

# Price expectations, distressed mortgage markets and the housing wealth effect

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## Abstract

Using a unique combination of regulatory and survey micro-data, we examine the importance of the life-cycle theory of consumption, in estimating housing wealth effects for the Irish mortgage market. Since the recent financial crisis, this market has experienced substantial house price declines and negative equity. Thus, house price expectations are likely to be important in influencing housing wealth effects. We find a positive correlation between consumption and changes in housing wealth among our sample of mortgaged Irish households. Furthermore, we find that this positive association only exists when housing wealth changes are perceived to be of a permanent nature.

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## Introduction

Heightened levels of uncertainty have significant implications for consumer behaviour; the life cycle theory of consumption draws a well-established distinction between the implications of changes in income/wealth perceived to be of a “transitory” as opposed to a “permanent” nature. Households’ expectations of future developments have always been central to their consumption decisions, however, these expectations are to the fore, at present, given the recent turbulence in international housing markets. Many countries, across the OECD, experienced persistent house price increases in the run-up to the 2007 financial crisis, only for prices to fall sharply in the same markets thereafter. With certain markets still experiencing price declines, some households have arguably never faced more uncertainty in this regard. These expectations are likely to be influenced by the difficulties many mortgaged households have experienced subsequent to the crisis with escalating levels of negative equity being a particular concern.

In this paper we estimate housing wealth effects for a representative sample of mortgaged Irish households. In particular, we wish to test whether different outlooks for house price movements amongst households have implications for the relationship between consumption and housing wealth. Since the seminal work of Ando and Modigliani (1963), household consumption is generally considered to be determined by income and asset wealth. The positive impact on consumption due to the increase in housing wealth is called the housing wealth effect and in empirical studies this is typically, although not exclusively, measured as the change in house prices. The Irish market is of specific interest owing to the acutely turbulent nature of housing developments post-2007. Irish house price growth was, between 1995 and 2007, the largest across the OECD. However, by 2012, prices, in nominal terms, had fallen by nearly 55 per cent. Additionally, over the period 2004 - 2006, when prices were at or near their peak, nearly 340,000 mortgages were approved vis-à-vis an outstanding national stock of 800,000. Thus, many Irish mortgages are relatively new and, consequently, quite vulnerable to emerging difficulties in residential markets.

In estimating the wealth effect, we avail of two unique micro-data sources. The first is mortgage loan-level data gathered on a regular basis for the three main Irish financial institutions and consists of information on individual mortgage amounts, house prices at point of loan origination

and mortgage repayment histories.<sup>1</sup> This is supplemented by information from a representative household survey conducted in 2012/2013 on the mortgage books of the same institutions.<sup>2</sup> In particular, details such as the actual consumption, income, expenditure, savings and employment status of these households are recorded.

In light of the disparate nature of crisis-related effects, the availability of survey data makes it clearly advantageous to examine the relationship between consumption and wealth from a microeconomic, household perspective.<sup>3</sup> For example, a characteristic of the survey used here is that it includes detailed information on households' expectations of future economic developments and, more specifically, of developments in the housing market. The use of households' subjective expectations has become an increasingly popular means of deciphering between current economic conditions that are perceived to be of a permanent as opposed to a transitory nature.

Negative equity is a particular concern in the Irish market at present. Given the substantial fall in Irish house prices, estimates suggest that almost 400,000 Irish properties are now in negative equity. The prevalence and scale of negative equity provides an additional, compelling reason for the precise estimate of property-related wealth effects; certain proposals to alleviate the Irish mortgage crisis have included the prospect of significant debt relief for distressed borrowers. Clearly, the economy-wide benefit of such a move requires an accurate evaluation of the wealth impact on consumption.

Our results suggest that for Irish households a positive correlation exists between consumption and housing wealth. Furthermore, and, in accordance with the life-cycle theory, we find that changes in housing wealth are only positively correlated with consumption when those changes are perceived to be of a permanent nature.

The rest of this paper is structured as follows; in the next section we examine the international literature on the range of wealth effects across countries. We then discuss the Irish housing

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<sup>1</sup>These are Allied Irish Bank (AIB), Bank of Ireland (BOI) and Irish Life and Permanent (ILP). In mid-2012 these institutions accounted for approximately 70 per cent of mortgage credit in the Irish market.

<sup>2</sup>This survey was conducted between May 2012 and February 2013, and was designed to be representative of the mortgage book of the three institutions AIB, BOI and ILP.

<sup>3</sup>See Campbell and Cocco (2007) for a detailed discussion of the merits of estimating wealth effects with micro level data.

market and the unique data sources used for the current analysis. The empirical results are then presented and finally, some conclusions are offered.

## **What previous research suggests**

While there have been many aggregate level studies of consumption and wealth effects, the greater availability of survey data has resulted in a small but increasing number of micro-level applications in the area.<sup>4</sup> For example, Englehardt (1996), Flavin and Yamashita (2002) and Sheiner (1995) consider the impact of housing shocks on savings and asset allocation, while Atanasio and Weber (1994) examine whether greater financial liberalisation and the house price boom experienced in the UK throughout the 1980s explained the increase in consumption. Bostic et al. (2009) estimate, in the case of US households, that consumption spending is more sensitive to changes in housing rather than financial wealth. Campbell and Cocco (2007) assess the response of UK household consumption to house price changes and find the house price effect to be most significant for older homeowners, whereas for young renters the house price effect on consumption is negligible.

In a European context, Paiella (2007) finds a relatively large wealth effect for Italian households with respect to financial wealth, while Guiso et al. (2005) find that the wealth effect for Italian homeowners due to increases in house prices is comparable to that in other countries. In looking at consumption and wealth effects for Spanish households, Bover (2005) observes a significant and strong housing effect for prime-age adults with an insignificant financial wealth effect. Bover (2005) also notes that many household estimates of the wealth effect may be downward biased due to measurement error associated with household wealth. Using micro-data from the Luxembourg Wealth Study, Sierminska and Takhtamanova (2007) find significant differences in the wealth effect across age groups within different countries. In particular, they find a strong wealth effect for older households in Canada and middle-aged groups in Finland and Italy.

Addressing the aftermath of the financial crisis, Christelis et al. (2011) use US survey data to examine the impact of the associated wealth and unemployment shocks. They distinguish between

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<sup>4</sup>For a comprehensive literature review see Muellbauer (2007).

temporary and permanent wealth effects by splitting the sample between those who think that the market will recover in a years time and those who don't. They find a greater financial wealth effect than that of housing. Other studies which also look at wealth effects of the recent crisis include both Hurd and Rowhedder (2010a) and Hurd and Rowhedder (2010b). These studies respectively find that between 2008 and 2010, up to 40 per cent of American households were affected by issues such as unemployment, negative equity, mortgage arrears or foreclosure. They also find that older households have experienced substantial losses in wealth levels.

Other recent studies focussing on post crisis wealth losses include Bricker et al. (2011) and Petev et al. (2011). In the former, significant disparities are noted across household wealth levels between 2007 and 2009, with changes in asset values rather than changes in the ownership of the assets being the contributing factor to the observed differences. Petev et al. (2011) find that the consumption patterns of the relatively wealthier US households fell more than the less wealthy over the 2007 - 2009 period. Again using micro data, Arrondel et al. (2011) document the degree to which French households adjusted their consumption during the 2008/09 crisis. They also emphasise the role of expectations and a related confidence channel on consumption plans.

A related strand of the literature distinguishes between the effects of predictable versus unpredictable house prices on consumption. Campbell and Cocco (2007) note that house prices may be positively related to consumption for a number of reasons; including wealth and substitution effects, borrowing constraints, precautionary savings or myopic behaviour by households. As noted by Disney et al. (2010) contemporaneous changes in housing values may have no impact on household consumption growth if they were anticipated by consumption-smoothing households.

### **A model of consumption, labour income and asset prices**

In understanding the relationship between consumption and future housing wealth, it is particularly beneficial to consider a theoretical model, which relates consumption  $C_t$  to labour income  $Y_t$  and household assets  $A_t$  such as housing. Variants of this model are in Flavin (1981), Blanchard and Fischer (1989) and Deaton (1993). Start with the following identity:

$$A_{t+1} = (1 + r_{t+1})(A_t + Y_t - C_t). \quad (1)$$

where  $r_{t+1}$  is the return on household assets. Assuming that agents have rational expectations, that the expected return on assets equals a constant,  $r$  and using repeat substitution, results in the following:<sup>5</sup>

$$A_t = \sum_{k=0}^{\infty} \frac{E_t(C_{t+k} - Y_{t+k})}{(1+r)^k}. \quad (2)$$

This can be re-written to give the following intertemporal budget constraint:

$$\sum_{k=0}^{\infty} \frac{E_t C_{t+k}}{(1+r)^k} = A_t + \sum_{k=0}^{\infty} \frac{E_t Y_{t+k}}{(1+r)^k}. \quad (3)$$

The present value of current and future household consumption must equal the current stock of household assets and the present sum of current and future labour income. To derive a consumption function, we use the optimality condition proposed by Hall (1978) which posits a specific relationship between the expected future consumption  $E_t C_{t+k}$  and the current value of consumption.

In particular, the Euler-equation proposed by Hall (1978), implies that the optimal solution involves next period's expected value of consumption equalling the current value. Repeated iteration results in the following:

$$C_t = E_t(C_{t+k}) \quad k = 1, 2, 3, \dots \quad (4)$$

To get an explicit formula for what consumption should equal, we substitute (4) into the intertemporal budget constraint (2). Therefore, the rational expectations permanent income hypothesis can be presented as:

$$C_t = \frac{r}{1+r} A_t + \frac{r}{1+r} \sum_{k=0}^{\infty} \frac{E_t Y_{t+k}}{(1+r)^k}. \quad (5)$$

where the current value of consumption is determined by the following three factors:

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<sup>5</sup>Note we invoke the "transversality condition i.e. that the terminal term  $\frac{E_t A_{t+k}}{(1+r)^k}$  goes to zero as  $k$  gets large.

- The expected present discounted sum of current and future labour income.
- The current value of household assets such as housing and
- The expected return on assets. This is reflected in the coefficient  $\frac{r}{1+r}$  which multiplies both housing and the expected present value of labour income.

In this case, households are assumed to expect a constant return on assets. However, the model can be easily modified to include time-varying asset returns. For example, the following intertemporal budget constraint equivalent to (3) can be derived via the repeated substitution method:

$$\sum_{k=0}^{\infty} \frac{E_t C_{t+k}}{\left(\prod_{m=1}^{k+1} (1+r_{t+m})\right)} = A_t + \sum_{k=0}^{\infty} \frac{E_t Y_{t+k}}{\left(\prod_{m=1}^{k+1} (1+r_{t+m})\right)}. \quad (6)$$

where  $\prod_{n=1}^h x_i$  is the product of  $x_1, x_2, \dots, x_h$ . It can be shown that the optimisation problem associated with this results in the following Euler equation:

$$U'(C_t) = E_t \left[ \left( \frac{1+r_{t+1}}{1+\beta} \right) U'(C_{t+1}) \right]. \quad (7)$$

where  $\beta$  is the discount factor reflecting that households prefer a unit of consumption today to a unit tomorrow. The modified Euler equation (7) can be compared with the corresponding equation under constant returns:

$$U'(C_t) = E_t \left[ \left( \frac{1+r}{1+\beta} \right) U'(C_{t+1}) \right]. \quad (8)$$

## The Irish housing and mortgage market

Housing has traditionally constituted a significant portion of Irish households' asset holdings. While historical reasons can be offered for the Irish obsession with *bricks and mortar*, in the main its predominant status reflects, partly due to capital controls, the lack of diversity in household portfolios. For many, until recently, the only realistic alternative asset to housing was a domestic bank deposit. In Figure 1, the total stock of Irish housing and financial assets is plotted for the

period 2002 - 2012. Over the period, both the significant increase and subsequent decline in the value of housing is readily apparent.

The 1990s heralded profound changes in both the Irish economy and housing market. The emergence of the so-called *Celtic Tiger* in the mid-1990s occurred after a decade of negligible economic growth and high average unemployment rates. The change in Irish economic fortunes thereafter was truly substantial. Sustained economic growth saw the total number of people employed in the country surge by almost 50 per cent, while the accompanying increase in income levels was coupled with a stable, low interest rate environment. Figure 2 presents key Irish macroeconomic variables, including changes in aggregate consumption, over the period 1990 to 2011, while Table 1 traces changes in the main indicators of Irish housing activity over the same period.

The combination of continuing income growth and benign monetary conditions (formalised by Ireland's entry into the single European currency in 1999), contributed to a major house price boom, which, in later years, prompted a significant increase in housing supply. In an international context, the performance of the Irish housing market between 1995 and 2007 was exceptional; real Irish house prices grew by nearly 9 per cent per annum - the next highest country growth rate in the OECD was 7.6 per cent. Housing supply, which escalated markedly post-2000, averaged 84,000 units between 2004 and 2006 comparing with just over 225,000 units built for the same period in the UK despite a fourteen-fold population differential.

Given the increases in both prices and activity levels, the housing market, had, by 2007, assumed a disproportionate importance vis-à-vis the overall economy. The number of persons directly employed in construction doubled between 1997 and 2007 to constitute 13.3 per cent of the total workforce. Owing to the transaction based nature of the Irish taxation system, the contribution of the housing sector to the national exchequer became substantial over the same period. Stamp duty and capital gains taxes alone accounted for just over 13 per cent of all tax revenue in 2007 (and 15 per cent in 2006), as compared with 4 per cent in 1996.

Inevitably, the increase in activity in the residential property market substantially heightened the property exposure amongst leading Irish financial institutions. Almost 40 per cent of the total



stock of Irish mortgages was issued between 2004 and 2007, when house prices were at their highest. Much of this lending was increasingly funded by the ability of Irish credit institutions to borrow abroad. Consequently, total private sector credit, with property constituting an increasing proportion, as a percentage of GDP, increased from 65 per cent in 1995 to 100 per cent in 2000 and up to over 200 per cent in 2008. This growing divergence between total lending and domestic deposits rendered Irish institutions particularly vulnerable post the crisis.

The scale of difficulties in the Irish mortgage market is now quite sizeable. Central Bank of Ireland estimates, based on earlier work by Duffy (2010), suggest that between 40 to 50 per cent of the total stock of Irish mortgages was, at end-2012, in negative equity. At end-March 2013, 12.3 per cent of private residential mortgage accounts were in arrears over 90 days with a further 6 per cent of mortgage accounts in arrears of less than 90 days. The equivalent 90+ days past due figures in March 2012 and 2010 were 9.9 and 4.1 per cent respectively. Given the number of households in less than 90 days arrears and those already restructured, about one fifth of Irish mortgages are presently in some form of distress.<sup>6</sup>

Thus, what emerges is a mortgage market experiencing a number of related pressures; liquidity constraints due to the growing mortgage arrears situation, substantial levels of negative equity and the possibility of credit constraints owing to the significant deleveraging underway in the Irish financial sector.

## Overview of data

Two sources of data are used in this paper. The first is a loan-level dataset collected by the Central Bank of Ireland as part of a Prudential Capital Assessment Review exercise, which assesses the potential capital requirements of the Irish banks under various stress scenarios. The dataset includes a snapshot of the entire residential mortgage books of three Irish banks at June 2012. At 70 per cent, these banks account for the majority of the Irish mortgage market.<sup>7</sup> The loan level dataset incorporates a broad array of information for each loan, including borrower and mortgage

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<sup>6</sup>Over 10 per cent of mortgage accounts have been classified as restructured by Irish financial institutions. Forbearance techniques include a switch to an interest only mortgage; a reduction in the payment amount; a temporary deferral of payment; extending the term of the mortgage; and capitalising arrears amounts and related interest.

<sup>7</sup>The three banks are: Allied Irish Bank, Bank of Ireland, and Permanent TSB.

details from the point of loan origination as well as information on the value of the property on which the mortgage is secured. Table 11 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. 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 mortgagees in Ireland. This survey is the second source of information used in the current study.

The mortgage holders' survey was conducted by ipsos MRBI on behalf of the Central Bank of Ireland. The survey, which is representative of the entire mortgage books of the three banks in the loan-level dataset, was administered to over 2,000 households all of whom are included in the loan-level dataset. Crucially, each individual's survey responses can be linked back to their corresponding mortgage information in the loan-level dataset, where the respondent gave permission for this linking to take place.<sup>8</sup> This is important as it ensures that the values, for example, for house prices and mortgage loan amounts included in the data are the actual levels reported by the financial institution as opposed to those "recalled" by the survey participant. The survey itself was conducted over the period May 2012 to February 2013 with 97 questions, in total, being asked of participating households. The questions can be summarised along the following lines:

- (1) Mortgage background, including questions on the contributors to the mortgage repayment, the current educational and employment characteristics of such contributors and unemployment details where relevant.
- (2) Income and finance, including detailed questions on household income, its composition and recent changes, details on expenditure and questions on household financial distress.
- (3) Residential investment properties and other financial holdings, details of institutions where borrowings and savings are held, on credit applications and outcomes, and future expecta-

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<sup>8</sup>The majority of the sample (88 per cent) gave permission for this linking to take place.

tions.

- (4) Questions on the mortgage arrears resolution process (MARP) and the degree and nature of contact with the mortgage lender.<sup>9</sup>

To capture household consumption, respondents were presented with the following question:

*Thinking of total household spending on all goods and services, but excluding mortgage and other debt repayments, how much would you say that your household spends in an average month? Please include spending on groceries, household utilities, clothing and footwear, travel expenses, childcare expenses, socialising, etc.*

Table 2 provides an overview of the characteristics of the sample used in this study. We focus on a cleaned sub-sample of the portion of respondents that allowed their survey responses to be linked to their loan-level data, so the sample size at this stage is 1,400.<sup>10</sup> Among the sample, the largest portion of respondents are in the 35 to 44 year age group. The majority of respondents are married (83 per cent), employed (85 per cent) and are relatively well educated, with almost 45 per cent 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 2 also shows average values of key financial variables used in the current study. The median annual gross income among the sample is €55,000 while the median annual level of spending on goods and services is €15,300. The average house price at June 2012 among the sample was just over €184,000 while the average mortgage outstanding was approximately €151,000. The final panel in Table 2 shows that 40 per cent of the sample was in a position of negative equity in mid-2012 while 18.4 per cent of the sample had outstanding arrears on their property. Finally, in almost 60 per cent of cases, respondents reported having some level of savings or investments available to them.

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<sup>9</sup>The Central Bank of Ireland introduced the MARP in February 2009 and updated it in February 2010. The purpose of this process is to provide a framework that lenders must use when dealing with borrowers in arrears or facing arrears with their mortgage.

<sup>10</sup>Full details of the cleaning exercise are available in Table 12 in the Appendix. In Table 12 in the appendix, we compare the characteristics of the final usable sample with those of the full linked sample and find no substantial differences between the two groups.

While the Irish property and mortgage market experienced significant change in the aftermath of the house price peak in 2007, by 2012, conditions (such as house price movements and changes in the number of households experiencing mortgage arrears) had stabilised. Therefore, survey responses obtained in that year are likely to be more representative of steady-state conditions in the Irish market than for any year since the mid-1990s.

## Empirical approach

### Baseline model

Our baseline model, typical in the literature, is a reduced-form specification relating household consumption to the household's current house price, income levels and a series of household demographic, labour market and educational attainment controls. We specify our model in terms of the *levels* of consumption and house prices for a number of reasons. First the underlying theoretical model described in section 2.1 is in terms of levels. The use of levels is further supported by Attanasio et al. (2009) who argue for house price levels on the basis that, under the permanent income hypothesis, it should be the level of resources that affects the level of consumption. Furthermore, Attanasio et al. (2009) also argue that, compared with growth rates, house price levels could be closely related to permanent income as they might be influenced by the levels of productivity and economic activity in that particular market. Therefore, the model, which is estimated cross-sectionally, can be summarised as follows, where lower case denotes logs:

$$c_i = \beta_0 + \beta_1 h_i + \beta_2 y_i + \sum_{j=3}^n \beta_j \phi_{i,j} + \epsilon_i. \quad (9)$$

$c_i$  is household  $i$ 's annual consumption on all goods and services (excluding mortgage and other debt repayments),  $h_i$  is the current house price for household  $i$ ,  $y_i$  is annual household income and  $\phi_{i,j}$  are household specific socio-economic and demographic controls. Table 3 provides a full overview of the independent variables used in the model.

The house price level for each household is calculated by taking the reported house purchase price in the loan level data (at the point of loan origination) and then “forecasting” the data forward

to the present using official regional house price data.<sup>11</sup>

To control for the effect of debt burdens on consumption, we include two dummy variables indicating if the household has a second mortgage or unsecured lending. We also include a mortgage repayment-to-income ratio (MRTI) for each household. This variable, which was originally presented in McCarthy and McQuinn (2011), can be regarded as a household liquidity indicator, particularly at a time when many Irish households are experiencing mortgage repayment difficulties.

Finally, much of the recent literature on consumption and wealth effects (cited earlier) assesses the importance of both housing and financial wealth in household consumption. In the Irish case, it is important to note that housing wealth has tended to assume a majority share of households' wealth portfolios, thereby making it an important consideration in consumption and wealth assessments. In Figure 1 (shown earlier) we saw that housing wealth accounted for over two thirds of total household wealth in 2007. Despite the sharp reduction in house prices in recent years, housing wealth still accounts for 50 per cent of total household wealth.

In terms of financial wealth, while we do not have information on these holdings for Irish mortgaged households, we can control for this effect by combining a number of questions in the survey to determine whether a household regularly saves and/or invests in financial products. Specifically, we generate a dummy variable (*save – invest*) that captures people who save regularly, receive any income from savings or investments, or who report that they have savings or investments that they can use in financial difficulties, and we include this as an additional control in the model.

Table 4 presents the results of the initial estimation. While it is common in the literature to use the marginal propensity to consume (MPC) as the standard indicator of the wealth effect, we take, as our point of comparison, the estimated elasticity (the coefficient from the log-log regression). Evaluating the relative impact of wealth effects via the MPC, particularly across countries, is complicated by the size of the accompanying consumption-to-wealth ratio. For example, in an

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<sup>11</sup>Full details of this exercise are available in the Appendix.

Irish context, this ratio is quite low owing to the relatively high level of Irish house prices.<sup>12</sup> Thus, the MPC can be relatively low in a country if housing is quite expensive.

At 0.11, the estimated elasticity for the Irish market is quite high by international standards.<sup>13</sup> Sierminska and Takhtamanova (2007) comment on the relatively high estimates of 0.123 and 0.135 for Canada and Italy respectively, so the Irish result would appear to be at the high end of the international spectrum. This is not altogether surprising given the traditional role played by housing amongst Irish householders' balance sheets. Furthermore, it is not uncommon for financial innovation in countries which have experienced substantial housing booms to increasingly facilitate collateral based lending. Lydon and O'Hanlon (2012) present evidence which suggests that the significant increase in equity release borrowing in the Irish market since 2000 may have fed into greater consumption of durable goods.

The remaining results in Table 4 conform with *a priori* expectations; consumption is larger amongst the older cohorts of the sample, for those households where the head of household is employed and among relatively larger households. Similarly, income is positively correlated with consumption.<sup>14</sup> Interestingly, having unsecured lending or a second mortgage appears to be positively correlated with consumption, while having additional wealth in the form of savings or investments does not have a statistically important effect. The coefficient on the MRTI variable is positive, suggesting that higher debt burdens are positively correlated with consumption. This result, however, is not significant. In the next section, we examine the effect of the current state of the Irish mortgage market on the housing wealth effect in some detail.

## **Mortgage market uncertainty**

The life-cycle theory of consumption suggests that a household's consumption behaviour should only be affected by changes in key economic variables perceived to be of a permanent rather than temporary nature. In the current context, this means that consumption should only respond to changes in income or wealth that are perceived to be permanent. We now explore this issue

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<sup>12</sup>Gan (2010) makes a similar point in the case of Hong Kong.

<sup>13</sup>This implies that a 10 per cent increase in house prices results in a 1.1 per cent increase in consumption.

<sup>14</sup>We also try replacing the log income variable with the log of income after the mortgage repayment. The results are essentially unchanged from those presented here.

for, arguably, the most volatile variable impacting on the Irish mortgage market at present; house price movements. Figure 3 plots both the level and volatility of Irish house prices from 1990 to 2012.<sup>15</sup> From the chart it is clear that households are currently confronted both by a period of persistent downward house price movements and greater volatility in these movements. This growing uncertainty is likely to have marked implications for households' expectations of future housing developments.

Following Manski (2004), Christelis et al. (2011), who use households' subjective expectations, measured through their response to particular survey questions, as a means of characterising their attitudes to the distribution of future shocks. They examine households' expectations about the short-term future of the stock market to see whether the financial losses experienced during the financial crisis are considered to be permanent or temporary. Consequently, they expect financial wealth losses to have a larger impact on consumption for households who perceive the stock market decline to be permanent, compared to those who believe that stock prices will recover quite quickly. They find evidence in support of their hypothesis, showing that individuals, who perceived their wealth changes to be permanent, adjusted their consumption spending much more than those who viewed the changes to be temporary.

In a similar vein, we now assess the implications for housing wealth effects on consumption of changes in house prices that are perceived to be permanent versus those that are perceived to be temporary. We employ responses to the following survey question:

*What is your expectation of house price movements over the next one to two years?*

*Will they (a) continue to fall / (b) stay the same / (c) begin to increase?*

As discussed earlier, Irish house prices have fallen substantially since their peak in 2007. If an individual believes that house prices will remain at their current level in coming years, they should answer (b) to the question above. In other words, they view recent changes in house prices to be of a permanent nature. If, on the other hand, they believe that house prices will recover in coming years (i.e. they answer (c) to the above question), then this implies that they do not

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<sup>15</sup>Volatility is captured using an 8 quarter rolling standard deviation.

view the current level of house prices to be permanent. Similarly, if they expect house prices to continue to fall, then they do not view the current level of house prices to be permanent. With this in mind, we create a dummy variable ‘permanent hp’ which captures individuals who view recent changes in house prices as permanent and we include this as an additional control in our model. To assess the importance of house price expectations for the housing wealth effect, we also include an interaction term between ‘permanent hp’ and the housing wealth variable. The results are shown in Tables 5.

The first point of note is that the coefficient on the housing wealth variable, while still positive, is no longer significant. However, the interaction term between ‘permanent hp’ and the housing wealth variable is positive and significant (albeit only at a 10 per cent significance level). The interaction term captures the housing wealth effect for those individuals who view recent house price movements as permanent, while the coefficient on the housing wealth variable captures the effect for those individuals who view recent house price movements as temporary. The results, therefore, suggest that changes in house prices are only positively correlated with consumption if the change is deemed to be of a permanent nature. This result is in line with previous research on the importance of expectations for household consumption and is in keeping with the life-cycle hypothesis which suggests that a household’s consumption behaviour should only be affected by changes in key economic variables perceived to be of a permanent nature. In terms of the remaining variables in the model, after controlling for house price expectations, we still find household income, household size, other borrowings, the employment status and the age of the head of household to be associated with household consumption.<sup>16</sup>

### **Negative equity**

As a next step, we examine the implications of house price expectations for those households experiencing negative equity. As many households secured their mortgage in the Irish market at a time when house prices were substantially overvalued, the subsequent correction in prices has led to a sizeable cohort of mortgaged households experiencing this phenomenon.<sup>17</sup> Central

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<sup>16</sup>We also assess the role of expectations of future income developments on household consumption, but the inclusion of this additional variable has no impact on the results reported here. We include these additional results in the Appendix, for information.

<sup>17</sup>Honohan (2010) summarises many of these studies.



Bank of Ireland estimates, based on earlier work by Duffy (2010), suggest that between 40 to 50 per cent of the total stock of Irish mortgages was, at end-2012, in negative equity. Clearly, house price expectations are likely to be especially important in this case. To assess this, we focus only on the sub-group of households experiencing negative equity and examine the implications for the housing wealth effect. Our sample size at this stage is 477, and given the smaller sample size, the results are not directly comparable to those presented in Table 5. The results are shown in Table 6.<sup>18</sup>

In line with our previous finding for the whole sample, we find that house price expectations are correlated with housing wealth among the sub-group of households experiencing negative equity. Specifically, the coefficient on the house price variable is not significant, while the coefficient on the interaction term (between 'permanent hp' and housing wealth) is positive and significant (albeit only at the 10 per cent level). This result suggests that the consumption level of households in negative equity is only correlated with housing wealth if the change in housing wealth is perceived to be permanent. The remaining results in the table are similar to those for the whole sample; household income, household size and additional borrowings are all correlated with household consumption.

From a policy perspective the results are quite informative. While a relatively large and significant wealth effect suggests that developments in the housing market can have an influential role in overall Irish economic activity, it is clear, particularly, for those households in negative equity, that house price increases have to be perceived as being permanent in nature for the wealth effect to be realised. Given the recent turbulent nature of house price movements, this may take some time to occur.

One reason why those in negative equity may respond in a more significant fashion to changes in housing wealth could be due to the *rational inattention* hypothesis. In examining the consumption decisions of agents who face costs of acquiring and processing information, Reis (2006), following work by Sims (2003) and Mankiw and Reis (2002), suggests that consumers/agents may only update their plans if they feel the cost of doing so is less than the benefit of it. Therefore, con-

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<sup>18</sup>We repeat the analysis for the sub-group in positive equity, but do not find any significant relationship between housing wealth and consumption among this sub-group. The results are available from the authors, on request.

sumers may rationally choose to only sporadically update their information remaining inattentive between review dates.

The rational inattention hypothesis could provide a reason why households in negative equity are more familiar with their equity status than other households; there are many reasons why it is important and beneficial for a household to know the equity status of its mortgage loan. For example, it has been demonstrated that negative equity can act as a friction in the labour market where it prevents households from moving to areas with relatively better employment opportunities (Stein (1995), Chan (2001) and Engelhardt (2003)). Furthermore, in much of the international literature on mortgage arrears, negative equity can prompt strategic behaviour by households in terms of meeting their mortgage repayment obligations (Ghent and Kudlyak (2011), Bajari et al. (2008) or Deng et al. (2000), for example).

Given the scale of changes in the Irish housing market between 2007 and 2012 (see Duffy and O'Hanlon (2014) for details) and the relatively large presence of negative equity in the market, it may well be that those households experiencing negative equity are more familiar with their housing equity position and consequently are more inclined to react to changes in housing wealth from a consumption perspective.

## **Robustness checks**

### **Housing wealth**

It is plausible that household consumption may respond to housing wealth at the *beginning* of the period of analysis rather than to the current value of housing wealth. Muellbauer (2007), for example, contains a discussion of this issue in considering appropriate consumption functions for estimating wealth effects. As a robustness check of the results in the previous regressions (shown in Tables 4 to 6), we therefore re-run the model replacing the current actual house price with its one-year lag. The results, shown in Table 7, are broadly unchanged; the coefficient on the house price lagged in the baseline model (Model 1), for example, is 0.119 (relative to 0.111 previously). Furthermore, even after controlling for the lag of house prices, we still find that household consumption is higher amongst those households with higher income, among the older cohorts of the sample, among those households where the head is employed and among

relatively larger households. Similarly, additional lending continues to display a positive correlation with consumption, while having additional wealth does not have a statistically important effect.

### **Endogeneity concern**

A further issue that could impact the overall results presented earlier, relates to the potential importance of *expected* future income for the analysis of wealth effects. In this context, a common criticism is that the analysis of wealth effects suffers from endogeneity bias, i.e. house prices and consumption could be related to *expected* future income rather than current income. To control for this, we replace household income in the previous regression (Tables 4 to 6) with its expected value. We follow the recent literature (Himmelberg et al. (2005) and Duca et al. (2011), for example) and proxy for expected income using the average of the lagged levels of income over the previous four year period (see A.3 in the Appendix for further details). The results, which are available in Table 8, reveal little differences relative to those reported in Table 4. The coefficient on the house price variable in the baseline model (Model 1) under this scenario is 0.118 (relative to 0.111 previously), and this result is highly significant. Similarly, the coefficient on the expected income variable is relatively unchanged (it now stands at 0.319 and this is highly significant; under the baseline the coefficient was 0.321). The remaining results in the model are also unchanged when we control for expected income.

A further endogeneity concern relates to the potential link between house price expectations and house price developments, where a dual-causality may be at play.<sup>19</sup> We address this issue in a two staged fashion. In the first stage we regress the house purchase price for each household on a series of economic variables (at point of loan origination) that are commonly used to model house prices. As controls, we include household characteristics (age, education level, household income and the number of borrowers) and mortgage characteristics (mortgage interest rate, the down-payment for each household, the mortgage-repayment-to-income ratio and the mortgage term). The results from this first stage regression are shown in Table 9.

Following the asset price literature (see Blanchard and Watson (1982) and Summers (1986)) where the value of the asset is decomposed into a fundamental and a non-fundamental compo-

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<sup>19</sup>We are grateful to an anonymous referee for pointing this out.

ment, the fitted value from the first stage regression can be interpreted as a “fundamental” house price with the difference between the actual house price and the fitted value being deemed a “bubble component”. Much of the house price literature associates this latter bubble component as being a function of house price expectations (see Stiglitz (1990) and Case and Shiller (2003) for example). Thus, we believe the fitted value is that part of the house price level which is uncorrelated with house price expectations. Therefore, in the second stage regression we control for endogeneity by including the fitted value of the house price as opposed to the actual house price in our consumption regression. The results, which are shown in Table 10, support the earlier findings - the housing wealth effect is significant only for those households who believe that house prices are at their permanent level.

## Conclusions

At present many economies are still struggling to emerge from the aftermath of the 2007/08 financial crisis. For some of these countries, the origin of much of the difficulty lay in the interaction between the housing market and the real economy. After a prolonged period of growth, house price levels inevitably began to deviate significantly from what fundamental values based on economic variables suggested. In certain distressed markets, the subsequent decline in prices has given rise to substantial levels of negative equity and a downturn in overall economic activity has contributed to a growing mortgage arrears problem.

In that context, as countries seek to emerge from these difficulties, understanding the link between variables such as consumption and investment and house prices has, arguably, never been more important. Accurately assessing these relationships is essential in the design of efficient and effective policy responses. This paper uses two unique data sources to address this issue for the Irish mortgage market - a market, presently, experiencing considerable distress. The presence of questions eliciting subjective expectations amongst households is a particular advantage of micro-level survey data as it provides an additional means of distinguishing between movements in key variables perceived to be of a permanent or temporary nature.

Our results indicate a positive correlation between consumption and house prices amongst Irish

households, particularly when compared with comparable type estimates from other jurisdictions. We find tentative support for the life cycle hypothesis in the Irish market, with (perceived) permanent price movements to be of particular importance for housing wealth effects. This finding is further borne out for those households experiencing negative equity. The significance of this latter result underscores the need for Irish house prices to move to an era of positive and sustainable growth.

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## A Creation of Variables from Loan-Level Dataset

The analysis in this paper relies, in part, on variables that are generated from the loan-level data (described previously). Here we detail precisely how these variables are calculated.

### A.1 Current house price

The loan-level dataset includes the value of the house for which the original mortgage was taken out as well as the valuation date. The current house price ( $P_t$ ) is calculated as follows:

$$P_t = P_0 \times \frac{\bar{P}_t}{\bar{P}_0} \quad (10)$$

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  $t=0$  and  $t=t$ .

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.

### A.2 Equity or Current Loan-to-Value Ratio

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:

$$LTV_t = \frac{Debt_t}{P_t} \quad (11)$$

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.

### A.3 Expected Income

The dataset that we use in the current analysis includes only the current gross income for each household in 2012. To calculate expected income in 2012 for household  $i$ , we follow the recent literature such as Himmelberg et al. (2005) and Duca et al. (2011) who argue (in the case of house prices) that expected values can be tracked by lagged values over the previous five and four years respectively. We therefore proxy for expected household income in 2012 using the average of the annual values over the 2008-2011 period.

Since our dataset does not include the value of household income in previous years, we calculate this by back-casting the current value of household income (in 2012) by the annual growth rate of household income in the region in which the household resides. These annual growth rates are available from the Irish Central Statistics Office ([www.cso.ie](http://www.cso.ie)) under the heading “Total Household Income by County and Region and Year”.



## **B The survey of mortgage holders**

The survey used in the present study was conducted by ipsos MRBI on behalf of the Central Bank of Ireland. The primary purpose of the survey was to collect up-to-date information on a mortgage holder's financial position, which could be appended to the mortgage loan level information held by the Central Bank for the three main Irish financial institutions (AIB, BOI and ILP). The survey was designed to be representative of the loan books of the three main institutions along five dimensions: lender type, borrower type, interest rate type, arrears and county of residence.

A two-stage sampling approach was used for the selection of cases for interview. In the first stage, representative clusters were formed from the loan-level data. In the second stage, clusters were randomly selected for interview. The total sample size achieved was 2,086 households, while the linked sample (those cases that permitted for their survey information to be linked back to their loan-level data at the Central Bank of Ireland) accounted for 88 per cent of this.

## **C Impact of future income expectations on household consumption**

In an empirical context we test for the impact of expectations of future income volatility on household consumption. We use two different variables from the household survey to proxy for this. Specifically, respondents are asked:

(1) Thinking about your financial circumstances, over the next year or so, do you expect to be (a) better off financially than you are now, (b) worse off financially than you are now, or (c) about the same as you are now?

(2) Which one of these statements best describes how well you think your household will be keeping up with your bills and/or credit commitments in one year's time? (a) Keeping up with all commitments without much difficulty, (b) Keeping up with all commitments, but struggling from time to time, (c) Keeping up with all commitments, but it will be a constant struggle, (d) Will have financial problems, falling behind on some commitments, or (e) Will have financial problems, falling behind with many commitments.

For the first question, we generate a dummy variable ("expects better") that equals one if respondents expect to be better off in the future, and zero otherwise. For the second question, we generate a dummy variable ("expects no struggle") that equals one if the respondent expects to be able to keep up with all of their financial commitments in the future (i.e. they answer (a) to question 2), and zero otherwise.

We try adding each of these variables to the model from Table 4. However, the overall finding of a significant correlation between (permanent changes in) housing wealth and consumption remains. These results are shown in Table 14.

Table 1: Summary of Irish Residential Mortgage Market Statistics: 1990 - 2012

| Variable                                 | Unit      | 1990   | 1995   | 2000    | 2005    | 2007    | 2012    |
|--|-----------|--------|--------|---------|---------|---------|---------|
| Outstanding Level of Residential Lending | € million | 6,563  | 11,938 | 32,546  | 94,259  | 123,002 | 84,973  |
| Total Value of Mortgages Issued          | € million | 1,492  | 2,666  | 9,004   | 27,753  | 24,064  | 3,225   |
| Average Mortgage Issued                  | €         | 42,856 | 54,094 | 111,355 | 231,206 | 271,154 | 184,485 |
| Total Number of Mortgages Issued         |           | 34,812 | 49,288 | 80,856  | 120,037 | 88,747  | 17,769  |
| House Prices                             | €         | 65,541 | 77,994 | 169,191 | 276,221 | 322,634 | 220,415 |
| Housing Supply                           |           | 19,539 | 30,575 | 49,812  | 80,957  | 78,027  | 8,488   |

**Note:** This table shows the significant changes which occurred in key Irish housing and credit statistics over the period 1990 to 2012. The figures reveal the degree to which changes in the property market and credit market went hand in hand over this period. The figure for the outstanding level of residential lending is from the Central Bank of Ireland, while the total value and number of mortgages issued is from the Irish Department of the Environment as is the data on both house prices and supply.

Table 2: Demographic and economic characteristics of the sample, % of sample unless otherwise stated

| Variable                  |                      | %       |
|---------------------------|----------------------|---------|
| Age Group (years)         | 18-34                | 15.1    |
|                           | 35-44                | 41.9    |
|                           | 45-54                | 29.4    |
|                           | 55-64                | 11.4    |
|                           | 65+                  | 2.2     |
| Marital Status            | Married / Couple     | 82.5    |
|                           | Widowed/Separated    | 6.3     |
|                           | Single               | 11.2    |
| Work Status               | Employed             | 85.2    |
|                           | Unemployed           | 6.1     |
|                           | Retired/Inactive     | 8.6     |
| Education Status          | Low                  | 12.6    |
|                           | Medium               | 42.6    |
|                           | High                 | 44.7    |
| Household Composition     | 1 Adult, 0 kids      | 9.6     |
|                           | 2 Adults, 0 kids     | 14.8    |
|                           | 3+ Adults, 0 kids    | 7.0     |
|                           | 1+ Adults, with kids | 60.9    |
|                           | Undefined            | 7.8     |
| Median Financial Data (€) | Income               | 55,000  |
|                           | Consumption          | 15,300  |
|                           | Current House Price  | 184,901 |
|                           | Mortgage Outstanding | 151,433 |
| Negative Equity           | % of Group           | 40.2    |
| Any Arrears               | % of Group           | 18.4    |
| Has Savings/Investments   | % of Group           | 59.6    |
| N                         |                      | 1,400   |

**Notes:** The table presents an overview of the descriptive statistics among the sample that is used in the regression analysis. Low education refers to individuals with a junior certificate education level or less (lower second level education); medium education includes individuals with a leaving certificate (upper second-level) or third level (non-degree) education; high education includes individuals with at least a third level degree qualification. The retired/inactive group includes individuals who are not available for work because they are retired, studying or working in the home.

Table 3: Independent Variables

| Variable            | Description   |
|---------------------|---|
| $h_i$               | Logged house price (at June-2012) for household i.  |
| $y_i$               | Logged gross annual income for household i.   |
| $disposable\ y_i$   | Logged disposable annual income for household i (gross household income less mortgage repayments).                        |
| $male$              | 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.   |
| $age : 18 - 34$     | Omitted category - captures survey respondents who are aged between 18 and 34 years.                                      |
| $age : 35 - 44$     | Dummy variable indicating that the survey respondent is aged between 35 and 44 years.                                     |
| $age : 45 - 54$     | Dummy variable indicating that the survey respondent is aged between 45 and 54 years.                                     |
| $age : 55 - 64$     | 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.  |
| $low\ education$    | Omitted category - captures survey respondents with a low level of education (lower second level or less).                |
| $medium\ education$ | Dummy variable indicating that the survey respondent has a medium level of education (upper second level and non-degree). |
| $high\ education$   | 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.).         |
| $mrti$              | Log of the mortgage-repayment-to-income ratio for household i.  |
| $other\ mortgage$   | Dummy variable indicating that the household has a second mortgage.   |
| $unsecured\ debt$   | Dummy variable indicating that the household has unsecured debt.  |
| $saves - invests$   | Dummy variable indicating if the household has savings or investments.  |

**Notes:** The table describes the independent variables that are used in the regression analysis.

Table 4: Baseline consumption regression

| Variable                   | Coefficient | T-Stat |
|----------------------------|-------------|--------|
| <i>constant</i>            | 3.84***     | 8.33   |
| <i>h<sub>i</sub></i>       | 0.11***     | 3.00   |
| <i>y<sub>i</sub></i>       | 0.32***     | 9.44   |
| <b>Additional Controls</b> |             |        |
| <i>male</i>                | -0.02       | -0.69  |
| <i>married</i>             | 0.07        | 1.56   |
| <i>HH size</i>             | 0.12***     | 8.71   |
| <i>age : 35 – 44</i>       | 0.08*       | 1.81   |
| <i>age : 45 – 54</i>       | 0.10**      | 2.30   |
| <i>age : 55 – 64</i>       | 0.09*       | 1.66   |
| <i>age : 65+</i>           | 0.13        | 1.27   |
| <i>medium education</i>    | 0.08*       | 1.76   |
| <i>high education</i>      | 0.04        | 0.82   |
| <i>employed</i>            | 0.16***     | 2.57   |
| <i>retired/inactive</i>    | 0.05        | 0.68   |
| <i>mrti</i>                | 0.03        | 1.17   |
| <i>other mortgage</i>      | 0.03**      | 2.50   |
| <i>unsecured debt</i>      | 0.06**      | 2.04   |
| <i>saves – invests</i>     | 0.01        | 0.23   |
| N                          | 1,400       |        |
| F-stat                     | 36.32       |        |
| Prob>F                     | 0.0000      |        |
| Adj. R <sup>2</sup>        | 0.3003      |        |

**Notes:** The results from the baseline regression are shown in this table. The dependent variable is the log of household consumption, and this is regressed on a variety of household specific controls, as detailed in Table 3. Variable significance levels are captured as follows: \*\*\* Significant at 1 per cent level; \*\* Significant at 5 per cent level; \* Significant at 10 per cent level. The age, education and labour market status variables should be compared to their omitted categories, which are as follows: age group 18-34 years, low education level and unemployed labour market status, respectively.

Table 5: Consumption regression, including interaction between price expectations and house price

| Variable                            | Coefficient | T-Stat |
|-------------------------------------|-------------|--------|
| <i>constant</i>                     | 4.72***     | 7.45   |
| <i>h<sub>i</sub></i>                | 0.05        | 0.92   |
| <i>permanent hp</i>                 | -1.57*      | -1.91  |
| <i>h<sub>i</sub> * permanent hp</i> | 0.13*       | 1.87   |
| <i>y<sub>i</sub></i>                | 0.32***     | 9.11   |
| <b>Additional Controls</b>          |             |        |
| <i>male</i>                         | -0.02       | -0.60  |
| <i>married</i>                      | 0.07        | 1.50   |
| <i>HH size</i>                      | 0.12***     | 8.57   |
| <i>age : 35 – 44</i>                | 0.07        | 1.51   |
| <i>age : 45 – 54</i>                | 0.09*       | 1.91   |
| <i>age : 55 – 64</i>                | 0.10*       | 1.81   |
| <i>age : 65+</i>                    | 0.13        | 1.16   |
| <i>medium education</i>             | 0.07        | 1.45   |
| <i>high education</i>               | 0.04        | 0.75   |
| <i>employed</i>                     | 0.14**      | 2.25   |
| <i>retired/inactive</i>             | 0.06        | 0.71   |
| <i>mrti</i>                         | 0.02        | 0.80   |
| <i>other mortgage</i>               | 0.03**      | 2.50   |
| <i>unsecured debt</i>               | 0.04        | 1.43   |
| <i>saves – invests</i>              | 0.01        | 0.16   |
| N                                   | 1,321       |        |
| F-stat                              | 29.83       |        |
| Prob>F                              | 0.0000      |        |
| Adj. R <sup>2</sup>                 | 0.2933      |        |

**Notes:** This table reports the results from the consumption model (from Table 4), augmented with a control for house price expectations and the interaction of house price expectations with housing wealth. The dependent variable is the log of household consumption. Variable significance levels are captured as follows: \*\*\* Significant at 1 per cent level; \*\* Significant at 5 per cent level; \* Significant at 10 per cent level. The age, education and labour market status variables should be compared to their omitted categories, which are as follows: age group 18-34 years, low education level and unemployed labour market status, respectively.

Table 6: Consumption regression, sub-group in negative equity

| Variable                            | Coefficient | T-Stat |
|-------------------------------------|-------------|--------|
| <i>constant</i>                     | 4.49***     | 4.01   |
| <i>h<sub>i</sub></i>                | -0.04       | -0.39  |
| <i>permanent hp</i>                 | -2.76*      | -1.81  |
| <i>h<sub>i</sub> * permanent hp</i> | 0.22*       | 1.75   |
| <i>y<sub>i</sub></i>                | 0.43***     | 6.26   |
| <b>Additional Controls</b>          |             |        |
| <i>male</i>                         | -0.01       | -0.24  |
| <i>married</i>                      | 0.1         | 1.28   |
| <i>HH size</i>                      | 0.12***     | 4.96   |
| <i>age : 35 – 44</i>                | 0.07        | 1.16   |
| <i>age : 45 – 54</i>                | -0.01       | -0.18  |
| <i>age : 55 – 64</i>                | 0.13        | 0.93   |
| <i>age : 65+</i>                    | 0.35        | 1.43   |
| <i>medium education</i>             | 0.02        | 0.20   |
| <i>high education</i>               | -0.05       | -0.49  |
| <i>employed</i>                     | 0.12        | 1.12   |
| <i>retired/inactive</i>             | 0.03        | 0.19   |
| <i>mrti</i>                         | 0.09        | 1.53   |
| <i>other mortgage</i>               | 0.03*       | 1.67   |
| <i>unsecured debt</i>               | 0.05        | 0.98   |
| <i>saves – invests</i>              | -0.02       | -0.39  |
| N                                   | 477         |        |
| F-stat                              | 12.24       |        |
| Prob>F                              | 0.0000      |        |
| Adj. R <sup>2</sup>                 | 0.3097      |        |

**Notes:** This table focusses on the sub-group of households in negative equity, and reports the results from the consumption model augmented with house price expectations. The control variables are unchanged from those in Table 5. The dependent variable is the log of household consumption. Variable significance levels are captured as follows: \*\*\* Significant at 1 per cent level; \*\* Significant at 5 per cent level; \* Significant at 10 per cent level. The age, education and labour market status variables should be compared to their omitted categories, which are as follows: age group 18-34 years, low education level and unemployed labour market status, respectively.

Table 7: Consumption regression, controlling for lagged house prices

| Variable                            | Model 1     |        | Model 2     |        | Model 3     |        |
|-------------------------------------|-------------|--------|-------------|--------|-------------|--------|
|                                     | Coefficient | T-Stat | Coefficient | T-Stat | Coefficient | T-Stat |
| <i>constant</i>                     | 3.77***     | 8.16   | 4.69***     | 7.36   | 4.47***     | 3.97   |
| <i>lagged h<sub>i</sub></i>         | 0.12***     | 3.22   | 0.05        | 1.02   | -0.03       | -0.31  |
| <i>permanent hp</i>                 |             |        | -1.65**     | -1.99  | -2.86*      | -1.85  |
| <i>h<sub>i</sub> * permanent hp</i> |             |        | 0.13**      | 1.94   | 0.23*       | 1.79   |
| <i>y<sub>i</sub></i>                | 0.32***     | 9.32   | 0.32***     | 9.00   | 0.42***     | 6.07   |
| <b>Additional Controls</b>          |             |        |             |        |             |        |
| <i>male</i>                         | -0.02       | 0.66   | -0.02       | -0.60  | -0.01       | 0.26   |
| <i>married</i>                      | 0.07        | 1.51   | 0.07        | 1.50   | 0.10        | 1.27   |
| <i>HH size</i>                      | 0.12***     | 8.64   | 0.12***     | 8.57   | 0.12***     | 4.96   |
| <i>age : 35 – 44</i>                | 0.08*       | 1.81   | 0.07        | 1.51   | 0.07        | 1.18   |
| <i>age : 45 – 54</i>                | 0.10**      | 2.25   | 0.09*       | 1.89   | -0.01       | -0.15  |
| <i>age : 55 – 64</i>                | 0.09*       | 1.63   | 0.10*       | 1.77   | 0.13        | 0.93   |
| <i>age : 65+</i>                    | 1.25        | 0.13   | 0.12        | 1.14   | 0.35        | 1.44   |
| <i>medium education</i>             | 0.08*       | 1.76   | 0.07        | 1.45   | 0.02        | 0.19   |
| <i>high education</i>               | 0.04        | 0.80   | 0.04        | 0.73   | -0.06       | -0.51  |
| <i>employed</i>                     | 0.16***     | 2.61   | 0.15***     | 2.28   | 0.12        | 1.14   |
| <i>retired/inactive</i>             | 0.05        | 0.68   | 0.06        | 0.72   | 0.03        | 0.19   |
| <i>mrti</i>                         | 0.03        | 1.08   | 0.02        | 0.72   | 0.09        | 1.45   |
| <i>other mortgage</i>               | 0.02**      | 2.40   | 0.03**      | 2.50   | 0.03*       | 1.67   |
| <i>unsecured debt</i>               | 0.06**      | 2.04   | 0.04        | 1.43   | 0.05        | 0.96   |
| <i>saves – invests</i>              | 0.01        | 0.23   | 0.01        | 0.16   | -0.02       | -0.37  |
| <b>N</b>                            | 1,400       |        | 1,321       |        | 477         |        |
| <b>F-stat</b>                       | 36.42       |        | 29.94       |        | 12.27       |        |
| <b>Prob&gt;F</b>                    | 0.0000      |        | 0.0000      |        | 0.0000      |        |
| <b>Adj. R<sup>2</sup></b>           | 0.3009      |        | 0.2940      |        | 0.3102      |        |

**Notes:** As a robustness check of the previous consumption models from Tables 4 to 6, the housing wealth variable is replaced with its 1-year lag and the results are reported in this table. The dependent variable is the log of household consumption. Variable significance levels are captured as follows: \*\*\* Significant at 1 per cent level; \*\* Significant at 5 per cent level; \* Significant at 10 per cent level. The age, education and labour market status variables should be compared to their omitted categories, which are as follows: age group 18-34 years, low education level and unemployed labour market status, respectively.



Table 8: Consumption regression, controlling for expected income

| Variable                            | Model 1     |        | Model 2     |        | Model 3     |        |
|-------------------------------------|-------------|--------|-------------|--------|-------------|--------|
|                                     | Coefficient | T-Stat | Coefficient | T-Stat | Coefficient | T-Stat |
| <i>constant</i>                     | 3.75***     | 8.09   | 4.70***     | 7.38   | 4.51***     | 4.00   |
| <i>h<sub>i</sub></i>                | 0.12***     | 3.19   | 0.05        | 0.92   | -0.04       | -0.42  |
| <i>permanent hp</i>                 |             |        | -1.56*      | -1.89  | -2.78*      | -1.82  |
| <i>h<sub>i</sub> * permanent hp</i> |             |        | 0.12*       | 1.85   | 0.22*       | 1.76   |
| <i>expected y<sub>i</sub></i>       | 0.32***     | 9.38   | 0.32***     | 9.14   | 0.43***     | 6.25   |
| <b>Additional Controls</b>          |             |        |             |        |             |        |
| <i>male</i>                         | -0.02       | -0.62  | -0.02       | -0.60  | -0.01       | -0.24  |
| <i>married</i>                      | 0.07        | 1.53   | 0.07        | 1.51   | 0.10        | 1.32   |
| <i>HH size</i>                      | 0.12***     | 8.64   | 0.12***     | 8.57   | 0.12***     | 4.96   |
| <i>age : 35 – 44</i>                | 0.08*       | 1.81   | 0.07        | 1.51   | 0.07        | 1.16   |
| <i>age : 45 – 54</i>                | 0.10**      | 2.27   | 0.09*       | 1.93   | -0.01       | -0.17  |
| <i>age : 55 – 64</i>                | 0.1*        | 1.70   | 0.11*       | 1.88   | 0.13        | 0.93   |
| <i>age : 65+</i>                    | 0.12        | 1.25   | 0.13        | 1.16   | 0.35        | 1.43   |
| <i>medium education</i>             | 0.08*       | 1.78   | 0.07        | 1.47   | 0.02        | 0.20   |
| <i>high education</i>               | 0.04        | 0.80   | 0.04        | 0.73   | -0.05       | -0.49  |
| <i>employed</i>                     | 0.16***     | 2.59   | 0.14**      | 2.25   | 0.12        | 1.13   |
| <i>retired/inactive</i>             | 0.05        | 0.67   | 0.06        | 0.70   | 0.03        | 0.19   |
| <i>mrti</i>                         | 0.03        | 1.13   | 0.02        | 0.84   | 0.09        | 1.53   |
| <i>other mortgage</i>               | 0.03**      | 2.50   | 0.03**      | 2.50   | 0.03*       | 1.67   |
| <i>unsecured debt</i>               | 0.06**      | 2.00   | 0.04        | 1.40   | 0.05        | 0.96   |
| <i>saves – invests</i>              | 0.01        | 0.23   | 0.01        | 0.16   | -0.02       | -0.36  |
| N                                   | 1,398       |        | 1,319       |        | 476         |        |
| F-stat                              | 36.44       |        | 29.86       |        | 12.20       |        |
| Prob>F                              | 0.0000      |        | 0.0000      |        | 0.0000      |        |
| Adj. R <sup>2</sup>                 | 0.3013      |        | 0.2938      |        | 0.3094      |        |

**Note:** As a robustness check, we control for expected future income instead of its current value. We follow the recent literature (Himmelberg et al. (2005) and Duca et al. (2011)) and proxy for expected income using the average of the lagged levels of income over the previous four year period, (see A.3 in the Appendix for further details). The dependent variable is the log of household consumption. Variable significance levels are captured as follows: \*\*\* Significant at 1 per cent level; \*\* Significant at 5 per cent level; \* Significant at 10 per cent level. The age, education and labour market status variables should be compared to their omitted categories, which are as follows: age group 18-34 years, low education level and unemployed labour market status, respectively.

Table 9: House Prices

| Controls (at point of origination) | Coefficient  | T-Stat |
|------------------------------------|--------------|--------|
| <i>constant</i>                    | -148021.8*** | -4.05  |
| <i>deposit</i>                     | 0.93***      | 38.54  |
| <i>mrti</i>                        | 0.5          | 0.06   |
| <i>income</i>                      | 0.28***      | 8.11   |
| <i>interest rate</i>               | -527272.8    | -1.47  |
| <i>term</i>                        | 8118.09***   | 13.48  |
| <i>no. of contributors</i>         | 7537.69      | 1.06   |
| <i>age of head of household</i>    | 2673.93***   | 5.81   |
| <i>medium education</i>            | 16847.76     | 1.47   |
| <i>high education</i>              | 62593.73***  | 5.41   |
| N                                  | 1,147        |        |
| F-stat                             | 217.62       |        |
| Prob>F                             | 0.0000       |        |
| Adj. R <sup>2</sup>                | 0.6298       |        |

**Notes:** To account for potential endogeneity between house price expectations and house price developments, where a dual-causality may be at play in the previous models, we employ a two-stage methodology. In the first stage we regress the house purchase price for each household on a series of economic variables (at point of loan origination) that are commonly used to model house prices. In the second stage we control for endogeneity by including the fitted value of the house price from the first stage regression (instead of the actual house price), in our consumption regression. The results from the first stage regression are reported in this table, while Table 10 reports the results from the second stage regression. As controls for the first-stage regression, we include mortgage characteristics (mortgage interest rate, the down-payment/deposit for each household, the mortgage-repayment-to-income (mrti) ratio and the mortgage term) and household characteristics (age, education level, household income and the number of borrowers). The education level of the head of household is only available at the point of survey - we assume this is unchanged from the point of loan origination. \*\*\*, \*\* and \* indicate significance at the 1, 5 and 10 per cent levels respectively.

Table 10: Consumption regression, including interaction between price expectations and *fitted* house price

| Variable                                | Coefficient | T-Stat |
|---|-------------|--------|
| <i>constant</i>                         | 4.06***     | 5.31   |
| <i>h<sub>i</sub> fit</i>                | 0.05        | 0.96   |
| <i>permanent hp</i>                     | -1.55*      | 1.70   |
| <i>h<sub>i</sub> fit * permanent hp</i> | 0.12*       | 1.60   |
| <i>y<sub>i</sub></i>                    | 0.37***     | 9.74   |
| <b>Additional Controls</b>              |             |        |
| <i>male</i>                             | -0.02       | -0.59  |
| <i>married</i>                          | 0.10*       | 1.89   |
| <i>HH size</i>                          | 0.10***     | 6.25   |
| <i>age : 35 – 44</i>                    | 0.08*       | 1.70   |
| <i>age : 45 – 54</i>                    | 0.06        | 0.06   |
| <i>age : 55 – 64</i>                    | 0.09        | 0.09   |
| <i>age : 65+</i>                        | 0.13        | 0.13   |
| <i>medium education</i>                 | 0.08        | 0.08   |
| <i>high education</i>                   | 0.01        | 0.01   |
| <i>employed</i>                         | 0.14*       | 1.97   |
| <i>retired/inactive</i>                 | 0.06        | 0.67   |
| <i>mrti</i>                             | 0.07**      | 2.41   |
| <i>other mortgage</i>                   | 0.03***     | 2.31   |
| <i>unsecured debt</i>                   | 0.05        | 1.47   |
| <i>saves – invests</i>                  | -0.02       | -0.56  |
| N                                       | 1,074       |        |
| F-stat                                  | 22.78       |        |
| Prob>F                                  | 0.0000      |        |
| Adj. R <sup>2</sup>                     | 0.2784      |        |

**Notes:** This table reports the results of the consumption model, when the housing wealth variable is replaced with its fitted value from a house price regression. This methodology is used to control for potential endogeneity between house price expectations and house price developments. \*\*\*, \*\* and \* indicate significance at the 1, 5 and 10 per cent levels respectively.

Table 11: Appendix Table: Loan-Level Data Fields / Information Content

| Unit Identifier | Borrower                          | Property                         | Loan                  | Interest Rate         | Performance        |
|-----------------|-----------------------------------|----------------------------------|-----------------------|-----------------------|--------------------|
| Bank            | Borrower Type<br>(FTB, BTL, etc.) | Geographic Location              | Origination Date      | Current Interest Rate | Arrears Balance    |
| Borrower        | Income                            | Property Type<br>New or Existing | Original Loan Balance | Interest Rate Type    | (June-12)          |
| Property        | Income Verified                   | Original Valuation<br>(and date) | Current Loan Balance  | Interest Rate Margin  | Arrears Balance    |
| Loan            | Credit Quality                    | Original LTV                     | Loan Term             | Rate Revision Date    | for Past 12 months |
|                 |                                   | Construction Year                | Loan Purpose          |                       | Collection Status  |
|                 |                                   |                                  | Current Repayment     |                       | Modification /     |
|                 |                                   |                                  | Payment Type          |                       | Forbearance Flag   |
|                 |                                   |                                  | Interest Rate Info.   |                       |                    |
|                 |                                   |                                  | Performance Info.     |                       |                    |

**Notes:** This table presents an overview of the type of information available in the loan-level dataset that is employed in this paper. The variables can be summarised as those reflecting information about the borrower, the property, or the loan.

Table 12: Final Sample

|                                    |       |
|------------------------------------|-------|
| No. of surveyed households         | 2,086 |
| No. of linked observations         | 1,837 |
| <i>Of which:</i>                   |       |
| Missing house price data           | 49    |
| Top/Tail 1% off house price        | 17    |
| Missing income data                | 250   |
| Missing household consumption data | 67    |
| Missing data on mortgage repayment | 8     |
| Missing demographic information    | 46    |
| Final Sample                       | 1,400 |

**Notes:** This table details the cleaning exercise undertaken on the data employed in the current analysis. The cleaning steps are specified, as well as the number of observations dropped at each stage of the exercise. The overall sample size is 2,086 (i.e. this number of borrowers in the loan-level dataset completed the household survey, as requested by the Central Bank of Ireland). However, only 1,837 households agreed to allow their survey information to be linked to their administrative data, as captured in the loan-level dataset.

Table 13: Comparison of linked, and usable samples  
Demographic and economic characteristics, % of group unless otherwise stated

| Variable                  |                      | (a)<br>Usable<br>Sample (%) <sup>a</sup> | (b)<br>Linked<br>Sample (%) <sup>b</sup> |
|---------------------------|----------------------|--|--|
| Age Group (years)         | 18-34                | 15.1                                     | 14.6                                     |
|                           | 35-44                | 41.9                                     | 39.9                                     |
|                           | 45-54                | 29.4                                     | 29.8                                     |
|                           | 55-64                | 11.4                                     | 12.6                                     |
|                           | 65+                  | 2.2                                      | 2.7                                      |
| Marital Status            | Married / Couple     | 82.5                                     | 83.3                                     |
|                           | Widowed/Separated    | 6.3                                      | 6.1                                      |
|                           | Single               | 11.2                                     | 10.5                                     |
| Work Status               | Employed             | 85.2                                     | 84.5                                     |
|                           | Unemployed           | 6.1                                      | 6.1                                      |
|                           | Retired/Inactive     | 8.6                                      | 9.2                                      |
| Education Status          | Low                  | 12.6                                     | 13.1                                     |
|                           | Medium               | 42.6                                     | 43.6                                     |
|                           | High                 | 44.7                                     | 42.5                                     |
| Household Composition     | 1 Adult, 0 kids      | 9.6                                      | 9.4                                      |
|                           | 2 Adults, 0 kids     | 14.8                                     | 16.0                                     |
|                           | 3+ Adults, 0 kids    | 7.0                                      | 7.4                                      |
|                           | 1+ Adults, with kids | 60.9                                     | 60.0                                     |
|                           | Undefined            | 7.8                                      | 7.2                                      |
| Median Financial Data (€) | Income               | 55,000                                   | 55,000                                   |
|                           | Consumption          | 15,300                                   | 15,300                                   |
|                           | Current House Price  | 184,901                                  | 180,697                                  |
|                           | Mortgage Outstanding | 151,433                                  | 144,554                                  |
| Negative Equity           | % of Group           | 40.2                                     | 38.9                                     |
| Any Arrears               | % of Group           | 18.4                                     | 20.9                                     |
| Has Savings/Investments   | % of Group           | 59.6                                     | 56.7                                     |
| N                         |                      | 1,400                                    | 1,837                                    |

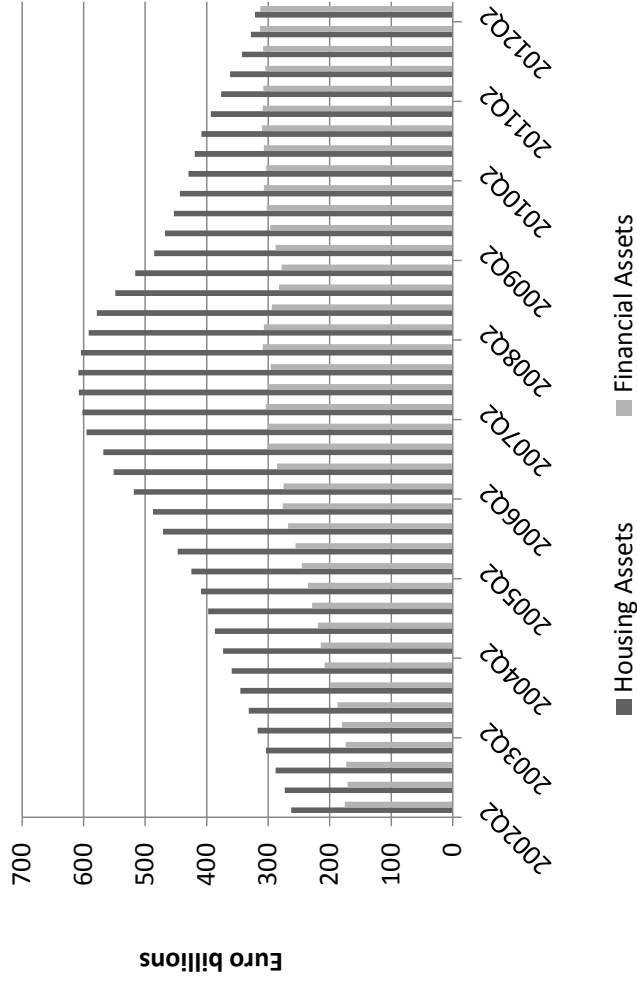
**Notes:** This table compares the descriptive statistics from the regression sample (“usable sample”) to the overall “linked sample”. <sup>a</sup>The usable sample includes all those observations that are utilised in the baseline regression. It is lower than the linked sample shown in column b because of missing information on key variables used in the regression. <sup>b</sup>In the linked sample, where group totals do not equal 100%, the residual is accounted for by “don’t know” or “refused” responses. While the overall sample size is 1,837, in cases where respondents did not provide an answer, the sample size is as follows: household income (1,578); household consumption (1,700); the current house price (1,788); and negative equity (1,788).

Table 14: Consumption regression, controlling for future income volatility

| Variable                            | Model 1     |        | Model 2     |        |
|-------------------------------------|-------------|--------|-------------|--------|
|                                     | Coefficient | T-Stat | Coefficient | T-Stat |
| <i>constant</i>                     | 4.7***      | 7.41   | 4.73        | 7.44   |
| <i>h<sub>i</sub></i>                | 0.05        | 1.04   | 0.05        | 0.94   |
| <i>permanent hp</i>                 | -1.36*      | -1.66  | -1.60**     | -1.95  |
| <i>h<sub>i</sub> * permanent hp</i> | 0.11*       | 1.65   | 0.13**      | 1.88   |
| <i>y<sub>i</sub></i>                | 0.31***     | 8.86   | 0.32***     | 9.11   |
| <b>Additional Controls</b>          |             |        |             |        |
| <i>male</i>                         | -0.02       | -0.57  | -0.02       | -0.60  |
| <i>married</i>                      | 0.09*       | 1.89   | 0.07        | 1.45   |
| <i>HH size</i>                      | 0.12***     | 8.21   | 0.12***     | 8.43   |
| <i>age : 35 – 44</i>                | 0.08*       | 1.95   | 0.07*       | 1.63   |
| <i>age : 45 – 54</i>                | 0.1*        | 1.98   | 0.09*       | 1.93   |
| <i>age : 55 – 64</i>                | 0.11*       | 1.90   | 0.11*       | 1.84   |
| <i>age : 65+</i>                    | 0.08        | 0.72   | 0.13        | 1.15   |
| <i>medium education</i>             | 0.08*       | 1.72   | 0.07        | 1.55   |
| <i>high education</i>               | 0.06        | 1.20   | 0.04        | 0.82   |
| <i>employed</i>                     | 0.16**      | 2.48   | 0.15**      | 2.30   |
| <i>retired/inactive</i>             | 0.08        | 1.05   | 0.06        | 0.75   |
| <i>mrt<sub>i</sub></i>              | 0.02        | 0.64   | 0.02        | 0.60   |
| <i>other mortgage</i>               | 0.03**      | 2.27   | 0.02**      | 2.40   |
| <i>unsecured debt</i>               | 0.03        | 1.10   | 0.03        | 1.03   |
| <i>saves – invests</i>              | 0.01        | 0.03   | 0.01        | 0.31   |
| <i>Expects better</i>               | 0.08**      | 1.83   |             |        |
| <i>Expects no struggle</i>          |             |        | -0.04       | -1.21  |
| <b>N</b>                            | 1,283       |        | 1,310       |        |
| <b>F-stat</b>                       | 28.78       |        | 28.16       |        |
| <b>Prob&gt;F</b>                    | 0.0000      |        | 0.0000      |        |
| <b>Adj. R<sup>2</sup></b>           | 0.3023      |        | 0.2933      |        |

**Notes:** As a robustness check, the models reported in this table augment the original consumption models with additional controls for future income expectations. We use two different variables from the household survey to proxy for future income expectations; Model 1 includes a dummy variable ‘*expects better*’ that equals one for people who expect their financial circumstances to improve over the next year, and zero otherwise. Model 2 includes a dummy variable ‘*expects no struggle*’ that equals one for people who expect to be better able to keep up with their bills and credit commitments in a years time, and zero otherwise. Variable significance levels are captured as follows: \*\*\* Significant at 1 per cent level; \*\* Significant at 5 per cent level; \* Significant at 10 per cent level. The age, education and labour market status variables should be interpreted relative to their omitted categories, which are as follows: age group 18-34 years, low education level and unemployed labour market status, respectively.

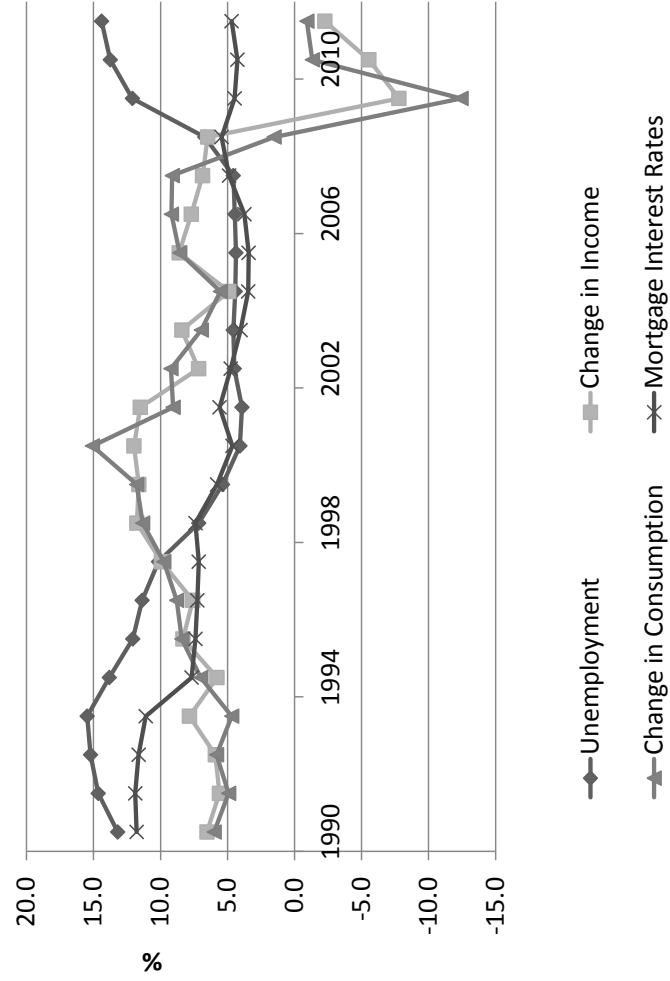
**Figure 1:**  
Select Irish Household Balance Sheet Items: 2002-2012



**Note:** This figure plots the value of total Irish household housing and financial assets over the period 2002 to 2012. The data is from the Central Bank of Ireland "Financial Sector Accounts". The data clearly illustrates both the significant increase and subsequent decline in the value of housing, compared with financial assets, in the Irish economy over the period in question.

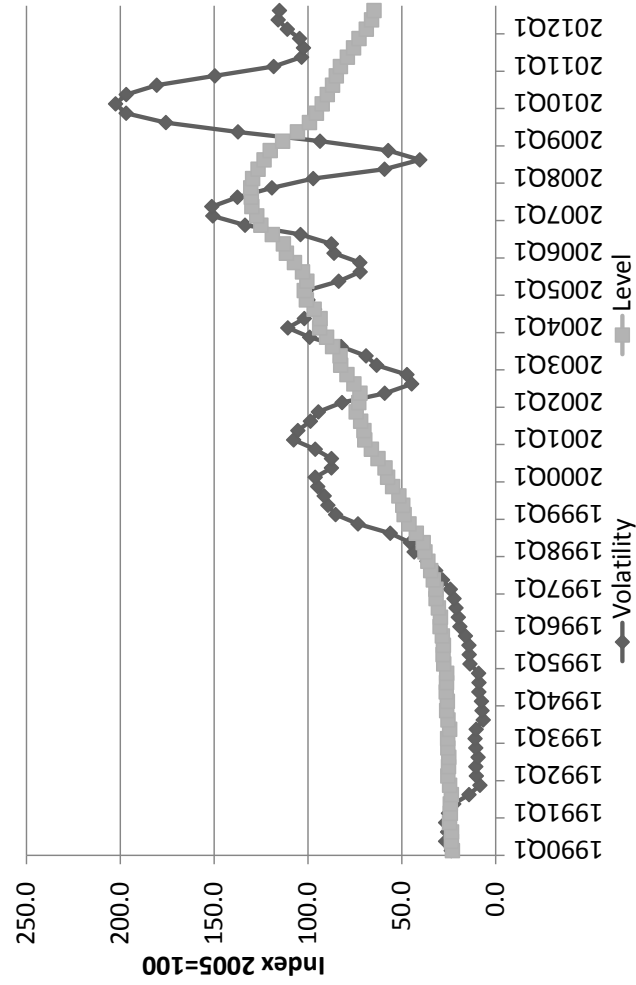


**Figure 2:**  
Select Irish Macroeconomic Variables: 1990-2011



**Note:** This figure plots key Irish macroeconomic data over the period 1990 to 2011. In particular it plots macroeconomic variables which are of interest to the housing market. The strong increases in consumption and income during the period of the Celtic Tiger are evident as is the fall in unemployment. Mortgage interest rates experienced a long consistent decline from the early 1990s.

**Figure 3:**  
Irish Nominal House Price Levels and Volatility: 1990-2012



**Note:** This figure plots both the actual price level and the volatility of Irish house prices over the period 1990 to 2012. The volatility is captured using an 8 quarter rolling standard deviation. From the chart it is clear that households are currently confronted both by a period of persistent downward house price movements and greater volatility in these movements.