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Income Security Programmes and Retirement Behaviour in Ireland

Roman Raab and Brenda Gannon

Income Security Programmes and Retirement Behaviour in Ireland+

Roman Raab*   Brenda Gannon**

Abstract: This paper gives a first-time assessment of the interaction between income security programmes (public and private) and the labour force behaviour of older people in Ireland. Workers close to retirement age face a trade-off between earnings from continued work and benefit payments from income security programmes (public and private). Using the methodology portrayed in Gruber and Wise (1999), we simulate the long-term payoffs arising from these programmes, i.e. income security wealth, its accrual, and the tax on work for stylised cases in Ireland. We find that income security programmes in Ireland are an important feature of the opportunity set for older workers planning their retirement. Our results highlight the important variation in the Irish retirement system and hence it is difficult to draw general conclusions. Nonetheless, our results are innovative and an original contribution to pension policy in Ireland. Half the workforce depends on public old-age income provision only and we find that this system embeds important financial signals for early retirement. We find that people depending on public state pension only have incentives to retire, especially for low earners. For people who also have an occupational pension, the incentive to retire early is much stronger.

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1. Introduction

Most developed countries are experiencing an increasingly ageing population, while at the same time, older workers exit into retirement at an earlier age. Very often, a public pension system facilitates this trend into early retirement by providing financial incentives to retire early. Therefore, the current and future financial burden on public retirement systems has become one of the most discussed issues of modern welfare states.

In contributing to this important debate, our paper presents first-time evidence on the impact of income security programmes on retirement behaviour in Ireland. In other countries, one of the major findings about labour supply of older workers is the incentive effects of income security programmes with respect to labour force participation (see Gruber and Wise 1999, 2004). For pension reform, it is important to know the structure of these incentives and this is different from country to country. Each country has a different setup of its income security system for older people and therefore it has been shown that behaviour also differs substantially. In Ireland, the income security system for older people provides income from Social Welfare, State Pensions, occupational pensions, and private pensions. In this paper, the present values of income security wealth, its accrual, and the tax on work for different ages of labour force exit for Irish workers.

Incentive effects of old-age income security systems have two major strands of research interest. The first concerns incentives about savings, the second investigates incentives about labour force participation of older workers (see Feldstein and Liebman, 2002). Our contribution to this literature is a first time assessment of the link between the retirement decision and the incentive effects in the Irish income security system for older workers. Gruber and Wise (1999, 2004) show in their

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landmark study, that there are substantial incentives for early retirement across different OECD countries and different retirement systems. Investigating 11 OECD countries, they find, despite a great variety of institutional designs, that all systems financially reward early retirement. These rewards are, however, different in extent and over ages of feasible retirement. Therefore, early retirement behaviour varies a lot across countries. In some countries, for instance in Germany, it used to be an over-boarding threat to financing of pensions (see Boersch-Supan et al., 2004). In other countries like in the United States, early retirement does occur but without being a major issue at the moment (see Diamond and Gruber, 1999). We need to study each country separately in order to give policy recommendations on income security design.

Unlike most OECD countries, because the population is on average younger than in other countries, public expenditures on pensions in Ireland are relatively low. The Irish public pension system provides a basic flat-rate pension, not related to earnings and the replacement of pre-retirement income is one of the lowest in the OECD. Occupational and private pensions aim to close this retirement-savings gap. However, it should be noted that approximately one half of the workforce is only covered by public income security, and is not eligible for an occupational or private pension (Central Statistics Office Ireland, 2008).

Adopting the methodology in Gruber and Wise (1999), we will assess the financial incentives embedded in the Irish old-age income security system. We take account of the basically twofold distribution of income provision arrangements in Ireland: on the one hand the dependency on public benefits only, and on the other hand the dependency on public and occupational income sources. Our simulations show at what age the income security system provides huge, moderate or minimal

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financial incentives for an Irish older worker to leave the labour force. Our findings suggest that income security programmes in Ireland are an important element in the opportunity set of older workers planning their retirement in Ireland. We find that people depending on public state pension only have incentives to retire, especially for low earners. For people who also have an occupational pension, the incentive to retire early is much stronger.

2. Background

2.1. Empirical Evidence of Retirement Behaviour in Ireland

In terms of public pensions, Ireland is significantly different from other OECD countries (see Table 1). Old-age benefits amount to 2.5 percent of GDP and this is half of the US and only one fifth of the Austrian expenditures. In line with the low expenditures, the payroll tax rate for pension purposes is relatively low in Ireland, currently 12.5 percent of gross salary. Only the US has a lower rate, while most countries are near a rate of 20 percent. Of course, Ireland has a slightly lower old-age dependency ratio than most OECD countries. By 2050, the ratio of retirees to workers will deteriorate from currently 19 to 50 percent in Ireland and this will impose a huge burden on financing public pensions.

Table 1. Public finances

Country	Old age benefits as % of GDP*	Payroll tax rate**	Old-age dependency ratio***	
			2000	*2050*
Ireland	2.5	12.5	19	50
Austria	12.4	22.8	25	55
US	5.4	12.4	21	39
Germany	11.1	19.9	26	54
Switzerland	6.5	23.8	25	43
Sweden	7.4	18.91	30	43

Sources: * ILO, 2009b, ** US Social Security Administration, 2008, *** OECD, 2009a.
Notes: Table compares selected OECD countries to Ireland. The payroll tax rate is the proportion of gross income born by employees and employers for the entitlement to a public pension. The old-age dependency ratio is the population aged 65+/population aged 15-64.

Labour force participation rates of older workers in Ireland rank in the middle of the OECD distribution (Table 2). There is a sharp decline starting at age 60 and in Ireland, Sweden, and in the US, this decline at age 60+ is 20 percentage points. In contrast, countries like Germany, Austria, and Switzerland have an even greater decline, between 30 and 40 percentage points.

Table 2. Labour force participation rates of older workers, selected countries

Country	Labour force participation rates by age group				
	55-59	60-64	65-69	70-74	75+
Ireland	63.5	46.0	18.5	8.6	3.4
Austria*	51.9	14.0	6.2	2.8	1.0
US	72.0	53.3	29.7	17.2	6.8
Germany*	73.2	31.6	6.6	2.6	0.9
Switzerland	82.2	55.3	17.0	9.4	3.8
Sweden	82.8	63.6	15.0		6.5

Sources: ILO, 2009a, * ILO, 2005.

The crucial question is what factors are causing this decline? Since the official retirement age in Ireland is 65, and no public pension is available before, there are three main explanations. Either these people leaving the labour force become homemakers, or they live on Social Welfare benefits, or they claim an early retirement occupational pension. Our study examines the incentive effects of these social welfare programmes and pensions.

Table 3. Statutory vs. average retirement ages

Country	Statutory retirement ages		Average retirement ages	
	Males	Females	Males	Females
Ireland	65	65	65.2	66.2
Austria	65	60	59.6	58.9
US	65	65	65.0	62.9
Germany	65	65	60.9	60.2
Switzerland	65	63	66.6	63.2
Sweden	65	65	63.5	62.0

Sources: OECD, 2009b.
Notes: The OECD reports the age of 66 as the statutory retirement age for Irish workers. However, at age 65, Irish workers are entitled to the State Pension (transition) as the common scheme of entry into retirement.

Related to the declining labour force participation rate is the question why the average retirement age in Ireland is relatively identical to the official age. Should it not be lower given the 20 percentage decline in participation in the age group 60 to 64? In most OECD countries, the standard age of retirement is 65 or 66, but the actual labour force withdrawal rate is often quite different. Table 3 shows that it is generally lower, except for Ireland and Switzerland. This indicates that Irish workers stay in the labour force longer than their European colleagues, possibly as a result of institutional factors. However, labour force participation rates also show that there is some degree of retirement before age 65. We must take a closer look at the pre-65 retirement behaviour to see what factors could enable people to retire before 65 or alternatively postpone retirement until 65?

The low public pension could be a contributing factor towards later retirement because of insufficient earnings replacement. The general target of public pension systems is either income replacement or minimum standard of living in old age. The Irish system targets the latter where public pensions aim to be a basic first pillar of old-age income. The net replacement rate, i.e. the after tax ratio of pension benefits compared to pre-retirement earnings, is relatively low (Table 4). Since pension benefits are flat rate, the net replacement rate declines in the level of pre-retirement earnings. However, the level of state pensions in Ireland does not seem to be sufficient for combating poverty. While the poverty rate of people aged 65+ is 13.32 percent on average in the OECD, Ireland has the highest rate with 35.47 percent (OECD, 2007). In contrast, countries like Austria cover up to 90 percent of pre-retirement earnings by social security. Therefore, the replacement rate in Ireland is uniquely low compared to the OECD average of 71 percent. In the basic labour-leisure choice model, a low level

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of public pensions would probably not alter the budget enough to result in a zero hours of labour supply (i.e., retirement). Therefore, Irish workers have a higher labour supply than their colleagues from high-replacement rate countries.

Table 4. Net replacement rates, selected countries

Country	Net replacement rate by pre-retirement earnings level					
	0.5	*0.75*	*1*	*1.5*	*2*	*2.5*
Ireland	65.8	49.3	38.5	29.3	23.5	19.5
Austria	90.4	90.6	90.9	89.2	66.4	53.7
US	67.4	58.0	52.4	47.9	43.2	38.6
Germany	53.4	56.6	58.0	59.2	44.4	35.4
Switzerland	75.7	69.4	64.9	46.2	35.4	29.2
Sweden	82.9	70.6	65.6	73.5	74.9	74.9

Source: OECD, 2009c.
Notes: Table compares the ratio of public pension benefits to the level of pre-retirement earnings, both net of taxes. Pre-retirement earnings are assessed at 50, 75, 100, 150, 200, and 250 percent of country-wide average earnings of older workers.

Let us now turn to the factors enabling early retirement in Ireland. The institutional setup of a pension system is crucial for the number and feasibility of exit routes into (early) retirement. Ireland does not have a very flexible retirement regime and there is currently no form of early retirement pensions. The *Pre-Retirement Allowance* as the only form of early retirement was abolished in 2007. However, in the case of unemployment or disability, permanent Social Welfare benefits may be claimed prior to the statutory retirement age.
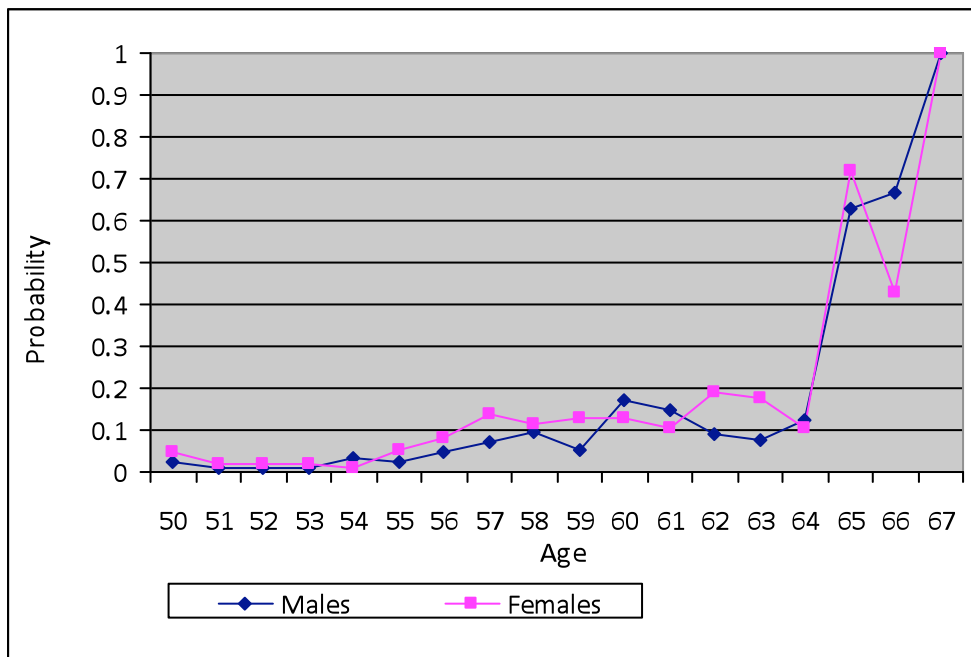
Figure 1. Retirement hazard rates Ireland, by age and sex

Retirement behaviour can be summarized by the retirement hazard function, $h(t) = \lim_{\Delta t \to 0} \dfrac{\Pr\left[t \le T < t + \Delta t \mid T \ge t\right]}{\Delta t}$. The retirement hazard function shows conditional probabilities of retirement in a certain age interval provided a person has participated in the labour force to the beginning of that respective age interval. Figure 1 depicts hazard rates for persons having retired between the ages of 50 and 67. Typically, the curve of a retirement hazard rate spikes at ages where individuals become eligible for retirement. In Ireland, this age is 65. Moreover, spikes before the age of 65 indicate common ages of early retirement due to unemployment, ill-health, social norms, or occupational early retirement options. In Ireland, males have early retirement spikes at the ages of 54, 58, and 60. Females have these spikes at the ages of 57 and 62. As Gruber and Wise (1999) showed, multiple retirement spikes are very common across

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OECD countries. Usually local spikes are around early retirement ages followed by a maximum spike at the statutory age. This indicates that a certain share of the older workforce in Ireland indeed chooses to retire early, while the majority retires at age 66. The impact of income security programmes on this decision has been studied mainly in international research, and we now review this work.

2.2. Retirement Behaviour and Income Security Programmes in the Literature

Research on potential financial incentives within the public pension system in Ireland is relatively scarce compared to other countries. In the research on older workers, primarily the issues of population ageing and its fiscal impact (Barrett and Bergin, 2005), the fiscal interactions between private and public pensions (Callan et al., 2007) have been addressed. From a policy perspective, The *Green Paper on Pensions (2007)* is the central government report on the status quo and policy options on public pensions.

The analysis of financial incentives and the retirement decision is based on the life cycle model by Modigliani and Brumberg (1954) and Friedman (1957). Basically, an individual maximizes lifetime utility subject to a lifetime wealth constraint. This constraint is determined by payoffs from work and non-labour income, i.e. private pensions, public pensions or social welfare payments accessible to older workers. In this lifetime perspective, the timing of labour force exit depends on earnings at each age and the stream of income security wealth from non-work sources at each possible age. Fields and Mitchell (1984) and Samwick (1998) use a life cycle model of consumption and endogenous retirement leisure to explain the date of retirement.

The impact of financial incentives in pension systems on the retirement decision was first empirically tested by Feldstein (1974). Important later work includes Samwick (1998), Stock and Wise (1990), as well as Gruber and Wise (1999,

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2004). In Ireland, there is substantial labour force exit before the official retirement age 65 in Ireland, despite the strong institutional constraints. Our study is a first-step investigation of financial incentive signals for Ireland. To this end, we now describe the coverage and main features of income security programmes for older people in Ireland. Data on these programmes are used later on in our simulations of income security wealth.

3. Main Features of Income Security for Older Adults in Ireland

We now provide details of the income sources that are available for retirement in Ireland and we describe the share of the workforce covered by different arrangements (i.e. public and occupational routes of labour force exit).

3.1. Programme Coverage

In general, the income provision for retirees arises from three pillars. Retirees may be covered by a basic flat-rate State Pension, an occupational pension, or a private retirement savings account. However, the reality in Ireland is quite different from the normative postulate of a "three-pillar system". Table 5 shows the share of workforce covered under different pillars. The most common case with a share of 46 percent of the workforce is coverage by public income security only.

Table 5. Pension coverage of workforce in 2008 (in percent aged 20 to 69)

	1 pillar: *Public pension*	2 pillars: *Public and occupational pension*	2 pillars: *Public and private pension*	3 pillars: *Public, occupational, and private pension*	Total
Total workforce	46	37	13	4	100
Public administration	7	86	n/a	6	100
Hotel and restaurants	77	9	14	n/a	100
Professionals	25	55	13	7	100
Sales	67	23	8	n/a	100

Source: Central Statistics Office Ireland, 2008. table 3, n/a numbers not reported.
Notes: This table shows the share of workforce in Ireland covered by different arrangements for income in old age.

Overall, only 54 percent of the workforce has some kind of more-than-one pillar arrangement regarding retirement income. Ranking second, 37 percent are covered by public and occupational pensions. Only 13 percent are covered by public and a private pension, 4 percent have a three-pillar coverage consisting of public, occupational and private pensions. This suggests for our simulation of retirement incentives, in Ireland there are currently two main scenarios of interest (1) State Pensions/Social Welfare only; 46 percent of workforce covered and (2) State Pensions and an occupational pension; 37 percent of workforce covered. Both scenarios together account for 83 percent of the workforce.

Striking differences in coverage exist between industries and occupations. While in public administration, 86 percent are covered by public and occupational pensions, only 9 percent are covered by such an arrangement in the hotel and

restaurants industry[1]. However, most industries have some scenario 2 coverage. With respect to occupation, 55 percent of professionals have scenario 2 coverage while this is the case for only 23 percent of sales persons. Due to the complexity of data required, we focus on all industries together, but separate analyses for each industry are an interesting avenue for future research.

3.2. Key Features of State Pensions

At the age of 65, Irish workers are entitled to the *State Pension (transition),* substituted at ages 66+ by the *State Pension (contributory*). Current benefits amount to EUR 230 per week for a person with no adult dependant and supplements are granted for adult and child dependants. The flat-rate benefit is independent of pre-retirement earnings and age of retirement and eligibility requires at least 5 years of PRSI contributions. The benefit level is slightly decreased in the case where PRSI contributions are less than on average 48 weeks for each year in a person's work history. The *State Pension (non-contributory)* is available from age 66+ if these eligibility conditions are not met.

A unique feature in the Irish public pension system is the treatment of post-retirement work. There is a retirement test for the *State Pension (transition)*, but not for *the State Pension (contributory)*. Therefore from age 66+, one can choose to work full time while receiving a full State Pension. Another differentiating feature is the OECD-lowest replacement rate. The State Pension only replaces approximately 38.5 percent of industrial average pre-retirement earnings, as shown earlier in Table 4. This makes clear that for people only covered by a public pension, there might be need of

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[1] While occupational pensions are not mandatory in the private sector, civil servants have a compulsory occupational pension scheme.

post-retirement work in order not to loose almost two thirds of their standard of living.

3.3 Social Welfare Programmes

There is no public programme for early retirement in Ireland. However, under the coverage of an occupational pension, often the possibility of retirement before age 65 arises. In the absence of occupational or private pension coverage, one could potentially avail of Social Welfare programmes to exit the labour force permanently. By the nature of these programmes access is rather difficult, as it is clear that one cannot freely choose to retire on an unemployment benefit or a disability pension. On the other hand, it cannot be completely ruled out that a certain share of benefit recipients uses income support programmes for the purpose of permanently exiting the labour force. This may even be economically rational.

In the case of unemployment or disability, older workers are eligible for income security in the form of Jobseeker's benefit, Jobseeker's Allowance, Invalidity Pension (available to people with permanent incapacity to work due to illness or disability) or Disability Allowance (available to people with disability expected to last at least one year). These programmes are relatively large in terms of recipients and budget volume. Benefit levels for disability and unemployment do not vary substantially. The weekly rate of payment is 204.30 Euros for the Jobseeker's Benefit, the Jobseeker's Allowance and the Disability Allowance. For an Invalidity Pension, the weekly payment is 209.80 Euros. Given an annual benefit differential of only 286 Euros between these social welfare programmes, we consider both disability and unemployment in our calculations.

Remarkably, the benefits paid from Social Welfare Programmes are very close to the level of a State Pension. For someone covered solely by public pensions, it does financially not make a significant difference to retire at the official retirement age 65, or to exit the labour force on unemployment compensation at age 63.

Although these programmes are not excessively used compared to some continental European countries, there is an important degree of permanent labour force exit before age 65 in Ireland. Therefore, we find it necessary to include Social Welfare payments in addition to State Pensions in our simulations, similar to Kapteyn and de Voos (1999) where they analysed incentive effects for a similar system in the Netherlands.

3.4 Occupational and Private Pensions

Ireland has a huge variety of occupational and private pension options. Unlike in other multiple-pillar systems, firm pensions are not in general mandatory in Ireland and this possibly accounts for the low coverage of only 37 percent. In general, the maximum benefit from a firm pension is 2/3rd of final salary and this is monitored by Irish Pension Board. The majority of employees are covered under a defined benefit (DB) scheme, as opposed to a defined contribution (DC) plan. DB plans guarantee a certain level of benefits independent of contributions. They are usually earnings-tested, and in many cases more generous in terms of benefits than DC plans.

Since there is no "standard" private sector pension plan (like for instance in the Netherlands), and documentation on specific firms is not available, we take the public sector scheme which is well documented. Specific firm schemes may either be the same, or deviate in calculating benefits, but are all within the bandwidths set down by the Pension Board. Basically, they are all following the same model of calculation,

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only the parameters vary. We use as an example the *Superannuation Scheme for Established Civil Servants, appointed before 6 April 1995[2]*, for our simulations. For retirement on age, ill-health or redundancy reasons, an established civil servant, having at least 5 years pensionable service, is eligible from age 60 or later, for (a) a pension of 1/80th of final salary per year of pensionable service subject to a maximum of ½ final salary[3]; and (b) a tax free lump sum of 3/80ths of final salary per year of pensionable service, subject to a maximum of 1½ times final salary (see Irish Department of Finance, 2006). From age 50 to age 59, a person is entitled to retire early under the *"Cost Neutral" Incentivised Early Retirement Scheme*. This basically means a deduction of roughly 5 percentage points from the above pension and lump sum per year of early retirement (see Irish Department of Finance, 2009).

For private sector schemes, the mechanics of calculating a pension are very similar to the above scheme, but, the specific details vary a lot. Sometimes, a mandatory retirement age of 65 applies to a particular scheme. However, post-retirement work is often feasible. We provide a detailed discussion of this issue in section 5. Retirement savings accounts usually work on a DC basis and we do not include them in our analysis, since they are relatively new. Importantly, we point out that in strong contrast to public pensions, occupational pensions allow for early retirement before age 65.

4. Theory of Retirement and Financial Incentives

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[2] The pension scheme for civil servants hired after 6 April 1995 was recently reformed. The replacement rate was reduced significantly by deducting the amount of State Pension from the civil service pension (see Irish Department of Social and Family Affairs, 2007)

Fields and Mitchell (1984) and Samwick (1998) use a life cycle model of consumption and endogenous retirement leisure to explain the date of retirement. In this framework, retirement is mainly driven by financial incentives. A person t years of age plans to retire at age $s = R$, and expects to survive until age T. They receive earnings before R, and non-labour benefits B after R. Earnings streams during labour force participation (*PDVE*), discounted to time t, are defined as

$$PDVE = \int_{t}^{R} e^{-\delta(s-t)} Y_s \, ds \,, \tag{1}$$

where expected real earnings at age s is Y_s, δ is a discount rate representing time preference and mortality. Once the individual retires, earnings are replaced by income from one or multiple pensions. The expected stream of pension benefits, discounted for time preference and mortality, is called income security wealth (*ISW*):

$$ISW = \int_{R}^{T} e^{-\delta(s-t)} B_s(R, \Theta) \, ds \,, \tag{2}$$

where $B_s(R, \Theta)$ is the amount of real pension benefits from retiring at age R. Typically, the amount of pension benefits depends on the date of retirement R and other factors Θ determined by the pension law. So, it is natural to compare the *ISW* from retiring at different ages. In order to capture the dynamics of income security wealth over time, there is an incentive measure called the accrual of income security wealth (*ACC*). This is the difference in *ISW* from postponing retirement to age R:

$$ACC = \frac{\partial ISW}{\partial R} = \int_{R}^{T} e^{-\delta(s-t)} \frac{\partial B_s}{\partial R}(R, \Theta) \, ds - e^{-\delta(R-t)} B_R(R) \,. \tag{3}$$

Important financial factors that determine this decision include potential earnings from continued work and the gain or loss in income security wealth from postponing retirement. These factors determine the relative price of retirement leisure and can be

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interpreted as financial incentives to retire. In order to empirically implement variations in the relative price of retirement leisure, we will look at the age profiles of income security wealth, the accrual in income security wealth and the implicit tax or subsidy rate on work.

The optimal choice of the retirement date depends on the relative price of retirement leisure through potential earnings and the accrual *ACC* during the year of postponement. The retirement decision is decomposed into a (wealth-) level and a relative price (accrual) component. *ISW* represents the level effect. If pension benefits are increased at each date of retirement, lifetime wealth will go up. They can consume more of all goods including retirement leisure and hence the date of retirement should decrease in the level of *ISW*. Changes in the relative price of retirement leisure are captured by the *ACC*. A positive or at least non-negative *ACC* provides an incentive to stay in the labour force. By postponing retirement by one year, a worker will be rewarded if they receive a higher level of *ISW* compared to retiring now. If the accrual is negative, then there is no incentive to postpone retirement for another year. This would penalize a worker by providing a lower level of *ISW* compared to retiring now. In other words, as the accrual increases, the relative price of taking up retirement leisure now increases and the date of retirement increases in the *ACC*. It represents the increment in *ISW* by postponing retirement for one year. Increasing accruals make it more likely to postpone retirement. If the ACC is non-negative, the pension system may be called 'actuarially fair', since it financially rewards delayed retirement. But many countries have pension systems that are actuarially unfair and encourage early retirement (Gruber and Wise, 1999).

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Thus, the decision to retire involves a wealth and a price effect[4]. Both effects work into the opposite direction. So, a change in the pension benefit structure, if for example from pension reform, may have an ambiguous effect on retirement behaviour.

Another way to look at the financial incentives to retire is a comparison of the *ACC* and potential earnings during the year of postponement. We relate gains or losses in income security wealth to potential earnings from work in the year of postponing retirement. This can also be interpreted as a tax or subsidy rate on continued labour force participation (ITR). The response to this incentive measure depends on a person's idiosyncratic preferences about labour and retirement leisure. A positive accrual will result in a subsidy rate, the *ITR* being negative. This implies an incentive to stay in the labour force. Delaying retirement is rewarded by a gain in *ISW*. The more negative the subsidy ratio, the bigger this incentive effect becomes. If the accrual is smaller than potential earnings, then the *ITR* is negative but greater than (-1). In this case, the incentive to work is weak. If the *ITR* is positive, we think of it as a tax on continued work. Having a negative accrual makes the *ITR* a tax, and therefore penalises a continued stay in the labour force. The more positive the *ITR* is, the higher the incentive to retire now is. Tax rates below 1 provide a weak incentive to retire.

5. Simulation Approach

We adopt the reduced form framework by Gruber and Wise (1999) and align our simulations to Ireland-typical retirement scenarios. This method has already been applied to most OECD countries in Western Europe and North America. First, we

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[4] Fields and Mitchell (1984) provide detailed comparative statics of the life cycle model.

define retirement. In Ireland, we assume that some share of the workforce rationally respond to work disincentives of social welfare programmes[5]. Consequently, it seems to be natural to use the term "retirement" in a broader sense including intended permanent labour force exit. Therefore, we include Irish Social Welfare programmes available to older workers in our simulations.

Second, we note the situation in which someone receives a pension, but keeps working post-retirement. In Ireland, this is possible from age 66+ without loosing a State Pension. In some company pension plans, an occupational pension may be claimed while the recipient is allowed to work full or part time, or to be self-employed. We realise that under these scenarios, the financial incentives to retire would be hard to interpret, and post-retirement work seems to be an important feature of the Irish labour market for older workers. However, in the age group 65 to 69 the labour force participation rate dramatically drops from 40 to 18.5 percent (see ILO, 2009a). In any case, standard theory of labour-leisure choice predicts that a non-work payment shifts the budget constraint upwards. Consequently, leisure being a normal good, a person will reduce hours of work supplied. This does not necessarily result in a corner solution (i.e. complete labour force exit). So, even if someone receives a pension and keeps working, the person will change behaviour and switch for instance from full to part-time work. But because of the relatively pronounced drops in labour force participation before and after the official retirement age 65 we will assume that agents retire and quit working simultaneously. In summary, our definition of retirement includes statutory retirement and actual labour force exit with the intent to

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[5] Numerous studies, for instance Moffitt and Nicholson (1982), provide evidence on work-disincentives of welfare programmes.

permanently leave the labour force. The analysis of post-retirement work is an interesting topic for further research.

We calculate financial measures for two main arrangements of retirement income, for three levels of pre-retirement earnings, and separate by males and females. To control for differences across income levels, we consider low, medium and high earnings (50, 100, 150 percent of age-specific mean industrial earnings). All estimates are in real terms and discounted to retirement planning age 55.

The analysis of retirement incentives considering State Pensions/Social Welfare only, is valid for almost half the workforce in Ireland. On the other hand, there is an infinitely large variety of individual arrangements and it is difficult to look at them all. Nonetheless, we attempt to account for the two most frequent scenarios.

Scenario 1: Social Welfare and State Pensions only.

This scenario applies to 46 percent of the workforce. A person with no adult dependants considers the lifetime payoffs of non-work benefits for their labour force exit at age 55. From age 55 to 64, a Social Welfare benefit (in case of unemployment or disability) is available. The annual payoff amounts to Euros 10,909.60[6]. We report the replacement rate for this period under the disclaimer that the exit route Social Welfare is not available to everyone and strictly connected to special individual conditions like disability or unemployment. From age 65 and above, the person is eligible for a State Pension. This implies a slight increase in the amount of annual payoff, i.e. Euros 11,975.60. Someone at age 65, claiming a State Pension (transition)

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[6] The rates of payment are identical or insignificantly different by type of Social Welfare benefit received. Therefore, we use a Social welfare benefit equal to the payment for an *Invalidity Pension*.

is required to quit working full time. From age 66 onwards, there is no retirement test. We assume that our person quits working at the time of first State Pension receipt. This seems to be a reasonable assumption, even though the labour force participation rate in Ireland between ages 65 and 69 is relatively high at 18.5 percent.

Scenario 2: State Pension and occupational pension.

This second arrangement applies to 37 percent of the workforce. A person with no adult dependants considers again the lifetime payoffs of occupational pension benefits according to the DB scheme outlined in section 3.4. The person could be a public or a private sector employee. For the latter, in addition to a company pension the person is entitled to a State Pension from age 65 onwards. We report the replacement rates and incentive measures for the window of early retirement between age 55 and 59, for the period of "preserved benefits" from 60 to 64, and for "normal" or deferred retirement from age 65 to 67. We assume that our person quits work at the time of retirement. For benefit calculation purposes, we assume that the person had 30 years of service at the company at age 55, which implies 40 years of service at age 65. Replacement rates and incentive measures reported include payments from the occupational pension as well as the State Pension from age 65+. We assume that when working at the same company, the level of salary remains constant in real terms from age 59 onwards.

For scenarios 1 and 2, we calculate incentive measures encouraging or discouraging retirement as follows. The basic incentive measure is income security wealth (*ISW*). It is the present discounted value of expected future non-work benefit streams accessible

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to older workers. We calculate *ISW* at all possible ages of retirement or actual labour force exit starting at age 55. *ISW* at retirement or labour force exit age *R* is defined as

$$ISW(R) = \sum_{R}^{T} B_s(R, \Theta) \, p(t \mid t-1) \rho^{t-R}. \qquad (4)$$

$B(R, \Theta)$ = expected pension or social welfare benefit one is entitled to by leaving the labour force at age *R*. Θ is a vector of attributes influencing the level of payments.

p = probability of survival until age *t* conditional on having survived until age *t*-1.

$\rho = \dfrac{1}{1+r}$ = rate of time preference.

We use 2009 Irish benefit entitlement rules (Irish Department of Social and Family Affairs, 2009) for a person with no adult dependants and we discount the stream of benefit payments to age 55. Age and sex specific conditional survival probabilities *p* up to age 99 are taken from Irish life tables (Central Statistics Office Ireland, 2009a). Furthermore, we discount expected future benefit payments at a real rate of *r* = 3 percent in order to reflect time preferences. For all entitlements, we assume zero real growth in the years subsequent to the initial year of payment. To compute net income levels, we use income and payroll tax schedules for 2009, keeping tax rates and brackets fixed in real terms for all years after 2009.

Similarly, we calculate the accrual (*ACC*) in income security wealth for someone comparing *ISW* from postponing retirement for one more year to *ISW* from retiring now, i.e.,

$$ACC(R+1) = SSW(R+1) - SSW(R) \qquad (5)$$

Accordingly we measure the percentage increase or decrease in *ISW* by the one-year accrual rate *ACCR*,

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$$ACCR(R+1) = \frac{SSW(R+1) - SSW(R)}{SSW(R)} .$$

(6)

In order to account for potential earnings from work during the year of postponement, we rescale as

$$ITR(R+1) = -\frac{SSW(R+1) - SSW(R)}{Y_R}$$

(7)

and call it the implicit tax or subsidy rate on work *ITR*.

6. Results for Ireland

6.1 Scenario 1: State Pensions and Social Welfare only

In tables 6, A1 and A2[7], we provide age dependent estimates of financial incentives to exit the labour force for an illustrative Irish worker aged 55 in 2009. Table 6 gives an example for people on average industrial wages and Tables A1 and A2 provide similar results for those on low and high earnings. All numbers are in real terms, net of all taxes on income[8], and discounted to age 55 present values.

The replacement rate in the first year of benefit receipt for the base case is between 30.8 and 37.8 percent for males, depending on the age of labour force exit. A starred replacement rate indicates exit from the labour force before official retirement becomes available. Since females have lower average earnings, their replacement rates are on average higher, between 43.6 and 54.3 percent. Workers on low earnings receive a benefit replacing a higher portion of their pre-retirement earnings, i.e. 62.5

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[7] Since State Pensions and Social Welfare payments are not related to earnings, *ISW*, *ACC*, and *ACCR* are equal across reported earnings levels.

[8] It should be noted that income from State Pensions or Social Welfare payments only is too low to be actually taxable.

percent for males and 97.8 percent for females upon age 65 retirement. Workers on high earnings will have a very low replacement rate by public income security only, ranging from 28.6 percent for men to 40.5 percent for women at age 65. Accordingly, the higher the pre-retirement earnings, the greater the need to complement a State Pension by some form of private pension arrangement (compare replacement rates in Tables 6, A1, and A2).

Table 6. Retirement incentives, average industrial wage

Retirement age	Males Replacement rate	ISW €	ACC €	ACCR	ITR	Females Replacement rate	ISW €	ACC €	ACCR	ITR
					Scenario 1: Social Welfare + State Pension only					
55	0.308*	272,288	-10,849	-0.040	0.307	0.436*	277,526	-10,871	-0.039	0.435
56	0.308*	261,438	-10,528	-0.040	0.297	0.436*	266,655	-10,551	-0.040	0.422
57	0.308*	250,910	-10,215	-0.041	0.289	0.436*	256,105	-10,240	-0.040	0.409
58	0.308*	240,695	-9,910	-0.041	0.280	0.436*	245,865	-9,937	-0.040	0.397
59	0.308*	230,785	-9,614	-0.042	0.272	0.436*	235,928	-9,643	-0.041	0.385
60	0.344*	221,171	-9,326	-0.042	0.294	0.495*	226,285	-9,358	-0.041	0.424
61	0.344*	211,845	-9,045	-0.043	0.285	0.495*	216,927	-9,080	-0.042	0.412
62	0.344*	202,800	-8,772	-0.043	0.276	0.495*	207,847	-8,810	-0.042	0.399
63	0.344*	194,027	-8,507	-0.044	0.268	0.495*	199,037	-8,548	-0.043	0.388
64	0.344*	185,520	-8,249	-0.044	0.260	0.495*	190,489	-8,293	-0.044	0.376
65	0.377	177,271	-8,779	-0.050	0.276	0.543	182,196	-8,832	-0.048	0.400
66	0.377	168,492	-8,510	-0.051	0.268	0.543	173,364	-8,567	-0.049	0.388
67	0.377	159,982	-8,247	-0.052	0.260	0.543	164,796	-8,309	-0.050	0.377
					Scenario 2: Early Retirement Occupational Pension + State Pension					
55	0.458	621,061	1,289	0.002	-0.036	0.410	463,601	876	0.002	-0.035
56	0.481	622,350	1,767	0.003	-0.050	0.430	464,477	1,182	0.003	-0.047
57	0.505	624,117	756	0.001	-0.021	0.452	465,659	1,183	0.003	-0.047
58	0.526	624,873	-267	0.000	0.008	0.475	466,842	1,300	0.003	-0.052
59	0.548	624,606	-2,121	0.003	-0.060	0.500	468,142	1,848	0.004	-0.074
60	0.638	626,727	-6,984	-0.011	0.220	0.527	469,990	-4,475	-0.010	0.179
61	0.653	619,743	-7,297	-0.012	0.230	0.542	465,515	-4,764	-0.010	0.190
62	0.668	612,446	-7,583	-0.012	0.239	0.557	460,751	-5,061	-0.011	0.202
63	0.683	604,863	-7,846	-0.013	0.247	0.572	455,690	-5,341	-0.012	0.213
64	0.697	597,017	-8,094	-0.014	0.255	0.587	450,349	-5,604	-0.012	0.224
65	1.127	588,923	-27,883	-0.047	0.878	1.081	444,745	-999	-0.002	0.040
66	1.127	561,040	-27,043	-0.048	0.852	1.081	443,746	-975	-0.002	0.039
67	1.127	533,997	-26,220	-0.049	0.826	1.081	442,771	-59,002	-0.133	2.358

The level of *ISW* arising from a Social Welfare Programme or a State Pension decreases in the age of retirement for both, males and females. The incentive signal to leave the labour force responding to the level of payments, the "wealth effect", is relatively weak reflecting the overall low replacement rate internationally. In general, people with lower earnings, and hence a higher replacement rate should respond stronger to the "wealth effect" than people with higher earnings. Females have a higher level of *ISW* due to their higher life expectancy. Since the Irish public income security system provides a flat-rate payments, benefits do not vary with age. The only exception is a slight increase in pension benefits between a Social Welfare benefit available before age 65 and an old-age pension available from age 65 und above. Therefore, the main source of variation of age specific *ISW* levels comes from inflation, time preferences, and mortality.
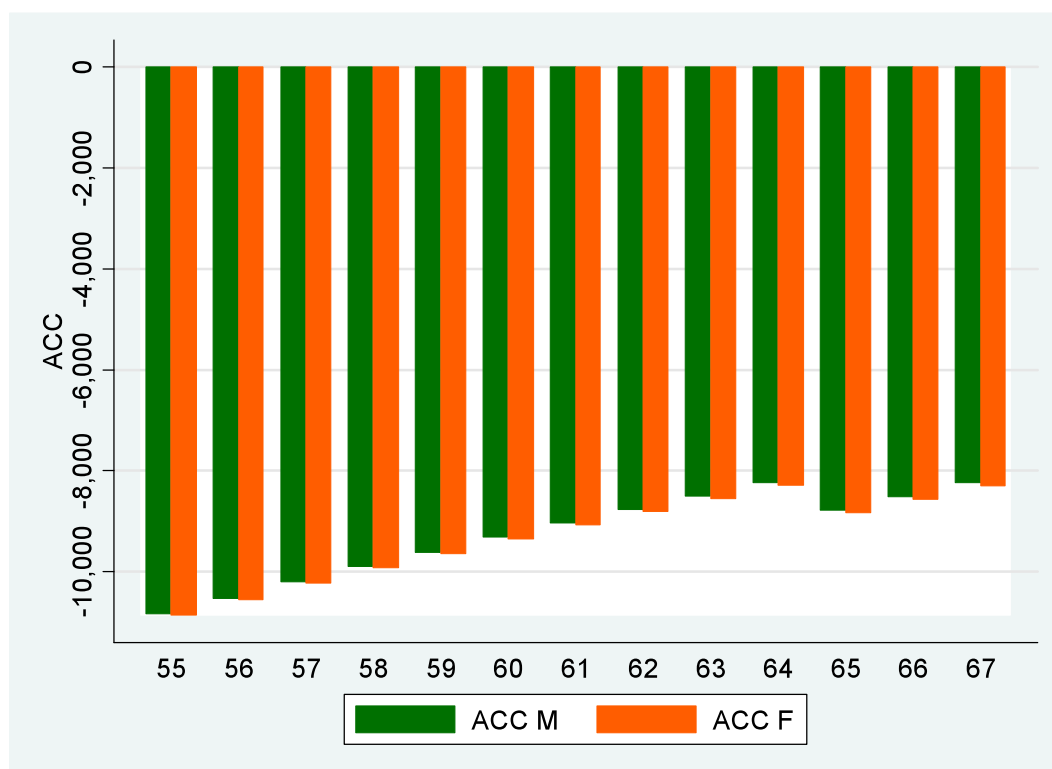

Figure 1. Age profile of the accrual (*ACC*)

Source: Authors' own calculations.
Notes: The accrual is the gain or loss in *ISW* from postponing retirement for one more year. It is calculated for illustrative male or female agents having no dependants. All numbers are discounted to age 55, and expressed in 2009 Euros.

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For our illustrative Irish worker, an example age profile of the *ACC* is depicted in Figure 1. This shows a sequence of losses in *ISW* from postponing retirement. From age 55 to 67, one experiences a negative accrual. Of course, accruals and accrual rates are identical at each level of pre-retirement earnings because everyone receives the same amount of benefit. Theory suggests that the negative accruals should provide an incentive to retire as soon as possible, because every year of postponement would result in a loss of pension wealth. Therefore, the public income security system (with no other pension) in Ireland is *actuarially unfair*. An *actuarially fair* system would imply that the accruals are zero or positive. Each year of postponing labour force exit would result in a loss of *ISW* of approximately 4 to 5 percent over the remaining expected lifetime (Table 6). This suggests that the disincentive to continue work is rather weak looking ahead one year. One would only loose approximately 8,000 to 10,000 Euros non-work income. Therefore, we would not expect a great response to the accrual incentive in Ireland. However, the lower one's earnings are, the greater this response would be. This should become apparent by looking at the *ITR*, the tax on work.

We consider potential earnings from postponing retirement by relating the accrual *ACC* to potential earnings Y_R in the year of postponement, the implicit tax or subsidy rate on work *ITR*. Given idiosyncratic preferences about labour and retirement leisure, this ratio compares the losses from not claiming non-labour income to receiving earnings from work looking ahead one year. Overall, implicit tax rates on work are positive and less than 1 (Tables 6, A1, and A2). Again, a positive *ITR* indicates a tax or penalty on work. An *ITR* less than 1 implies that this penalty is rather weak, since the loss in *ISW* is smaller than prospective earnings Y_R. Females

would have a slightly higher incentive to leave work than males since they earn less. In general, the disincentive to work is higher for low income earners than for middle income earners, and lowest for high income earners. The lower one's earnings are, the greater the relative loss of non-labour income compared to earnings from work. Thus, the disincentive to work should result in a stronger response with lower potential earnings.

In summary, our simulations for scenario 1 suggest an *actuarially unfair* structure of incentive effects. Each year of postponing retirement results in a loss of *ISW*. However, these incentive effects are rather weak because of the low benefit levels. They become stronger the lower one's earnings are, since Social Welfare/State Pensions replace a higher proportion of earnings. If legislation is reformed to a system of flexible retirement ages, these incentives could result in more flexible retirement behaviour for lower income people. This is an important innovative finding from our analysis.

6.2. Scenario 2: Occupational Pensions and State Pensions

Results for scenario 2 draw a very different picture about the incentives to leave the labour force. An illustrative Irish worker aged 55 in 2009 and with no dependants faces the age profile of financial incentives to retire originating from an occupational pension and a State Pension. Between ages 55 to 59, the person is eligible for "cost neutral" early retirement. Age 60 to 65 offer the option to retire on a "Preserved Benefit" pension according to the Civil Servant Scheme. However, also in the private sector, similar DB-plans are frequently used. From age 65 onwards, the occupational pension is complemented by the State Pension. All numbers are in 2009 Euros, net of all taxes on income, and discounted to age 55 present values.

The replacement rates in the base case range from 45.8 to 112.7 percent for males, and 41.0 to 108.1 percent[9]. This suggest that even deductions for "cost neutral" early retirement would make retirees better off than labour force exit on Social Welfare like in scenario 1. In general, replacement rates arising from occupational pensions approach 70 percent for males (60 percent for females) retiring before age 65. The additional State Pension at age 65 considerably increases the replacement rate. Especially from age 65 +, across gender and earnings levels, a combined State and occupational pension replaces over 100 percent of pre-retirement earnings which provides a very strong incentive to quit work. In general, we observe that with higher pre-retirement earnings there are higher replacement rates. It is striking that an occupational pension results in higher replacement rates pre-65 for medium and high earnings compared to Social Welfare. However, low earnings imply lower replacement rates under scenario 2, which are especially low for women. Therefore, occupational pensions seem to benefit high earners more than low earners.

The levels of *ISW* arising from an occupational and a State Pension are relatively high compared to scenario 1[10]. Therefore, the incentive signal to leave the labour force considering the "wealth effect" of pensions is by far stronger than in scenario 1. Across genders and pre-retirement earnings levels, *ISW* amounts to a multiple of scenario 1 figures. Corresponding to the analysis of the replacement rate, the strength of the "wealth effect" increases in pre-retirement earnings.

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[9] The pension formula for an occupational pension would suggest that replacement rates are constant across different earnings levels. However, we calculate the net-of-all-taxes values, and therefore, they are different due to different marginal tax rates.

[10] As a caveat for comparing scenario 1 and 2 levels of *ISW*, we need to be aware that the first year of retirement under scenario 2 includes a relatively high tax-free lump sum payment additional to this year's pension benefit. This lump sum payment is included in the calculation of *ISW*, but not in the calculation of the replacement rate for the first retirement year.

The "accrual effect" of scenario 2 retirement income in general weakens compared to scenario 1. While the age-corridor of "cost neutral" early retirement does not imply any incentive to exit the labour force at a specific age (almost all *ACCs* are positive, so the age profile is even *actuarially fair*), the age 60 to 65 corridor has very small but negative *ACC*s. Only post-65 deferred retirement would result in significant *ISW* losses. Overall, we would not expect behavioural responses to the "accrual effect" under scenario 2. In other words, scenario 2 signals about the timing of retirement are negligible, even though the previously discussed "wealth effect" suggests very strong signals not to supply labour from age 55 to 65 in general.

Turning to the *ITR*, we can confirm from the lower accruals, that the taxes on work are in general lower in scenario 2 compared to scenario 1. For medium and low earners, there is even a small subsidy on continued labour force participation for feasible retirement ages 55 to 59. This confirms that the incentive to retire at a specific age is negligible.

Consequently, our simulations for scenario 2 suggest a situation close to *actuarial fairness*. Later retirement is either not at all or hardly penalised by the setup of combined occupational and public pensions. While the accruals and tax rates on work are too low to play an important role in the retirement decision, in contrast the high levels of *ISW* send out strong incentive signals to leave the labour force. With the "accrual effect" close to zero and the "wealth effect" being extremely high, we would generally expect a strong behavioural response to discontinue work, but not at a particular age. This response increases in the level of pre-retirement earnings. Our results highlight important variations in the Irish retirement system. Ireland does not have a unique set of incentives driving the retirement decision. This makes it more

difficult for us to draw policy conclusions from our research but in the final section we propose some basic reforms that could help to promote later retirement.

7. Conclusions

In the case where a person depends on public income security only (scenario 1), we conclude that the accruals in *ISW* are not very high, but *actuarially unfair*. Therefore, we would expect a modest disincentive to work coming from Social Welfare programmes as well as State Pensions in Ireland ("accrual effect"). For the person covered by occupational and public pensions, they may experience a huge disincentive to work due to the high level of *IWS*. On the other hand, there is hardly any disincentive arising from the accruals. They are rather small and almost setup in an *actuarially fair* way. So, for the illustrative agent for which we calculated entitlements under scenario 2, we expect that older workers in Ireland only respond to incentives as their earnings increase ("wealth effect").

We saw that the specific design of a retirement arrangement is crucial for behaviour. In the Irish case, there is a great variety of feasible arrangements. An actuarially fair deduction of benefits for each year of early labour force exit would remove the existing, however relatively small, incentive to leave the labour force before age 65. Turning to occupational pensions, there seems to be a slight equity issue. Low income earners are worse off in earnings replacement. Even Social Welfare would put them into a better position than an occupational pension.

Unlike in most continental European countries, on average, Irish workers retire at the statutory retirement age, most likely because the routes to retirement are not very flexible. However, as we noted in this paper, public and occupational income

security potentially does lend itself to early retirement. This is an interesting result based on latest data available. In the past year, as financial security for many people has reduced it is quite probable this scenario would not now result in excessive early retirement, even if more flexible routes become available. In this scenario, if decisions to retire were based primarily on financial factors people would not rush into early retirement. Nonetheless, we should also note that health and other personal factors are important determinants of retirement. The question is, if channels became more flexible, would people now leave early? Recent news has shown that people do not avail of voluntary redundancies and yet our results suggest that they would retire earlier (in the case where they have public pension only).

In terms of policymaking, this is a critical issue as government policy in general aims to increase the working life of people due to the effects of demographic changes. But in the recent recession year, it may be more desirable to take older workers out of the labour force to free jobs for younger workers. There are some options with this that we propose. First, introduce a retirement test for receipt of a state pension: then, people could not claim a state pension when they continue working. Second, have a partial retirement option, whereby from a certain age, people could choose to get a partial pension and work part time, if they wish to do so. Third, introduce an (early) retirement corridor: for example from 63 to 66. Then, those who retire later within this corridor should be rewarded, (increase in replacement rate for later retirement) in order to comply with the actuarial fairness principle. People who have ill health or a disability, or have some chronic disease within the family might have a lower life expectancy. Therefore, they could be enabled to retire earlier in

order to "compensate" for their shorter expected duration of retirement. However, the latter option would require high levels of monitoring.

Policy makers face the dilemma that promoting early retirement would contradict the general target of increasing actual retirement ages. However, in the case of a retirement corridor with financial rewards for later retirement, many people would retire earlier, especially those with a high preference for retirement leisure. Others, for instance professionals on high salaries would respond to financial incentives and retire later at 65 or 66. So overall, the average retirement age may most likely go down. Building incentives into the system could solve some problems by providing compensation for shorter life expectancy, early retirement for people with very low preference for work. Deferred retirement is then rewarded and early retirement does not have to become compulsory.

In conclusion, this paper focused on financial incentives as an important factor in the retirement decision. An overall assessment would require the impact of health and other personal factors. Demand side factors should also be taken into consideration. Nonetheless, this supply side analysis provides an excellent starting point to address a gap in research in Ireland. An ongoing programme of research will focus on a comprehensive analysis to include health and other factors.

Notes to tables 6, A1 and A2:

(1) Tables 6, 7, and 8 show for different age and sex specific pre-retirement earnings levels the age profiles of financial incentive measures faced by illustrative agents in their retirement planning.

(2) The *replacement rate* is the ratio of income security benefits in the initial year of retirement and pre-retirement earnings. In scenario 2, occupational lump sum payments upon retirement are not included in the replacement rate.

(3) Income security wealth (*ISW*) is the actuarial present value of expected lifetime pension benefits coming from a Social Welfare benefit (Euros 10,909.60 per anno) or a State Pension (Euros 11,975.60 per anno), or an occupational pension with example replacement rates taken from the Irish civil servants' scheme. Income security wealth is calculated for illustrative male or female agents having no dependants. All numbers are discounted to age 55, and expressed in 2009 Euros.

(4) *ACC* is the gain or loss in *ISW* from postponing retirement for one year at age a.

(5) *ACCR* is *ACC/ISW*, i.e., the percentage increase or decrease in *ISW* from postponing retirement for one year.

(6) *ITR* is the implicit tax or subsidy on work arising from a postponement of retirement by one year. It is the negative ratio of the *ACC* and potential earnings from work in case retirement is postponed.

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Table A1. Retirement incentives, low earnings

Retirement age	Males Replacement rate	ISW €	ACC €	ACCR	ITR	Females Replacement rate	ISW €	ACC €	ACCR	ITR
Scenario 1: Social Welfare + State Pension only									
55	0.498*	272,288	-10,849	-0.040	0.495	0.739*	277,526	-10,871	-0.039	0.736
56	0.498*	261,438	-10,528	-0.040	0.480	0.739*	266,655	-10,551	-0.040	0.715
57	0.498*	250,910	-10,215	-0.041	0.466	0.739*	256,105	-10,240	-0.040	0.694
58	0.498*	240,695	-9,910	-0.041	0.452	0.739*	245,865	-9,937	-0.040	0.673
59	0.498*	230,785	-9,614	-0.042	0.438	0.739*	235,928	-9,643	-0.041	0.653
60	0.569*	221,171	-9,326	-0.042	0.487	0.891*	226,285	-9,358	-0.041	0.764
61	0.569*	211,845	-9,045	-0.043	0.472	0.891*	216,927	-9,080	-0.042	0.741
62	0.569*	202,800	-8,772	-0.043	0.458	0.891*	207,847	-8,810	-0.042	0.719
63	0.569*	194,027	-8,507	-0.044	0.444	0.891*	199,037	-8,548	-0.043	0.698
64	0.569*	185,520	-8,249	-0.044	0.430	0.891*	190,489	-8,293	-0.044	0.677
65	0.625	177,271	-8,779	-0.050	0.458	0.978	182,196	-8,832	-0.048	0.721
66	0.625	168,492	-8,510	-0.051	0.444	0.978	173,364	-8,567	-0.049	0.699
67	0.625	159,982	-8,247	-0.052	0.430	0.978	164,796	-8,309	-0.050	0.678
Scenario 2: Early Retirement Occupational Pension + State Pension									
55	0.378	400,607	524	0.001	-0.024	0.347	322,898	438	0.001	-0.030
56	0.396	401,131	794	0.002	-0.036	0.364	323,336	591	0.002	-0.040
57	0.416	401,925	765	0.002	-0.035	0.383	323,927	592	0.002	-0.040
58	0.437	402,690	847	0.002	-0.039	0.402	324,519	649	0.002	-0.044
59	0.460	403,537	1,247	0.003	-0.057	0.423	325,168	909	0.003	-0.062
60	0.485	404,784	-3,695	-0.009	0.169	0.446	326,077	-2,222	-0.007	0.150
61	0.499	401,089	-3,949	-0.010	0.180	0.459	323,855	-2,382	-0.007	0.161
62	0.513	397,140	-2,626	-0.007	0.120	0.472	321,473	-2,531	-0.008	0.171
63	0.527	394,514	-5,966	-0.015	0.272	0.485	318,942	-2,670	-0.008	0.181
64	0.541	388,548	170,995	0.440	-7.803	0.497	316,272	-2,802	-0.009	0.190
65	1.101	559,543	-26,935	-0.048	1.229	1.321	313,470	-14,887	-0.047	1.008
66	1.101	532,608	-26,116	-0.049	1.192	1.321	298,583	-14,444	-0.048	0.978
67	1.101	506,492	-25,316	-0.050	1.155	1.321	284,139	-14,011	-0.049	0.949

Table A2 Retirement incentives, high earnings

Retirement age	Males Replacement rate	ISW €	ACC €	ACCR	ITR	Females Replacement rate	ISW €	ACC €	ACCR	ITR
					Scenario 1: Social Welfare + State Pension only					
55	0.231*	272,288	-10,849	-0.040	0.229	0.324*	277,526	-10,871	-0.039	0.322
56	0.231*	261,438	-10,528	-0.040	0.223	0.324*	266,655	-10,551	-0.040	0.313
57	0.231*	250,910	-10,215	-0.041	0.216	0.324*	256,105	-10,240	-0.040	0.304
58	0.231*	240,695	-9,910	-0.041	0.210	0.324*	245,865	-9,937	-0.040	0.295
59	0.231*	230,785	-9,614	-0.042	0.203	0.324*	235,928	-9,643	-0.041	0.286
60	0.261*	221,171	-9,326	-0.042	0.223	0.369*	226,285	-9,358	-0.041	0.316
61	0.261*	211,845	-9,045	-0.043	0.216	0.369*	216,927	-9,080	-0.042	0.307
62	0.261*	202,800	-8,772	-0.043	0.210	0.369*	207,847	-8,810	-0.042	0.298
63	0.261*	194,027	-8,507	-0.044	0.203	0.369*	199,037	-8,548	-0.043	0.289
64	0.261*	185,520	-8,249	-0.044	0.197	0.369*	190,489	-8,293	-0.044	0.280
65	0.286	177,271	-8,779	-0.050	0.210	0.405	182,196	-8,832	-0.048	0.299
66	0.286	168,492	-8,510	-0.051	0.203	0.405	173,364	-8,567	-0.049	0.290
67	0.286	159,982	-8,247	-0.052	0.197	0.405	164,796	-8,309	-0.050	0.281
					Scenario 2: Early Retirement Occupational Pension + State Pension					
55	0.487	829,881	-10,346	-0.012	0.219	0.447	601,615	1,505	0.003	-0.045
56	0.485	819,535	-4,530	-0.006	0.096	0.469	603,120	1,974	0.003	-0.059
57	0.505	815,005	-5,408	-0.007	0.114	0.493	605,094	1,992	0.003	-0.059
58	0.527	809,597	-5,236	-0.006	0.111	0.518	607,086	1,743	0.003	-0.052
59	0.551	804,361	-4,784	-0.006	0.101	0.542	608,829	2,221	0.004	-0.066
60	0.577	799,577	-13,594	-0.017	0.287	0.566	611,050	-7,882	-0.013	0.234
61	0.591	785,983	-14,084	-0.018	0.298	0.579	603,168	-6,798	-0.011	0.202
62	0.605	771,899	-14,533	-0.019	0.307	0.592	596,370	-7,066	-0.012	0.210
63	0.619	757,366	-14,949	-0.020	0.316	0.605	589,304	-7,311	-0.012	0.217
64	0.634	742,417	86,776	0.117	-1.834	0.618	581,993	-7,542	-0.013	0.224
65	0.888	829,193	-37,918	-0.046	0.802	1.012	574,451	-26,664	-0.046	0.791
66	0.888	791,275	-36,775	-0.046	0.777	1.012	547,787	-25,874	-0.047	0.767
67	0.888	754,500	-35,659	-0.047	0.754	1.012	521,913	-25,102	-0.048	0.745

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