The Great Recession and Mental Health: the Effect of Income Loss on the Psychological Health of Young Mothers

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Abstract

There is little consensus as to the effect of recessions on health, which may be due to the heterogenous nature of recessions, the choice of health outcome or the description of the independent variable involved. In contrast to previous work, which has predominantly studied labour market loss, I examine the relationship of income loss and health, and in particular focus on psychological rather than physical health. I study disposable income loss because disposable income is related to consumption expenditure, and therefore satisfaction. Psychological, rather than physical, health is important because younger populations are unlikely to manifest clinical evidence of recession-related disease in the short term. The Irish recession provides me with an opportunity to study the effect of changes in income, since households who remained in employment also experienced changes in disposable income. Using panel data from three waves of the Growing Up in Ireland study, I find that income loss is associated with an increase in depression, but not in parental stress. This effect of income loss is seen for those who are home owners, and subjective reports of being in mortgage or rent arrears is also associated with an increase in depression score.

1. Introduction

Despite considerable research examining the effect of recessions on health (Ruhm 2015) (Ruhm 2005) (Ruhm 2000) (Gerdtham 2006) (Wang 2017) (Asgeirsdottir 2012) (Ásgeirsdóttir 2014), there remains little consensus as to the true health effect of economic downturns. This is not altogether unexpected, as recessions are not homogenous entities. Even taking into account the global nature of the Great Recession that began in 2008, there remained cross-country variations in both the size of the contraction and the type of shock experienced, as well as in the fiscal response of individual governments. In view of this heterogeneity, and since the majority of studies examining the effect of recessions on health predate the Great Recession, it remains unclear if these studies can provide a reliable guide to the implications of this latest financial crisis. For instance, empirical evidence from the pre-Great Recession era suggested that mortality varies procyclically with the business cycle in high-income countries for deaths due to cardiac disease and road traffic accidents (Ruhm 2000) (Gerdtham 2006) (Buchmueller 2007) (Ariizumi 2012) but not for other causes of death (Neumayer 2004) (Gerdtham 2006) (Buchmueller 2007). In contrast, the post Great Recession literature has shown varying results, with some studies showing no relationship between reductions in mortality (Ruhm 2015), while others report a decrease in death due to road traffic accidents (Regidor 2014), and others an improvement in health behaviour (Ásgeirsdóttir 2016).

Considering the lack of evidence of a consistent effect it may seem prudent to simply assume that there is no reliable and reproducible effect of recessions on health. However, it is also likely that the different results obtained may be related to the fact that both health outcomes and the independent variables used to describe the effect of the recession can differ between studies. While labour market outcomes tend to be used in studies examining the recession because of an explicit recognition of the importance of unemployment on the welfare of the population (Layton 2003), they are not the only channel by which a recession may affect individuals and households. Although time series studies prior to the

Great Recession have shown that income effects were predominantly due to unemployment, more recent models have suggested that these models may no longer be relevant because of the effect of social transfers (Jantti 2010). Indeed, those studies that examine the Great Recession period have shown that household income may fall because of policy responses to the recession, as well as labour market losses (Jenkins 2012).

In contrast to the majority of research examining the relationship of recessions and health that use labour market and gross income shocks as independent variables, I choose to examine the relationship of disposable income shocks and health. To the best of my knowledge this area has not been commonly studied, which may be because any potential relationship between income shocks (from decreased wages and higher taxes secondary to recessions) and health is often constrained by the fact that income shocks are commonly associated with a labour market loss (Brand 2015). Heretofore unemployment has been commonly used as the independent variable. However, data from Ireland allows examination of the relationship of income shocks secondary to a recession, rather than relying on unemployment. This is because the Irish recession resulted in a decrease in disposable income due to an increase in tax burden for most households, as well as direct and indirect cuts to pay (Savage 2015). While changing labour market circumstances did account for the deteriorating economic situation of poorer households (McGinnity 2014), income losses were also felt by those with stable employment. Along with structural changes in taxation (Keane 2015), reductions in gross pay were also felt for public sector workers (Keane 2015) (Doris 2015) resulting in income loss despite labour market security (Mac Carthaigh 2017). In this paper I examine the effect of changes in disposable income on the psychological health of the mothers of young children, using the Infant cohort of the Growing Up in Ireland study. I choose to study disposable, rather than gross, income because it is related to consumption expenditure, and ability to consume is related to satisfaction (Clark 2008). The Growing Up in Ireland study is a nationally representative longitudinal study involving the period of the financial crisis, and collects data on socioeconomic and demographic factors, as well as physical health, psychological

health and relationship satisfaction. In contrast to other papers in the literature, I use both disposable household income and subjective reports of the effect of the recession as the independent variable of interest, and I focus on subjective scores of psychological health rather than pathological and physiological conditions. This is because younger populations are unlikely to develop clinical manifestations of recession related disease in the immediate term, and therefore objective changes of health may not be readily identifiable in this population. Furthermore, a decline in wellbeing is particularly salient for economic hardship (Riumallo-Herl 2014) even in the absence of a clinical diagnosis of a mental health disorder. I also include an outcome variable that indicates if there has been utilization of mental health resources. This is important for two reasons – in the first instance it represents the degree of support available to respondents. In the second instance, it adds to discussions around burden of illness, as respondents may report low levels of depression at the time of interview because they have received treatment, however they may still have a history of poor psychological health that would otherwise not be determined.

I find that change in income during the recession is associated with a change in depression score, which is seen for those who are private owners (likely mortgage holders). This association is not seen for changes in parental stress, which suggests that income loss is not affected with the child-related stress of being a parent. An increase in depression score is also seen for those who report difficulty in paying rent or mortgage due to the recession. This change in depression is not associated with a labour market loss. I also find that being in mortgage or rent arrears is associated with receiving treatment for mental health problems.

The paper is structured as follows. In Section 2 I provide context for this work by exploring previous work on recessions and health, the biological pathway of stress, the importance of income (as distinct from unemployment) in wellbeing, and details on the Irish recession. Section 3 describes the GUI dataset and the choice of variables, and presents the econometric model. Section 4 presents the results, and Section 5 discusses the findings.

2. Context

Health and recessions

The financial crisis that began in 2008 has reignited interest in examining the relationship between the business cycle and health. Following on from Ruhm's paper documenting a procyclical relationship between mortality and the business cycle (Ruhm 2000), further empirical work added to his theory that health outcomes worsen during times of economic growth in high income countries (Ariizumi 2012) (Buchmueller 2007) (Gerdtham 2006). However, there is less of a consensus on the procyclical relationship of the business cycle and health in the years following the Great Recession. Post Great Recession papers have indeed suggested that health may be acyclical (Ruhm 2015). Results may differ based on which health outcome is measured. For instance mortality due to malignancies may not be affected in the same manner as mortality due to cardiac disease. The fact that homicide and cancer do not exhibit the same procylical variation with the business cycle as cardiac disease has previously been established (Neumayer 2004) (Gerdtham 2006) (Buchmueller 2007). This lack of a procyclical variation may also be due in no small part to the biological model of stress as well as the population studied.

Biological reasons why recessions may affect health

Recessions have been shown to cause stress through adverse psychosocial job conditions, which are not solely linked to fear of unemployment (ten Have 2015). The association between health outcomes and chronic stress is well described, particularly in terms of the effect of chronic stress on hypertension and vascular hypertrophy (Schnall 1994) The effect is mediated in two ways – either through unhealthy behaviours, such as substance and alcohol use, unhealthy eating, and smoking (Gerber 2009), or as a direct psychobiological effect. Elevated stress hormones dysregulate proinflammatory cytokines and suppress cellular and humoral immunity (Segerstrom 2004), resulting in both increased susceptibility to infection and an increased likelihood of malignancy. This prolonged and repeated activation of the Hypothalamic-Pituitary Axis and the sympathetic Adreno-Medullary System results in altered physiological responses. The direct,

biological, effect has been shown to be more pronounced and significant than the indirect pathway in a Dutch study of the association of financial strain with stress and health, where indirect effects only explained 4.9% of health changes (Prentice 2017). The role of financial strain as a precursor of inflammation has also been examined using US National Social Life, Health and Aging Project (NSHAP) data (Das 2016). However, in that case the age of the study group was 62-90, and therefore not necessarily generalizable for a younger population.

Gender difference may also play a role, as women demonstrate greater physiological reactivity to laboratory psychosocial stress than men (Kudielka 2004), are slower to recover from these stressors (Bale 2006), and have greater overall secretion of cortisol than men in response to a social stressor (Chopra 2009). A gender difference is also seen in the non-laboratory setting, where women have lower rates of mortality than men, yet report higher rates of distress and psychiatric disturbances (Mc Donough 2001). Furthermore, women respond to social stress by internalization, such as self-incrimination or rumination, which can prolong the experience (Nolen-Hoeksema 1994). These perseverative strategies which have been shown to be associated with increased depressive symptoms and poorer physical health outcomes (Moller-Leimkuhler 2010). The effect of stress may also differ depending on social class, with suggestions that while higher perceived social class may be protective in the absence of financial stress, it has the opposite effect in the presence of financial stressors, and may in fact predispose individuals to greater inflammation (Sturgeon 2016). This is because individuals with higher social status may view themselves as having more to lose.

The biological pathway of stress also provides clarity on why it is not unusual for physical health changes to manifest in the long run rather than in the short run. Cardiac disease and malignancies may take decades to manifest as clinical conditions for a younger, fitter, population. By only including these objective measures of physical illness in assessing the effect of the recession on health we may underestimate its true effect.

Unemployment versus loss of income

The majority of studies examining the effect of recessions on health have used unemployment as the primary independent variable of interest. This is evident in Ruhm's use of state unemployment rates (Ruhm 2000), (Ruhm 2005), (Ruhm 2015), regional unemployment rates in a study of body mass index (Böckerman 2007), county level unemployment rates which were used to examine health and health behaviours (Wang 2017), the study of unemployment and health behaviours (Tekin 2013) (Latif 2014), and the study of unemployment and psychological health (Latif 2015) (Farre 2015). The use of labour market outcomes (both unemployment and underemployment) as an indicator of structural economic decline is longstanding in population level analysis (Brenner 1983), and stems from the recognition of the importance of incorporating the impact of output fluctuations on the welfare of the individual and community (Layton 2003). Yet, just as there is no overall consensus about the health effects of recessions, the distributional effects of recessions are also not straightforward. While employment income typically makes a larger contribution to household income inequality than any other source, it is not the only relevant channel, and the net effect on household income depends on both the precise nature of the recession and the policy responses to it. In contrast to the pre-Great Recession literature where the effects of income came primarily from the labour market, more recent literature has shown that there is no robust evidence of a relationship between income distribution and unemployment (Jenkins 2012) (Jantti 2010).

Although uncommonly used as a marker of recessions in the health economic literature, income has a role to play, as it is related to relative risk aversion utility models describing how individuals experience lowered utility in the event of decreased income, and also how lower income results in lowered consumption (Attanasio 2010). While income was included in the study of health behaviours during the recession in Iceland (Asgeirsdottir 2012), the income data collected was pre-tax. Using this income variable they found that the recession was associated with a reduction in health compromising behaviour, but the effect on health promoting behaviour was both negative and positive depending on the behaviour studied. The relationship of wealth loss due to the stock market crash

and psychological health has also been studied (McInerney 2013), yet this also included measurement of assets. In that case the stock market crash was associated with worse subjective mental health. To the best of my knowledge there remains no work in the economics literature examining the effect of an exogenous disposable income shock from recessions on health. Disposable income is important predominantly due to its relationship to consumption, as satisfaction and wellbeing are related to consumption expenditure (Clark 2008). Taking into account the habituation theory (Easterlin 1979), it would hold that an individual takes account of their past income, and a loss has a negative effect on wellbeing (Clark 2008). Who is at particular risk following an income shock depends on the extent to which the shock is anticipated, its persistence, and the ability of the household to buffer these shocks (Jappelli 2010).

Irish Recession in Global Picture

Households which cannot buffer income shocks due to credit constraints tend to be either younger or poorer (Dolde 1971). In the Irish case this income shock is demonstrated by the decrease in overall consumption for the population as a whole by 8.8% between 2008 and 2010 (Gerlach-Kristen 2014). Credit constraints were evident and indeed the scale of debt experienced by Irish households was exceptional in EU terms. To understand why the recession in Ireland provides a unique opportunity to examine the effect of income loss during recessions on health, rather than relying on labour market loss, one should take into account the effect of the housing market crash. Over the period of 2004-2006, with house prices at their peak, 340,000 mortgages were approved out of a total of 800,000. Many of these mortgages were taken out by a young population, with the result that mortgage repayments consumed a large portion of household income (Mc Carthy 2014). Added to this burden of high mortgage repayment, when the economy deteriorated, disposable incomes fell both for those who remained in full employment and those with a labour market loss. Indeed it is recognized that Irish job loss data underestimated the full extent of deterioration in income (Nolan 2016). This decrease in disposable income was in part due to significant cuts in public sector pay (Nolan 2016), structural changes in taxation with the introduction of additional taxes (Universal Social

Charge and Property Tax), and a reduction in tax credits and the standard rate band (Keane 2015). In the first year of the recession, pay rates in the public sector were reduced by 5-10.5%, with further reductions of 5-10% in 2010, and an additional 5.5-10% of pay reductions in 2013 for those earning above €65,000. By 2011, the rate of mortgage and rent arrears was the highest in the EU at 11.6%, compared with an average 4.1% across the EU 28 (Whelan 2016) and 85% of those in mortgage arrears in 2014 had a head of household in employment (Mc Carthy 2014). Rather than the high unemployment rate that was a feature of the Great Recession across multiple countries, it was this decline in net income and credit constraint while remaining affected households' ability to buffer shocks induced by the recession that makes Ireland an interesting case to study.

3. **Dataset, Descriptive Statistics & Model**

The Growing Up in Ireland study is a longitudinal study of a nationally representative group of children and their families, which is unique in collecting both health data and socio-economic data for working age parents in Ireland. Although the complete study involves two groups, a child cohort and an infant cohort, in this paper I am only concerned with results from the infant cohort, with data collection beginning when the infants were 9 months of age. This is because the infant cohort had three waves of data available for analysis which encompassed the period of the recession. Although the infant is the main focus of interest for the Growing Up in Ireland study, I examine the health of the primary caregiver where they are the biological mother of the study infant. I only examine the effect on mothers because less is known about the effect of recessions on women. This is because previous research has tended to use labour market outcomes as indicators of a recession, and this choice means that there is a disproportionate examination of the effect of recessions on men's health. This maternal group is also important because any resultant impact on health may also have important spillover effects on child cognitive development. Three waves of data are currently available for the infant cohort – 11134 infants and their families were included in the first wave from September 2008 to April

2009, 9793 of those infants and their families were included in the second wave from January to August 2011, and 9240 were included in the third wave of from January to August 2013. The timing of the data collection encompasses the period of the financial crisis in Ireland. Although the country entered a recession by the time of the first wave in 2009, budgetary changes resulting in changes to disposable income occurred after this first wave. Data collection for the second wave, in 2011, took place during the recession. As the third wave of data collection began, unemployment started to decrease, and the State exited the IMF/ECB/EU Bailout at the end of 2013.

Although the Growing Up in Ireland study collects both objective and subjective health data for the primary caregiver, for the purposes of this paper I focus on measures of health that represent subjective wellbeing. These measures are depression, parental stress and treatment for anxiety or depression. I use psychological rather than physical measures of health because they remain underexplored in the context of income shocks, and because the long run effects on physical health are unlikely to be discoverable in the three waves covered by this panel.

I use a balanced panel in this paper, which results in 6821 households included in the final analysis[1]. A subgroup of those who report the economic status of a secondary caregiver (indicating that they are likely to have a partner to share the economic burden) is reported in the Appendix.

Dependent variable:

Depression

The primary dependent variable of interest is depression, which is scored using a short form of Centre for Epidemiological Depression Scale (CES-D). The initial CES-D scale was a 20 item measure self report instrument (Radloff 1977) shown to be reliable when the individual items are summed (Nunally 1978), with internal reliability ($\alpha = 0.84$) previously reported by GUI study group (Cruise 2017). The CES-D 8 is a shortened form of the CES-D, with a range from 0 to 24,

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[1] I examined the effect of attrition from an unbalanced panel and found there to be no association between missing cases and either socio-economic variables of interest or health variables.

and a threshold of 7 indicates a likely diagnosis of depression. The CES-D 8 has been shown to be reliable within a general population context (van de Velde 2009). Despite the correlation of this threshold with a clinical diagnosis of depression, the role of the CES-D is to determine the likely epidemiology of depressive symptoms in the general population, rather than as a means of diagnosis or evaluating response to treatment (Radloff 1977). Therefore, I primarily consider the depression scale to be continuous in nature, although I also use this threshold to examine if the effect of the recession resulted in a change in symptoms that would be consistent with a clinical diagnosis of depression.

Although my focus is on subjective reporting of depression, I also include a variable that indicates if the respondent has been treated for depression or anxiety. This is important because while respondents may have low scores on the depression scale at the time of interview, this could be secondary to successful treatment. The variable is binary in nature, with a yes/no answer to a question of having received any treatment in the interview year.

Stress

I use the Parental Stress Scale (Berry 1995) as a second measure of subjective wellbeing. Parental stress is a relevant measure of wellbeing during the recession because a number of studies have shown an association between financial strain and hostile parenting behaviours (Lempers 1989) (Conger 1994) (Mistry 2002). It is important to note, however, that this particular scale refers to parental rather than general stress. Therefore it focuses on parental stress levels which are due to the influence of children, rather than an assessment of general stressors (Zelman 2018). Although the full stress scale is an 18 item self-report scale which measures both positive and negative aspects of parenthood (Berry 1995), the GUI study uses the 6 item stress subscale. This subscale demonstrates satisfactory levels of internal reliability ($\alpha = 0.76$) (Murray 2014). Since parental personality, rather than external factors, has been shown to be explain the largest variance in parental stress (Vermaes 2008), I am not concerned with absolute measures of stress, but with changes in these stress levels over time.

The scale ranges from 6 to 30, with no specific threshold to indicate a likely diagnosis of 'parental stress'.

I also examine one of the items in isolation in an attempt to distinguish between on stress due to the parental role rather than general stress. I choose this particular item because it is most closely related to financial stress, as it asks if having children has been a financial burden. For the purposes of this paper I have recoded it to a binary yes/no response. Although I take this item as the closest approximation of general stress, it should be remembered that this choice has not been validated in the literature.

Independent variables:

The primary independent variable of interest is income, which is disposable equivalised income in logarithmic form (adjusted to 2009 figures). Disposable income is total household income, net of statutory reductions of income tax and social insurance contributions. In a sensitivity analysis I include the interaction of this disposable equivalised income loss with the first wave tenancy status of the primary caregiver.

I create a 6 category variable for housing tenure, which includes owner occupied (outright or with mortgage), purchased from local authority (this indicates low cost repayment), rented from local authority (low rent which is rent controlled), rented from private landlord, rented from parents, and free of rent.

I also examine the effect of primary caregiver unemployment, since income loss during a recession is often due to labour market loss. This variable is self-reported, therefore unemployment may potentially include the 'never-employed'. Because of the longitudinal nature of the panel, using a fixed effects approach should eliminate the distinction between the 'never-employed' and those who become unemployed, although it may of course include those who report unemployment immediately after the end of their education.

Separate from my examination of income and employment on health, I also include variables that reflect a subjective perception of the effect of the recession. These variables are only available in wave 2 and wave 3. I use self-reports of being in mortgage or rent arrears, primary caregiver wage reduction,

decreased work hours for either the primary or secondary care giver, decreased wages for either the primary or secondary caregiver, decreased social welfare, and being in utility arrears.

The explanatory variables included in each model are changes in the highest level of education reported, partnership status, a square of age, child illhealth, number of people in the household, maternity leave, and secondary caregiver unemployment. I also include secondary caregiver economic status where available as a partner's unemployment can result in negative spillover effects on a spouse which is almost as strong as for the individual themself (Marcus 2013) and include the results for this subgroup in the appendix.

Descriptive Statistics

Summary statistics for the balanced panel of the three waves of the infant cohort are shown in Table 1. This describes the outcomes for singleton infants where the primary caregiver is the biological mother of the study child. Only singleton infants are included because there are few non-singleton children in the study, yet the effect on their caregivers may be substantially different. The variables used in balancing the panel are those which are included in the estimation - self assessed health, depression, stress, income, employment (from socio-economic status), as well as explanatory variables of education, age, child health, numbers in household and partnership status.

Table 1 describes the changes in socio-economic and demographic factors over the three waves. There was little change in partnership status, and highest level of education over the three waves. The largest age group in wave 1 was the 30-34 year olds. There was an increase in child illhealth in waves 2 and 3, but the overall numbers reporting child illhealth were small.

The predominant change over the waves was seen in primary caregiver employment status and in secondary caregiver economic status. Fulltime employment for the primary caregiver decreased in wave 2, with a slight increase in wave 3. At the same time unemployment increased in wave 2, and decreased slightly in wave 3. Those engaged in home duties increased over the three waves.

It is important to note the fluctuations over the three waves in the number of observations for the secondary caregivers. This is because this variable was not used obtaining a balanced panel[2]. Employment rates decreased between wave 1 and wave 2, with a subsequent small increase in wave 3. The unemployment rate followed a similar pattern, increasing in wave 2, and falling again in wave 3, although not to wave 1 level. Finally, in Table 1 summary statistics are reported for the tenancy status of the household over the three waves, with little fluctuation over the waves.

Table 2 describes changes in income over the three waves. This is equivalised disposable income, adjusted to January 2009 levels using the Consumer Price Index. Mean income decreased over the three waves for the population as a whole, from €22336 in wave 1 to €19226 in wave 2 and €17933 in wave 3. I report income for each quintile separately, and show that this pattern of decreased income is not seen for every income group. The poorest income quintile experienced an increase in mean income in wave 2, from €7691 in wave 1 to €8241 in wave 2. While mean income decreased in wave 3 (to €8008) it did not reach wave 1 levels. In contrast, for the remaining income quintiles, mean income decreased in wave 2 and increased in wave 3, although it did not return to wave 1 levels. For instance, mean income of the wealthiest quintile decreased from €37146 in wave 1 to €35415 in wave 2, and increased to €36621 in wave 3.

In table 3 the variable 'effect of the recession' is reported for waves 2 and 3[3]. 60.94% reported having experienced a 'large effect of the recession' in wave 2, which increased to 64.73% in wave 3. 32.84% reported a 'small effect', which decreased to 29.22% in wave 3, and while 6.22% reported 'no effect' of the recession in wave 2, this decreased to 6.04% in wave 3.

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[2] A separate set of descriptive statistics and results are reported in the Appendix for households which do include a secondary caregiver.
[3] This variable was not part of the survey in wave 1.

Potential recessionary effects are also shown in table 3. This list is non-exhaustive, and includes mortgage or rent arrears, primary caregiver redundancy, decreased work hours for either primary or secondary caregiver, decreased wages for either the primary or secondary caregiver, decreased social welfare and utility arrears. In all cases the percentage of those reporting each effect of the recession was higher in wave 3 than in wave 2, with particularly large increase in rates for those reporting decreased social welfare, and mortgage or rent arrears. [4]

Table 4a describes the depression scores (using CES-D) over the three waves. The range is from 0-24, with higher scores indicating more depressive symptoms. The mean depression score decreased for the population as a whole. When subdivided by income quintile, the highest mean scores were for the poorest income quintile, and rates fell for each group over the three waves. Mean depression score by tenancy status show that scores increase for owner occupiers via the local authority in wave 2 and wave 3, but decrease for the other groups. Table 4b describes treatment for mental health by income group and tenancy. The numbers of those being treated for mental health decreased over the three waves, but rose in the poorest income quintile in wave 2 before falling again, while in the richest income quintile the rates decreased in the second wave but increased in the third. When these rates are examined by tenancy status, the overall picture shows a decrease in rates of those being treated, but an increase in wave 3 for those who are owners via the local authority, rent from their parents, or have a home free of rent.

In table 5a I describe the stress scores for both the population as a whole, for the individual income quintiles, and the mean scores for each housing group. This measure is the Parental Stress Score, with a range of 6-30, where higher scores represent higher levels of parental stress. Mean stress scores decrease over the

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[4] Descriptive statistics are reported for Table 3, rather than summary statistics due to the methodology of creating the variable

three waves, from 14.46 in wave 1, to 12.24 in wave 2, and 11.68 in wave 3. This fluctuation could be related to the changing age of the child rather than changes due to the recession. This decrease in stress score is most pronounced for the poorest income quintile, where the mean stress score in wave 1 was 15.4, while it was 12.5 in wave 2 and 11.8 in wave 3. The stress scores for each wave based on the tenancy status of the household show that owner occupiers had the lowest mean stress score in each of the waves. Table 5 b describes the rate of those reporting stress due to the financial burden of having children. The rates decrease over the three waves for all groups except income quintile 2, and the high rates of stress due to the financial burden of children in the first wave is more likely to be related to the cost of children in the first year of life, rather than an external cause. It is seen that rates increase in wave 3 for those who own via the local authority and for private renters, while they decrease for other groups.

Econometric Model

In the first instance I estimate the fixed effects model

$$y_{it} = \alpha_i + \beta x_{it} + \gamma w_{it} + \epsilon_{it}$$

which relates the cardinal health outcome y_{it} to the independent variable x_{it}, endogenous explanatory variables w_{it}, a time invariant individual specific effect α_i, and an error term ϵ_{it}. Since both y_{it} and x_{it} may be related to α_i, I use a fixed effects approach. As this means that many time invariant characteristics are no longer in the model, I include the square of age as an explanatory variable. Although the fixed effects model is helpful since many features, including education level and tenancy status, are time constant, it also carries some difficulties. For example, if tenancy status is included as an explanatory variable it is likely to be differentiated out during using the fixed effects process, as the descriptive statistics suggest that there is little fluctuation in tenancy status over time. Therefore it would not be possible to examine if changes in income affect health based on tenancy groups. To resolve this issue I include tenancy status in a sensitivity analysis, where disposable household income is interacted with the tenancy status of the primary caregiver in wave 1. X_{it} includes changes in income, unemployment, and subjective measures of the recession. There is

evidence of correlation between absolute income and unemployment (.154), however change in income is less strongly correlated with unemployment (.051). To avoid correlation between the objective and subjective measures of the recession, the objective measures of the recession (income and unemployment) are not included as variables in the sensitivity analysis examining the relationship of subjective measures of the recession on changes in health.

My main focus are psychological measures of health that are available as continuous measures. However, I also include a binary variable which indicates a likely diagnosis of depression in a fixed effects logit model[5], to examine if any changes in depression score are likely to be clinically important, as well as a binary variable indicating stress due to the financial burden of a child. Furthermore I also include a binary outcome variable representing treatment of a mental health condition.

4. Results

Table 6 reports the results of a fixed effects model examining the relationship between change in income and change in depression score. I also account for changes in unemployment as the literature has focused primarily on changes in labour market status as a measure of the recession. The relationship between changes in depression and reporting subjective effects of the recession is also examined in the sensitivity analysis of Table 6, but in this case unemployment is not included as these variable include Primary Caregiver Redunancy. The control variables included are changes in household size, number of children, child ill-health, partnership status, age, and education. A subgroup including secondary care giver unemployment can be found in the Appendix (table 6).

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[5] The fixed effects logit estimator uses the fact that the within individual sum is a sufficient statistic for α_i (Chamberlain 1980), thereby allowing a consistent estimator for β. Although this has been used in longitudinal studies of self-assessed health I am concerned that using a binary variable for self assessed health will result in a loss of data for those whose health state changes but does not reach this arbitrary threshold.

The results indicate that there is evidence of a statistically significant relationship between changes in income during the recession, and changes in depression score, which is significant at p<.05. The sign on the co-efficient is negative, which could indicate that either decreases in income are associated with increased total depression score, or increases in income are associated with decreased depression score. Taking into account the descriptive statistics findings showing that mean income decreased for the population as a whole, and for all income quintiles except the poorest, it is likely that this negative co-efficient indicates an increase in depression score is associated with a decrease in income. Importantly, I find no effect of becoming unemployed on changes in depression.

This income effect is further substantiated by the sensitivity analysis examining the effect of income based on tenancy status in wave 1. In this case there is evidence of a statistically significant relationship between changes in income and depression for those who are owner occupiers, but not for the other tenancy groups. This relationship is significant at p<.005, and the sign on the co-efficient indicates that income loss is associated with an increased depression score. The poorest income quintile would not be included in the owner/mortgage holder tenancy group, therefore those in this group experienced an income loss, rather than an income gain. In terms of causality, it could be argued that any decrease in income was due to poorer depression scores. However, it seems unlikely that lower income is a result of worse mental health (and their resultant effect on the labour market) for two reasons. In the first instance the impact of the Great Recession was felt by all social classes in Ireland, and recessionary effects were due not only to labour market loss, but also because of changes in tax and social welfare policy. Indeed the changes in disposable income seen here mirror the results of other work on the effect of the recession on income in Ireland (Savage 2015) (Nolan 2016) (Keane 2015) (Doris 2015). Secondly, the descriptive statistics show that mean scores are not consistent with a likely diagnosis of depression (which requires a CES-D >7), indicating that this score alone would not be sufficient to result in a labour market change. The effect seen here is similar to the findings of a previous study examining income and depression,

although in that case pre-tax income was examined over a 2 wave period (Wilkinson 2016). Furthermore, being in mortgage or rent arrears is associated with an increase in depression score, which is significant at p<.005, with no evidence of a relationship between any of the other subjective measures of the recession and changes in depression. This again points to the importance of being able to consume goods, including paying for housing costs, for psychological health.

Since 340,000 mortgages (out of a total of 800,000) were approved over the period of 2004-2006, many of these new mortgages were held by younger households, with mortgage repayments consuming a large portion of household income (Mc Carthy 2014). The burden of credit constraints, high mortgage repayments, and falls in disposable income, were not merely confined to those who experienced labour market losses (Mc Carthy 2014). The association of changes in income and depression for owners, and also the association of mortgage/rent arrears on higher depression scores is consistent with qualitative studies which have shown that mortgage difficulties can lead to depression, anxiety and poor mental health (Nettleton 1998) (Alley 2011), and that high status groups experience shame and self-blame when they experience financial loss (Houle 2017).

In the appendix (table 6) I report the results of the subgroup with both a primary and secondary caregiver. In this smaller subgroup the relationship disappears, and it is interesting that secondary caregiver unemployment is not associated with increased depression, suggesting that spillover effects from partner's unemployment may not be important.

In Table 7 I report the results of two fixed effects logit models where the dependent variable represents firstly a likely clinical diagnosis of depression (indicated by a CES-D score of >=7), and secondly having treatment for a mental health condition. My interest here is in examining if the effect of an income loss was important for those who did cross the threshold of a likely diagnosis of depression. In the first case the results indicate that there is evidence of a statistically significant relationship at p<.05, with similar findings to Table 6. Income changes were associated with a movement across this threshold. This

was found for all tenancy groups except those who were owners of their homes via the local authority. The negative sign on the coefficient here indicates that income loss is associated with a clinically significant increase in depression. Furthermore being in mortgage or rent arrears due to the recession is also associated with a change in depression status (indicative of a diagnosis of depression) while the other markers of the recession are not associated with this change. I follow this with a fixed effects logit approach to examine the effect on treatment for these mental health conditions. In this second case there is no effect of income on treatment, however being in mortgage or rent arrears is again associated with a statistically significant change in receiving treatment for mental health.

When parental stress is examined, the result of the fixed effects model in Table 8 shows that there is no evidence of a relationship in the base case between changes in income or unemployment and changes in parental stress score. This lack of evidence of a statistically significant relationship is also seen when changes in log income are examined based on the tenancy status of the household. However, when the emphasis is on the subjective markers of the recession, there is evidence of a relationship between both reduced wages (p<.001), and decreased social welfare (p<.05), and a change in parental stress score. The sign on the co-efficient indicates that decreased wages and reduced social welfare are both associated with a decrease in stress scores. This effect of decreased wage on decreased stress is also seen in the subgroup where the household has both a primary and secondary caregiver (Appendix table 8), however in this case decreased social welfare is not associated with reduced stress, while both primary caregiver redundancy and reduced wage are associated with lower stress. Secondary caregiver unemployment is not associated with changes in primary caregiver stress levels. There is no evidence of any relationship between either income, or the subjective reports of the recession, and parental stress due to the financial burden of having children in the fixed effects logit model (table 9).

Therefore the effects of income loss on stress are not the same as for depression, as no relationship is seen when the independent variable is parental stress. This lack of a consistent pattern could suggest that the results do not indicate a true effect, and that there may be bias from unobservables. However, heterogenous effects are also plausible, and may be representative of issues with the stress score itself. Considering that the Parental Stress Score was designed in order to distinguish between general stress and parental stress it is likely that this latter reason is relevant. A different result may be seen if a variable that accounts for general stress was available in the dataset. Despite evidence that financial stress affects parenting (Lempers 1989) (Conger 1994) (Mistry 2002), it is important to remember that the stress variable used here measures stress related to the parental role (childcare, schooling, housing), therefore may not be adequately tailored to assess clinical diagnosis of general stress.

One of the merits of this paper is that the focus is on income loss, rather than unemployment. This differs from many current papers on the recession, which include individual level, or state/county level unemployment as the independent variable (Ruhm 2000) (Ruhm 2005) (Böckerman 2007) (McInerney 2012) (McInerney 2013) (Tekin 2013) (Latif 2014) (Ruhm 2015) (Latif 2015) (Farre 2015) (Haaland 2015) (Wang 2017). Since it may be argued that the effects of income loss are secondary to labour market loss, I include unemployment in the models. I find no evidence that it has a negative effect on any of the health measures. I also take account of secondary caregiver unemployment, as there may be a spillover effect from partner's economic state. However, there is no evidence of a relationship between change in secondary caregiver unemployment and change in depression or stress when households with a secondary caregiver are examined as a subgroup in the Appendix.

6. Conclusion

This work adds to the literature examining the effect of the recession on health outcomes in several ways. In the first instance I use clinical knowledge of the biological effects of stress in my choice of health outcome. Since the clinical manifestations of stress are unlikely to become evident in the same time period as episodes of financial stress or labour market vulnerability, I choose subjective measures of psychological health. It would be reasonable to use biomarkers of stress or indicators health behaviour, if available, as they are early measures of health. However objective measures of cardiovascular disease and malignancies are unlikely to present in the short run of the business cycle, particularly in this young population. Therefore using these objective measures as indicators of health effects may underestimate potential health effects. In the absence of these biomarkers, subjective assessments of health are useful in determining early changes in health state.

While the biological pathway suggests that psychological health may be affected before physical health, measures of stress and depression are noticeable in their absence from papers examining the effects of the recession. Indeed, although clinically significant depression and depressive symptoms have been studied in association with job insecurity (Ferrie 2001) (Ferrie 2002) transitions to inadequate employment (Ferrie 2001) (Thomas 2005), and income insecurity (Prause 2009), there are relatively few studies examining the pro and counter cyclical effects of the business cycle on depression.

Due to the emphasis on unemployment as the predominant etiological factor in the relationship of the recession and health in previous literature, I use this work to draw attention to the role of income loss rather than labour market loss. While both population level (state, county and country) and individual level unemployment have been used as potential explanatory factors, this may be an incomplete representation of how recessions affect households. I find no evidence of a statistically significant relationship between becoming unemployed and changes in any measure of health. Nor is there evidence of a

significant relationship when secondary caregiver unemployment is included (for the households with a secondary caregiver).

However, I focus on disposable income because of relative risk aversion utility models that describe how individuals experience lowered utility in the event of decreased income, and also how lower income results in lowered consumption (Attanasio 2010). I find that changes in disposable income during the recession may explain some changes in health outcomes, particularly depression. This was seen for an increase in overall depression score and movement across a threshold consistent with a likely diagnosis of depression. I find that income loss affected the depression scores of those who were private owners, but not the parental stress scores of those who were private owners or renters. This is consistent with the idea that the threat of losing a home is associated with shame and loss (Nettleton 1998). This is further demonstrated by the sensitivity analysis which shows that increases in depression scores are associated with being in mortgage or rent arrears. If one assumed that the effect of the recession can be explained solely by labour market loss, there is a potential that the true effects might be underestimated. It is therefore important to included changes in disposable income, particularly for a population who are unlikely to be able to buffer an income shock.

Table 1. Summary statistics of socio-economic factors

	Wave 1 Mean	SD	Wave 2 Mean	SD	Wave 3 Mean	SD
Married	.702	.458	.735	.441	.759	.428
Single	.272	.445	.23	.421	.201	.4
Separated	.015	.122	.022	.146	.027	.161
Divorced	.009	.096	.011	.106	.01	.1
Widowed	.002	.047	.002	.045	.002	.05
Education						
Low Sec	.097	.296	.076	.265	.061	.24
Upr Sec	.313	.464	.282	.45	.291	.454
Non degree	.208	.406	.228	.42	.227	.419
Prim deg	.241	.427	.239	.426	.238	.426
High deg	.141	.348	.175	.38	.183	.387
SES PCG						
Mat leave			.067	.25	.034	.18
Empl	.624	.484	.524	.499	.566	.496
Student	.018	.133	.023	.151	.019	.138
Unemp	.029	.168	.047	.212	.041	.198
Sick/Disa	.007	.081	.012	.108	.012	.108
Home duties	.321	.467	.319	.466	.316	.465
Other	.001	.034	.008	.091	.012	.11
Irish	.86	.347	.868	.339	.892	.311
Unwell child	.01	.099	.022	.147	.017	.129
Tenancy						
Owner (mortgage)	.724	.447	.728	.445	.732	.442
Owner (Loc Auth)	.004	.064	.006	.075	.005	.069
Rented (Loc Auth)	.066	.249	.083	.277	.096	.295
Rented (private)	.175	.38	.161	.368	.15	.358
Rented (parents)	.014	.118	.011	.104	.008	0.09
Free of rent	.016	.124	.01	.01	.008	.084

Secondary Care Giver						
No obs	5527		5292		5139	
Employed	.729	.444	.65	.477	.64	.48
Student	.004	.065	.009	.094	.013	.115
Unemp	.044	.206	.098	.298	.079	.27
Sick/Disa	.006	.077	.009	.095	.009	.096
Home duties	.008	.089	.006	.078	.007	.083
Other	.001	.038	.003	.057	.005	.07

Mean scores reported (with SD in parentheses)

Table 2. Summary Statistics for equivalised disposable income (adjusted to 2009 levels)

	Wave 1	Wave 2	Wave 3
Total	6821	6821	6821
Mean	22336 (12304)	19226 (10224)	17933 (10356)
Inc Quintile 1	(922)	(1229)	(1505)
Mean	7691 (2066)	8241 (1692)	8008 (1695)
Inc Quintile 2	(1083)	(1437)	(1452)
Mean	12227 (1296)	12296 (1260)	12284 (1190)
Inc Quintile 3	(1297)	(1398)	(1500)
Mean	17080 (1500)	17002 (1442)	16773 (1448)
Inc Quintile 4	(1476)	(1449)	(1404)
Mean	23023 (2025)	22948 (2110)	22876 (2146)
Inc Quintile 5	(2043)	(1308)	(960)
Mean	37146 (10497)	35415 (9199)	36621 (12529)

Mean income scores reported (with SD)

Table 3. Descriptive Statistics – subjective reports of recessionary effect

	Wave 2	Wave 3
Large effect recession	4157 (60.94%)	4415 (64.73%)
Small effect recession	2240 (32.84%)	1993 (29.22%)
No effect recession	424 (6.22%)	412 (6.04%)
Mortgage/Rent arrears	491 (7.68%)	772 (12.05 %)
PCG Redudancy	7736(11.51%)	794 (12.39%)
Decr wrk hrs (PCG/SCG)	1493 (21.89%)	1808 (26.51%)
Decr wages (PCG/SCG)	4314 (67.44%)	4547 (70.96%)
Decr Soc Welfare	3236 (50.59%)	4083 (63.72%)
Utility arrears	777 (12.15%)	981 (15.31%)

Table 4a. Summary statistics – depression score using CES-D

	Wave 1	Wave 2	Wave 3
Total	2.32 (3.46)	2.25 (3.34)	2.1 (3.19)
Inc Quint 1	3.28 (4.4)	2.96 (4.06)	2.75 (3.97)
Inc Quint 2	2.77 (3.81)	2.71 (3.9)	2.25 (3.29)
Inc Quint 3	2.41 (3.63)	2.06 (3.05)	1.98 (2.89)
Inc Quint 4	2.16 (3.13)	1.91 (2.91)	1.71 (2.62)
Inc Quint 5	1.75 (1.75)	1.64 (2.37)	1.61 (2.65)
Owner (mortgage)	2.1 (3.22)	2.03 (3.11)	1.93 (2.98)
Owner (Loc Auth)	2.35 (2.53)	3.28 (4.07)	2.61 (2.87)
Rented (Loc Auth)	3.06 (4.14)	2.88 (3.87)	2.8 (4.15)
Rented (private)	2.78 (3.8)	2.82 (3.87)	2.4 (3.3)
Rented (parents)	3.62 (4.72)	2.51 (3.13)	2.79 (3.95)
Free of rent	3 (4.37)	2.88 (3.81)	2.77 (3.76)

Mean scores reported (with SD in parentheses)

Table 4 b Summary statistics – treatment for depression

	Wave 1	Wave 2	Wave 3
Total	.123 (.329)	.105 (.307)	.101 (.302)
Inc Quint 1	.148 (.355)	.152 (.359)	.128 (.334)
Inc Quint 2	.161 (.368)	.111 (.314)	.111 (.314)
Inc Quint 3	.139 (.346)	.111 (.314)	.1 (.301)
Inc Quint 4	.105 (.307)	.082 (.27)	.071 (.256)
Inc Quint 5	.091 (.287)	.066 (.248)	.079 (.27)
Owner (mortgage)	.12 (.325)	.096 (.294)	.092 (.29)
Owner (Loc Auth)	.071 (.262)	.051 (.223)	.061 (.242)
Rented (Loc Auth)	.173 (.378)	.172 (.378)	.147 (.355)
Rented (Private)	.122 (.327)	.115 (.32)	.108 (.311)
Rented (Parents)	.103 (.306)	.133 (.342)	.143 (.353)
Free of rent	.104 (.306)	.074 (.263)	.189 (.395)

Mean scores reported (with SD in parentheses)

Table 5a Summary statistics – stress score using Parental Stressors Subscale

	Wave 1	Wave 2	Wave 3
Total	14.46 (4.14)	12.24 (4.09)	11.68 (4)
Inc Quint 1	15.4 (4.49)	12.5 (4.48)	11.8 (4.28)
Inc Quint 2	14.68 (4.18)	12.31 (4.15)	11.78 (4.02)
Inc Quint 3	14.4 (4.11)	12.06 (3.96)	11.61 (3.93)
Inc Quint 4	14.26 (4)	12.16 (4.08)	11.62 (3.85)
Inc Quint 5	14.09 (3.85)	12.22 (3.78)	11.56 (3.83)
Owner (mortgage)	14.24 (3.98)	11.9 (3.93)	11.36 (3.82)
Owner (Loc Auth)	15.43 (3.82)	12.38 (3.95)	11.94 (3.98)
Rented (Loc Auth)	15.17 (4.51)	12.52 (4.3)	11.84 (4.44)
Rented (private)	15 (4.27)	13.5 (4.38)	12.96 (4.28)
Rented (parents)	14.75 (4.25)	13.17 (4.58)	12.93 (3.61)
Free of rent	14.78 (4.36)	13.25 (4.24)	12.34 (3.76)

Mean scores reported (with SD in parentheses)

Table 5 b. Summary statistics for parental stress due to the financial burden of child(ren)

	Wave 1	Wave 2	Wave 3
Total	.154 (.361)	.052 (.222)	.048 (.214)
Inc Quint 1	.216 (.412)	.052 (.223)	.052 (.222)
Inc Quint 2	.171 (.377)	.046 (.209)	.051 (.221)
Inc Quint 3	.146 (.353)	.047 (.213)	.036 (.187)
Inc Quint 4	.139 (.346)	.06 (.238)	.053 (.226)
Inc Quint 5	.126 (.332)	.053 (.224)	.048 (.213)
Owner (mortgage)	.132 (.339)	.044 (.205)	.041 (.198)
Owner (Loc Auth)	.214 (.418)	.026 (.16)	.03 (.174)
Rented (Loc Auth)	.199 (.4)	.053 (.224)	.05 (.218)
Rented (Private)	.22 (.414)	.084 (.277)	.085 (.279)
Rented (Parents)	.227 (.421)	.053 (.226)	.018 (.134)
Free of rent	.142 (.35)	.103 (.306)	.038 (.192)

Mean scores reported (with SD in parentheses)

Table 6 – Linear Fixed Effects model for Depression

	Linear FE Depression
No obs	6821
Ln Inc	-.186*
	(.08)
Unemployment	.187
	(.134)
Income effect *tenancy	
Ln Inc * Owners (mortgage)	-.29**
	(.086)
Ln Inc *Owner (Loc Auth)	-.12
	(1.191)
Ln Inc *Rented (Loc Auth)	-.063
	(.303)
Ln Inc*Rented (private)	.08
	(.194)
Ln Inc *Rented (parents)	.681
	(.54)
Ln Inc *Free of rent	-.676
	(.485)
Effect of recession	
Mortgage/Rent arrears	.159**
	(.047)
PCG Redundancy	-.001
	(.037)
Decr work hours (PCG or SCG)	-.009
	(.027)
Decr wage (PCG or SCG)	.007
	(.027)
Decr Social Welfare	-.002
	(.022)
Utility arrears	-.03
	(.043)

Adjusted for education, additional children, age squared, child illhealth, maternity, number in the household, partnership status. Standard errors in parentheses
*p<.05, ** p<.005, ***p<.001

Table 7. Fixed Effects Logit model for change in depression status across threshold, and receiving treatment for mental health

	Depression	Mental Health treatment
Ln Inc	-.243* (.112)	.016 (.11)
Unemployment	.035 (.172)	.06 (.163)
Income effect based on tenancy		
Ln Inc * Owners (mortgage)	-.243* (.112)	.004 (.111)
Ln Inc *Owner (Loc Auth)	-.234 (.124)	-.071 (.127)
Ln Inc *Rented (Loc Auth)	-.253* (.114)	.044 (.113)
Ln Inc*Rented (private)	-.225* (.114)	.028 (.111)
Ln Inc *Rented (parents)	-.247* (.12)	-.002 (.119)
Ln Inc *Free of rent	-.253* (.121)	-.035 (.12)
Effect of recession		
Mortgage/Rent arrears	.26** (.055)	.108* (.054)
PCG Redundancy	.081 (.055)	.099 (.052)
Decr work hours (PCG or SCG)	.002 (.045)	.036 (.043)
Decr wage (PCG or SCG)	-.015 (.043)	.007 (.04)
Decr Social Welfare	-.02 (.038)	-.011 (.036)
Utility arrears	-.05 (.049)	-.005 (.049)

Adjusted for education, additional children, age squared, child illhealth, maternity, number in the household, partnership status. Standard errors in parentheses
*p<.05, ** p<.005, ***p<.001

Table 8. Linear Fixed Effects model for Parental Stress

	FE stress
No obs	6821
Ln Inc	-.117 (.096)
Unemployment	.133 (.158)
Income effect *tenancy	
Ln Inc * Owners (mortgage)	-.118 (.097)
Ln Inc *Owner (Loc Auth)	-.088 (.11)
Ln Inc *Rented (Loc Auth)	-.151 (.099)
Ln Inc*Rented (private)	-.111 (.097)
Ln Inc *Rented (parents)	-.162 (.105)
Ln Inc *Free of rent	-.133 (.103)
Effect of recession	
Mortgage/Rent arrears	.038 (.049)
PCG Redundancy	-.055 (.047)
Decr work hours (PCG or SCG)	.064 (.033)
Decr wage (PCG or SCG)	-.166*** (.032)
Decr Social Welfare	-.076* (.027)
Utility arrears	-.071 (.046)

Adjusted for education, additional children, age squared, child illhealth, maternity, number in the household, partnership status. Standard errors in parentheses
*p<.05, ** p<.005, ***p<.001

Table 9 Fixed Effects logit model examining Parental Stress due to the financial burden of child(ren)

	Financial stress due to child
Ln Inc	-.127 (.121)
Unemployment	-.221 (.196)
Income effect based on tenancy	
Ln Inc * Owners (mortgage)	-.151 (.122)
Ln Inc *Owner (Loc Auth)	-.144 (.135)
Ln Inc *Rented (Loc Auth)	-.135 (.123)
Ln Inc*Rented (private)	-.113 (.122)
Ln Inc *Rented (parents)	-.153 (.131)
Ln Inc *Free of rent	-.134 (.134_
Effect of recession	
Mortgage/Rent arrears	.034 (.068)
PCG Redundancy	-.028 (.068)
Decr work hours (PCG or SCG)	.097 (.052)
Decr wage (PCG or SCG)	-.082 (.048)
Decr Social Welfare	-.066 (.043)
Utility arrears	-.059 (.06)

Adjusted for education, additional children, age squared, child illhealth, maternity, number in the household, partnership status. Standard errors in parentheses
*p<.05, ** p<.005, ***p<.001

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Appendix

Table 1 Summary statistics of socio-economic factors for Balanced Panel (Subgroup with secondary care givers in household)

	Wave 1 Mean	SD	Wave 2 Mean	SD	Wave 3 Mean	SD
Married	.819	.385	.865	.341	.895	.307
Single	.167	.373	.122	.328	.097	.296
Separated	.005	.073	.003	.057	.002	.044
Divorced	.009	.096	.009	.092	.006	.077
Widowed	.001	.025	.001	.025	.000	.015
Education						
Low Sec	.065	.246	.048	.214	.041	.199
Upr Sec	.275	.447	.241	.428	.497	.5
Non degree	.211	.408	.23	.421	.136	.343
Prim deg	.274	.446	.266	.442	.21	.407
High deg	.174	.379	.214	.41	.116	.321
SES PCG						
Mat leave			.079	.269	.038	.191
Empl	.68	.466	.563	.496	.608	.488
Student	.009	.092	.012	.109	.013	.111
Unemp	.022	.147	.038	.192	.028	.166
Sick/Disa	.005	.068	.012	.108	.011	.105
Home duties	.283	.451	.287	.452	.292	.455
Other	.001	.033	.009	.095	.011	.103
Irish	.866	.341	.872	.334	.897	.303
Unwell child	.008	.088	.018	.133	.013	.111
Owner (mortgage)	.821	.384	.852	.355	.863	.344
Owner (Loc Auth)	.004	.06	.006	.077	.006	.075
Rented (Loc Auth)	.034	.181	.048	.214	.052	.223
Rented (private)	.128	.334	.147	.354	.155	.362
Rented (parents)	.004	.064	.001	.036	.002	.039
Free of rent	.009	.095	.005	.07	.004	.066

Secondary Care Giver						
Empl	.912	.284	.858	.35	.876	.33
Student	.008	.09	.011	.105	.016	.125
Unemp	.063	.242	.111	.314	.082	.274
Sick/Disa	.009	.096	.011	.104	.011	.106
Home duties	.006	.075	.007	.083	.009	.094
Other	.002	.046	.003	.057	.006	.077

Mean scores reported

Table 2. Summary Statistics for equivalised disposable income (adjusted to 2009 levels)
(Subgroup with secondary care givers in household)

	Wave 1	Wave 2	Wave 3
Total	(4640)	(4640)	(4640)
Mean	24623 (12241)	20864 (10245)	19513 (10679)
Inc Quintile 1	(353)	(562)	(713)
Mean	7914 (1904)	8419 (1491)	8158 (1628)
Inc Quintile 2	(569)	(843)	(891)
Mean	12336 (1168)	12439 (1235)	12383 (1153)
Inc Quintile 3	(894)	(1009)	(1103)
Mean	17147 (1492)	17005 (1450)	16797 (1473)
Inc Quintile 4	(1124)	(1141)	(1134)
Mean	23084 (2000)	22998 (2098)	22922 (2148)
Inc Quintile 5	(1700)	(1085)	(799)
Mean	37154 (10366)	35204 (8960)	36505 (12716)

Mean scores reported (with SD in parentheses)

Table 3. Descriptive Statistics – subjective reports of recessionary effect

(Subgroup with secondary care givers in household)

	Wave 2	Wave 3
Large effect recession	2777 (59.85%)	2946 (64.49%)
Small effect recession	1568 (33.79%)	1408 (30.34%)
No effect recession	295 (6.36%)	286 (6.16%)
Mortgage/Rent arrears	262 (6.03%)	438 (10.06%)
PCG Redudancy	498 (11.46%)	522 (11.99%)
Decr wrk hrs (PCG/SCG)	1025 (22.09%)	1227 (26.44%)
Decr wages (PCG/SCG)	3285 (75.6%)	3353 (77.01%)
Decr Soc Welfare	1992 (45.85%)	2632 (60.45%)
Utility arrears	373 (8.58%)	492 (11.3%)

Table 4a. Summary statistics – depression score using CES-D (Subgroup with secondary care givers in household)

	Wave 1	Wave 2	Wave 3
Total	2.01 (3.07)	1.97 (3.03)	1.82 (2.85)
Inc Quint 1	2.53 (3.71)	2.52 (3.68)	2.17 (3.45)
Inc Quint 2	2.2 (3.33)	2.06 (3.16)	1.85 (2.83)
Inc Quint 3	2.24 (3.38)	1.9 (3.003)	1.77 (2.68)
Inc Quint 4	1.82 (2.71)	1.699 (2.54)	1.64 (2.53)
Inc Quint 5	1.64 (2.58)	1.58 (2.41)	1.4 (2.15)
Owner (mortgage)	1.95 (3.04)	1.89 (2.93)	1.8 (2.81)
Owner (Loc Auth)	2.35 (2.62)	4.53 (5.49)	1.54 (1.94)
Rented (Loc Auth)	2.08 (3.16)	2.21 (3.28)	2.36 (3.77)
Rented (private)	2.3 (3.33)	2.36 (3.55)	1.8 (2.76)
Rented (parents)	2.1 (2.38)	2.17 (4.83)	1.57 (1.9)
Free of rent	1.95 (2.49)	1.74 (2.61)	1.3 (2.54)

Mean scores reported (with SD in parentheses)

Table 4 b Summary statistics – treatment for depression
(Subgroup with secondary care givers in household)

	Wave 1	Wave 2	Wave 3
Total	.113 (.316)	.092 (.289)	.087 (.282)
Inc Quint 1	.146 (.353)	.126 (.332)	.111 (.314)
Inc Quint 2	.143 (.35)	.103 (.304)	.092 (.29)
Inc Quint 3	.119 (.323)	.091 (.288)	.084 (.278)
Inc Quint 4	.101 (.302)	.069 (.253)	.069 (.24)
Inc Quint 5	.086 (.281)	.066 (.248)	.073 (.26)
Owner (mortgage)	.117 (.322)	.092 (.289)	.087 (.282)
Owner (Loc Auth)	0	0	.077 (.277)
Rented (Loc Auth)	.139 (.347)	.095 (.293)	.103 (.304)
Rented (private)	.086 (.28)	.099 (.3)	.072 (.26)
Rented (parents)	0	0	.143 (.378)
Free of rent	.119 (.328)	.043 (.209)	.25 (.444)

Mean scores reported (with SD in parentheses)

Table 5a Summary Statistics of Parental Stressors Subscale
(Subgroup with secondary care givers in household)

	Wave 1	Wave 2	Wave 3
Total	14.17 (3.94)	12.01 (3.92)	11.39 (3.83)
Inc Quint 1	14.379 (4.055)	12 (4.17)	11.37 (4.08)
Inc Quint 2	14.31 (4.04)	11.81 (3.87)	11.35 (3.76)
Inc Quint 3	14.29 (3.99)	12 (3.84)	11.16 (3.6)
Inc Quint 4	14.1 (3.94)	11.99 (3.89)	11.73 (3.93)
Inc Quint 5	13.98 (3.8)	12.28 (3.78)	11.49 (3.7)
Owner (mortgage)	14.1 (3.93)	11.84 (3.87)	11.24 (3.76)
Owner (Loc Auth)	15.12 (4.37)	11.87 (3.52)	11.85 (3.91)
Rented (Loc Auth)	14.35 (4.25)	11.96 (4.07)	11.09 (3.98)
Rented (private)	14.56 (3.92)	13.17 (3.96)	12.67 (4.11)
Rented (parents)	13.89 (3.23)	16.5 (6.89)	12.86 (3.98)
Free of rent	14.05 (3.95)	12.22 (4.22)	12.45 (4.14)

Mean scores reported (with SD in parentheses)

Table 5 b. Summary statistics for parental stress due to the financial burden of child(ren) (Subgroup with secondary care givers in household)

	Wave 1	Wave 2	Wave 3
Total	.138 (.345)	.046 (.209)	.042 (.201)
Inc Quint 1	.155 (.362)	.034 (.18)	.039 (.195)
Inc Quint 2	.151 (.359)	.038 (.191)	.043 (.203)
Inc Quint 3	.134 (.342)	.051 (.221)	.023 (.151)
Inc Quint 4	.134 (.342)	.051 (.22)	.062 (.24)
Inc Quint 5	.126 (.332)	.058 (.234)	.051 (.22)
Owner (mortgage)	.13 (.336)	.044 (.205)	.039 (.194)
Owner (Loc Auth)	.235 (.437)	0	.077 (.277)
Rented (Loc Auth)	.146 (.353)	.03 (.171)	.033 (.178)
Rented (private)	.185 (.389)	.065 (.247)	.068 (.253)
Rented (parents)	.263 (.452)	.167 (.408)	0
Free of rent	.071 (.26)	.087 (.288)	.05 (.224)

Mean scores reported (with SD in parentheses)

Table 6 – Linear Fixed Effects model for depression (subgroup with secondary caregiver)

	FE depress
No obs	4640
Ln Inc	-.14 (.091)
Unemployment	.296 (.167)
Paternal Unemployment	.058 (.127)
Income effect based on tenancy	
Ln Inc * Owners (mortgage)	-.141 (.091)
Ln Inc *Owner (Loc Auth)	-.049 (.125)
Ln Inc *Rented (Loc Auth)	-.168 (.102)
Ln Inc*Rented (private)	-.126 (.092)
Ln Inc *Rented (parents)	-.081 (.106)
Ln Inc *Free of rent	-.125 (.099)
Effect of recession	
Mortgage/Rent arrears	.076 (.059)
PCG Redundancy	.016 (.042)
Decr work hours (PCG or SCG)	-.06 (.031)
Decr wage (PCG or SCG)	-.038 (.03)
Decr Social Welfare	.019 (.025)
Utility arrears	.025 (.054)

Adjusted for education, additional children, age squared, child illhealth, maternity, number in the household, partnership status. Standard errors in parentheses
*$p<.05$, ** $p<.005$, ***$p<.001$

Table 7 Fixed Effects Logit Model for depression and treatment for mental health (subgroup with secondary caregiver)

	Depression	Treated for Mental Health
Ln Inc	-.174 (.161)	-.187 (.153)
Unemployment	.137 (.286)	.114 (.24)
Pat Unempl	.152 (.184)	-.094 (.179)
Income effect based on tenancy		
Ln Inc * Owners (mortgage)	-.17 (.162)	-.188 (.154)
Ln Inc *Owner (Loc Auth)	-.122 (.187)	-.347 (.198)
Ln Inc *Rented (Loc Auth)	-.19 (.164)	-.199 (.161)
Ln Inc*Rented (private)	-.18 (.163)	-.207 (.156)
Ln Inc *Rented (parents)	-.121 (.191)	-.241 (.207)
Ln Inc *Free of rent	-.11 (.182)	-.193 (.17)
Effect of recession		
Mortgage/Rent arrears	.143 (.082)	.023 (.079)
PCG Redundancy	.091 (.075)	.103 (.065)
Decr work hours (PCG or SCG)	-.022 (.057)	-.065 (.054)
Decr wage (PCG or SCG)	-.079 (.058)	.041 (.051)
Decr Social Welfare	.055 (.051)	-.07 (.046)
Utility arrears	-.042 (.078)	.08 (.076)

Adjusted for additional children, age squared, child illhealth, maternity, number in the household, partnership status. Standard errors in parentheses
*p<.05, ** p<.005, ***p<.001
Depression 1=CES-D>=7 0=CES-D <7

Table 8 Linear Fixed Effects model for Parental Stress (subgroup with secondary caregiver)

	FE stress
No obs	4640
Ln Inc	-.088 (.119)
Unemployment	.248 (.212)
Paternal Unemployment	-.226 (.147(
Income effect based on tenancy	
Ln Inc * Owners (mortgage)	-.088 (.118)
Ln Inc *Owner (Loc Auth)	.039 (.145)
Ln Inc *Rented (Loc Auth)	-.213 (.126)
Ln Inc*Rented (private)	-.089 (.121)
Ln Inc *Rented (parents)	-.045 (.146)
Ln Inc *Free of rent	-.165 (.127)
Effect of recession	
Mortgage/Rent arrears	.094 (.062)
PCG Redundancy	-.152* (.055)
Decr work hours (PCG or SCG)	.055 (.039)
Decr wage (PCG or SCG)	-.21*** (.038)
Decr Social Welfare	-.034 (.032)
Utility arrears	.007 (.059)

Adjusted for additional children, age squared, child illhealth, maternity, number in the household, partnership status. Standard errors in parentheses
*p<.05, ** p<.005, ***p<.001

Table 9 Fixed Effects Logit Model for Parental Stress due to financial burden of child(ren) (subgroup with secondary caregiver)

	Financial stress
Ln Inc	-.059 (.177)
Unemployment	-.27 (.31)
Pat Unempl	-.356 (.231)
Income effect based on tenancy	
Ln Inc * Owners (mortgage)	-.059 (.178)
Ln Inc *Owner (Loc Auth)	-.052 (.193)
Ln Inc *Rented (Loc Auth)	-.141 (.186)
Ln Inc*Rented (private)	-.037 (.179)
Ln Inc *Rented (parents)	-.084 (.193)
Ln Inc *Free of rent	-.107 (.209)
Effect of recession	
Mortgage/Rent arrears	.143 (.095)
PCG Redundancy	-.157 (.094)
Decr work hours (PCG or SCG)	.02 (.066)
Decr wage (PCG or SCG)	-.083 (.062)
Decr Social Welfare	.003 (.057)
Utility arrears	.055 (.029)

Adjusted for additional children, age squared, child illhealth, maternity number in the household, partnership status. Standard errors in parentheses
*p<.05, ** p<.005, ***p<.001