DISCUSSION PAPER SERIES

IZA DP No. 8037

The Impact of Adult Child Emigration on the Mental Health of Older Parents

Irene Mosca
Alan Barrett

March 2014

Forschungsinstitut
zur Zukunft der Arbeit
Institute for the Study
of Labor

The Impact of Adult Child Emigration on the Mental Health of Older Parents

Irene Mosca
Trinity College Dublin

Alan Barrett
Economic and Social Research Institute,
Trinity College Dublin and IZA

Discussion Paper No. 8037
March 2014

IZA

P.O. Box 7240
53072 Bonn
Germany

Phone: +49-228-3894-0
Fax: +49-228-3894-180
E-mail: iza@iza.org

IZA Discussion Paper No. 8037
March 2014

ABSTRACT

The Impact of Adult Child Emigration on the Mental Health of Older Parents

A growing literature within economics has sought to examine the impacts of emigration on sending countries. Some of the studies have looked within families and have investigated how emigration affects those family members who are left behind. In this paper, we explore whether older parents of adult children who emigrate experience declines in mental health compared to parents whose children do not migrate. We use data from the first two waves of The Irish Longitudinal Study on Ageing. This is a nationally representative sample of 8,500 people aged 50 and above living in Ireland collected in 2009-11 (Wave 1) and 2012-13 (Wave 2). To deal with the endogeneity of migration, we apply fixed effects estimation models and control for a broad range of life-events occurring between the two waves. These include the emigration of a child but also events such as bereavement, onset of disease, retirement and unemployment. We find that depressive symptoms and feelings of loneliness increase among the parents of migrant children but that the effect is only present for mothers. Given the relationship between mental health and other health outcomes, the potential impacts for the older populations of migrant-sending regions and countries are significant.

JEL Classification: I15, J61

Keywords: emigration, depression, mental health

Corresponding author:

Alan Barrett
Economic and Social Research Institute
Whitaker Square
Sir John Rogerson's Quay
Dublin 2
Ireland
E-mail: alan.barrett@esri.ie

SECTION 1: INTRODUCTION

The impact of emigration on sending countries has received increasing attention in recent years. Among the issues that have been explored are the potentially positive effects of remittances and the potentially negative effects of the so-called "brain-drain". These are enormously important issues because they impact directly on the capacity of less-developed countries to generate economic growth and reductions in poverty.

One strand of the literature on sending countries has looked within families and has investigated how family members left behind are affected by the emigration of parents, children and spouses. On the emigration of parents, Cox-Edwards and Ureta (2003) showed that this had a positive impact on the education levels of the children left behind in El Salvador. However, Giannelli and Mangiavacchi (2010) found the opposite results for Albania. Hildebrandt and McKenzie (2005) found positive effects of parental emigration on children's health in Mexico. As regards the emigration of spouses, Grigorian and Melkonyan (2011) found that the emigration of a spouse tended to reduce the labour supply of the spouse left behind.

In this paper, we explore the impact of adult child emigration on the mental health of older parents and in so doing we build on the work of Antman (2010, 2011 and 2013). Using the first wave of the Mexican Health and Ageing Study (MHAS), Antman found evidence of negative impacts on both the mental and physical health of Mexican parents due to the emigration of their children. As Antman (2010, p.208) argues, these are important findings because they "cast further doubt on the assumption that family members left behind in source countries should always benefit from the international migration of their relatives".

We use data from the first two waves of The Irish Longitudinal Study on Ageing (TILDA). This is a nationally, representative sample of people aged 50 and over and living in Ireland with Wave 1 undertaken in 2009-2011 and Wave 2 undertaken in 2012-2013. Given the economic collapse in Ireland in 2008 and 2009, high levels of out-migration have resumed and so Ireland once again provides a useful setting in which to study emigration. The TILDA data contain information on whether the children of the respondents live in Ireland or in another country. Combining the data from Wave 1 and Wave 2, we can identify the parents whose children emigrated between the waves. The data also contain measures of mental health at Wave 1 and at Wave 2. Hence, we can observe changes in mental health. Through fixed effects models, we explore whether there is a relationship between the emigration of children and the mental health of parents, controlling for other negative life events that occurred between Waves 1 and 2. We find evidence of increased levels of depressive symptoms and feelings of loneliness among the mothers of emigrants but not for fathers. As Antman (2010 and 2011) uses a single cross-section and instrumental variables, our use of two waves from a panel and fixed effects modelling makes this paper an important addition to the earlier work.

The paper is structured as follows. In Section 2, we describe the data more fully. In Section 3, we set out our estimation framework and discuss how our fixed effects approach is designed to overcome the key empirical challenge in studies such as this, namely, the endogeneity of the migration decision[1]. In Section 4, we discuss the results and also additional efforts to rule out endogeneity as the driver of our results. We conclude in Section 5.

[1] Antman (2013) provides a good discussion on techniques used in this context.

SECTION 2: THE DATA

The data we use are from the first two waves of The Irish Longitudinal Study on Ageing. TILDA is a nationally representative sample of community dwelling individuals aged 50 and over (and their spouses and partners of any age) living in Ireland. It is modelled closely on the Health and Retirement Study (HRS), the English Longitudinal Study on Ageing (ELSA) and the Survey of Health, Retirement and Ageing in Europe (SHARE).

The first wave of data was collected between October 2009 and July 2011. A total of 8,504 participants were recruited from a clustered random sample of all households in Ireland. All participants provided written informed consent. Those with cognitive impairment that prevented consent being given were not included in the study. Respondents first completed a computer-assisted personal interview (CAPI) in their own homes. Respondents were then invited to travel to one of two health centres for a comprehensive health assessment. If unable or unwilling to attend a health centre, they were offered a modified and partial assessment in their own home. Respondents were also asked to complete a self-completion questionnaire (SCQ), which was designed to explore areas that were considered particularly sensitive, such as relationship quality, loneliness and stressful life events. A total of 6,910 respondents aged 50 and over completed and returned the self-completion questionnaire. The overall response rate for the first wave of the study was 62%.

The second wave of data was collected between April 2012 and January 2013 and a response rate of 86% was achieved (Dooley, 2014). Respondents completed a CAPI in their own homes and were asked to complete a SCQ. Unlike Wave 1 of the study, there was no health assessment at Wave 2. While every effort was made to achieve in-person interviews, 80

proxy interviews were carried out for respondents who were deemed unable to participate in an interview due a physical or cognitive impairment. Proxy interviews are excluded from our analyses, for the simple reason that we do not observe the relevant variables for these respondents. To account for the sampling structure at Wave 1 and non-response at Wave 2, we use appropriate survey estimation methods and weights that are available in the data.

Because our interest is in seeing if the out-migration of a child leads to a deterioration in parental mental health, we restrict the sample to parents of children aged 16 and over at Wave 1 and all of whose children were living in Ireland at Wave 1. This gives a sample of 2,911 parents. Of this group, 361 parents have seen one or more children emigrate between the two survey waves. A total of 310 parents have seen only one child emigrate, 48 parents have seen two children emigrate and 3 parents have seen three or four children emigrate. The parents in our final sample have, on average, 3.2 living children.

SECTION 3: THE ESTIMATION FRAMEWORK

Consider the following equation:

$$MH_{it} = \alpha + \beta\, w_t + \gamma\, D_{it} + \delta\, SE_{it} + \lambda\, PH_{it} + \nu\, EC_{it} + \psi\, OC_{it} + a_i + u_{it} \qquad t=1,2 \qquad \text{(Eq 1)}$$

where MH_{it} denotes the mental health status of parent i in time period t; w is a dummy variable that equals zero when t=1 and one when t=2; D is a vector of demographic variables; SE is a vector of socio-economic variables; PH is a vector of physical health variables; EC is the dependent variable of most interest here, emigration of a child; OC is a vector of other

children's circumstances; a_i is a time-invariant unobserved effect and u_{it} is the time-varying error. Here, a_i and u_{it} are unobserved, whereas D_{it}, SE_{it}, PH_{it}, EC_{it} and OC_{it} are observed.

OLS estimation of v is complicated by the (potential) endogeneity of EC: a_i is unobserved so EC may not be orthogonal to the residual term $a_i + u_{it}$. Since we have two waves of data at our disposal, we deal with this endogeneity problem by using a fixed-effect approach based on the first-differences of Equation 1 over time. By doing so, we remove the time-invariant unobserved effect from our model. Let Δ denotes the first difference operator from t=1 to t=2, so, for example, $\Delta D_i = D_{i2} - D_{i1}$. We have that:

$$\Delta MH_i = \beta + \gamma \Delta D_i + \delta \Delta SE_i + \lambda \Delta PH_i + v \Delta EC_i + \psi \Delta OC_i + \Delta u_i \quad \text{(Eq 2)}$$

Critically, the unobserved effect a_i does not appear in Equation 2 because it has been differenced away. Similarly, time-invariant regressors have also been differenced away. All time-variant regressors remain in Equation 2 and are expressed as changes between the two waves. The intercept in Equation 2 is the change in intercept from t=1 to t=2. Equation 2 explicitly considers how demographic, socioeconomic and physical health changes and changes in children's conditions over time affect parental mental health changes over the same time period.

Dependent variables

We use three different measures of mental health: depressive symptoms; self-rated emotional/mental health and loneliness feelings.

Depressive symptoms

In TILDA, the 20-item Center for Epidemiological Studies Depression Scale (CES-D) is used to measure the degree to which respondents have experienced a wide variety of depressive symptoms in the week prior to the interview (Radloff, 1977). The test includes questions on negative feelings (like having the blues, experiencing life as a failure, feeling lonely or sad, having crying spells), on positive thoughts (as being hopeful about the future, feeling happy, enjoying life), on somatic activity (like losing appetite, suffering from a restless sleep, talking less), and on social contacts (experiencing other persons as unfriendly). Each of the 20 items is measured on a four point scale leading to a total score of 60, with higher scores indicating higher depressive symptoms. A cutoff score of ≥16 is used to determine clinically significant depressive symptoms (Radloff, 1977).

Changes in depressive symptoms are obtained by subtracting the CES-D score at Wave 1 from the CES-D score at Wave 2. Positive changes indicate that depressive symptoms have increased between the two interviews. Negative changes indicate that depressive symptoms have decreased.

Self-rated mental health

In both waves, respondents are asked whether they rate their mental/emotional health as: excellent, very good, good, fair, or poor. The responses are then coded from 1 to 5, with 1 being excellent and 5 being poor.

Loneliness

In TILDA, loneliness is measured using a modified version of the University of California Los Angeles (UCLA) Loneliness Scale (Russell, 1996). Four negatively worded and one positively worded question are used: How often do you feel a lack of companionship? How

often do you feel left out? How often do you feel isolated from others? How often do you feel lonely? How often do you feel in tune with the people around you? The frequency of the outcome variable is assessed as: 'Hardly ever or never'; 'Some of the time'; or 'Often'. The responses to the five questions are summed and the final score ranges from 0 (not lonely) to 10 (extremely lonely).

As with depressive symptoms and self-rated mental health, changes in loneliness feelings are obtained by subtracting the loneliness score at Wave 1 from the loneliness score at Wave 2. Positive (negative) changes indicate that loneliness feelings have increased (decreased) between the two interviews. Finally, because loneliness feelings are measured in the self-completed questionnaire in TILDA, the loneliness model is based on a smaller sample size as compared to the other two models.

Independent variables

Child emigration

The main independent variable of interest is whether or not a child of the parents in question emigrated. In each wave of TILDA, respondents are asked a set of questions about their children, including whether they live with their parents, elsewhere in Ireland or outside of Ireland. We select our sample to be parents whose children were all living in Ireland at Wave 1. If we observe in the Wave 2 data that a child now lives outside of Ireland, this parent is coded as having seen a child emigrate. The fact that the observations on where the children live are contemporaneous with the other data collected at Wave 1 and Wave 2 provides an advantage over migration data that is recall biased. We should note that although we know that children are living outside of Ireland, we do not have information on what country they are living in.

A crucial assumption of the model of Equation 2 is that the change in the idiosyncratic error $\Delta u_{i,}$ is uncorrelated with changes in the explanatory variables. If this assumption holds, we can get consistent estimators using OLS. Our estimates of the impact of child emigration will be improved if we include a wide array of other time-varying determinants of mental health including demographic, socioeconomic and physical health events and events affecting respondents' children.

Demographic and socioeconomic changes

The demographic events included in our model are widowhood and loss of close friends and relatives. The death of the spouse and the loss of close friends or relatives have regularly been shown as important sources of psychological stress (Choi and Bohman, 2007; Dykstra et al., 2005; Theeke, 2009).

Because changes in labour market status and changes in income may also affect mental health (Lindeboom et al., 2002; Dave et al., 2008; Mandal and Roe, 2008; Tiedt, 2013), we include retirement and becoming unemployed as regressors and also control for changes in weekly individual gross income. In TILDA, information on individual income is collected through a series of questions covering labour income and income from social welfare, pensions, investment incomes and other sources (O'Sullivan et al., 2013). The questions are taken directly from the recent versions of the European Union Statistics on Income and Living Conditions (EU-SILC) questionnaire.[2] It is important to control for these changes so that we

[2] Labour income consists of employee income from the respondent's main job in the past twelve months and the gross profit from self-employment for self-employed people as well as pre-tax farm income for those engaged in farming. Pension income is made up of both regular and lump sum income from occupational and private

reduce the probability that "child emigration" is simply a proxy for the effect of Ireland's economic recession on the parent in question.

Physical health changes

The evidence collected in the medical literature shows that disability, new medical illness and poor (self-perceived) health are significant risk factors for depression and mental health difficulties (Cole and Dendukuri, 2003; Choi and Bohman, 2007; Schoevers et al., 2000). Because TILDA includes a wide battery of questions on health status, we are in the fortunate position to observe and measure the extent to which the health status of TILDA respondents has changed or deteriorated between the two survey interviews.

Focusing first on the onset of disease, respondents are asked whether since the last interview they have been diagnosed with one or more cardiovascular condition or chronic illness. Examples of cardiovascular conditions are high blood pressure, high cholesterol, heart attack or stroke. Examples of chronic illnesses are asthma, arthritis, osteoporosis or cancer. Onset of cardiovascular disorder and onset of chronic illness are included as regressors.

---

schemes. Social welfare payments made to the respondent, income from assets and irregular income are also included in our measure of gross income. To reduce item non-response in relation to income sources, unnfolding brackets are used when respondents refuse or say that they "do not know" the relevant amount. If respondents do not provide a point estimate and also do not provide a banded a value, we use conditional hot-deck imputation techniques to impute the relevant amount. TILDA also includes a single comprehensive question about net household income. Unfortunately, because the phrasing of the question differs between the two waves, we cannot control for changes in household income in our model.

For the purpose of assessing functional capacity, respondents are asked about any difficulties they have in carrying out a range of activities. These activities fall into two groups: activities of daily living (ADLs), which are the basic tasks of everyday life, such as eating, bathing, dressing, toileting, and moving about; and instrumental activities of daily living (IADLs), which are the activities performed in order to live independently in a community setting, such as managing money, shopping, using the telephone, housekeeping, preparing meals, and taking medications correctly. In our model, loss of functional capacity is measured by an increase in the number of ADLs and IADLs respondents have difficulties with.

Finally, we include two variables capturing whether respondents perceive that their physical health has deteriorated between the two survey waves. Self-rated physical health is measured using five response options "excellent, very good, good, fair, or poor". We classify respondents by whether they have experienced a deterioration of one or two or more points in their physical health. To illustrate, a respondent who rates her physical health as very good in Wave 1 and good in Wave 2 would experience a one-point deterioration. A respondent who rates her physical health as very good in Wave 1 and fair in Wave 2 would experience a two-point deterioration.

Changes in children's conditions

Turning then to changes in children's conditions, other than emigration, we include two dummy variables capturing whether respondents have seen one or more of their children (a) become unemployed or (b) become widowed, separated, divorced or single between the two waves of the survey. As with the emigration variable, these variables are constructed by looking at the responses in both waves and by coding as 1 changes in circumstances and 0 where no change occurred. We are interested in these variables partly by way of seeing

whether there is evidence of other elements of inter-personal utility between parents and their children, in addition to emigration.

Changes in quality of social relationships

In the loneliness model we include two regressors capturing changes in respondents' quality of social relationships. These are derived from a number of questions asked in the self-completion questionnaire aimed to assess the extent to which respondents receive 'social support' or are affected by 'relationship strain' (Ailshire and Crimmins, 2011; Schuster et al., 1990; Stafford et al., 2011).

Social support is captured by three items covering empathy, dependability and confiding which are asked of respondents four times to capture relationships with: spouse or partner; children; other immediate family and friends. Relationship strain is captured by four items covering criticism, demands, annoyance and being let down, which are also asked of respondents for each relationship type. The items are summed to create a social support scale and a relationship strain scale for all types of relationship combined. [3] Positive changes in the

[3] Social support is measured with the following three items: How much do they really understand the way you feel about things? How much can you rely on them if you have a serious problem? How much can you open up to them if you need to talk about your worries? Relationship strain is measured with the following four items: How much do they make too many demands on you? How much do they criticize you? How much do they let you down when you are counting on them? How much do they get on your nerves? Possible responses for each type of relationship are: 'A lot' (coded as 3); 'Some' (coded as 2); 'A little' (coded as 1) or 'Not at all' (coded as 0). The social support scale ranges from 0 (no support) to 36 (extreme support); the relationship strain scale ranges from 0 (no strain) to 45 (extreme strain).

social support scale indicate that social support has increased. Positive changes in the relationship strain scale indicate that relationship strain has increased.

SECTION 4: RESULTS

Descriptive statistics

Table 1 illustrates the summary statistics for the 2,911 parents in our sample, distinguished by the migration status of their children. The table illustrates the changes observed in the scores measuring mental health and the frequencies of events occurring between the two waves. Mothers and fathers are firstly looked at together and then separately.

The first two columns of Table 1 show that while parents of non-emigrating children have experienced, on average, a decrease in depressive symptoms, parents of emigrating children have experienced, on average, an increase in depressive symptoms. The difference between the two groups is, however, not statistically significant. The third and fourth columns show that there exist significant differences in changes in depressive symptoms, self-rated mental health and loneliness feelings for mothers of emigrating children as compared to mothers of non-emigrating children. To illustrate, mothers of emigrating children have experienced, on average, an increase in depressive symptoms of 0.48 points. This compares to a decrease of 0.61 points for mothers of non-emigrating children. The last two columns show that there are no differences in changes in the mental health status for fathers of emigrating children and fathers of non-emigrating children.

Table 2 investigates whether parents of emigrating children and parents of non-emigrating children differ with respect to: i) (time-invariant) characteristics that are differenced-away in

Equation 2; and ii) baseline mental and physical health status. One can see that mothers and fathers of emigrating children are on average younger, more likely to be highly educated and in better physical health at baseline. Mothers of emigrating children also have lower depression and loneliness scores at baseline. Analyses not reported here illustrate that important differences also emerge among emigrating and non-emigrating children. The average age of emigrating children is 28.6 years and 43.8% of children in this group are highly educated. These compare to an average age of 35.9 years and a total of 30.8% with high education for non-emigrating children.

Regression results

Tables 3, 4 and 5 report the results of the fixed effects models which we have put into operation by running OLS regressions with respect to changes in depressive symptoms (Table 3), changes in self-rated mental health (Table 4) and changes in loneliness feelings (Table 5), all related to changes in the individuals' circumstances. As with the descriptive statistics, the results are presented first for mothers and fathers together and then for mothers and fathers separately.

Focusing first on our variable of interest, Tables 3, 4 and 5 show that the emigration of a child has a negative effect on the mental health status of the mothers left behind. Mothers of emigrating children are found to experience higher depressive symptoms, a deterioration in self-rated mental health and higher feelings of loneliness. For example, Table 3 shows that, controlling for other events, the change in depression symptoms experienced by mothers of an emigrating child is 1.23 points greater than the change experienced by mothers of non-emigrating children. Similarly, the results of Table 5 show that the change in loneliness feelings experienced by mothers of an emigrating child is 0.43 points greater than the change

experienced by mothers of non-emigrating children. In contrast, no effects are found for fathers.

Turning to the other events occurring between the two waves, strong negative effects are found for a number of demographic, socioeconomic and physical health events. Not surprisingly, conjugal bereavement is responsible for higher depressive symptoms for both mothers and fathers. Similarly, onset of a cardiovascular disorder, deterioration in self-rated physical health and retirement are associated with higher depressive symptoms for both mothers and fathers. Onset of a chronic illness, loss of functional capacity and loss of close friends or relatives are associated with higher depressive symptoms for mothers. Table 5 also shows that changes in social support and relationship strain are strong predictors of changes in loneliness feelings for both mothers and fathers. Greater social support is associated with lower loneliness feelings for both mothers and fathers. Greater relationship strain score is associated with greater loneliness feelings for both mothers and fathers.

Next, we repeat the analysis of Tables 3-5 controlling for the *proportion* of children emigrating between the two waves. To illustrate, we code this variable as 50% if a parent has two children and only one emigrates. Similarly, we code it as 100% if a parent has one child, and this child emigrates or if a parent has two children, and they both emigrate. Around 28% of parents of emigrating children in our sample see 50% of their children emigrate. This compares to 19% and 6% of parents seeing 25% and 100% of their children emigrate, respectively. We expect to find that parents who see a higher proportion of children emigrate experience a greater deterioration in mental health.

Results are presented in Table 6. Holding other factors fixed, the change in depression symptoms experienced by mothers who see all of their children emigrate is 3.13 points greater than the change experienced by mothers of non-emigrating children. Similarly, mothers who see all their children emigrate experience a greater deterioration in self-rated mental health as compared to mothers of non-emigrating children.

Further efforts to address reverse causation

While the fixed effects approach used above will remove the biases that would result from endogeneity under many circumstances, we want to explore more fully the following potential concern. People with poor mental health may experience faster increases in depressive symptoms compared to others. If this is true, we could be capturing situations in which children emigrate because of the poor mental health of parents and the observed decline in mental health is not caused by the emigration of the child – it is caused by the underlying poor mental health.

In order to see if this type of process is contaminating the results, we take two approaches both of which are aimed at looking at parents with poor and good mental health separately. First, we restrict the sample to parents who were in good mental health in Wave 1. Second, we draw on data which allows us to identify parents who had earlier histories of mental health problems and use this data to see if our observed effects are still present for parents with no prior histories.

Looking at our first approach, we restrict the sample to parents who did not have clinically significant depressive symptoms at Wave 1 (CES-D score <16). The results of Tables 7 and 8 show that, for mothers, the coefficient of our variables of interest (i.e. child's emigration and

proportion of children emigrating) are still positive and statistically significant at 10%. We also restrict the sample to parents who reported to be in excellent, very good or good mental health at Wave 1. Once again, the coefficients of our variables of interest are still positive and statistically significant at 10% for mothers (Table 9 and 10).

Turning to our second approach, TILDA respondents are asked whether they have ever been diagnosed with depression or manic depression. Around 5.5% of the parents in our sample (4.8% of fathers and 6.1% of mothers) report to have been diagnosed at some point in their life with depression.

We use this data by re-running the model of Equation 2 and interacting the 'child emigrating' binary variable with the binary variable 'past diagnosis of depression'.[4] Results are presented in Table 11. Focusing first on mothers with no history of depression, the results of Table 11 show that for these mothers, having an emigrating child is associated with greater depressive symptoms, but the coefficient is not statistically significant (t = 1.44). Turning then to mothers with history of depression, the results of Table 11 show that for these mothers having an emigrating child is associated with greater depressive symptoms: the coefficient of the interaction term is large in magnitude and significant at 1% level. In contrast, mothers with history of depression who did not see a child emigrate experienced lower depressive symptoms.

In Table 12, we re-employ the basic model again but interact the variable 'proportion of children emigrating' with the binary variable 'past diagnosis of depression'. Mothers with

[4] As Wooldridge (2006, p. 488) points out, although time-constant variables cannot be included themselves in a fixed effects model, they can be interacted with variables that change over time.

earlier episodes of depression who see all their children emigrate experience a change in depressive symptoms which is 13.7 points greater than that experienced by mothers with history of depression who do not see any of their children emigrate. Among mothers with no history of depression, the change in depressive symptoms for those who see all their children emigrate is 2.4 points greater than that of mothers of non-emigrating children. This estimate is statistically significant and so suggests that the effect is not just present for parents with past diagnoses of depression.

Final thoughts on reverse causation

If results were purely driven by reverse causation, we would expect the probability of having an emigrating child to be higher for parents who had previously been diagnosed with depression. To test this hypothesis, we employ a probit model in which the dependent variable 'child emigrating between the two survey waves' is regressed on a number of parental baseline characteristics and past diagnosis of depression. The results of Table 13 show that the probability of seeing a child emigrate between the two survey waves is not higher for parents with a history of depression. If anything, parents with a higher CES-D score at Wave 1 are less likely to see a child emigrate between the two survey waves.

As a final point in support of our view that endogeneity is not a major problem in our results, Figure 1 presents data on emigration from Ireland in recent years. As can be seen, Ireland's recession seems to have generated a jump in emigration. The TILDA data was collected from 2009 onwards. Based on the figure, it seems reasonable to argue that much of the emigration from Ireland in this period was the result of a shock which was exogenous for the families in the TILDA data.

The characteristics of the parents and of the children

We now investigate whether the negative effect of child's emigration on parental mental health is stronger for parents with certain characteristics. One hypothesis is that children's emigration may have a greater negative effect on older parents, who might require more physical care from their children. Parents who were already widowed, separated or divorced at Wave 1 may also be at higher risk, as they may lack close substitutes for children if these leave. Around one fifth of parents in our sample are return migrants: they lived abroad for six months or more before returning to Ireland. If parents who are return migrants themselves believe that emigration maximises their children's opportunities, then we may find weaker effects for this group of parents.

To investigate these possibilities, we interact the child's emigration binary variable with a number of binary variables capturing parental characteristics. These are as follows: parental age group (aged≤65 and 65+); parental marital status at Wave 1 (married/cohabiting and widowed/separated/divorced); and parental return migration status (return migrant and stayer). Results are presented in Table 14.

Contrary to expectations, we find that the negative effect of child's emigration on parental depressive symptoms is stronger for younger parents, and especially for younger mothers. The results of Table 14, Panel 1 show that the effect of child's emigration is estimated to be around 2.3 points higher for younger mothers than for older mothers. Turning to changes in the loneliness score, the results of Table 14, Panel 1 partly confirm our expectations: older fathers of an emigrating child experience greater loneliness feelings. The effect of child's emigration is estimated to be around 0.86 points higher for older fathers than for younger fathers.

The results of Table 14, Panel 2 show that the effect of a child's emigration on changes in depressive symptoms, self-rated mental health and loneliness feelings does not seem to differ among parents who were married or widowed/separated/divorced at Wave 1. Turning finally to the results of Table 14, Panel 3, we find that greater loneliness feelings are experienced by mothers who never left Ireland as compared to mothers who lived abroad for some time.

Finally, we investigate whether the characteristics of the emigrating child are important in determining the negative effect of child's emigration on parental mental health. In particular, we investigate whether it matters if the emigrating child: is male or female; is younger (aged 16 to 24) or older (aged 25+); was living with parents or somewhere else in Ireland at Wave 1; and had children or was childless at Wave 1 data collection. Results are presented in Table 15 but little emerges by way of statistically significant differences between the effects caused by the emigration of children with different characteristics.

SECTION 5: CONCLUSION

In very broad terms, our goal in this paper has been to add to the growing literature on the impacts of emigration on the sending country. More specifically, we have tried to extend the research which has looked within families and sought to identify effects on family members left behind. We have found that the emigration of a child appears to impact negatively on the mental health of mothers, although in general no evidence of this was found for fathers. The one exception to this was with respect to older fathers and their feelings of loneliness. Our use of fixed effects modelling should have allowed us to overcome the potential problems associated with endogeneity so we are confident when attributing causation.

This core finding is important from three perspectives. First, the most direct implication is that emigration causes pain. While the economics literature has long factored the psychic costs of the individual migrant into analyses, the results here show that there are psychic costs to family members too. Second, as poor mental health can lead to a deterioration in physical health, our findings suggest that emigration could have impacts on health service utilisation rates in the countries and regions affected by outmigration and also on labour force withdrawal and hence social assistance receipt. Third, while Mincer's (1978) model of tied-migrants and tied-stayers was typically applied to spouses, our results suggest that tied-stayers might results from a process whereby children anticipate the likely mental health impact on their parents if they were to emigrate. All of these considerations point to the importance of continued work in this area.

REFERENCES

Ailshire, Jennifer A. and Eileen M. Crimmins (2011), "Psychosocial Factors Associated with Longevity in the United States: Age Differences between the Old and Oldest-Old in the Health and Retirement Study", *Journal of Aging Research*, Article ID 530534

Antman, Francisca M. (2010), "Adult Child Migration and the Health of Elderly Parents Left Behind in Mexico", *American Economic Review: Papers & Proceedings* 100: 205-208

Antman, Francisca M. (2011), "How Does Adult Child Migration Affect the Health of Elderly Parents Left Behind? Evidence from Mexico", University of Colorado Boulder Population Programme Working Paper POP2011-09

Antman, Francisca M. (2013), "The Impact of Migration on Family Left Behind", chapter 16 in Amelie F. Constant and Klaus F. Zimmermann (eds.) *International Handbook on the Economics of Migration*, Edward Elgar, Cheltenham, UK and Northampton, USA

Choi, Namkee G. and Thomas M. Bohman (2007), "Predicting the Changes in Depressive Symptomatology in Later Life. How Much Do Changes in Health Status, Marital and Caregiving Status,Work and Volunteering, and Health-Related Behaviors Contribute?", *Journal of Aging and Health* 19(1): 152-177

Cole, Martin G. and Nandini Dendukuri (2003), "Risk Factors for Depression Among Elderly Community Subjects: A Systematic Review and Meta-Analysis", *American Journal of Psychiatry* 160:1147–1156

Cox-Edwards, Alejandra and Manuelita Ureta (2003), "International Migration, Remittances and Schooling: Evidence from El Salvador", *Journal of Development Economics*, 72(2): 429-61

Dave, Dhaval, Inas Rashad and Jasmina Spasojevici (2008), "The Effects of Retirement on Physical and Mental Health Outcomes", *Southern Economic Journal*, 75(2), 497-523

Dooley, Cara (2014), "Methodology", chapter 7 in Anne Nolan, Claire O'Regan, Cara Dooley et al. (eds.*). The Over 50s in a Changing Ireland: Economic circumstances, Health and Well-Being*, Trinity College Dublin

Dykstra, Pearl D, Theo G. van Tilburg and Jenny de Jong Gierveld (2005), "Changes in Older Adult Loneliness: Results From a Seven-Year Longitudinal Study", *Research on Aging* 27:725-747

Giannelli, Gianna Claudia and Lucia Mangivacchi (2010), "Children's Schooling and Parental Migration: Empirical Evidence on the "Left-behind" Generation in Albania", *Labour* 24: 76-92

Grigorian, David A. and Tigran A. Melkonyan (2011), "Destined to Receive: The Impact of Remittances on Household Decisions in Armenia", *Review of Development Economics*, 15(1): 139-53

Hildebrandt, Nicole and David J. McKenzie (2005), "The Effects of Migration on Child Health in Mexico", *Economica*, 6(1):257-289

Lindeboom, Maarten, France Portrait and Gerard J. van den Berg (2002), "An Econometric Analysis of the Mental-Health Effects of Major Events in the Life of Older Individuals", *Health Economics*, 11: 505-520

Mandal, Bidisha and Brian Roe (2008), "Job Loss, Retirement and the Mental Health of Older Americans". *The Journal of Mental Health Policy and Economics*, 167-176

Mincer, Jacob (1978), "Family Migration Decisions", *Journal of Political Economy*, 86(5): 749-73

O'Sullivan, Vincent, Brian Nolan and Alan Barrett (2013), "Income and Wealth in The Irish Longitudinal Study on Ageing". IZA Discussion Paper No. 7393

Radloff, Lenore S. (1977), "The CES-D scale: A Self-report Depression Scale for Research in the General Population", *Applied Psychological Measurement* 1:385-401

Russell D. (1996). "The UCLA Loneliness Scale (Version 3): Reliability, Validity, and Factor Structure", *Journal of Personality Assessment* 66: 20-40

Schoevers, R.A., Beekman, ATF, Deeg DI, Geerlings, MI and Jonker, C, Van Tilburg, W (2000). "Risk factors for depression in later life; results of a prospective community based study (AMSTEL)", *Journal of Affective Disorders* 59: 127-137

Schuster, Tonya L., Ronald C. Kessler and Robert H. Aseltine Jr. (1990), "Supportive Interactions, Negative Interactions, and Depressed Mood", *American Journal of Community Psychology* 18(3): 423-438

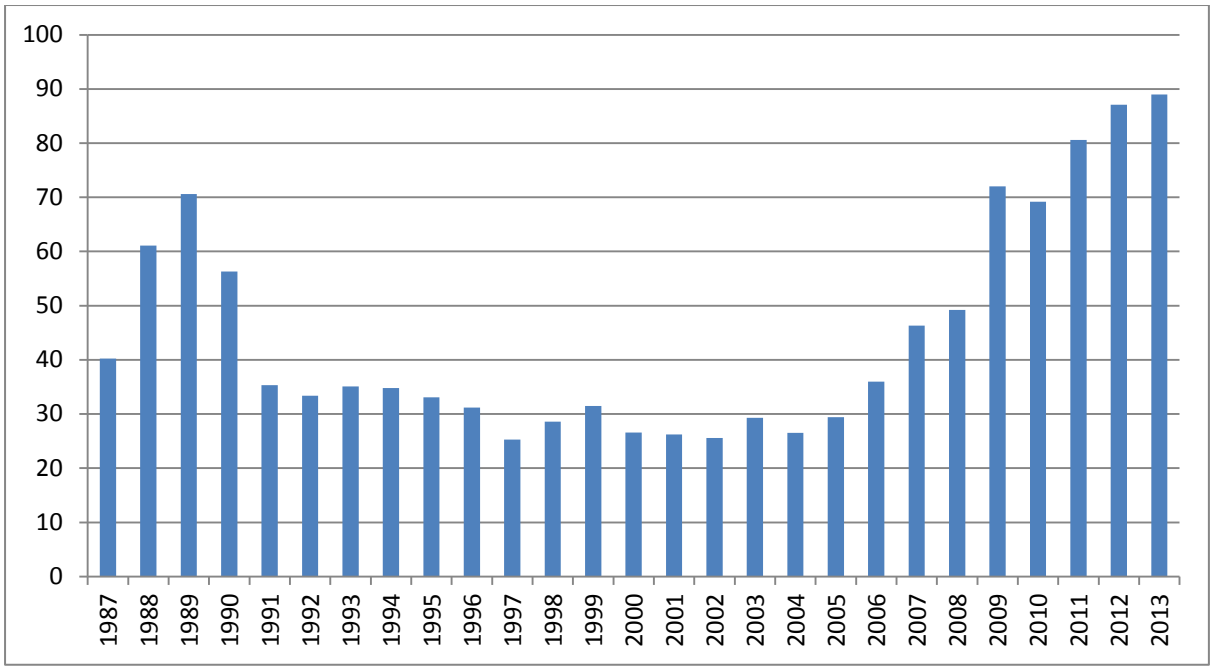
Stafford, Mai, Anne McMunn, Paola Zaninotto and James Nazroo (2011), "Positive and Negative Exchanges in Social Relationships as Predictors of Depression: Evidence from the English Longitudinal Study of Aging", *Journal of Aging and Health* 23(4): 607-628

Theeke, Laurie A. (2009) "Predictors of Loneliness in U.S. Adults Over Age Sixty-Five", *Archives of Psychiatric Nursing*, 23(5): 387-396

Tiedt, Andrew D. (2013) "Cross-National Comparisons of Gender Differences in Late-Life Depressive Symptoms in Japan and the United States", *Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, 68(3): 443-454

Wooldridge, Jeffrey M. (2006) "*Introductory Econometrics: A Modern Approach*", Thomson South-Western

Figure 1: Emigration from Ireland in thousands, 1987 to 2013



Source: Central Statistics Office (CSO)

Table 1: Parental descriptive statistics by children's migration status - dependent and independent variables used in empirical models

	Mother s & Fathers		**Mothers Only**		**Fathers Only**	
	No children emigrating	1+ children emigrating	No children emigrating	1+ children emigrating	No children emigrating	1+ children emigrating
Dependent variables						
Change in CES-D score, mean	-0.518	0.151	-0.612	0.482*	-0.395	-0.208
Change in self-rated mental health score, mean	0.135	0.166	0.135	0.286*	0.136	0.035
Change in loneliness score, mean	0.029	0.226	-0.009	0.456***	0.071	-0.008
Independent variables						
Demographic changes:						
Widowhood	1.5%	0.3%	1.7%	0.6%	1.2%	0.0%
Loss of close relatives/friends	43.8%	47.3%	44.0%	45.4%	43.5%	49.3%
Health changes:						
Loss in functional capacity (new ADL)	4.2%	1.4%**	5.3%	1.3%**	2.9%	1.5%
Loss in functional capacity (new IADL)	5.6%	1.1%***	7.0%	1.3%**	3.8%	0.8%
Onset of cardiovascular disorder	21.9%	21.7%	20.9%	24.9%	23.3%	18.4%
Onset of chronic illness	26.6%	22.7%	32.6%	30.3%	18.6%	14.3%
1-point deterioration in self-rated health	19.8%	18.2%	18.8%	19.6%	21.1%	16.6%
2+-point deterioration in self-rated health	4.8%	4.0%	5.1%	4.3%	4.4%	3.7%
Economic changes:						
Retirement	4.6%	6.3%	3.4%	6.9%**	6.1%	5.7%
Unemployment	1.1%	2.8%**	0.5%	1.6%**	2.0%	4.0%
Change in weekly individual gross income, mean	1.458	-15.755	6.208	3.467	-4.758	-36.611
Changes in children's conditions:						
Child's unemployment	11.6%	10.1%	12.1%	12.1%	10.9%	8.0%
Child's marital breakdown/widowhood	5.1%	5.1%	5.2%	4.3%	4.9%	5.9%
N	2,550	361	1,498	208	1,052	153

Differences between parents with 'no child emigrating' and 'parents with children emigrating' significant at: *** 1% level; ** 5% level; * 10% level

Table 2: Parental descriptive statistics by children's migration status – selected characteristics

	Mothers & Fathers		**Mothers Only**		**Fathers Only**	
	No children emigrating	1+ children emigrating	No children emigrating	1+ children emigrating	No children emigrating	1+ children emigrating
Age at Wave 2, mean	66.3	60.5***	66.5	60.5***	66.1	60.5***
Educational attainment at Wave 2:						
Low	41.5%	22.7%***	41.0%	21.6%***	42.3%	24.0%***
Medium	43.8%	52.1%***	45.1%	54.5%**	42.3%	49.5%*
High	14.7%	25.2%***	14.0%	23.9%***	15.5%	26.5%***
CES-D score at Wave 1	6.07	4.68***	7.09	5.38***	4.74	3.91
Loneliness score at Wave 1	1.60	1.47	2.72	1.28***	1.46	1.59
Self-rated mental health at Wave 1	2.22	2.17	2.26	2.12	2.17	2.21
Self-rated physical health at Wave 1	2.67	2.47**	2.65	2.47*	2.69	2.48*

Differences between parents with 'no child emigrating' and 'parents with children emigrating' significant at: *** 1% level; ** 5% level; * 10% level

Table 3: Results of OLS regression. Outcome variable is change in CES-D score between waves

	Mothers & Fathers		**Mothers Only**		**Fathers Only**	
	Coeff.	*t stat.*	*Coeff.*	*t stat.*	*Coeff.*	*t stat.*
Widowhood	5.156***	(3.88)	5.136***	(2.89)	5.001***	(3.20)
Loss of close relatives/friends	0.731**	(2.42)	1.165***	(2.88)	0.128	(0.33)
Loss in functional capacity (new ADL)	1.828**	(2.00)	2.378**	(2.01)	0.643	(0.53)
Loss in functional capacity (new IADL)	0.544	(0.64)	0.473	(0.45)	0.880	(0.65)
Onset of cardiovascular disorder	0.945***	(2.68)	1.024**	(2.01)	0.838**	(2.05)
Onset of chronic illness	0.546	(1.58)	0.808*	(1.75)	0.0946	(0.19)
1-point deterioration in self-rated health	0.944***	(2.87)	1.760***	(3.80)	-0.0973	(-0.23)
2+-point deterioration in self-rated health	2.024***	(2.97)	1.363	(1.51)	3.080***	(2.81)
Retirement	1.072***	(2.65)	1.179*	(1.80)	0.821*	(1.71)
Unemployment	0.634	(0.49)	-2.660	(-1.03)	1.980	(1.50)
Change in income (000s)	-0.0431	(-0.46)	-0.0563	(-0.41)	-0.0225	(-0.20)
Child's emigration	0.809*	(1.78)	1.229**	(2.06)	0.292	(0.54)
Child's unemployment	0.305	(0.69)	0.418	(0.71)	0.0508	(0.09)
Child's marital breakdown/widowhood	0.965	(1.22)	1.011	(0.96)	0.725	(0.86)
Constant	-1.799***	(-7.67)	-2.380***	(-7.05)	-1.019***	(-3.27)
N	2911		1706		1205	

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

For events like widowhood or retirement, the change between the two waves is a dichotomous variable equal to 1 if the event happened; 0 otherwise.

Table 4: Results of OLS regression. Outcome variable is change in self-rated mental health score between waves

	Mothers & Fathers		**Mothers Only**		**Fathers Only**	
	Coeff.	*t stat.*	*Coeff.*	*t stat.*	*Coeff.*	*t stat.*
Widowhood	0.359*	(1.86)	0.365	(1.46)	0.338	(1.16)
Loss of close relatives/friends	0.0123	(0.30)	-0.00512	(-0.10)	0.0345	(0.55)
Loss in functional capacity (new ADL)	0.0719	(0.59)	0.0809	(0.51)	0.0711	(0.42)
Loss in functional capacity (new IADL)	0.0544	(0.49)	0.0717	(0.51)	0.0177	(0.10)
Onset of cardiovascular disorder	0.0130	(0.26)	0.00740	(0.11)	0.0122	(0.17)
Onset of chronic illness	0.0877*	(1.91)	0.113**	(2.05)	0.0443	(0.54)
1-point deterioration in self-rated health	0.439***	(8.48)	0.419***	(5.98)	0.449***	(6.44)
2+-point deterioration in self-rated health	0.930***	(8.53)	0.871***	(6.54)	1.020***	(5.69)
Retirement	0.178**	(2.26)	0.0717	(0.64)	0.261**	(2.45)
Unemployment	0.204	(1.14)	0.203	(0.81)	0.224	(0.99)
Change in income (000s)	-0.0198	(-1.32)	-0.00082	(-0.03)	-0.0251	(-1.31)
Child's emigration	0.0505	(0.92)	0.166**	(2.20)	-0.0738	(-0.93)
Child's unemployment	0.0309	(0.45)	0.117	(1.44)	-0.0930	(-0.88)
Child's marital breakdown/widowhood	0.0776	(0.75)	0.188*	(1.67)	-0.0592	(-0.41)
Constant	-0.0569	(-1.61)	-0.0677	(-1.44)	-0.0436	(-0.87)
N	2911		1706		1205	

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Results of OLS regression. Outcome variable is change in UCLA loneliness score between waves

	Mothers & Fathers		**Mothers Only**		**Fathers Only**	
	Coeff.	*t stat.*	*Coeff.*	*t stat.*	*Coeff.*	*t stat.*
Widowhood	0.936	(1.52)	0.495	(0.65)	1.712*	(1.94)
Loss of close relatives/friends	0.0989	(1.15)	0.167	(1.47)	0.0468	(0.36)
Social support	-0.0695***	(-5.78)	-0.0940***	(-5.56)	-0.0504***	(-3.21)
Relationship strain	0.0553***	(5.11)	0.0595***	(4.10)	0.0517***	(3.69)
Loss in functional capacity (new ADL)	-0.126	(-0.30)	-0.480	(-0.88)	0.574	(0.94)
Loss in functional capacity (new IADL)	-0.229	(-0.78)	-0.136	(-0.40)	-0.200	(-0.33)
Onset of cardiovascular disorder	-0.115	(-1.03)	-0.213	(-1.40)	0.00918	(0.06)
Onset of chronic illness	0.108	(0.96)	0.244*	(1.76)	-0.243	(-1.28)
1-point deterioration in self-rated health	0.112	(1.01)	0.252*	(1.70)	-0.0500	(-0.30)
2-point deterioration in self-rated health	0.0891	(0.52)	0.446*	(1.67)	-0.277	(-1.18)
Retirement	-0.0748	(-0.59)	-0.0707	(-0.33)	-0.0696	(-0.39)
Unemployment	0.317	(1.07)	0.0838	(0.13)	0.506	(1.34)
Change in income (000s)	-0.0388	(-0.91)	-0.164**	(-2.29)	0.0135	(0.41)
Child's emigration	0.203	(1.48)	0.432***	(2.78)	-0.0320	(-0.14)
Child's unemployment	0.0331	(0.21)	-0.203	(-1.01)	0.362	(1.49)
Child's marital breakdown/widowhood	0.0286	(0.14)	-0.00888	(-0.04)	0.127	(0.40)
Constant	-0.0293	(-0.39)	-0.0945	(-0.89)	0.0338	(0.33)
N^a	1732		983		749	

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The loneliness model is based on a lower number of observations, as the loneliness questions are in self-completion questionnaire

Table 6: Results of OLS regressions. Outcome variables are changes in: CES-D score; self-rated mental health score; loneliness score. Explanatory variable of interest is: proportion of children emigrating between the two waves

	Mothers & Fathers		**Mothers Only**		**Fathers Only**	
	Coeff.	*t stat.*	*Coeff.*	*t stat.*	*Coeff.*	*t stat.*
Δ CES-D score	1.554*	(1.76)	3.135***	(2.77)	-0.194	(-0.15)
Δ self-rated mental health score	0.0553	(0.48)	0.338**	(2.00)	-0.208	(-1.28)
Δ loneliness score	0.0521	(0.17)	0.461	(1.25)	-0.364	(-0.80)

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The explanatory variables listed in Table 1 are included as controls.

Table 7: Results of OLS regression. Outcome variable is change in CES-D score between waves. Only parents with a CES-D score<16 at Wave 1

	Mothers & Fathers		**Mothers only**		**Fahters nly**	
	Coeff.	*t stat.*	*Coeff.*	*t stat.*	*Coeff.*	*t stat.*
Widowhood	4.483***	(4.10)	4.450***	(3.01)	4.300***	(3.17)
Loss of close relatives/friends	0.320	(1.24)	0.419	(1.21)	0.162	(0.48)
Loss in functional capacity (new ADL)	1.621	(1.59)	1.927	(1.40)	1.142	(0.96)
Loss in functional capacity (new IADL)	1.459*	(1.88)	1.478	(1.56)	1.330	(1.04)
Cardiovascular disorder	0.836***	(2.63)	1.055**	(2.23)	0.590	(1.57)
Chronic illness	1.009***	(3.28)	1.405***	(3.53)	0.216	(0.43)
1-point deterioration in self-rated health	0.440	(1.50)	0.866*	(1.96)	-0.0946	(-0.28)
2-point deterioration in self-rated health	1.776***	(2.92)	1.201	(1.63)	2.602**	(2.45)
Retirement	0.341	(0.86)	0.526	(0.83)	0.148	(0.31)
Unemployment	0.787	(0.69)	-0.149	(-0.07)	1.267	(0.94)
Change in income (000s)	-0.102	(-1.39)	-0.144	(-1.14)	-0.0742	(-0.90)
Child's emigration	0.448	(1.07)	0.917*	(1.66)	-0.0847	(-0.17)
Child's unemployment	0.214	(0.51)	0.120	(0.20)	0.296	(0.60)
Child's marital breakdown/widowhood	0.910	(1.25)	1.410	(1.49)	0.332	(0.40)
Constant	-0.674***	(-3.29)	-0.972***	(-3.40)	-0.291	(-1.06)
N	2647		1510		1137	

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 8: Results of OLS regression. Outcome variable is change in CES-D score between waves. Explanatory variable of interest is: proportion of children emigrating between the two waves. Only parents with a CES-D score<16 at Wave 1

	Mothers & Fathers		**Mothers only**		**Fahters nly**	
	Coeff.	*t stat.*	*Coeff.*	*t stat.*	*Coeff.*	*t stat.*
Widowhood	4.483***	(4.10)	4.450***	(3.01)	4.300***	(3.17)
Loss of close relatives/friends	0.320	(1.24)	0.419	(1.21)	0.162	(0.48)
Loss in functional capacity (new ADL)	1.621	(1.59)	1.927	(1.40)	1.142	(0.96)
Loss in functional capacity (new IADL)	1.459*	(1.88)	1.478	(1.56)	1.330	(1.04)
Cardiovascular disorder	0.836***	(2.63)	1.055**	(2.23)	0.590	(1.57)
Chronic illness	1.009***	(3.28)	1.405***	(3.53)	0.216	(0.43)
1-point deterioration in self-rated health	0.440	(1.50)	0.866*	(1.96)	-0.0946	(-0.28)
2-point deterioration in self-rated health	1.776***	(2.92)	1.201	(1.63)	2.602**	(2.45)
Retirement	0.341	(0.86)	0.526	(0.83)	0.148	(0.31)
Unemployment	0.787	(0.69)	-0.149	(-0.07)	1.267	(0.94)
Change in income (000s)	-0.102	(-1.39)	-0.144	(-1.14)	-0.0742	(-0.90)
Proportion of children emigrating	0.448	(1.07)	0.917*	(1.66)	-0.0847	(-0.17)
Child's unemployment	0.214	(0.51)	0.120	(0.20)	0.296	(0.60)
Child's marital breakdown/widowhood	0.910	(1.25)	1.410	(1.49)	0.332	(0.40)
Constant	-0.674***	(-3.29)	-0.972***	(-3.40)	-0.291	(-1.06)
N	2647		1510		1137	

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 9: Results of OLS regression. Outcome variable is change in self-rated mental health score between waves. Only parents who self-rated to be in good, very good or excellent mental health at Wave 1

	Mothers & Fathers		**Mothers only**		**Fathers only**	
	Coeff.	*t stat.*	*Coeff.*	*t stat.*	*Coeff.*	*t stat.*
Widowhood	0.366*	(1.73)	0.358	(1.38)	0.297	(0.81)
Loss of close relatives/friends	0.0162	(0.40)	-0.00675	(-0.13)	0.0468	(0.75)
Loss in functional capacity (new ADL)	0.0932	(0.72)	0.129	(0.75)	0.0365	(0.20)
Loss in functional capacity (new IADL)	0.200	(1.62)	0.251*	(1.75)	0.0824	(0.39)
Cardiovascular disorder	0.0393	(0.79)	0.0326	(0.48)	0.0445	(0.60)
Chronic illness	0.0711	(1.49)	0.0853	(1.49)	0.0323	(0.38)
1-point deterioration in self-rated health	0.408***	(7.93)	0.381***	(5.49)	0.427***	(6.07)
2-point deterioration in self-rated health	0.894***	(7.82)	0.776***	(5.55)	1.064***	(5.76)
Retirement	0.117	(1.50)	0.0274	(0.24)	0.185*	(1.73)
Unemployment	0.152	(0.83)	0.246	(1.11)	0.156	(0.68)
Change in income (000s)	-0.0195	(-1.35)	-0.00045	(-0.02)	-0.0241	(-1.29)
Child's emigration	0.0289	(0.51)	0.181**	(2.46)	-0.128	(-1.58)
Child's unemployment	0.0780	(1.09)	0.149*	(1.78)	-0.0335	(-0.31)
Child's marital breakdown/widowhood	0.0753	(0.75)	0.209*	(1.88)	-0.0803	(-0.58)
Constant	0.0412	(1.16)	0.0527	(1.12)	0.0300	(0.60)
N	2647		1527		1120	

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 10: Results of OLS regression. Outcome variable is change in self-rated mental health score between waves. Explanatory variable of interest is: proportion of children emigrating between the two waves. Only parents who self-rated to be in good, very good or excellent mental health at Wave 1

	Mothers & Fathers		**Mothers only**		**Fathers only**	
	Coeff.	*t stat.*	*Coeff.*	*t stat.*	*Coeff.*	*t stat.*
Widowhood	0.365*	(1.72)	0.358	(1.39)	0.300	(0.82)
Loss of close relatives/friends	0.0166	(0.41)	-0.00683	(-0.13)	0.0451	(0.72)
Loss in functional capacity (new ADL)	0.0924	(0.72)	0.124	(0.72)	0.0339	(0.19)
Loss in functional capacity (new IADL)	0.198	(1.61)	0.243*	(1.70)	0.0829	(0.39)
Cardiovascular disorder	0.0394	(0.79)	0.0356	(0.53)	0.0445	(0.60)
Chronic illness	0.0708	(1.48)	0.0842	(1.48)	0.0321	(0.38)
1-point deterioration in self-rated health	0.408***	(7.93)	0.379***	(5.46)	0.427***	(6.07)
2-point deterioration in self-rated health	0.894***	(7.82)	0.778***	(5.57)	1.065***	(5.76)
Retirement	0.118	(1.50)	0.0237	(0.21)	0.187*	(1.75)
Unemployment	0.154	(0.84)	0.250	(1.13)	0.160	(0.69)
Change in income (000s)	-0.0195	(-1.35)	0.000285	(0.01)	-0.0235	(-1.25)
Proportion of children emigrating	0.0169	(0.14)	0.348**	(2.08)	-0.282*	(-1.71)
Child's unemployment	0.0778	(1.09)	0.151*	(1.80)	-0.0339	(-0.31)
Child's marital breakdown/widowhood	0.0755	(0.75)	0.211*	(1.88)	-0.0819	(-0.59)
Constant	0.0439	(1.26)	0.0586	(1.26)	0.0289	(0.59)
N	2647		1527		1120	

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 11: Results of OLS regression. Outcome variable is change in CES-D score between waves. Child's emigration binary variable interacted with binary variable: parent has a history of depression or not

	Mothers & Fathers		**Mothers only**		**Fathers only**	
	Coeff.	*t stat.*	*Coeff.*	*t stat.*	*Coeff.*	*t stat.*
Widowhood	5.050***	(3.80)	5.028***	(2.82)	4.892***	(3.15)
Loss of close relatives/friends	0.713**	(2.37)	1.132***	(2.83)	0.124	(0.32)
Loss in functional capacity (new ADL)	1.792**	(1.97)	2.286*	(1.94)	0.712	(0.58)
Loss in functional capacity (new IADL)	0.724	(0.86)	0.727	(0.71)	0.909	(0.67)
Cardiovascular disorder	0.972***	(2.77)	1.010**	(1.99)	0.858**	(2.09)
Chronic illness	0.522	(1.52)	0.756*	(1.65)	0.0768	(0.15)
1-point deterioration in self-rated health	0.926***	(2.81)	1.752***	(3.77)	-0.120	(-0.29)
2-point deterioration in self-rated health	1.986***	(2.89)	1.356	(1.50)	3.012***	(2.74)
Retirement	1.048**	(2.58)	1.206*	(1.82)	0.771	(1.60)
Unemployment	0.598	(0.47)	-2.709	(-1.04)	2.013	(1.52)
Change in income (000s)	-0.0449	(-0.47)	-0.0470	(-0.34)	-0.0348	(-0.32)
Reference: No child's emigration x no history of depression						
No child's emigration x history of depression	-1.971**	(-2.08)	-1.995	(-1.64)	-1.741	(-1.20)
Child's emigration x no history of depression	0.619	(1.35)	0.870	(1.44)	0.308	(0.60)
Child's emigration x history of depression	2.347	(0.90)	7.108***	(2.97)	-1.182	(-0.33)
Child's unemployment	0.322	(0.73)	0.430	(0.73)	0.109	(0.18)
Child's marital breakdown/widowhood	0.914	(1.17)	0.886	(0.85)	0.690	(0.82)
Constant	-1.683***	(-7.32)	-2.229***	(-6.70)	-0.934***	(-3.06)
N	2911		1706		1205	

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 12: Results of OLS regression. Outcome variable is change in CES-D score between waves. Explanatory variable: proportion of children emigrating between the two waves interacted with binary variable: parent has a history of depression or not

	Mothers & Fathers		**Mothers only**		**Fathers only**	
	Coeff.	*t stat.*	*Coeff.*	*t stat.*	*Coeff.*	*t stat.*
Widowhood	5.148***	(3.88)	5.159***	(2.90)	4.935***	(3.16)
Loss of close relatives/friends	0.739**	(2.44)	1.171***	(2.90)	0.117	(0.30)
Loss in functional capacity (new ADL)	1.816**	(1.99)	2.367**	(2.00)	0.634	(0.52)
Loss in functional capacity (new IADL)	0.520	(0.61)	0.456	(0.44)	0.857	(0.63)
Cardiovascular disorder	0.952***	(2.69)	0.982*	(1.92)	0.814**	(2.01)
Chronic illness	0.546	(1.58)	0.805*	(1.75)	0.0583	(0.12)
1-point deterioration in self-rated health	0.937***	(2.85)	1.752***	(3.77)	-0.0978	(-0.23)
2-point deterioration in self-rated health	2.026***	(2.96)	1.403	(1.56)	3.052***	(2.78)
Retirement	1.060***	(2.62)	1.179*	(1.81)	0.789	(1.64)
Unemployment	0.639	(0.50)	-2.605	(-1.00)	2.074	(1.51)
Change in income (000s)	-0.0418	(-0.47)	-0.0529	(-0.38)	-0.0446	(-0.47)
Proportion of children emigrating x no history of depression	1.516*	(1.95)	2.416**	(2.14)	0.431	(0.43)
Proportion of children emigrating x history of depression	2.048	(0.27)	13.69***	(3.35)	-7.587	(-0.84)
Child's unemployment	0.311	(0.70)	0.461	(0.79)	0.0471	(0.08)
Child's marital breakdown/widowhood	0.972	(1.22)	0.971	(0.93)	0.709	(0.83)
Constant	-1.777***	(-7.63)	-2.365***	(-7.09)	-0.954***	(-3.08)
N	2911		1706		1205	

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 13: Results of probit model. Outcome variable is: 1 if parent experiences child's emigration between the two survey waves; 0 otherwise. Explanatory variables capture parental characteristics at baseline (Wave 1)

	Mothers & Fathers		**Mothers only**		**Fathers only**	
	Coeff.	*t stat.*	*Coeff.*	*t stat.*	*Coeff.*	*t stat.*
Male	0.0600	(0.94)	--	--	--	--
Age	-0.0481***	(-8.05)	-0.0457***	(-6.47)	-0.0519***	(-5.52)
Ref: Low education						
Medium education	0.164*	(1.75)	0.164	(1.31)	0.161	(1.22)
High education	0.334***	(2.97)	0.285*	(1.94)	0.407***	(2.73)
Ref: Retired						
Employed	-0.148	(-1.31)	-0.175	(-1.13)	-0.0969	(-0.61)
Other	-0.135	(-1.21)	-0.150	(-1.10)	0.0242	(0.12)
Ref: Lives in Dublin						
Another town/city	-0.118	(-0.98)	-0.179	(-1.35)	-0.0101	(-0.07)
Rural area	-0.105	(-1.00)	-0.185	(-1.58)	0.0221	(0.16)
Ref: Income 1st quintile						
Income 2nd quintile	-0.0205	(-0.19)	0.0349	(0.26)	-0.182	(-0.80)
Income 3rd quintile	-0.108	(-0.78)	-0.0703	(-0.41)	-0.267	(-1.23)
Income 4th quintile	0.0578	(0.48)	0.149	(1.00)	-0.0902	(-0.49)
Income 5th quintile	-0.0270	(-0.22)	0.0847	(0.49)	-0.163	(-0.94)
Married/cohabiting	0.101	(1.01)	0.0471	(0.41)	0.273	(1.63)
Number of children	0.161***	(6.62)	0.144***	(5.41)	0.187***	(5.57)
Return migrant	0.255***	(2.61)	0.160	(1.30)	0.346***	(2.61)
Past diagnosis of depression	0.109	(0.67)	-0.106	(-0.45)	0.306	(1.31)

CES-D score	-0.0129*	(-1.85)	-0.0145**	(-1.98)	-0.0119	(-1.09)
Ref: Excellent/very good self-rated health						
Good self-rated health	0.0197	(0.25)	0.0272	(0.27)	0.0175	(0.13)
Fair/poor self-rated health	-0.0707	(-0.56)	-0.103	(-0.64)	-0.0704	(-0.36)
Past diagnosis of cancer	0.0421	(0.28)	-0.0406	(-0.22)	0.195	(0.73)
Past diagnosis of heart attack	-0.691**	(-2.21)	-0.417	(-0.92)	-0.918**	(-2.23)
Constant	1.270***	(3.13)	1.290***	(2.66)	1.271**	(2.09)
N	2,723		1,589		1,134	

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 14: Results of OLS regression. Outcome variables are changes in: CES-D score; self-rated mental health score; loneliness score. Child's emigration variable is interacted with parental characteristics

	Mothers & Fathers		**Mothers only**		**Fathers only**	
	Coeff.	*t stat.*	*Coeff.*	*t stat.*	*Coeff.*	*t stat.*
Panel 1						
Coefficient & t statistics of interaction 'Child's emigration x parent aged 65+'						
Reference is 'Child's emigration x parent aged ≤65'						
Δ CES-D score	-1.724**	(-2.07)	-2.307*	(-1.81)	-0.561	(-0.58)
Δ self-rated mental health score	0.00788	(0.07)	-0.0159	(-0.09)	0.0573	(0.40)
Δ loneliness score	0.680**	(2.40)	0.557	(1.04)	0.863**	(2.18)
Panel 2						
Coefficient & t statistics of interaction 'Child's emigration x parent is widowed/separated/divorced at Wave 1'						
Reference is 'Child's emigration x parent is married/cohabiting at Wave 1'						
Δ CESD score	1.992	(1.43)	1.741	(1.11)	2.005	(0.79)
Δ self-rated mental health score	-0.0191	(-0.13)	-0.0419	(-0.23)	-0.143	(-0.66)
Δ loneliness score	0.693	(1.29)	0.300	(0.73)	1.211	(0.76)
Panel 3						
Coefficient & t statistics of interaction 'Child's emigration x parent is a return migrant'						
Reference is 'Child's emigration x parent is not a return migrant'						
Δ CESD score	0.410	(0.46)	1.968	(1.55)	-1.113	(-0.95)
Δ self-rated mental health score	-0.107	(-0.81)	0.0773	(0.43)	-0.236	(-1.26)
Δ loneliness score	-0.482	(-1.61)	-0.843*	(-1.92)	-0.109	(-0.26)

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The explanatory variables listed in Table 1 are included as controls.

Table 15: Results of OLS regressions. Outcome variables are changes in: CES-D score; self-rated mental health score; loneliness score. Explanatory variables of interest are emigrating child's characteristics

	Mothers & Fathers		**Mothers Only**		**Fathers Only**	
Outcome variable: ΔCESD score	***Coeff.***	***t stat.***	***Coeff.***	***t stat.***	***Coeff.***	***t stat.***
Emigrating child's gender						
1) Male	0.751	(1.12)	1.162	(1.33)	0.161	(0.21)
2) Female	1.305*	(1.90)	1.939**	(2.21)	0.534	(0.58)
P value of Wald Test: $\beta_{1)} = \beta_{2)}$ [a]	>0.10		>0.10		>0.10	
Emigrating child's age group						
1) Aged 16-24	1.414*	(1.76)	2.667**	(2.39)	-0.0754	(-0.09)
2) Aged 25+	0.701	(1.15)	0.819	(1.12)	0.545	(0.68)
P value of Wald Test: $\beta_{1)} = \beta_{2)}$	>0.10		>0.10		>0.10	
Emigrating child's place of residence at Wave 1						
1) Living with parents	0.858	(1.15)	1.036	(1.01)	0.571	(0.76)
2) Not living with parents	0.756	(1.36)	1.355*	(1.91)	0.0217	(0.03)
P value of Wald Test: $\beta_{1)} = \beta_{2)}$	>0.10		>0.10		>0.10	
Emigrating child's childbearing status						
1) Has children	2.476	(1.47)	3.337*	(1.89)	1.275	(0.56)
2) Has no children	0.729	(1.50)	1.105*	(1.65)	0.189	(0.31)
P value of Wald Test: $\beta_{1)} = \beta_{2)}$	>0.10		>0.10		>0.10	
Outcome variable: Δ mental health score						
Emigrating child's gender						
1) Male	0.0751	(1.03)	0.257***	(2.59)	-0.112	(-1.01)
2) Female	0.0612	(0.61)	0.167	(1.27)	-0.0690	(-0.55)

P value of Wald Test: $\beta_{1)} = \beta_{2)}$	>0.10		>0.10		>0.10	
Emigrating child's age group						
1) Aged 16-24	0.159*	(1.69)	0.278**	(2.27)	0.0472	(0.36)
2) Aged 25+	0.0161	(0.21)	0.188*	(1.79)	-0.190*	(-1.75)
P value of Wald Test: $\beta_{1)} = \beta_{2)}$	>0.10		>0.10		>0.10	
Emigrating child's place of residence at Wave 1						
1) Living with parents	0.103	(1.35)	0.158	(1.51)	0.0512	(0.45)
2) Not living with parents	0.0386	(0.54)	0.197*	(1.94)	-0.148	(-1.46)
P value of Wald Test: $\beta_{1)} = \beta_{2)}$	>0.10		>0.10		>0.10	
Emigrating child's childbearing status						
1) Has children	0.0680	(0.39)	0.178	(0.69)	-0.0945	(-0.36)
2) Has no children	0.0699	(1.10)	0.228***	(2.74)	-0.0964	(-1.06)
P value of Wald Test: $\beta_{1)} = \beta_{2)}$	>0.10		>0.10		>0.10	
Outcome variable: Δ loneliness score						
Emigrating child's gender						
1) Male	0.309*	(1.69)	0.455**	(2.14)	0.167	(0.56)
2) Female	0.279	(1.23)	0.684***	(2.65)	-0.166	(-0.51)
P value of Wald Test: $\beta_{1)} = \beta_{2)}$	>0.10		>0.10		>0.10	
Emigrating child's age group						
1) Aged 16-24	0.0186	(0.09)	0.453	(1.62)	-0.450	(-1.62)
2) Aged 25+	0.487**	(2.54)	0.605***	(2.97)	0.341	(1.01)
P value of Wald Test: $\beta_{1)} = \beta_{2)}$	>0.10		>0.10		10%	
Emigrating child's place of residence at Wave 1						
1) Living with parents	0.390*	(1.87)	0.537**	(2.40)	0.228	(0.67)
2) Not living with parents	0.229	(1.35)	0.493**	(2.35)	-0.0345	(-0.14)

P value of Wald Test: $\beta_{1)} = \beta_{2)}$	>0.10		>0.10		>0.10	
Emigrating child's childbearing status						
1) Children	0.166	(0.44)	0.572	(1.24)	-0.490	(-0.75)
2) No children	0.314**	(2.10)	0.541***	(3.07)	0.0801	(0.35)
P value of Wald Test: $\beta_{1)} = \beta_{2)}$	>0.10		>0.10		>0.10	

* p < 0.10, ** p < 0.05, *** p < 0.01

a: Wald test tests the restriction that the coefficients on the two binary variables (e.g. child emigrating is male and child emigrating is female) are equal.

For simplicity purposes, only parents with one emigrating child or no emigrating children are included. Parents with two or more emigrating children are excluded.