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### The effect of unemployment, arrears and negative equity on consumption: Ireland in 2009/10

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*Abstract:* Since the onset of the financial crisis, income and consumption have fallen sharply in Ireland, particularly for young households. This paper shows that young households are more likely than older ones to be exposed to unemployment, arrears and negative equity. These may give rise to credit constraints and buffer-stock savings. Savings may be built up not only to finance future consumption, but also to deleverage, since high indebtedness makes the access to additional credit more difficult. We show that the permanent income hypothesis, which posits that consumption should evolve more smoothly than actual income, apparently fails to hold for households in negative equity, at risk thereof and at risk of unemployment. This may have caused much of the decline in aggregate consumption during the crisis.

*Key words:* Credit constraints, Ireland, Household Budget Survey

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# The effect of unemployment, arrears and negative equity on consumption: Ireland in 2009/10

## 1. Introduction

Between the beginning of the financial crisis in 2007 and the end of 2012, real per capita income and consumption in Ireland have both decreased by 20%.<sup>1</sup> Data available from the Irish Household Budget Survey (HBS) suggest that this decline is mainly due to a drop in consumption of households where the reference person is under the age of 55.

Indeed, consumption has declined below income for most of these households, which means that they have started saving. This seems to contradict the permanent income hypothesis (Friedman, 1957), which states that households smooth consumption to a level that mirrors their life-time income, even if actual income varies over time. If actual income falls temporarily, earlier savings and loans should be used to smooth consumption.

Why then has Irish consumption fallen so much? It seems highly likely that households have corrected downward their permanent income expectations since the end of the boom. Presumably, however, this correction was smaller than the drop in actual income, because incomes tend to recover after the end of recessions. If permanent income expectations are higher than actual household income, consumption should be higher than actual income. In the data, the opposite is true for many households, and there are two possible explanations for this.

First, credit constraints may be binding. The literature on credit constraints goes back to Leland (1968) and Tobin and Dolde (1971).<sup>2</sup> The main hypothesis in this literature is that households that represent a poor credit risk from the point of view of a bank are unable to smooth consumption because they cannot get loans. Earlier studies have shown that credit constraints tend to matter for young, unemployed households with little education or wealth. In the Irish context, households in negative equity – having no collateral to offer – and households in arrears – already having a poor credit record – are likely to be deemed a poor credit risk by banks as well.<sup>3</sup>

Second, buffer-stock savings may depress consumption. This strand of the literature posits that even if credit constraints are not currently binding, risk averse households try to avoid a situation of binding credit constraints in the future by building up savings beforehand (see

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<sup>1</sup> See O'Connell et al (2013) for a comparison of real per capita consumption before and during the financial crisis in the euro zone. Studies on Irish household consumption include Hogan and O'Sullivan (2007), Lydon and O'Hanlon (2012) and Gerlach-Kristen (forthcoming).

<sup>2</sup> Another strand of the literature on the permanent income hypothesis tests for excess sensitivity of consumption, i.e. if households that do not face credit constraints respond to temporary income changes. There is considerable evidence for excess sensitivity, even though this contradicts the permanent income hypothesis (see e.g. Hall and Mishkin, 1982, Bernanke, 1985, and Campbell and Mankiw, 1990).

<sup>3</sup> Disney et al (2010) find in UK data that the consumption pattern of households in negative equity differs from that of other households.

e.g. Deaton, 1991, and Carroll, 1992). If uncertainty about the future suddenly rises, as it arguably has done with the onset of the crisis, buffer-stock savings could cause a considerable decline in consumption.

In the Irish context, savings may not only be used to finance future consumption, but also to deleverage. During the boom years, banks' lending standards were rather lax and existing debt was not a major factor making the access to additional credit difficult. This has changed with the crisis. The level of personal indebtedness, be it in form of mortgage or other loans, has become a crucial factor in banks' decisions to allocate loans, so that high debt now is a constraint in the access to credit.<sup>4</sup> Households thus have an incentive to pay back outstanding loans, and this deleveraging is at least partially financed out of reduced consumption. The incentive to deleverage is particularly strong for households in negative equity, given their lack of collateral.

This paper asks what households are likely to be facing credit constraints or building up buffer-stock savings, and if their consumption pattern differs from that of others. In particular, we examine what households are affected by unemployment, arrears and negative equity, and find that young households are particularly exposed to these problems. We then estimate household consumption functions and test the permanent income hypothesis. It seems that households in negative equity, those at risk of negative equity and those at risk of unemployment do not smooth consumption. We interpret this as evidence of credit constraints and/or deleveraging for households in negative equity, as evidence of buffer-stock savings for households at risk of unemployment and as evidence of buffer-stock savings and/or deleveraging for households at risk of negative equity.

We also calculate the impact on aggregate consumption. Credit constraints arising from negative equity seem to account for some of the decline but are dwarfed by the savings caused by the risk of negative equity and of unemployment. Overall, the simulations suggest two things. First, negative equity has a large impact on the Irish economy that is independent from its effect on banks' balance sheets. This implies that the importance of negative equity may have been underestimated. Second, uncertainty about the future is a major factor in the fall in Irish consumption. If sentiment turned, consumption might respond fast, though it seems likely that the process of deleveraging would continue and slow down the recovery.

The rest of the paper is structured as follows. Section 2 presents the data. In Section 3 we study what households are likeliest to be affected by unemployment, arrears and negative equity. We then go on to assess in Section 4 if unemployment, arrears and negative equity affect spending behaviour, or if the risk of future unemployment and negative equity does. Section 5 computes the macroeconomic impact of credit constraints, and Section 6 concludes.

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<sup>4</sup> The HBS does not provide data on the value of non-mortgage loans. We therefore concentrate on mortgages, and more specifically on negative equity, in the analysis.

## 2. The data

The Irish HBS provides detailed information on household composition, expenditure, labour situation and income.<sup>5</sup> There also is information on financial circumstances, though this is more limited (e.g. the number of loans is reported, but not their value). In this study, we use four waves of the HBS, spanning data from 1994 to 2010. There are between 5889 and 7877 households in the individual waves. Since in each wave different households were interviewed, we are dealing with a series of cross-sectional datasets, not with a panel.

### 2.1 Consumption, actual and permanent income

We define as consumption all expenditure items except mortgage and rent payments.<sup>6</sup> We exclude housing expenditure because of arrears. The reason for this is as follows. A household in arrears automatically has lower monthly expenditures than a similar household that makes mortgage payments. If we were analysing consumption including housing payments, where made, a regression that included an arrears dummy would automatically suggest a large negative effect of arrears in consumption. By concentrating on non-housing expenditure only, the arrears dummy may be negative (if households in arrears save, for instance to start paying again next month) or positive (if households use the money not spent on the mortgage payment on consumption items). We therefore think that excluding housing expenditure is desirable, but we also perform robustness checks that include housing expenditure in consumption.

Figure 1 shows weekly consumption and disposable income by age group. The data underlying are from the HBS and are inflation adjusted to the 2010 price level. The percentage indicated in each plot reflects how large the respective age group is relative to the whole population. Income measures disposable income, i.e. earnings from labour, property and other assets after taxes.

The impact of the crisis is most clearly visible for young households (defined as having a household reference person under the age of 35). Both disposable income and consumption drop sharply between 2004/05 and 2009/10, by on average 25.2% and 41.3%, respectively. For households in the middle-age bracket (head between 35 and 54 years of age), income rose by 4.4% in real terms, while consumption declined by 14.2%. For older households, income rose by 62.5% and consumption by 49.8%.

In interpreting these results, it is important to note that the plots in Figure 1 show households in the respective age group at the time of data collection. Thus, a household with a head aged 50 in the 1999/2000 survey contributes to the average shown for that period in the “middle-aged” plot. In the 2009/2010 survey, this household, the head now

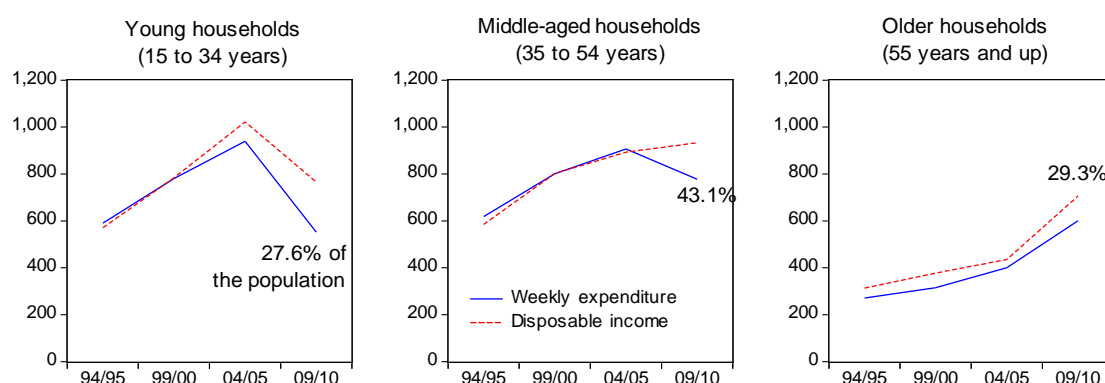
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<sup>5</sup> Income and consumption are reported for the household as a whole, not broken down by individual.

<sup>6</sup> The HBS reports expenditure, not consumption. This means that a household's consumption jumps up if for instance a new car is bought. The consumption utility derived from the services of the car is not recorded in the data.

being aged 60, contributes to the “older” plot. Since education and thus income levels of those aged 60 in 2009/10 clearly exceeded those of 60-year olds in 1999/2000, the rise in income for elder households is at least partly explained by more highly educated households aging. That said, Callan et al (2013) examine the impact of the crisis on the Irish income distribution and find that older households have suffered least.

**Figure 1: Weekly real consumption and disposable income by age group**



*Note:* Values in 2010 prices, age of the household reference person. Average income and consumption by group, taking into account the grossing factors capturing the representativeness of the individual households interviewed in the HBS. Percentage numbers indicate the size of a group in question relative to the full population.

Figure 1 suggests that the typical older household was saving in all four HBS waves. Young households began consuming less than their current income in the 2004/05 survey, and middle-aged households in 2009/10. It is interesting to note that if housing expenditure is counted as expense, young households spent more than they earned in 2004/05 and only began saving in 2009/10.<sup>7</sup>

Permanent income is central to consumption studies. In micro panel studies, permanent income is often proxied by the long-term average income of the individual household. We are not able to construct individual average income from the HBS since the survey waves constitute a series of cross-sectional datasets rather than a panel.

Nevertheless there is a way to make use of the time-series dimension in income. Similar to the work on pseudo panels in Alessi et al (1997), we create groups of households with shared characteristics and compute their average income over time. In particular, we create 27 groups that differ by age (young, middle-aged, older), by education level (low, middle, high) and by tenancy (renters, mortgage and outright owners).<sup>8</sup>

<sup>7</sup> For the economy as a whole, the savings rate computed from Gross National Disposable Income and personal savings before stock appreciation is 4.2% for 1995, -0.5% for the year 2000, 2.9% for 2005 and 3.8% for 2010.

<sup>8</sup> The exact education groups are: no formal education, primary education, lower secondary (which we all count as low education level), higher secondary, post leaving certificate, higher certificate (middle education level), ordinary degree, honours degree, postgraduate degree (high education level) and other.

We then compute the permanent real income for all young renter households with low education levels as the average over time of the average income in that group in each HBS wave. Taking the average over time helps us address that permanent income expectations were presumably too high during the boom. Table 1 shows the permanent income estimates. Mortgage owners, more educated households and middle-aged households tend to have the highest permanent incomes.

**Table 1: Estimates of permanent income by tenancy and education level**

Education	Renters			Mortgage owners			Outright owners		
	low	middle	high	low	middle	High	low	middle	high
Young	507	663	889	817	919	1098	672	689	899
Middle aged	467	575	820	827	996	1185	700	841	1100
Older	301	357	298	516	704	777	397	509	485

*Note:* Permanent income, in 2010 euros, by population group, constructed as the average over time of the average group income in the 1994/95 to 2009/10 HBS waves. Young = household reference person between 15 and 34 years of age, middle aged = between 35 and 54 years, older = 55 years and up.

## 2.2 Unemployment, arrears and negative equity

In the 2009/10 HBS, 15.5% of all households had at least one unemployed member. The Quarterly National Household Survey, for comparison, records for the period in which these HBS interviews were conducted, 2009Q3 to 2010Q3, an overall unemployment rate rising from 12.9% to 14.1%.

In the analysis, we concentrate on unemployment of the household reference person, since his/her income, when in work, tends to be the largest.<sup>9</sup> Table 2 shows that in the 2009/10 survey, 9.3% of all household reference persons were unemployed. This is a sharp increase compared with the 2004/05 survey, when only 2.0% of households had an unemployed head.

**Table 2: Prevalence of unemployment, arrears and negative equity**

	2009/10	2004/05	1999/2000	1994/95
Unemployed household reference person	9.3%	2.0%	3.4%	7.9%
Arrears	Overall	2.0%	0.5%	1.9%
	Of mortgages	5.3%	1.4%	5.3%
Negative equity	Overall	3.6%	0	0
	Of mortgages	9.5%	0	0

*Note:* Survey averages.

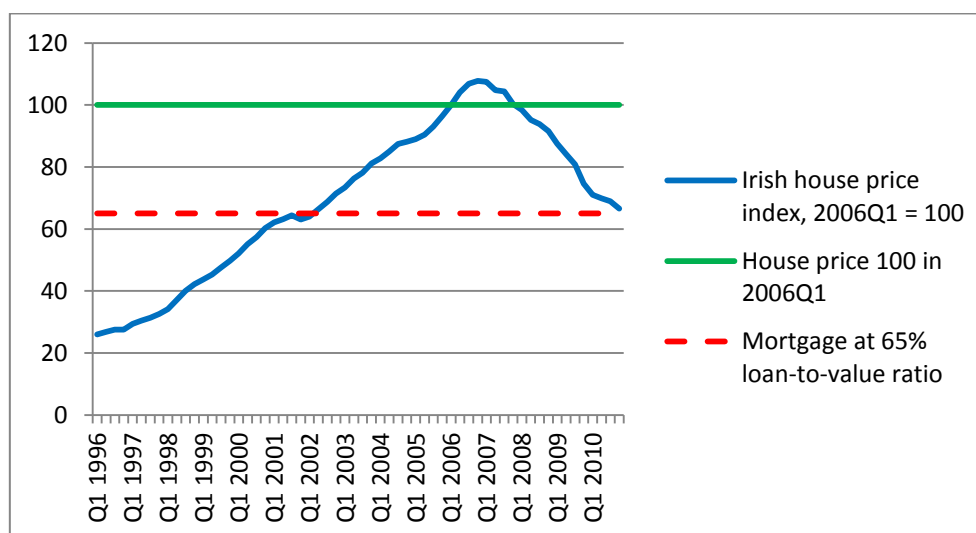
<sup>9</sup> We also considered unemployment of other household members, which affected 11.7% of the households in the 2009/10 HBS wave, many of which had low education levels and were young. We did not identify a systematic impact of this variable on consumption, and therefore do not comment on it further.

We define arrears as a situation in which a mortgage household has not made a mortgage interest rate payment in the past month. We thus capture 30-day arrears, rather than the standard 90-days arrears measure and therefore are bound to find a relatively large prevalence of arrears. On the other hand, we are unable to identify households that only made a partial payment or households that missed a payment before the interview but not in the month itself. Standard arrears measures also include these cases, so that we may be underestimating the incidence of arrears. Indeed, we identify only 2.0% of all households, or 5.3% of mortgage households, in the 2009/10 HBS as being in arrears. Kennedy and McIndoe Calder (2011) report for the end of 2010 a 30-days arrears rate of 12.3% of all mortgage households. Nevertheless, our measure identifies the rise in arrears after the onset of the crisis: compared with the 2004/05 survey, our measure roughly quadruples.

The last row in Table 2 shows our estimate of negative equity. This variable is only a rough proxy since the HBS does not provide information on property values. Instead, we have constructed a dummy that takes the value of unity if a mortgage household last moved place between 2006 and 2007.<sup>10</sup> Figure 2 illustrates why we choose this measures.

National property prices had by the end of 2010 fallen back to the level of mid-2002. Kennedy and McIndoe Calder (2011) report an average loan-to-value ratio of about 65% in the years before the crisis.<sup>11</sup> In the figure, it can be seen that a household that purchased in mid-2006 a place with a 65% loan-to-value ratio had slid into negative equity by the end of 2010.

**Figure 2:** Irish house prices and the emergence of negative equity



Note: Permanent tsb/ESRI house price index, normalised to 100 for 2006Q1. The index was discontinued in 2011,

<sup>10</sup> More precisely, we count in the negative equity group those mortgage households that moved three years before the interview. Thus, for households interviewed in 2009, this covers moves in 2006, and for households interviewed in 2010, moves in 2007. We also considered if concentrating on negative equity households with children, who might most urgently need to move house, improves the consumption estimates below, but no clear pattern emerged.

<sup>11</sup> Duffy (2012) reports that at the peak in 2009, the average loan-to-value ratio was 94% for new houses and 85% for second-hand houses.

when the CSO began publishing its own index.

Using this definition of negative equity, we find that 3.6% of all households in the sample or 9.5% of all mortgage households were in negative equity in 2009/10. Again, this is a conservative estimate. For comparison, Kennedy and McIndoe Calder (2011) report that 30.6% of all mortgages were in negative equity at the end of 2010.<sup>12</sup> For the earlier surveys, Table 2 reports zero negative equity because of the steady house price increase in the years before the financial crisis.

Since the consumption analysis below considers the possibility that the risk of negative equity may also reduce expenditure, we construct a simple measure for negative equity risk. In particular, we define households that purchased a home with a mortgage between 2001 and 2006 and that haven't moved place since as at risk of negative equity.<sup>13</sup> This definition captures 13.8% of all households in the 2009/10 HBS wave, or 36.9% of the mortgage households.

### 3. The risk of unemployment, arrears and negative equity

As a first step of our analysis, we examine what households are faced with unemployment, arrears and negative equity.

#### 3.1 Unemployment

Table 3 shows what households have an unemployed head.<sup>14</sup> Our baseline household is a single man who rents privately in an urban area. The regressions suggest that unemployment is more likely, the younger and less educated this person is. Unemployment is less likely in households with a female head, for self-employed individuals and for those that own a house, be it outright or with a mortgage. These results are stable over the different HBS waves.<sup>15</sup> The role of family size and children seems to have changed over time, with families with many grown-ups being less likely to have an unemployed head in 2009/10, but more likely in 1994/95. Also, while in the 1990s rural households were less likely to be unemployed than those in cities, the opposite seems true in 2009/10.

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<sup>12</sup> Duffy and O'Hanlon (2013) present a study that concentrates on property purchases after January 2005 and includes apartments. In their data set, 50% of households were in negative equity by the end of 2010.

<sup>13</sup> This variable is constructed by counting mortgage households that moved between four and eight years before the interview.

<sup>14</sup> We also analysed what households are likely to have other members than the head unemployed. It generally were young households with little education and low permanent income. Since other unemployed household members do not matter significantly in the consumption equations, we do not report those results here.

<sup>15</sup> The marginal effects are rather small. For instance, for a single urban male renting employee with average permanent income, the marginal effect of *age* is -0.058.



**Table 3: Unemployment risk of household reference person**

	2009/10	2004/05	1999/2000	1994/95
Age	-0.205***	-0.207***	-0.150***	-0.305***
Education	-0.164***	-0.095***	-0.047**	-0.326***
Female	-0.416***	-0.362***	-0.470***	-0.673***
Size	-0.059*	-0.021	0.061**	0.068***
Children	0.127***	-0.024	-0.056	-0.062**
Rural	0.128**	-0.111	-0.002	-0.165***
Self-employed	-0.700***	-0.593***	-0.732***	-0.851***
Local authority housing	-0.065	0.139	0.294**	0.107
Outright owner	-0.501***	-0.302**	-0.271**	-0.393***
Mortgage owner	-0.513***	-0.629***	-0.426***	-0.587***
Permanent income	0.110***	-0.063**	-0.139***	0.118***
Number of obs	5196	6464	7494	7661

*Note:* Probit estimates, robust standard errors. Permanent income in real terms and in logs. \* /\*\*/\*\*\* denotes significance at the 10/5/1 percent level.

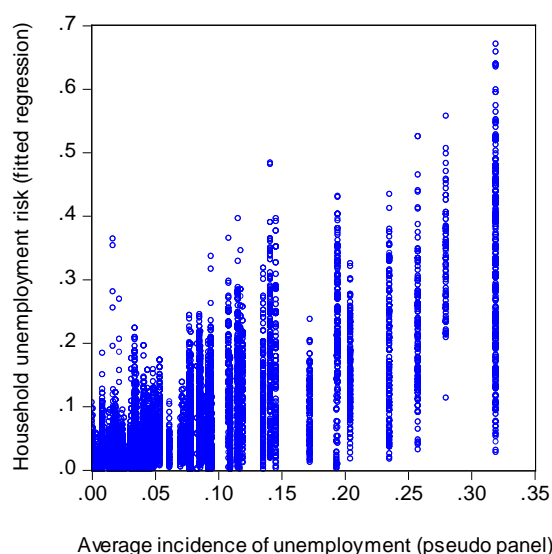
The most interesting finding concerns permanent income. In 2009/10, household reference persons with a high permanent income were particularly likely to be unemployed. In earlier surveys, this was not the case. One explanation for this finding for 2009/10 is that this reflects the drop in employment in the previously well-paying boom sectors (construction, real estate services, financial services etc). Before the crisis, by contrast, unemployment typically affected households with low permanent income.

In the consumption analysis below, we examine if actual unemployment affects consumption, which it may because of credit constraints. We are also interested in the question if the risk of unemployment leads to lower consumption through buffer-stock savings. We measure a household's risk of unemployment in two ways. First, we use the fitted values from the equations underlying Table 3. This is attractive because this risk measure is household specific, but it has the drawback that it is a generated regressor. Pagan (1984) shows that generated regressors yield biased coefficient estimates and standard errors.

We try to correct for this bias by treating the household unemployment risk as a variable with measurement error and instrument it with our second measure of unemployment risk. This second measure is computed using the pseudo panels discussed in Section 2. In particular, we compute for each wave of the HBS the incidence of unemployment for the population subgroups we used above, defined by age, education level and tenancy.

Figure 3 plots for the 2009/10 HBS wave the household-specific unemployment risk against the pseudo-panel unemployment. It is clear that the household-specific and the panel measures are positively correlated, though the variance of the former is considerably larger. We will return to these measures in Section 4 below.

Figure 3: Measures of unemployment risk, 2009/10 HBS wave



### 3.2 Arrears

Next we turn to the question which households are most likely to be in arrears. Table 4 shows the analysis, using data for mortgage households only. We find that a low current income relative to permanent income is a crucial predictor of arrears over the different HBS waves. Households that expect a high income, get a mortgage reflecting these expectations and then are confronted with a drop in current income find themselves overstretched and go into arrears. Unemployment does only matter separately in the 1994/95 wave, and negative equity is insignificant.<sup>16</sup>

Table 4: The risk of arrears

	2009/10	2004/05	1999/2000	1994/95
Age	-0.101*	0.248***	0.297***	0.386***
Education	-0.078*	-0.331***	-0.162***	-0.412***
Female	0.046	0.099	0.374***	0.134
Size	-0.010	0.185**	0.197***	0.179***
Children	0.110	-0.259**	-0.216***	-0.107**
Rural	-0.237**	-0.455**	-0.295***	-0.459***
Self employed	-0.218	-0.299	-0.163	-0.473***
Permanent income	0.301***	-0.049	0.316***	0.331***
Current income	-0.452***	-0.317**	-0.627***	-0.535***
Unemployment	0.232	0.398	-0.010	0.359***
Negative equity	0.141	NA	NA	NA
Number of obs	1937	2295	2628	2827

Note: Probit estimates, robust standard errors. Permanent and current income in real terms and in logs. \* /\*\*/\*\*\* denotes significance at the 10/5/1 percent level.

<sup>16</sup> If we drop the income measures, unemployment becomes highly significant in all periods. Interestingly, the coefficient on current income is larger in absolute values than that on permanent income. Prima facie, this suggests that a low current income reduces the probability of a household going into arrears. However, the comparatively small coefficient on permanent income may simply reflect that we are using a poor proxy and obtain a coefficient estimate that is biased downward because of this measurement problem.

Arrears are more common in urban areas and for households with low education levels. Before the crisis, arrears were also more frequent for large households with few children. This pattern disappears in 2009/10. Most striking, however, is the change in sign on age. Whereas before the crisis it were mainly older households that went into arrears, in the crisis it are the young. This is compatible with the notion taken from Figure 1 that they have been the population group most affected by the crisis.

### 3.3 Negative equity

Table 5 shows what households were particularly likely to be in negative equity. The analysis is performed only on the 2009/10 HBS wave since house prices were increasing in the earlier survey periods and our negative equity measure is zero. Since house prices had increased steadily in the years before the crisis, only more recent mortgage households should be affected, and since it is not surprising that age is the most important variable in explaining negative equity. The younger the mortgage household, the more likely it is to be in negative equity. This finding is in line with Duffy and O’Hanlon (2013). There is also weak evidence that self-employed households are more likely to be affected.

**Table 5: The risk of negative equity**

	2009/10
Age	-0.328***
Education	0.029
Female	0.035
Size	-0.062
Children	-0.043
Rural	0.090
Self employed	0.166*
Permanent income	-0.032
Current income	0.035
Unemployment	0.083
Number of obs	1937

*Note:* Probit estimates, robust standard errors. Permanent and current income in logs. \* /\*\*/\*\*\* denotes significance at the 10/5/1 percent level. Since negative equity is constructed as mortgage households that moved place in 2006 or 2007, estimation for earlier HBS waves is not possible.

## 4. The impact of unemployment, arrears and negative equity on consumption

We now turn to the question of what impact unemployment, arrears and negative equity have had on consumption during the crisis. In particular, we examine if current credit constraints cause consumption smoothing to fail or if the fear of future constraints cause buffer-stock savings.

#### 4.1 Baseline model

The standard consumption function assumes that consumption of household  $j$  depends on permanent income in a nonlinear fashion,

$$C_j = AY_j^b,$$

where  $A$  is a shift factor and  $b$  is the income elasticity of consumption, also called the marginal propensity to consume out of income. Taking the logarithm and denoting  $c_j = \log(C_j)$  etc, one obtains

$$c_j = a + by_j.$$

In our regressions, we let  $a$  depend on demographic characteristics of the household, tenancy status and self-, employment. Moreover, we let  $a$  and  $b$  vary depending on whether a household is unemployed, in arrears or negative equity (and thus potentially facing credit constraints), or at risk of unemployment or negative equity (which might cause buffer-stock savings).<sup>17</sup> It should be noted that a household at risk of arrears are not expected be saving to build up a buffer stock but to use resources available to meet its mortgage payments. We thus do not expect savings in this situation, and preliminary regressions confirmed this guess. We therefore do not include a measure of the risk of arrears in our regressions.

Our hypotheses are the following. First, the permanent income hypothesis should hold for most households, i.e.  $b=1$ . When permanent income changes by one percentage point, so does consumption. Second, households in unemployment, arrears or negative equity face credit constraints and are therefore unable to smooth consumption, i.e.  $b<1$ . Third, households in negative equity may save to deleverage, again implying  $b<1$ . Fourth, households that face the risk of future unemployment build up buffer-stock savings and therefore do not smooth consumption, i.e. again  $b<1$ . Fifth, households at risk of negative equity may build up buffer-stock savings as well, but they also may save to deleverage. Both of these imply  $b<1$ .

Since it is a common finding in the literature that young households are subject to credit constraints, we also test if there is a separate effect beyond the fact that unemployment, arrears and negative equity mainly affect younger households. To do so, we construct a separate dummy *young* that takes the value of unity for household reference persons under 35 years of age and zero otherwise.

We estimate the consumption equation using GMM, for two reasons. First, since the permanent income hypothesis states that permanent, rather than current, income drives consumption decisions, we treat current household income as an imperfect measure of permanent. To control for measurement error, we instrument current income with variables related to permanent income, but not to consumption (see also Gerlach-Kristen, forthcoming). In particular, we use the pseudo-panel estimate of permanent consumption,

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<sup>17</sup> We also tried interacting  $b$  with demographic, tenancy and employment information, but these interactions were generally insignificant.

the education level and the gender of the household reference person. The rationale for the two latter instruments is that better educated individuals tend to earn more, as do men.<sup>18</sup>

Second, our measures of unemployment risk are generated regressors, since they have been constructed as the fitted values of the regressions for unemployed household reference persons and other household members.<sup>19</sup> Pagan (1984) has shown that this can cause biased coefficient estimates and standard errors and suggests estimating all regressions simultaneously. However, since the unemployment regression is a probit and the consumption equation uses instrumental variables for income, this way forward is impracticable. Instead, we treat our measures of unemployment risk as variables with measurement error and instrument them with the pseudo-panel measures of unemployment presented in Figure 3.

Table 6 presents the estimates by HBS wave. For the 2009/10 data, we estimate an income elasticity of consumption  $b$  of 0.97. A Wald test does not reject the hypothesis of this coefficient being equal to unity (p-value 0.52). The permanent income hypothesis is thus not rejected for households that are not exposed to unemployment, arrears or negative equity.

However, we find that negative equity and the risk thereof significantly decrease the income elasticity of consumption. This is compatible with the existence of credit constraints and/or deleveraging for those in actual negative equity, and buffer-stock savings and/or deleveraging for those at risk. Unemployment, the risk thereof and arrears are insignificant, albeit at low probability levels ranging between 0.11 and 0.18. The bottom of the table shows p-value for a Wald test that the permanent income hypothesis holds for households we expect to face credit constraints or to build up buffer-stock savings. The test is rejected for households in negative equity and the risk thereof, and close to rejection levels for unemployment, arrears and the risk of unemployment.

It should be noted that we estimate significantly larger shift factors for households facing negative equity than for the baseline household. This suggests that savings only occur from a certain income level onwards. In particular, negative equity seems to depress consumption from an income level of 814 euros onwards, and the risk of negative equity from 802 euros onwards. Poorer households do not appear to save because of negative equity.

Importantly, we do not find a separate impact of young age on the income elasticity for consumption in 2009/10. The estimation thus suggests that the low consumption of younger households shown in Figure 1 is due to negative equity and the risk thereof, but not to age per se.

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<sup>18</sup> J-tests for the exogeneity of these instruments with respect to consumption do not reject by a wide margin.

<sup>19</sup> Our measure of the risk of negative equity, which is a dummy for mortgage households that last moved place between 2001 and 2006, is not constructed from a first-stage regression and thus not a generated regressor.

**Table 6: Consumption function estimates**

	2009/10	2004/05	1999/2000	1994/95
Constant	-0.232	-0.030	2.345***	-1.091***
Age	-0.027***	-0.036***	-0.103***	-0.054***
Size	0.064***	0.050***	0.255***	0.073**
Children	-0.005	-0.032**	-0.205***	-0.057***
Rural	0.032**	0.003	-0.071**	0.091***
Local authority housing	0.104***	0.155***	-0.559***	0.042
Outright owned	0.254***	0.225***	0.110**	-0.005
Mortgage owned	0.206***	0.189***	0.343***	0.150***
Self employed	0.100***	0.059**	0.214***	0.168***
Young	-1.922	0.914*	0.109	0.498
Unemployment	2.717*	-0.523	2.966	1.313
Arrears	1.357	-0.807	0.903	1.980*
Negative equity	3.733***			
Risk of unemployment	3.995	1.582	32.249*	-3.281
Risk of negative equity	2.902***			
Income	0.969***	0.965***	0.632***	1.105***
Income*young	0.300	-0.139*	-0.027	-0.067
Income*unemployment	-0.427	0.103	-0.470*	-0.147
Income*arrears	-0.218	0.112	-0.156	-0.250*
Income*negative equity	-0.557***			
Income*risk of unemployment	-0.737	-0.397	-3.873*	0.406
Income*risk of negative equity	-0.434***			
Number of obs	5196	6464	3497	3220
Adjusted R <sup>2</sup>	0.587	0.626	0.598	0.615
Test of permanent income hypothesis (p-values)				
Unemployment	0.101	0.866	0.003	0.792
Arrears	0.131	0.772	0.000	0.291
Negative equity	0.000			
Risk of unemployment	0.118	0.794	0.063	0.292
Risk of negative equity	0.000			

*Note:* GMM estimates. Income instrumented with pseudo-panel permanent income, household reference person age and gender, individual household unemployment prediction instrumented with pseudo-panel average unemployment. Income and consumption in real terms and in logs. \* /\*\*/\*\*\* denotes significance at the 10/5/1 percent level.

#### 4.2 Robustness checks

The rest of Table 6 shows estimates for earlier HBS waves. In the 2004/05 wave, we identify a significantly negative impact of young age on the income elasticity. Thus, it seems to have been more difficult for young households to smooth consumption during the boom years. The permanent income hypothesis is rejected with a p-value of 0.05 (not reported in the table). This evidence is compatible with the literature reporting tighter credit constraints for younger households.

In the 1999/2000 survey, the permanent income hypothesis is rejected for households with an unemployed head and one at risk. It is also rejected for those in arrears, even though the interaction term with income is insignificant. Thus, credit constraints and buffer-stock

savings seem to have affected consumption at the turn of the millennium. Finally, we estimate a significant interaction between arrears and income in 1994/95. The permanent income hypothesis, however, is not rejected.

This analysis over time suggests that credit constraints and buffer-stock savings existed and affected consumption in the late 1990s and early 2000, and thus in a period when rapid growth was arguably still driven by fundamentals. In 2004/05, during the bubble years, credit constraints do not appear to have played a role in consumption decisions. This is compatible with the broad anecdotal evidence of how easily loans were available during that period. With the onset of the crisis, credit constraints seem to have started to matter again, and buffer-stock savings seem to be built up.

Table 7 presents further robustness checks for the 2009/10 HBS wave. The first two columns examine whether the results depend on our treatment of the generated regressors capturing the risk of unemployment. The first column presents results disregarding this problem entirely and thus not instrumenting with the pseudo-panel average unemployment, the second column uses the pseudo-panel measure only. Concentrating on the tests on the permanent income hypothesis, we find for both robustness checks that actual negative equity and the risk thereof again cause a rejection. Moreover, we find in both cases that the risk of unemployment has the same effect. In the regression using only individual unemployment data, the permanent income hypothesis is also rejected for households in arrears and with an unemployed head.

The third column presents estimates of the consumption function obtained if we include housing costs, i.e. rents for tenants and mortgage payments for mortgage households. As in the baseline regression, households in negative equity and at risk thereof do not seem to smooth consumption as predicted by the permanent income hypothesis. Moreover, we again also reject the hypothesis for households in arrears and at risk of unemployment.

**Table 7: Robustness checks**

	Individual un-employment risk only	Average un-employment risk only	Consumption including housing	Durables only	Non-durables only
Constant	-0.266	-0.831***	0.346	-1.601***	1.016**
Age	-0.029***	-0.011	-0.039***	-0.020**	-0.052***
Size	0.067***	0.057**	0.036**	0.008	0.208***
Children	-0.004	-0.017	0.007	0.037**	-0.111***
Rural	0.035**	0.022	0.009	0.038**	0.043
Local authority housing	0.095***	0.095**	-0.067**	0.094**	0.072
Outright owned	0.248***	0.278***	-0.026	0.206***	0.336***
Mortgage owned	0.198***	0.246***	0.120***	0.136***	0.366***
Self employed	0.092***	0.149***	0.111***	0.110***	0.090***
Young	-2.071	-2.592	-1.325	-0.733	-4.651*
Unemployment	2.939*	-0.034	1.326	1.065	5.280**
Arrears	1.611	1.719	1.486	2.390**	-0.910
Negative equity	4.148***	3.924***	3.654***	2.451**	4.886***
Risk of unemployment	4.682**	11.770***	4.164	-0.049	11.262**
Risk of negative equity	3.002***	3.049***	2.328***	3.010***	2.273***
Income	0.978***	1.044***	0.944***	1.136***	0.552***
Income*young	0.322	0.401	0.203	0.107	0.735*
Income*un-employment	-0.463*	0.014	-0.196	-0.151	-0.855**
Income*arrears	-0.256	-0.270	-0.271	-0.368**	0.120
Income*negative equity	-0.618***	-0.585***	-0.535***	-0.372**	-0.729***
Income*risk of unemployment	-0.860**	-1.857***	-0.734*	-0.126	-1.839**
Income*risk of negative equity	-0.449***	-0.455***	-0.343***	-0.448***	-0.345***
Adjusted R <sup>2</sup>	0.591	0.582	0.641	0.589	0.253
Test of permanent income hypothesis (p-values)					
Unemployment	0.066	0.844	0.292	0.961	0.001
Arrears	0.093	0.177	0.049	0.199	0.115
Negative equity	0.000	0.001	0.000	0.162	0.000
Risk of unemployment	0.001	0.002	0.056	0.985	0.001
Risk of negative equity	0.000	0.000	0.000	0.000	0.000

*Note:* GMM estimates for 2009/10 HBS wave, 5196 observations. Income instrumented with pseudo-panel permanent income, household reference person age and gender, individual household unemployment prediction instrumented with pseudo-panel average unemployment, except for the first two columns where no instrument for unemployment is used. Income and consumption in logs. \* /\*\*/\*\*\* denotes significance at the 10/5/1 percent level.



The last two columns split our baseline measure of consumption, excluding housing costs, into durable and non-durable consumption.<sup>20</sup> The permanent income hypothesis regarding durables is only rejected for households at the risk of negative equity. For non-durables, it is rejected for households with an unemployed household reference person, in negative equity, at risk of unemployment or at risk of negative equity. It thus appears that households mainly reduce their expenditure on non-durables, which we may think of as day-to-day items. Credit constraints and the fear thereof thus affect the quality of daily life.

### *4.3 Severity of the credit constraints*

For formulating policy, the central question is how important unemployment, arrears and negative equity are in reducing consumption. To gain a sense of how much consumption is lost due to credit constraints and buffer-stock savings, we turn to simulations.

For the simulations, we exclude the insignificant variables from the baseline regression presented in the first column of Table 6 by dropping them successively. When we do this, the impact of unemployment risk, which we had already detected in the robustness checks, becomes clear as well. Table 8 shows the restricted equation. Interestingly, the risk of unemployment causes the permanent income hypothesis to fail for households at all income levels. The risk of becoming unemployed thus seems to reduce consumption also in the lowest income brackets.<sup>21</sup>

Based on the estimates shown in Table 8, we first compute consumption for all households in our sample, using the grossing factors provided by the Central Statistics Office to account for how representative each household in the sample is. The sum of these values yields our estimate of aggregate consumption.<sup>22</sup> Compared with 2004/05, aggregate consumption in the 2009/10 survey is by 10.8% lower.

We then simulate the model, first setting to zero our measure for negative equity for all households, then setting to zero the risk of negative equity instead and then the risk of unemployment. It should be noted that we are not able to quantify the effect of the downward correction in permanent income expectations. We are unable to do so because we compute permanent income as an average by household type over all four HBS waves. If the HBS asked households in each wave about their permanent income expectations, we could examine the effect of a change. As it is, we cannot.

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<sup>20</sup> We define as durable consumption expenditures on what the HBS calls “durable household goods” and motor vehicles. Non-durables are motor vehicles and all remaining expenditure items.

<sup>21</sup> The level from which negative equity reduces consumption below that of the baseline household changes slightly from the regression shown in Table 6, 750 euros. The risk of negative equity now is estimated to depress consumption from an income of 810 euros onwards.

<sup>22</sup> As is common, the aggregate measure derived in this way falls short of the consumption data recorded in national accounts. While for the interview period 2009Q3 to 2010Q3, annual consumption in the Irish national account is 81.8 bln euros, we compute only an aggregate consumption of 46.2 bln. One explanation the literature offers for the underestimation of national aggregates in survey data is that partly or fully self-employed households underreport income and consumption.

**Table 8: Restricted model used in the simulations**

	2009/10
Age	-0.026***
Size	0.043***
Rural	0.038**
Local authority housing	0.127***
Outright owned	0.250***
Mortgage owned	0.205***
Self employed	0.125***
Unemployment	0.133***
Negative equity	3.112***
Risk of negative equity	2.860***
Income	0.940***
Income*negative equity	-0.470***
Income*risk of unemployment	-0.113***
Income*risk of negative equity	-0.427***
Number of obs	5196
Adjusted R <sup>2</sup>	0.587
Test of permanent income hypothesis (p-values)	
Income*negative equity	0.000
Income*risk of unemployment	0.000
Income*risk of negative equity	0.000

*Note:* GMM estimates. Income instrumented with pseudo-panel permanent income, household reference person age and gender, individual household unemployment prediction instrumented with pseudo-panel average unemployment. Income and consumption in real terms and in logs. \* /\*\* /\*\*\* denotes significance at the 10/5/1 percent level.

Consequently, our simulations may overstate the size of the effect of negative equity, its risk and the risk of unemployment on consumption. Nevertheless, it allows us to compare the relative sizes of the effects and draw policy conclusions from this.

We first set our measure for negative equity to zero for all households. Comparing the aggregate consumption derived for this simulation, we find that consumption would be 0.9% higher if there were no credit constraints and no deleveraging arising from negative equity. Performing the same calculation for negative equity risk, we find that in the absence of buffer-stock savings and deleveraging associated with this risk, aggregate consumption would be 3.1% higher.

Without unemployment risk, aggregate consumption would be 6.0% higher, though obviously, unemployment risk never is zero. While we compute the average unemployment risk as 8.9% in the 2009/10 survey, it was 2.1% in the 2004/05 survey, 3.4% in the 1999/2000 wave and 8.2% in 1994/95. If the probability of becoming unemployed had not changed from its 2004/05 level, aggregate consumption in 2009/10 would have been 4.5% higher.

Overall, these simulations suggest that negative equity, the risk thereof and the risk of unemployment have had a large effect on aggregate consumption. Because we are not able

to quantify the impact of the change in permanent income expectations, the point estimate of a 8.5% reduction should, however, be seen as an upper bound.

Nevertheless, two implications are worth pointing out. First, uncertainty, be it relating to negative equity or unemployment, accounts for more of the decline in consumption than actual credit constraints arising from negative equity. A sustained recovery of employment and house prices therefore would have a large effect on consumption and thus output. That said, the process of deleveraging would probably continue. Second, negative equity matters about as much in the decrease in consumption as the risk of unemployment. While there has been much public debate on what effect negative equity might have in the future on banks' balance sheets, this finding suggests that it is already now having a large impact on the economy through consumption.

## 5. Conclusions

Young Irish households have been particularly hard hit by the financial crisis. This paper shows that they have been more exposed than older households to unemployment, arrears and negative equity. These are all factors that can lead to credit constraints and thus a drop in consumption below permanent income in times when actual income declines. Also, the risk of unemployment and negative equity may give rise to buffer-stock savings, i.e. an attempt to put money aside for a rainy day in which credit constraints may start binding. Finally, households in negative equity, and more generally those with a high level of indebtedness, may consume little to use the savings to deleverage, because they find that high debt levels act as a credit constraint.

We estimate the impact of these credit constraint factors on consumption and find that negative equity, the risk thereof and the risk of the household reference person becoming unemployed seem to reduce consumption. Arrears and actual unemployment do not seem to matter systematically, while young age per se does not explain low consumption in 2009/10.

Two implications are important for policy. First, the risk of unemployment and negative equity has a much larger effect on aggregate consumption than actual negative equity. Once uncertainty recedes, Irish consumption might recover fast, though not to pre-crisis levels since permanent income expectations have shifted downwards. The recovery might also be slowed down by a continued process of deleveraging. Second, negative equity is having a large effect on the economy, not via banks' balance sheets, where at the time of writing they mainly represent a risk, but through consumption. A recovery of house prices would help consumption rise, while a further decline would depress it even more.

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