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Essays on the Income, Wealth and Family Transfers of the Older Generation

A THESIS SUBMITTED TO THE UNIVERSITY OF DUBLIN, TRINITY COLLEGE

IN APPLICATION FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

BY

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and

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2015

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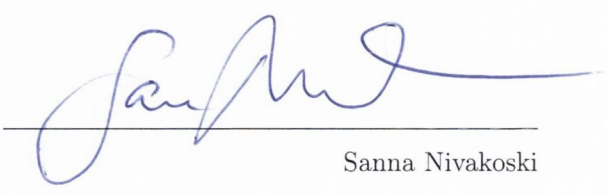

Sanna Nivakoski

Summary

This thesis consists of three core chapters which contain empirical analyses of financial decision-making among older people. The chapters focus on pension coverage, retirees' incomes and replacement rates, subjective life expectancy and its effect on wealth and the exchange motive in intergenerational transfers from parents to their adult children. The data used in the examination of these topics come from the first two waves of The Irish Longitudinal Study on Ageing (TILDA).

Following an introductory chapter that motivates the research in this thesis, the second chapter examines current Irish retirees' incomes, pension coverage and retirement income replacement rates. Because of the virtually flat rates of payment of State welfare pensions, supplementary (i.e. private and occupational) pensions play an important role in replacing labour earnings in retirement. Prompted by this finding, an exploration of factors that determine whether or not a retiree is in receipt of income from a supplementary pension is carried out. Focusing on retirees who have worked in the private sector where supplementary pension saving is not mandatory, the findings of a multivariate analysis suggest that both work history and individual socio-economic characteristics are significant in explaining the variation in supplementary pension coverage. Individuals with low education levels, with no asset income, those who live outside Dublin and those previously employed in small firms or with short tenures in their last employment are less likely to receive income from a supplementary pension. Retirement income replacement rates are calculated using retrospective data on past earnings. Because State welfare pension payment rates are not linked to earnings, the pension system is highly progressive: replacement rates fall continuously across the pre-retirement earnings distribution, with the rate of decline faster among former private sector employees (compared to the public sector). Supplementary pensions add an earnings-related component to the overall pension system and insulate the post-retirement incomes of middle- and high-earners to some degree.

The third chapter examines the relationship between subjective life expectancy and saving behaviour. A prediction arising from the life-cycle hypothesis is that people who expect to live longer should accumulate more wealth during working life to fund consumption in retirement. The prediction is examined by testing whether higher subjective survival probability (SSP) — a proxy measure of self-assessed life expectancy — leads to higher levels of wealth holdings among the pre-retirement older population. A comprehensive measure of wealth, including pension wealth, is used in the analysis. Instrumental variables are

used to address biases caused by measurement error in the SSP responses and the reverse causality between SSP and wealth. A positive and statistically significant effect of SSP on wealth is found: a 1 percentage point increase in the self-assessed probability of reaching age 75 increases an individual's financial wealth by approximately EUR 3,400. This effect corresponds to a 3.9 per cent increase at the mean wealth level. The corresponding effect on total wealth (financial wealth and pension wealth) is an increase of approximately EUR 6,200 (a 1.7 per cent increase at the mean). The significant positive effect is also found after the exclusion of defined benefit and social welfare pension wealth (which are arguably computationally related to life expectancy). Specifications excluding people whose parents died before the age of 50 and those with focal responses to the SSP question provide findings similar to those of the main models. The findings are relevant to pension system reforms: the outcomes of pension systems with high individual responsibility for making retirement provisions depend in part on the ability of individuals to make decisions based on correct assessments of mortality risk.

The fourth chapter focuses on the exchange motive in intergenerational monetary transfers. The exchange motive is in operation if parents make transfers to their children in exchange for services. The analysis incorporates data on current *inter vivos* transfers and planned future transfers via bequests. The identification strategy is to examine the causal effect of child-provided services on the probability of a transfer taking place. The measure of service is the practical help with household chores and paperwork that children provide. The data come from a sample of parent households who have non-resident adult children, obtained from the first two waves of TILDA. In a cross-sectional analysis of the probability of parents making transfers, the effect of help is found to be positive and significant with the strength of the relationship inversely related to the size of the transfer: the effect is only found for small (between EUR 250 and EUR 5,000) transfers, whereas the effect is not statistically significant for large (above EUR 5,000) transfers. The analysis of planned bequests reveals no effect of help provided by children. The correlation between help and transfers is a necessary but not a sufficient condition for the exchange motive to exist. Endogeneity caused by omitted variables and reverse causality are addressed by including usually unmeasured covariates (parental personality and emotional closeness between parent and child) and by using a lagged value of child help. The estimated effect of help on the probability of parents making small *inter vivos* transfers remains significant. In an analysis of first-differenced data which addresses endogeneity issues further, the effect is statistically significant at the 10 per cent level. These findings support the theory that (especially small) *inter vivos* transfers are better suited to exchange than bequests are, and therefore the two types of transfers are not driven by the same motives.

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To my families in Finland and Ireland.

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Chapter 1

Introduction

The ageing of populations in many countries has motivated research into the economic circumstances of people as they age. Demographic changes have raised concerns about future pension provision and the sustainability of current pension systems. Arising from these concerns, topics that are of interest to researchers and policy makers alike include the adequacy of retirement provisions, individuals' behavioural responses to changing longevity and the role of the state in redistributing resources between generations. This thesis uses recently collected micro-data from Ireland to explore three research questions related to these issues: What are the determinants of retirees' pension coverage and adequacy? Do individuals' longevity expectations affect their wealth accumulation? Does the exchange motive play a role in intergenerational transfers from older parents to their adult children?

Ireland has a relatively young population in comparison to other European countries: the Irish old-age support ratio[1] is projected to decrease from 5.4 to 2.3 between 2010 and 2050, whereas the ratio is expected to decrease from 3.5 to 1.8 over the same time period in the European Union overall (Eurostat, 2012). The increasing length of time spent in retirement is evident when examining Irish data on longevity and retirement ages: between 1970 and 2005, life expectancy at birth increased by approximately six years whereas effective retirement age[2] decreased by nearly ten years.[3] As a reflection of these trends, the National Pensions Framework projects an increase in the country's public pension spending from approximately 5.5 per cent of GDP in 2008 to almost 15 per cent of GDP in 2050 (Department of Social and Family Affairs, 2010).

The Irish government has acknowledged the challenges facing future pension provision. Currently, Irish State welfare pensions are not related to earnings, and therefore most of the income replacement in retirement is done via supplementary pensions (over and

[1]The old-age support ratio is the ratio of working age population (aged between 20 and 64 years) to population aged 65 and over.

[2]The average effective retirement age is defined as the average age of exit from the labour force during a 5-year period (Keese, 2006).

[3]Sources: Central Statistics Office (2010) and Organisation for Economic Co-operation and Development (2013a).

above State welfare pensions). Supplementary pension saving is not currently mandatory for private sector employees, which leads to large variations in supplementary pension coverage and pension contribution rates. The National Pensions Policy Initiative set a target for a supplementary pension coverage rate of 70 per cent for the total workforce over the age of 30 (Pensions Board, 1998). A target of 50 per cent of gross pre-retirement income was also set for retirement income replacement rates, subject to a minimum of 34 per cent of average industrial earnings. These targets were re-stated in the Green Paper on Pensions (Department of Social and Family Affairs, 2007) with a suggestion that the targets could only be met through the introduction of mandatory supplementary pensions. The introduction of mandatory or "soft-mandatory"[4] supplementary pensions was also recommended in the OECD's Review of the Irish Pension System (Organisation for Economic Co-operation and Development, 2013c).

In the light of these concerns, Chapter 2 examines how the Irish pension system has performed for the current cohort of retirees. The analysis focuses on retirees' incomes, income compositions, supplementary pension coverage and retirement income replacement rates. Multivariate analyses highlight the individual socio-economic and work history characteristics that are associated with supplementary pension coverage and retirement income replacement rates.

Policies that increase individual responsibility for retirement saving are commonly suggested as ways to alleviate pressures on public finances caused by rising pension expenditures. The success of such policies depends partly on individual ability to make rational saving decisions that incorporate correct assessments of mortality risk. The traditional life-cycle model of saving and consumption predicts that individuals with lower mortality risk should accumulate more wealth during their working lives, *ceteris paribus* (Hurd et al., 1998; Alessie and Kapteyn, 2001; Bloom et al., 2004).

Chapter 3 examines the extent to which saving behaviour is rational in this respect, by testing whether longevity expectations affect individual wealth accumulation. The empirical strategy is to examine the causal link between people's subjective survival probability — a proxy measure of self-assessed life expectancy — and wealth levels. Subjective survival probability questions have been included in many ageing studies, and the data have been found to have strong predictive power for actual mortality. Subjective survival probability estimates are also highly correlated with life table survival probability estimates and with known mortality risk factors.[5] Therefore, subjective survival probability data provide

[4] A "soft-mandatory" scheme is one where an employee is automatically enrolled but they may opt out if they wish.

[5] See Hamermesh (1985), Smith et al. (2001), Hurd and McGarry (2002), Siegel et al. (2003) and Post and Hanewald (2013).

valuable information about individual heterogeneity in mortality, which can be exploited in micro-level analyses.

The analysis in Chapter 3 captures all wealth types (including pensions) and uses instrumental variables to deal with the endogeneity of survival beliefs, thereby addressing the two major challenges in empirical studies on the effect of longevity expectations on saving.

Funding consumption in retirement is an important motive for accumulating wealth, but other reasons also exist. One of these reasons is to transfer wealth to one's children. Economists have examined patterns of these intergenerational transfers and the motives influencing them. The two main motives that have been suggested are that parents are either altruistic or that transfers are made in exchange for services that children provide. Parents transfer wealth via bequests and give monetary gifts to their their children while they are alive (i.e. *inter vivos* transfers). Transfers between generations are common even in developed countries with public income redistribution and public care provision, which should reduce the need for family members to rely on each other for assistance. Studies by Kotlikoff et al. (1981), Piketty (2011) and Ohlsson et al. (2014) have examined intergenerational transfers in different countries and have generally found that a large proportion of people's wealth is passed on from one generation to the next rather than accumulated over the individual's life-cycle.

Chapter 4 examines the presence of the exchange motive in intergenerational transfer behaviour by studying the causal effect of help that adult children provide to their parents and monetary transfers that flow in the opposite direction. McGarry (1999) and Bernheim and Severinov (2003) suggest that *inter vivos* transfers are better suited to exchange and therefore are likely not to be influenced by the same motives as bequests. Therefore, the analysis in Chapter 4 models both *inter vivos* transfers and expected bequests.

Intergenerational transfers are an important topic of analysis because they play a role in the saving behaviour of both the parents and the children. They affect decisions regarding investment in both human and physical capital through schooling decisions and house purchases, usually in the case where the children are credit constrained in early life. From a public policy point of view, understanding the motives behind transfer behaviour is relevant for predicting the likely impacts of public redistributional policies. If intergenerational transfers are motivated by altruism, public income distribution between generations can potentially be reversed by private transfers flowing in the opposite direction (Bernheim et al., 1985; Cox, 1987). Depending on their motivations, private transfers between generations may counteract or reinforce public spending on education, care to the elderly, transfers to young families, and pensions. Motives for intergenerational transfers are also relevant in the taxation of estates and gifts.

Chapter 2

Determinants of pension coverage and retirement income replacement rates

2.1 Introduction

In Ireland, the absence of statutory earnings-related pensions in the private sector has led to large variations in pension coverage and adequacy. This Chapter uses recent data from The Irish Longitudinal Study on Ageing (TILDA) to develop an insight into how the pension system has performed for the current retiree cohort. The analysis focuses on retirees' income levels, income sources, supplementary pension coverage and retirement income replacement rates and compares them to targets set by the government. The research aims to inform future pension policy affecting current labour market participants.

The Irish State provides welfare pensions which are made up of the Contributory and the Non-contributory pensions.[1] Entitlements to the former are built up over the working life of an individual through the accumulation of Pay-Related Social Insurance (PRSI) credits. The latter is means-tested. The State welfare pensions guarantee a basic retirement income and are not linked to earnings. Supplementary pensions (over and above the State welfare pensions) consist of private and occupational pensions which replace the majority of labour income in retirement.

Ireland is one of only two OECD countries (the other being New Zealand) with no statutory earnings-related pension provision in the private sector (Whiteford and Whitehouse, 2006). Much of the responsibility for retirement saving therefore lies with the individual, leading to large variations in supplementary pension coverage and retirement income replacement rates. In the Irish context, this research updates retirees' income analysis using a large, nationally representative new data source that purposely samples the older population. In addition, the calculation of individuals' retirement income replacement rates has not previously been carried out at the individual level in Ireland.

[1] See Section 2.2 for a full description of the Irish pension system.

This research is motivated by global concerns about the funding of pension systems in the future, stemming from the ageing of populations. In Ireland, the old-age support ratio[2] is projected to decrease from 5.4 in 2010 to 2.3 in 2050, whereas the ratio is expected to decrease from 3.5 to 1.8 over the same time period in the European Union overall (Eurostat, 2012). Although the Irish population is relatively young compared to other European countries — due to a relatively recent decline in fertility and net emigration before the 1990s — the Irish government has acknowledged the challenges facing future pension provision (Department of Social and Family Affairs, 2002). The National Pensions Framework (Department of Social and Family Affairs, 2010) projects an increase in public pension (State welfare pensions and public service occupational pensions) spending in Ireland from approximately 5.5 per cent of GDP in 2008 to almost 15 per cent of GDP in 2050. The Framework highlights the need for increased supplementary pension coverage and higher contribution rates among those covered.

In the National Pensions Policy Initiative, the Irish Pensions Board — the national pensions industry regulator — set a target for a supplementary pension coverage rate of 70 per cent for the total workforce over the age of 30 (Pensions Board, 1998). A target of 50 per cent of gross pre-retirement income was also set for retirement income replacement rates, subject to a minimum of 34 per cent of average industrial earnings (Pensions Board, 1998). These targets were restated in the Green Paper on Pensions (Department of Social and Family Affairs, 2007) with a suggestion that the targets could only be met through the introduction of mandatory supplementary pensions.[3] The introduction of mandatory or "soft-mandatory" supplementary pensions was also recommended in the OECD's Review of the Irish Pension System (Organisation for Economic Co-operation and Development, 2013c).

This Chapter firstly focuses on the levels and compositions of retirees' incomes, examined across different educational, occupational and work history categories. The examination highlights the importance of supplementary pensions in determining retirees' incomes. This is due to the structure of the Irish pension system: the State welfare pensions are flat-rated and not related to earnings and therefore only provide a minimum level of income for retirees. Because supplementary pensions contribute most to the variance of retirement incomes, it is of interest to investigate which factors determine supplementary pension coverage. This analysis is carried out by estimating multivariate models of the probability that an individual who has worked in the private sector (with no statutory supplementary

[2]The old-age support ratio is the ratio of working age population (people between the ages of 20 and 64) to population aged 65 and over.

[3]A plan to introduce a "soft-mandatory" supplementary pension to all employees was put in place in the National Pensions Framework (Department of Social and Family Affairs, 2010). It suggests that employees would automatically be enrolled into a pension scheme unless already a member of their employer's scheme with higher contribution levels. The employee may opt out of the scheme if they wished. The introduction of these schemes, however, has been postponed.

pension) prior to retirement receives income from a supplementary pension. This analysis finds that individuals with low levels of education, those with no asset income, those who live outside Dublin and those previously employed in small firms or with short tenures in their last employment are less likely to receive income from a supplementary pension.

Combining current retirement income data with past earnings data of each individual allows for the calculation of a retirement income replacement rate which is defined as the ratio of current income to inflation-adjusted pre-retirement labour earnings. Replacement rates fall continuously across the pre-retirement earnings distribution, with the rate of decline faster among former private sector employees compared to those who retired after having worked in the public sector. A multivariate analysis suggests that, *ceteris paribus*, supplementary pensions replace a greater share of earnings for individuals with higher education, who have worked in larger firms, in white-collar occupations or in the public sector.

The remainder of this Chapter is structured as follows: Section 2.2 describes the Irish pension system while Section 2.3 summarises the relevant international and Irish literature. Section 2.4 presents the data and descriptive statistics, followed by Section 2.5 which discusses supplementary pension coverage and presents the findings of probit models of supplementary pension receipt. Section 2.6 presents the results of the retirement income replacement rate analysis. Section 2.7 offers concluding remarks. Appendix 2.A contains additional information about the Irish pension system. Appendix 2.B explains the method for calculating current income from different sources and Appendix 2.C provides details about the imputation methods used for replacing missing values in the income variables.

2.2 Irish pension system

The Irish pension system can be divided into three pillars: State welfare pensions, occupational pensions and private pensions.[4] These three pillars, the payment rules that apply to the cohorts being analysed in this Chapter and the payment rates in 2010 (when the majority of TILDA Wave 1 data was collected) are described below.[5]

[4]Traditionally, pension systems can be divided into two main types: Bismarckian and Beveridgean, the first of which are typical of continental Europe. Bismarckian state pensions are, in general compulsory for workers, entitlements are strongly linked to contributions, and retirement income replacement rates are high. Beveridgean state pension systems, on the other hand, are traditional in Anglo-Saxon countries. Membership is universal and the link between contributions and benefits is weaker, with the state providing a flat-rate payment which guarantees a minimum level of retirement income. The Irish system is of the Beveridgean type.

[5]More details are found in documentation by the Department of Social Protection, the Department of Social and Family Affairs (2010) and the Organisation for Economic Co-operation and Development (2013a).

2.2.1 State welfare pensions

The State welfare pensions consist of Contributory and Non-contributory pensions.[6] Both of these pensions are flat-rated and are not linked to earnings, and therefore act as a safety net to keep retirees' incomes from falling below a certain threshold. The payment rates are not indexed, however payment rates are amended in governmental budgets at the discretion of the Minister.[7] For all State welfare pensions, there are additional payments for dependants.

Entitlements to the **Contributory State welfare pension** are built up over the working career of an individual through the accumulation of Pay-Related Social Insurance (PRSI) credits, and the payment is not means-tested. For the population under analysis in this Chapter,[8] to qualify for Contributory State pension, an individual must have reached the State Pension Age (SPA) of 66 years,[9] started paying social insurance before reaching age 56, and paid social insurance contributions for at least 5 years. Additionally, the individual needs to meet one of the two criteria for minimum average contributions:

Option A If the person has paid contributions for an average of 48 weeks (or more) per year since 1979, they are entitled to the full (maximum rate) pension.

Option B If the person does not qualify under Option A, they are assessed under Option B. If the person has paid contributions for an average of 10 weeks (or more) per year since 1953[10], they are entitled to the minimum rate pension. A yearly average of 48 full rate contributions since 1953[11] is needed for the maximum payment rate.

In 2010, the minimum gross payment rate was EUR 115.20 per week per person, and the maximum gross payment rate was EUR 230.30 per week per person. There were increases for people living alone, and for those aged 80 years or over, and for those living on certain offshore islands.

[6] A part of the Contributory State welfare pension, the Transition State welfare pension, was payable from the age of 65 but had higher contribution requirements than the contributory State welfare pension. As this analysis only includes people aged 66 or over, income from the Transition State welfare pension is zero.

[7] The indexation of the State welfare pensions to wages or inflation has been suggested by Organisation for Economic Co-operation and Development (2013a).

[8] The qualification rules for the Contributory State pension depend on year of birth. For rules that apply to younger cohorts, see Appendix 3.B.

[9] State Pension Age (SPA) is depends on the year of birth of the individual as outlined in the Social Welfare and Pensions Act of 2011. It is 66 for those born before 1954, 67 for those born between 1954 and 1960 and 68 for those born in or after 1961.

[10] Or the year when the individual started paying contributions, if later.

[11] Or the year when the individual started paying contributions, if later.

As the pension is only payable from State Pension Age, no allowances are made for early retirement. Suggestions have been made about decrements (more flexibility in deciding when to retire) and increments (to the for workers to remain in the labour market longer) to the payment rates of the Contributory State pension.

The Contributory State welfare pension payments are financed on a pay-as-you-go (PAYG) basis from the Social Insurance Fund (SIF). Contributions to the SIF are made by employees, employers and the self-employed (social insurance contributions for the self-employed, class S, were introduced in 1988), but not retirees. The Exchequer covers any gaps between revenues and expenditures.

A payment to a widow(er) — the Widow's, Widower's or Surviving Civil Partner's (Contributory) Pension — is paid to the husband, wife or civil partner of a deceased person. The payment is not means-tested. The payment rates and qualification rules are explained in Appendix 2.A.

The second type of State pension is the **Non-contributory State welfare pension**, which is a means-tested social insurance payment, financed through general taxation. The eligibility for pension does not depend on past employment history. In order to qualify for the non-contributory State welfare pension, a person must have reached State Pension Age, must not be eligible for the Contributory State welfare pension, must pass a means test based on both income and wealth (see Appendix 2.A), and must be habitually resident in Ireland.

In 2010, the Non-contributory State welfare pension was payable from age 66 and the maximum pre-tax rate of payment was EUR 219 per week per person (allowing for weekly means assessment of up to EUR 30). The first EUR 30 per week of means are disregarded. After that, the pension is reduced by EUR 2.50 each week for every EUR 2.50 of weekly means. The minimum pre-tax rate of payment was EUR 4 per week per person (allowing for weekly means assessment of between EUR 242.50 to EUR 245). No payments were made to those with assessed weekly means of EUR 245 or more. There were increases for people living alone, and for those aged 80 years or over, and for those living on certain offshore islands.

2.2.2 Occupational pensions

Occupational pensions are common in public sector employment in Ireland but are also a feature of private sector employment, especially in larger firms, where most schemes are funded. There is no legal obligation for employers to provide occupational pension

schemes. Contributions to occupational pensions are deductible from income taxation (up to certain limits). Public service occupational pension schemes are in place for staff in the civil service, local authorities, Garda Síochána (the Irish police), the defence forces, the health and education sectors and non-commercial State bodies. Public service pension schemes are mainly statutory, and virtually all of the schemes are financed on a PAYG basis.

Like many other OECD countries, Ireland has seen a shift from DB to DC schemes. In DB plans, members may be able to take an actuarially reduced early retirement (as opposed to the typical State Pension Age retirement at age 65) from age 50 onwards. Early retirement due to ill-health is allowed at any age. Deferred retirement is usually possible and increments are paid in that case. A typical occupational DB pension plan would have an accrual rate of 1/60th for each year of service, therefore resulting in a maximum of 66 per cent of pensionable salary after a 40 years of contributions. Most DB schemes are integrated with the State pension. Employees are generally required to contribute to DB plans. When it comes to DC pensions, average contribution rates are usually between 5 and 10 per cent of earnings, with employers and employees making equal contributions.

2.2.3 Private pensions

Private pensions are voluntary and consist of Retirement Annuity Contracts (RACs) which are commonly used by the self-employed, and Personal Retirement Savings Accounts (PRSAs) which were introduced in 2002 with an aim of increasing pension coverage among low-coverage employee groups. Subject to certain limits, contributions to private pensions are deductible from income taxation. Contributions to private pension plans are generally made by the employee only. Employers must offer access to a PRSA to any employee who is not eligible to join an occupational pension scheme.

2.3 Existing research

According to Math (2004), the general trend in European pension reforms has been to limit future expenditure on pay-as-you-go state pension schemes by promoting privately provided funded schemes and other forms of long-term saving.[12] Similar reforms have also taken place or are under review in Ireland (Department of Social and Family Affairs, 2010).

[12]Other changes that have taken place in many European countries include the reduction of rates of pay of state provided pensions, the increase of taxes and other charges levied on pensions, moves from defined benefit to defined contribution systems, the raising of retirement ages, changing the calculation rules for pension entitlements and changes to the indexation of pension payments (Math, 2004).

The trends towards more individual responsibility about the choice to save, how much to save and how to invest those savings has led to a growing strand of literature exploring the ability of individuals to make retirement saving decisions and individuals' characteristics that determine saving behaviours.

One of the theories explaining pension scheme participation — the segmented labour market theory — predicts that, for certain groups within the workforce, participation in a pension scheme is not determined by choice but rather by constraints experienced by these groups. Therefore, pension coverage is assumed to be determined by variables such as industry, work history, unionisation, the size of the firm and whether the work is full- or part-time (Ghilarducci, 1992).

Pensions act as a mechanism for employee retention, which can be in the interest of both the employee and the employer. The employee is more committed to a long career with the employer, especially in the case of defined benefit pension schemes where pension payments are usually linked to final year or end-of-career salary. Attracting employees by means of pension entitlements as a type of wage component can lengthen tenures and therefore decrease training costs as well as other costs associated with staff turnover. Another factor that may affect pension coverage is the size of the employer firm. As economies of scale also apply to pension provision, larger firms have lower costs of providing pension benefits per employee (Dummann, 2008).

Yabiku (2000) uses data from the US Health and Retirement Study (HRS) to examine the determinants of a person receiving income from a supplementary pension. He examines how family history variables affect the probability of private pension receipt and how these effects vary between men and women. Being married has a positive effect on pension coverage for men, but the effect is negative for women. This difference has been theorised to be the consequence of specialisation of labour within the family.[13] Yabiku (2000) finds that womens' labour market participation is more likely to be non-continuous with higher rates of part-time and short-tenured employment. He also finds private pension coverage to be positively correlated with early retirement (defined as retirement before the age of 65). He suggests that having inadequate retirement resources forces people to extend their careers, whereas generous pension arrangements reduce the labour market participation of older workers.

Existing work examining the determinants of pension scheme participation include Barrientos (1998) and Holzmann et al. (2000) in Chile and Argentina, Guariglia and Markose

[13]The traditional Family Model of Labour Supply (Honig, 1996) predicts that the husband is the main provider of labour income and the wife specialises in care-giving and other non-market labour.

(2000) in the UK, by Bassett et al. (1998) in the US, Dominguez-Barrero and Lopez-Laborda (2007) in Spain and Dummann (2008) in Germany. These studies focus on pension plan participation of current employees. These analyses generally find that individuals with low incomes, low levels of education and those who are self-employed are less likely to contribute to pension plans, as are women (particularly married women). Age, employment history, firm size, occupational indicators, income and geographical location are also found to be significant in determining the probability of an individual participating in a pension plan. Bassett et al. (1998) also finds that private pension scheme participation is associated with higher employer pension contributions.

The financial well-being of Irish retirees have previously been examined by Blackwell (1984), Layte et al. (1999), Hughes and Nolan (1999) and Connell and Stewart (2004). The existing Irish analyses have assessed retirees' poverty rates, deprivation rates and the relative size of different income components. In existing studies, the inadequacy of retirement saving is reported especially in the cases of women, young people and those with part-time or non-continuous work histories. Hughes and Nolan (1999) carry out an analysis of pension entitlement in Ireland using data from the Living in Ireland Survey of 1994. According to their findings, certain groups of workers in Ireland experience life-long consequences arising from their type of occupation in terms of not acquiring a supplementary pension while working and not having the time or the resources to make alternative arrangements, leading to these workers depending on the State welfare pensions for income in retirement. This Chapter provides an updated analysis using recent data collected from a nationally representative sample of the older Irish population.

The analysis of Irish retirement income adequacy has relied mainly on the calculation of replacement rates of representative workers or households, using average national data on earnings, work histories and State welfare pension rates of payment.[14] This research makes an important contribution to the Irish literature by calculating retirement income replacement rates using individual-level data, therefore allowing for analysis of realised replacement rates, their distribution and their heterogeneity across different socio-economic groups.

2.4 Data

This Chapter uses data from the first and second waves of The Irish Longitudinal Study on Ageing (TILDA). The TILDA dataset provides information on the health, lifestyles

[14]Some analyses of the adequacy of retirement incomes have been carried out using retirement income replacement rates. Internationally, investigations into the adequacy of North American (mostly US but also Canadian) retirement saving reach different conclusions depending on the definitions of adequacy used. See, for example, Moore and Mitchell (1997), Engen et al. (1999), Wolff (2002) and Scholz et al. (2006).

and socio-economic characteristics of a nationally representative[15] sample of Irish people aged 50 and over and their spouses. The TILDA study closely follows the structure of the Health and Retirement Study (HRS), the English Longitudinal Study of Ageing (ELSA) and the Survey of Health, Retirement and Ageing in Europe (SHARE). The first wave of TILDA data collection took place between 2009 and 2011, containing information on 8,504 individuals living in 6,279 households. Each participant underwent a face-to-face computer-assisted personal interview (CAPI) in their home, was given a self-completion questionnaire and was invited to a health assessment. The overall response rate of the first wave was 62 per cent. The second wave of the data was collected between 2012 and 2013, and had an overall response rate of 86 per cent.

Crucially for this work, TILDA contains detailed information about the individuals' sources of income (including asset income), work histories as well as tenure and earnings data from the last employment prior to retirement. The sub-sample of TILDA data examined in this Chapter is restricted to individuals who are more than 65 years old (the State welfare pension entitlement age), who state that they are retired,[16] and who have a relatively substantial working history (more than 10 years for women, more than 20 years for men[17]). The focus is on individuals with a relatively substantial working history because they have had the opportunity to accumulate supplementary pensions through work, and this Chapter focuses on how the Irish pension system has performed for those individuals. Additionally, the focus on retirees is necessary because the analysis involves the calculation of retirement income replacement rates, the calculation of which is only possible for individuals who retired from employment (and therefore past earnings data is available for them). The analysis is carried out at the individual rather than the household level because the focus is on the way in which the Irish pension system provides retirement income for individuals with different socio-economic backgrounds and labour market histories.

Table 2.1 presents data on the sample selection process, with the number of observations deleted in and remaining after each round of sample selection. The sample size of the first wave of TILDA data is 8,504. The individuals included in this analysis are those who are aged 65 years or more and who are retired with a relatively substantial work history. The analysis sample needs to be restricted to individuals for whom there is a

[15] In order to make the TILDA sample nationally representative, weights reflecting each individual's probability of participation in the survey were estimated by comparing the numbers of individuals in the sample with a given combination of characteristics with the same number in the Irish population. The weights were estimated using the Irish Quarterly National Household Survey. The characteristics compared were age, sex and educational attainment, with education being the key determinant (Barrett et al., 2011). All of the analyses in this Chapter are carried out with the inclusion of these survey weights.

[16] As the focus is on retirees, individuals who classify themselves as looking after the home, or who are permanently sick or disabled and those who have never worked are not included in the analyses.

[17] This restriction virtually only affects the sample of women. Very few men who classify themselves as retired report having worked for less than 20 years.

financial respondent present in the household, for whom income data is imputable[18] and to those with no extreme outliers for the income data. The final sample is made up of 1,864 individuals.

Table 2.1: Selection of the analysis sample

Sample description	Remaining observations
TILDA respondents in Wave 1	8,504
Aged 65 years or more	3,499
Retired	2,351
Some work history	2,110
Substantial work history*	1,957
Financial respondent present	1,941
Imputable income data	1,933
Income outliers	1,864
Final sample size	**1,864**

*at least 20 years for men, at least 10 years for women

2.4.1 Descriptive statistics

Tables 2.2 and 2.3 present summary statistics of the main socio-economic and work history variables, respectively. Of the individuals in the analysis sample, 65 per cent are male and 35 per cent are female. This reflects the higher labour market participation rates among (especially older) men in Ireland. The mean age for both men and women in the sample is 74 years. Nearly 60 per cent of the men have only primary level education, and one in eight has obtained a third level qualification. The women have acquired more education than the men and are also more likely to have worked in the public sector prior to retirement. The men in the sample have had long working careers; the average total years worked is 47 years, bearing in mind that the sample is restricted to men with a minimum of 20 years worked. As expected, women have shorter working careers on average, with mean number of years worked being 35.

The percentages of Irish retirees receiving income from the two types of State welfare pensions, occupational pensions, private pensions, social welfare and assets[19] are presented in Table 2.4, with the figures reported by retirement income quartiles, separately for men and women. Men have a higher coverage rate for the contributory State welfare pension, whereas a slightly higher percentage of women receive the means-tested non-contributory State welfare pension. Overall, just below 50 per cent of the individuals in the sample report receiving income from a supplementary pension, with women being less likely to

[18]See Appendix 2.C for details about the imputation methods used for replacing missing values in the income variable.

[19]Asset income comprises of interest from savings, interest from financial assets and rental income from property. See Appendix 2.B for details.

Table 2.2: Individual socio-economic variables (Wave 1 data)

	Gender		
	Male	Female	Total
	%	%	%
Age (years)			
65-74	59.3	57.2	58.6
75+	40.7	42.8	41.4
Children			
0	18.4	24.5	20.5
1-2	23.0	24.7	23.5
3-4	36.3	33.1	35.2
5+	22.4	17.7	20.8
Married/widow			
No	15.5	20.1	17.1
Yes	84.5	79.9	82.9
Divorced			
No	96.2	95.5	95.9
Yes	3.8	4.5	4.1
Single (never married)			
No	88.3	84.4	87.0
Yes	11.7	15.6	13.0
Education			
Primary/none	57.5	44.6	53.1
Secondary	29.3	36.0	31.6
Third/higher	13.2	19.4	15.3
Poor as child (self-reported)			
No	69.8	77.5	72.4
Yes	30.2	22.5	27.6
Homeowner			
No	10.2	13.9	11.4
Yes	89.8	86.1	88.6
Self-reported health			
Poor/Fair	30.2	32.2	30.9
Good	35.8	34.6	35.4
Very good/Excellent	34.0	33.2	33.7
Location			
Dublin	24.2	32.9	27.1
Another town/city	30.8	33.0	31.6
Rural	45.0	34.1	41.3
Sample size	**1,226**	**638**	**1,864**

Note: The *Poor as child* variable takes on a positive value if the respondent selects the last option in the question *"Think about your family when you were growing up, from birth to age 14. Would you say your family during that time was pretty well off financially, about average, or poor?"*

Table 2.3: Work history variables (Wave 1 data)

	Gender		
	Male	**Female**	**Total**
	%	%	%
Firm size (employees)			
1-5	31.7	26.4	29.9
6-15	13.5	17.3	14.8
16-24	7.8	9.9	8.5
25-199	24.5	25.7	24.9
200-499	9.5	9.1	9.4
500+	12.9	11.6	12.5
Occupation			
Professional	5.2	1.7	4.0
Managerial	19.4	29.1	22.7
Non-manual	10.4	24.8	15.3
Skilled manual	22.8	12.2	19.2
Semi-skilled	18.5	17.1	18.0
Unskilled	8.1	8.7	8.3
Unknown/unskilled	3.9	3.6	3.8
Farmer	11.8	2.7	8.7
Sector of employment			
Private	73.9	65.2	70.9
Public	26.1	34.8	29.1
Total years worked			
11-20	0.0	17.4	5.9
21-30	2.4	19.4	8.2
31-40	16.4	27.9	20.3
41+	81.2	35.3	65.5
Tenure (years)			
1-10	16.0	26.2	19.5
11-20	18.0	33.6	23.3
21-30	16.1	20.5	17.6
31-40	21.5	11.2	17.9
41+	28.4	8.6	21.6
Sample size	**1,226**	**638**	**1,864**

Note: *Tenure* refers to the years work in the last job prior to retirement.

have supplementary pensions than men (41 versus 54 per cent). In comparison, the target coverage rate for the total workforce over the age of 30 is 70 per cent (Pensions Board, 1998). Slightly below 50 per cent of men and 38 per cent of women receive income from an occupational pension. The coverage rate for private pensions is lower for both men and women (at 6 and 5 per cent, respectively). When examining differences across the income distribution, the variation in occupational pension coverage is pronounced: 9 per cent of men in the lowest income quartile have an occupational pension, whereas the corresponding figure is 95 per cent among the men in the highest income quartile. The difference in occupational pension cover is less pronounced for women, which is a reflection of the higher proportion of women having worked in the public sector with widespread compulsory occupational pensions.

Table 2.5 reports the EUR amounts of total retirement income that individuals report receiving from different sources.[20] The figures are reported by total retirement income quartiles, separately for men and women. For both genders, the largest share of total income on average comes from State welfare pensions, in particular the contributory State welfare pension. For men on average, the State welfare pensions provide 50 per cent of total income whereas the corresponding figure is 58 for women. For men and women in the lowest income quartile, this percentage rises to 88 and 69, respectively. Therefore, it is evident that for individuals with lower incomes, State welfare pensions play an important role in retirement income provision. For those with higher incomes, supplementary (mainly occupational) pensions are more important due to the flat-rate nature of the State welfare pensions: for men in the top income quartile, supplementary pensions provide 72 per cent of total income. For women in the top income quartile on average, 68 per cent of income comes from supplementary pensions.

Table 2.6 reports the amounts of retirement incom from different sources for individuals, calculated per equivalent adult. For these estimates, total household income is equivalised by using the OECD equivalence scale. For this part of the analysis, households were excluded only if neither spouse had at worked for at least 10 years. Two-person households in which either the husband or wife refused to take part in the survey were excluded. The resulting sample size for the equivalised income analysis is 1,987 individuals. Examining the equivalised income distribution, total retirement income is slightly lower for men when compared with non-equivalised personal income, but the equivalisation increases women's income estimates considerably, as expected.

The significance of the length of working history in determining retirement income is depicted in Figure 2.1. On average, individuals with career lengths between 35 and 45 years

[20]The quality of TILDA income data is discussed in O'Sullivan et al. (2014). They carry out an analysis of the external validity of the income data by comparing it to the European Union Survey on Income and Living Conditions (EU-SILC) data from Ireland.

Table 2.4: Percentages in receipt, by income quartile (Wave 1 data)

MALE	1st	2nd	3rd	4th	All
Contributory State pension	56.9	79.7	76.0	72.7	71.1
Non-contributory State pension	27.5	16.6	7.3	3.5	14.7
Occupational pension	8.5	36.4	76.8	94.7	50.0
Private pension	3.6	5.3	9.3	9.2	6.6
Social welfare	12.7	11.4	11.2	7.2	10.9
Asset income	25.3	59.8	59.3	75.4	53.0

FEMALE	1st	2nd	3rd	4th	All
Contributory State pension	29.2	85.3	70.9	61.2	60.7
Non-contributory State pension	31.8	12.3	14.2	3.9	16.8
Occupational pension	26.1	5.1	46.5	93.8	38.8
Private pension	3.1	1.0	9.3	6.1	4.7
Social welfare	24.8	5.4	24.7	11.5	17.1
Asset income	48.3	40.1	64.5	70.9	54.6

Table 2.5: Individual income from different sources in EUR, by income quartile (Wave 1 data)

MALE	1st	2nd	3rd	4th	All
Contributory State pension	113.0	184.1	191.5	172.5	164.0
Non-contributory State pension	53.5	36.2	17.3	8.3	30.8
Occupational pension	9.1	20.6	163.1	569.2	160.0
Private pension	3.1	4.1	12.9	33.4	11.7
Social welfare	6.5	4.5	9.7	6.3	6.7
Asset income	4.0	8.2	18.0	44.6	16.6
Total income	189.2	257.7	412.4	834.4	389.8

FEMALE	1st	2nd	3rd	4th	All
Contributory State pension	49.1	193.0	163.5	134.8	132.2
Non-contributory State pension	54.0	28.0	31.2	10.1	32.9
Occupational pension	23.7	2.2	57.5	383.4	97.1
Private pension	0.8	0.6	2.6	4.3	1.9
Social welfare	15.7	4.2	17.3	10.0	12.0
Asset income	6.3	2.7	11.7	27.5	10.9
Total income	149.5	230.7	283.7	570.2	287.0

Table 2.6: Equivalised income from different sources in EUR, by income quartile (Wave 1 data)

MALE	1st	2nd	3rd	4th	All
Contributory State pension	117.1	180.3	184.3	168.8	161.0
Non-contributory State pension	72.6	50.3	21.0	16.4	42.7
Occupational pension	26.0	27.7	145.6	449.6	139.1
Private pension	3.3	2.9	11.8	36.1	11.7
Social welfare	15.4	11.0	17.7	10.4	13.8
Asset income	6.1	9.4	20.6	50.0	19.2
Total income	240.5	281.5	401.0	731.3	387.5

FEMALE	1st	2nd	3rd	4th	All
Contributory State pension	99.6	153.3	201.6	173.1	157.0
Non-contributory State pension	17.6	77.1	46.3	16.1	41.5
Occupational pension	180.0	67.0	49.3	341.6	145.9
Private pension	11.1	6.2	8.1	12.6	9.2
Social welfare	14.0	23.4	11.7	10.6	15.3
Asset income	11.2	7.7	9.9	48.2	17.4
Total income	333.4	334.7	326.9	602.2	386.2

have higher retirement income levels than those who have either worked for less than 35 years or for more than 45 years. Individuals with long careers have been able to accumulate more substantial retirement wealth by acquiring supplementary pensions. Individuals with working histories of 50 years or longer have lower average retirement income levels, which may be explained by the lower education levels within this group, compared to those who have shorter work histories. 7 per cent of the individuals who have worked for 50 years or more have third level education, compared to 16 per cent of those who have worked for less than 50 years. The average amount of contributory State welfare pension income increases with the length of career, as expected, because the pension entitlement is relative to the amount of Pay Related Social Insurance (PRSI) credits accumulated. PRSI credits are linked to the number of years worked, not to pre-retirement earnings levels.

The sizeable difference in income levels and compositions between those previously employed in the private sector and in the public sector is depicted in Figure 2.2. The income of individuals whose last employment before retirement was in the public sector is, on average, 43 per cent higher than income of those who worked in the private sector. The findings are broadly in line with those of existing studies using Irish data. Stewart (2011), using data from the 2004/2005 Household Budget Survey, finds mean weekly pension incomes of EUR 377 and EUR 293 for public and private sector employees, respectively. Occupational pensions make up more than half of total income of public sector retirees, whereas private sector retirees receive less than a quarter of their total retirement income from occupational pensions.

Figure 2.1: Retirement income components, by length of work history (Wave 1 data)

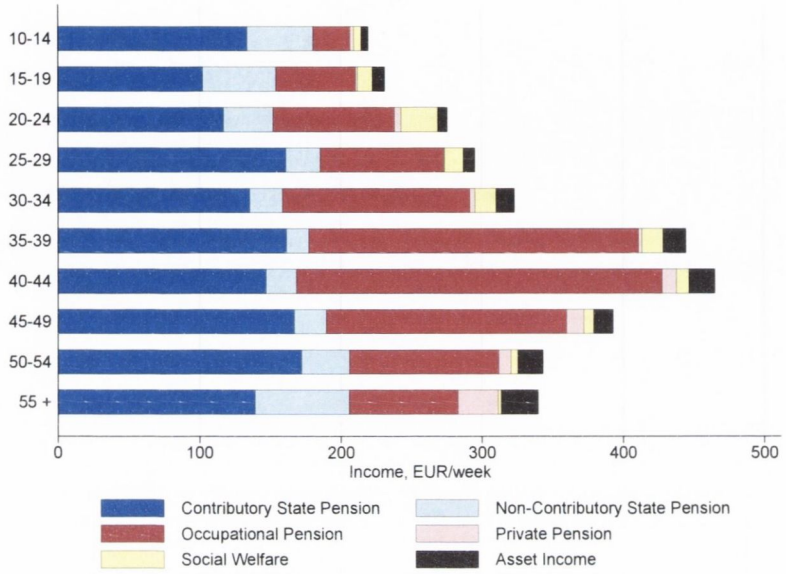
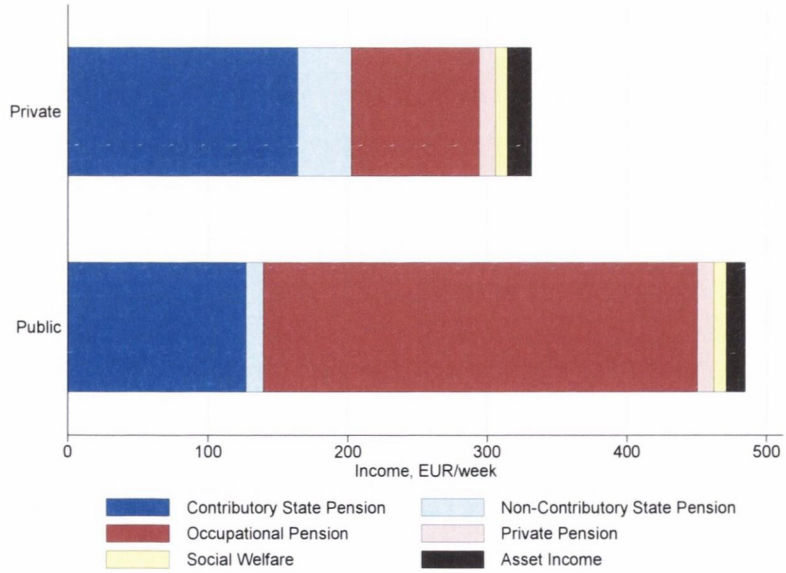


Figure 2.2: Retirement income components, by sector of former employment (Wave 1 data)



2.5 Supplementary pensions

An examination of the data in Table 2.5 reveals the importance of supplementary pensions in the income provision of Irish retirees. This section examines the patterns of supplementary pension coverage and its determinants. Because occupational pension coverage among public sector workers in Ireland is almost universal, the analysis is carried out using data on former private sector employees. Firstly, the patterns of supplementary pension coverage among different socio-economic and work history groups are examined. Then, the probability of an individual receiving income from a supplementary pension is examined in a multivariate setting.

Tables 2.7 and 2.8 present supplementary pension coverage rates for private sector workers by socio-economic and work history characteristics, respectively. Again, the figures are presented separately for men and women. The coverage rates for supplementary pension plans are highly differentiated depending on individual characteristics. Overall, supplementary pension coverage is higher among the younger cohorts. Among men, coverage increases with the number of children and being married, whereas the patterns are reversed for women. Pension coverage also increases with education, with being a home owner, with better subjective health and is highest among Dublin residents.

With reference to work history characteristics, pension coverage increases with the size of the firm (measured in number of employees) and total number of years worked. Coverage is highest among high-skilled occupations. When it comes to tenure in the last employment before retirement, pension coverage generally increases with longer tenure, but falls quite dramatically for those who have tenures exceeding 40 years. This is likely to be explained by the lower education levels within this group, compared to those who have shorter tenures. The results for women are similar to those of the men, although coverage rates are generally lower. The differences between genders can be found in the family characteristics: pension coverage decreases with being married and with having children. The tenure effect does not appear to be as strong for women as for men. However, the sample size of women with tenures exceeding 40 years is very small.

In order to examine the effects of individual characteristics while controlling for other covariates, the next part of the analysis uses a probit estimation technique, modelling the probability of a retired individual receiving income from a supplementary pension (specification shown in Equation 2.1). The analysis is again restricted to individuals who report having worked in the private sector before retirement. The models are estimated separately for men and women, as the covariates may have effects which are different in magnitude and direction depending on gender. As the coefficients of a probit model cannot

Table 2.7: Supplementary pension coverage, by individual socio-economic characteristics (private sector only, Wave 1 data)

	Gender		
	Male	**Female**	**Total**
	Mean	Mean	Mean
Age (years)			
65-74	46.0	28.1	40.6
75+	42.3	29.0	37.9
Children			
0	29.6	31.1	30.1
1-2	45.4	25.4	38.6
3-4	51.3	24.6	43.2
5+	45.5	36.8	43.2
Married/widow			
No	29.2	33.0	30.5
Yes	47.4	27.4	41.3
Divorced			
No	44.7	28.8	39.7
Yes	38.5	22.5	32.7
Single (never married)			
No	47.0	27.2	40.9
Yes	26.2	36.6	29.8
Education			
Primary/none	34.0	23.7	31.2
Secondary	57.0	31.4	47.2
Third/higher	74.2	40.8	63.1
Poor as child (self-reported)			
No	44.6	29.3	39.5
Yes	43.5	25.8	38.9
Homeowner			
No	25.6	28.8	26.8
Yes	46.8	28.4	41.3
Self-reported health			
Poor/Fair	39.5	20.1	33.2
Good	44.7	33.1	41.0
Very good/Excellent	49.1	32.1	43.9
Location			
Dublin	68.2	41.0	57.0
Another town/city	46.7	18.1	37.1
Rural	31.9	25.2	30.3
Sample size	**870**	**377**	**1,247**

Note: The *Poor as child* variable takes on a positive value if the respondent chooses the last option in the question *"Think about your family when you were growing up, from birth to age 14. Would you say your family during that time was pretty well off financially, about average, or poor?"*

Table 2.8: Supplementary pension coverage, by work history characteristics (private sector only, Wave 1 data)

	Gender		
	Male	**Female**	**Total**
	Mean	Mean	Mean
Firm size (employees)			
1-5	22.7	18.7	21.6
6-15	46.1	24.9	38.3
16-24	43.8	22.7	35.8
25-199	58.9	32.4	50.3
200-499	67.6	47.1	62.2
500+	81.2	62.5	76.2
Occupation			
Professional	75.0	42.1	71.4
Managerial	72.9	36.3	60.0
Non-manual	47.6	31.2	37.3
Skilled manual	40.2	11.3	34.0
Semi-skilled	53.0	25.7	44.3
Unskilled	25.6	36.6	28.7
Unknown/unskilled	45.3	34.9	40.8
Farmer	12.4	26.7	13.9
Total years worked			
11-20		29.3	29.3
21-30	27.1	25.1	25.5
31-40	46.0	31.6	39.5
41+	44.7	27.7	41.9
Tenure (years)			
1-10	42.5	20.8	33.2
11-20	37.9	30.8	34.6
21-30	49.6	28.1	42.4
31-40	66.8	39.3	61.0
41+	37.3	34.6	37.0
Sample size	**870**	**377**	**1,247**

Note: *Tenure* refers to the years work in the last job prior to retirement.

be interpreted directly, the marginal effects calculated at the means of the explanatory variables are reported.

The estimated model is:

$$T_{prob\ i} = f(\alpha_0 + \alpha_1 \mathbf{I}_i + \alpha_2 \mathbf{W}_i + a_i) \tag{2.1}$$

where:
$f(.)$ is the standard normal cumulative distribution function
$T_{prob\ i}$ is a probability of individual i receiving income from a supplementary pension
α_0 = constant term
$\mathbf{I}_i$ = a vector of individual i's socio-economic characteristics
$\mathbf{W}_i$ = a vector of individual i's work history characteristics
a_i = residual term of individual i

The findings are presented in Table 2.9. Both work history characteristics and individual socio-economic characteristics are significant in determining supplementary pension coverage, although results differ somewhat for men and women. The findings are largely as expected. Having secondary or third level education (as opposed to no education or primary level education) has a positive effect for men. For women, the education effect disappears when work history characteristics are added to the model. Having asset income (proxy for income) has a positive effect for both genders. The coefficient on being a home owner is only positive and significant in the case of men. Living outside of Dublin has a negative and significant effect on supplementary pension receipt for both men and women. As expected, the coefficients are positive and significant for larger firm size (firm size of 1 to 5 employees being the reference category). The coefficient also grows in magnitude with firm size. For men only, the coefficients for managerial, professional and non-manual occupations have significant positive coefficients, compared with the reference category of unskilled or unknown occupations. A dummy variable for having spent at least 5 years living abroad is positive and significant for women.

Interestingly, years worked is not significant for men or for women (see Models 1 and 3 in Table 2.9), but tenure has a positive and statistically significant association with the probability of receiving income from a supplementary pension. The mechanism behind this finding may be that the length of time with the same employer is a key determinant of pension coverage rather than the total number of years spent in work, because the latter can be non-continuous. Also, tenure in the last employment before retirement is likely to have a significant impact on pension saving behaviour, as individuals are likely to prepare for their retirement the further along they are in their working careers. There is an issue

of possible reverse causality explaining the significance of tenure. Potentially, individuals don't acquire a pension because of a long-term employment contract, but rather they remain in the same job due to generous pension entitlements, especially in later stages of their career. Overall, the multivariate analyses in this Chapter are intended to be interpreted as extensions to simple bivariate correlation analyses.

2.6 Retirement income replacement rates

In order to draw conclusions about the quality of pension provision, the extent to which pension incomes replace labour earnings needs to be assessed. This section examines retirement income replacement rates which measure the percentage of past earnings that is replaced by retirement income. The retirement income replacement rate is calculated as a ratio of current income (or a component of it) to inflation-adjusted pre-retirement labour earnings.

For the calculation of retirement income replacement rates, data from both the first and the second Wave of TILDA are used. The reason for using Wave 2 data is that the retrospective questions regarding after-tax income from last employment before retirement[21,22] were asked in a more comprehensive way in the Wave 2 questionnaire compared with Wave 1. As a result of using Wave 2 data, the sample size is smaller for the remaining part of the analysis (n=526). Two different specifications are used for the calculation of the retirement income replacement rate for this analysis:

$$\text{RR} = \frac{\text{total retirement income}}{\text{pre-retirement earnings}} \times 100 \tag{2.2}$$

$$\text{RR (suppl.)} = \frac{\text{supplementary pension income}}{\text{pre-retirement earnings}} \times 100 \tag{2.3}$$

The calculation of retirement income is described in detail in Appendix 2.B. In the TILDA questionnaire, pre-retirement earnings data is recorded net of taxes, and (current) retirement income is recorded on a pre-tax basis. Therefore, the estimated retirement income replacement rates are higher than they would be if net income was used in both the numerator and the denominator. However, as retirees' incomes are generally lower than those of

[21] The respondents also report the year in which they left this employment and which currency they referred to if they had retired before January 1st 2002 (when the Euro was introduced in Ireland).

[22] The question asked was *"What was the total net salary/wage (i.e. after deductions at source and excluding expense refunds) you received in the last year you worked in this job?"*

Table 2.9: Supplementary pension coverage. Probit marginal effects at means, private sector employees only

	Male				Female			
	(1)		(2)		(3)		(4)	
INDIVIDUAL								
Age	0.00	(0.00)	0.00	(0.00)	0.01	(0.00)	0.01	(0.00)
Children	0.02*	(0.01)	0.02*	(0.01)	0.02	(0.01)	0.02	(0.01)
Married/widow	0.02	(0.06)	0.02	(0.06)	-0.05	(0.07)	-0.04	(0.07)
Self-reported health	0.01	(0.03)	0.01	(0.03)	0.04	(0.03)	0.05	(0.03)
Homeowner	0.16**	(0.07)	0.15**	(0.07)	-0.03	(0.08)	-0.02	(0.08)
Has asset income	0.17***	(0.04)	0.16***	(0.04)	0.12**	(0.05)	0.13**	(0.05)
Lived abroad	0.03	(0.05)	0.06	(0.05)	0.15**	(0.06)	0.18***	(0.06)
Location								
Town	-0.19***	(0.06)	-0.19***	(0.06)	-0.26***	(0.07)	-0.25***	(0.07)
Rural	-0.17***	(0.06)	-0.18***	(0.06)	-0.19***	(0.07)	-0.17**	(0.07)
Education								
Secondary	0.14***	(0.05)	0.14***	(0.05)	0.06	(0.06)	0.04	(0.06)
Third level	0.18***	(0.07)	0.18**	(0.07)	0.11	(0.08)	0.10	(0.08)
WORK HISTORY								
Years worked	0.00	(0.00)			0.00	(0.00)		
Tenure			0.00**	(0.00)			0.01**	(0.00)
Permanent job	0.05	(0.07)	0.00	(0.07)	0.02	(0.07)	-0.01	(0.07)
Firm size (employees)								
6-15	0.24***	(0.07)	0.25***	(0.07)	0.07	(0.07)	0.11	(0.08)
16-24	0.24***	(0.09)	0.24***	(0.09)	0.01	(0.10)	0.02	(0.10)
25-199	0.36***	(0.06)	0.36***	(0.06)	0.14*	(0.07)	0.16**	(0.07)
200-499	0.41***	(0.08)	0.39***	(0.08)	0.29***	(0.11)	0.30***	(0.10)
500+	0.57***	(0.08)	0.56***	(0.08)	0.38***	(0.11)	0.38***	(0.11)
Occupation								
Professional	0.38***	(0.11)	0.38***	(0.12)	0.08	(0.16)	-0.02	(0.16)
Managerial	0.40***	(0.10)	0.39***	(0.10)	0.03	(0.12)	-0.02	(0.12)
Non-manual	0.23**	(0.10)	0.22**	(0.10)	-0.12	(0.11)	-0.16	(0.12)
Skilled manual	0.16*	(0.09)	0.16*	(0.09)	-0.27**	(0.12)	-0.31**	(0.13)
Semi-skilled	0.27***	(0.09)	0.28***	(0.09)	-0.10	(0.12)	-0.14	(0.12)
Farmer	0.07	(0.11)	0.03	(0.11)	0.05	(0.17)	-0.08	(0.17)
Unknown	0.14	(0.14)	0.16	(0.15)	-0.13	(0.16)	-0.16	(0.16)
Observations	849		837		370		367	
LogLikelihood	-435.55		-431.17		-184.98		-182.11	
Pchi2	0.00		0.00		0.00		0.00	
PseudoR2	0.26		0.26		0.19		0.19	

Standard errors in parentheses

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

Dependent variable equals 1 if individual receives income from a supplementary pension, 0 otherwise. *Reference categories*: Location: Dublin. Education: primary/none. Firm size: 1 - 5 employees. Occupation: unskilled.

pre-retirees, and as retirees do not make PRSI contributions, the difference between gross and net earnings for retirees is not as large as for non-retirees.

The mean retirement income replacement rate using total retirement income (Equation 2.2) is 66 per cent, with the average figure for public sector workers being 71 per cent and the corresponding figure for private sector workers 65 per cent. Comparing replacement rates with the Irish government target figures, 37 per cent of the sample have a replacement rate of less than 50 per cent. When only taking supplementary pension income into the calculation (Equation 2.3), the mean overall replacement rate is 25 per cent (46 per cent in the public sector, 15 per cent in the private sector).[23]

Mean retirement income replacement rates by socio-economic and work history characteristics are shown in Table 2.10, using total retirement income and supplementary pension income. Due to the smaller sample size, the figures are calculated jointly for men and women in order to avoid cells with very few observations. As entitlement to State welfare pensions is only a function of PRSI contributions — and therefore closely linked to the length of work history — the retirement income replacement rates calculated using Equation 2.2 don't vary systematically across most of the individual characteristics. There is a U-shaped relationship between the replacement rate and education: individuals in the lowest and highest education categories have higher replacement rates than those with secondary level education. This relationship is expected when considering that individuals with the lowest levels of education also have the lowest levels of labour earnings, and as the State pension system is not linked to pre-retirement earnings, those at the bottom of the earnings distribution are able to replace a higher proportion of their earnings with State (and other) pensions. Beyond a certain point in the education/earnings distribution, the capacity to contribute to a supplementary pension increases, and the earnings-linked supplementary pension income increases retirement income replacement rates.

Examining the figures in the second column of Table 2.10, supplementary pension replacement rates vary systematically with education, health status, geographical location, firm size, length of work history and tenure in the last employment. However, the supplementary pension replacement rate falls at the highest categories of years worked, tenure and labour earnings.

Figure 2.3 depicts the variation of replacement rates (using different retirement income sources in the numerator) across pre-retirement earnings levels for private and public sector

[23]Comparing State pension replacement rates internationally, the OECD (2013) has estimated State pension replacement rates across the OECD countries. The mean value of a median male earner's net pension replacement rate across the OECD countries is 69 per cent, varying from 43 per cent in Japan to 104 per cent in the Netherlands (Organisation for Economic Co-operation and Development, 2013b). According to OECD's estimates, the average Irish net pension replacement rate for a median earner who has worked a full career is 52 per cent, bearing in mind that only State welfare pensions (Contributory and Non-contributory) were included in the estimates.

Table 2.10: Mean values of retirement income replacement rates

	RR	RR(supp)
Age		
65-69	68.3	25.9
70-74	65.6	25.1
75-79	62.1	24.1
80+	70.3	22.9
Children		
0	70.2	23.4
1-2	64.4	21.1
3-4	68.4	30.4
5+	61.8	20.8
Married/widow		
No	69.1	21.8
Yes	65.7	25.1
Education		
Primary/none	65.1	12.9
Secondary	63.9	28.8
Third/higher	75.5	51.7
Health		
Poor/Fair	67.3	18.5
Good	60.5	21.5
Very good/Excellent	72.1	33.1
Location		
Dublin	65.3	30.8
Another town/city	66.6	26.9
Rural	66.7	18.9
Firm size		
1-5	64.0	9.5
6-15	68.3	20.4
16-24	75.7	25.2
25-199	67.5	29.7
200-499	59.1	26.6
500+	66.3	40.8
Years worked		
11-20	24.3	7.9
21-30	59.6	15.2
31-40	72.1	34.1
41+	68.2	22.7
Tenure (years)		
1-10	55.1	11.5
11-20	62.3	15.7
21-30	69.4	26.3
31-40	72.0	39.2
41+	69.3	26.2
Earnings quartile		
1st	99.4	18.0
2nd	64.2	24.7
3rd	53.3	30.0
4th	39.3	26.6
Sample size	**526**	**526**

The first column reports RR calculated using Equation 2.2, second column using Equation 2.3.

workers. The progressivity of the retirement income system is evident when examining the data in Figure 2.3. The progressivity is especially pronounced in the case of the individuals who have worked in the private sector. Individuals belonging to the lowest pre-retirement earnings quintile replace more than 100 per cent of their earnings in retirement, whereas the corresponding figure is less than 40 per cent for those in the highest pre-retirement earnings quintile. These findings can be attributed to the flat-rated nature of the State welfare pensions and the lower supplementary pension coverage in the private sector.

Figure 2.3: Replacement rates from different sources, by pre-retirement earnings quintile

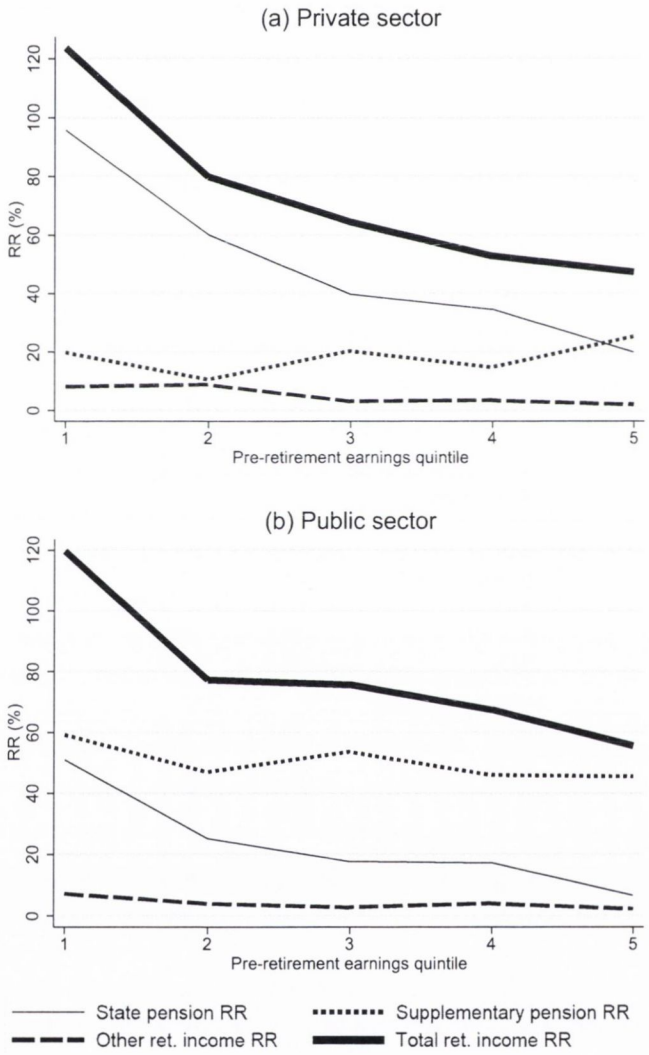


Table 2.11 presents results from OLS regression models, with retirement income replacement rate as the dependent variable (see Equation 2.4 for econometric specification). Columns 1-2 use the total retirement income replacement rate, and columns 3-4 use the supplementary pension income replacement rate as the dependant variable. Reflecting the

results from the simple bivariate analysis of Table 2.10, most of the coefficients are statistically insignificant in the models presented in Columns 1 and 2. The U-shaped effect of education is still reflected in the coefficient signs, but the effects are not statistically significant. The only significant determinant of retirement income replacement rates (using total retirement income) is the length of work history, and the effect diminishes as work history lengthens, indicated by the negative and significant coefficient on the quadratic term. The result that the model has low explanatory power is to be expected, as the State welfare pensions are flat-rated and the entitlement depends on the PRSI contribution accumulation of the individual, regardless of individual characteristics or the type of employment. The State welfare pension payment rates are not related to earnings, therefore equalising income differentials among retirees.

$$RR_i = \beta_0 + \beta_1 \mathbf{I}_i + \beta_2 \mathbf{W}_i + b_i \tag{2.4}$$

where:
RR_i is the retirement income replacement rate of individual i
β_0 = constant term
$\mathbf{I}_i$ = a vector of individual i's socio-economic characteristics
$\mathbf{W}_i$ = a vector of individual i's work history characteristics
b_i = residual term of individual i

When it comes to the determinants of supplementary pension income replacement rates, however, many of the variables that are correlated with the replacement rate in a bivariate setting (Table 2.10) are also significant in the multivariate framework. Education has a significant, positive effect across the specifications, as do firm size and occupational dummies. The public sector dummy has a large and highly significant *ceteris paribus* effect on the replacement rate, with former public sector employees having a replacement rate 17 percentage points higher than their private sector counterparts. Years worked has a positive and significant diminishing effect, whereas the effect of tenure is smaller, as can be seen in Column 4.[24] Similarly as in the case of the probit models explaining supplementary pension coverage, the regression analysis of retirement income replacement rates is intended to be interpreted as an extensions to simple bivariate correlation analysis presented in Table 2.10.

[24]The results are virtually unchanged when the models are estimated for former private sector employees only.

Table 2.11: OLS regression models (public and private sectors included)

	(1) RR		(2) RR		(3) RR(suppl.)		(4) RR(suppl.)	
INDIVIDUAL								
Age	0.25	(0.41)	0.30	(0.44)	0.07	(0.23)	0.07	(0.24)
Children	-0.83	(1.13)	-0.91	(1.19)	-0.11	(0.61)	-0.33	(0.63)
Married/widow	-5.07	(6.15)	-4.17	(6.10)	-0.19	(4.31)	1.21	(4.25)
Self-reported health	0.27	(3.04)	0.87	(3.34)	0.74	(1.73)	0.47	(1.81)
Homeowner	6.98	(7.18)	7.11	(7.08)	1.02	(5.09)	0.71	(5.02)
Has asset income	5.41	(5.13)	5.21	(5.22)	8.04***	(2.76)	7.44***	(2.81)
Lived abroad	-6.44	(4.73)	-5.97	(5.24)	0.92	(2.98)	3.80	(3.04)
Location								
Town	-0.95	(8.61)	-1.18	(8.88)	-3.60	(4.78)	-3.99	(4.71)
Rural	-6.04	(6.73)	-6.01	(6.74)	-5.18	(4.28)	-5.27	(4.15)
Education								
Secondary	-7.28	(5.16)	-7.55	(5.23)	4.22	(3.17)	3.43	(3.22)
Third level	10.06	(7.32)	9.02	(7.74)	17.40***	(5.70)	17.51***	(5.70)
WORK HISTORY								
Years worked	0.33	(1.76)			0.73	(1.11)		
Sq years worked	-0.00	(0.02)			-0.01	(0.01)		
Tenure			-0.44	(1.00)			0.34	(0.42)
Sq tenure			0.01	(0.02)			0.00	(0.01)
Permanent job	6.78	(7.25)	8.31	(7.94)	10.86***	(4.16)	10.00**	(4.47)
Firm size (employees)								
6-15	3.35	(7.87)	3.04	(8.05)	3.52	(4.36)	4.40	(4.41)
16-24	3.09	(7.51)	3.44	(7.53)	-1.18	(4.65)	-0.27	(4.51)
25-199	5.28	(6.36)	6.09	(6.29)	12.44***	(4.04)	12.81***	(3.88)
200-499	-3.66	(7.85)	-4.45	(8.36)	11.59**	(5.03)	10.57**	(5.27)
500+	12.18	(13.68)	11.97	(13.70)	19.25***	(6.24)	18.56***	(6.17)
Occupation								
Professional	-24.01*	(13.84)	-25.98*	(14.44)	4.89	(10.24)	4.15	(10.76)
Managerial	-6.47	(12.94)	-7.88	(13.23)	13.03*	(7.57)	11.85	(8.01)
Non-manual	-8.44	(13.35)	-10.41	(13.54)	6.63	(8.11)	6.91	(8.47)
Skilled manual	-14.95	(11.46)	-16.64	(11.84)	-5.24	(6.90)	-5.79	(7.50)
Semi-skilled	2.33	(14.04)	0.56	(14.19)	-2.17	(7.29)	-0.68	(8.23)
Farmer	-10.53	(11.78)	-13.68	(12.22)	-1.52	(6.83)	-9.22	(7.57)
Unknown	-15.22	(14.76)	-17.23	(15.07)	-8.75	(9.14)	-6.76	(9.69)
Public sector	-1.10	(6.30)	-1.01	(6.00)	18.42***	(3.92)	17.19***	(3.81)
Constant	47.08	(47.67)	55.82	(36.86)	-27.17	(29.88)	-18.25	(20.05)
Observations	516		511		516		511	
R^2	0.054		0.055		0.298		0.309	

Clustered standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dependent variable in Models 1-2: retirement income replacement rate (using total retirement income). Dependent variable in Models 3-4: retirement income replacement rate (using supplementary pension income).

2.7 Conclusion

This Chapter attempts to develop a deeper insight into the structure of the incomes of Ireland's retirees. The purpose of the analysis is to examine how the pension system has shaped the incomes of those who have now left the labour force. The research aims to inform pension policy which affects current labour market participants.

With regard to retirees' incomes, the analysis reveals that the flat-rated State welfare pensions provide the majority of retirement income for a large fraction of the current retiree cohorts. Therefore, a reduction in State welfare pension rates would negatively impact the incomes of a significant group of retirees and the effect would be highly regressive. The proportion of the total retiree population that relies heavily on the State welfare pensions is likely to be larger than the group identified in this research, as this Chapter only focuses on individuals with a relatively substantial work history, therefore omitting individuals who have not participated in the labour force.

The most striking feature emerging from the analysis of retirees' incomes is the crucial role that supplementary pensions play in retirement income provision. Prompted by this finding, the exploration of factors that determine whether or not a retiree is in receipt of income from a supplementary pension is carried out. A multivariate analysis of the determinants of supplementary pension coverage reveals that former public sector employees are significantly more likely to be covered than former private sector workers. Focusing on retirees who have worked in the private sector before retirement, findings suggest that both work history and individual socio-economic characteristics are significant in explaining supplementary pension coverage. Individuals with low levels of education, those with no asset income, those who live outside Dublin and those previously employed in small firms or with short tenures in their last employment are less likely to receive income from a supplementary pension.

If policy aims to increase supplementary pension coverage, the mechanisms through which individuals acquire supplementary pensions need to taken into consideration. The results presented here suggest that, for some groups of retirees, not having a supplementary pension is largely influenced by their occupational and other job characteristics. The finding provides support for the theory of segmented labour markets, according to which pension coverage is restricted for certain sections of the labour force with specific job types. The selection into these specific job types is, in turn, influenced by socio-economic characteristics. Focusing measures to increase supplementary pension coverage for women in particular could be desirable, as women are disproportionally represented in the groups of workers with low earnings and non-continuous labour market participation patterns.

The final part of the analysis calculates retirement income replacement rates and analyses how they vary across individuals. In this context, two important features emerge, as shown in Figure 2.3. First, the structure of Ireland's pension system — in particular the flat-rated State welfare pension — leads to a high degree of progressivity in the system. Replacement rates fall continuously across the pre-retirement earnings distribution, with the rate of decline faster among former private sector employees, compared to the public sector. Second, supplementary pensions add an earnings-related component to the overall pension system and insulate post-retirement incomes of middle- and high-earners to some degree.

Two criticisms that are often expressed about Ireland's pension system are that i) the State welfare pensions are virtually flat-rated and not linked to earnings, and ii) tax deductibility of contributions to supplementary pension schemes makes the system regressive because the tax relief is given at the marginal rate of income tax of the individual. Looking at these two issues in isolation, the criticisms can be justified. However, the analysis in this Chapter shows that the two issues should not be assessed separately. Firstly, even though tax deductibility of pension contributions is regressive, the overall system appears highly progressive. Secondly, while the basic State welfare pension is not earnings-related, (tax-incentivised) supplementary pensions provide an earnings-related dimension to the pension system.

By viewing these dimensions of Ireland's pension system together, the findings of this Chapter suggest that caution should be exercised in reviewing elements of the pension system in isolation. Currently, the various elements in combination produce an outcome which is progressive, while at the same time providing an earnings-related component. Therefore, any changes to one element could alter the overall outcome of the system.

Although the flat-rated State welfare pensions introduce a progressive element to the Irish pension system, differential mortality also needs to be taken into consideration. Although those with lower earnings contribute less to State welfare pensions and receive the same State pension payment rates as those with higher earnings, the higher overall pension payments stemming from longer lifespans among the higher earners dampens the element of progressivity in the system.

Appendix to Chapter 2

2.A Irish pension system: additional information

Widow's, Widower's or Surviving Civil Partner's (Contributory) Pension

Widow's, Widower's or Surviving Civil Partner's (Contributory) Pension is paid to the husband, wife or civil partner of a deceased person. The payment is not means-tested. Weekly Widow's Contributory State welfare pension payment rates in 2010 were:

- EUR 230.30 for 48 or more average yearly contributions
- EUR 225.80 for 36-47 average yearly contributions
- EUR 220.40 for 24-35 average yearly contributions

In order to qualify for this pension, a person must:

- be widowed or a surviving civil partner OR divorced from late spouse prior to spouse's death and not remarried OR have had their civil partnership dissolved and have not registered a new civil partnership

  AND

- not be cohabiting as a couple

  AND

- satisfy the following social insurance contribution conditions (before the death):
  either the surviving or the deceased spouse (or civil partner) must have at least 260 weeks' paid PRSI contributions.
  The surviving or the deceased spouse (or civil partner) must also have a yearly average of either:

  - 39 paid or credited social insurance contributions in the 3 or 5 tax years before the death of the spouse/civil partner or before they reach SPA. This gives entitlement to a *maximum* rate pension.
    OR

- at least 24 paid or credited social insurance contributions from the year of first entry into social insurance until either the year of death of the spouse/civil partner or the year they reached SPA, whichever is earlier. This gives entitlement to a *minimum* rate of pension. An average of 48 per year entitles the person to the *maximum* rate pension.

Means test for Non-contributory State welfare pension

Means are assessed under cash income and value of capital.

Cash income includes income from earnings, investments, renting out a part of primary residence[25] and pensions from other countries. Earnings of up to EUR 200 per week from employment (but not self-employment) are disregarded, as are proceeds from selling the primary residence under certain conditions.[26]

Savings and investments (including investment property) are assessed as **capital**. The value of the primary residence is not taken into account in the means test. The first EUR 20,000 is disregarded. The next EUR 10,000 is assumed to yield 0.1 per cent annual return. The next EUR 10,000 is assumed to yield 0.2 per cent annual return. Any wealth above EUR 40,000 is assumed to yield 0.4 per cent annual return.

In the case of married couples, civil partners or a cohabiting couples, a person's means are taken to be half of the total means of the household.

[25] If not renting the room means that the person would be living alone, the rental income from rent is disregarded.

[26] A certain amount of the sales proceeds are disregarded if the person sells their primary residence if the accommodation no longer suits the person, or the person is no longer able to maintain the property.

2.B Income calculation

The gross weekly income for each individual is calculated by adding together income from:

- Contributory State welfare pension
- Non-contributory State welfare pension
- Transition State welfare pension
- occupational pensions
- private pensions
- social welfare income:
  - Disability Allowance, Disability Benefit, Invalidity Pension, Carers Allowance, Supplementary Welfare Allowance, foreign social welfare payments, and the combined income from any other social welfare payments[27]
- interest on savings*[28]
- interest on financial assets*[29]
- rental income*
- other assets*[30]

*Only asked of the Financial Respondent within the household. Therefore, asset income is assumed to be divided equally between spouses if respondent is married/cohabiting.

[27] Pre-retirement Allowance, Back To Work Allowance, Back To Work Enterprise Allowance, Back To Education Allowance, Part-time Job Incentive Scheme, Farm Assist Scheme, Widow's or Widower's Non-Contributory Pension, Widowed Parent Grant, Deserted Wife's Benefit, Bereavement Grant, Injury Benefit, Disablement Benefit, Blind Pension, Constant Attendance Allowance, Infectious Diseases Maintenance Allowance and Medical Care Scheme. The income from these sources is reported jointly, and therefore can not be disaggregated.

[28] If an individual reports having savings but doesn't know or refuses to report the interest income, 3 per cent return on savings value assumed.

[29] If an individual reports having financial assets but doesn't know or refuses to report the interest income, 3 per cent return on asset value assumed. If asset value reported as a range, the mid-point of that range recorded as asset value.

[30] Land, a firm or business, an inheritance or money owed, etc. If an individual reports having other assets but doesn't know or refuses to report the interest income, 3 per cent return on asset value assumed.

2.C Unfolding brackets and data imputation

As is common in surveys, some TILDA respondents answer questions — especially financial ones — with "I don't know" or "I'd rather not say". To overcome the issue of missing data, TILDA uses unfolding brackets in many of the questions. A large fraction of initial non-respondents are willing to answer the unfolding bracket questions. If a bracket value was provided, the median point of the range was used to replace the missing value for the point estimate.

Imputation — a technique of replacing missing data with plausible values — is common in household surveys, especially for sensitive financial information. A smaller sample resulting from resorting to complete-case analysis results in a loss of efficiency and deleting missing data can yield biased inference when the probability of item non-response is correlated with the variable itself. Missing data can be described as "missing completely at random" (MCAR) if the probability that data are missing does not depend on observed or unobserved data. Under the MCAR assumption, the missing values are a random sample of all values (missing and non-missing), and therefore analyses excluding the missing values are consistent, although less efficient. As is common with survey data, data are defined as "missing at random" (MAR) if the probability of missingness does not depend on unobservables but may be correlated with observables. Under MAR, the probability that data is missing is not a function of the missing data values themselves. In the MAR case, listwise deletion of data can lead to biased results. If the missingness of the data depends on the missing data values, the missing-data mechanism is called "missing not at random" (MNAR). For such missing data, the reasons for its missingness must be accounted for in the model. This can be argued to be the case for missing income data, as it is likely that people with either low or high incomes do not report their income levels. In practice, it is difficult to test the ignorability assumption formally, as the MAR mechanism can be distinguished from the MNAR mechanism only through the missing data that are not observed (Stata Corp, 2013).

Predictive mean matching was used to impute missing income component values (and no bracket was provided). Out of the 6 main income components, 2 had more than 5 per cent missing observations (occupational pensions and asset income, with 6.3 per cent and 19.5 per cent missing observations, respectively). The missing values were imputed by replacing them with predicted values obtained by regressing the income component in question against a group of covariates for those individuals with non-missing data. The predicted value of the income component was then estimated for those with missing income data, using covariate values and the estimated coefficients. The covariates used were age, education level, number of years worked, and dummy variables indicating the presence of

children, the sector of previous employment, home ownership, gender, and being married (or cohabiting).

Chapter 3

Wealth and the effect of subjective survival probability

3.1 Introduction

In many countries, the ageing of populations caused by declines in both mortality and fertility rates has made retirement income provision a policy concern. As retirement ages have not increased at the same rate, people are spending a longer time in retirement. Figure 3.1 presents the time series of Irish life expectancy and effective retirement age data.[1] Between 1970 and 2005, life expectancy at birth increased by approximately six years for both men and women, whereas effective retirement ages decreased by nearly ten years.

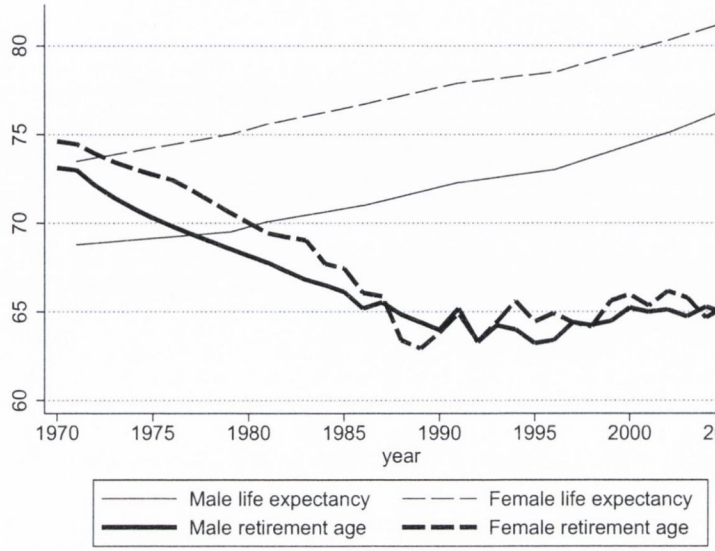
To prevent declines in consumption in a longer retirement, people can either save more or delay retirement. However, the latter option might not be available to all because of institutional factors restricting retirement timing or health issues that restrict the possibility of extending working lives.

As a way to reduce the burden of pension provision on public finances, many countries are implementing policy reforms that increase individual responsibility for saving for retirement (Post and Hanewald, 2013). The success of such policies depends partly on the ability of the individuals to make rational decisions which incorporate accurate assessments of future risks that include mortality risk. This chapter examines the extent to which saving behaviour is rational in this respect, by testing whether longevity expectations affect saving behaviour.

The traditional life-cycle model of saving and consumption predicts that individuals with lower mortality risk should accumulate more wealth during their working lives, *ceteris*

[1] The average effective retirement age is defined as the average age of exit from the labour force during a 5-year period. It is below the official retirement age in most OECD countries apart from Japan and South Korea (Keese, 2006).

Figure 3.1: Life expectancy at birth and average effective age of retirement in Ireland, 1970-2006



Sources: Irish Life Tables (Central Statistics Office, 2010) and Organisation for Economic Co-operation and Development (2013a)

paribus (Hurd et al., 1998; Alessie and Kapteyn, 2001; Bloom et al., 2004). As De Nardi et al. (2009) point out, an unhealthy 70 year old male at 20^{th} percentile of the permanent income distribution only expects to live to age 76, whereas a woman of the same age at the 80^{th} percentile of the permanent income distribution expects to live to age 86. Such differences in length of life should be reflected in saving behaviour. To test this prediction empirically, this chapter examines the link between pre-retirees's subjective survival probability — a proxy measure of self-assessed life expectancy — and wealth levels. Subjective survival probability data collected in ageing studies have been found to have strong predictive power of observed mortality, high correlation with life table survival probability estimates, and to correlate as expected with known risk factors, thereby providing valuable information about individual heterogeneity in mortality.[2]

The data come from The Irish Longitudinal Study on Ageing (TILDA) which includes a measure of subjective survival probability and data from which a comprehensive measure of pre-retirement wealth can be estimated. Previous research into mortality risk and saving suffers from sub-optimal measures of wealth. Some studies have examined current period saving rates, which fail to capture the long-run nature of wealth accumulation and are prone to mis-measurement (Hurd et al., 1998) or only focus on a single component of wealth, for example financial wealth (Bloom et al., 2006, 2007). This analysis includes

[2]See Section 3.2.3 for a summary of existing analyses of the quality of subjective survival probability data.

a comprehensive measure of wealth, including financial wealth, property, pensions, and social welfare pension entitlements.

This study also improves upon existing analyses by using a rich set of control variables and by incorporating the instrumental variable approach suggested by O'Donnell et al. (2008), who use both parental mortality and smoking behaviour as instruments for subjective survival probability, although in a different context. The instrumental variables address the issues of reverse causality, measurement error and focal points in subjective survival probability (SSP hereafter) responses.

The findings suggest a positive and statistically significant effect of subjective survival probability on pre-retirees' wealth — a 1 percentage point increase in self-assessed probability of reaching age 75 increases an individual's financial wealth (the sum of saving and deposit accounts, stocks, bonds, life insurance, mutual funds, investment property, land, businesses and due inheritance, less outstanding debt) by approximately EUR 3,400. This effect corresponds to a 3.9 per cent increase at the mean level of financial wealth. A 1 percentage point increase in self-assessed probability of reaching age 75 increases an individual's total wealth (financial wealth and pension wealth, including State welfare pensions, occupational pensions and private pensions) by approximately EUR 6,200, which corresponds to a 1.7 per cent increase at the mean.

The results are robust to the exclusion of annuity wealth held in defined benefit and State welfare pensions. Arguably, these types of pension wealth can be computationally linked to life expectancy because the wealth held in a defined benefit pension is estimated as the present value of future streams of payment from the pension (using life table estimates of longevity as the length of future payment period). Robustness checks that exclude people whose parents died before the age of 50 and respondents with focal responses to the SSP question provide findings similar to the main specifications.

The remainder of this chapter is structured as follows: Section 3.2 reviews the relevant literature, while Section 3.2 describes the data. Section 3.4 describes the methodology, and Section 3.5 presents the results of the econometric analysis. The final section (3.6) offers concluding remarks. Appendix 3.A contains supplementary regression estimates. Appendices 3.B and 3.C detail the methodologies used in estimating the values of different wealth components and in imputing missing values, respectively.

3.2 Existing research

3.2.1 Theory of mortality risk and saving

The length of the horizon over which an individual is assumed to maximise their utility is crucial in economic models. Hamermesh (1985) notes the lack of research into how individual expectations about length of life are formed. Theoretical work since then has focused on how both differences in the expected length of life and differences in the uncertainty about longevity may affect saving behaviour.

Yaari (1965), Levhari and Mirman (1977) and Hurd (1989), among others, develop life-cycle models of consumption and saving that relax the assumption of a known length of life. These models suggest that the level of uncertainty about the length of life has an impact on the level of saving, as well as asset allocation and the timing of retirement. Yaari (1965) builds on the initial work of Fisher (1930) and develops a life-cycle model of consumption in which the horizon of human lifetime is modelled as a set of possible survival probabilities and individuals differ when it comes to risk aversion. He shows that high risk aversion affects consumption in the same way as having a high discount rate. Levhari and Mirman (1977) show that, for individuals with a high degree of risk aversion, changes in uncertainty about length of life affect consumption and saving choices because of fear of outliving savings and because of preference over current (guaranteed) consumption. The relative sizes of these forces depend on risk aversion, the form of the utility function, and rates of return.

More recent theoretical work on the effect of longevity risk on retirees' saving (as opposed to pre-retirees) has been carried out by Gan et al. (2004) and De Nardi et al. (2006, 2009). Gan et al. (2004) develop a dynamic life-cycle model which estimates the effects of expected future mortality on saving and bequests. They find that subjective mortality data preforms better than life table estimates of mortality when predicting wealth levels among the Asset and Health Dynamics Among the Oldest Old (AHEAD) survey respondents. De Nardi et al. (2006, 2009) focus on the wealth holdings of those in retirement. They develop a structural model of elderly singles' saving behaviour that incorporates different mortality risk based on gender, income, health and medical expenses and find that the risks of living a long life and high medical expenses explain a large part of old people's savings decisions using the AHEAD dataset. They find that rich people expect to live long and to face high medical expenses in the future, thereby making their asset decumulation in retirement slow. Using data on expected mortality stratified by some observable characteristics (gender, health and income), they simulate wealth trajectories and find that differences in mortality risk have a significant impact on (dis)saving among the older population.

Cocco and Gomes (2012) develop a life-cycle model with differential mortality risk and endogenous saving and retirement decisions of pre-retirees. They find that individuals respond to longer life expectancy with higher saving rates, assuming that they are aware of increases in life expectancy, the associated implications for saving requirements and that individuals also adjust their behaviour by delaying retirement if retirement timing is flexible.

In this analysis, an assumption is made that individuals' longevity expectations do not change over time (or that longevity expectations have not changed between the start of the wealth accumulation process and the point of measurement of survival beliefs). The evolution of health and longevity expectations are a dynamic, endogenous process, as discussed by Benitez-Silva and Ni (2008). However, as the focus of this Chapter is on pre-retirees, this assumption is more likely to hold than if the focus was on retirees — who are more likely to have experienced health shocks personally, or to those around them.

3.2.2 Subjective survival probability

As emphasised by Manski (2004), incorporating expectations is crucial in models of economic behaviour. An agent making inter-temporal decisions needs to incorporate probability distributions of future events in their decision-making process (Hurd and Rohwedder, 2008). In traditional life-cycle models, individuals are assumed to make decisions about saving and consumption based partly on mortality risk. The common assumption is that individuals' subjective and objective probability distributions of mortality risk are identical, and therefore survival probability data have been taken from cohort-generic life table estimates of life expectancy (Hurd, 1989; Bloom et al., 2003).

Sometimes the life expectancies are stratified by age, gender, race, education, occupation or other *observable* characteristics, in order to model the individual heterogeneity in mortality (Skinner, 1985; Hurd et al., 1998; De Nardi et al., 2009). This approach, however, does not account for the mostly *unobservable* traits, such as genetics and health behaviours, that also affect longevity about which the individual herself has valuable information. If the differences between life table and subjective mortality risk measures are correlated with unobserved factors that explain variation in saving, empirical estimates of the effects of mortality risk will yield biased results (Hamermesh, 1985; Salm, 2010).

To aid the modelling of inter-temporal decision-making, many contemporary surveys include measures of subjective probabilities of the likelihood of future events. The use of subjective probability measures has been established in empirical studies since the 1980s. Alessie and Kapteyn (2001) and Manski (2004) document the change in attitudes among

applied econometricians towards using subjective probability measures in analyses of saving behaviour. Alessie and Kapteyn (2001) suggest that subjective information can in some cases be the only acceptable way to examine certain behaviours to do with longevity and risk aversion.

In an early analysis of the quality of subjective survival probability data, Hamermesh (1985) collects two relatively small samples of subjective life expectancy data from white males in the US, one from economists and one from the general public.[3] He compares the distribution of the SSP responses to the distribution of the actuarial life table figures for men, stratified age. He finds that for both groups, on average, subjective life expectancies coincide relatively closely with actuarial life tables. However, when it comes to the distribution of these expectations, respondents in both groups are inconsistent: they underestimate the probability that they will reach the age of 60 and overestimate the probability of surviving from 60 to 80. He also studies the effect of individual characteristics on SSP and finds that parental longevity is a strong predictor of SSP responses.

Studies including Hurd and McGarry (1995, 2002), Smith et al. (2001) and Elder (2007) examine the quality of the SSP responses in the Health and Retirement Study (HRS) of older US individuals. Hurd and McGarry (1995, 2002), in line with Hamermesh's earlier findings, show that SSP data have approximately the same mean as the corresponding life-table estimates and that SSP data are correlated with known factors associated with mortality risk, such as socio-economic status and smoking status. Smith et al. (2001) find the HRS SSP data to be predictive of actual mortality observed in subsequent waves of the survey.

An analysis of the validity of SSP data in the AHEAD survey has been carried out by Siegel et al. (2003), who find that self-rated life expectancy predicts mortality, even when self-rated health and socio-demographic characteristics are controlled for. Post and Hanewald (2013) analyse the SSP responses within the Survey of Health, Ageing and Retirement in Europe (SHARE) dataset. They find that the distribution of subjective survival probabilities is positively linked to the distribution of objective survival probabilities, indicating that SHARE respondents are aware of average longevity risk.

Well-documented issues with subjective survival probability data are classical measurement error and focal points in the responses. The measurement error issue is discussed by Bloom et al. (2006, 2007) who describe the aggregate over- and underestimation of survival probabilities in the HRS and AHEAD data. The phenomenon where responses are clustered

[3]The size of the economist sample used is 411, whereas the size of analysis sample from the general population is 363. The two populations were chosen because economists are assumed to have a better-than-average understand of expectations and probabilities, and therefore Hamermesh (1985) could compare the responses of these two groups.

at certain points in the distribution is known as focal responses (Hurd and McGarry, 2002; Post and Hanewald, 2013). The issue of focal point in SSP data is discussed in existing work by Hurd and McGarry (1995), Hurd et al. (1998), Bassett and Lumsdaine (2001), Bloom et al. (2003), Bloom et al. (2007) and Post and Hanewald (2013), among others. Previous studies have dealt with focal response in data by either using instrumental variables, by imputing values for the focal responses or by treating a focal response as an indicator of the individual's lack of knowledge of the underlying probability (Post and Hanewald, 2013).

3.2.3 Empirical studies of SSP and saving

The majority of the empirical research into the effect of individually heterogeneous mortality risk on saving behaviour has been carried out using HRS and AHEAD data from the US. These analyses include papers by Hurd et al. (1998) and Bloom et al. (2006, 2007). A more recent analysis using European SHARE data was carried out by Post and Hanewald (2013). These studies use either a measure of the uncertainty about longevity or a direct measure of individuals' mortality beliefs. This analysis adopts the latter approach.

Hurd et al. (1998) look at the relationship between saving behaviour and beliefs about survival using saving data from AHEAD. They use an ordered probit specification to model whether an individual is a net saver, a zero saver, or a net dis-saver. They find a significant positive correlation between SSP and saving among couples but not singles and that people seem to respond to subjective beliefs about mortality rather than to life table probabilities. Post and Hanewald (2013) carry out an empirical analysis of uncertainty about survival on saving behaviour using data from SHARE. They measure survival uncertainty as dispersion of SSP data from their objective counterparts and find that individuals hold higher levels of wealth when faced with greater uncertainty about longevity.

Neither Hurd et al. (1998) nor Post and Hanewald (2013), however, address the possibility of reverse causality between survival beliefs and wealth. Wealth can affect a person's health and, through that channel, their survival beliefs. Explanations for the effects of wealth on health include differences in access to healthcare and lifestyle differences when it comes to expenditure on alcohol, tobacco and certain foods (Alessie and Kapteyn, 2001). Therefore, it is possible that wealth plays a part in determining life expectancy; a possibility also discussed by Attanasio and Hoynes (2000), Meer et al. (2003) and Adda et al. (2009).

The reverse causality issue has been addressed by Bloom et al. (2006, 2007) by using an instrumental variables approach. Bloom et al. (2006, 2007) examine the effect of SSP on the probability of an individual retiring between two time periods and on the levels of financial wealth of households. They deal with the possible reverse causality issue (and

the issues of measurement error and focal points in the subjective life expectancy data) by instrumenting for the SSP data with the respondent's parents' current age or, alternatively, their age at death, for the first time in the literature. The shortcomings of Bloom et al. (2006, 2007) — as they acknowledge — are that they have no measure of social security or pension wealth, which clearly play a central role when deciding about retirement saving and wealth accumulation. Using financial wealth as the dependent variable, they find a significant effect of SSP for two-person households, with a one percentage point increase in SSP of the husband increasing the household financial wealth by approximately USD 2,800. They find a positive but statistically insignificant effect of SSP on financial wealth for single households.

A related paper that also examines the causal effects of SSP, but focuses on retirement timing, is O'Donnell et al. (2008). They examine three waves the English Longitudinal Study of Ageing (ELSA) data and use both parental longevity and smoking behaviour as instruments for SSP. They calibrate the SSP data on life table figures to generate and index measuring how optimistic or pessimistic an individual is about their survival in comparison to the objective estimates.[4] A measure of survival probability that uses both objective and subjective information is also used by Salm (2010), who examines how SSP affects consumption growth.[5]

A narrow definition of wealth and the issue of reverse causality between survival beliefs and wealth are the two major issues in the empirical study of effect of survival beliefs on saving, and this research contributes to the literature by addressing both issues. Although some papers deal with these issues in isolation, no existing study tackles both issues simultaneously. The main contribution of this research to the existing literature is the use of a comprehensive measure of wealth as the dependent variable. As Bloom et al. (2006, 2007) acknowledge, including all forms of wealth in the analysis is crucial, especially when it comes to pension wealth; a major component of wealth for most people. Modelling the stock of wealth (rather than the current-period flow of saving or consumption) also mitigates the problem of measurement error in the estimation: saving behaviour in a given period may fluctuate but the accumulated stock of wealth in the years leading up to retirement reflect the saving behaviour of an individual over their whole lifetime. This research also contributes to the relatively narrow existing body of literature, by testing the validity and performance of instrumental variables that have been used or suggested in existing literature.

[4]The methodology for developing the "pessimism" measure initially comes from Gan et al. (2005). O'Donnell et al. (2008) find that females are more pessimistic about their survival probabilities than men and that both genders on average overestimate their mortality risk when compared with life table information.

[5]Salm (2010) measures consumption using two waves of the Consumption and Activities Mail Survey which was administered to a subset of the HRS respondents. He finds that a one-percent increase in SSP leads to a 1.8 per cent decrease in consumption of non-durables.

3.3 Data

The data come from the first wave of The Irish Longitudinal Study on Ageing (TILDA).[6] TILDA is an ideal dataset for examining retirement resources because the respondents are relatively close to retirement. Pension wealth is likely to be estimated more accurately for older households, as explained by Scholz et al. (2006).

Table 3.1 presents data on the sample selection process, with the number of observations deleted in and remaining after each round of sample selection. As the subjective survival probability question was only included in the first wave of the data collection, any research using this data is restricted to cross-sectional analysis. The sample size of the first wave of data is 8,504. The individuals included in this analysis are those living in households where both spouses are less than 65 years old,[7] and neither spouse is retired. After excluding those aged 65 and over, and retirees, the remaining sample size is 3,304 individuals. A further 942 observations are excluded due to a missing financial respondent for the household (and therefore no financial wealth data is available) or one of the spouses refuses to take part in the survey. The SSP data is missing for a further 105 individuals, and 125 have missing values for one or more of the control variables. Due to missing values for the variables used in the imputation of the missing wealth data, 16 individuals are excluded from the analysis sample.[8] The final sample contains 2,116 individuals living in 1,464 households.

Table 3.1: Selection of the analysis sample

Sample description	Remaining observations
TILDA respondents in Wave 1	8,504
Between 50 and 64 years old*	4,062
Not retired*	3,304
Household has a financial respondent	3.219
Both spouses take part in survey†	2,362
Non-missing SSP data	2,257
Non-missing control variables	2,132
Imputable wealth data	2,116
Final sample size	**2,116**

*both spouses if married or cohabiting
†if married or cohabiting

3.3.1 Control variable summary statistics

Table 3.2 presents summary statistics for the main control variables, while the dependent variable and the SSP measure are discussed in more detail in the following sections. Two-

[6] See Section 2.4 for a description of the TILDA study.
[7] Some TILDA respondents' spouses are less than 50 years old. They are excluded from the analysis as the probability weights used to make the sample representative of the population are not available for them.
[8] Missing wealth data is imputed as described in Appendix 3.C.

thirds of the individuals in the sample are either employed or self-employed, with the remainder either unemployed, sick, home-makers or in education. For the majority, a second-level qualification is the highest education obtained, with one-fifth having a third-level qualification. Working careers are long, particularly for men. Roughly a third of the respondents report their health as being good; however, a fifth rate their health as poor or fair. Two-thirds of the sample are married or cohabiting, 14 per cent have never married, 15 per cent are separated or divorced and 7 per cent are widows. Equivalised income[9] is between EUR 10,000 and EUR 19,000 for 32 per cent of the sample and between EUR 20,000 and EUR 35,000 for 31 per cent of the sample. Examining health behaviours, 31 per cent report drinking less than one unit of alcohol weekly, whereas 9 per cent drink 20 units or more. Two thirds of the sample report having not done any vigorous physical activities[10] in the previous week.

3.3.2 Wealth

Total projected wealth for each individual is calculated by adding together the following wealth components:

1. Net financial wealth, which includes saving and deposit accounts, stocks, shares, life insurance, mutual funds, investment property, land, businesses, due loans or inheritance etc.[11], less outstanding non-mortgage debt[12]
2. Present discounted value of occupational and private pensions
3. Present discounted value of Contributory and Non-contributory State welfare pensions

Housing wealth is not included in the analysis because it is rarely used to finance consumption in retirement due to the illiquidity of the asset and the associated high transaction costs (Gan et al., 2004). TILDA financial wealth data is collected from one person within

[9]Current income has been equivalised by dividing total household income by 1.66 for two-person households to make adjustments to the income in a way that enables analysis of the relative well-being of households of different sizes.

[10]Such as heavy lifting, digging, aerobics, or fast bicycling.

[11]After questions about saving and deposit accounts, stocks, shares, life insurance, mutual funds and investment properties, the respondents were asked about the value of any other assets "*such as land, a firm or business, an inheritance or money owed to you, etc.*"

[12]The quality of TILDA wealth data is discussed in O'Sullivan et al. (2014). Validating the wealth data is difficult due to detailed wealth data not having been collected in Ireland since 1987. They find the wealth data to be plausible when compared with information available in recent Irish Censuses.

Table 3.2: Descriptive statistics by gender

	Gender		
	Male %	Female %	Total %
Socioeconomic status			
Employed	43.0	52.7	47.5
Self-employed	29.4	6.1	18.5
Unemployed	15.2	6.5	11.2
Permanently sick / disabled	10.6	9.4	10.0
Looking after home	1.3	24.0	11.9
In education	0.5	1.2	0.8
Age			
50 - 54	31.2	40.1	35.4
55 - 59	40.9	38.9	39.9
60 - 64	27.9	21.0	24.7
Education level			
Primary/none	28.8	20.6	25.0
Secondary	52.5	54.9	53.6
Third level/higher	18.7	24.5	21.4
Years worked			
0-9	1.2	13.0	6.7
10-19	2.1	19.4	10.2
20-29	7.2	26.2	16.1
30-39	50.0	33.0	42.0
40+	39.4	8.5	25.0
Number of children			
0	21.7	14.1	18.2
1-2	27.7	29.4	28.5
3-4	38.5	42.1	40.1
5+	12.1	14.5	13.2
Health			
Poor/Fair	22.5	20.0	21.3
Good	33.4	31.7	32.6
Very good	29.4	29.2	29.3
Excellent	14.7	19.1	16.8
Marital status			
Married	68.0	60.4	64.4
Single (never married)	16.7	10.2	13.7
Separated / divorced	11.4	18.8	14.8
Widowed	3.9	10.5	7.0
Equivalised HH income (1000s)			
Less than 10	20.1	16.9	18.6
10 to 19	32.6	32.3	32.5
20 to 34	29.1	32.2	30.6
35 or more	18.2	18.6	18.3
Weekly alcohol units			
Less than 1	24.7	39.2	31.5
1 to 4	19.3	26.2	22.5
5 to 19	41.6	32.0	37.1
20 or more	14.4	2.6	8.9
Weekly exercise days			
Less than 1	57.9	76.8	66.7
1 to 2	13.0	11.5	12.3
3 to 4	10.5	5.7	8.2
5 or more	18.7	6.1	12.8
Sample size	996	1,120	2,116

Table 3.3: Percentages holding wealth, by total wealth quartile

a) Singles

	1st	2nd	3rd	4th	All
Financial wealth	24.9	50.4	67.6	83.8	54.8
Supplementary pension wealth	6.8	27.5	54.3	77.0	39.2
Contributory pension wealth	86.0	93.9	94.9	96.8	92.7
Non-Contributory pension wealth	14.0	5.6	4.3	1.8	6.7

b) Couples

	1st	2nd	3rd	4th	All
Financial wealth	52.9	78.1	83.7	91.7	75.5
Supplementary pension wealth	22.6	41.5	60.9	74.6	48.9
Contributory pension wealth	99.4	100.0	100.0	100.0	99.8
Non-Contributory pension wealth	30.1	4.6	0.6	0.0	9.5

Table 3.4: Mean values of wealth holdings (EUR), by total wealth quartile

a) Singles

	1st	2nd	3rd	4th	All
Financial wealth	-390	15,454	46,233	242,323	66,089
Supplementary pension wealth	2,062	16,700	62,181	324,306	88,583
Contributory pension wealth	118,195	142,385	153,549	159,020	142,204
Non-Contributory pension wealth	17,648	7,623	5,104	2,546	8,570
Total wealth	137,516	182,162	267,067	728,195	307,094

b) Couples

	1st	2nd	3rd	4th	All
Financial wealth	23,473	54,486	158,938	660,861	208,354
Supplementary pension wealth	28,666	97,664	210,523	695,072	239,014
Contributory pension wealth	286,997	425,196	450,440	452,749	398,662
Non-Contributory pension wealth	33,378	3,841	744	0	10,256
Total wealth	372,515	581,187	820,645	1,808,681	855,243

the household, the financial respondent,[13] therefore the net financial wealth is measured at the household level and subsequently divided equally between the spouses in the case of a married couple. All other wealth measures are observed at the individual level. The estimation of current value of pension plans requires various assumptions to be made about past and future contribution histories and wages. The methodology adopted closely follows that of Banks et al. (2005) and Crawford and O'Dea (2012), who estimate individual pension wealth for the respondents of the English Longitudinal Study of Ageing (ELSA). How the wealth holdings are calculated and what assumptions are made are explained in Appendix 3.B. The imputation method for replacing missing values and bracketed responses is described in Appendix 3.C.

Examining the relative importance of the different wealth components across the wealth distribution, Table 3.3 presents the percentages of households holding different types of wealth, whereas Table 3.4 presents the mean values these wealth holdings. Overall, 55 per cent of the single-person households and three-quarters of the couples report having positive financial wealth. A sizeable portion have accumulated supplementary pensions. The majority of individuals have worked at some point in their lives, therefore acquiring entitlements to State welfare pensions. The mean total wealth held by single households is approximately EUR 307,000, and couples' total wealth is estimated to be an average of EUR 855,000. The flat-rated State pension wealth distributions are relatively even, whereas financial and supplementary pension wealth holdings are highly skewed across the total wealth distributions.

3.3.3 Subjective survival probability

The TILDA survey asks the respondents directly about their self-assessed probability of reaching a certain age. The respondents are shown a card depicting a continuous line with the number 0 at the left side and 100 at the right side, and asked the below question:

"Using the scale on this card, what is the percent chance that you will live to be 75?"[14]

Figure 3.2 depicts the distribution of the SSP responses for men and women. The mean (median) reported survival probability to age 75 is 79.9 (90). The SSP responses are higher for women than for men, as expected. As is customary with SSP data, the distributions are characterised by focal responses, with the distributions having two noticeable peaks at 50 per cent and 100 per cent. Over 60 per cent of the sample report that they have at

[13]The respondents are asked at the start of the interview which spouse is most knowledgeable about family finances and retirement planning, and the more knowledgeable is assigned the role of financial respondent.

[14]For respondents who are older than 65, the "target" age is higher, but older age groups are not included in this analysis.

least an 80 per cent probability of reaching the age of 75. Just over 12 per cent estimate the probability at 50 per cent, and 39 per cent estimate the probability to be 100 per cent. Therefore, approximately half of the individuals in the sample give a response clustered either at 50 or 100 per cent. This finding is consistent with evidence from SHARE (Post and Hanewald, 2013), ELSA (O'Donnell et al., 2008) and HRS (Bloom et al., 2006, 2007).

As suggested in the literature reviewed in Section 3.2.3, some diagnostics can be used to assess the validity of SSP responses, even when using cross-sectional data. Diagnostics employed here are the comparison of the average SSP values with survival probabilities calculated from actuarial life tables and the examination of the variation in SSP stratified by observable mortality risk factors. Figure 3.3 compares the mean values of subjective and objective (life table) values of the probability of surviving to age 75 for different aged individuals. The objective SSP values are obtained from the Irish Central Statistics Office life tables, conditional on year of birth and gender. O'Donnell et al. (2008) find that, in the ELSA data, both genders, on average, estimate their survival probability to be lower than what actuarial life table estimates would suggest, with women being more pessimistic than men. Examining the data in Figure 3.3, Irish women's subjective survival beliefs coincide very closely with their objective counterparts in all the age groups, whereas Irish men's average estimates lie above their life table counterparts for all age groups.

Table 3.5 presents mean values of SSP for different categories of variables correlated with mortality rates. For example, SSP is negatively associated with being male and smoking, whereas those with higher education or income, better self-reported health, and those whose parents died at an older age (or are older currently) report higher subjective survival probabilities. Actuarial survival probabilities increase with age, and this is reflected in the subjective survival probability data.

3.4 Methodology

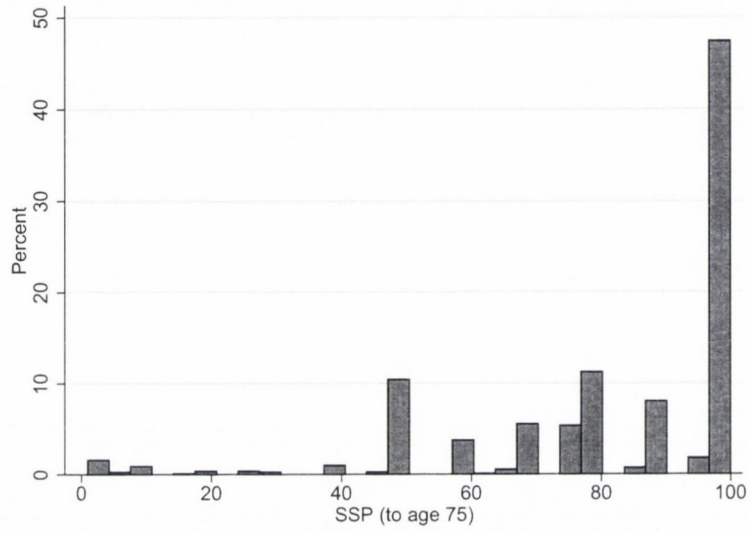
The OLS model for examining the effect of SSP on wealth is specified in Equation 3.1. The dependent variable is measured in levels instead of logarithms because of the negative and zero values, following Bloom et al. (2006, 2007).

$$Wealth_i = \alpha_0 + \alpha_1 SSP_i + \alpha_2 I_i + \alpha_3 H_i + e_i \tag{3.1}$$

where:
$Wealth_i$ = wealth of individual i

Figure 3.2: The distribution of subjective probability of reaching age 75

(a) Women



(b) Men

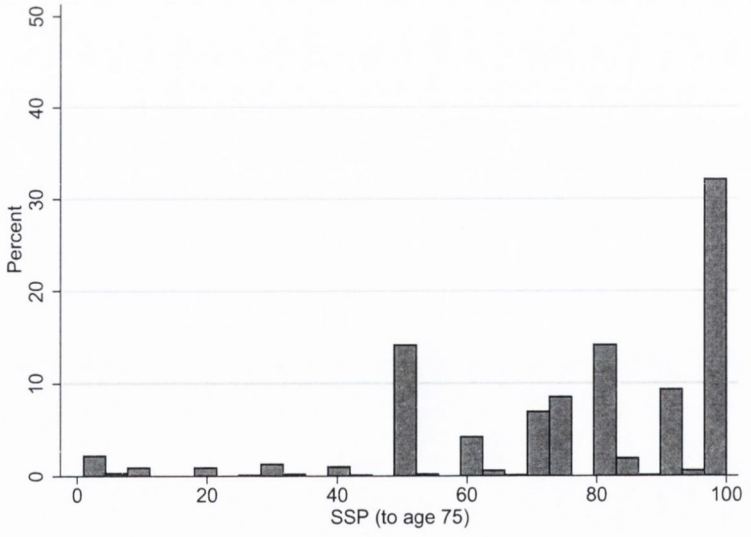
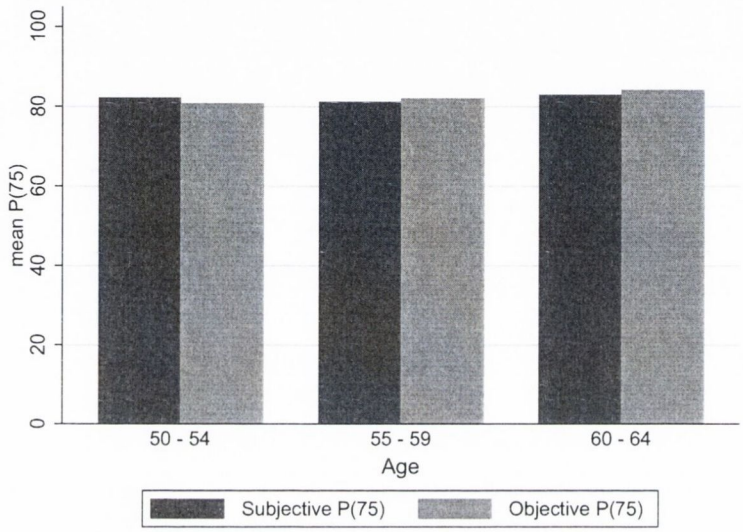
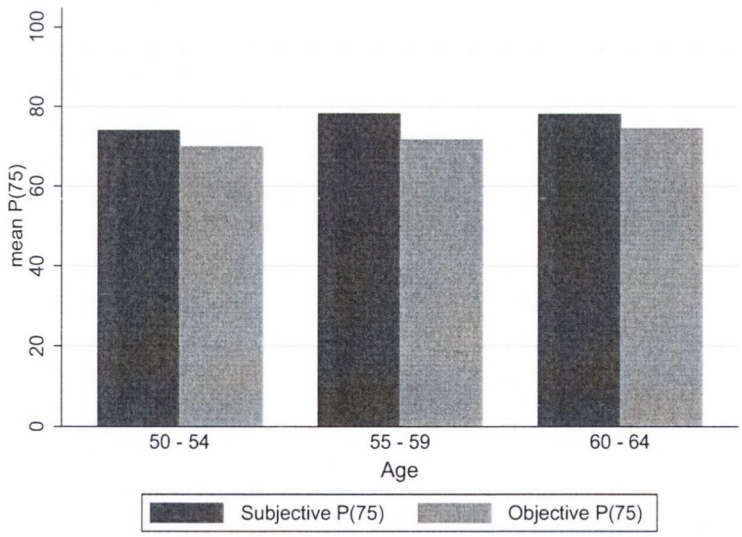


Figure 3.3: Subjective and objective mean probability of reaching age 75, by age

(a) Women



(b) Men



Source of objective P(75) data: CSO Irish Life Tables

Table 3.5: Mean values of SSP, by variables correlated with mortality

	Mean
Gender	
Male	76.9
Female	81.9
Age	
50 - 54	78.3
55 - 59	79.6
60 - 64	80.1
Highest education achieved	
Primary/none	78.6
Secondary	79.0
Third/higher	80.9
Equivalised HH income (1000s)	
Less than 10	76.4
10 to 19	78.7
20 to 34	81.0
35 or more	80.4
Health	
Poor/Fair	69.8
Good	78.9
Very good	81.2
Excellent	88.6
Smokes now	
No	81.4
Yes	72.7
Mother's (death) age	
less than 70	73.8
70-79	81.7
80-89	79.8
90+	82.9
Father's (death) age	
less than 70	74.7
70-79	79.2
80-89	83.0
90+	86.2
Sample size	2,116

α_0 = intercept term
SSP_i = subjective survival probability of individual i
I_i = vector of individual-level control variables
H_i = vector of household-level control variables
e_i = error term of of individual i

Vector I_i contains variables measured at the individual level that explain variation in wealth levels such as gender, age, work history, education and self-assessed health. Vector H_i contains control variables that are measured at the household level — namely marital status, number of children and equivalised income. The standard errors in all models are clustered at the household level, as the unobservable characteristics of individuals living in the same households are likely to be correlated.

As discussed in existing literature in this area, the estimated coefficient on the SSP variable (α_1) obtained using simple OLS is expected to suffer from biases caused by reverse causality and measurement error. Reverse causality introduced by the positive effect that wealth is likely to have on survival beliefs would bias the estimate of (α_1) upwards. On the other hand, measurement error in the SSP variable is expected to bias the coefficient estimate downwards. The net effect of these biases is ambiguous.

An instrumental variables Two Stage Least Squares (2SLS) approach is adopted in order to address the biases. The instruments used are parental longevity and smoking status. The former is used by Bloom et al. (2006, 2007) when examining the causal effect of SSP on retirement and wealth, whereas both instruments are used by O'Donnell et al. (2008) when examining the effect of SSP on retirement timing. Parental longevity is measured as the age at death of the individual's mother and father. If the parents are still alive, their current age is used (Bloom et al., 2006, 2007). Parental longevity has been argued to be highly correlated with the endogenous variable (SSP): existing research has examined the link between parental longevity and the children's survival expectations and found that parental mortality is a strong predictor of both the child's mortality experience and of the expectations that the children have, therefore making parental longevity a potentially strong instrument for SSP (Hurd and McGarry, 1995; Hurd et al., 1998).

The exclusion restriction is arguably satisfied in the case of parental longevity because parents' age at death should only affect wealth through its effect on the child's survival beliefs. This being the case, the instrument is not correlated with e_i in Equation 3.1. There are arguments for why parental longevity may not be strictly exogenous: if the parents die when the child is young (perhaps before finishing education), by affecting the education and employment choices of the child, parental longevity could directly affect the child's wealth levels later in life. In order to account for this possibility, a robustness check is

carried out where individuals whose parents died before the child was 25 years old and those whose parents (both) died before the age of 60 are excluded from the sample. The results are robust to this alternative specification, and the estimation results are presented in Section 3.5.5. The exclusion restriction may also be violated if parental longevity affects a person's wealth level directly via bequest receipt. As the TILDA dataset does not contain information about received inheritances, a dummy variable indicating whether both of the respondents' parents are deceased is added as a control variable.

The smoking status variable takes on the value 1 if the person currently smokes and 0 otherwise. When it comes to the smoking instrument, the satisfaction of the exclusion restriction is not as easily argued. Smoking status may be a proxy measure of an individual's discount rate — a person who values today much more than tomorrow is more likely to smoke and also less likely to accumulate wealth due to precautionary saving motives. Smoking can arguably also be a measure of risk-aversion (or risk-loving), which can be correlated directly with saving behaviour. In an attempt to mitigate this effect, other proxy measures of discount rates and risk aversion (namely, exercise and alcohol consumption) are included in the regressions where smoking status is used as an instrument. Additionally, all the models are estimated i) using the parental mortality instrument only, ii) using the smoking instrument only, and iii) using both parental mortality and smoking instruments, and the statistically significant findings do not hinge on the use of the smoking instrument.

The first stage of the 2SLS procedure is to fit the linear regression (Equation 3.2) following Bloom et al. (2006, 2007).[15] The SSP variable is regressed against the proposed instruments alongside the exogenous control variables.

$$SSP_i = \beta_0 + \beta_1 PM_i + \beta_2 MM_i + \beta_3 S_i + \beta_4 I_i + \beta_5 H_i + u_i \tag{3.2}$$

where:
SSP_i = subjective survival probability of individual i
β_0 = intercept term
PM_i = current age (or age at death) of father of individual i
MM_i = current age (or age at death) of mother of individual i
S_i = smoking status of individual i
I_i = vector of individual-level control variables
H_i = vector of household-level control variables
u_i = error term of individual i

[15] Robustness checks are carried out using Tobit models to calculate the fitted values of the instrumented SSP variable. The results remain the same. Further discussion is provided in the next section.

Depending on the specification, models are estimated using only parental mortality, only smoking status, or both instruments simultaneously. The fitted values of SSP are saved from the estimated models and used in the second-stage estimation:

$$Wealth_i = \alpha_0 + \alpha_1 FSSP_i + \alpha_2 I_i + \alpha_3 H_i + e_i \tag{3.3}$$

where:
$Wealth_i$ = wealth of individual i
α_0 = intercept term
$FSSP_i$ = fitted value of subjective survival probability
I_i = vector of individual-level control variables
H_i = vector of household-level control variables
e_i = individual error term

3.5 Results

3.5.1 2SLS first stage

The output from the first-stage regressions is presented in Table 3.6. Mother's and father's longevity both have positive and significant effects on survival beliefs, with the paternal longevity effect being stronger and more statistically significant. As expected, smoking status has a negative impact on survival beliefs. The result of the F-test of the joint significance of the instruments is reported in the last row of Table 3.6. The instrument strength is high across all the specifications, with the F-statistic ranging between 15 and 28 in the models including both genders.[16] A histogram of the fitted values obtained from the first-stage regression (Model 3 in Table 3.6) is presented in Figure 3.4.

[16]Interestingly, when the first stage regressions are estimated separately for men and women (results presented in Appendix 3.A Table 3.16, it is apparent that subjective survival beliefs are influenced more by the mortality experience of the parent of the same gender as the respondent — daughters are influenced more by their mothers than their fathers, and fathers' longevity affects the survival beliefs of the sons. This finding is in contrast with that of Hurd et al. (1998) who finds statistically significant associations only between daughters and their fathers. Smoking status is negatively associated with survival beliefs, with a larger coefficient value and higher statistical significance for women. As expected, the F statistic of the joint significance of the instruments is lower due to smaller sample size. For women, the F statistic is between 7 and 9 with the parental mortality instrument, and roughly 12 using the smoking status dummy while controlling for alcohol intake and exercise. For men, only father's mortality appears to fill the criteria of a strong instrument, with an F statistic of 18 when included on its own.

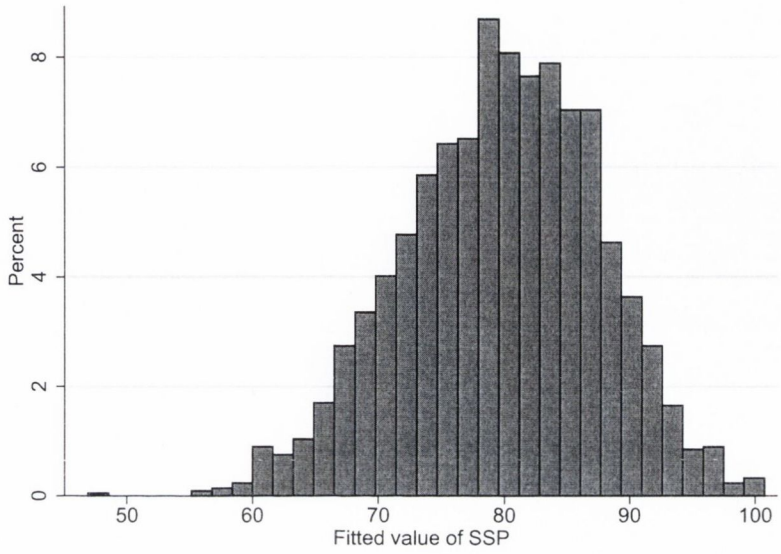
Table 3.6: First-stage results

	(1)	(2)	(3)	(4)	(5)
Mother's (death) age	0.17***		0.16***		0.18***
	(0.04)		(0.04)		(0.04)
Father's (death) age		0.22***	0.21***		0.20***
		(0.04)	(0.04)		(0.04)
Smokes now				-6.08***	-5.46***
				(1.55)	(1.55)
Female	6.87***	6.54***	6.81***	5.33***	5.63***
	(1.27)	(1.26)	(1.26)	(1.34)	(1.33)
Age	0.34**	0.36**	0.30**	0.35**	0.27
	(0.15)	(0.15)	(0.15)	(0.17)	(0.17)
Years worked	0.12**	0.10*	0.10*	0.07	0.06
	(0.05)	(0.05)	(0.05)	(0.06)	(0.06)
Number of children	0.17	0.23	0.22	-0.01	0.01
	(0.35)	(0.36)	(0.36)	(0.38)	(0.38)
Education					
Secondary	-2.38	-2.15	-2.60*	-2.58	-3.26**
	(1.50)	(1.49)	(1.48)	(1.66)	(1.64)
Third level/higher	-2.23	-2.09	-2.79*	-2.66	-3.80**
	(1.66)	(1.65)	(1.65)	(1.79)	(1.78)
Health					
Good	9.07***	9.05***	8.99***	8.14***	8.07***
	(1.69)	(1.67)	(1.67)	(1.92)	(1.89)
Very good	11.42***	11.35***	11.37***	10.99***	11.15***
	(1.72)	(1.70)	(1.71)	(1.95)	(1.91)
Excellent	18.56***	18.32***	18.34***	17.36***	17.30***
	(1.73)	(1.72)	(1.72)	(1.87)	(1.86)
Marital status					
Married	-0.17	-0.54	-0.31	-1.01	-0.84
	(1.85)	(1.88)	(1.85)	(2.02)	(2.00)
Divorced/separated	-4.54*	-5.13**	-4.74**	-5.10**	-5.02**
	(2.36)	(2.38)	(2.37)	(2.54)	(2.53)
Widowed	-0.88	-1.15	-0.92	1.01	0.96
	(2.48)	(2.49)	(2.47)	(2.82)	(2.80)
Equivalised HH income (1000s)	-0.02	-0.02	-0.02	-0.03	-0.03
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Both parents alive	6.84***	5.31***	4.78**	5.66**	3.21
	(1.93)	(1.95)	(1.95)	(2.24)	(2.24)
Weekly alcohol				-0.06	-0.06
				(0.05)	(0.05)
Weekly exercise				0.04	-0.01
				(0.28)	(0.28)
Constant	33.35***	29.92***	21.11**	51.56***	29.08***
	(8.86)	(9.06)	(9.04)	(9.55)	(9.92)
Observations	2116	2116	2116	1714	1714
R^2	0.094	0.099	0.105	0.101	0.120
Ftest	16.78	28.12	22.82	15.45	19.85

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dependent variable: Subjective survival probability of reaching age 75.
Reference categories: Education: primary/none. Health: poor/fair. Marital status: single (never married)

Figure 3.4: Histogram of fitted values of SSP



3.5.2 Effect of SSP on financial wealth

This section presents the findings from the estimation of the effect of SSP on financial wealth (excluding pension wealth) using Ordinary Least Squares (OLS) regression (which ignores the biases) and the 2SLS method. The estimates of models with net financial wealth as the dependent variable are presented in Table 3.7. The coefficient value associated with the SSP variable can be interpreted as the *ceteris paribus* change in financial wealth (in thousands of EUR) as SSP increases by one unit, i.e. by one percentage point. The models are first estimated using only financial wealth as the dependent variable in order to compare the findings to those of Bloom et al. (2006, 2007). The next section examines the effect of SSP on a comprehensive measure of wealth which includes private and occupational pensions as well as social welfare pensions.

In line with the findings of Bloom et al. (2006, 2007), the OLS estimation suggests no link between SSP and financial wealth. The IV results in Columns 2 - 6 suggest a significant positive relationship between SSP and wealth. Interpreting the coefficient in Column 2 of Table 3.7, a one percentage point increase in self-assessed probability of reaching age 75 increases financial wealth by approximately EUR 3,400 on average. As the mean value of financial wealth is EUR 87,470, the estimated corresponding percentage change in financial wealth is approximately 3.9 per cent. Depending on the instruments used, the estimated effect of the SSP variable is statistically significant at the 1 or 5 per cent levels of confidence, and the estimate value varies between 3.4 and 4.6. All of the estimated

coefficients associated with the control variables have the expected signs. Women and single individuals have lower levels of financial wealth, as do individuals with less education and lower current equivalised income and individuals whose parents are both still alive. The coefficient estimate on the SSP variable has a larger magnitude and smaller standard error in Models 3, 4 and 5 where smoking status is used as an instrument. Model 5 includes additional proxy measures for time preference, and the sample size decreases due to missing values for these variables. The Durbin-Wu-Hausman test of the consistency of the OLS estimates[17] is carried out, and the p-value (reported in "DWHtest" value for Model 1 in Table 3.7) indicates that OLS estimates are not consistent.

3.5.3 Effect of SSP on total wealth

Table 3.8 presents results of the models of Table 3.7 re-estimated using total wealth as the dependent variable. Total wealth includes net financial wealth as well as the net present values of supplementary pensions and State welfare pensions. Depending on the instruments used, the estimated effect of the SSP variable is statistically significant at the 1 or 5 per cent level of significance, and the coefficient magnitudes are larger (as expected), due to the dependent variable capturing more wealth components. The estimated coefficient value varies between 5.1 and 7.3, suggesting that a one percentage point increase in a person's self-assessed probability of reaching age 75 increases their total wealth by between EUR 5,100 and EUR 7,300 on average. As the mean value of total wealth is EUR 374,350, the estimated corresponding percentage changes in total wealth vary between 1.4 and 2.0. The Durbin-Wu-Hausman test of the consistency of the OLS estimates again indicates the non-consistency of the OLS estimate.

As discussed in the preceding section, robustness checks are carried out using Tobit models to calculate the fitted values of the instrumented SSP variable.[18] The Tobit model is used to constrain the fitted value of the SSP variable between 0 and 100, as it is a probability measure. The Tobit model estimated is censored from below at 0 and from above at 100. When using parental longevity as the instrument, the second stage estimates remain largely the same.[19]

[17] The Durbin-Wu-Hausman test of the consistency of the OLS estimates is performed by including the residuals of an auxiliary regression of the SSP variable against the parental mortality instruments and the exogenous regressors, as a function of all exogenous variables, in a regression of the original model (Equation 3.1).

[18] As Angrist and Krueger (2001) explain, the consistency of second-stage estimates does not depend on the functional form of first-stage the equations.

[19] The second-stage coefficient of the SSP variable is 3.67 in the case of the financial wealth and 5.60 in the case of total wealth, using the parental mortality instruments. The coefficient estimates are statistically significant at the 5 and 1 per cent levels of confidence, respectively.

As some of the specifications include more instruments than endogenous variables, tests of overidentifying restrictions are carried out. The Sargan chi-squared test of the null hypothesis that the instruments are valid (and therefore do not violate the exclusion restriction) is based on the assumption that at least one of the instruments is valid. The p-value associated with the Sargan chi-squared test is reported in the last row of the 2SLS estimation tables. The null hypothesis is not rejected in any of the specifications, providing evidence of the validity of the instruments.

3.5.4 Analysis by marital status

In order to compare the results to those of Hurd et al. (1998) and Bloom et al. (2006, 2007) who run their analyses separately for singles and couples. The unit of analysis in this section is the household, and therefore the sample size falls. There are 759 single households and 651 two-person households included in the analysis. The dependent variables remain the same as in the earlier models for single households, but in the case of couples, individual financial wealth is doubled (because financial wealth is only measured at the household level) and total wealth is the sum of the individual spouses' total wealth.

Modelling decision-making within a two-person household is complicated by the existence of influences from both spouses, whose characteristics such as survival beliefs, education, age and income are likely to be correlated, therefore introducing multicollinearity to models that incorporate both spouses' characteristics. A further difficulty for the identification of the effect of SSP on wealth is the increase in standard errors in both stages of the estimation caused by the smaller sample size.

When it comes to the one-person households, the second stage results are presented in Table 3.9, where the dependent variable is net financial wealth in columns 1 to 5 and total wealth in columns 6 to 10. The effect of SSP is still significant, but the significance levels are lower than the corresponding levels from the previous analysis, as expected.[20] In the case of the two-person households, in models with the characteristics of both spouses as the determinants of wealth levels, none of the coefficient estimates are statistically significant. Therefore, the models are re-estimated using only one spouse's characteristics as explanatory variables. When using the female spouse's characteristics, the effect of SSP on financial or total wealth is found to be insignificant (results omitted for brevity). When the male spouse's characteristics are used, the effect of SSP on both wealth variables is also found to be statistically insignificant in some specifications.[21] When using the parental mortality instrument, the effect of SSP on financial wealth is statistically significant at the

[20]The first stage results for single households are presented in in Table 3.14 of Appendix 3.A.
[21]See the OLS and 2SLS regression results using the husband's characteristics in Table 3.10.

Table 3.7: OLS and IV results, financial wealth

	(1) OLS	(2) IV(P)	(3) IV(S)	(4) IV(P+S)	(5) IV(P+S)
SSP (to age 75)	0.0510	3.416**	4.584***	3.960***	3.938***
	(0.160)	(1.658)	(1.497)	(1.214)	(1.510)
Female	-4.271	-26.46*	-34.15**	-30.04**	-21.97
	(8.445)	(13.76)	(14.29)	(12.30)	(14.32)
Age	1.309	-0.0206	-0.482	-0.236	-0.523
	(1.498)	(1.561)	(1.626)	(1.536)	(1.740)
Years worked	1.255***	0.860*	0.722	0.796*	0.864
	(0.406)	(0.446)	(0.503)	(0.456)	(0.535)
Number of children	-0.901	-1.520	-1.735	-1.620	-2.723
	(3.503)	(3.752)	(3.858)	(3.791)	(4.065)
Education					
Secondary	16.20*	22.63*	24.86**	23.67**	28.77*
	(9.397)	(11.76)	(12.32)	(11.84)	(14.74)
Third level/higher	76.81***	81.85***	83.60***	82.67***	90.29***
	(18.75)	(20.33)	(20.46)	(20.31)	(24.03)
Health					
Good	15.96	-14.78	-25.45	-19.75	-22.91
	(9.858)	(19.64)	(17.11)	(16.08)	(19.77)
Very good	21.00*	-17.37	-30.68	-23.57	-26.84
	(11.15)	(23.19)	(20.99)	(18.89)	(23.30)
Excellent	46.63***	-15.78	-37.43	-25.87	-37.36
	(15.80)	(35.45)	(31.51)	(27.86)	(33.70)
Marital status					
Married	23.10	24.48	24.96	24.70	33.96
	(19.96)	(21.23)	(21.85)	(21.50)	(23.78)
Divorced/separated	-22.65	-6.030	-0.263	-3.342	5.173
	(18.63)	(22.62)	(21.84)	(21.71)	(25.22)
Widowed	7.238	10.99	12.29	11.59	16.12
	(23.16)	(24.72)	(25.36)	(24.96)	(26.94)
Equivalised HH income (1000s)	0.529*	0.587**	0.607***	0.597***	0.525**
	(0.297)	(0.232)	(0.211)	(0.221)	(0.219)
Both parents alive	-20.83*	-45.88**	-54.58***	-49.93***	-43.26**
	(12.56)	(20.29)	(20.06)	(18.64)	(20.51)
Weekly alcohol					-0.00354
					(0.427)
Weekly exercise					4.846
					(2.998)
Constant	-93.58	-237.6*	-287.5**	-260.8**	-257.3*
	(91.42)	(129.1)	(121.4)	(117.8)	(146.5)
Observations	2116	2116	2116	2116	1714
R^2	0.047	.	.	.	.
DWHtest	0.0325				
ORtest		0.0105	.	0.0385	0.0108

Standard errors in parentheses

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

Dependent variable: Net Financial Wealth, EUR 1000s

Reference categories: Education: primary/none. Health: poor/fair. Marital status: single (never married)

P = Parental longevity, S = Current smoker

Table 3.8: OLS and IV results, total wealth

	(1) OLS	(2) IV(P)	(3) IV(S)	(4) IV(P+S)	(5) IV(P+S)
SSP (to age 75)	0.143	5.098**	7.299***	6.118***	6.036***
	(0.307)	(2.280)	(2.635)	(1.695)	(2.051)
Female	41.45**	8.782	-5.730	2.060	18.75
	(16.47)	(25.03)	(24.57)	(22.00)	(26.36)
Age	1.549	-0.409	-1.279	-0.812	-1.999
	(1.853)	(1.979)	(2.196)	(1.951)	(2.206)
Years worked	5.331***	4.749***	4.490***	4.629***	4.820***
	(0.640)	(0.766)	(0.771)	(0.738)	(0.913)
Number of children	-9.879**	-10.79**	-11.20**	-10.98**	-11.19**
	(4.620)	(4.897)	(5.052)	(4.945)	(5.579)
Education					
Secondary	29.63*	39.09**	43.29**	41.03**	51.25**
	(15.79)	(17.78)	(21.00)	(18.95)	(21.03)
Third level/higher	207.3***	214.7***	218.0***	216.3***	233.4***
	(26.58)	(27.90)	(29.59)	(28.49)	(32.28)
Health					
Good	31.99*	-13.28	-33.38	-22.59	-16.29
	(16.81)	(30.12)	(27.48)	(24.20)	(28.73)
Very good	37.19**	-19.31	-44.41	-30.93	-29.86
	(15.28)	(31.84)	(34.58)	(26.34)	(31.18)
Excellent	103.8***	11.91	-28.91	-7.001	-11.16
	(29.26)	(47.94)	(52.94)	(37.99)	(45.04)
Marital status					
Married	107.5***	109.5***	110.4***	109.9***	116.8***
	(31.53)	(33.41)	(34.38)	(33.81)	(39.81)
Divorced/separated	-22.50	1.976	12.85	7.013	5.381
	(31.85)	(37.65)	(35.07)	(35.47)	(43.58)
Widowed	16.86	22.38	24.84	23.52	20.04
	(36.73)	(38.41)	(38.97)	(38.56)	(46.38)
Equivalised HH income (1000s)	1.454**	1.540**	1.578***	1.558**	1.517**
	(0.726)	(0.632)	(0.594)	(0.613)	(0.691)
Both parents alive	-29.09	-65.99**	-82.38**	-73.58**	-64.51**
	(22.31)	(31.05)	(34.27)	(29.62)	(32.01)
Weekly alcohol					0.538
					(0.689)
Weekly exercise					2.967
					(4.047)
Constant	-84.59	-296.6*	-390.8**	-340.2**	-298.6*
	(111.8)	(162.0)	(176.1)	(150.5)	(180.1)
Observations	2116	2116	2116	2116	1714
R^2	0.159	0.056	.	0.010	0.013
DWHtest	0.0187				
ORtest		0.00983	.	0.0344	0.00371

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dependent variable: Net Total Wealth, EUR 1000s
Reference categories: Education: primary/none. Health: poor/fair. Marital status: single (never married)
P = Parental longevity, S = Current smoker

12 per cent level. The corresponding level of significance is 9 per cent when examining the effect on total wealth. The estimated coefficient associated with SSP in this case is 14.6, meaning that a percentage point increase in self-assessed probability of reaching age 75 increases a household's total wealth by approximately EUR 14,600. This effect corresponds to a 1.7 per cent increase at the mean value of financial wealth for two-person households.[22] The finding that the husband's characteristics are more significant than the wife's may reflect the traditional role of the male spouse as the financial head of household, especially considering the age group used in the analysis. As Smith et al. (2010) show, there is evidence that the characteristics of the financial respondent of a two-person household (the spouse that is most knowledgeable about family finances and retirement planning) may be more important in determining a family's financial outcomes. A robustness analysis was carried out using the characteristics of the financial respondent as the regressors. The results are largely unchanged. Slightly over 60 per cent of TILDA financial respondents in two-person households are male (O'Sullivan et al., 2014).

The findings differ from those of Bloom et al. (2006, 2007), who find no effect of SSP on wealth for single households. They do, however, find a significant effect of SSP for two-person households when using both spouses' characteristics as the explanatory variables. The findings of this chapter are arguably more intuitive in the sense that the effect should be easier to identify among single households where financial decisions are made by one person only. In two-person households, financial decisions may have been made before the couple became a joint household. As both spouses influence decision-making within the household, the effect of one spouse is more difficult to disentangle.

[22]The first stage results are presented in Table 3.15 in Appendix 3.A.

Table 3.9: OLS and IV results for single households

	FINANCIAL					TOTAL				
	(1) OLS	(2) IV(P)	(3) IV(S)	(4) IV(P+S)	(5) IV(P+S)	(6) OLS	(7) IV(P)	(8) IV(S)	(9) IV(P+S)	(10) IV(P+S)
SSP (to age 75)	0.16	4.35**	4.56***	4.47***	4.19**	0.57	8.33**	7.85***	7.99***	7.11***
	(0.22)	(2.21)	(1.69)	(1.42)	(1.64)	(0.54)	(3.92)	(2.91)	(2.17)	(2.58)
Female	-35.78**	-71.60**	-73.35***	-72.59***	-76.46***	14.24	-51.93	-47.86	-49.07	-34.78
	(15.31)	(28.42)	(24.36)	(23.60)	(29.06)	(34.42)	(58.06)	(37.23)	(40.64)	(57.37)
Age	0.74	-1.39	-1.49	-1.44	-0.96	3.17	-0.75	-0.51	-0.58	-2.26
	(1.60)	(2.29)	(2.12)	(2.09)	(2.50)	(2.29)	(3.24)	(3.38)	(3.08)	(3.41)
Years worked	1.71***	1.08	1.05	1.07	1.27	6.80***	5.66***	5.73***	5.71***	6.68***
	(0.56)	(0.77)	(0.70)	(0.70)	(0.78)	(0.95)	(1.43)	(1.08)	(1.15)	(1.36)
Number of children	2.64	6.19	6.36	6.29	8.12	2.13	8.69	8.29	8.41	13.18
	(3.99)	(5.15)	(5.48)	(5.25)	(5.42)	(4.65)	(7.87)	(7.68)	(7.44)	(8.26)
Education										
Secondary	10.55	5.76	5.53	5.63	15.28	39.36	30.52	31.06	30.90	47.07
	(15.47)	(18.70)	(18.63)	(18.59)	(22.80)	(24.03)	(30.40)	(28.19)	(28.84)	(34.84)
Third level/higher	44.30**	40.38*	40.19*	40.28*	45.63	194.31***	187.07***	187.52***	187.39***	196.51***
	(21.55)	(23.67)	(24.02)	(23.85)	(29.42)	(30.87)	(36.20)	(35.98)	(35.93)	(39.68)
Health										
Good	26.17**	-29.68	-32.41	-31.22	-28.54	59.66*	-43.50	-37.16	-39.05	-0.37
	(12.18)	(32.97)	(26.66)	(23.84)	(31.90)	(30.86)	(70.15)	(45.91)	(45.08)	(62.73)
Very good	48.30***	-6.46	-9.13	-7.96	-0.19	67.07***	-34.08	-27.85	-29.71	17.20
	(15.27)	(34.65)	(27.96)	(25.81)	(32.70)	(24.06)	(58.86)	(48.78)	(41.28)	(47.35)
Excellent	73.37**	-12.39	-16.57	-14.75	-28.66	88.81**	-69.62	-59.87	-62.78	-39.65
	(28.69)	(52.77)	(42.39)	(38.64)	(43.91)	(35.56)	(85.51)	(70.60)	(56.76)	(61.84)
Divorced/separated	-22.20	-11.13	-10.58	-10.82	-5.07	-44.98	-24.53	-25.78	-25.41	-35.57
	(19.67)	(24.46)	(22.30)	(22.87)	(23.88)	(33.77)	(43.41)	(36.18)	(38.36)	(47.08)
Widowed	8.88	4.76	4.56	4.64	2.75	-8.29	-15.90	-15.43	-15.57	-34.30
	(25.56)	(28.70)	(29.77)	(29.33)	(29.78)	(38.86)	(43.85)	(45.38)	(44.71)	(53.69)
Equivalised HH income (1000s)	0.11	0.27**	0.28**	0.28**	0.23*	0.70	1.00**	0.98**	0.99**	0.88**
	(0.12)	(0.13)	(0.13)	(0.12)	(0.12)	(0.54)	(0.43)	(0.48)	(0.45)	(0.41)
Both parents alive	-10.25	-47.26	-49.07*	-48.28*	-49.99*	9.49	-58.88	-54.67	-55.93	-53.20
	(15.98)	(30.31)	(28.55)	(26.97)	(29.20)	(34.98)	(53.94)	(50.29)	(46.70)	(52.19)
Weekly alcohol					-0.38					0.34
					(0.48)					(0.93)
Weekly exercise					4.62					-0.71
					(5.13)					(6.76)
Constant	-68.45	-201.50	-207.99*	-205.15*	-225.78	-248.33*	-494.09**	-478.97**	-483.49***	-392.92**
	(92.80)	(122.37)	(121.56)	(115.21)	(138.43)	(137.47)	(220.89)	(187.08)	(183.24)	(199.44)
Observations	759	759	759	759	569	759	759	759	759	569
R^2	0.061	.	.	.	.	0.155	.	.	.	.
ORtest		0.30	.	0.52	0.41		0.24	.	0.33	0.18

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dependent variable: Net Financial Wealth in Columns 1-6, Net Total Wealth in Columns 7-12 (EUR 1000s)
Reference categories: Education: primary/none. Health: poor/fair. Marital status: single (never married)
P = Parental longevity, S = Current smoker

Table 3.10: OLS and IV results for two-person households, using husband's characteristics

	FINANCIAL					TOTAL				
	(1) OLS	(2) IV(P)	(3) IV(S)	(4) IV(P+S)	(5) IV(P+S)	(6) OLS	(7) IV(P)	(8) IV(S)	(9) IV(P+S)	(10) IV(P+S)
Husband's subjective P(75)	-0.86	9.97	15.58	10.89*	11.81	-2.07	14.59*	12.48	14.21*	15.28*
	(0.76)	(6.45)	(11.87)	(6.03)	(7.41)	(1.33)	(8.67)	(14.72)	(7.91)	(9.26)
Age	-6.02	-7.22	-7.85	-7.33	-9.78	-8.25	-10.10	-9.87	-10.06	-7.16
	(5.24)	(5.95)	(7.23)	(6.13)	(7.29)	(6.59)	(7.95)	(7.54)	(7.84)	(9.86)
Years worked	8.26***	3.96	1.73	3.59	4.69	13.76***	7.14	7.98	7.30	4.89
	(2.26)	(3.99)	(6.05)	(3.95)	(5.01)	(3.25)	(5.93)	(7.50)	(5.74)	(7.65)
Education										
Secondary	-21.48	27.04	52.20	31.16	43.93	-9.36	65.28	55.83	63.56	87.76
	(37.00)	(59.73)	(81.70)	(59.75)	(67.94)	(54.30)	(83.54)	(105.65)	(83.39)	(87.68)
Third level/higher	169.89**	234.45**	267.93**	239.94**	241.55**	403.41***	502.73***	490.16***	500.44***	453.01***
	(75.15)	(100.78)	(116.20)	(99.01)	(117.35)	(99.57)	(122.49)	(148.69)	(122.20)	(138.88)
Health										
Good	-59.56	-110.73*	-137.26	-115.08*	-126.97*	-11.15	-89.86	-79.90	-88.04	-99.14
	(41.91)	(63.51)	(84.80)	(63.71)	(70.71)	(51.50)	(80.16)	(96.40)	(77.93)	(84.51)
Very good	-23.34	-109.09	-153.55	-116.37*	-151.92*	44.15	-87.76	-71.06	-84.71	-164.65
	(49.46)	(69.79)	(117.69)	(70.29)	(81.38)	(62.37)	(92.55)	(145.51)	(91.57)	(102.76)
Excellent	2.36	-173.84	-265.22	-188.82	-223.00	200.16*	-70.92	-36.61	-64.66	-111.96
	(58.12)	(130.22)	(207.14)	(124.63)	(144.82)	(109.82)	(162.51)	(255.97)	(152.82)	(171.95)
Equivalised HH income (1000s)	2.70***	2.57***	2.51***	2.56***	4.57***	6.00***	5.80**	5.82**	5.80**	13.74***
	(0.61)	(0.69)	(0.75)	(0.70)	(1.60)	(2.30)	(2.39)	(2.39)	(2.39)	(3.04)
Both parents alive	-113.85**	-213.80**	-265.64**	-222.30***	-224.69**	-143.01**	-296.78**	-277.31*	-293.23***	-254.06**
	(47.17)	(86.52)	(126.44)	(83.70)	(93.59)	(62.29)	(116.41)	(152.88)	(109.91)	(117.70)
Number of children	-1.63	-2.18	-2.47	-2.23	-7.15	-24.53	-25.38	-25.27	-25.36	-28.14
	(10.93)	(12.56)	(14.35)	(12.81)	(14.49)	(15.05)	(16.86)	(16.26)	(16.75)	(19.36)
Husband exercise					10.24					5.80
					(9.24)					(12.25)
Husband alcohol					-0.87					-0.37
					(1.43)					(2.18)
Constant	252.30	-329.01	-630.47	-378.41	-385.61	764.58**	-129.71	-16.50	-109.06	-426.70
	(313.34)	(559.54)	(810.45)	(548.39)	(664.61)	(347.42)	(682.06)	(960.55)	(662.13)	(785.29)
Observations	651	651	651	651	549	651	651	651	651	549
R^2	0.063	.	.	.	.	0.156	.	.	.	.
ORtest		0.32	.	0.61	0.38		0.24	.	0.50	0.23

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dependent variable: Net Financial Wealth in Columns 1-6, Net Total Wealth in Columns 7-12 (EUR 1000s)
Reference categories: Education: primary/none. Health: poor/fair.
P = Parental longevity, S = Current smoker

3.5.5 Robustness analysis

Exclusion of Defined Benefit and social welfare pensions

A possible issue with including annuity wealth, held in Defined Benefit pensions and social welfare pensions, in the wealth variable is that, by definition, the current value of an annuity payment is a function of life expectancy. Therefore, there exists a computational relationship between wealth and life expectancy. For example, the net present value of a social welfare payment is calculated as the sum of the income payments received by the individual over their estimated remaining lifetime, discounted to present time. The SSP measure is not equivalent to an actuarial cohort level life expectancy estimate, but the two are potentially highly correlated. In order to test if the association between SSP and total wealth is caused or strengthened by this structural link, the models are re-estimated using only net financial wealth and defined contribution pensions in the wealth variable. The results of this estimation are presented in Table 3.11. Depending on specification, the estimated SSP coefficient is statistically significant at the 1 or 10 per cent significance level, and the estimate value varies between 3.3 and 6.2. Therefore, the findings presented here appear not to be driven by the computational relationship between wealth and life expectancy.[23]

Exclusion of early orphans

As discussed in Section 3.4, the exclusion restriction of the parental mortality instrument might be violated in the case of an early death of a parent influencing the child's wealth directly through their choices when it comes to education and work. Therefore, the models are re-run only using the observations on individuals whose parents died after the age of 50. The results are presented in Table 3.12. The estimates are very close to the initial estimates with the early orphans included, therefore providing evidence that the link between SSP and wealth is not driven by the correlation between parental mortality and the child's later life wealth that might arise from losing a parent early in life.

Exclusion of focal responses

The main specifications (presented in Section 3.5.2) are re-estimated excluding the focal responses, i.e individuals whose SSP variable takes on value of 0, 50 or 100. This robustness

[23]The null hypothesis of valid instruments in the Sargan chi-squared test is not rejected in any of the specifications.

analysis is carried out to establish whether there is something unique about the focal responses that is driving the results. The results are presented in Table 3.13. The estimate of the coefficient on SSP is now larger in magnitude, and the statistical significance is broadly unchanged despite the reduction in sample size. The findings suggest that the SSP on wealth is heterogeneous across the focal and non-focal response groups, but the significant result is not driven by the focal respondents.

Table 3.11: OLS and IV results, excluding Defined Benefit and social welfare pensions

	(1) OLS	(2) IV(P)	(3) IV(S)	(4) IV(P+S)	(5) IV(P+S)
SSP (to age 75)	-0.141	3.297*	6.209***	4.619***	4.533***
	(0.278)	(1.869)	(1.883)	(1.354)	(1.656)
Female	-1.654	-24.32	-43.51**	-33.03*	-22.64
	(14.94)	(21.94)	(19.78)	(19.24)	(23.72)
Age	1.217	-0.141	-1.292	-0.664	-1.057
	(1.608)	(1.643)	(1.900)	(1.671)	(1.895)
Years worked	1.492***	1.088	0.746	0.933	1.035
	(0.575)	(0.664)	(0.684)	(0.651)	(0.804)
Number of children	-2.316	-2.949	-3.484	-3.192	-4.278
	(4.137)	(4.396)	(4.691)	(4.498)	(5.039)
Education					
Secondary	26.08**	32.64**	38.20**	35.16**	41.17**
	(10.75)	(12.80)	(15.59)	(13.74)	(17.01)
Third level/higher	91.24***	96.39***	100.8***	98.37***	106.3***
	(20.64)	(22.13)	(23.31)	(22.45)	(26.22)
Health					
Good	27.06**	-4.340	-30.94	-16.42	-17.08
	(13.69)	(24.39)	(21.15)	(19.73)	(24.10)
Very good	26.22**	-12.98	-46.18*	-28.05	-28.71
	(12.02)	(25.51)	(26.20)	(21.03)	(25.91)
Excellent	71.50***	7.757	-46.24	-16.76	-23.02
	(27.61)	(39.07)	(41.60)	(31.87)	(38.44)
Marital status					
Married	24.84	26.25	27.44	26.79	33.35
	(28.86)	(30.18)	(31.61)	(30.72)	(36.96)
Divorced/separated	-29.13	-12.15	2.235	-5.618	-1.462
	(28.33)	(33.68)	(31.52)	(32.04)	(40.04)
Widowed	5.695	9.526	12.77	11.00	9.003
	(33.09)	(34.62)	(35.92)	(35.02)	(41.89)
Equivalised HH income (1000s)	0.852*	0.912**	0.962***	0.935**	0.862**
	(0.476)	(0.412)	(0.367)	(0.389)	(0.420)
Both parents alive	-32.66**	-58.25**	-79.93***	-68.10***	-60.99***
	(14.31)	(22.64)	(25.34)	(21.62)	(23.17)
Weekly alcohol					0.286
					(0.575)
Weekly exercise					4.234
					(3.488)
Constant	-83.74	-230.8	-355.4***	-287.4**	-275.3*
	(98.13)	(140.4)	(136.8)	(126.7)	(155.6)
Observations	2116	2116	2116	2116	1714
R^2	0.049	.	.	.	.
ORtest		0.0211	.	0.0571	0.0197

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dependent variable: net financial wealth + supplementary Defined Contribution pension wealth, EUR 1000s.

Reference categories: Education: primary/none. Health: poor/fair. Marital status: single (never married)

P = Parental longevity, S = Current smoker

Table 3.12: OLS and IV results, excluding early orphans

	FINANCIAL					TOTAL				
	(1) OLS	(2) IV(P)	(3) IV(S)	(4) IV(P+S)	(5) IV(P+S)	(6) OLS	(7) IV(P)	(8) IV(S)	(9) IV(P+S)	(10) IV(P+S)
SSP (to age 75)	0.139	3.354**	4.761***	4.031***	4.606***	0.230	4.734**	7.047***	5.848***	6.360***
	(0.164)	(1.625)	(1.461)	(1.145)	(1.409)	(0.323)	(2.172)	(2.533)	(1.576)	(1.866)
Female	-3.368	-24.66*	-33.97**	-29.14**	-25.51	42.60**	12.78	-2.532	5.405	16.48
	(9.533)	(14.30)	(15.27)	(13.06)	(15.91)	(18.13)	(26.24)	(25.25)	(23.18)	(28.26)
Age	1.767	0.225	-0.449	-0.0994	-0.462	1.699	-0.461	-1.570	-0.995	-2.264
	(1.588)	(1.734)	(1.747)	(1.662)	(1.875)	(1.942)	(2.116)	(2.330)	(2.048)	(2.331)
Years worked	1.304***	0.962**	0.812	0.890*	0.896	5.433***	4.953***	4.706***	4.834***	4.984***
	(0.450)	(0.478)	(0.549)	(0.498)	(0.605)	(0.701)	(0.807)	(0.816)	(0.789)	(1.007)
Number of children	-1.507	-1.720	-1.813	-1.765	-3.464	-11.13**	-11.43**	-11.58**	-11.50**	-12.87**
	(3.431)	(3.668)	(3.869)	(3.756)	(4.027)	(4.595)	(4.798)	(5.068)	(4.911)	(5.579)
Education										
Secondary	16.44	23.45*	26.52**	24.93*	32.41*	30.03*	39.86**	44.91**	42.29**	55.20**
	(10.07)	(12.69)	(13.44)	(12.83)	(16.67)	(17.07)	(19.13)	(22.80)	(20.47)	(23.13)
Third level/higher	75.56***	80.14***	82.15***	81.11***	87.76***	209.0***	215.4***	218.7***	217.0***	232.1***
	(19.65)	(21.28)	(21.62)	(21.37)	(25.52)	(27.88)	(29.21)	(31.05)	(29.90)	(33.65)
Health										
Good	13.03	-16.61	-29.58*	-22.85	-30.89	26.39	-15.13	-36.46	-25.40	-26.07
	(10.25)	(19.45)	(17.04)	(15.68)	(19.26)	(17.50)	(29.59)	(26.60)	(23.36)	(27.42)
Very good	23.30*	-14.98	-31.74	-23.04	-33.30	41.61**	-12.02	-39.56	-25.29	-32.42
	(12.12)	(24.50)	(22.40)	(19.87)	(23.94)	(16.33)	(32.09)	(35.58)	(26.54)	(30.52)
Excellent	46.30***	-13.78	-40.07	-26.43	-47.66	106.2***	22.07	-21.15	1.248	-13.32
	(16.92)	(35.98)	(31.33)	(27.63)	(32.15)	(31.55)	(48.41)	(52.46)	(38.10)	(42.76)
Marital status										
Married	22.20	23.32	23.81	23.55	36.82	106.9***	108.5***	109.3***	108.9***	121.8***
	(21.08)	(22.33)	(23.18)	(22.70)	(25.51)	(33.46)	(35.16)	(36.26)	(35.63)	(42.28)
Divorced/separated	-20.92	-3.119	4.671	0.629	17.02	-21.92	3.016	15.82	9.187	20.60
	(19.79)	(24.24)	(23.30)	(23.13)	(27.37)	(33.63)	(40.19)	(36.35)	(37.32)	(46.07)
Widowed	7.346	10.01	11.17	10.57	16.64	17.93	21.66	23.57	22.58	23.29
	(24.45)	(25.81)	(26.74)	(26.19)	(28.15)	(38.59)	(39.61)	(40.25)	(39.82)	(47.73)
Equivalised HH income (1000s)	0.512*	0.580**	0.610***	0.595***	0.540**	1.399**	1.494**	1.543***	1.518**	1.491**
	(0.293)	(0.235)	(0.212)	(0.222)	(0.213)	(0.709)	(0.631)	(0.593)	(0.611)	(0.680)
Both parents alive	-21.38	-45.76**	-56.43***	-50.89***	-46.05**	-32.51	-66.66**	-84.20**	-75.11***	-68.89**
	(13.08)	(20.22)	(20.18)	(18.52)	(20.95)	(22.79)	(30.45)	(33.63)	(29.00)	(31.95)
Weekly alcohol					-0.181					0.196
					(0.446)					(0.682)
Weekly exercise					4.244					2.913
					(3.238)					(4.269)
Constant	-124.2	-249.1**	-303.7**	-275.4**	-308.0**	-96.61	-271.6*	-361.4**	-314.8**	-307.7*
	(96.74)	(125.3)	(122.2)	(117.1)	(149.1)	(116.3)	(156.1)	(171.4)	(148.4)	(180.4)
Observations	1938	1938	1938	1938	1574	1938	1938	1938	1938	1574
R^2	0.045	.	.	.	.	0.156	0.074	.	0.028	0.002
ORtest		0.00711	.	0.0263	0.0290		0.00455	.	0.0162	0.00598

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dependent variable: Net Financial Wealth (Models 1-5), Net Total Wealth (Models 6-10), EUR 1000s. *Reference categories*: Education: primary/none. Health: poor/fair. Marital status: single (never married). P = Parental longevity, S = Current smoker

Table 3.13: OLS and IV results, excluding focal responses

	FINANCIAL					TOTAL				
	(1) OLS	(2) IV(P)	(3) IV(S)	(4) IV(P+S)	(5) IV(P+S)	(6) OLS	(7) IV(P)	(8) IV(S)	(9) IV(P+S)	(10) IV(P+S)
SSP (to age 75)	0.0176	10.49**	10.30**	10.53***	9.537***	0.305	12.02**	10.93**	11.71***	11.34***
	(0.317)	(4.716)	(4.122)	(3.311)	(3.259)	(0.449)	(5.544)	(5.185)	(4.042)	(3.988)
Female	-7.335	-16.68	-16.51	-16.71	8.033	36.24*	25.79	26.77	26.07	59.16*
	(17.70)	(24.24)	(23.45)	(23.81)	(27.70)	(20.83)	(27.83)	(26.70)	(27.25)	(31.31)
Age	1.725	-1.379	-1.324	-1.390	-1.387	1.235	-2.238	-1.915	-2.145	-2.641
	(2.135)	(2.812)	(3.054)	(2.826)	(2.973)	(2.581)	(3.353)	(3.475)	(3.282)	(3.690)
Years worked	0.890	0.550	0.556	0.548	0.817	3.933***	3.552***	3.588***	3.562***	3.682***
	(0.656)	(0.973)	(0.929)	(0.952)	(1.038)	(0.876)	(1.212)	(1.127)	(1.173)	(1.393)
Number of children	-2.544	4.357	4.235	4.382	0.826	-10.65	-2.923	-3.642	-3.132	-5.525
	(5.337)	(7.737)	(7.156)	(7.219)	(7.507)	(6.809)	(9.085)	(8.603)	(8.565)	(9.540)
Education										
Secondary	23.93	36.66	36.43	36.70	37.49	28.62	42.86	41.53	42.47	44.01
	(15.57)	(25.85)	(24.73)	(25.22)	(26.88)	(21.07)	(31.12)	(29.59)	(30.30)	(35.36)
Third level/higher	86.52***	113.9***	113.4***	114.0***	119.2***	214.0***	244.6***	241.8***	243.8***	262.4***
	(24.63)	(37.07)	(34.11)	(34.95)	(39.39)	(33.25)	(46.31)	(43.59)	(44.28)	(51.51)
Health										
Good	0.135	-86.91*	-85.37**	-87.23**	-99.40**	4.535	-92.87*	-83.80*	-90.24**	-104.6**
	(16.58)	(46.96)	(42.45)	(37.57)	(42.02)	(22.09)	(54.45)	(50.46)	(43.83)	(49.65)
Very good	5.953	-94.41*	-92.64*	-94.77**	-105.4**	2.424	-109.9*	-99.42*	-106.9**	-121.9**
	(18.07)	(50.23)	(47.65)	(40.14)	(44.22)	(22.06)	(59.38)	(56.37)	(47.34)	(53.08)
Excellent	34.97	-116.0	-113.3*	-116.5**	-120.7*	93.23**	-75.70	-59.96	-71.13	-86.36
	(27.64)	(75.93)	(67.97)	(58.36)	(61.80)	(40.55)	(92.74)	(83.96)	(72.51)	(77.95)
Marital status										
Married	31.36	22.09	22.26	22.06	39.54	147.7***	137.4***	138.3***	137.6***	159.6***
	(31.35)	(37.65)	(37.30)	(37.53)	(39.69)	(37.72)	(44.43)	(43.47)	(44.05)	(49.75)
Divorced/separated	-18.08	34.71	33.78	34.90	42.61	-0.501	58.57	53.07	56.97	63.45
	(28.99)	(47.40)	(46.34)	(44.71)	(46.74)	(35.56)	(55.86)	(52.05)	(51.28)	(57.00)
Widowed	6.043	51.77	50.96	51.94	69.50	19.34	70.51	65.75	69.13	82.25
	(31.74)	(50.36)	(50.67)	(49.23)	(52.04)	(40.86)	(60.19)	(58.30)	(57.86)	(65.38)
Equivalised HH income (1000s)	0.622	0.314	0.320	0.313	0.292	2.320**	1.976**	2.008**	1.985**	1.917*
	(0.424)	(0.454)	(0.463)	(0.451)	(0.439)	(0.929)	(0.926)	(0.945)	(0.931)	(0.979)
Both parents alive	-18.81	-105.1**	-103.5**	-105.4**	-102.3**	-43.25	-139.8**	-130.8**	-137.2**	-138.8**
	(21.28)	(52.64)	(50.24)	(45.60)	(48.48)	(29.87)	(64.50)	(61.07)	(56.01)	(62.63)
Weekly alcohol					1.393					1.489
					(1.140)					(1.384)
Weekly exercise					13.19**					15.58**
					(5.382)					(6.605)
Constant	-95.81	-620.7*	-611.4**	-622.6**	-597.3**	-55.78	-643.1*	-588.4*	-627.3**	-623.9*
	(133.1)	(317.9)	(263.9)	(252.0)	(276.4)	(158.6)	(370.0)	(329.3)	(302.2)	(330.1)
Observations	992	992	992	992	806	992	992	992	992	806
R^2	0.042	.	.	.	.	0.191	.	.	.	.
ORtest		0.231	.	0.493	0.183		0.0688	.	0.192	0.0641

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dependent variable: Net Financial Wealth (Models 1-5), Net Total Wealth (Models 6-10), EUR 1000s. *Reference categories*: Education: primary/none. Health: poor/fair. Marital status: single (never married). P = Parental longevity, S = Current smoker

3.6 Conclusion

This chapter examines whether higher subjective survival probability — a proxy measure of self-assessed life expectancy — leads to higher levels of wealth holdings among the pre-retirement older population. A comprehensive measure of wealth, including wealth held in State welfare pensions and supplementary pensions is used as the dependent variable. Parental mortality and smoking status are used as instruments for subjective survival probability to address the issues of reverse causality, measurement error and focal points in subjective survival probability responses.

A narrow definition of wealth and the issue of reverse causality between survival beliefs and wealth are the two major issues in the existing studies in this area. This research contributes to the literature by addressing both issues simultaneously. The findings presented in this chapter contribute to the existing body of literature that has found evidence of a causal link between survival beliefs and saving behaviour. The OLS estimation suggests no link between SSP and financial wealth. However, the IV estimates show a positive and statistically significant effect of subjective survival beliefs on the level of wealth — a 1 percentage point increase in self-assessed probability of reaching age 75 increases an individual's financial wealth by approximately EUR 3,400. This effect corresponds to a 3.9 per cent increase at the mean value of financial wealth.

Depending on the instrument used, the IV estimates show a positive and statistically significant effect of SSP total wealth. The estimated coefficient value varies between 5.1 and 7.3, suggesting that a one percentage point increase in SSP leads to an increase total wealth of EUR 5,100 to EUR 7,300 on average, corresponding to a 1.4 to 2.0 per cent increase in total wealth at the mean. The results are robust to a Tobit model specification in the first stage of the 2SLS, to the exclusion of annuity wealth held in defined benefit and social welfare pension wealth, to the exclusion of individuals who were orphaned relatively early, and to the exclusion of individuals with focal-point values for the SSP variable. When the analysis is carried out at the household level and the models are estimated separately for singles and couples, the results remain relatively constant for singles but the coefficient significance decreases for couples, possibly due to smaller sample sizes and to the difficulty of modelling both spouses' influences in the process.

People's lives are longer than ever before, with rapid declines in mortality rates the in the past few decades. Many pension systems incentivise retirement at certain ages, and healthy life expectancy is not increasing at the same rate as overall life expectancy. These facts suggest that delaying retirement by long enough to fill the savings gap may not be a solution to retirement funding issues. These developments have consequences for social security systems, insurance providers, employers and policy makers alike. Whether

people are aware of declines in mortality rates, and whether they adjust their survival expectations accordingly, is important in saving decision-making. The findings of this research are relevant when it comes to the design of pension systems that increase the responsibility of the individual when making retirement provisions. For an optimal outcome in systems with an emphasis on the personal responsibility for pension saving, it is necessary that individuals make informed decisions based on realistic expectations about risks, with mortality risk being a crucial factor. From that point of view, it is of interest to policy-makers to find that individuals appear to adjust their saving behaviour in response to differential mortality.

Appendix to Chapter 3

3.A Supplementary tables

Table 3.14: First-stage results for single households

	(1)	(2)	(3)	(4)	(5)
Mother's (death) age	0.105		0.102		0.156**
	(0.0694)		(0.0691)		(0.0770)
Father's (death) age		0.206***	0.204***		0.242***
		(0.0751)	(0.0752)		(0.0796)
Smokes now				-5.596**	-5.240**
				(2.385)	(2.384)
Age	0.563**	0.566**	0.529**	0.619**	0.539**
	(0.253)	(0.250)	(0.252)	(0.268)	(0.260)
Years worked	0.0243	-0.00558	-0.000880	-0.0326	-0.0621
	(0.0918)	(0.0932)	(0.0932)	(0.100)	(0.0990)
Number of children	-0.724	-0.664	-0.666	-1.321*	-1.293*
	(0.667)	(0.659)	(0.658)	(0.758)	(0.752)
Education					
Secondary	1.501	1.402	1.057	0.725	-0.631
	(2.426)	(2.441)	(2.420)	(2.732)	(2.693)
Third level/higher	2.257	2.334	1.777	1.438	-0.139
	(2.753)	(2.713)	(2.737)	(3.063)	(3.002)
Health					
Good	13.95***	13.84***	13.80***	14.13***	13.73***
	(2.653)	(2.622)	(2.622)	(3.123)	(3.110)
Very good	13.41***	13.40***	13.44***	13.71***	13.91***
	(2.688)	(2.643)	(2.645)	(3.150)	(3.055)
Excellent	21.79***	21.43***	21.37***	21.38***	20.50***
	(2.683)	(2.660)	(2.669)	(3.095)	(3.129)
Marital status					
Divorced/separated	-1.209	-1.748	-1.461	-1.024	-0.949
	(2.807)	(2.785)	(2.802)	(3.001)	(3.034)
Widowed	2.995	2.697	2.891	5.769*	5.735*
	(2.969)	(2.967)	(2.955)	(3.382)	(3.367)
Equivalised HH income (1000s)	-0.0379*	-0.0386*	-0.0391*	-0.0409**	-0.0433**
	(0.0211)	(0.0210)	(0.0209)	(0.0178)	(0.0176)
Both parents alive	8.898***	7.356**	7.050**	8.008**	5.511
	(3.129)	(3.116)	(3.137)	(3.511)	(3.498)
Weekly alcohol				-0.0744	-0.0855
				(0.0587)	(0.0592)
Weekly exercise				0.0151	0.0676
				(0.461)	(0.459)
Constant	26.36*	20.48	14.87	36.76**	13.64
	(14.63)	(15.19)	(15.53)	(15.75)	(17.64)
Observations	759	759	759	569	569
R^2	0.115	0.121	0.123	0.154	0.173
Ftest	2.296	7.504	5.197	5.508	6.814

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dependent variable: Subjective survival probability of reaching age 75.
Reference categories: Education: primary/none. Health: poor/fair. Marital status: single (never married)

Table 3.15: First-stage results for two-person households, using the husband's characteristics only

	(1)	(2)	(3)	(4)	(5)
Husband's father's age	0.281***	0.269***		0.259***	0.216***
	(0.0762)	(0.0768)		(0.0754)	(0.0721)
Husband's mother's age		0.129*		0.126	0.129
		(0.0770)		(0.0771)	(0.0836)
Husband smokes			-4.499*	-3.721	-4.187
			(2.571)	(2.508)	(2.939)
Age	0.115	0.0739	0.0929	0.0596	0.127
	(0.336)	(0.339)	(0.336)	(0.333)	(0.403)
Years worked	0.345	0.339	0.371*	0.320	0.219
	(0.214)	(0.214)	(0.215)	(0.211)	(0.276)
Education					
Secondary	-4.457*	-4.511*	-4.980**	-4.924**	-4.547*
	(2.332)	(2.336)	(2.300)	(2.294)	(2.471)
Third level/higher	-6.589**	-6.736**	-6.823**	-7.421***	-7.240**
	(2.641)	(2.647)	(2.642)	(2.606)	(3.016)
Health					
Good	4.984*	4.828*	4.496	4.633*	3.502
	(2.785)	(2.786)	(2.822)	(2.774)	(3.006)
Very good	7.900***	7.862***	7.633***	7.627***	7.862**
	(2.809)	(2.806)	(2.825)	(2.783)	(3.152)
Excellent	16.38***	16.41***	15.65***	15.89***	15.42***
	(2.815)	(2.821)	(2.808)	(2.789)	(3.119)
Equivalised HH income (1000s)	0.0160	0.0129	0.00974	0.0109	-0.0396
	(0.0196)	(0.0199)	(0.0194)	(0.0202)	(0.0584)
Both parents alive	6.117**	5.524*	8.853***	5.340*	3.906
	(3.010)	(3.023)	(2.917)	(3.027)	(3.611)
Number of children	0.0558	0.0795	0.0760	0.0993	-0.0306
	(0.556)	(0.553)	(0.551)	(0.544)	(0.555)
Husband exercise					-0.108
					(0.413)
Husband alcohol					-0.0360
					(0.0689)
Constant	34.79**	28.39*	57.34***	32.26**	37.99**
	(16.15)	(15.87)	(15.37)	(15.44)	(16.74)
Observations	651	651	651	651	549
R^2	0.106	0.111	0.090	0.115	0.104
Ftest	13.59	8.924	3.063	6.337	5.562

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dependent variable: Husband's subjective survival probability of reaching age 75.
Reference categories: Education: primary/none. Health: poor/fair.

Table 3.16: First-stage results, by gender

	Females					Males				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Mother's (death) age	0.18***		0.19***		0.21***	0.14**		0.12**		0.13*
	(0.06)		(0.06)		(0.06)	(0.06)		(0.06)		(0.07)
Father's (death) age		0.16***	0.17***		0.13**		0.26***	0.25***		0.26***
		(0.06)	(0.06)		(0.06)		(0.06)	(0.06)		(0.06)
Smokes now				-8.08***	-7.49***				-3.55	-2.76
				(2.01)	(2.01)				(2.26)	(2.24)
Age	0.34*	0.34	0.30	0.25	0.20	0.16	0.22	0.17	0.27	0.21
	(0.21)	(0.21)	(0.21)	(0.22)	(0.22)	(0.25)	(0.25)	(0.25)	(0.28)	(0.28)
Years worked	0.03	0.02	0.02	0.02	0.02	0.31**	0.26*	0.26*	0.20	0.16
	(0.06)	(0.06)	(0.06)	(0.07)	(0.07)	(0.14)	(0.14)	(0.14)	(0.16)	(0.16)
Number of children	0.28	0.41	0.33	0.05	-0.03	-0.01	0.01	0.03	-0.13	-0.07
	(0.49)	(0.48)	(0.48)	(0.56)	(0.55)	(0.50)	(0.50)	(0.50)	(0.52)	(0.52)
Education										
Secondary	-2.51	-1.66	-2.77	-3.12	-4.35*	-1.76	-1.86	-1.96	-1.96	-2.53
	(2.14)	(2.12)	(2.12)	(2.32)	(2.33)	(1.99)	(1.96)	(1.96)	(2.18)	(2.15)
Third level/higher	0.57	1.35	-0.05	-0.83	-2.68	-4.33*	-4.54*	-4.81**	-4.29	-5.02*
	(2.28)	(2.23)	(2.29)	(2.42)	(2.47)	(2.44)	(2.41)	(2.41)	(2.62)	(2.60)
Health										
Good	9.35***	9.00***	9.19***	8.18***	8.23***	8.03***	8.31***	8.14***	7.51***	7.60***
	(2.37)	(2.37)	(2.36)	(2.78)	(2.75)	(2.29)	(2.26)	(2.26)	(2.55)	(2.50)
Very good	10.72***	10.34***	10.66***	11.13***	11.55***	11.34***	11.50***	11.37***	10.37***	10.63***
	(2.37)	(2.35)	(2.35)	(2.69)	(2.66)	(2.33)	(2.28)	(2.29)	(2.71)	(2.65)
Excellent	15.87***	15.08***	15.59***	15.45***	15.81***	20.87***	21.04***	20.85***	19.39***	19.37***
	(2.46)	(2.47)	(2.46)	(2.76)	(2.73)	(2.36)	(2.34)	(2.35)	(2.61)	(2.60)
Marital status										
Married	-0.98	-1.74	-1.14	-0.99	-0.35	-0.19	-0.25	-0.22	-1.03	-1.10
	(2.64)	(2.63)	(2.61)	(2.76)	(2.69)	(2.53)	(2.54)	(2.52)	(2.84)	(2.83)
Divorced/separated	-3.21	-4.16	-3.35	-1.45	-0.67	-7.08**	-7.39**	-7.32**	-10.44**	-11.07***
	(3.16)	(3.15)	(3.16)	(3.08)	(3.05)	(3.39)	(3.36)	(3.36)	(4.15)	(4.09)
Widowed	-1.44	-2.01	-1.50	2.09	2.55	-1.13	-1.18	-1.01	-0.57	-0.85
	(3.17)	(3.17)	(3.15)	(3.65)	(3.57)	(4.41)	(4.40)	(4.41)	(5.29)	(5.24)
Equivalised HH income (1000s)	0.02	0.02	0.01	0.02	0.02	-0.04*	-0.03	-0.04	-0.05***	-0.05***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)
Both parents alive	4.37*	3.39	2.83	4.26	2.54	9.93***	7.78***	7.37**	8.06**	5.05
	(2.64)	(2.67)	(2.68)	(2.93)	(2.95)	(2.89)	(2.90)	(2.91)	(3.54)	(3.58)
Weekly alcohol				-0.21**	-0.20*				-0.04	-0.04
				(0.10)	(0.10)				(0.05)	(0.05)
Weekly exercise				-0.10	-0.08				0.00	-0.07
				(0.47)	(0.47)				(0.35)	(0.35)
Constant	40.03***	43.06***	30.81**	63.42***	41.26***	39.52***	29.51**	24.19*	52.28***	28.54*
	(12.60)	(12.40)	(12.89)	(12.76)	(13.45)	(12.96)	(13.51)	(13.49)	(14.18)	(14.71)
Observations	1120	1120	1120	911	911	996	996	996	803	803
R^2	0.069	0.067	0.076	0.092	0.109	0.115	0.127	0.130	0.116	0.138
Ftest	9.01	7.40	8.35	16.25	11.52	5.61	18.19	11.53	2.46	9.06

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dependent variable: Subjective survival probability of reaching age 75. *Reference categories*: Education: primary/none. Health: poor/fair. Marital status: single (never married)

3.B Wealth calculation

This appendix describes the methodology used in calculating the present value of different components of wealth.

General assumptions:

- Variables that are assumed constant from now until SPA in the wealth calculation:
  - Employment status
  - Marital status
  - Earnings
  - Future pension contributions (fraction of earnings)[24]
- A person pays (and has paid in the past) full PRSI contributions while working
- A person has been in full-time employment for the number of years that they state they have worked since leaving full-time education[25]
- A couple is categorised as "married" if they are married of cohabiting as if married[26]
- The State Pension Age (SPA) is assumed to depend on the year of birth of the individual as outlined in the Social Welfare and Pensions Act of 2011:
  - 66 if born before 1954
  - 67 if born between 1954 and 1960
  - 68 if born in or after 1961

[24] According to Banks et al. (2005), median pension contribution rates among the under 60s are relatively invariant with age, therefore suggesting that a constant contribution rate is a reasonably fair assumption.

[25] For the few individuals who don't know the number of years worked, a value is imputed using conditional hotdecking. The conditioning variables are gender, broad age group, marital status and education, following the methodology of Banks et al. (2005). See Appendix 3.C for more information about the imputation methodology.

[26] Except when calculating entitlements to the Widow's Contributory State welfare pension. The entitlement is calculated only for those legally married.

3.B.1 Net financial wealth

Financial wealth is calculated at the household level, and subsequently divided equally between the spouses in the case of a married or cohabiting couple. Net financial wealth includes saving and deposit accounts, stocks, bonds, life insurance, mutual funds, investment property, land, businesses, due inheritance etc., less outstanding debt. If the asset value is not known, but the amount of interest earned on those assets is known, the value is estimated as the interest divided by an assumed interest rate. Financial wealth levels are imputed for households that provide bracketed values or who refuse or don't know the value of the asset. The imputation methodology is described in Appendix 3.C.

Present discounted value of financial assets:

$$\mathrm{W} = (\frac{1}{1+d})^{SPA-age}(1+i)^{SPA-age}A$$

Where:
age = age at interview
SPA = State Pension Age (retirement age)
d = discount rate (2.5 per cent)[27]
i = real interest rate (2.5 per cent)[28]
A = current value of asset

As d and i are assumed to be equal, the present discounted value of financial assets is equivalent to its current value, A.

3.B.2 Supplementary pension wealth

Wealth held in occupational and private pensions (collectively known as supplementary pensions) is calculated at the individual level. The methodology follows that of Banks et al. (2005) and Crawford and O'Dea (2012) who estimate the pension wealth of ELSA respondents using data very similar to that of TILDA. The TILDA data contains detailed information about the length of work histories, the current value of pension plans, the pension contributions of both employees and employers, and expected income from pension. However, estimating supplementary pension wealth requires certain assumptions to

[27] As per Crawford and O'Dea (2012).
[28] As per Crawford and O'Dea (2012).

be made about past and future labour market participation, earnings, and pension contributions. Supplementary pension wealth is calculated separately for private sector occupational DC schemes, private sector occupational DB schemes, public sector occupational schemes, PRSAs, private pension plans, and other plans.

The present discounted value of wealth (W) held in a supplementary pension is calculated as

$$\mathrm{W} = \sum_{n=SPA}^{SPA+LE} \left(\frac{1}{1+d}\right)^{n-age}(1+i)^{n-SPA}P \tag{4}$$

where:
age = age at interview
SPA = State Pension Age (retirement age)
LE = actuarial life expectancy at SPA
d = discount rate
i = real growth rate of pension payment
P = annual pension income at SPA

Private sector occupational pensions

If a private sector employee with an occupational pension does not know whether their pension scheme is of the Defined Benefit or Defined Contribution type, the TILDA questionnaire asks the respondent the questions related to a Defined Contribution scheme. Therefore, those who are unsure of their scheme type, Defined Contribution is assumed.

Public sector pensions

Public sector pensions are calculated by estimating the sum of all pension income for all years in retirement, and discounting this stream of income back to current year (year of interview). The pension income in first retirement year is estimated by multiplying the estimated plan participation years by estimated final salary and by a fraction of one eightieth.

Other pensions

PRSA (Personal Retirement Savings Accounts) wealth is calculated in the same way as private sector occupational pensions. PRSAs which were introduced in 2002 with an aim to increase pension coverage among low-coverage employee groups

Wealth in private pensions (up to 2 schemes) are calculated in the same way as private sector occupational pensions and PRSAs, and added together.

Those who refuse to say, or don't know if they have pension entitlements from previous employers are assumed to have wealth in these pensions. Other pensions from previous employers are calculated by estimating the present value of the stream of lump-sum payment and monthly payments that the individual expects to receive from these pensions (in total). The estimation technique differs from those of other pensions because the TILDA questionnaire does not include a question about the current value of or contributions to these additional pensions.

3.B.3 Social welfare wealth

The source of the rules and rates applied to the social welfare wealth estimation is obtained from the Department of Social Protection documentation. In the calculations, the payment rates and rules are assumed to remain at the 2010 levels in future years.

Contributory State welfare pension

State pension (contributory) is a social insurance payment made when an individual reaches the State Pension Age. It is based on social insurance (PRSI) contributions. The pension payment is not means-tested.[29] To qualify for State pension (contributory), an individual must have reached the SPA and fulfil the below conditions:

- started paying social insurance before reaching age 56
- a yearly average of either:

[29]However, Increase for a Qualified Adult is a means-tested payment.

- at least 10 appropriate contributions paid or credited from the year first entered insurance or from 1953, whichever is later to the end of the tax year before reaching SPA. This is called the *normal average rule.* A yearly average of 10 full rate contributions is needed for the minimum payment rate. A yearly average of 48 full rate contributions is needed for the maximum payment rate.
  OR
- 48 Class A, E, F, G, H, N or S contributions (paid or credited) for each contribution year from the 1979/80 tax year to the end of the tax year before reaching SPA. This average would entitle the individual to the maximum pension. There is no provision for a reduced pension when this *alternative average rule* is used.

- a minimum of total contributions:
  - Born before Apr 1946

    No pension if <5 years worked before SPA

    Full pension if 5+ years worked before SPA
  - Born Apr 1946 - Jan 1954

    No pension if <10 years worked before SPA

    Full pension if 10+ years worked before SPA
  - Born after Jan 1954

    No pension if <10 years worked before SPA

    10 years worked by SPA= 10/30 of full pension

    11 years worked by SPA= 10/30 + 1/30 of full pension

    12 years worked by SPA= 10/30 + 2/30 of full pension

    ...

    30 years worked by SPA= 10/30 + 20/30 of full pension

Note: A person's average contributions are assessed in two ways - the usual average and the alternative average. If an individual does not have an average of 48 contributions from 1979, then the normal method of assessing the average will be looked at and the individual may get a reduced pension.

The present discounted value of wealth (W) from future Contributory State welfare pension income is calculated as

$$\mathrm{W} = \sum_{n=SPA}^{SPA+LE} (\frac{1}{1+d})^{n-age}(1+i)^{n-SPA}P \tag{5}$$

where:
age = age at interview
SPA = State Pension Age (retirement age)
LE = actuarial life expectancy at SPA
d = discount rate
i = real growth rate of pension payment
P = annual pension income at SPA

Widow's Contributory State welfare pension

Widow's, Widower's or Surviving Civil Partner's (Contributory) Pension is paid to the husband, wife or civil partner of a deceased person. The payment is not means-tested. Weekly Widow's Contributory State welfare pension payment rates in 2010:

- EUR 230.30 for 48 + contributions
- EUR 225.80 for 36-47 contributions
- EUR 220.40 for 24-35 contributions

In order to qualify for this pension, a person must:

- be widowed or a surviving civil partner OR divorced from late spouse prior to spouse's death and not remarried OR have had their civil partnership dissolved and have not registered a new civil partnership

  AND

- not be cohabiting as a couple

  AND

- satisfy the following social insurance contribution conditions (before the death):
  either the surviving or the deceased spouse (or civil partner) must have at least 260 weeks' paid PRSI contributions.
  The surviving or the deceased spouse (or civil partner) must also have a yearly average of either:

  - 39 paid or credited social insurance contributions in the 3 or 5 tax years before the death of the spouse/civil partner or before they reach SPA. This gives entitlement to a *maximum* rate pension
    OR

– at least 24 paid or credited social insurance contributions from the year of first entry into social insurance until either the year of death of the spouse/civil partner or the year they reached SPA, whichever is earlier. This gives entitlement to a *minimum* rate of pension. An average of 48 per year entitles the person to the *maximum* rate pension.

Increases:	Rate per Week
Living Alone Increase for people age 66 or over	EUR 7.70
Extra increase for people age 80 or over	EUR 10.00

Present discounted value of wealth from future Widow's pension income is calculated using formula:

$$W = \sum_{n=SPA}^{SPA+LE} (\frac{1}{1+d})^{n-age}(1+i)^{n-SPA}P + I[\sum_{n=D^s}^{D^s+LE^d} (\frac{1}{1+d})^{D^s-age}(1+i)^{n-D^s}]$$

Where:
I = indicator that spouse is deceased
age = age at interview
D^s = age when spouse dies
LE^d = actuarial life expectancy at spouse's death
d = discount rate
i = real growth rate of pension payment
P = annual pension income at spouse's death

Non-contributory State welfare pension wealth

In order to qualify for the non-contributory State welfare pension, a person must fulfil the below four conditions:

1. aged 66 if born before 1955 / aged 67 if born between 1955-1960 / aged 68 if born in 1961 or later
2. not eligible for the contributory State welfare pension
3. pass a means test (see below)
4. meet the habitual residence condition (all TILDA respondents are assumed to meet)

Different assets are added together and derived into weekly means income as per Table 3.17.

Table 3.17: Means test for Non-contributory State welfare pension

Income	Assets
Included in calculation: cash income (income from supplementary pensions), employment income (assumed zero in this analysis) and maintenance (assumed zero in this analysis).	Included in calculation: Investment property, savings and investments.
Excluded from calculation: Income from property already assessed on its capital value. (A list of other income sources are also excluded from the income means test, however these are mostly social welfare payments that are not included in this analysis.)	Excluded from calculation: Owner-occupied housing.
	First EUR 20,000 is disregarded. The next EUR 10,000 is assumed to yield 0.1 per cent annual return. The next EUR 10,000 is assumed to yield 0.2 per cent annual return. Any wealth above EUR 40,000 is assumed to yield 0.4 per cent annual return.

The first EUR 30 per week of means does not affect the rate of Non-contributory State welfare pension payment. After that, the pension is reduced by EUR 2.50 per week for every EUR 2.50 of means. When the means test is carried out for couples, income and capital are divided equally between the spouses.

Weekly income from supplementary pensions (P) is calculated as:

$$P = \frac{r\,(PV)}{1-(1+r)^{-LE}} \tag{6}$$

Where:

r = annuity rate (assumed 5.367555 per annum[30])

LE = actuarial life expectancy at SPA

PV = value of supplementary pension at SPA

[30]Annuity rate is the average single life annuity rate of four Irish life insurance companies reported by the Department of Social Protection Report on Pension Charges in Ireland (2012), assuming a capital amount of EUR 500,000, with no escalation and no guarantee period.

The present discounted value of wealth (W) from future Non-contributory State welfare pension income is calculated as

$$\mathrm{W} = \sum_{n=SPA}^{SPA+LE} (\frac{1}{1+d})^{n-age}(1+i)^{n-SPA}P \tag{7}$$

Where:
age = age at interview
SPA = State Pension Age (retirement age)
LE = actuarial life expectancy at SPA
d = discount rate
i = real growth rate of pension payment
P = annual pension income at SPA

The maximum weekly payment of the Non-Contributory State Pension was EUR 219 per week, with EUR 10 increase for those aged 80 or over.

Note: If eligible for the non-contributory State welfare pension, a person may also be entitled to the following payments: Supplementary Welfare Allowance, Rent Supplement, Mortgage Interest Supplement, Living Alone Increase, Household Benefits Package, Free Travel Pass, Fuel Allowance, Island Increase, Centenarian's Payment, Respite Care Grant. In the calculations in this paper, income from these additional payments is assumed to be zero.

3.C Unfolding brackets and data imputation

For observations with missing or bracketed data for a wealth item, conditional hotdeck imputation is used to predict a value for that wealth category. Specifically, this method is carried out by replacing the missing data point with a random draw from observations with similar characteristics who report a continuous value for the wealth item. Similar observations are defined as those with same values for categorical variables such as broad age group and household type. The wealth level category is also used as a defining characteristic for cases for whom the wealth range is known (reported via unfolding brackets).

The methodology adopted in this paper broadly follows the imputation procedure of Crawford and O'Dea (2012) and Oldfield (2012) for ELSA data. The conditioning variables used in the hotdeck imputation for wealth sub-categories are listed below:

- Financial wealth

  Deposit and savings accounts: broad age group (under/over 55) and household type (married/single female/single male)

  Other financial assets (life insurance, mutual funds, bonds or shares): broad age group (under/over 55), household type (married/single female/single male) and wealth bracket (if given)

  Investment property: broad age group (under/over 55), household type (married/single female/single male) and wealth bracket (if given)

  Other assets (land, a firm or business, an inheritance or money owed, etc.): broad age group (under/over 55), household type (married/single female/single male) and wealth bracket (if given)

  Debt (excluding mortgages): broad age group of the financial respondent (under/over 55) and household type (married/single female/single male)

- Supplementary pension wealth

  Private sector occupational pension contribution rate: gender and educational level (following Banks et al. (2005))

  Private sector occupational pension plan value: the quartile of current annual earnings multiplied by pension plan tenure (following Banks et al. (2005))

  Other pensions from previous employment, lump-sum and expected income amounts: unconditional hotdeck using values from individuals with non-missing data

- Equivalised household income

  Income bracket

Chapter 4

The exchange motive in intergenerational transfers

4.1 Introduction

This chapter examines the presence of the exchange motive in intergenerational monetary transfers. The exchange motive is in operation if parents make transfers to their children in exchange for services. The main alternative explanation for intergenerational transfers is altruistic behaviour, meaning that parents derive utility from their children's utility. The analysis aims to identify the exchange motive by examining the causal effect of child-provided services on transfers from parents to children. Cox and Rank (1992) suggest this approach but it has rarely been implemented in empirical work.[1]

The data are obtained from the first two waves of The Irish Longitudinal Study on Ageing (TILDA), focusing on a sample of parent households who have non-resident adult children. The analysis incorporates both *inter vivos* transfers (while parents are alive) and expected transfers via bequests (after parents' death). The explanatory variable of interest is the practical help that children provide with household chores and paperwork. Among existing studies, only Cox and Rank (1992), McGarry and Schoeni (1997) and Norton and Van Houtvent (2006) use a direct measure of help (or informal caregiving) provided by children as a determinant of transfers.

Transfers from parents to their adult children are common even in developed countries with public income redistribution and public care provision, which should reduce the need for family members to rely on each other for assistance.[2] Studies including Kotlikoff et al.

[1] In contrast, the common way to identify transfer motives is to estimate the effect of the child's income on the value of transfers. In the case of altruism, the value of transfers is expected to decrease as the child's income increases, *ceteris paribus*. In the case of exchange, this relationship can be positive (if the demand for child-provided services is own-price inelastic). Section 4.2.1 of this chapter discusses these theoretical predictions in more detail.

[2] Transfers between generations take many forms. When thinking about intergenerational transfers, economists traditionally focus on *inter vivos* gifts, bequests and services, but families also exchange biological traits such as natural talents and genetics and share valuable social networks (Hochguertel and Ohlsson, 2009).

(1981), Modigliani (1988), Gale and Scholz (1994), Piketty (2011) and Ohlsson et al. (2014) examine the magnitude of intergenerational transfers in the US and in Europe. They generally find that a large proportion of people's wealth is passed on from one generation to the next, rather than accumulated over the individual's life-cycle.

When it comes to provision of informal care and help within families, Cox and Rank (1992) and Van Houtven and Norton (2004) find that sizeable proportions of older households in the US receive informal care or help around the house, with the latter being more common than the former.[3] Alessie et al. (2014) examine European data from the Survey of Health, Ageing and Retirement in Europe (SHARE) and find that, depending on the country, between 10 to 15 per cent of older households provide help with paperwork to their parents and between 15 to 30 per cent of households assist their parents with practical household chores.

Examining the latest wave of the sample of TILDA data used in this analysis, 47 per cent of parent households have made *inter vivos* transfers to their non-resident adult children over the past 2 years with a total unconditional mean value of just over EUR 4,000. When it comes to future bequests, 90 per cent of the parent households expect to leave an inheritance and two-thirds expect to leave an inheritance worth EUR 150,000 or more. In the same sample, 38 per cent of parent households received help from their children with household chores or paperwork over the past 2 years with an unconditional mean of 6 hours per month.

The multivariate analysis in this chapter firstly examines the association between help and the probability of *inter vivos* transfers in cross-sectional data, finding a positive and significant relationship between the two variables. The strength of the relationship is inversely related to the size of the transfer: the relationship is only statistically significant in the case of small (between EUR 250 and EUR 5,000) transfers whereas it is not significant for large (above EUR 5,000) transfers.

The correlation between help and the probability of a transfer taking place is a necessary condition for the exchange motive to exist. However, it is not a sufficient one because this association is also consistent with two-way altruism (Cox and Rank, 1992). In order to estimate the causal effect of help on transfer probability, biases caused by omitted variables and reverse causality need to be addressed. The cross-sectional results are robust to the inclusion of a measure of the emotional closeness between the children and parents and

[3]Cox and Rank (1992) report that in their analysis sample of the National Survey of Families and Households (NSFH) data, 42 per cent of (child) households gave help in the form of transportation, repairs, work around the house or advice to their parents. Norton and Van Houtvent (2006) find that in their sample of the Asset and Health Dynamics Among the Oldest Old (AHEAD) data, nearly 10 per cent of older parents receive informal care from their children.

variables that characterise the personality of the parent. The findings are also robust to the use of a lagged value of child-provided help.

When examining *inter vivos* transfers, the availability of two waves of data enables the incorporation of fixed effects to account for unobserved time-invariant heterogeneity. Unmeasurable factors such as preferences and the type of relationship between the parents and their children are likely to be correlated with both transfers and services, which makes them a concern in cross-sectional analysis of transfer motives. In fixed effects estimates, the effect of help on the probability of a transfer is still positive and statistically significant at the 10 per cent level. These findings suggest that the exchange motive influences *inter vivos* transfers. In existing work, only Norton and Van Houtvent (2006) use fixed effects in examining the effect of child-provided services on the probability of transfer.

The cross-sectional analysis of expected bequests reveals no effect of help provided by children.[4] These findings support the hypotheses of McGarry (1999) and Bernheim and Severinov (2003) who suggest that *inter vivos* transfers are better suited to exchange, and therefore are likely not to be influenced by the same motives as bequests. The finding that the exchange motive only drives small *inter vivos* transfers is also consistent with this prediction: if transfers are made in small quantities, they can be made more frequently which in turn makes the enforcement of the contract between the parent and the child easier.

In addition to binary transfer indicators, this analysis makes use of a continuous measure of the value of *inter vivos* transfers. This allows for conclusions to be drawn about price elasticity of demand for child-provided services. The elasticity analysis can shed light on the availability of market substitutes for services traded within families. The findings of this analysis indicate that the demand for child help is price inelastic, possibly as a result of the lack of market substitutes for informal help. An analysis of the price elasticity of demand for child-provided services has previously only been carried out by Cox and Rank (1992) who study transfers in a cross-sectional setting.

Intergenerational transfers are an important topic of analysis because they play a role in the saving behaviour of both the donors (the parents) and the recipients (the children) as well as investment decisions in both human and physical capital, for example through schooling decisions and house purchases. Intergenerational transfers affect wealth distributions within families and have an impact on the equality of opportunities between individuals. From a public policy point of view, understanding the motives behind transfer behaviour

[4]Because bequest data was not collected in the first wave of TILDA, the analysis on expected bequests is restricted to Wave 2 data. However, the relationship between help and expected bequests is insignificant in cross-sectional analysis and therefore an endogeneity-corrected estimate of the relationship is likely to be less significant.

is relevant for predicting the likely consequences of changes to public provision of care, taxation of estates and gifts or changes to public income redistribution.

If the exchange motive influences intergenerational transfers, increased public care provision to older people may decrease caring provided by children and consequently decrease monetary transfers to children (Kohli and Künemund, 2003). When it comes to bequests, if they are planned and used to compensate children for caring for their elderly parents, inheritance taxes may dis-incentivise within-family provision of these services (Jürges, 2001). Depending on what motivates intergenerational transfers, changes to public income distribution between cohorts may either crowd out or reinforce private flows of monetary transfers (Cox, 1987; Cox and Rank, 1992).

The remainder of this chapter is structured as follows: Section 4.2 describes the theoretical framework and Section 4.3 summarises existing empirical work. Section 4.4 describes the data and provides summary statistics. Section 4.5 presents the empirical methods and findings and Section 4.6 offers concluding remarks. Appendix 4.A contains the estimates using a continuous amount of child help, and Appendix 4.B describes the Irish tax and legal systems regarding gifts and bequests.

4.2 Transfer motives: Altruism and exchange

The two main theories suggested as motivations for transfers from parents to children are altruism and exchange.[5] The altruism model was developed by Barro (1974) and Becker (1974, 1981). An altruistic parent's utility is a function of the child's utility. The parent makes transfers to the child as long as i) the parent's income is high enough relative to the child's, and ii) the parent gives sufficient weight to the child's utility in their own utility function. Transfers are compensatory, meaning that parents make transfers to children with relatively low incomes. The main prediction arising from the altruism model is the idea of income pooling within families. If a non-altruistic child's income is reduced and an altruistic parent's income is increased by the same amount via public income redistribution, a private transfer in the opposite direction cancels out the public transfer. The idea of *redistributive neutrality* follows from altruistic behaviour: redistributing income between generations has no impact on consumption as long as transfers between parents and children are possible.

[5]Other suggested motivations for intergenerational transfers are reciprocity (giving back what one has received earlier, perhaps from their own parents), sense of obligation, separation between parents and children (keeping autonomy or distance), status (concern for one's social honour) and compliance with external norms (Kohli and Künemund, 2003).

Theoretical frameworks around the exchange motive are developed by Bernheim et al. (1985) when it comes to bequests and by Cox (1987) when it comes to *inter vivos* transfers. The exchange motive is in operation if parents make *inter vivos* transfers (or promises of future bequests) to children in exchange for services. The service can take on many forms, ranging from formal (such as caregiving) to casual (e.g. companionship). The parent derives utility from the service, whereas the service provision is costly for the child. A transfer takes place if both benefit from the transaction. If transfers are motivated by exchange, the *redistributive neutrality* result does not hold: a private transfer may not cancel out a public one, and in some cases may even amplify it. The details of this prediction are discussed below.

4.2.1 Identifying transfer motives

Ways to identify altruism and exchange motives in intergenerational transfer behaviour are described in this section. Laferrère and Wolff (2006) provide a detailed summary of the theoretical frameworks developed for examining transfer motives.

Effect of child's income on transfers

The most-explored way to identify transfer motives is to estimate the effect of children's income on transfers. In the case of both altruism and exchange, the *probability* of a transfer (T_{prob}) is negatively related to the child's income (Y_k). In altruism, this relationship follows from the compensatory nature of transfers.[6] In exchange, Y_k determines the value of the child's time, i.e. the implicit price of their services. Therefore, as the child's income increases, the parent is less likely to enter into an exchange.

$$\text{Altruism and exchange:} \quad \frac{\partial T_{prob}}{\partial Y_k} < 0 \tag{4.1}$$

Differentiation between altruism and exchange can potentially be made when examining the effect of Y_k on the *value* of the transfer (T_{value}: the price of the service multiplied by quantity of the service traded). In the case of altruism, an increase in Y_k has a negative effect on T_{value} because transfers are compensatory. In exchange, the direction of the effect of Y_k on T_{value} depends on the own-price elasticity of demand for child services: the effect is positive if the demand for child services is own-price inelastic. Conversely, the effect is negative if the demand for child services is own-price elastic.[7] Therefore, estimating the

[6]The effect of parental income on transfers is the opposite of the child income effect.
[7]See Cox (1987) for a thorough discussion.

effect of Y_k on T_{value} is informative of transfer motives only in the case of finding a positive coefficient, in which case it serves as evidence of exchange.

Whether demand for child services is own-price elastic or inelastic depends on the availability of substitutes for the services. When the service in question is informal (such as companionship), the availability of substitutes is unlikely. Therefore, when modelling informal services, assuming that demand is inelastic is likely to be reasonable. However, in the case of more formal help (such as help with household chores or nursing), market substitutes are likely to be available and the identification of transfer motives by examining the effect of child income on the value of transfer is difficult. An issue with examining very informal services (such as visits and contact/communication) is that the distinction between who is providing the service and who is the recipient of it can be unclear. When it comes to more formal types of services (such as help with housework and care to an older parent), the roles of the two parties are somewhat easier to ascertain (Laferrère and Wolff, 2006).

Effect of child-provided services on transfers

A direct way of testing for the presence of the exchange motive is to estimate the effect of child-provided services (S) on transfers (Cox and Rank, 1992). In the case of exchange, the effect of S on T_{prob} is positive:

$$\frac{\partial T_{prob}}{\partial S} > 0 \tag{4.2}$$

The direction of the effect of S on T_{value} depends on whether the demand for services is own-price elastic or inelastic. If the demand is own-price elastic, T_{value} increases with S, whereas the opposite is the case when demand is own-price inelastic.

Although the correlation between transfers and help is a necessary condition for the exchange motive, it also consistent with two-way altruism (Cox and Rank, 1992). In order to estimate the causal effect of help on the probability of transfer, one needs to address two possible biases affecting the coefficient estimate. The first bias is caused by omitted variables that are correlated with both help and transfers, such as emotional closeness between the child and the parent. If the relationship is close, the child is more likely to provide help to the parents, and the parents are more likely to make transfers. The second bias in the coefficient estimate may arise from reverse causality. Arguably, transfers from parents may cause the children to provide help to the parents. The effect of transfers on help is discussed by Norton and Van Houtvent (2006) and Henretta et al. (1997).

4.2.2 Differences in motives for *inter vivos* and bequests

The fact that bequests are usually divided equally among children while *inter vivos* transfers are not has been noted in many previous studies (Menchik, 1988; McGarry, 1999; Bernheim and Severinov, 2003; Norton and Taylor, 2005). These empirical observations of differences in behaviour when it comes to *inter vivos* transfers and bequests have led to the development of models that allow for the two types of transfers to be influenced by different motives. McGarry (1999) develops a framework for examining bequests and *inter vivos* transfers that does not assume that the determinants for the two types of transfers are identical. She predicts that short-run income uncertainty and liquidity constraints are important factors that determine *inter vivos* transfers to children, whereas long-run trends in permanent income are more important in giving via bequests.

Norton and Van Houtvent (2006) hypothesise that *inter vivos* transfers are a preferred transfer vehicle for households with an exchange motive. The parent can easily adjust the transfer to correspond with the service, and therefore the enforceability of the contract between parent and child is easier than in the case of bequests. Transferring wealth via bequests also carries the risk that the parent spends some or all of the intended bequest on unexpected medical or other expenses or that the parent lives longer than anticipated. Additionally, *inter vivos* transfers are potentially more convenient for exchange purposes because they can be hidden from the siblings of the recipient more easily than bequests — perhaps to prevent conflict between the children or to avoid the children perceiving unequal affection from the parents.

4.3 Existing empirical evidence

Empirical research into intergenerational transfers has suffered from the unavailability of suitable data until relatively recently. As Laferrère and Wolff (2006) explain, the requirements are extensive: data are needed on the donors, the recipients and the value of transfers. Repeated observations are desirable so that unobserved heterogeneity can be accounted for. Laferrère and Wolff (2006) provide an extensive review of previous empirical work.

The majority of existing studies estimate the effect of income on transfers. Some studies that employ this identification strategy have been carried out since the review of Laferrère and Wolff (2006). Hochguertel and Ohlsson (2009) examine six waves of HRS data and find *inter vivos* transfers to be somewhat compensatory (although far from eliminating between-sibling income differences). They find that daughters receive more *inter vivos*

transfers than sons, which they interpret as a possible indication of the exchange motive. Nordblom and Ohlsson (2011) study the channels that parents use to make transfers to their children. They use cross-sectional Swedish data from the 1998 wave of the Household Market and Nonmarket Activities survey (HUS). They find that higher parental resources increase the probability of transfers.

Some existing studies have examined the relationship between child-provided services and transfers. Bernheim et al. (1985), Perozek (1998) and Alessie et al. (2014) examine the determinants of the supply of services from the child's point of view. Bernheim et al. (1985) examine US data from the 1973 wave of the Longitudinal Retirement History Survey (LRHS) and find parental bequeathable wealth to be a significant determinant of the child's supply of services. They find this effect only to be present in families with more than one child. They interpret this finding as evidence of strategic bequests; in families with multiple children, the threat of disinheritance is credible and can be used to influence potential beneficiaries' behaviour. Perozek (1998) uses US data from the 1987 National Survey of Families and Households (NSFH) to re-examine the hypotheses of Bernheim et al. (1985). She includes additional control variables and finds that the positive effect of bequeathable wealth on services is not robust across alternative specifications. Alessie et al. (2014) examine both *inter vivos* time and money transfers using data from the 2004 wave of the Survey of Health, Ageing and Retirement in Europe (SHARE). They find transfers not to be compensatory and that poorer children provide more care to their parents. The analysis of cross-country data (from 11 countries) allows for conclusions to be drawn regarding the possible effects of institutions such as public care provision and public income redistribution on intergenerational transfers.

The effect of child-provided services on transfers has previously been examined by Cox and Rank (1992), McGarry and Schoeni (1997) and Norton and Van Houtvent (2006). McGarry and Schoeni (1997) focus on the effect of child income on transfers. They also include a dummy variable of a child providing help with (I)ADLs[8] to their parents in their cross-sectional fixed effects[9] financial transfer regression. They find that the estimated coefficient is negative and statistically insignificant for both the dummy variable and a continuous measure of the hours of help provided.

Cox and Rank (1992) carry out an analysis of the effect of care and contact on transfers. The cross-sectional data come from the National Survey of Families and Households (NSFH). They estimate models of both the probability of a transfer and the value of those

[8] ADLs (Activities of Daily Life) include tasks required to take care of oneself and move around using one's body, whereas IADLs (Instrumental Activities of Daily Life) include activities that people commonly do outside of ADLs (i.e. cooking, household chores, grocery shopping, using the telephone, taking medications and managing finances).

[9] The fixed effects are the family-level fixed effects because they have observations of many children within a family. Therefore, their identification relies on between-family variance.

transfers as a function of help that children provide and the contact between children and parents. They find that empirical patterns for *inter vivos* transfers are more consistent with exchange than with altruism: the child's income has a negative effect on the probability of receiving a transfer but a positive effect on the value of transfer. They estimate the effect of child-provided help on the probability of transfer to be positive and statistically significant. They find the effect of help to be insignificant in determining the transfer amount, but they justify this finding with the assumption that the demand for child help is own-price inelastic. NSFH also contains information about the amount of contact between the parents and the children in the form of visits and telephone conversations. Cox and Rank (1992) find that the effect of contact on transfer probability is also positive and significant while the effect on the value of transfer is insignificant. The shortcomings of the analysis arise from data limitations: there is only one cross-section available, and therefore unobservables that are likely to be correlated with both caregiving and transfers can not be accounted for. As a result, the coefficient estimate of help on transfers is likely to be biased. Also, the transfers in NSFH are measured over the preceding 5 years, whereas caregiving is only recorded over one year.

Norton and Van Houtvent (2006) is the only existing study that exploits panel data in examining the effect of child-provided services on transfers. They use US data from the 1993 and 1995 waves of the Asset and Health Dynamics Study (AHEAD) to test the effect of providing informal care on the likelihood of receiving *inter vivos* transfers from parents. As discussed, Norton and Van Houtvent (2006) theorise that the exchange motive is expected to be stronger for *inter vivos* transfers than for bequests. They find significant effects of a child giving informal care on the likelihood of them receiving a transfer (compared to a sibling who does not provide care) by estimating logit models with and without household fixed effects (using within-household variation). Their findings are robust to specifications that account for the possible endogeneity of informal care using lagged values of informal care and instrumental variables.[10]

4.4 Data

The data used in this analysis come from the first two waves of The Irish Longitudinal Study on Ageing (TILDA),[11] conducted in 2009-2011 (Wave 1) and in 2012-2013 (Wave 2). TILDA is well suited to an examination of intergenerational transfers because it contains information about both the donors and the recipients as well as detailed information about

[10] Norton and Van Houtvent (2006) also examine the likelihood of a parent household planning to divide their bequests equally among their children. They find that the effect of informal care is not statistically significant.

[11] See Section 2.4 for a description of the TILDA data.

inter vivos transfer amounts and the expected probability of leaving a bequest. Crucially for examining the exchange motive in family transfers, TILDA also contains information on help that parents receive from their children.

The selection of the sub-sample of TILDA data used in this analysis is described in Table 4.1. The number of households taking part in both waves of the survey was 5,427. As is standard in this literature,[12] the sample is restricted to families with children, all of whom are aged 18 or older and no longer live with the parents. This selection is carried out to exclude families where children are still financially dependent on the parents. Co-residence is a type of transfer, the value of which is difficult to estimate. Living in the same household usually involves sharing living expenses, which can not be separated in the data. Families where children are in education are excluded from the analysis because parents are likely to under-report or omit amounts that they invest in the children's education through the payment of rent or tuition fees. The sample is restricted to families with both a financial and a family respondent present (so that information about transfers is recorded). Further exclusions are made to exclude households where a spouse refuses to take part in the survey (in the case of married or cohabiting parents) and households with missing data for any of the analysis variables. The resulting sample size is 1,035 families (499 two-parent and 536 one-parent families[13]) with a total number of 3,602 children (an average of 3.48 per family.)

As data about expected bequests were only collected in Wave 2, the panel analysis of transfers is limited to examining *inter vivos* giving. When it comes to the larger (EUR 5,000 and over) *inter vivos* transfers, the Wave 1 questionnaire asked about transfers in the preceding 10 years, whereas Wave 2 focused on the preceding 2 years. Due to this time inconsistency, the panel analysis of transfers is restricted to the smaller (EUR 250 to EUR 5,000) *inter vivos* transfers for which the questions in both waves were identical. The collection of the transfer data is discussed in more detail in the proceeding sections.

4.4.1 *Inter vivos* transfers

The TILDA dataset contains data on monetary *inter vivos* transfers between parents and their children, including information about the total amounts.[14] The question regarding the large (EUR 5,000 and over) transfers is worded as follows:[15]

[12] See Bernheim et al. (1985) Norton and Van Houtvent (2006), McGarry (1999) and Alessie et al. (2014), among others.

[13] 72 per cent the one-parent households are widows.

[14] The phrasing follows the HRS (the Health and Retirement Study) and SHARE (the Survey of Health, Ageing and Retirement in Europe) questionnaires.

[15] The question about large transfers differs slightly between the two survey waves. The Wave 1 question was: *"In the last ten years, have you given the deeds of a house, business, property, or a large amount of money of EUR 5,000 or more to any of your children (or grandchildren)?"*

Table 4.1: Selection of the analysis sample

Sample description	Remaining households
TILDA respondents in Wave 1 and 2	5,427
Has children	4,043
Has no resident children	2,312
Has no child under 18 years of age	2,287
Has no child in education	1,975
Household has a financial and family respondent	1,924
Both spouses take part in survey	1,412
Non-missing transfer data	1,236
Non-missing expected bequest data	1,093
Non-missing help data	1,075
Non-missing control variables	1,035
Final sample size	**1,035**

"Not counting any shared housing or shared food, in the last two years, have you given financial help or gifts, including help with education, of EUR 5,000 or more to any child (or grandchild)?"[16]

If the answer was "yes", a follow-up question about the total value of the transfers was asked.

Information about smaller (EUR 250 to EUR 5,000) transfers was recorded using the following question:

"I would now like to ask about financial assistance to your children apart from any large lump sums that you mentioned in the previous question. During the last 2 years, did you (or your spouse/partner) give financial or in-kind support totalling EUR 250 or more to any of your children and/or grandchildren (or their spouse/partner)?"

Again, a question about the total value of the transfers was asked if the household had made transfers.

Descriptive statistics of *inter vivos* transfers are presented in Table 4.2. Nearly 40 per cent of families made small transfers in both waves, with the average total value of the transfers declining between waves. The larger transfers were less common, with 29 per cent of families reported having made them in Wave 1 and 14 per cent in Wave 2.[17] Among families making transfers, 94 per cent reported a total transfers below taxable limits.[18]

[16]The question was explained further: *"By financial help we mean giving money, helping pay bills, or covering specific types of costs such as those for medical care or insurance, schooling, down payment for a home, rent, etc. The financial help can be considered support, a gift or a loan."*

[17]As discussed, in Wave 1 the respondents were asked about transfers over the preceding 10 years, whereas in Wave 2 transfers were recorded over the preceding 2 years. This time discrepancy carries across to the third column, which presents the combined averages of the preceding columns.

[18]In Ireland, the first EUR 3,000 of all gifts taken by a recipient from one donor in any calendar year are exempt from Capital Acquisitions Tax. See Appendix 4.B for a description of Irish tax and legal systems regarding gifts and bequests.

Table 4.2: *Inter vivos* transfer amounts from parents to children during past 2 years

	Small transfers[a]	Large transfers[b]	Total transfers[c]
Wave 1*			
Percentage of households making transfers	39	29	53
Unconditional mean	1,675	21,179	22,854
Standard deviation	7,831	83,059	83,750
Unconditional median	0	0	400
Conditional mean†	4,302	74,056	43,323
Standard deviation†	12,100	142,308	111,440
Conditional median†	2,000	30,000	7,250
Wave 2			
Percentage of households making transfers	39	14	47
Unconditional mean	1,361	2,705	4,067
Standard deviation	15,936	12,460	20,411
Unconditional median	0	0	0
Conditional mean†	3,470	19,858	8,714
Standard deviation†	25,318	28,348	29,209
Conditional median†	1,000	10,000	2,000
Sample size	1,035	1,035	1,035
	[a] €250-5,000	[b] €5,000+	[c] a+b

*Preceding 10 years for Wave 1 large transfers
†Conditional on a positive transfer amount

4.4.2 Expected bequests

In Wave 2 of the study, TILDA respondents were asked about their expected bequests:[19,20]

"What are the chances that you will leave any inheritance?"

If the answer was non-zero, the below follow-up question was asked:

"What are the chances that you will leave an inheritance totalling EUR 50,000 or more?"

Again, if the answer was non-zero, the below follow-up question was asked:

"What are the chances that you will leave an inheritance totalling EUR 150,000 or more?"

The respondents were explained that the question covers properties and other valuables.

Descriptive statistics of expected bequests data are presented in Table 4.3. The vast majority (90 per cent) of households indicate that they have a non-zero probability of leaving a bequest. The average reported percentage probability of leaving a bequest is 86. When examining the data on bequests of at least EUR 50,000 and EUR 150,000, the probabilities diminish as expected. Two thirds of parent households report a non-zero probability of leave a bequest in excess of EUR 150,000. The unconditional mean percentage probability of leaving a bequest of this size is 59. As 88 per cent of the parent households were homeowners in Wave 1 (see Table 4.5), the high estimated probabilities are reasonable: among those who expected to leave an inheritance of at least EUR 150,000, the mean probability of leaving an inheritance of this size is 88 per cent. As few people use housing equity to fund consumption in retirement, it is to be expected that older people expect to bequeath their residential property.

4.4.3 Help provided by children

In both waves of the survey, TILDA respondents were asked:[21]

> *"In the last 2 years, have your children or grandchildren spent at least 1 hour a week helping you with things like:*

[19] The respondents were shown a card depicting a continuous line with the number 0 at the left end and 100 at the right end.

[20] The wording follows the ELSA (The English Longitudinal Study of Ageing) questionnaire.

[21] The background to the question was also explained to the respondents: *"The next section will ask about regular non-financial assistance that you received from your children. This refers only to help received from children outside the household i.e. help received from co-resident children is to be excluded."*

Table 4.3: Expected bequest probabilities (in per cent)

	Any bequest	Bequest EUR 50k +	Bequest EUR 150k +
Percentage of households planning a bequest with positive probability	90	83	67
Unconditional mean	86	77	59
Standard deviation	33	39	46
Unconditional median	100	100	100
Conditional mean†	95	93	88
Standard deviation†	17	19	26
Conditional median†	100	100	100
Sample size	1,035	1,035	1,035

†Conditional on a positive probability

1. *Practical household help, e.g. with home repairs, gardening, transportation, shopping, household chores?"*
2. *Help with paperwork, such as filling out forms, settling financial or legal matters?"*

If the respondent had received help, a follow-up question was asked about the total number of hours of help per month that the children had provided.

Table 4.4 presents summary statistics of these data. On average, a lower share of households received help in Wave 2 than in Wave 1; however, the unconditional mean of total monthly hours increased slightly between waves, reflecting the increase in conditional hours.[22]

4.4.4 Control variables

Table 4.5 compares the means and standard deviations of the explanatory variables used in the analyses across the two waves of data. At the mean, 49 per cent of a family's

[22]The TILDA questionnaire also contains information about help that the respondents receive with Activities of Daily Life (ADL)s and Instrumental Activities of Daily Life (IADL)s (see footnote on page 93 for definitions). Also the person providing this help and the hours of help provided are recorded. Although approximately 10 per cent of the households in the analysis sample have a member who receives help with ADLs and/or IADLs, the main helper is commonly the spouse. Less than 4 per cent of the households in the sample receive (I)ADL help from their children. Therefore, this measure is not used in the analysis.

Table 4.4: Help provided by children to parents during past 2 years

Wave 1	
Percentage of households receiving help	42
Unconditional mean monthly hours	6
Standard deviation	16
Unconditional median monthly hours	0
Conditional mean monthly hours†	13
Standard deviation†	23
Conditional median monthly hours†	8
Wave 2	
Percentage of households receiving help	39
Unconditional mean monthly hours	6
Standard deviation	19
Unconditional median monthly hours	0
Conditional mean monthly hours†	17
Standard deviation†	28
Conditional median monthly hours†	8
Sample size	1,035

†Conditional on receiving help

children are female, the average child is 38 years old in Wave 1 and has 1.4 children.[23] Home ownership of children was recorded in Wave 1 with 75 per cent being homeowners. Some children acquire education between the waves.[24] The geographical location of children is relatively constant across time, with slight decreases in shares of children living in the same neighbourhood as their parents and increases in children living abroad. As expected, the marriage, divorce, separation and widowhood rates among the children increase, whereas fewer children are single or cohabiting in Wave 2. The effects of the recession are visible when examining the labour market status of the children: fewer are employed full-time while more are self-employed or out of the workforce. A slightly lower share are unemployed, perhaps as a result of leaving the workforce or emigrating.

Children's current incomes are not reported in TILDA, but current labour market status serves as an indication of shocks to current income. However, using proxy measures of permanent income (education and home ownership) may be preferred because current income is more likely to suffer from reverse causality with transfers. This could be an issue if children adjust their labour supply as a reaction to parental transfers. Issues arising from the non-availability of a children's current income data are discussed by Arrondel and Masson (2001) who use proxy measures for child income. Using a sub-sample of their dataset with information about the child's income, they test the size of the bias in the results. They find that introducing the child's income in the transfer models does not qualitatively change the other coefficient estimates.

Examining the characteristics of the parents, the average age of the spouses (if married or cohabiting) is 68 years in Wave 1. On average, parents feel emotionally close to 91 per cent of their children.[25] Nearly 88 per cent own their home, and the mean annual income of the household is EUR 30,020 in Wave 1 and EUR 25,260 in Wave 2, reflecting the reductions in incomes as people retire. Perhaps surprisingly, individuals report their overall health levels to be better in Wave 2 than in Wave 1. Approximately a third of parents report primary education as their highest qualification, whereas 40 per cent have finished secondary school and just over a quarter have obtained a third level qualification. As expected, fewer household heads are employed in Wave 2 and compared to Wave 1, and a larger share report being retired in Wave 2. Nearly half of the parent households are married or cohabiting, whereas just over a third are widows.

[23]The number of children that the respondents' children have was not recorded in Wave 2, and therefore Wave 1 figures are also presented in the Wave 2 column.

[24]As explained, families with children in full-time education are excluded from the analysis. Therefore any children who have obtained further education have done so part-time or between the survey waves.

[25]The emotional closeness variable is discussed further in Section 4.5.3.

Table 4.5: Means and standard deviations of control variables

	(1) Wave 1		(2) Wave 2	
CHILD CHARACTERISTICS				
Share females	0.492	(0.295)	0.492	(0.295)
Children's avg. age	38.451	(7.610)	40.451	(7.610)
Number of children	1.374	(0.984)	1.374	(0.984)
Share owns home in Wave 1	0.752	(0.316)	0.752	(0.316)
Share with primary highest	0.023	(0.123)	0.022	(0.118)
Share with junior cert highest	0.103	(0.243)	0.100	(0.236)
Share with leaving cert highest	0.287	(0.350)	0.272	(0.345)
Share with diploma highest	0.191	(0.285)	0.199	(0.284)
Share with primary degree highest	0.253	(0.330)	0.247	(0.324)
Share with postgraduate degree	0.144	(0.277)	0.160	(0.291)
Share in same neighbourhood as parents	0.184	(0.274)	0.178	(0.269)
Share in diff. neighbourhood but same county as parents	0.308	(0.333)	0.306	(0.333)
Share in diff. county but same country as parents	0.268	(0.316)	0.265	(0.315)
Share in diff. country to parents	0.237	(0.310)	0.248	(0.317)
Share married	0.573	(0.349)	0.596	(0.341)
Share cohabiting	0.124	(0.227)	0.115	(0.223)
Share single	0.255	(0.309)	0.235	(0.298)
Share separated	0.025	(0.095)	0.029	(0.100)
Share divorced	0.014	(0.077)	0.017	(0.083)
Share widowed	0.008	(0.068)	0.009	(0.069)
Share full-time employed	0.656	(0.332)	0.647	(0.340)
Share part-time employed	0.098	(0.194)	0.098	(0.193)
Share self-employed	0.069	(0.176)	0.073	(0.181)
Share unemployed	0.083	(0.189)	0.075	(0.176)
Share out of workforce	0.094	(0.197)	0.107	(0.211)
PARENT HOUSEHOLD CHARACTERISTICS				
Number of children	3.475	(1.861)	3.475	(1.861)
Share of children emotionally close to	0.907	(0.237)	0.913	(0.221)
Homeowner household	0.877	(0.328)	0.874	(0.332)
Spouses' avg. age	68.335	(8.654)	70.380	(8.653)
HH income (EUR 1,000s)	30.020	(53.554)	25.259	(31.188)
Average self-rated health poor/fair	0.264	(0.396)	0.230	(0.383)
Average self-rated health good	0.317	(0.407)	0.336	(0.413)
Average self-rated health very good/excellent	0.419	(0.441)	0.434	(0.442)
Average education level primary	0.344	(0.441)	0.344	(0.441)
Average education level secondary	0.391	(0.431)	0.391	(0.431)
Average education level third level	0.264	(0.401)	0.264	(0.401)
Head of Household employed	0.118	(0.323)	0.091	(0.287)
Head of Household self-employed	0.090	(0.286)	0.091	(0.287)
Head of Household unemployed	0.043	(0.202)	0.032	(0.176)
Head of Household retired	0.596	(0.491)	0.644	(0.479)
Head of Household sick or disabled	0.047	(0.212)	0.045	(0.208)
Head of Household a homemaker	0.090	(0.286)	0.086	(0.280)
Head of Household in education	0.003	(0.054)	0.006	(0.076)
Married	0.482	(0.500)	0.482	(0.500)
Separated/divorced	0.134	(0.341)	0.134	(0.341)
Widow	0.373	(0.484)	0.373	(0.484)
Single (never married)	0.011	(0.103)	0.011	(0.103)
Observations	1035		1035	

4.5 Multivariate analysis

This section presents the findings of the empirical analysis of the exchange motive in intergenerational transfer behaviour. The unit of analysis is the family because the data on child-provided help are aggregated at the family level. Both average parental and average child-level variables are included in the models.

The analysis adopts a hurdle (i.e. two-part) model specification where the probability of transfer (T_{prob}) and the value of the transfers (T_{value}) are modelled separately, following Cox and Rank (1992) and Alessie et al. (2014), among others. T_{prob} is modelled using a probit specification, after which T_{value} is modelled using linear regression, conditional on a transfer taking place ($T_{value} > 0$). The hurdle model approach is chosen because the prediction of the exchange model is that the effect of Y_k may be positive on T_{prob} but negative on T_{value}. Similarly, the effect of S may be positive on T_{prob} but negative on T_{value}. A Tobit model is often used to account for zeros in a distribution, but a Tobit specification would be unsuitable in this analysis because it estimates a single set of coefficients for both the T_{prob} and the T_{value} models, therefore assuming that the effect is of the same sign in both (Greene, 2003).

After the hurdle models have been estimated using data from the two waves separately, the analysis is extended to account for possible biases in cross-sectional analysis arising from omitted variables and reverse causality (see discussion in Section 4.2.1). The additional specifications consist of cross-sectional models with added covariates measuring the emotional closeness between the children and the parents, as well as variables measuring the personality type of the parents. Also, the lagged value of help is used to address reverse causality. As a final step in the analysis, logit models with fixed effects that capture time-invariant heterogeneity are estimated.

4.5.1 Cross-sectional probit models of the transfer decision

The binary outcome in the probit models is the probability of the parents in a family making (or planning to make) monetary transfers to their children. The first outcome is a positive *inter vivos* transfer to (any) child, while the second outcome is the expectation to leave a bequest with a positive probability.

The estimated model is:

$$T_{prob\ i} = f(\alpha_0 + \alpha_1 S_i + \alpha_2 \mathbf{Y_{k}}_i + \alpha_3 \mathbf{K}_i + \alpha_4 Y_{p\ i} + \alpha_5 \mathbf{P}_i + a_i) \tag{4.3}$$

where:
$f(.)$ is the standard normal cumulative distribution function
$T_{prob\ i}$ is a probability of either:
parents of family i making *inter vivos* transfers
parents of family i reporting a positive probability of leaving a bequest
α_0 = constant term
S_i = a variable that equals 1 if family i's children provide help to parents, and 0 otherwise
$\mathbf{Y_{k}}_i$ = a vector of proxy measures for family i's children's income
$\mathbf{K}_i$ = a vector of family i's children's characteristics
$Y_{p\ i}$ = parental income of family i
$\mathbf{P}_i$ = a vector of family i's parental characteristics
a_i = residual term of family i

The main coefficient of interest is α_1, measuring the effect of child help on the probability of transfer. α_2 and α_4, the effects of child and parent income, are also relevant in the examination of transfer motives. α_1 is expected to be positive in the case of exchange. The expected sign of α_2 depends on the particular element of the vector: education and house ownership (proxies for permanent income) are expected to have negative effects on T_{prob} in the case of both altruism and exchange, whereas a child currently not working is expected to have a positive effect. α_4 is expected to be positive.

The estimates of the probit models for *inter vivos* transfers (T_{prob}) are presented in Table 4.6. The columns contain the estimated marginal effects and their standard errors, estimated at the mean values of the explanatory variables (see Table 4.5 for the mean values). The estimates using small *inter vivos* transfer data are presented in Models 1 and 2, and the ones using large *inter vivos* data are presented in Models 3 and 4.

The results suggest that the probability of making small *inter vivos* transfers has a statistically significant positive association with the children of the family providing help to the parents, confirming prior expectations regarding the sign of α_1. The estimated value of α_1 using Wave 1 data, estimated at the mean values of the control variables, is 0.11 (see Model 1), meaning that a family where at least one child provides help to the parents is 11 percentage points more likely to make *inter vivos* transfers from parents to children, compared to a family where no children provide help.[26,27] The estimate for α_1 using Wave 2 data is 0.09, also significant at the 1 per cent level. The finding of a significant, positive estimate of α_1, is consistent with exchange but also with two-way altruism.

[26]The corresponding marginal effect estimated using a logit model is 0.101.

[27]Instead of using a dummy indicator of help as the main explanatory variable, alternative specifications presented in Table 4.11 of Appendix 4.A use a continuous variable measuring the total daily hours of help that the children provide. The relationship is less robust than when a binary variable of help is used, possibly due to measurement error in the continuous variable.

The relationship between the probability of a family making large transfers and child-provided help is not statistically significant (in Table 4.6, see Model 3 for Wave 1 estimates and Model 4 for Wave 2 estimates). This finding is likely to be due to the difference in the suitability of different types of transfers when it comes to exchange: the smaller the individual transfer is in value, the more frequently parents can make transfers, which in turn increases the enforceability of the (informal) contract between the parent and the child.

Examining the figures in Table 4.6, the estimates of α_2 (child income) are statistically insignificant in most cases; however, the cases in which the coefficient estimate is statistically significant, the signs mostly confirm prior expectations. There is a significant negative association between the share of children with university degrees and transfer probability (Model 2). An interesting finding in Model 3 is the significant positive effect of the share of children who are homeowners in Wave 1. This effect is likely to be linked to the parents assisting the children with property purchases. Considering that the data about large *inter vivos* transfers was recorder over the preceding 10 years in Wave 1 and that the average age of children in Wave 1 was 38 years, the property purchases of the children are likely to have taken place within this time period. Unexpectedly, the share of children not working has a negative association with probability of small transfers in Wave 1. α_4 (the effect of parental income on transfer probability) is estimated to be positive, as expected: *ceteris paricus*, parents with higher incomes are more likely to make transfers to their children. Also, the proxy measures of parental permanent income (homeowner household, education level) have positive effects on the probability of transfers to children.

Some of the control variable coefficient estimates deserve discussion. Children's age is negatively associated with the probability of small transfers, but positively associated with larger transfers. These findings are probably due to younger children being more likely to be credit constrained and parents making small transfers to assist them with day-to-day finances. Larger transfers (linked to property purchases or passing on a family business) are more likely to be made to children that are older. The share of children living in the same county as the parents is positively associated with the likelihood of parents making small transfers (but insignificant when it comes to large transfers). Parents who perceive their health to be very good or excellent are more likely to make transfers to their children, perhaps due to lower expected medical expenses in the future. Parents with a higher level of education are more likely to make transfers to their children, possibly reflecting lower perceived risk of future income fluctuation.

The estimates of probit models of planning a bequest (T_{prob}) are presented in Table 4.7. Again, the columns contain the estimated marginal effects at the means and the associated standard errors. The probability of a parent household reporting a positive likelihood of

leaving a bequest is measured for three bequest sizes: a bequest of any magnitude; of EUR 50,000 or over; or of EUR 150,000 or more). Only data from Wave 2 can be used for the bequest analysis because the questions were not included in the Wave 1 questionnaire. The estimated marginal effects associated with the help indicator are statistically insignificant in all of the bequest model specifications.[28] The control variable marginal effects are largely of the same sign as in the *inter vivos* transfer models; however, the statistical significance is generally lower in the case of the children's characteristics but stronger in the case of the parental characteristics. The lack of significance of children's characteristics may be linked to the uncertainty associated with future events, such as unexpected medical expenses and the uncertainty about longevity. The coefficient estimates of the parental house ownership indicator have very small standard errors. This is potentially linked to the finding that most parents report a very high probability of leaving a bequest, which may be an indication of the high rate of house ownership in Ireland. Few older people in Ireland sell property in order to finance consumption in old age and are therefore likely to expect to bequeath the family home.[29]

As discussed above, McGarry (1999) and Bernheim and Severinov (2003) develop theories which allow for *inter vivos* transfers and bequests to have heterogeneous determinants. McGarry (1999) expects *inter vivos* transfer and bequest giving to be driven by different motives because, depending on the situation, one mode of transfer may be preferred over the other. As a contribution to the existing literature, this Chapter examines *inter vivos* transfer size groups separately. The evidence of the exchange motive only being present in small *inter vivos* transfers is consistent with these predictions: large *inter vivos* transfers resemble bequests more than small transfers do. The larger the individual transfer, the more difficult it is to conceal from the recipient's siblings and the fewer possibilities the parent has to adjust the transfer to reflect the quality or quantity of the child's service.

The bequest expectation questions are perhaps not interpreted by the respondents as planned transfers to children at the end of life but may to some extent incorporate the perceived uncertainties about outcomes of events between now and end of life as well as the uncertainty about length of life itself. Whereas bequests can be accidental (arising from these uncertainties), *inter vivos* transfers are always intentional. Therefore, *inter vivos* transfer data may be better suited to the examination of transfer motives.

[28] Alternative specifications presented in Table 4.12 of Appendix 4.A use a continuous variable measuring the total daily hours of help that the children provide. Again, the estimated effect of help on expected bequests is statistically insignificant.

[29] In the data used in this analysis, the home ownership rate increases with age in cross-sectional analysis of either wave (in Wave 2 data, 83 per cent of parent households where the average age of spouses is less than 60 are homeowners whereas the corresponding figure among the over 80-year-olds is 94). The home ownership rate remains virtually constant across waves.

Table 4.6: Probit models of T_{prob} for *inter vivos* transfers, marginal effects at mean

	Small transfer				Large transfer			
	(1) Wave 1		(2) Wave 2		(3) Wave 1		(4) Wave 2	
CHILDREN								
Any child provides help	0.11***	(0.03)	0.09***	(0.03)	0.05	(0.03)	0.03	(0.02)
Avg. age group								
Aged 30-39	-0.07	(0.06)	-0.07	(0.07)	0.11**	(0.05)	0.08*	(0.05)
Aged 40+	-0.10	(0.08)	-0.18**	(0.09)	-0.05	(0.07)	0.06	(0.05)
Avg. number of children	0.01	(0.02)	0.01	(0.02)	-0.06***	(0.02)	-0.02	(0.01)
Share female	0.02	(0.05)	0.03	(0.05)	0.02	(0.05)	0.03	(0.03)
Share with third level degree	-0.05	(0.05)	-0.10**	(0.05)	-0.03	(0.04)	0.01	(0.03)
Share owns home in W1	-0.07	(0.06)	-0.06	(0.06)	0.18***	(0.06)	-0.02	(0.04)
Share in same county as parents	0.05	(0.05)	0.11**	(0.05)	-0.02	(0.05)	-0.02	(0.03)
Share not working	-0.07*	(0.04)	0.01	(0.04)	0.02	(0.03)	0.00	(0.02)
Marital status								
Share married	-0.05	(0.08)	0.06	(0.07)	0.01	(0.07)	0.02	(0.04)
Share cohabiting	0.02	(0.08)	0.16*	(0.08)	-0.01	(0.08)	0.07	(0.05)
Share separ./divorced/widow	0.09	(0.08)	0.09	(0.08)	0.01	(0.08)	0.00	(0.05)
PARENTS								
Number of children	-0.01	(0.01)	-0.01	(0.01)	0.01	(0.01)	0.00	(0.01)
Homeowner household	0.08	(0.06)	0.10*	(0.05)	0.04	(0.06)	0.03	(0.04)
Spouses' avg. age	-0.00	(0.00)	-0.00	(0.00)	-0.00	(0.00)	-0.00	(0.00)
HH income (EUR 10,000s)	0.04	(0.03)	0.17**	(0.08)	0.11*	(0.06)	0.03	(0.03)
Avg. self-rated health								
Good	0.08	(0.05)	0.07	(0.05)	0.07	(0.05)	0.07**	(0.03)
Very good/excellent	0.14***	(0.05)	0.12**	(0.05)	0.08*	(0.04)	0.03	(0.03)
Avg. education level								
Secondary	0.09**	(0.04)	0.14***	(0.04)	0.07*	(0.04)	0.11***	(0.03)
Third level	0.18***	(0.05)	0.10*	(0.05)	0.22***	(0.04)	0.11***	(0.03)
Head of HH status								
Retired	-0.05	(0.05)	0.11**	(0.05)	0.06	(0.04)	0.03	(0.03)
Not working	-0.18***	(0.05)	0.05	(0.06)	-0.09	(0.05)	-0.04	(0.04)
Marital status								
Divorced/separated/single	-0.07	(0.05)	-0.01	(0.05)	-0.15***	(0.05)	-0.10***	(0.04)
Widow	-0.09**	(0.04)	-0.01	(0.04)	-0.03	(0.04)	-0.05**	(0.02)
Observations	1034		1035		1035		1035	
LogLikelihood	-626.51		-652.23		-534.13		-372.20	
Pchi2	0.00		0.00		0.00		0.00	
PseudoR2	0.09		0.06		0.14		0.10	

Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.
Dependent variable: 1 if household makes *inter vivos* transfers, 0 otherwise
Reference categories: Avg. age group: 18-29. Marital status: Share single. Avg. self-rated health: Poor/fair. Avg. education level: Primary/none. Head of HH status: Working. Marital status: Married/cohabiting.

Table 4.7: Probit models of T_{prob} for planned bequests, marginal effects at mean

	(1) Any bequest		(2) Bequest 50k+		(3) Bequest 150k+	
CHILDREN						
Any child provides help	0.01	(0.01)	-0.00	(0.02)	-0.05	(0.03)
Avg. age group						
Aged 30-39	-0.04	(0.02)	-0.03	(0.05)	0.01	(0.08)
Aged 40+	-0.03	(0.03)	-0.03	(0.06)	-0.06	(0.09)
Avg. number of children	0.00	(0.01)	-0.00	(0.01)	-0.03	(0.02)
Share female	0.03	(0.02)	0.01	(0.03)	0.00	(0.06)
Share with third level degree	0.02	(0.02)	0.04	(0.03)	0.02	(0.06)
Share owns home in W1	0.00	(0.02)	0.05	(0.04)	0.16**	(0.07)
Share in same county as parents	-0.02	(0.01)	-0.05*	(0.03)	-0.10**	(0.05)
Share not working	0.00	(0.01)	0.03	(0.02)	0.05	(0.04)
Marital status						
Share married	-0.01	(0.03)	-0.03	(0.05)	-0.05	(0.08)
Share cohabiting	-0.01	(0.03)	-0.03	(0.05)	-0.02	(0.09)
Share separ./divorced/widow	0.00	(0.03)	-0.11**	(0.04)	-0.04	(0.08)
PARENTS						
Number of children	-0.01**	(0.00)	-0.01*	(0.01)	-0.01	(0.01)
Homeowner household	0.13***	(0.02)	0.36***	(0.04)	0.67***	(0.08)
Spouses' avg. age	0.00*	(0.00)	0.00**	(0.00)	0.01***	(0.00)
HH income (EUR 10,000s)	0.17***	(0.05)	0.28***	(0.08)	0.54***	(0.12)
Avg. self-rated health						
Good	0.01	(0.01)	-0.02	(0.03)	0.07	(0.05)
Very good/excellent	0.04**	(0.02)	0.07**	(0.03)	0.11**	(0.05)
Avg. education level						
Secondary	-0.00	(0.01)	0.06**	(0.02)	0.18***	(0.04)
Third level	0.04**	(0.02)	0.11***	(0.03)	0.30***	(0.05)
Head of HH status						
Retired	0.00	(0.02)	-0.01	(0.03)	-0.07	(0.05)
Not working	0.01	(0.02)	0.02	(0.03)	-0.05	(0.06)
Marital status						
Divorced/separated/single	-0.01	(0.02)	-0.03	(0.03)	-0.12**	(0.06)
Widow	-0.01	(0.02)	0.00	(0.03)	-0.00	(0.04)
Observations	1035		1035		1035	
LogLikelihood	-210.56		-257.25		-451.18	
Pchi2	0.00		0.00		0.00	
PseudoR2	0.37		0.46		0.31	

Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

Dependent variable: 1 if parent household reports a positive probability of leaving a bequest, 0 otherwise

Reference categories: Avg. age group: 18-29. Marital status: Share single. Avg. self-rated health: Poor/fair. Avg. education level: Primary/none. Head of HH status: Working. Marital status: Married/cohabiting.

4.5.2 Cross-sectional models of transfer value

This part of the analysis focuses on the determinants of the total value of the *inter vivos* transfer (T_{value}).[30]

The estimated OLS regression model is defined as:

$$T_{value\ i} = \beta_0 + \beta_1 S_i + \beta_2 \mathbf{Y_{ki}} + \beta_3 \mathbf{K}_i + \beta_4 Y_{p\ i} + \beta_5 \mathbf{P}_i + b_i \tag{4.4}$$

where the explanatory variables are the same as in the probit model presented in Equation 4.3. The model is estimated for families who make transfers, i.e. $T_{value} > 0$.

The analysis of the determinants of T_{value} allows for conclusions to be drawn about the elasticity of demand for child help with respect to the implicit price of the service — the child's income. As explained in Section 4.2.1, a positive effect of Y_k (child income) on T_{value} can be interpreted as evidence of the exchange motive (whereas a negative effect is consistent with both exchange and altruism). The direction of the effect of S on T_{value} depends on whether the demand for child services is price elastic or inelastic.

The OLS coefficient estimates and standard errors are presented in Table 4.8, again for small *inter vivos* transfers in Columns 1 and 2 and for large transfers in Columns 3 and 4. In both waves, approximately 39 per cent of families reported making small *inter vivos* transfers. Therefore, the sample size in the models presented in Columns 1 and 2 is slightly above 400. As fewer families make large *inter vivos* transfers, the sample size of the last two models is 296 and 141, respectively.

The estimated effect of child-provided help (S) on T_{value} is negative and statistically insignificant in nearly all of the specifications, with the exception of Model 3 in which the estimate is positive but also statistically insignificant.[31] This general result is consistent with Cox and Rank (1992) who also find a negative and statistically insignificant effect of child-provided services on the value of parental transfers. They interpret the finding to be consistent with the exchange model, assuming that the demand for child services is own-price inelastic. This finding indicates the lack of market substitutes for child-provided services. Considering that the measure of child services used in this analysis is the practical

[30] An analysis of the continuous measures of the percentage probability of leaving a bequest was also carried out. However, the results were largely similar to those of the probit bequest models with insignificant coefficient estimates associated with the child help variable.

[31] Alternative specifications presented in Table 4.13 of Appendix 4.A use a continuous measure of the total daily hours of help that the children provide. Again, the estimated effect of help is statistically insignificant.

help that children provide with household chores and paperwork — a relatively informal type of service — this finding is consistent with the predictions of the exchange model.

Although statistically insignificant, the positive coefficients related to the permanent income of the children (education and house ownership) are in line with the predictions of the exchange model. The majority of control variable coefficient estimates are also statistically insignificant, which may be an indication of measurement error in the dependent variable (Gujarati, 2003).

Table 4.8: OLS models of T_{value} for *inter vivos* transfers, conditional on $T_{value} > 0$

	Small transfer				Large transfer			
	(1) Wave 1		(2) Wave 2		(3) Wave 1		(4) Wave 2	
CHILDREN								
Any child provides help	-1.38	(1.01)	-4.86	(4.05)	19.57	(19.74)	-4.72	(5.39)
Avg. age group								
Aged 30-39	0.22	(0.89)	-2.53	(2.80)	2.94	(20.33)	3.49	(6.65)
Aged 40+	-2.00	(1.83)	-0.39	(1.74)	-17.53	(31.09)	-4.88	(11.42)
Avg. number of children	0.23	(0.76)	0.76	(0.57)	-23.81*	(13.10)	-9.14*	(4.93)
Share female	1.19	(1.53)	1.20	(1.32)	-39.66	(26.69)	-2.90	(9.27)
Share with third level degree	0.31	(1.30)	2.55	(3.07)	10.12	(18.43)	2.51	(6.55)
Share owns home in W1	2.34	(2.00)	5.75	(3.70)	29.45	(26.64)	20.46	(13.37)
Share in same county as parents	-1.91	(1.45)	1.93	(3.16)	-31.04*	(16.96)	7.46	(10.77)
Share not working	0.75	(1.85)	1.77	(1.44)	-24.94	(16.36)	-7.84	(5.84)
Marital status								
Share married	-1.34	(1.68)	-4.04	(3.03)	-42.28	(40.36)	1.17	(10.20)
Share cohabiting	-2.09	(2.34)	3.18	(4.10)	-35.46	(39.71)	9.66	(12.61)
Share separ./divorced/widow	-3.32	(2.23)	-4.18	(3.74)	131.58	(98.20)	9.56	(12.53)
PARENTS								
Number of children	0.31	(0.24)	3.91	(3.81)	6.79	(5.70)	2.98	(2.12)
Homeowner household	0.57	(1.08)	1.23	(1.15)	-85.77	(62.32)	-0.04	(7.31)
Spouses' avg. age	-0.00	(0.06)	0.06	(0.09)	3.07	(2.14)	0.52	(0.67)
HH income (EUR 10,000s)	1.65	(1.07)	0.53	(0.97)	0.79	(5.31)	-2.03	(5.55)
Avg. self-rated health								
Good	-0.88	(1.25)	3.21	(3.91)	-12.82	(28.16)	-12.49	(9.32)
Very good/excellent	-0.78	(1.65)	-2.23	(1.75)	-4.38	(26.86)	-9.72	(8.18)
Avg. education level								
Secondary	-0.51	(0.90)	1.00	(1.36)	-45.17	(28.11)	-4.17	(11.42)
Third level	0.56	(1.75)	0.71	(1.24)	-25.82	(29.11)	12.10	(11.93)
Head of HH status								
Retired	1.19	(1.88)	0.70	(1.08)	3.40	(20.89)	-0.67	(6.26)
Not working	-1.78**	(0.85)	0.43	(1.31)	-32.52	(28.72)	-6.89	(6.91)
Marital status								
Divorced/separated/single	-0.25	(1.58)	-0.37	(1.09)	-4.26	(21.98)	1.05	(7.02)
Widow	0.22	(1.00)	-3.95	(3.39)	15.60	(19.56)	1.46	(6.60)
Constant	2.05	(3.64)	-16.34	(17.01)	8.26	(122.84)	-19.68	(40.63)
Observations	403		406		296		141	
R^2	0.044		0.072		0.148		0.175	

Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.
Dependent variable: value of *inter vivos* transfers (EUR 1,000).
Reference categories: Avg. age group: 18-29. Marital status: Share single. Avg. self-rated health: Poor/fair. Avg. education level: Primary/none. Head of HH status: Working. Marital status: Married/cohabiting.

4.5.3 Issues of causality

In order to estimate the causal effect of help on transfers, two possible sources of endogeneity bias need to be accounted for. The first potential bias is caused by omitted variables,

which are correlated with both child-provided help and transfers, such as emotional closeness between the child and the parent. If a child and parent have a strong emotional bond, the child is more likely to provide help to the parent and the parent is more likely to make transfers to the child.

The TILDA survey contains a question about the number of their children that the respondents "feel very close to".[32] The emotional closeness measure is constructed by dividing the number of children the respondent reports feeling very close to by the total number of children they have. Virtually constant across the waves, on average the parents report that they feel very close to 91 per cent of their children (see Table 4.5.) The small *inter vivos* transfer probit (for T_{prob}) and OLS models (for T_{value}) were re-estimated using Wave 2 data[33] with the inclusion of the emotional closeness variable. The estimates are presented in Models 1 and 2 in Table 4.9. The results reveal no significant impact of the emotional closeness measure on transfer behaviour, and the coefficient estimate of child help remains unchanged.

In Wave 2, TILDA also measured the respondents' personality type. The "big five", a widely-used measure of personality, divides aspects of personality into five traits (extraversion, agreeableness, conscientiousness, emotional stability, and openness to experience) (Cobb-Clark and Schurer, 2012). The household head's score in relation to these five traits was included in the models of small *inter vivos* transfers. Model 3 of Table 4.9 presents the estimated marginal effects of the probit models of T_{prob}, whereas Model 4 contains the OLS estimates of T_{value}).[34] Again, the estimates are similar to the initial specifications with no significant change to the estimates of the effects of child help.

The second bias in the coefficient estimate may arise from reverse causality if the transfer decision and the help decision are made simultaneously. Norton and Van Houtvent (2006) suggest using a lagged value of child-provided services in cross-sectional analysis to account for the simultaneity bias.[35] The Wave 2 *inter vivos* transfer models of T_{prob} and T_{value} were re-estimated with the inclusion of the lagged value of child-provided help. The estimates of these specifications are presented in Models 5 and 6 of Table 4.9. The results are robust to this specification, with the sign of the OLS coefficient on child help now positive but still not significantly different from zero.

[32] The question is worded: *"How many of your children do you feel very close to?"*.

[33] The estimates using Wave 1 data are virtually the same as the Wave 1 models of Tables 4.6 and 4.8.

[34] As well as including the personality variables together, the models were also re-estimated with each personality measure included individually. The findings were virtually identical to the ones presented here.

[35] In addition to estimating fixed effects models and using lagged values of caregiving, Norton and Van Houtvent (2006) also use instrumental variables. However, they acknowledge that valid instruments for caregiving are difficult to find and conclude that the fixed effects model is their preferred specification.

Overall, the findings presented in Table 4.9 go some way towards alleviating the concerns about biases in the estimate of effect of help on transfer behaviour. The following section makes use of the panel structure of the TILDA data to further examine the causal effect of child help on transfers.

Fixed effects analysis

To address the endogeneity concerns in a more robust manner, a fixed effects estimation is adopted. A fixed effects logit model is estimated by conditional maximum likelihood (Chamberlain, 1980). The models can only be estimated for families for whom the transfer status changes between periods (n=330).[36] In addition, the effects of time-invariant variables can not be estimated with fixed effects specifications.[37]

Equation 4.5 shows the cross-sectional logit model of the probability that a family makes small *inter vivos* transfers:

$$T_{prob\ it} = f(\gamma_0 + \gamma_1 S_{it} + \gamma_2 \mathbf{Y_k}_{it} + \gamma_3 \mathbf{K}_{it} + \gamma_4 Y_{p\ it} + \gamma_5 \mathbf{P}_{it} + c_{it} + d_i) \tag{4.5}$$

where $f(.)$ is the logistic cumulative distribution function. The error term is divided into two components: a time-varying error (c_{it}) and a time-invariant error (d_i). The fixed effects estimation controls for the effects of the time-invariant unobservable factors captured in d_i. These factors are likely to include unobserved characteristics such as personality traits and risk aversion that may be correlated with transfers and help. Also, observed events such as retirement, changes in health status, change of children's location, etc. are controlled for in the covariate vectors.

The analysis using first-differenced data is restricted to small (EUR 250 to EUR 5,000 in value) *inter vivos* transfers because the time over which transfers are recorded is not consistent across waves for the large transfers. Also, expected bequests can not be modelled using first-differenced data because the bequest data is only available for Wave 2.

Table 4.10 presents the estimates of the fixed effects logit models. All of the estimated coefficient of the model which measures child help using a dummy indicator (Model 1) are

[36] In the two-wave panel case, the fixed effects logit is equivalent to a binary logit model with the change in the regressors between waves as the explanatory variables and the change in the outcome as the dependent variable (Verbeek, 2008). The dependent variable equals 1 if a family didn't make transfers in Wave 1 but made them in Wave 2, and equals 0 if the family made transfers in Wave 1 but didn't make them in Wave 2.

[37] The time-invariant variables dropped from the analysis are the number of children that the respondents' children have, the gender of the children, the children's house ownership, the number of children, the parents' education and the parents' marital status.

statically insignificant. This may be expected in a fixed effects model with only two time periods and in which both of the dummy dependent variable and the main independent dummy variable have little variation. For approximately 70 per cent of the families, the help indicator does not vary across time. The specification presented in Model 2 uses a continuous measure of the hours of help provided, and the associated coefficient estimate is statistically significant at the 10 per cent level.

The findings of the analysis presented in this Chapter indicate that parents make small *inter vivos* transfers to their children in exchange for help. The implications of the existence of the exchange motive on public policy depends on the availability of market substitutes for the services that are traded within families. The findings of the effect of child help on transfer value indicate that the demand for child services is own-price inelastic, suggesting that there are no market substitutes for child-provided services. Considering that the child-provided help measure is relatively informal in nature (the practical help that children provide with household chores and paperwork), this finding is in line with the predictions of the exchange model of intergenerational transfers.

The findings of this research have implications for many public policies, many of which are of particular importance to countries with ageing populations. The motives driving intergenerational transfers affect the outcomes of policies which include the public provision of care to older people, public income redistribution between generations, and the taxation of *inter vivos* transfers and bequests. If there is an increase to publicly provided care to older people, and if this displaces care that was previously provided within families, the resulting effect on intergenerational transfers (if any) depends on whether these services are traded within families in exchange for money or not. In addition, if services are traded within a family, and an increase in the public provision of these services decreases parental demand for these services, the likelihood of a transfer from parent to child decreases but the value of the remaining transfers may increase or decrease, depending on the own-price elasticity of demand for these services. Therefore, differentiating between formal (such as nursing care) and informal (such as companionship) care that children provide to their older parents is important when predicting the likely outcomes of any changes to public provision of care services.

The effect of changes to public income redistribution between generations also depends on the motives that drive financial transfers within families. As explained in Section 4.2, resources are pooled within families if transfers are motivated by altruism. Therefore, in the case of altruism, a public transfer is counteracted by a private transfer in the opposite direction. However, if transfers are motivated by exchange, a private transfer may not cancel out the public one. Indeed, the public transfer may be reinforced by further private transfers if the demand for child-provided services is own-price inelastic.

The outcomes of changes to the taxation of *inter vivos* transfers and bequests also depend on the motivation behind within-family transfers. The relative tax treatment of *inter vivos* transfers and bequests may only affect the timing of wealth transfer between generations if intergenerational transfers are motivated by altruism. However, if transfers are driven by exchange, taxation of intergenerational transfers may reduce parental demand for child-provided services, therefore increasing demand for public provision of care.

Table 4.9: Models of small *inter vivos* transfers (T_{prob} and T_{value}) in Wave 2 (with additional covariates)

	Emotional Closeness				Personality				Lagged help			
	(1) Probit mfx		(2) OLS		(3) Probit mfx		(4) OLS		(5) Probit mfx		(6) OLS	
Share of children emotionally close to	-0.001	(0.074)	3.263	(3.377)								
Parental personality												
Neuroticism					0.001	(0.003)	0.073	(0.093)				
Extraversion					0.001	(0.004)	0.018	(0.060)				
Openness					-0.000	(0.003)	-0.069	(0.087)				
Agreeableness					0.003	(0.004)	0.047	(0.072)				
Conscientiousness					0.001	(0.004)	0.013	(0.037)				
CHILDREN												
Any child provides help (lagged)									0.091***	(0.034)	0.472	(1.128)
Any child provides help	0.093***	(0.034)	-4.812	(4.012)	0.087**	(0.040)	-0.657	(0.591)				
Avg. age group												
Aged 30-39	-0.068	(0.071)	-2.636	(2.887)	-0.039	(0.080)	-0.093	(0.520)	-0.070	(0.070)	-3.004	(3.165)
Aged 40+	-0.183**	(0.086)	-0.344	(1.773)	-0.178*	(0.097)	-1.224	(1.078)	-0.185**	(0.085)	-0.941	(1.594)
Avg. number of children	0.009	(0.022)	0.690	(0.554)	0.031	(0.027)	0.819	(0.610)	0.011	(0.022)	0.522	(0.545)
Share female	0.025	(0.054)	1.081	(1.273)	-0.013	(0.062)	0.721	(0.723)	0.022	(0.053)	0.724	(1.106)
Share with third level degree	-0.095*	(0.049)	2.418	(2.966)	-0.090*	(0.054)	-0.663	(0.550)	-0.101**	(0.048)	3.122	(3.532)
Share owns home in W1	-0.062	(0.062)	5.918	(3.839)	-0.056	(0.070)	2.601*	(1.509)	-0.058	(0.062)	5.441	(3.549)
Share in same county as parents	0.112**	(0.047)	1.892	(3.134)	0.128**	(0.055)	-1.005	(0.922)	0.108**	(0.047)	1.390	(2.659)
Share not working	0.009	(0.036)	1.611	(1.347)	0.045	(0.041)	0.862	(0.984)	0.010	(0.036)	1.829	(1.476)
Marital status												
Share married	0.064	(0.073)	-4.270	(3.185)	0.023	(0.084)	-2.298	(1.859)	0.057	(0.073)	-3.781	(2.923)
Share cohabiting	0.156*	(0.083)	3.135	(4.072)	0.110	(0.095)	-0.401	(1.648)	0.157*	(0.083)	2.443	(3.634)
Share separ./divorced/widow	0.085	(0.080)	-4.143	(3.701)	0.111	(0.101)	-1.077	(1.651)	0.085	(0.080)	-3.606	(3.274)
PARENTS												
Number of children	-0.013	(0.010)	3.919	(3.816)	-0.013	(0.011)	-0.097	(0.271)	-0.015	(0.010)	3.736	(3.665)
Homeowner household	0.100*	(0.055)	0.862	(1.067)	0.109*	(0.064)	0.914	(0.580)	0.095*	(0.055)	0.418	(0.960)
Spouses' avg. age	-0.001	(0.003)	0.063	(0.093)	-0.002	(0.004)	-0.007	(0.036)	-0.001	(0.003)	0.025	(0.076)
HH income (EUR 10,000s)	0.168**	(0.078)	0.524	(0.968)	0.170**	(0.086)	0.006	(1.002)	0.162**	(0.078)	0.407	(0.927)
Avg. self-rated health												
Good	0.073	(0.050)	3.098	(3.824)	-0.004	(0.060)	-0.543	(0.574)	0.074	(0.050)	3.830	(4.408)
Very good/excellent	0.117**	(0.048)	-2.329	(1.812)	0.054	(0.058)	-0.838	(0.885)	0.124***	(0.048)	-2.013	(1.603)
Avg. education level												
Secondary	0.137***	(0.043)	0.999	(1.365)	0.155***	(0.051)	0.178	(0.450)	0.128***	(0.042)	1.230	(1.427)
Third level	0.095*	(0.049)	0.772	(1.242)	0.118**	(0.058)	1.010	(0.710)	0.087*	(0.049)	1.700	(1.381)
Head of HH status												
Retired	0.107**	(0.046)	0.851	(1.136)	0.137**	(0.054)	0.498	(0.929)	0.101**	(0.045)	1.461	(1.414)
Not working	0.053	(0.057)	0.542	(1.384)	0.071	(0.067)	-0.749	(0.626)	0.047	(0.057)	0.589	(1.349)
Marital status												
Divorced/separated/single	-0.004	(0.055)	-0.241	(1.138)	-0.005	(0.064)	-0.816	(0.848)	-0.006	(0.055)	-0.868	(1.073)
Widow	-0.014	(0.040)	-3.880	(3.335)	0.031	(0.047)	-0.408	(0.483)	-0.012	(0.041)	-4.795	(4.111)
Constant			-18.974	(19.290)			-0.591	(3.310)			-14.490	(15.566)
Observations	1034		406		803		326		1035		406	
R^2			0.072				0.056				0.064	
LogLikelihood	-651.754				-511.019				-652.238			
Pchi2	0.000				0.000				0.000			
PseudoR2	0.059				0.058				0.059			

Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.
Dependent variable in Models 1, 3 and 5: 1 if household makes small *inter vivos* transfers, 0 otherwise
Dependent variable in Models 2, 4 and 6: value of small *inter vivos* transfers (EUR 1,000).
Reference categories: Avg. age group: 18-29. Marital status: Share single. Avg. self-rated health: Poor/fair. Avg. education level: Primary/none. Head of HH status: Working. Marital status: Married/cohabiting.

Table 4.10: Fixed effects Logit (T_{prob})

	(1) FE Logit		(2) FE Logit	
CHILDREN				
Any child provides help	0.106	(0.204)		
Daily hours help provided			0.366*	(0.210)
Avg. age group				
Aged 30-39	-0.584	(0.467)	-0.590	(0.470)
Aged 40+	-0.484	(0.617)	-0.505	(0.620)
Share with third level degree	0.382	(0.583)	0.371	(0.582)
Share in same county as parents	-0.696	(0.631)	-0.714	(0.632)
Share not working	-0.065	(0.343)	-0.120	(0.347)
Marital status				
Share married	1.598	(1.034)	1.618	(1.040)
Share cohabiting	0.333	(0.887)	0.323	(0.888)
Share separ./divorced/widow	1.194	(1.128)	1.253	(1.142)
Homeowner household	0.142	(0.626)	0.102	(0.629)
Spouses' avg. age	0.019	(0.061)	0.010	(0.061)
HH income (EUR 10,000s)	0.612	(0.423)	0.596	(0.420)
Avg. self-rated health				
Good	-0.034	(0.307)	-0.004	(0.308)
Very good/excellent	0.291	(0.382)	0.315	(0.383)
Head of HH status				
Retired	0.208	(0.369)	0.192	(0.369)
Not working	-0.043	(0.404)	-0.035	(0.402)
Observations	660		660	

Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.
Reference categories: Avg. age group: 18-29. Marital status: Share single. Avg. self-rated health: Poor/fair. Head of HH status: Working.

4.6 Conclusion

Demographic changes in many countries have raised concerns about the provision of income and care for older people. Intergenerational transfers play a major role in the income, saving and investment profiles of families. It is important to understand the motivations behind intergenerational transfers because the effectiveness and implications of policies such as bequest taxation, gift taxation, pension policy and publicly provided care to the elderly are influenced by motives of within-family transfers.

This chapter examines the presence of the exchange motive in intergenerational monetary transfers. The aim of the analysis is to estimate the causal effect of child-provided services on the probability of transfers being made within a family. The findings suggest a causal relationship between care-giving provided by adult children and the *inter vivos* transfers that parents make to their children.

Summarising the findings presented in this chapter, the cross sectional analysis reveals a positive correlation between children providing help to the parents and the likelihood of the

parents making small *inter vivos* transfers to their children. The estimated marginal effect suggest that a family where at least one child provides help to the parents is 11 percentage points more likely to make *inter vivos* transfers from parents to children, compared to a family where no children provide help.

The correlation between help and transfers is a necessary condition for the exchange motive to exist, but the result can not be interpreted as evidence against the altruism motive in intergenerational transfers because this finding is also consistent with two-way altruism. In order to estimate a causal effect, endogeneity caused by omitted variables and reverse causality are addressed by including control variables measuring parental personality and emotional closeness between parent and child. In addition, the lagged value of child help is included in the models. The estimated effect of help remains significant and virtually of the same magnitude across the specifications. In an analysis of first-differenced data which addresses endogeneity issues further, the effect is statistically significant at the 10 per cent level. These findings provide evidence of the existence of the exchange motive in the *inter vivos* transfer behaviour of families with non-resident adult children.

The relationship between child-provided help and the probability of a family making large *inter vivos* transfers is not statistically significant. Also, there is no evidence of a correlation between help and expected bequests. The heterogeneity in the effect of child services on transfers depending on the *inter vivos* transfer size group is a novel finding of this analysis. The evidence of the exchange motive only being present in small *inter vivos* transfers is consistent with the predictions of McGarry (1999) and Bernheim and Severinov (2003) who suggest that the larger the transfer is, the more difficult it is to conceal from the recipient's siblings. In addition, in the case of large infrequent transfers, the parent has fewer possibilities to make adjustments to the transfer in response to the service provided by the child. As large *inter vivos* transfers resemble bequests with regard to these characteristics, the findings of this research are consistent with these theoretical predictions.

In order to provide evidence of the own-price elasticity of demand for child services, the analysis in this chapter includes the estimation of the effect that child-provided help has on the value of transfers. The effect of child-provided services on the total value of transfers is statistically insignificant in cross-sectional analysis — a finding also reported by Cox and Rank (1992). The non-positive coefficient estimate suggests that the demand for child services is own-price inelastic, which indicates the non-availability of substitutes for the help that children provide to their parents with household chores and paperwork. Considering the relatively informal nature of these services, this finding is not surprising.

Depending on what motivates intergenerational transfers, changes to public income distribution between cohorts may either be counteracted or reinforced by private flows of

monetary transfers (Cox, 1987; Cox and Rank, 1992). In the case of the exchange motive driving intergenerational transfers and child-provided services having few market substitutes, a public redistribution of income from the parent to the child generation is expected to increase the value of transfers from parents to children.

Also, the effectiveness of public provision of care to older people depends on how much of private care-giving would be displaced by it. If there are no market substitutes for the services that children provide, an increase in the public provision of services to the parents does not decrease within-family service provision.

Appendix to Chapter 4

4.A Continuous measure of help (hours per day)

Table 4.11: Probit models of T_{prob} using help hours, marginal effects at mean

	Small transfer				Large transfer			
	(1) Wave 1		(2) Wave 2		(3) Wave 1		(4) Wave 2	
CHILDREN								
Daily hours help provided	0.15***	(0.04)	0.04	(0.03)	0.02	(0.03)	-0.01	(0.02)
Avg. age group								
Aged 30-39	-0.08	(0.06)	-0.07	(0.07)	0.10*	(0.05)	0.08*	(0.05)
Aged 40+	-0.11	(0.08)	-0.19**	(0.09)	-0.05	(0.07)	0.06	(0.05)
Avg. number of children	0.01	(0.02)	0.01	(0.02)	-0.06***	(0.02)	-0.02	(0.01)
Share female	0.01	(0.05)	0.03	(0.05)	0.02	(0.05)	0.03	(0.03)
Share with third level degree	-0.05	(0.05)	-0.11**	(0.05)	-0.03	(0.04)	0.01	(0.03)
Share owns home in W1	-0.08	(0.06)	-0.06	(0.06)	0.18***	(0.06)	-0.02	(0.04)
Share in same county as parents	0.06	(0.05)	0.12***	(0.05)	-0.01	(0.05)	-0.01	(0.03)
Share not working	-0.08**	(0.04)	0.01	(0.04)	0.01	(0.03)	0.00	(0.02)
Marital status								
Share married	-0.05	(0.08)	0.06	(0.07)	0.02	(0.07)	0.02	(0.04)
Share cohabiting	0.02	(0.08)	0.16*	(0.08)	-0.01	(0.08)	0.08	(0.05)
Share separ./divorced/widow	0.10	(0.08)	0.07	(0.08)	0.01	(0.08)	-0.00	(0.05)
PARENTS								
Number of children	-0.01	(0.01)	-0.01	(0.01)	0.01	(0.01)	0.00	(0.01)
Homeowner household	0.09	(0.06)	0.10*	(0.05)	0.04	(0.06)	0.03	(0.04)
Spouses' avg. age	-0.00	(0.00)	-0.00	(0.00)	-0.00	(0.00)	0.00	(0.00)
HH income (EUR 10,000s)	0.04	(0.04)	0.17**	(0.08)	0.11*	(0.06)	0.03	(0.03)
Avg. self-rated health								
Good	0.08	(0.05)	0.07	(0.05)	0.07	(0.05)	0.07**	(0.03)
Very good/excellent	0.14***	(0.05)	0.12**	(0.05)	0.08*	(0.04)	0.03	(0.03)
Avg. education level								
Secondary	0.10**	(0.04)	0.13***	(0.04)	0.07*	(0.04)	0.10***	(0.03)
Third level	0.19***	(0.05)	0.09*	(0.05)	0.22***	(0.04)	0.11***	(0.03)
Head of HH status								
Retired	-0.05	(0.05)	0.10**	(0.05)	0.05	(0.04)	0.02	(0.03)
Not working	-0.18***	(0.06)	0.05	(0.06)	-0.09*	(0.05)	-0.05	(0.04)
Marital status								
Divorced/separated/single	-0.06	(0.05)	-0.00	(0.05)	-0.15***	(0.05)	-0.10**	(0.04)
Widow	-0.09**	(0.04)	-0.00	(0.04)	-0.03	(0.04)	-0.05**	(0.02)
Observations	1034		1035		1035		1035	
LogLikelihood	-622.13		-654.89		-534.93		-373.10	
Pchi2	0.00		0.00		0.00		0.00	
PseudoR2	0.10		0.06		0.14		0.09	

Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.
Dependent variable: 1 if household makes *inter vivos* transfers, 0 otherwise
Reference categories: Avg. age group: 18-29. Marital status: Share single. Avg. self-rated health: Poor/fair. Avg. education level: Primary/none. Head of HH status: Working. Marital status: Married/cohabiting.

Table 4.12: Probit models of T_{prob} for planned bequests (marginal effects at mean), using help hours

	(1) Any bequest		(2) Bequest 50k+		(3) Bequest 150k+	
CHILDREN						
Daily hours help provided	0.01	(0.01)	0.01	(0.02)	0.02	(0.02)
Avg. age group						
Aged 30-39	-0.04	(0.02)	-0.03	(0.05)	0.02	(0.08)
Aged 40+	-0.03	(0.03)	-0.03	(0.06)	-0.06	(0.09)
Avg. number of children	0.00	(0.01)	-0.00	(0.01)	-0.04	(0.02)
Share female	0.03	(0.02)	0.01	(0.03)	0.00	(0.06)
Share with third level degree	0.02	(0.02)	0.04	(0.03)	0.02	(0.06)
Share owns home in W1	0.00	(0.02)	0.05	(0.04)	0.16**	(0.07)
Share in same county as parents	-0.01	(0.01)	-0.05*	(0.03)	-0.11**	(0.05)
Share not working	0.00	(0.01)	0.03	(0.02)	0.05	(0.04)
Marital status						
Share married	-0.01	(0.03)	-0.03	(0.05)	-0.04	(0.08)
Share cohabiting	-0.01	(0.03)	-0.03	(0.05)	-0.02	(0.09)
Share separ./divorced/widow	-0.00	(0.03)	-0.10**	(0.04)	-0.02	(0.08)
PARENTS						
Number of children	-0.01**	(0.00)	-0.01*	(0.01)	-0.01	(0.01)
Homeowner household	0.13***	(0.02)	0.36***	(0.04)	0.67***	(0.08)
Spouses' avg. age	0.00*	(0.00)	0.00**	(0.00)	0.01***	(0.00)
HH income (EUR 10,000s)	0.17***	(0.05)	0.27***	(0.08)	0.52***	(0.12)
Avg. self-rated health						
Good	0.01	(0.01)	-0.02	(0.03)	0.07	(0.05)
Very good/excellent	0.04**	(0.02)	0.06**	(0.03)	0.11**	(0.05)
Avg. education level						
Secondary	-0.00	(0.01)	0.06**	(0.02)	0.19***	(0.04)
Third level	0.04**	(0.02)	0.11***	(0.03)	0.32***	(0.05)
Head of HH status						
Retired	0.00	(0.02)	-0.01	(0.03)	-0.07	(0.05)
Not working	0.01	(0.02)	0.02	(0.03)	-0.05	(0.06)
Marital status						
Divorced/separated/single	-0.01	(0.02)	-0.03	(0.03)	-0.12**	(0.06)
Widow	-0.01	(0.01)	0.00	(0.03)	-0.01	(0.04)
Observations	1035		1035		1035	
LogLikelihood	-210.63		-257.01		-451.72	
Pchi2	0.00		0.00		0.00	
PseudoR2	0.37		0.46		0.31	

Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

Dependent variable: 1 if household plans to leave a bequest with a positive probability, 0 otherwise

Reference categories: Avg. age group: 18-29. Marital status: Share single. Avg. self-rated health: Poor/fair. Avg. education level: Primary/none. Head of HH status: Working. Marital status: Married/cohabiting.

Table 4.13: OLS models of T_{value} for *inter vivos* transfers conditional on $T_{value} > 0$, using help hours

	Small transfer				Large transfer			
	(1) Wave 1		(2) Wave 2		(3) Wave 1		(4) Wave 2	
CHILDREN								
Daily hours help provided	-0.39	(0.46)	-1.77	(1.66)	23.44	(17.18)	-2.55	(12.07)
Avg. age group								
Aged 30-39	0.26	(0.91)	-3.12	(3.25)	0.22	(19.74)	2.94	(6.40)
Aged 40+	-2.12	(1.89)	-1.28	(1.59)	-21.41	(31.45)	-5.90	(11.01)
Avg. number of children	0.25	(0.76)	0.60	(0.54)	-24.38*	(13.28)	-9.10*	(5.06)
Share female	1.21	(1.54)	0.64	(1.10)	-38.61	(26.91)	-3.32	(8.74)
Share with third level degree	0.57	(1.28)	2.94	(3.37)	9.63	(18.05)	2.39	(6.62)
Share owns home in W1	2.45	(2.05)	5.18	(3.34)	30.44	(26.65)	20.58	(13.61)
Share in same county as parents	-2.22	(1.58)	1.37	(2.75)	-26.55	(16.44)	6.92	(10.71)
Share not working	0.84	(1.90)	1.92	(1.54)	-26.98	(16.40)	-7.29	(5.79)
Marital status								
Share married	-1.55	(1.79)	-3.59	(2.79)	-37.74	(38.04)	1.69	(10.20)
Share cohabiting	-2.37	(2.50)	2.83	(3.90)	-31.38	(39.22)	9.52	(12.88)
Share separ./divorced/widow	-3.03	(2.10)	-3.46	(3.21)	134.38	(98.85)	10.38	(12.23)
PARENTS								
Number of children	0.28	(0.24)	3.78	(3.72)	6.68	(5.64)	2.93	(2.15)
Homeowner household	0.57	(1.08)	0.48	(0.93)	-86.47	(62.70)	0.07	(7.16)
Spouses' avg. age	-0.00	(0.06)	0.07	(0.10)	3.22	(2.20)	0.51	(0.67)
HH income (EUR 10,000s)	1.65	(1.07)	0.49	(0.97)	0.03	(5.89)	-2.35	(5.33)
Avg. self-rated health								
Good	-0.78	(1.26)	3.86	(4.42)	-12.87	(28.37)	-11.02	(8.89)
Very good/excellent	-0.62	(1.58)	-1.98	(1.59)	-2.77	(26.44)	-8.50	(7.80)
Avg. education level								
Secondary	-0.60	(0.95)	0.91	(1.30)	-48.12*	(29.05)	-3.73	(11.53)
Third level	0.49	(1.79)	1.23	(1.23)	-27.58	(29.84)	12.81	(11.79)
Head of HH status								
Retired	1.34	(1.93)	0.86	(1.11)	-0.17	(19.68)	-0.41	(5.94)
Not working	-1.60*	(0.86)	0.44	(1.29)	-35.18	(28.69)	-7.04	(6.92)
Marital status								
Divorced/separated/single	-0.12	(1.60)	-1.06	(1.09)	-3.97	(21.83)	0.56	(7.07)
Widow	0.13	(1.04)	-4.83	(4.10)	15.82	(19.69)	0.92	(6.79)
Constant	1.74	(3.53)	-16.46	(17.19)	6.50	(123.47)	-21.56	(40.89)
Observations	403		406		296		141	
R^2	0.042		0.066		0.149		0.170	

Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.
Dependent variable: value of *inter vivos* transfers a family makes (EUR 1,000)
Reference categories: Avg. age group: 18-29. Marital status: Share single. Avg. self-rated health: Poor/fair. Avg. education level: Primary/none. Head of HH status: Working. Marital status: Married/cohabiting.

4.B Gifts and bequests in Ireland

4.B.1 Capital Acquisitions Tax

In Ireland, Capital Acquisitions Tax (CAT) is payable on gifts and bequests. Gifts include transfers of cash, valuables, property, and financial assets. There are three tax-exemption thresholds, depending on the relationship between the donor and the recipient. The thresholds can be reached either by a single gift or by a series of gifts over a longer time period. Both the tax-exemption thresholds and the CAT rate payable on the balance have changed between the collection of Wave 1 and Wave 2 of TILDA data, as is apparent in Table 4.14.

Table 4.14: CAT exempt thresholds for gift tax by donor group type, and CAT rate due on the balance

	Relationship to Donor			
	Son/Daughter	Brother/Sister/ Niece/Nephew/ Grandchild/Parent	Other	CAT rate on balance
8/4/2009 - 31/12/2009	EUR 434,000	EUR 43,400	EUR 21,700	25
1/1/2010 - 7/12/2010	EUR 414,799	EUR 41,481	EUR 20,740	25
8/12/2010 - 31/12/2010	EUR 332,084	EUR 33,208	EUR 16,604	25
1/1/2011 - 6/12/2011	EUR 332,084	EUR 33,208	EUR 16,604	25
7/12/2011 - 5/12/2012	EUR 250,000	EUR 33,500	EUR 16,750	30
6/12/2012 onwards	EUR 225,000	EUR 30,150	EUR 15,075	33

The main exemptions from CAT are:

- the first EUR 3,000 of all gifts taken by a recipient from one donor in any calendar year (does not apply to bequests).[38]
- a gift between spouses or civil partners.
- 90 per cent of the value of a family business (or farm) is exempt from CAT when transferring it to a lineal descendant (child, grandchild, great-grandchild, etc.) if the descendant qualifies as working in the family business (or farm).

[38] Under certain conditions, property in which the recipient has been residing may also be gifted without gift tax liability. However, the analysis in this chapter focuses on households with non-resident children only, and the TILDA dataset does not contain information about whether any non-resident children are residing in properties owned by their parents.

4.B.2 Division of bequests

When a person dies, everything they owned is referred to as the deceased's estate. After payment of debts and taxes, the estate is divided among the beneficiaries in accordance with the deceased's will, or as per the details set in the Succession Act of 1965 (The Office of the Attorney General, 1965).

If there is a will

In Ireland in general, people can divide their estate freely, however the Succession Act set certain legal rights of spouses (and civil partners) and children. The spouse (or civil partner) is legally entitled to 1/2 of the estate if there are no children, and to 1/3 of the estate if there are children. Children do not have any absolute right to inherit their parent's estate. However, a child may appeal if they feel that they have not been adequately provided for.

If there is no will

If the deceased had no will, the estate is divided among the closest relatives in accordance with rules set out in the Succession Act. Some of the details of the Act are that if the deceased has:

- a surviving spouse (or civil partner) but no children: spouse inherits the estate
- surviving children (or their lineal descendants) but no surviving spouse (or civil partner): children inherit the estate
- both a spouse (or civil partner) and children: the spouse inherits 2/3, and the children (or their descendants if the children have deceased) inherit 1/3 of the estate
- neither a surviving spouse (or civil partner) nor lineal descendants: the estate is divided between either the deceased's parents, brothers and sisters, nephews and nieces, closer living relatives, or next of kin, depending on who exist
- no relatives: the estate goes to the State

Chapter 5

Conclusion

This thesis consists of three core chapters which contain empirical analyses of financial decision-making among older people. The chapters focus on pension coverage, retirees' incomes and replacement rates, subjective life expectancy and its effect on wealth and the exchange motive in intergenerational transfers from parents to their adult children. The data used in the examination of these topics come from the first two waves of The Irish Longitudinal Study on Ageing (TILDA), a recent study of a representative sample of older people living in Ireland.

The first analysis focuses on current Irish retirees' incomes, supplementary pension coverage and retirement income replacement rates, developing an insight into the structure of the incomes of Ireland's retirees. The purpose of the analysis is to examine how the pension system has shaped the incomes of those who have now left the labour force.

With regard to retirees' incomes, the analysis reveals the crucial role that supplementary pensions play in retirement income provision in Ireland, due to the virtually flat rates of payment of State welfare pensions. The exploration of factors that determine the likelihood of an individual receiving income from a supplementary pension reveals that former public sector employees are significantly more likely to be covered than former private sector workers. Focusing on retirees who have worked in the private sector before retirement, a multivariate analysis suggests that both work history and individual socio-economic characteristics are significant in explaining supplementary pension coverage. Individuals with low education levels, with no asset income, those who live outside Dublin and those previously employed in small firms or with short tenures in their last employment are less likely to receive income from a supplementary pension.

Concluding the first analysis, retirement income replacement rates are calculated using retrospective past earnings data. Two important features emerge from the analysis of these replacement rate data. Firstly, the structure of Ireland's pension system — the flat-rated State welfare pensions in particular — leads to a high degree of progressivity in the system: the average replacement rate falls continuously across the pre-retirement earnings

distribution. The rate of decline is faster among former private sector employees, compared to those employed in the public sector prior to retirement. Secondly, supplementary pensions add an earnings-related component to the overall pension system and insulate the post-retirement incomes of middle- and high-earners to some degree.

The second topic of analysis in this thesis concerns the relationship between subjective life expectancy and saving behaviour. The empirical analysis examines whether higher subjective survival probability (SSP) leads to higher levels of wealth holdings among the pre-retirement older population. A narrow definition of wealth and the issue of reverse causality between survival beliefs and wealth are the two major concerns in the existing studies in this area. This research contributes to the literature by addressing both issues simultaneously. The analysis is carried out using a comprehensive measure of wealth which includes pension wealth. Parental mortality and smoking status are used as instruments for SSP to address the issues of reverse causality, measurement error and focal points in SSP responses.

The findings provide evidence of a causal link between survival beliefs and saving behaviour. The 2SLS estimates show a positive and statistically significant effect of subjective survival beliefs on the level of wealth: a 1 percentage point increase in the self-assessed probability of reaching age 75 increases an individual's financial wealth by approximately EUR 3,400. This effect corresponds to a 3.9 per cent increase at the mean wealth level. The 2SLS estimates also uncover a positive and statistically significant effect of SSP total wealth: a 1 percentage point increase in SSP leads to an increase of approximately EUR 6,200 for total wealth (a 1.7 per cent increase at the mean). The findings are robust to the exclusion of Defined Benefit and social welfare pension wealth from the dependent variable, to the exclusion of individuals who were orphaned relatively early, and to the exclusion of individuals with focal-point values for the SSP variable.

The success of policies that increase individual responsibility for saving for retirement depends partly on the ability of the individuals to make rational decisions which incorporate accurate assessments of future risks, including mortality risk. The findings of this analysis suggest that individual saving behaviour is rational in the sense that it responds to individual-level heterogeneity in survival probability.

The third and final analysis focuses on the exchange motive in intergenerational monetary transfers, modelling both current *inter vivos* transfers and planned future transfers via bequests. The identification strategy is to examine the causal effect of child-provided services on the probability of a transfer taking place. Cox and Rank (1992) suggest this approach but it has rarely been implemented in empirical work. The measure of service is the practical help with household chores and paperwork that children provide to their parents.

In a cross-sectional analysis of the probability of parents making transfers, the effect of child-provided help is found to be positive and significant. The correlation between help and transfers is a necessary condition for the exchange motive to exist, but the result can not be interpreted as evidence against the altruism motive because this finding is also consistent with two-way altruism. In order to estimate a causal effect of child-provided help on the probability of a family making transfers, endogeneity caused by omitted variables and reverse causality are addressed by adding control variables measuring parental personality and emotional closeness between parent and child. In addition, the lagged value of child help is included in the cross-sectional probit models. The estimated effect of help remains significant and virtually of the same magnitude across the specifications. In an analysis of first-differenced data which addresses endogeneity issues further, the effect is statistically significant at the 10 per cent level. These findings provide evidence of the existence of the exchange motive in *inter vivos* transfer behaviour of families with non-resident adult children.

The implications of the existence of the exchange motive for public policy depends on the availability of market substitutes for the services that are traded within families. The findings of this research imply that there is a lack of market substitutes for the child-provided services measured in this analysis. If there are no market substitutes, an increase in the public provision of services to the parent cohorts is not expected to decrease within-family exchange. In the case of the exchange motive combined with the lack of market substitutes for child-provided services, a public redistribution of income from the parent to the child generation is expected to increase the value of transfers from parents to children.

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Essays on the Income, Wealth and Family Transfers of the Older Generation

Sanna Eeva Nivakoski

Abstract

This thesis contains three empirical analyses that focus on financial decision-making among older people. The analyses use data from Waves 1 and 2 of The Irish Longitudinal Study on Ageing (TILDA). The first analysis focuses on current Irish retirees' incomes, pension coverage and retirement income replacement rates. Because of the virtually flat rates of payment of State welfare pensions, supplementary pensions play an important role in replacing labour earnings in retirement. Focusing on retirees who have worked in the private sector (where supplementary pensions are not mandatory), a multivariate analysis suggests that both work history and individual socio-economic characteristics are significant in explaining variation in supplementary pension coverage. An analysis of retirement income replacement rates reveals that because State welfare pension payment rates are not linked to earnings, the overall pension system appears highly progressive: replacement rates fall continuously across the pre-retirement earnings distribution, with the rate of decline fastest among former private sector employees. Supplementary pensions add an earnings-related component to the overall pension system and insulate post-retirement incomes of middle- and high-earners to some degree.

The second analysis tests a prediction of the life-cycle hypothesis that longer life expectancy should, *ceteris paribus*, lead to the accumulation of more wealth during working life to fund consumption in retirement. The question is examined by testing whether higher subjective survival probability — a proxy measure of self-assessed life expectancy — leads to higher levels of wealth holdings among the pre-retirement older population. Subjective survival probability is instrumented to address endogeneity arising from measurement error in subjective survival probability responses and reverse causality between survival beliefs and wealth. The findings suggest a positive and statistically significant effect of subjective survival probability on wealth — a 1 percentage point increase in the self-assessed probability of reaching age 75 increases an individual's financial wealth by approximately EUR 3,400, which corresponds to a 3.9 per cent increase at the mean, and total wealth (financial wealth and pension wealth) by approximately EUR 6,200, which corresponds to a 1.7 per cent increase at the mean. The results are robust to the exclusion of defined benefit and social welfare pensions (which are arguably computationally related to life expectancy).

The third analysis focuses on the exchange motive in intergenerational monetary transfers. The analysis incorporates data on current *inter vivos* transfers and planned future transfers via bequests. The analysis focuses on the causal effect of child-provided help on transfers among families with non-resident adult children. In a cross-sectional analysis of the probability of parents making transfers, the effect of help is found to be positive and significant with the strength of the relationship inversely related to the size of the transfer: the effect is only found for small (between EUR 250 and EUR 5,000) transfers whereas the effect is not statistically significant for large (above EUR 5,000) transfers. The correlation between help and transfers is a necessary but not a sufficient condition for the exchange motive to exist. Endogeneity concerns are addressed by the inclusion of usually unmeasured covariates and a lagged value of child help. The estimated effect of help on the probability of parents making small *inter vivos* transfers remains significant. In an analysis of first-differenced data which addresses endogeneity issues further, the effect is statistically significant at the 10 per cent level. The analysis of planned bequests reveals no effect of child-provided help. These findings support the theory that *inter vivos* transfers are better suited to exchange than bequests are, and therefore the two types of transfers are not driven by the same motives.

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