current balance outstanding on all loans secured on the same property to derive a total property debt figure. The LTV ratio is then calculated as follows:

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[9]Our definition of deleveraging can be regarded as "explicit" deleveraging where households pay down debts in excess of required repayments. Deleveraging also occurs "implicitly" through the servicing of debt repayments in the absence of any additional debt being incurred.

$$(2) \qquad LTV_t = \frac{Debt_t}{P_t}$$

Those households with an LTV ratio of greater than 100 are deemed to be in negative equity, while those with an LTV ratio of less than or equal to 100 are deemed to have positive equity in their property.

3.4. *Overview of the Sample*

Table 1 provides an overview of the characteristics of the sample used in this study, according to deleveraging status. The overall sample at this stage is based on those households that allowed their survey responses to be linked to their loan-level data. In both the deleveraging and non-deleveraging groups, the largest portion of respondents is in the 35 to 44 year age group. The majority of respondents are married, employed and are relatively well educated, with about 40 percent of respondents having a third level degree or higher. In terms of household composition, the average household in the sample comprises three persons (usually two adults and one child).

TABLE 1

DEMOGRAPHIC AND ECONOMIC CHARACTERISTICS OF THE SAMPLE, % OF RESPONDENTS UNLESS OTHERWISE STATED

Variable	Group	% of Deleveraging Sample	% of Non-Deleveraging Sample
Age Group (years)	18–34	12.6	15.1
	35–44	41.2	40.3
	45–54	27.7	30.4
	55–64	16.0	11.7
	65+	1.7	2.2
Marital Status	Married/Couple	83.2	81.8
	Widowed/Separated	11.8	6.7
	Single	5.0	11.5
Work Status	Employed	84.0	81.5
	Unemployed	5.0	9.4
	Inactive	10.9	8.9
Education Status	Low	9.2	14.7
	Medium	44.5	45.0
	High	45.4	39.5
Household Composition	1 Adult, 0 kids	6.7	9.4
	2 Adults, 0 kids	13.5	14.6
	3+ Adults, 0 kids	5.9	6.9
	1+ Adults, with kids	65.6	62.5
	Undefined	8.4	6.2
Median Financial Data (€)	Income	65,000	55,000
	Consumption	21,000	15,300
	Current House Price	191,717	180,381
	Mortgage Outstanding	185,918	170,394
Negative Equity	% of Group	44.0	46.8
Any Arrears	% of Group	20.2	28.2
Has Savings/Investments	% of Group	89.1	40.9

Note: Where group totals do not equal 100%, the residual is accounted for by "don't know" or "refused" responses.

Comparing the deleveraging and non-deleveraging groups, the differences in demographic and labour market status do not appear stark. There are slightly more older cohorts, more employed or inactive people, more highly educated people and slightly more widowed, divorced or separated people among the deleveraging group, but these differences are minor. The differences between the groups are more pronounced, however, when considering the financial information.

Average income appears higher among the deleveraging sample; median income in this case is €65,000 relative to €55,000 in the case of the non-deleveraging group. Average consumption is also higher for those who deleverage, their current house value is greater and, notably, a much higher proportion of the deleveraging group report having savings or investments relative to those who do not deleverage. Specifically, almost 90 percent of the deleveraging group has savings or investments compared to only 41 percent of the non-deleveraging group. These results suggest that income and wealth may play a role in the deleveraging story. In the next section, we assess the importance of such factors in a multivariate setting.

4. Empirical Approach—Who Deleverages?

To explore the deleveraging decision empirically, we specify the following cross-sectional, probit model, where the probability of deleveraging is a function of income and a series of household-specific controls:

$$(3) \qquad Prob(y_i = 1) = F(\beta(x_i)) + \varepsilon i; i = 1, 2, \ldots n$$

Where y_i is the dependent variable "Deleverage", x comprises controls for the ith household's characteristics and financial information, β is a set of parameters to be estimated and ε_i is the error term.

Table 2 provides a full overview of the independent variables used in the model. To control for household characteristics, we include variables denoting the gender, age, marital status, educational attainment and employment status of the main mortgage contributor. We also control for the number of people in the household, the household's mortgage leverage (captured by the current loan-to-value ratio) and the *mrti* or mortgage repayment-to-income ratio of the household. This latter variable, which was originally presented in McCarthy and McQuinn (2011), is used as a household liquidity indicator and is particularly pertinent at a time when many Irish households are experiencing mortgage repayment difficulties.

4.1. *Baseline Results*

Column (1) in Table 3 presents the results of the initial estimation where the marginal effects and standard errors are reported. A clear picture emerges as to the profile of Irish households that are deleveraging; those with higher levels of income, with a head of household who is retired or inactive and those households with a relatively well educated head, are the most likely to deleverage. Interestingly, we do not find a relationship between deleveraging activity and household debt repayments or the current loan-to-value ratio. Therefore, it would appear

TABLE 2

INDEPENDENT VARIABLES

Variable	Description
male	Dummy variable indicating that the survey respondent is male.
married	Dummy variable indicating that the survey respondent is married.
HH size	Continuous variable indicating the number of people in the household.
age—1834	Omitted category—captures survey respondents who are aged between 18 and 34 years.
age—3544	Dummy variable indicating that the survey respondent is aged between 35 and 44 years.
age—4554	Dummy variable indicating that the survey respondent is aged between 45 and 54 years.
age—5564	Dummy variable indicating that the survey respondent is aged between 55 and 64 years.
age—65+	Dummy variable indicating that the survey respondent is aged 65 years or more.
edu—low	Omitted category—captures survey respondents with a low level of education (lower second level or less).
edu—med	Dummy variable indicating that the survey respondent has a medium level of education (upper second level and non-degree).
edu—high	Dummy variable indicating that the survey respondent has a high level of education (third level degree or above).
unemployed	Omitted category—captures respondents who are unemployed.
employed	Dummy variable indicating that the survey respondent is employed.
retired/inactive	Dummy variable indicating that the survey respondent is retired or inactive (student, stay at home parent, etc.).
y_i	Logged gross annual income for household i.
Income Quintile 1	Omitted category—captures respondents in the bottom 20 per cent of the income distribution.
Income Quintile 2	Dummy variable capturing respondents in the 2nd income quintile.
Income Quintile 3	Dummy variable capturing respondents in the 3rd income quintile.
Income Quintile 4	Dummy variable capturing respondents in the 4th income quintile.
Income Quintile 5	Dummy variable capturing respondents in the top 20 per cent of the income distribution.
mrti	Log of the mortgage-repayment-to-income ratio for household i.
savings	Dummy variable capturing households that save on a regular basis.
Current LTV	Loan-to-value ratio for household i (at June 2012).

that it is the ability to repay rather than the degree of indebtedness which is the main criteria affecting the decision to deleverage.

In the second column of Table 3 we repeat the previous regression, this time replacing the income variable with dummy variables capturing income quintiles. The omitted category "Income Quintile 1" captures the 20 percent of the sample with the lowest income levels. The results suggest that it is those households with the highest income level that are most likely to deleverage with the coefficient on "Income Quintile 5" suggesting that those households at the upper end of the income distribution have an 11.2 percentage point higher probability of deleveraging relative to those households at the lower end of the distribution.

As a further check on the results, we include one additional control in the regression to proxy for household wealth—a dummy variable for households who report that they have regular monthly savings. The results are shown in the third column of Table 3. In terms of household characteristics, the importance of the coefficients is much the same as in the earlier regressions; higher income

TABLE 3
PROBIT MODEL: DEPENDENT VARIABLE = DELEVERAGES

Variable	(1) Marginal Effect	(1) Std. Error	(2) Marginal Effect	(2) Std. Error	(3) Marginal Effect	(3) Std. Error	(4) Marginal Effect	(4) Std. Error	(5) Marginal Effect	(5) Std. Error	(6) Marginal Effect	(6) Std. Error
male	-0.012	0.023	-0.013	0.023	-0.011	0.023	-0.012	0.023	-0.011	0.023	-0.010	0.024
married	-0.007	0.037	0.003	0.035	-0.012	0.038	-0.011	0.037	-0.013	0.038	-0.014	0.039
HH size	0.012	0.011	0.012	0.011	0.015	0.011	0.014	0.011	0.014	0.011	0.015	0.011
age—3544	0.001	0.034	-0.002	0.034	-0.000	0.034	-0.004	0.034	0.000	0.034	0.003	0.035
age—4554	-0.009	0.037	-0.012	0.036	-0.009	0.036	-0.016	0.036	-0.008	0.036	-0.001	0.039
age—5564	0.079	0.062	0.075	0.062	0.089	0.064	0.082	0.064	0.089	0.065	0.102*	0.068
age—65+	-0.051	0.070	-0.054	0.067	-0.051	0.070	-0.055	0.067	-0.051	0.070	-0.052	0.073
edu—med	0.068	0.043	0.074*	0.043	0.058	0.043	0.061	0.043	0.061	0.043	0.062	0.044
edu—high	0.082*	0.048	0.087*	0.048	0.061*	0.043	0.073*	0.048	0.073	0.048	0.070	0.049
employed	0.071	0.037	0.078*	0.034	0.066	0.038	0.066	0.038	0.065	0.038	0.064	0.040
retired/inactive	0.166**	0.104	0.169**	0.103	0.156*	0.102	0.155*	0.102	0.156*	0.102	0.155*	0.103
y_i	0.053**	0.025			0.046*	0.025	0.046*	0.025	0.047*	0.025	0.047*	0.026
Income Quintile 2			0.040	0.042								
Income Quintile 3			-0.017	0.035								
Income Quintile 4			0.021	0.043								
Income Quintile 5			0.112**	0.059								
mrti	0.032	0.021	0.021	0.020	0.032	0.021	0.032	0.021	0.032	0.021	0.026	0.019
current ltv	-0.013	0.016	-0.009	0.016	-0.012	0.016	-0.001	0.020	-0.012	0.016	-0.011	0.017
savings					0.042*	0.026	0.042*	0.026	0.045*	0.026	0.042*	0.026
negative equity							-0.028	0.030				
credit constrained									0.015	0.029		
expect deterioration											-0.039*	0.023
N	830		830		826		826		826		797	
LR chi²	24.16		29.61		27.03		27.91		27.33		28.36	
Prob > chi²	0.0438		0.0293		0.0285		0.0324		0.0380		0.0287	
Pseudo R²	0.0396		0.0485		0.0443		0.0458		0.0448		0.0471	

Note: ***Significant at 1 per cent level; **Significant at 5 per cent level; *Significant at 10 per cent level. Omitted categories for dummy variables are: age 18–35; low education; unemployed and income quintile 1 (lowest income group).

households and those with retired heads have a higher probability of deleveraging. The savings dummy is significant at a 10 percent level and suggests that those households with regular monthly savings have a 4 percentage point higher probability of deleveraging relative to those households with no regular savings.

Thus far, the results suggest that it is those households with the means to deleverage who do. From a policy perspective, these results are important as they suggest that the less well-off sections of the mortgaged population are likely to remain significantly indebted while they are unable to address their leveraged position. This result may be of interest in the context of possible debt resolution strategies for the sizeable debt problem confronting the Irish mortgage market. In the next section, we examine whether the recent distress in the mortgage market has further implications for deleveraging.

4.2. *Mortgage Market Distress*

The Irish housing market has faced significant challenges in recent years, with Irish house prices falling by over 50 percent from their peak in 2007. Given that a sizeable portion of the stock of outstanding mortgages was taken out at a time when house prices were at or close to their peak, the proportion of mortgaged properties in negative equity is likely to be substantial. Central Bank of Ireland estimates, based on earlier work by Duffy (2010), suggest that about 50 percent of the total stock of Irish mortgages was in negative equity in June 2013. Given the significance of the problem, it is interesting to assess its importance for household deleveraging.

There are a number of reasons why one might expect households in negative equity to engage in deleveraging. Firstly, since high leverage ratios can have a negative impact on access to credit, households may be encouraged to deleverage to repair their equity position and to restore their credit access.[10] Or households may not be comfortable being in negative equity, preferring instead to keep their leverage close to some target lower level. On the other hand, however, negative equity may negatively impact deleveraging; households may feel uncertain about future policies in respect to debt reduction and easing of negative equity, thereby preferring to "wait-and-see" if some form of debt relief might be available.[11] Of course, there is also the possibility that households may not be aware of their equity position, perhaps not knowing exactly what their mortgage debt or current house price is, so that negative equity may have no impact at all on the deleveraging decision. In this context, McCarthy and McQuinn (2014) provide evidence that mortgage holders have difficulty in recalling details of their mortgage debt.

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[10]Dynan (2012) alludes to this issue. Individuals with high leverage ratios may currently be precluded from accessing further credit, since banks may deem these individuals too risky. However, if an individual expects to need to borrow in the future (e.g. for a child's education or for investment purposes) or if they simply want to preserve/improve their future prospects of access to credit in case it is needed, they may therefore opt to deleverage now.

[11]Certain recent legal reforms in Ireland, such as the introduction of new personal insolvency legislation, have lead some commentators to suggest that significant debt relief for distressed mortgagees may be inevitable—see FitchRatings "Debt forgiveness a potential concern for Irish RMBS" for example.

In the fourth column of Table 3 we include a dummy variable capturing households in negative equity in the deleveraging regression. The coefficient on the negative equity variable is negative but it is not significant, suggesting that negative equity does not have an impact on the deleveraging behaviour among our sample of mortgaged Irish households. The importance of the remaining variables in the model is not altered (from a statistical significance perspective) relative to the earlier findings. The result for the negative equity variable may be compared with the findings of Disney *et al.* (2010), who examine the impact of unanticipated housing gains (and losses) on household consumption in the UK. They find that households in negative equity exhibit a larger marginal propensity to consume out of unanticipated improvements in housing wealth, relative to households in positive equity. However, this effect does not hold for dis-improvements in housing wealth. They argue that this effect is likely related to higher precautionary savings among the negative equity group, a constraint which is eased when housing equity improves. In our case, the negative (albeit insignificant) effect of negative equity on deleveraging could also be related to a precautionary savings motive.

One further issue worth exploring at this stage, is whether credit constraints impact the deleveraging decision. Given the well documented problems in the Irish banking sector, banks are arguably more reluctant to lend to highly leveraged borrowers. As mentioned above, borrowers who are credit constrained might prefer to reduce their leverage to restore credit access. We explicitly test this hypothesis by using information on recent credit applications in our survey data. Specifically, respondents are asked: (1) if they applied for credit in the past three year, (2) about the outcome of any such applications, and (3) if they considered applying for credit but, fearing rejection, decided not to apply. This latter question could capture cases where past credit applications have been rejected.

We create a dummy variable, *credit constrained*, that captures individuals who either had a credit application rejected in the past three years or who did not apply for credit because they feared rejection, and include this as an additional control in the model.[12] The results, shown in column (5) of Table 3, reveal an insignificant coefficient on the credit constraints variable, suggesting that credit constraints are not a significant reason for deleveraging in the Irish market.[13]

4.3. *Future Income Uncertainty*

A key finding to emerge, therefore, is that it is those households with the means to deleverage that do. In this context, and given the significant changes experienced in key economic variables such as incomes and unemployment rates in Ireland in recent years, it is interesting to consider the effect of increased financial uncertainty on the deleveraging decision. To address this question, we follow Manski (2004), Christelis *et al.* (2011) and McCarthy and McQuinn (2013b) who use households' subjective expectations as a means of characterising their attitudes

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[12]Almost 14 percent of the sample falls into this group.
[13]As a further check on the results, we include two separate dummy variables capturing those individuals who had their credit application rejected and those who feared rejection. The coefficients on both dummies are negative but highly insignificant.

to the distribution of future shocks. In particular, we use a specific question to gauge households' subjective expectations for future financial developments.

Households are asked whether they expect to be better off, worse off or the same in terms of their financial circumstances over the next year. We generate a dummy variable that captures those individuals who expect to be worse off in a year, relative to those who expect their position to improve or stay the same, and include this as an additional control in the regression. The results, reported in the final column of Table 3, suggest that an expected deterioration in future financial circumstances leads to a *reduction* in deleveraging. In particular, individuals who expect to be worse off in the future have a 4 percent lower probability of deleveraging, relative to people who either expect no change in their circumstances or to be better off in the future. This result reinforces the notion that affordability is a key factor in the deleveraging decision.[14]

4.4. *Summary*

In summary, the analysis, thus far, has focussed on identifying the factors associated with the deleveraging decision. The results suggest that it is those households with the means to deleverage that do; households with retired heads, higher income and regular savings tend to deleverage more often than other types of households. Interestingly, recent distress in the mortgage market such as negative equity and credit constraints do not seem important. On the other hand, future expectations about a household's financial circumstances have a role to play in the deleveraging decision; those households that expect to be worse off in the future are less likely to deleverage relative to those households who expect either to be better off or to experience no change in their financial position. This provides further support for the finding that affordability plays a key role in deleveraging in an Irish context. As a next step in the analysis, we examine the implications of the deleveraging decision for household consumption.

4.5. *Selection Bias*

Given the nature of the survey questions, one issue which may arise is selection bias i.e. are the subset of households who are concerned about their debt representative of the overall sample?[15] As discussed in Section 3.1, the deleveraging variable is only available for those individuals who report that they are concerned about their debt. To control for the possible selectivity implied in excluding those individuals who are not concerned about their debt, we re-run our initial baseline estimation (Model 1) using a Heckprobit specification which controls for selection. The dependent variable of the selection equation is a dummy variable which equals one for individuals who are concerned about their debt, and zero otherwise.[16] As an exclusion restriction, we include an additional dummy variable in our selection

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[14]It is also possible that individuals facing income uncertainty decide not to deleverage, even if they can afford to do so, because this would reduce their current liquidity. They may instead opt to preserve their liquidity in case a negative income shock is realized in the future. We are grateful to an anonymous referee for pointing this out.

[15]We are grateful to an anonymous referee for pointing this out.

[16]We use the heckprob command in Stata for this purpose.

equation which captures individuals who are currently in arrears on their mortgage. Arguably, this variable could impact an individual's debt concern. However, it should not be important for deleveraging behaviour since our definition of deleveraging requires that individuals are *over-paying* their mortgage.

The results from both stages of the heckprobit model are reported in Table 4. In the first stage (selection equation), mortgage arrears is highly significant, suggesting it is a good addition to the model. In the second stage, the importance of the various explanatory factors (from a statistical significance point of view) is much unchanged from the original regression in Table 3. Furthermore, the selection coefficient (rho) is not significant, indicating that selection bias does not

TABLE 4
HECKMAN PROBIT ESTIMATES OF DELEVERAGING

	Variable	Coefficient	Std. Error
Outcome Equation	*male*	−0.071	0.123
	married	0.006	0.223
	HH size	0.044	0.080
	age—3544	0.004	0.178
	age—4554	−0.070	0.205
	age—5564	0.321	0.271
	age—65+	−0.316	0.575
	edu—med	0.364*	0.219
	edu—high	0.429*	0.236
	employed	0.513	0.329
	retired/inactive	0.697**	0.346
	y_i	0.314**	0.160
	mrti	0.163	0.117
	current ltv	−0.118	0.158
	constant	−5.411***	1.502
Selection Equation	*male*	0.050	0.073
	married	−0.334***	0.117
	HH size	0.140***	0.034
	age—3544	0.023	0.107
	age—4554	0.153	0.118
	age—5564	0.268*	0.152
	age—65+	−0.092	0.269
	edu—med	−0.041	0.121
	edu—high	−0.081	0.130
	employed	−0.655***	0.186
	retired/inactive	−0.529**	0.220
	y_i	−0.281***	0.085
	mrti	0.047	0.069
	current ltv	0.351***	0.050
	in arrears	−0.333***	0.101
	constant	2.290	0.926
	Athrho	−0.207	0.588
	Rho	−0.204	0.564
N		1,450	
Censored N		620	
Uncensored N		830	
Wald test (indep Eqns)		0.13 (0.7231)	
(Prob > chi² in parenthesis)			

Note: ***Significant at 1 per cent level; **Significant at 5 per cent level; *Significant at 10 per cent level. Note that the coefficients here are not comparable to earlier tables which reported the marginal effects.

appear to be a problem in the earlier estimations. Similarly, the Wald test of independent equations supports this finding. We can therefore be confident that our previous results are not impacted by selection bias.

5. Deleveraging and Household Consumption

As noted by Cooper and Dynan (2013), the theoretical case for a specific role for household debt in determining consumption is not readily apparent. In many standard models of consumption, debt does not exert an independent influence on consumption. In such cases, where households, say, experience a negative house price shock, debt levels contract, exclusively, in an endogenous fashion; in response to the ensuing negative wealth effect, households reduce their consumption and borrow less accordingly. Therefore, debt levels decline.

However, there are a number of reasons to believe that households may respond to or target the level of debt itself, independent of the wealth effect and this, in turn, could affect consumption. Households, may, for example, have a target level of debt relative to either household income or assets. In the latter case, with a significant fall in house prices, they may wish to redress the ratio by reducing debt levels. Similarly, as discussed in Section 4, debt levels can play an important role in accessing credit since financial institutions are typically reticent to lend to significantly indebted households. In terms of the life cycle hypothesis, this may be particularly relevant where households perceive their current income to be below the permanent level and thus, may wish to borrow to smooth consumption levels. Heightened levels of debt would clearly impede access to finance.

To date, micro level analysis of the relationship between debt and consumption at a household level is at a relatively nascent stage. Indeed, Cooper and Dynan (2013) describe household level empirical research in this area as being "limited". A number of U.S. based studies such as Dynan (2012b) and Cooper (2012) find that high levels of debt have a negative impact on consumption after controlling for income and net worth, while Dynan and Edelberg (2013) demonstrate that high debt households were more likely to reduce their consumption in 2009 after controlling for other determinants of spending.

To assess the impact of deleveraging on consumption, we use a survey question that asks respondents how their monthly consumption changed relative to a year earlier (increased/decreased/no change) and by how much it changed. A continuous variable is created capturing such information and this is used as the dependent variable.[17] As controls, we employ the same independent variables as before, however, we use annual changes in the continuous variables, where available. Specifically, to control for housing wealth effects, we include the percentage change in estimated housing values for each respondent between June 2011 and June 2012. In terms of income, our survey does not capture numerical changes. Rather respondents are asked only about how their income has changed in a qualitative sense (increased/decreased/no change) over the previous year. We

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[17]Full details of the questions employed are available in the Appendix.

TABLE 5

IMPLICATIONS FOR CONSUMPTION—DEPENDENT VARIABLE:
EURO CHANGE IN MONTHLY CONSUMPTION

Variable	Coefficient	Std. Error
constant	−321.124***	128.778
male	1.155	28.252
married	23.986	41.948
HH size	22.856*	13.101
age—3544	−7.767	40.855
age—4554	−24.598	42.978
age—5564	43.854	53.396
age—65+	−126.671	101.278
edu—med	86.378**	41.431
edu—high	74.391*	42.957
employed	57.406	47.702
retired/inactive	61.616	64.939
change in hp	−8.584	7.280
income: *no change*	76.255**	38.410
income: *increase*	88.537	60.065
deleverage	−78.761**	40.491
N	902	
F (15,886)	1.72	
Prob > F	0.0417	
R^2	0.0283	

Note: ***Significant at 1 percent level; **Significant at 5 percent level; *Significant at 10 percent level.

generate dummy variables capturing these changes and include them as controls in the regression.[18] The results are shown in Table 5.

Turning first to household characteristics, the education level of the head of the household has an important impact on consumption changes. More highly educated heads tended to register an increase in consumption levels over the year; heads with a medium education level saw their consumption rise by €86 relative to households where the head has a low level of education, while those with a high level of education increased their consumption by €74. Income developments also have an important impact on consumption among the sample. Relative to households that registered a drop in income over the year, households that saw no change or an increase in their income tended to record higher consumption levels, albeit only the "no change" differential is statistically significant. Finally, larger households (as captured by "HH size") tended to increase their consumption levels over the year.

In incorporating deleveraging into the consumption regression, we use the dummy variable outlined in Section 2. Therefore, in using the observed decision to reduce debt, rather than levels of leverage, our estimate of deleveraging is more precise than that used in other micro-level studies. The coefficient on our deleveraging variable is significant suggesting households engaged in deleveraging reduce their consumption. Thus, controlling for housing wealth, once households decide to deleverage, consumption is adversely affected. It should be noted,

[18]We also tried including the level of income, however, this was not significant in the regression.

however, that the magnitude of the effect (€78 a month) is small and is only of significance in a statistical sense. Nonetheless, the fact that we find a significant relationship between debt levels and consumption is of interest in light of earlier findings in Dynan (2012b) and Cooper (2012).

6. Conclusions

In assessing aggregate trends in total household debt and consumption levels, many commentators have speculated as to the implications of debt reduction amongst households on economic activity. Given a unique combination of survey and regulatory data, in this paper we directly observe deleveraging amongst a representative sample of mortgaged Irish households. Consequently, we are in a position to both observe the characteristics of those households which are deleveraging and to examine the implications for household consumption. Our results benefit from a relatively precise definition of deleveraging, while controlling for household-specific wealth effects.

Given that our results suggest that it is a relatively affluent cohort of the mortgaged population who are more likely to engage in deleveraging, a number of policy implications arise. Firstly, this suggests that certain less well-off sections of the mortgaged population are likely to remain significantly indebted while they are unable to address their leveraged position. This conclusion may be of interest in the context of possible debt resolution strategies for the sizeable negative equity problem confronting the Irish mortgage market.

The results also suggest that as household income levels begin to recover, the knock on implications for consumer demand may not be as significant as would be expected. While the economic magnitude of the deleveraging effect on consumption is small, it does suggest, given the scale of household debts which exist in the Irish market, the presence of a certain drag on future household consumption levels.[19] Finally, establishing any link between debt levels and consumption does demonstrate a potentially important channel between developments in the financial sector and the real economy.

References

CSO, "Household Finance and Consumption Survey 2013," the Central Statistics Office: Dublin, 2015.

Cussen, M., B. O'Leary, and D. Smith, "The impact of the financial turmoil on households: a cross country comparison," Irish Central Bank Quarterly Bulletin Article 02, April, 78–98, 2012.

Cussen, M. and G. Phelan, "Irish households: assessing the impact of the economic crisis," Irish Central Bank Quarterly Bulletin Article 04, October, 62–76, 2010.

Christelis, D., D. Georgarakos, and T. Jappelli, "Wealth shocks, unemployment shocks and consumption in the wake of the great recession," Centre for Studies in Economics and Finance (CSEF) Working paper no. 279, 2011.

Cooper, D. and K. Dynan, "Wealth shocks and macroeconomic dynamics," Federal Reserve of Boston Public Policy Discussion Paper Series No. 13–4, 2013.

Cooper, D., "U.S. household deleveraging: what do the aggregate and household data tell us?" FRB Boston Public Policy Brief Series no. 12–2, 2012.

[19]It may be recalled that our definition of deleveraging is an explicit one as it is where households pay down debts in *excess* of required repayments.

Disney, R., J. Gathergood, and A. Henley, "House price shocks, negative equity, and household consumption in the United Kingdom," *Journal of the European Economic Association*, 8(6), 1179–207, 2010.

Duffy, D., "Negative equity in the Irish housing market," *The Economic and Social Review*, 41(1), 109–32, 2010.

Dynan, K., "What's been weighing on consumption? An overview of the recent experiences of different types of households," prepared for Federal Reserve Board Academic Consultants meeting on "Heterogeneity and aggregate consumption". Available at http://www.brookings.edu/research/papers/2012/05/household_heterogeneity_dynan, 2012a.

———, "Is a household debt overhang holding back consumption?" Brookings Papers on Economic Activity, Spring 2012, 2012b.

Dynan, K. and W. Edelberg, "What's driving deleveraging? Evidence from the 2007–2009 Survey of Consumer Finances," Unpublished Manuscript, 2013.

Honohan, P. and A. Leddin, "Ireland in EMU—More Shocks, Less Insulation?" *The Economic and Social Review*, Economic and Social Studies, 37(2), 263–94, 2006.

Kelly, R., Y. McCarthy, and K. McQuinn, "Impairment and negative equity in the Irish mortgage market," *Journal of Housing Economics*, 21, 256–68, 2012.

Manski, C., "Measuring expectations," *Econometrica*, 72, 1329–76, 2004.

McCarthy, Y. and K. McQuinn, "How are Irish households coping with their mortgage repayments? Information from the Survey on Income and Living Conditions," *Economic and Social Review*, 42(1), 71–94, 2011.

———, "Credit conditions in a boom and bust property market," Central Bank of Ireland Research Technical Paper 8/RT/13, 2013a.

———, "Price expectations, distressed mortgage markets and the housing wealth effect," Central Bank of Ireland Research Technical Paper 6/RT/13, 2013b.

———, "Attenuation bias, recall error and the housing wealth effect," Central Bank of Ireland Research Technical Paper 6/RT/14, 2014.

Mian, A. and A. Sufi, "House prices, home equity-based borrowing and the US household leverage crisis," *American Economic Review*, 101, August 2132–56, 2011.

Mian, A., R. Kamalesh, and A. Sufi, "Household balance sheets, consumption and the economic slump," *The Quarterly Journal of Economics*, 128(4), 1687–726, 2013.

Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:

Appendix A: The Survey of Mortgage Holders
Table A.1: Loan-Level Data Fields/Information Content
Appendix B: Change in Household Consumption