

***Dis-entangling the mortgage arrears crisis:
The role of the labour market, income volatility and housing equity***

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Abstract

Despite various efforts to address the mortgage arrears crisis, arrears remain at an elevated level. Designing policies to deal with such high levels of distress requires a deep understanding of the precise sources of the problem. Efforts to date, however, have been hampered by a lack of appropriate data. This paper relies on two new and unique datasets which overcome such issues. Specifically, using a combination of administrative loan-level data and a detailed survey of mortgage holders, we assess the role of the labour market, income volatility and housing equity in the mortgage arrears crisis. The results provide new insights on mortgage distress in Ireland; unemployment and housing equity are key drivers, as shown by previous research. However, the results also show that many borrowers experiencing arrears are currently employed. Many of these borrowers have suffered a significant drop in their income, a change in employment conditions or are in fragile employment, i.e. they are on a temporary contract, have been with their employer for a short time or have a history of unemployment. This shows that the current mortgage crisis, and efforts to prevent a further deterioration, requires more than simply targeting unemployment. Rather, such efforts should also aim to strengthen overall labour market conditions and job security.

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Non-technical summary

About one in five residential mortgages in Ireland are currently in a delinquent state. This high rate of arrears has prompted much debate and a number of policy interventions to deal with the crisis. To date, much of the discussion has centred on the role of negative equity and unemployment. Given the extent of the deterioration in these factors over such a short period of time, and the accepted role that these factors have played in mortgage distress in other countries, this is not surprising. However, other factors are also likely to be important to the Irish mortgage arrears story.

A sizeable portion of the stock of mortgages in Ireland was taken out at a time when the Irish economy was growing strongly and experiencing significant improvements in incomes and living standards. However, the sharp deterioration in the Irish economy since the onset of the current crisis has had a depressing effect on household incomes which goes beyond the impact of unemployment alone. In this context, additional labour market issues such as deteriorating employment terms and income volatility are also likely to be important considerations. Previous research has not been able to examine the impact of such factors since the existing datasets on mortgage arrears did not contain such information.

In this paper, we use two new and unique datasets to assess the main drivers of Irish mortgage arrears. Unlike previous datasets, these new sources include both detailed information on mortgage arrears and housing equity as well as up-to-date borrower specific information on affordability factors (such as income and labour market data) that are likely to be relevant to the Irish mortgage arrears story. The results provide new and important insights on mortgage arrears in Ireland.

We find that unemployment and housing equity are key drivers of mortgage arrears in Ireland, as shown by previous research. However, the results also show that many borrowers experiencing arrears are currently employed. The data show that many of these borrowers have experienced a significant drop in their income or a change in employment conditions. Furthermore, some of these borrowers are in fragile employment, i.e. they are on a temporary contract, have been with their employer for a short time or have a history of unemployment. This shows that the current mortgage crisis, and efforts to prevent a further deterioration, requires more than simply targeting negative equity and unemployment. Rather, such efforts should also aim to strengthen overall labour market conditions and job security.

1 Introduction

With about one in five residential mortgages in a delinquent state, the Irish mortgage crisis is arguably the most profound across the OECD. The high rate of mortgage arrears has prompted much debate and a number of policy interventions to deal with the crisis. Despite this, the high rate of mortgage arrears has persisted. Understanding the determinants of mortgage arrears is a complex and difficult task, particularly in the Irish case. To date much of the discussion has centred on the role of negative equity and unemployment. Given the extent of the deterioration in these factors over such a short period of time, and the accepted role that these factors have played in mortgage distress in other countries, this is not surprising. Average house prices in Ireland have fallen by over 50 per cent since they peaked in 2007, and current estimates suggest that up to 50 per cent of mortgage holders could be in a position of negative equity. Unemployment, on the other hand, increased sharply from only 4.6 per cent at the end of 2007 to a high of 15 per cent at the end of 2012. However, other factors are also likely to be important to the Irish mortgage arrears story.

Over the period 2004-2006, when house prices were at their peak, almost 340,000 mortgages were approved out of a total stock of about 800,000. At the time, the Irish economy was experiencing significant improvements in living standards and hence the general ability within the economy to sustain such mortgages was thought to be quite high. However, many of these mortgages were taken out by a relatively young population at a time when eased credit conditions provided access to relatively high loan-to-value mortgages and mortgage repayments that consumed significant portions of household income.¹ Against this backdrop, most mortgages were reliant on at least two incomes to sustain repayments, and more specifically, were reliant on incomes remaining at least as high as they were at the point of mortgage approval. The sharp deterioration in the Irish economy since the onset of the current crisis, however, has had a depressing effect on household incomes which goes beyond the impact of unemployment alone.² In this context, additional labour market issues such as deteriorating employment terms and income volatility are also likely to be important considerations.

In this paper, we follow the recent literature on mortgage distress and explore the role of housing equity and unemployment in driving Irish mortgage arrears. Crucially, however, we also examine the importance of changes in household income and the labour market for mortgage delinquencies. This is the first attempt to explore these factors in an Irish setting since previous work has been based on limited datasets that did not contain any borrower-specific information on current affordability variables. Some recent work has attempted to proxy for such factors using variables like regional unemployment and income trends. These variables cannot capture the full complexity of the interaction between labour market developments and financial distress, and, furthermore there is evidence that the use of such aggregate affordability proxies

¹See McCarthy and McQuinn (2013) for an overview of developments in credit conditions throughout the 2000s.

²See Callan et al. (2013) for more on this.

can substantially underestimate the role of even these limited factors in mortgage distress (see Gyourko and Tracy (2013) for more on this). The work in this paper, therefore, will shed new light on the mortgage arrears crisis in Ireland.

The ability to undertake such a detailed analysis of mortgage arrears arises out of two new and unique datasets. The first is a mortgage loan-level dataset collected by the Central Bank of Ireland as part of a prudential capital assessment review exercise of the Irish banking sector. Covering three Irish residential mortgage banks, which account for approximately 70 per cent of the loans issued in the Irish market, the dataset includes a snapshot of the entire residential mortgage book of these institutions at June 2012. This dataset provides an objective overview of the current debt position of mortgaged Irish households. The second dataset comes from a detailed survey of mortgage holders and provides a wealth of information on the current income, labour market and future prospects of these same households. When combined, these two datasets provide an up-to-date overview of the current position of mortgaged Irish households.

The results in this paper provide new and important insights on mortgage arrears in Ireland; unemployment and housing equity are key drivers, as shown by previous research. However, the results also show that many borrowers experiencing arrears are currently employed. The data show that many of these borrowers have experienced a significant drop in their income or a change in employment conditions. Furthermore, some of these borrowers are in fragile employment, i.e. they are on a temporary contract, have been with their employer for a short time or have a history of unemployment. This shows that the current mortgage crisis, and efforts to prevent a further deterioration, requires more than simply targeting negative equity and unemployment. Rather, such efforts should also aim to strengthen overall labour market conditions and job security.

The rest of this paper is structured as follows: Section 2 summarises the existing literature on the drivers of mortgage distress. In Section 3 we describe the data used to undertake the current analysis. Section 4 follows with a descriptive overview of borrowers in arrears in Ireland. In Section 5, we model mortgage arrears and discuss the results. Finally, Section 6 provides some concluding comments.

2 Related Literature

Prompted by the sub-prime mortgage crisis, a significant recent literature has developed on mortgage distress in the US. The role of home equity as a driver of distress has featured heavily in this literature. A number of studies have emphasised the importance of “strategic” motivations in which borrowers in negative equity decide to cease mortgage repayments, not because they can no longer afford them, but because they believe that the financial gains of defaulting outweigh the costs of continuing to service the mortgage (Ghent and Kudlyak (2011), Bajari et al. (2008) or Deng et al. (2000), for example).

On the other hand, the “double-trigger” hypothesis posits that default is usually the result of a combina-

tion of negative shocks to a borrower's ability to pay their mortgage and equity factors. Foote et al. (2008), for example, find that when equity is negative but at a low level, default occurs only when combined with a negative income shock like job loss. To capture negative income shocks, the authors use a local unemployment indicator, which has now become standard in the literature. Similarly, Bhutta et al. (2011) argue that for borrowers with moderate levels of negative equity, the role of trigger events is likely to be important. Goodman et al. (2010) examine the relative importance of negative equity and unemployment in driving defaults in the US. Like Foote et al. (2008) they proxy for borrower job loss using county-level unemployment rates and find that negative equity is a better predictor of default behaviour than regional unemployment. However, they acknowledge the limits of using regional unemployment instead of borrower-specific data and the bias this might induce in the results. Finally, a more recent contribution on this issue comes from Gerardi et al. (2013). Unlike previous studies, they use borrower-specific data (albeit from a household survey) to assess the role of unemployment, negative equity and wealth in driving mortgage defaults in the US. They find a strong role for individual unemployment status in the mortgage default decision (this is the strongest predictor of default) and argue for the use of borrower-level data to most accurately capture the drivers of mortgage repayment problems.

While the international literature is informative, it mainly focuses on the causes of mortgage default and foreclosures rather than mortgage delinquencies. Furthermore, the differing institutional environments across countries means that results and implications are not necessarily transferable across borders. In an Irish context, the existing research on mortgage arrears has been limited by a lack of timely data to examine the issue. Some recent work has focussed on examining mortgage repayment burdens in Ireland using the Irish Survey on Income and Living Conditions (SILC). However, since this dataset has limited information on mortgage arrears, it is not suitable for understanding the current mortgage arrears crisis (see McCarthy and McQuinn (2011) or Kelly et al. (2012) for examples). Lydon and McCarthy (2013) on the other hand use detailed mortgage loan-level data from 2010 to examine Irish mortgage arrears. Their dataset does not include any information on the current labour market or income status of borrowers. Acknowledging this, they proxy for affordability conditions using aggregate data on regional unemployment rates. They find evidence that both negative equity and affordability factors (albeit proxies) are strongly correlated with arrears in an Irish context.

The current paper overcomes all of the issues in the existing literature by using new and timely data with detailed information not just on mortgage arrears and negative equity, but crucially, it also contains detailed borrower specific information on income and labour market conditions. This is important since these factors can vary substantially across borrowers in a way that cannot be captured by aggregate statistics. The availability of such detailed information, therefore, is a unique advantage in the current analysis as it provides a highly accurate assessment of the current affordability of mortgage repayment levels.

3 Data

The work in this paper is based on two new and unique data sources. The first is a mortgage loan-level dataset collected by the Central Bank of Ireland as part of a prudential capital assessment review exercise of the Irish banking sector. Covering three Irish residential mortgage banks, which account for approximately 70 per cent of the loans issued in the Irish market, the dataset includes a snapshot of the entire residential mortgage book at June 2012. The loan level dataset incorporates a broad array of objective information for each loan, including borrower and mortgage details from the point of loan origination, current information on the performance of the loan and information on the value of the property on which the mortgage is secured. Table 1 in the Appendix provides an overview of the contents of the dataset.

Complementing this information is a representative survey of the same residential loan book designed specifically to capture the current economic circumstances of Irish mortgagees.³ The survey, which was administered to over 2,000 households, all of whom are included in the loan-level dataset, was conducted over the period May 2012 to February 2013 and includes almost 100 questions that were asked of participants. Specifically, for the purposes of this study, the survey captures information on the current income and labour market status of mortgage holders. Current information of this sort is typically not available to banks, yet it is vital, given the changes that have occurred in Ireland in recent years, when examining the key drivers of mortgage arrears.

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.⁴ The work in this paper is based on a cleaned subset of this linked sample.⁵

3.1 Definition of Variables

For the analysis that follows, we define a number of key variables. Firstly, since we are interested in examining the drivers of mortgage arrears, we divide our sample into two groups of borrowers - those with no outstanding arrears in June 2012 (i.e. performing loans) and those with arrears outstanding at that time (i.e. distressed loans). Performing borrowers account for approximately 85 per cent of the sample while distressed borrowers account for the remaining 15 per cent.⁶

³This survey was commissioned by the Central Bank of Ireland and was carried out by Ipsos MRBI on behalf of the Central Bank. Further details on the survey are provided in the Appendix.

⁴The majority of the sample (88 per cent) gave permission for this linking to take place.

⁵Table 9 in the Appendix provides full details of the cleaning exercise. We exclude observations that have been modified at some stage in the past since this may have impacted the current mortgage terms. We also exclude cases where we are missing information important to the current study. We compare the characteristics of the entire sample with those of the final usable sample and find no obvious differences between the two groups (this table is available on request from the author).

⁶Official statistics from the Central Bank of Ireland show that about 82 per cent of mortgage accounts was performing in June 2012. The sample, therefore, looks relatively representative of the overall arrears situation prevailing in Ireland in mid-2012.

Furthermore, when analysing the amount of debt or arrears outstanding among borrowers in the sample, we focus on the *total property level* of these figures. This means that we aggregate up the outstanding balances and arrears amounts on all loans secured on the mortgaged property owned by the borrower to arrive at *total property debt* and *total property arrears* figures. We focus on the total property level aggregation so as to get the most accurate picture of the current loan-to-value ratio (or equity position) faced by a borrower on their property.

To capture housing equity for each property in our sample we use the current loan-to-value (CLTV) ratio. This comprises the current value of the property and the mortgage outstanding. As detailed above, the latter variable is already available in the dataset. In terms of the current value of the property, the dataset includes the value of the house for which the original mortgage was taken out as well as the valuation date. We calculate the value of the property (P) in June 2012 (t) as follows:

$$P_t = P_0 \times \frac{\bar{P}_t}{\bar{P}_0} \quad (1)$$

where P_0 is the value of the property at the time of loan origination, and $\frac{\bar{P}_t}{\bar{P}_0}$ is the change in the average value of ‘similar’ properties between $t=0$ and $t=t$.

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). The CSO index only goes back to 2005. Prior to 2005 we use the ptsb/ESRI house price index, which has a similar geographic breakdown, but not a similar breakdown by property type. We therefore apply the ptsb/ESRI price index changes to all house-types. The CLTV ratio is then calculated as follows:

$$CLTV_t = \frac{Debt_t}{P_t} \quad (2)$$

Finally, when examining the impact on arrears status of mortgage characteristics, such as the term remaining or interest rate type, we focus on the characteristics associated with the primary loan on a property. In other words, if a borrower has extracted equity from their property by taking out additional loans, we focus on the characteristics of the original mortgage that was taken out to purchase the property.⁷

4 Overview of Irish Mortgage Arrears

The combination of both the loan-level dataset and the survey of mortgage holders allows us to uniquely characterise arrears cases in a degree of detail that is new to the literature. In the tables that follow, we compare the characteristics of the average performing borrower with those of the average distressed borrower

⁷Approximately 30 per cent of the sample employed has multiple loans secured on their property.

in our sample. The key point to emerge is that distressed borrowers are quite different from performing borrowers along a number of dimensions. Most notably, a higher proportion of distressed borrowers has been affected by affordability shocks such as income reductions, unemployment and deteriorating employment conditions. In Section 5, we assess if these differences remain in a multivariate setting when we model arrears status as a function of these variables.

4.1 Household Characteristics

In Table 2 we compare household characteristics across the arrears and non-arrears groups. In most cases, we focus on the characteristics of the head of household, where the head is defined as the person who completed the survey. Firstly, there are no obvious differences in the gender or age composition of households according to arrears status. Clear differences emerge, however, when we examine the educational attainment, marital and parental status of heads of households.

Performing borrowers tend to be more highly educated than those in distressed households; 48 per cent of non-arrears cases has a head with a third level education as compared to only 28 per cent of arrears cases. Furthermore, heads of distressed households more often fall into the category “widowed/divorced or separated”, and on average, they more often have dependent children relative to households with no arrears; 89 per cent of arrears cases report having dependent children as compared to 82 per cent of non-arrears cases. These differences across groups are consistent with the existing literature on household financial distress. Typically, borrowers with dependent children, with lower education levels and those who have suffered a relationship breakdown or the loss of a partner tend to get into financial difficulties more often than borrowers outside of these groups (see Georgarakos et al. (2010) or McCarthy (2011) for example).

4.2 Labour Market Profile

Next we assess the labour market characteristics of the two groups of interest. The data allow us to capture not only the current labour market status of mortgage holders, but crucially, we also have information about how this status has changed in recent years and the types of labour market shocks encountered by mortgagees. Despite its importance, this type of detail has not been available in previous datasets used to assess the determinants of mortgage arrears. The results are presented in the lower panel of Table 2.

The first point of note is that distressed borrowers have a higher average unemployment rate relative to the average non-arrears borrower. This is clear along two dimensions. Firstly, only 5 per cent of households that are current on their mortgage repayments has an unemployed adult household member relative to almost 20 per cent of arrears households.⁸ Secondly, focusing on the heads of households only, we find

⁸This captures adults who normally contribute to the mortgage repayment, either directly or indirectly (by using funds to cover

that performing households have an average unemployment rate of only 3.6 per cent, as compared to 14.6 per cent among borrowers in arrears.

Interestingly, 75 per cent of arrears cases include households where the head is currently employed. Given that unemployment is typically assumed to be a key driver of mortgage repayment distress, this figure is somewhat surprising. As a next step, therefore, we examine the employment composition of mortgagees. Specifically, for those individuals in employment, we examine the type of employment held as well as their history of previous unemployment (see Table 2).

We find only a slight difference in the proportion of performing versus distressed borrowers who are employed in the public sector; about 30 per cent of performing borrowers work in the public sector relative to 26 per cent of borrowers in arrears. Furthermore, 86 per cent of performing borrowers are employed in a permanent job, as compared to 76 per cent of non-performing borrowers. Among employed borrowers, we also find a difference in average job tenures according to arrears status. Only 6 per cent of performing borrowers have been employed with the same company for less than 2 years while this figure is 16 per cent among borrowers in arrears. Finally, we find that a higher proportion of distressed borrowers have been without employment at some stage in the previous three years; almost one fifth of distressed borrowers have experienced recent unemployment compared to only 8 per cent of performing borrowers.

Characteristics such as temporary employment contracts, a recent unemployment history and short job tenures tend to be associated with a higher probability of falling into unemployment (and hence experiencing a loss of income) again in the future. This could render such households more susceptible to credit constraints or affect a borrower's ability to manage their finances in a way that might impact arrears status. We therefore create a summary measure to capture these characteristics, for inclusion in our model of mortgage arrears in Section 5. Specifically, we create a dummy variable, "fragile employment", which captures people who are employed on a temporary contract or who are with their current employer for less than two years or who were recently unemployed. About one quarter of households that are current on their mortgage have a mortgage contributor who has *fragile* employment. Among arrears cases, however, this figure is closer to 40 per cent. In other words, even though a relatively large proportion of borrowers who are in arrears are currently employed, a sizeable number of these borrowers are in a state of fragile employment.

Finally, we examine the proportion of borrowers who are currently employed but who have suffered a fall in nominal wages, overtime or hours of work within their current job. Approximately 54 per cent of performing borrowers fall into this category as compared to 65 per cent of distressed borrowers. It is clear, therefore, that while a significant portion of borrowers in arrears are still in employment, many of these borrowers have experienced a deterioration in affordability.

other household expenses).

4.3 Income and Mortgage Repayment Burdens

Figure 1 shows the distribution of gross annual household income by arrears status. Borrowers with arrears tend to report lower income levels, on average, than those borrowers with no outstanding arrears on their accounts; the median annual income among borrowers with arrears at €35,000 is significantly lower than the average of €65,000 among the non-arrears cases. In Table 3 we assess how household income has changed over the past year, according to arrears status. Over 50 per cent of borrowers in arrears report a significant fall in their nominal household income over the year, relative to about 34 per cent of non-arrears cases.⁹

We also assess the difference in mortgage repayment burdens faced by our two groups. To do this, we employ a mortgage repayment-to-income ratio (MRTI) which captures the share of a borrower's gross income that is committed to paying interest and principal on mortgage debt. This variable, which was originally presented in McCarthy and McQuinn (2011), provides a valuable insight into the ability of a household to service its mortgage. The median MRTI ratio is 17 per cent among non-arrears cases, while it is significantly higher, at 28 per cent, among borrowers in arrears.

4.4 Mortgage Characteristics

The existing literature on mortgage arrears highlights the importance of negative equity in driving distress. In Table 4 we show the distribution of housing equity across the sample in June 2012 by arrears status. A higher proportion of distressed borrowers are in a position of negative equity relative to performing borrowers. Specifically, while 64 per cent of performing borrowers have positive equity in their home (a current LTV ratio of 100 per cent or less), the corresponding figure among distressed borrowers is 57 per cent.

We also find differences across borrowers along other dimensions of mortgage characteristics. About one fifth of distressed borrowers are classified as 'buy-to-lets', versus 11 per cent of performing borrowers. A higher proportion of distressed borrowers are also classed as having standard variable rate (SVR) mortgages, which exposes these borrowers to fluctuations in mortgage repayments. Finally, we find no difference across borrowers in the average mortgage term applying to the loan, and only slight differences in the average debt balance outstanding.

4.5 Summary

In summary, it would appear that distressed borrowers are quite different from the average performing borrower. They differ on several aspects, from affordability (income and MRTI ratios) to housing equity.

⁹Borrowers are asked to think about changes in income which are unrelated to changes in taxes, levies or other bills.

Interestingly, there are also substantial differences in the labour market characteristics of these two groups and in the extent to which these groups have been exposed to recent shocks. These aspects may be important determinants of mortgage arrears, but they are typically not captured in loan-level datasets. In the next section, we examine the importance of these factors for mortgage arrears in a multivariate setting.

5 Modelling Approach and Results

To model mortgage arrears, we specify the following cross-sectional, probit model, where the probability of arrears is a function of affordability and equity factors as well as a series of household-specific controls:

$$Prob(y_i = 1) = F(\beta(x_i) + \epsilon_i); i = 1, 2, \dots, n \quad (3)$$

Where y_i is the dependent variable “Arrears”, x comprises controls for the i th household’s characteristics and financial information, β is a set of parameters to be estimated and ϵ_i is the error term.

The dependent variable takes a value of 1 if there is an arrears balance outstanding on the account in June-2012 and 0 otherwise. As independent variables we include dummies for age groups (the reference group is 25-34 year olds), being male, for marital status (the reference is married), for education status (the omitted group is low education, or those with lower second level education or less) and for dependent children. We also include dummies for buyer type (reference group is PDH buyers), interest rate type (reference group is tracker rate mortgages) and we include a host of equity and affordability indicators.¹⁰

5.1 Regression Results - Affordability and Equity

As a first step, we focus on arrears as a function of those variables typically included in models of mortgage distress - i.e. affordability and housing equity. Table 5 presents the results of the initial estimation. Focussing on the statistically significant variables, a clear picture emerges as to the importance of the various factors in Irish mortgage arrears.

As posited in all of the recent literature on mortgage distress, housing equity has a positive and significant impact on the probability of experiencing mortgage arrears. The results show that, *ceteris paribus*, a one unit increase in the log of the current LTV ratio raises the probability of mortgage arrears by 8 per cent. In terms of household income, we would expect that higher income would reduce financial distress since households with higher income levels, even if they have to sustain a high mortgage, are likely to enjoy relatively easier access to other forms of credit that can boost their liquidity. Our results support this intuition; controlling for the degree of indebtedness and other factors, we find that those with higher income

¹⁰PDH buyers are those borrowers that took out a mortgage to purchase their *primary dwelling house*. A tracker rate mortgage is one that ‘tracks’ the prevailing ECB interest rate.

levels have a lower probability of experiencing mortgage arrears. The coefficient on the MRTI ratio, which captures mortgage repayment burdens, suggests that a higher ratio leads to an increase the probability of mortgage arrears relative to borrowers with lower MRTI ratios. These results support the “double trigger” hypothesis which argues that both equity and affordability are important determinants of mortgage distress.

We also find that a number of mortgage and borrower characteristics are important correlates of mortgage arrears in this multivariate setting. Investment borrowers (buy-to-let) have a 10 per cent higher probability of experiencing mortgage arrears relative to borrowers who took out a mortgage to purchase their primary dwelling. Furthermore, borrowers with a standard variable interest rate on their mortgage have a 7 per cent higher probability of arrears relative to borrowers on tracker rate mortgages.¹¹ Finally, we find that borrowers who extracted equity from their property by taking out multiple loans on the property over time, have a 5 per cent higher probability of experiencing mortgage arrears relative to borrowers who did not extract equity.

In terms of borrower specific characteristics, the education level of the head of household has an impact on mortgage distress; higher education levels are associated with a lower probability of arrears relative to borrowers with lower education levels. This finding is common to the financial distress literature (see Georgarakos et al. (2010) or Lusardi and Tufano (2008), for example) and is in line with intuition since higher education is related to better career prospects and an upward sloping income profile over the life course. Aside from education, we also find that having dependent children increases the chances of mortgage arrears by 5 per cent.

5.2 The Role of the Labour Market and Recent Shocks

In Model 1 of Table 6 we present the results of the regression when we include information on the labour market status of borrowers and their recent experience of labour market shocks. As discussed earlier, these results are new to the literature on the causes of mortgage distress, since typically the current labour market status of borrowers is proxied by using regional labour market data. Intuitively, given the marked deterioration in the Irish labour market that occurred since 2008, and the descriptive statistics presented in Section 4, one would expect a negative relationship between mortgage arrears and unemployment. Job loss affects affordability but it can also impede access to credit which could be used to smooth temporary fluctuations in income.

As expected, the results in Table 6 show that unemployment plays an important role in Irish mortgage arrears; households where the head is unemployed have a 9 per cent higher probability of experiencing mortgage arrears relative to households where the head is employed in a “secure” job. Interestingly, the

¹¹In June-2012, the ECB main policy rate was only 1 per cent, having been on a downward trajectory for some time. On the other hand, the average rate on variable rate mortgages was over 4 per cent, which represented an increase relative to recent years. Borrowers on variable rate mortgages, therefore, are likely to have experienced an increasing mortgage burden over time relative to borrowers on a tracker rate mortgage.

coefficient on fragile employment is negative and significant. The result suggests that households where the head is working in fragile employment have a 5 per cent higher probability of experiencing mortgage arrears relative to households where the head is in a more “secure” job. As discussed in Section 4, the components of fragile employment tend to be linked with a higher probability of future unemployment and income loss, so this variable may operate through the credit access channel, i.e. banks may be reluctant to lend to borrowers in this situation making it difficult for them to smooth income fluctuations. It could also reflect the fact that many of these borrowers tend to have a recent experience with unemployment. The type of employment currently held by these borrowers may not be commensurate with previous employment (in terms of pay or conditions). Unfortunately, the current dataset does not contain information on this issue. However, the result highlights an important link between employment and mortgage arrears that has not previously been documented.

The final point to note at this stage is that, relative to the baseline results shown in the previous table, there is no change in the overall importance of the non-labour market variables in the regression. Equity and affordability factors remain important determinants of mortgage arrears, along with certain mortgage and household specific characteristics, even when controlling for the borrower’s labour market status.

5.2.1 Unemployment Duration

Unemployment has an important link with mortgage arrears, as shown above. However, it is interesting to assess if the duration of unemployment has an impact on mortgage arrears. Conefrey et al. (2013) show that longer unemployment durations reduce the probability of finding a new job, so the long-term unemployed may face additional affordability constraints over the recently unemployed (for example, available buffers that can be used to smooth a temporary loss in income may be extinguished). Herkenhoff and Ohanian (2012) find evidence in support of this hypothesis, showing that the long term unemployed in the US are the most likely to be liquidity constrained and to default on their mortgage payments.

To assess this issue in an Irish context, we split the unemployed category into two groups capturing the duration of their current unemployment spell. We categorise those individuals who became unemployed in 2011 or 2012 as having experienced a recent job loss, while those who were unemployed since prior to 2011 are deemed to be longer term unemployed. At this stage, the sample size in both groups is relatively small, so this must be borne in mind when assessing the results.¹²

The results are shown in Model 2 of Table 6. While the coefficients on both groups of unemployed are positive, suggesting that both groups have a higher probability of mortgage arrears relative to households with employed heads, the result is only significant for the longer term unemployed group (at a 10 per cent level). The result, therefore, albeit based on a small sample, points to the importance of targeting those in

¹²Only 72 cases in our unemployed group are classified as longer term unemployed, while only 40 cases are classed as recently unemployed.

long-term unemployment as part of an efficient policy response to the arrears crisis.

5.2.2 Changes in Employment Conditions

As shown in Section 4, a high proportion of borrowers have experienced a recent deterioration in conditions in their current job, such as a fall in wages, overtime or hours of work. We assess if these changes are important for Irish mortgage arrears by including a dummy variable capturing borrowers subject to such changes in our mortgage arrears model. The results, which are presented in Model 3 of Table 6, show a positive but insignificant coefficient on the employment deterioration variable. This suggests that there is no significant difference in the arrears status of borrowers who have experienced an employment deterioration versus those who have not. However, given that the model already controls for the current income of the borrower, so any reductions in pay as a result of the deterioration in employment conditions will already be controlled for, this result is perhaps anticipated.

5.3 Income Reductions

The descriptive statistics presented earlier showed a marked difference in the proportion of borrowers that experienced a significant and recent drop in income. In a perfect world with no credit constraints or credit market imperfections, we might expect such income volatility to have an insignificant effect on mortgage arrears (assuming the income change is temporary). However, previous research does not support a “perfect or frictionless world” hypothesis (see Jappelli and Pagano (1989), for example). Furthermore, the existing literature finds a significant relationship between adverse shocks like income volatility and household financial distress in other countries (examples include Diaz-Serrano (2004) and Duygan and Grant (2009)).

To test for the importance of income volatility in an Irish setting, we include a dummy variable capturing households that registered a significant drop in their income over the previous year in our model of mortgage arrears. The results, which are presented in Table 7, show a positive and significant coefficient on the income fall variable. This suggests that negative income shocks have an important relationship with mortgage arrears, even after controlling for all of the other covariates that impact mortgage repayment behaviour, including labour market shocks and current labour market status.

5.4 Household Wealth

As a final check on the results, we include additional controls in the regression to proxy for other household debts and household wealth. While the dataset does not include information on the amount of other debts outstanding or the amount of liquid assets available to borrowers, we do know if households hold these

financial products. As a robustness check, we therefore include two additional controls in our model of mortgage arrears: a dummy variable for households who report that they have regular monthly savings and a dummy variable for households with unsecured debt. The results are shown in Table 8.¹³

The inclusion of these additional household wealth variables does not change the overall importance of the original variables of interest in our model of mortgage arrears - the affordability and equity factors remain important determinants of mortgage arrears status, as do most of the variables capturing borrower and mortgage characteristics. Interestingly, the results show that household wealth is also important for mortgage arrears. Those household with regular monthly savings have a 3 per cent lower probability of experiencing mortgage arrears, while borrowers with unsecured debt have a 3 per cent higher probability of mortgage arrears, relative to borrowers with no unsecured debt.

6 Conclusions

Assessing the determinants of mortgage arrears is a complex task, particularly in the context of the changes witnessed in the Irish economy post-2007. In this paper we have addressed the issue using unique data that provides both an objective overview of the current debt position of mortgaged Irish households as well as a wealth of information on the current income, labour market circumstances and recent affordability shocks experienced by mortgage holders. To our knowledge, this is the first attempt to assess the importance of these factors in an Irish context at a borrower specific level.

The results confirm the importance of unemployment and housing equity in driving Irish mortgage arrears, as shown by previous research. However, the results also provide new insights on the factors associated with mortgage arrears in Ireland. Firstly, we find that many borrowers experiencing arrears are currently employed. The data show that many of these borrowers have experienced a significant drop in their income or a change in employment conditions. Furthermore, some of these borrowers are in fragile employment, i.e. they are on a temporary contract, have been with their employer for a short time or have a history of unemployment. In a multivariate setting, fragile employment and income changes show up as having a significant relationship with mortgage arrears. We also find tentative evidence that the duration of unemployment has an important link with mortgage distress.

The work in this paper has important policy implications. The results show that the current mortgage crisis, and efforts to prevent a further deterioration, requires more than simply targeting overall unemployment or negative equity. Rather, such efforts should also aim to strengthen labour market conditions and job security as well as targeting long-term unemployment. In terms of the latter, O'Connell (2009) and Kelly et al. (2011) provide evidence on the most effective labour market activation measures available in an Irish

¹³Note that the coefficients in this model are not directly comparable with those in previous models. However, we can assess the sign and statistical significance of the variables across models.

context.

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Household Income by Arrears Status

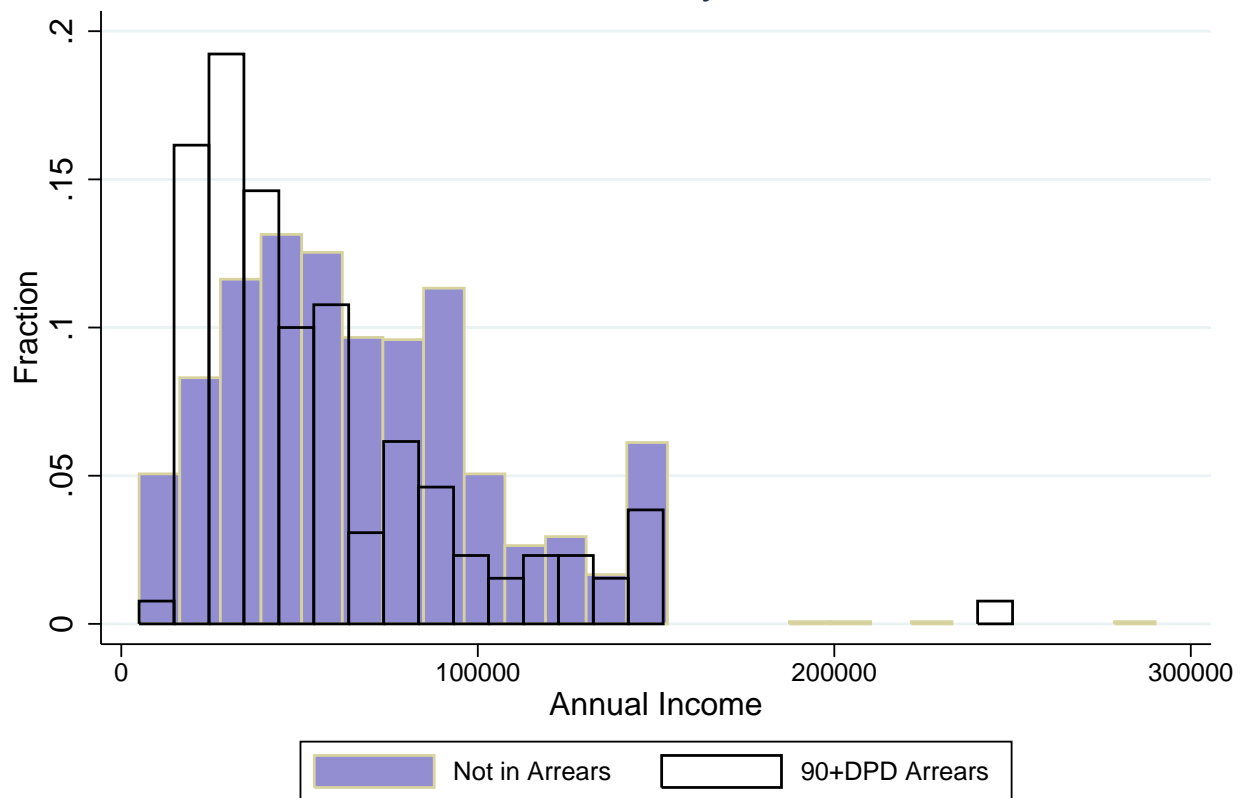


Table 1: Loan-Level Data Fields / Information Content

Unit Identifier	Borrower	Property	Loan	Interest Rate	Performance
Bank Borrower Property Loan	Borrower Type (FTB, BTL, etc.) Income Income Verified Credit Quality	Geographic Location Property Type New or Existing Original Valuation (and date) Original LTV Construction Year	Origination Date Original Loan Balance Current Loan Balance Loan Term Loan Purpose Current Repayment Payment Type Interest Rate Info. Performance Info.	Current Interest Rate Interest Rate Type Interest Rate Margin Rate Revision Date	Arrears Balance (June-2012) Arrears Balance for Past 12 months Collection Status Modification / Forbearance Flag

Notes: The above fields are not always populated in full.

Table 2: Household Summary Statistics, According to Arrears Status (% unless otherwise stated)

		No Arrears	Any Arrears
<i>Demographic Characteristics</i>			
Head of Household (HOH)	Male	56.1	55.6
	Age: 25-54 years	85.7	89.0
Marital Status (HOH)	Single	13.1	10.4
	Married	81.0	81.1
	W/D/S	5.8	8.5
Dependent Children		81.7	88.4
Education Status (HOH)	Lower 2nd Level	9.4	22.0
	Upper 2nd Level & Non-Degree	41.9	49.4
	3rd Level Degree	47.7	28.1
<i>Labour Market Characteristics</i>			
Work Status (HOH)	Unemployed	3.6	14.6
	Inactive	8.0	10.4
	Employed	88.1	75.0
Employment Characteristics (% of Employed Group)	Public Sector	30.5	26.0
	Permanent Contract	86.4	75.6
	<2 years with Employer	6.2	16.2
	Previously Unemployed	8.1	19.5
	Deterioration in Employment	54.2	64.9
N		1,042	164

Note: N = Number of households in sample. W/D/S = widowed / divorced / separated.

Table 3: Affordability Characteristics, According to Arrears Status (% unless otherwise stated)

		No Arrears	Any Arrears
Median Income	Euros	65,000	35,000
Income Change (past year)	Significant Fall	33.7	51.8
	Moderate Fall	35.0	28.1
	No Change	23.7	15.9
	Moderate Increase	5.9	1.8
	Significant Increase	1.4	1.8
Median MRTI Ratio	% of Gross Income	16.7	27.7
N		1,042	164

Note: N = Number of households in sample.

Table 4: Mortgage Characteristics, According to Arrears Status (% unless otherwise stated)

		No Arrears	Any Arrears
Current LTV (%)	<i>Positive Equity</i>		
	0-50	33.4	25.0
	51-80	19.2	22.5
	81-90	5.6	5.6
	91-100	5.8	3.6
	<i>Negative Equity</i>		
	101-110	5.4	6.1
	111-120	5.7	4.6
	121-130	4.8	4.6
	131-140	4.8	5.1
	141-150	4.3	3.6
	151+	11.1	9.4
Buyer Type	First Time Buyer (PDH)	29.3	24.0
	Second Time Buyer (PDH)	59.3	56.1
	Buy-to-Let	11.4	19.9
Interest Rate Type	Tracker	50.3	40.8
	SVR	36.6	48.5
	Fixed	13.1	10.7
Median Mortgage Term	Years	25	25
N		1,042	164

Note: N = Number of households in sample.

Table 5: Baseline Probit Model: Dependent Variable=Any Arrears

Variable	Marginal Effect	Std. Error
Log Current LTV	0.08***	0.0241
Log Household Income	-0.08***	0.0257
Log MRTI	0.05**	0.0233
Log Outstanding Debt	-0.03	0.0265
Buy-to-Let	0.10***	0.0410
SVR Mortgage	0.07***	0.0217
Fixed Rate Mortgage	-0.02	0.0259
Equity Release	0.05**	0.0219
Male	-0.01	0.0180
Age: 35-44	-0.01	0.0256
Age: 45-54	0.05*	0.0331
Age: 55-64	-0.02	0.0351
Age: 65+	-0.01	0.0576
Medium Education	-0.05**	0.0249
High Education	-0.08***	0.0282
Widowed/Divorced/Separated	0.03	0.0414
Single	-0.03	0.0287
Dependent Children	0.05**	0.0215
N	1,179	
LR chi ²	177.47	
Prob>chi ²	0.0000	
Pseudo R ²	0.1888	

Note: *** Significant at 1 per cent level; ** Significant at 5 per cent level; * Significant at 10 per cent level. Omitted categories for dummy variables are: Buyer type-First Time Buyer; Interest Rate-Tracker; Age: 25-34 yrs; Low Education and Married.

Table 6: Probit Model: Dependent Variable=Any Arrears, *Incorporating Labour Market Information*

Variable	Model 1		Model 2		Model 3	
	Marginal Effect	Std. Error	Marginal Effect	Std. Error	Marginal Effect	Std. Error
Log Current LTV	0.08***	0.0240	0.08***	0.0241	0.08***	0.0240
Log Household Income	-0.06**	0.0265	-0.06***	0.0266	-0.06**	0.0266
Log MRTI	0.05**	0.0234	0.05**	0.0235	0.04*	0.0234
Log Outstanding Debt	-0.03	0.0264	-0.03	0.0264	-0.03	0.0264
Buy-to-Let	0.10***	0.0408	0.10***	0.0408	0.10***	0.0407
SVR Mortgage	0.07***	0.0217	0.07***	0.0218	0.07***	0.0217
Fixed Rate Mortgage	-0.02	0.0266	-0.02	0.0267	-0.02	0.0265
Equity Release	0.04**	0.0220	0.05**	0.0220	0.05**	0.0219
Male	-0.01	0.0181	-0.01	0.0182	-0.01	0.0181
Age: 35-44	-0.01	0.0257	-0.01	0.0257	-0.01	0.0256
Age: 45-54	0.06*	0.0332	0.05*	0.0333	0.05	0.0331
Age: 55-64	-0.03	0.0349	-0.03	0.0350	-0.03	0.0348
Age: 65+	-0.02	0.0577	-0.02	0.0580	-0.02	0.0573
Medium Education	-0.05*	0.0251	-0.05*	0.0252	-0.05*	0.0252
High Education	-0.07**	0.0284	-0.07**	0.0283	-0.07**	0.0284
Widowed/Divorced/Separated	0.04	0.0444	0.04	0.0445	0.04	0.0443
Single	-0.02	0.0294	-0.02	0.0295	-0.02	0.0295
Dependent Children	0.05**	0.0219	0.05**	0.0219	0.05*	0.0220
Unemployed	0.09**	0.0546			0.11**	0.0608
Recently Unemployed			0.11	0.0944		
Longer Term Unemployed			0.08*	0.0625		
Inactive	0.03	0.0424	0.03	0.0424	0.04	0.0478
Fragile Employment	0.05**	0.0264	0.05**	0.0264	0.05**	0.0267
Employment Deterioration					0.02	0.0192
N	1,179		1,179		1,179	
LR chi ²	184.35		184.40		185.38	
Prob>chi ²	0.0000		0.0000		0.0000	
Pseudo R ²	0.1961		0.1962		0.1972	

Note: *** Significant at 1 per cent level; ** Significant at 5 per cent level; * Significant at 10 per cent level. Omitted categories for dummy variables are: Interest Rate-Tracker; Age: 25-34 yrs; Low Education; Married and Employed (in a "Secure" Job).

Table 7: Probit Model: Dependent Variable=Any Arrears, *Incorporating Income Shocks*

Variable	Marginal Effect	Std. Error
Log Current LTV	0.08***	0.0238
Log Household Income	-0.06**	0.0264
Log MRTI	0.04*	0.0232
Log Outstanding Debt	-0.04	0.0262
Buy-to-Let	0.10***	0.0407
SVR Mortgage	0.07***	0.0217
Fixed Rate Mortgage	-0.02	0.0261
Equity Release	0.04**	0.0216
Male	-0.00	0.0180
Age: 35-44	0.02	0.0724
Age: 45-54	0.01	0.0626
Age: 55-64	0.07	0.0738
Age: 65+	-0.03	0.0528
Medium Education	-0.05*	0.0249
High Education	-0.07**	0.0281
Widowed/Divorced/Separated	0.05	0.0463
Single	-0.02	0.0301
Dependent Children	0.05*	0.0217
Unemployed	0.09**	0.0548
Inactive	0.03	0.0428
Fragile Employment	0.05**	0.0264
Significant Income Drop	0.03*	0.0191
N	1,175	
LR chi ²	189.41	
Prob>chi ²	0.0000	
Pseudo R ²	0.2025	

Note: *** Significant at 1 per cent level; ** Significant at 5 per cent level; * Significant at 10 per cent level. Omitted categories for dummy variables are: Interest Rate-Tracker; Age: 25-34 yrs; Low Education; Married and Employed (in a "Secure" Job).

Table 8: Probit Model: Dependent Variable=Any Arrears, *Incorporating Household Wealth*

Variable	Marginal Effect	Std. Error
Log Current LTV	0.08***	0.0239
Log Household Income	-0.06**	0.0264
Log MRTI	0.05**	0.0230
Log Outstanding Debt	-0.03	0.0262
Buy-to-Let	0.10***	0.0408
SVR Mortgage	0.07***	0.0215
Fixed Rate Mortgage	-0.02	0.0259
Equity Release	0.04**	0.0214
Male	-0.00	0.0178
Age: 35-44	0.00	0.0259
Age: 45-54	0.05*	0.0335
Age: 55-64	-0.02	0.0348
Age: 65+	-0.02	0.0573
Medium Education	-0.04	0.0248
High Education	-0.06**	0.0279
Widowed/Divorced/Separated	0.03	0.0427
Single	-0.03	0.0276
Dependent Children	0.04	0.0230
Unemployed	0.07*	0.0515
Inactive	0.02	0.0394
Fragile Employment	0.04**	0.0254
Regular Saver	-0.03*	0.0191
Has Unsecured Debt	0.03**	0.0170
N	1,163	
LR chi ²	189.68	
Prob>chi ²	0.0000	
Pseudo R ²	0.2060	

Note: *** Significant at 1 per cent level; ** Significant at 5 per cent level; * Significant at 10 per cent level. Omitted categories for dummy variables are: Interest Rate-Tracker; Age: 25-34 yrs; Low Education; Married and Employed (in a "Secure" Job).

Appendices

A 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. The survey included questions in the following categories:

1. Mortgage background, including questions on the contributors to the mortgage repayment, the educational and employment characteristics of such contributors and details of unemployment where relevant.
2. Income and finances, including detailed questions on household income, recent income changes, details on household expenditures and questions on repayment difficulties where relevant.
3. Buy-to-lets and other financial holdings, details of institutions where borrowings and savings are held and questions on credit applications and rejections, and future expectations.
4. The mortgage arrears resolutions process (MARP), including questions on participation in the MARP process and the degree and nature of contact with the mortgage lender.

Table 9: Data Cleaning

No. of linked observations	1,837
<i>Less:</i>	
Modified cases	236
Missing house price data / outliers on CLTV	204
Missing income data / outliers on MRTI	191
Final sample	1,206