

*Estimating, and interpreting, retirement income  
replacement rates*

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*Abstract:* Longitudinal data are used to estimate retirement income replacement rates of employees in Ireland who transition into retirement over the period 2010 to 2014. The median replacement rate is estimated at 50 per cent, with the mean at 78 per cent. The mean estimate seems high relative to stated policy goals but further analysis shows that the estimate results in part from very high replacement rates at the lower end of the income distribution. This in turn results from the flat-rate nature of social welfare pensions in Ireland. More broadly, Ireland's pension system is shown to produce a more equal distribution of replacement rates compared to pre-retirement income. However, this leads to a question as to whether policy goals in the areas of pension adequacy should be set with respect to income or consumption levels as opposed to replacement rates.

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## Section I: Introduction

The adequacy of pension income has been to the fore in policy discussions for many years and in many countries. As noted by Mitchell and Phillips (2006) replacement rates are often used in these discussions. However, Mitchell and Phillips (2006), Biggs and Springstead (2008), Brady (2008) and MacDonald et al (2016) have all raised questions about the definition of replacement rates in the context of pensions. Similarly, they have each questioned the meaningfulness of policy targets that are stated in terms of replacement rates which are often loosely defined.

Ireland is among those countries where policy-makers have been, and continue to be, concerned about pension adequacy. Across the National Pensions Policy Initiative (The Pensions Board, 1998), the Green Paper on Pensions (The Department of Social and Family Affairs, 2007) and an OECD review of the Irish pension system (2014), targets have been set with respect to pension coverage and adequacy. In the case of the 2007 Green Paper, it was suggested that policy should aim to see state-provided and occupational pensions combining to replace “50 percent of pre-retirement earnings” (para 1.12).

In this paper, we provide new estimates of retirement income replacement rates for Ireland. Our objective in doing this is two-fold. First, we want to build on previous work by Nivakoski (2014) and to look at the distribution of replacement rates. Ireland is somewhat unusual amongst OECD countries in that state social welfare pensions are generally flat-rate and not earnings related. As shown by Nivakoski, this leads to a distribution of replacement rates which is much more equal when compared to the distribution in earnings. Nivakoski's earlier work was based on cross-sectional data but in this paper we use longitudinal data which offer advantages that are set out below. Our second goal is to assess what our estimates imply about the appropriateness of a policy goal such as a 50 percent replacement rates. We find high replacement rates for low income people so the question arises as to whether the actual level of income in retirement is a more meaningful policy goal below some point in the income distribution.

This paper uses data from The Irish Longitudinal Study on Ageing (TILDA). As TILDA is a longitudinal study, the same survey participants have been interviewed at Wave 1 (mainly in 2010), Wave 2 (in 2012) and Wave 3 (in 2014). As a result of this survey design, we are able to identify people who are employed at one survey wave but retired by the next. This allows us to examine labour earnings and pension income in real time, thereby reducing any possibility of recall error which may have impacted upon Nivakoski's earlier results. The data also facilitate an examination of how replacement rates vary across a number of factors such as gender, education and occupation. By generating these real-time data on replacement rates using a representative sample of the population, we aim to provide an important input into the on-going policy deliberations, mentioned above.

This paper is structured as follows. In the remainder of this introduction, we provide a brief overview of Ireland's pensions system. In Section 2, we describe the data in more detail and how the sample used in the analysis is constructed. We also describe how we calculate the key variable of interest, the retirement income replacement rate. In Section 3, we present our findings on replacement rates and how the rates vary across groups. Section 4 concludes with some reflections on the policy implications.

We turn now to the brief description of Ireland's pension system. The Irish pension system can be divided into three pillars: i) State welfare pensions, ii) occupational pensions, and iii) private pensions.<sup>2</sup> The first pillar provides a basic level of income for older people, and it is paid to most people of pension age. The other two (supplementary pension) pillars are typically linked to earnings.

As mentioned above, the first pillar pensions are flat-rated (not linked to earnings), providing a basic level of income. These payments consist of the Contributory and Non-contributory State welfare pensions.<sup>3</sup> To qualify for either of these pensions, an individual must have reached the State Pension Age (SPA) of 66 years.<sup>4</sup> Entitlements to the Contributory pension, delivered on a pay-as-you-go (PAYG) basis from the Social Insurance Fund (SIF), are built up over the working life of an individual through the accumulation of Pay-Related Social Insurance (PRSI) credits, and the payments are not means-tested. Between 2010 and 2014, when the majority of TILDA data used in this paper were collected, the maximum gross payment rate was EUR 230.30 per week per person. The Non-contributory State welfare pension is a means-tested payment. It is not dependent on past employment history and is financed through general taxation. In order to qualify for the Non-contributory State welfare pension, a person must not be eligible for the Contributory State welfare pension, pass a means test based on both income and wealth, and be habitually resident in Ireland. Between 2010 and 2014, the maximum pre-tax rate of payment was EUR 219 per week per person.

The second and third pillars consist of supplementary pensions, over and above the State welfare pensions. Contributions to supplementary pensions are deductible from income taxation (up to certain limits). 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. Public service occupational pension schemes are in place for staff in the civil service, local authorities, Garda Siochana (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. Private pensions are voluntary and consist of Retirement Annuity Contracts (RACs) and Personal Retirement Savings Accounts (PRSAs). RACs are commonly used by the self-employed. PRSAs which were introduced in 2002 with an aim of increasing pension coverage among low-coverage employee groups. 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.

## **Section 2: The data, the sample and the methodology**

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<sup>2</sup> More details are found in the Department of Social and Family Affairs (2007) and OECD (2014).

<sup>3</sup> The Transition State welfare pension was payable from age 65 but had higher contribution requirements than the Contributory State welfare pension. It was abolished in 2014.

<sup>4</sup> 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.

The data for this analysis come from The Irish Longitudinal Study on Ageing (TILDA). The data collection under TILDA began in 2009. Information was gathered on a sample of over 8,000 people aged 50 and over and their partners and spouses, including those aged under 50. The first wave achieved a response rate of 62 per cent. The survey covers topics such as income and wealth, demographics, health and labour force status. A detailed health assessment was conducted in Wave 1, and repeated every second subsequent wave.

The longitudinal structure of TILDA data makes it possible to examine changes in peoples' circumstances, including labour force status, health status, and living arrangements. Income changes could also be identified.

In this paper, we exploit the longitudinal nature of TILDA and it is important to describe how we arrive at the sample used in the analysis that follows. We focus on people who were interviewed in more than one wave and who describe themselves as being "employed" in one wave (1 or 2) and then "retired" in the subsequent wave (2 or 3). The number falling into this category is 419. However, we can only use cases where people have provided us with income data in both their pre- and post-retirement interviews. For this reason, our sample falls to 354.

In Table 1, we present information on the characteristics of the people in the sample used in the analysis below. We also provide information on all employees in the data so that comparisons are possible. The data on the sample used here are broken up between those retiring between Waves 1 and 2 and between Waves 2 and 3. The data on all employees are presented separately for Waves 1 and 2. As can be seen, the majority of those retiring are aged 60-70 and the age distribution of those retiring is very different from the age distribution of employees. We also see higher rates of retirement among public sector employees compared to their proportion of employees. This may have been a function of retirement arrangements in place for public servants. There appear to be lower rates of retirement among semi-skilled and unskilled occupations compared to their representation among employees generally, and higher rates of retirement among higher income groups.

It is useful to discuss two elements of the TILDA sample of employees as they may appear surprising. First, the female/male split is slightly over 60/40. There a number of reasons for this. First, women were generally more likely to participate in the study. Second, men in the sample were more likely than women to be self-employed. As we are excluding the self-employed, this further influences the gender balance in the sample.

The second potentially surprising element is the relatively even split between public and private sector employees. Comparing these estimates with data from the CSO's Quarterly National Household Survey (QNHS), the estimates are largely similar for the age group in question: the QNHS data for 2010 show that 42 per cent of employees aged 50 to 64 are working in the public sector.

Table 1: Description of all employed, and those who subsequently retire

	All employees		Transition into retirement	
	Wave 1	Wave 2	W1 → W2	W2 → W3
	per cent	per cent	per cent	per cent
<b>Age group</b>				
<60 years	76.7	73.1	42.7	37.2
60-70 years	22.1	25.4	54.9	61.5
>70 years	1.2	1.4	2.4	1.4
<b>Gender</b>				
Male	39.0	37.2	45.6	35.1
Female	61.0	62.8	54.4	64.9
<b>Education</b>				
Primary/none	13.8	12.7	14.1	18.2
Secondary	43.1	41.0	43.2	37.8
Third/higher	43.1	46.3	42.7	43.9
<b>Location</b>				
Dublin	26.7	26.5	28.8	34.0
Other town/city	27.8	27.2	28.3	31.3
Rural	45.4	46.2	42.9	34.7
<b>Employment sector</b>				
Private	49.9	51.7	34.0	47.3
Public	50.1	48.3	66.0	52.7
<b>Part-time / Full-time</b>				
Part-time	30.1	29.6	34.0	43.2
Full-time	69.9	70.4	66.0	56.8
<b>Marital status</b>				
Married	77.9	78.2	71.8	70.9
Never married	8.4	7.6	12.1	12.2
Separated/divorced	8.7	9.4	8.7	8.8
Widowed	5.0	4.8	7.3	8.1
<b>Occupation type</b>				
Professional / Managerial / Technical	33.0	31.1	54.6	34.9
Non-manual / Skilled manual	41.3	42.2	26.8	45.9
Semi-skilled / Unskilled	25.6	26.7	18.6	19.2
<b>Earnings category (EUR/week, gross)</b>				
0	1.5	1.8	n/a	n/a
1-299	17.0	16.3	18.4	20.9
300-699	35.7	36.0	27.2	31.8
700-1000	18.0	19.1	16.5	16.9
1000+	27.9	26.8	37.9	30.4
<b>Sample size</b>	<b>2,189</b>	<b>1,712</b>	<b>206</b>	<b>148</b>

Having described the data and the sample, the last item to be discussed before presenting the analysis is the calculation of the retirement income replacement rate. The basic formula is as follows:

$$\text{Replacement Rate} = \frac{\text{Pension Income}}{\text{Labour Earnings}} * 100$$

For each individual, pension income refers to gross weekly income and is made up of (a) the state welfare pension (pillar I), (b) occupational pension income (pillar II) and (c) private pension income (pillar III). Gross weekly labour earnings is taken from the survey wave where they indicated that they were still “employed”.

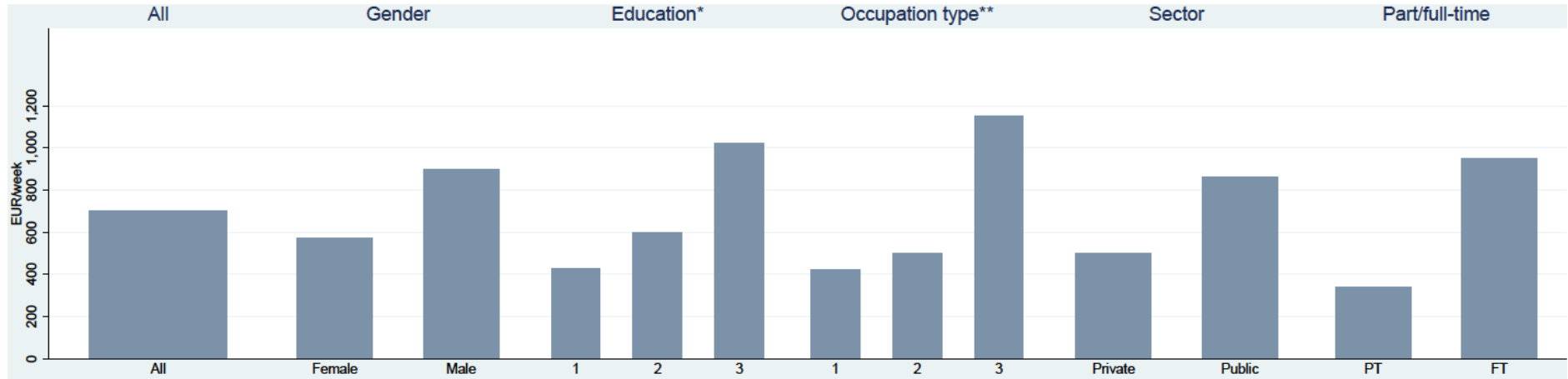
### **Section 3: Incomes and replacement rates**

We now turn to the main objective of the paper and present estimates of replacement rates and the distribution of the rates. We begin our presentation by examining the distribution of labour earnings for our sample and will then look at pension incomes before bringing the two together as replacement rates. We do this because the patterns observed for replacement rates will be better understood if the underlying components are known.

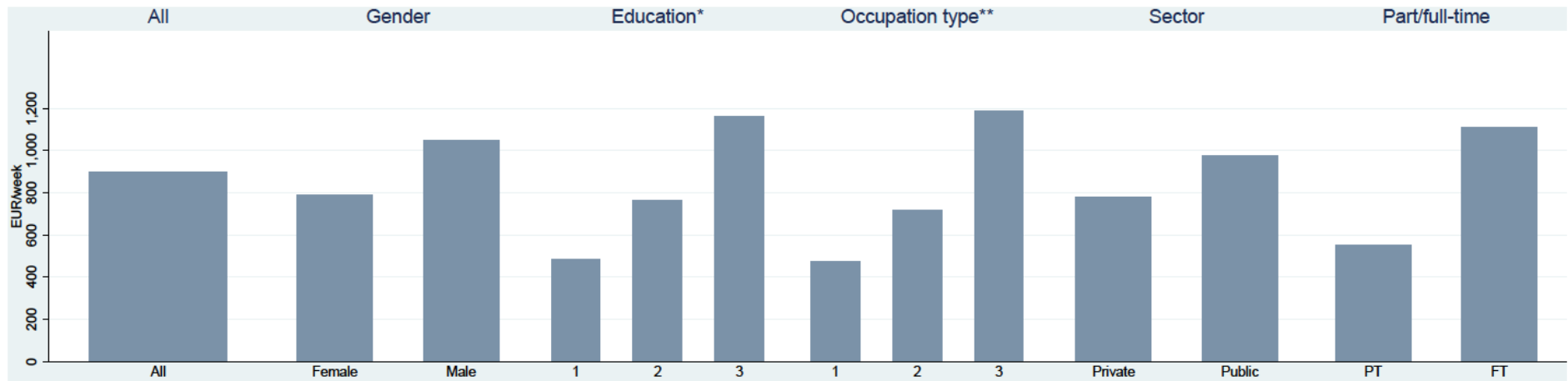
In Figure 1, we present gross weekly labour earnings: part a) shows the medians and part b) the means. The figures are also presented in number form in Appendix Table A1, along with their standard deviations. Median weekly labour earnings in our sample is EUR 700, with the mean being EUR 899. These values differ across different groups and in expected ways. For example, the mean weekly labour earnings for men is EUR 1,051 whereas for women, it is EUR 793. These figures imply a female-to-male wage ratio of 75 per cent. Labour income rises with education and with occupational level. Public sector employees are shown to earn more than private sector employees. Finally, full-time workers earn more than part-time workers.

Figure 1: Labour earnings

a) medians



b) means



\*Education level: 1: None / primary, 2: Secondary, 3: Third level / higher

\*\* Occupation types: 1: Semi-skilled/Unskilled, 2: Non-manual/Skilled manual, 3: Professional/Managerial/Technical

In Figure 2, we examine pension income for our sample. Again, part a) shows the medians and part b) the means. The means, medians and standard deviations of total pension income are presented also in Appendix Table A1. Median pension income is EUR 293; the mean is EUR 471. The male mean is EUR 539 and that for females is EUR 422. The implied female-to-male ratio is 78 per cent. If we compare this ratio to the female-to-male labour earnings ratio of 75 per cent, we get an indication that replacement rates might be higher for women than for men in our sample. While a higher replacement rate for women might appear, at face value, to be a positive finding for women, it should be understood that the higher replacement rate results from lower female earnings. This illustrates the point made above of the need to understand the components of the replacement rates. We will say more on this when we look at the estimated replacement rates.

As would be expected, pension incomes rise with education levels and with occupation levels and are higher for public sector workers. However, in each case labour earnings were also shown to be higher. Therefore, the difference in replacement rates between these groups depends on the level of pension income these groups receive relative to their previous labour earnings.

A further building block before looking directly at replacement rates is to consider how pension income is made up across the three sources – the three pillars of pension income – for people in our sample. As with the presentation in the earlier figures, an understanding of pension income by source will aid in understanding the patterns on replacement rates. We look at this in part b) of Figure 2.<sup>5</sup> The mean total pension income of EUR 471 is made up of the following components: an average state social welfare pension of EUR 89; an average occupation pension payment of EUR 353; an average private pension payment of EUR 28. These figures imply that 19 per cent of average pension income is made up of the social welfare pension (EUR 89/ EUR 471). However, this average of 19 per cent hides large variation across groups and this is best illustrated by the educational categories. For those with low levels of education, the social welfare pensions make up 64 per cent of their pension income. For those with high levels of education the corresponding figure is 7 per cent. This points to the importance of the social welfare pensions for lower income groups and the impact of this component of pensions on replacement rates will be seen below.

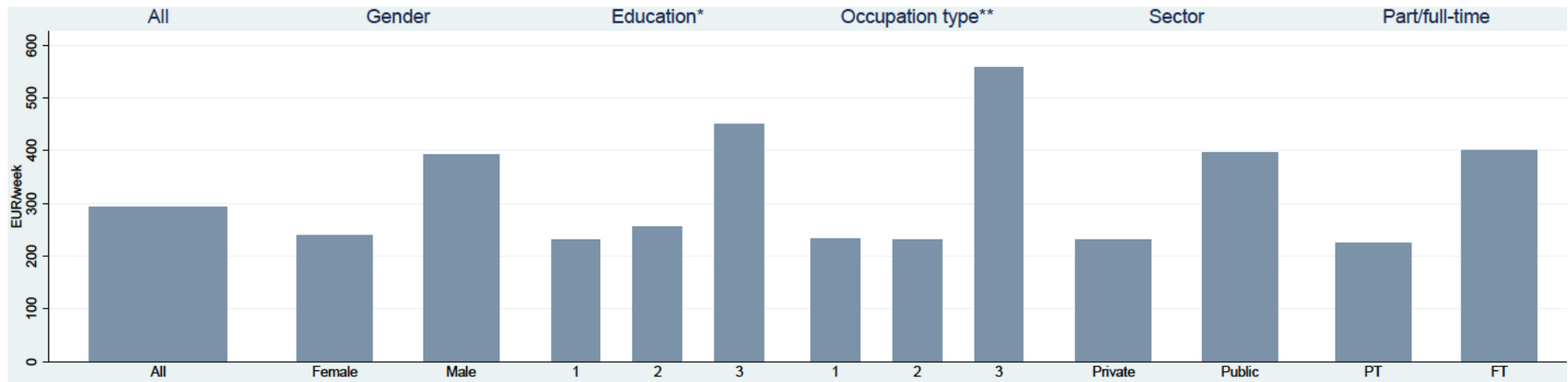
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<sup>5</sup> The mean and median pension incomes from different pensions (state welfare pensions, occupational pensions and private pensions) are listed in Appendix Table A2, along with standard deviations.



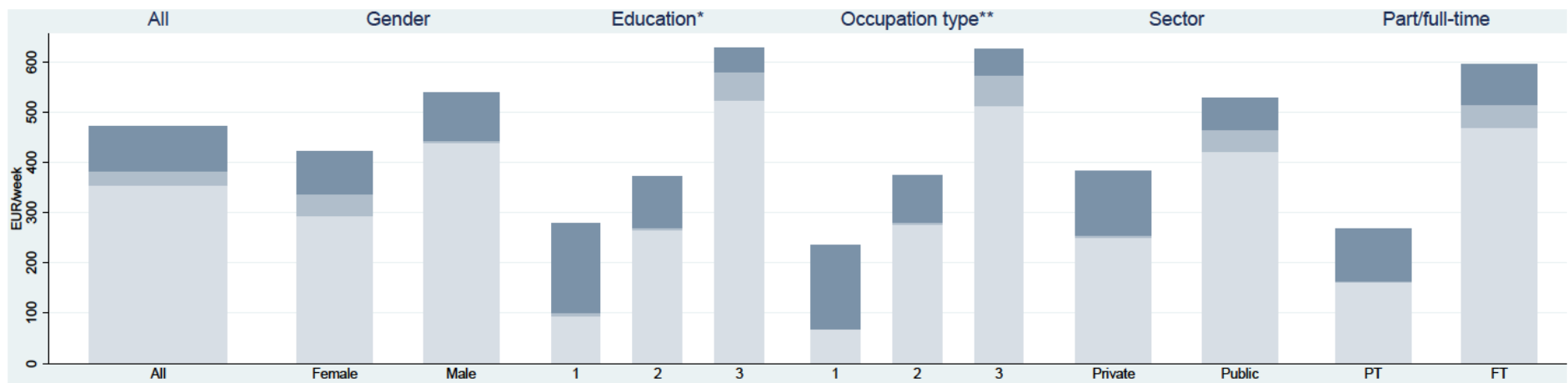
**Figure 2: Pension income**

**a) Medians**



**b) Means, with pension component breakdown**

Lightest bar: occupational pensions      Medium bar: private pensions      Darkest bar: social welfare pensions



\*Education level: 1: None / primary, 2: Secondary, 3: Third level / higher

\*\* Occupation types: 1: Semi-skilled/Unskilled, 2: Non-manual/Skilled manual, 3: Professional/Managerial/Technical

Part a) of Figure 3 combines the earlier pictures of labour and pensions incomes. Here, we examine the means of these two figures in one set of graphs, providing a visual representation of the components of the replacement rates. Although both labour earnings and pensions incomes vary, there is less variation in the proportionate falls between both types of income across the various breakdowns. This leads to an expectation of lower variability in replacement rates compared to either labour or pension incomes and this is what emerges as we examine means of retirement income replacement rates in part b) of Figure 3.

The first point to be read from Figure 3 b) is that the average replacement rate in the sample is 78 per cent.<sup>6</sup> Given the stated policy target of 50 per cent replacement rates, this estimate is perhaps surprisingly high. The median replacement rate is 50 per cent (not shown in the figure, but provided in Appendix Table A1) which might be more in line with expectations. From this mean and median comparison, it seems that the distribution is skewed towards some high values.

When we look beyond the overall value, some interesting points emerge. First, based on mean values, the female replacement rate is higher than the male replacement rate – 89 per cent for women and 63 per cent for men. As discussed above, the higher value for women is driven by lower female labour earnings and certainly not by higher pension incomes. Again, we note the median values which are 49 per cent for women and 50 per cent for men. Second, in spite of the fact that there is a positive relationship between education level and both labour earnings and pension income, there is a negative relationship between education level and replacement rates. Third, and echoing the finding with respect to education, the lowest occupation group has the highest replacement rates. The mean replacement rate for the highest occupation group is 73 per cent. This falls to 68 per cent for the middle occupation group and then rises again to 93 per cent for the lowest group. Such a U-shaped relationship was also found by Nivakoski (2014) with respect to education for all retirees so it is not entirely surprising.

Finally, we can note that the median replacement rates for the three education groups are as follows: for the highest group, the median value is 47 per cent; for the middle group, it is 49 per cent; for the lowest group it is 66 per cent. For the occupation groups, the median values are more centred: the value for the lowest occupation group is 52 per cent; it is 50 per cent for the middle group and 49 per cent for the highest group.

The broad picture to emerge from Figure 3 b) is of a greater degree of equality with respect to retirement income replacement rates when compared to incomes either before or after retirement. This feature of Ireland's pension system was also observed Nivakoski (2014) and she went on to explore the role played by the social welfare pensions in bringing about this pattern. We follow this approach and explore the component parts of replacement rates shown in Figure 3 b).

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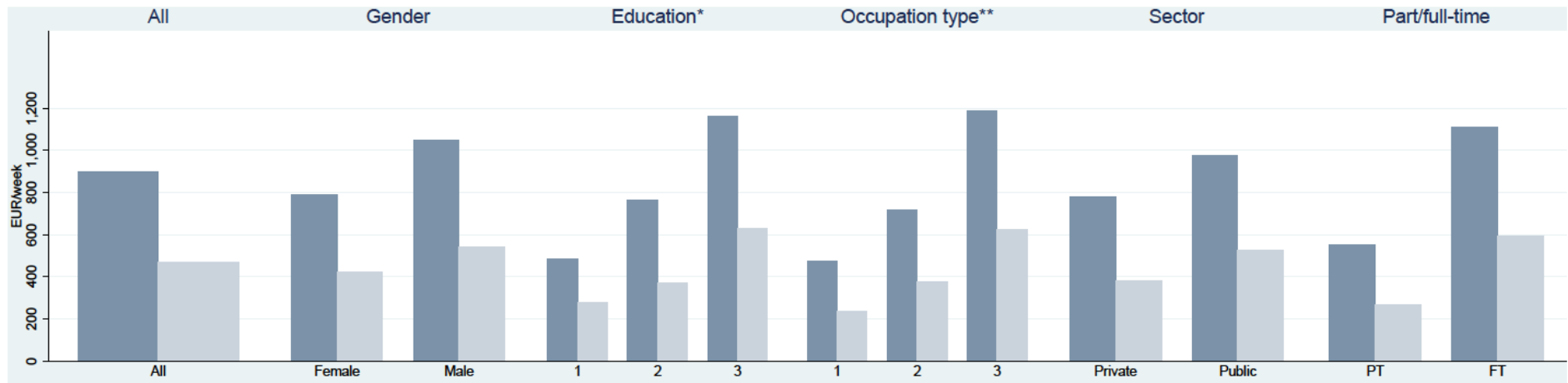
<sup>6</sup> When comparing average earnings and pension incomes with average replacement rates, one needs to bear in mind that the mean of the ratios of two variables is not equal to the ratio of their means. Therefore, the ratio of mean labour earnings (EUR 899) to mean pension income (EUR 471) – which is 52 per cent – does not equal the mean of the (individually calculated) replacement rates (78 per cent).

A strong and fascinating picture emerges of the key role played by the social welfare pensions in equalising outcomes. Focussing on the education component of the figure, it can be seen how replacement rates based only on supplementary pensions (occupational and private) result in a positive relationship between education levels replacement rates. However, the impact of the social welfare pension is to boost replacement rates for lower educational groups to a much greater extent (proportionately) and so the pattern for total replacement rates is reversed. A similar picture emerges with respect to occupation. Replacement rates based only on supplementary pensions are positively related to occupational grade. The social welfare pensions do not reverse the pattern fully but they lead to the U-shaped distribution discussed above and the vast improvement in replacement rates for lower occupational grades.

Examining differences between individuals retiring from public and private sector employment, it can be seen that we have estimated mean replacement rates to be higher for people retiring from the private sector (83 per cent) compared to people retiring from the public sector (75 per cent). The median values are essentially the same (51 per cent and 50 per cent respectively) but the finding on mean values may be somewhat surprising. The decomposition of replacement rates into social welfare and supplementary pension components provides one clue as to the source of this result. It can be seen that if we only consider supplementary (occupational and private) pensions there is a higher replacement rate in the public sector. As with our analysis of education and occupation above, the inclusion of social welfare pensions alters the pattern. As many of the public servants in our sample would not have had access to the state social welfare pension, the observed pattern seems plausible.

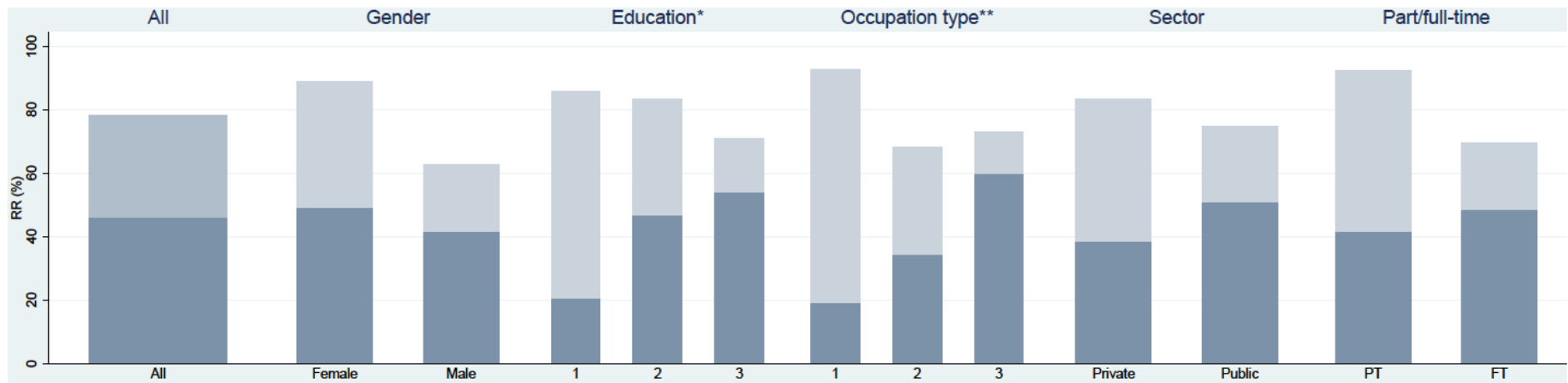
**Figure 3**

**a) Mean labour earnings and mean pension income**



**b) Mean Replacement Rate, with pension component breakdown**

Lighter bar: social welfare pensions      Darker bar: supplementary (occupational or private) pensions



\*Education level: 1: None / primary, 2: Secondary, 3: Third level / higher

\*\* Occupation types: 1: Semi-skilled/Unskilled, 2: Non-manual/Skilled manual, 3: Professional/Managerial/Technical

We look next at the relationship between replacement rates and labour earnings. Our analysis above of the relationship between education and occupational levels and replacement rates suggests that replacement rates are more equally distributed than incomes – both labour and pension incomes – so a direct examination of the relationship between labour earnings and subsequent replacement rates is of interest.

As with our approach above, it is useful to look first at the components of the replacement rate separately, so that the pattern of replacement rates is more readily understood. In Figure 4, we examine labour earnings and pension income across the five earnings quintiles. One point to emerge is that, although both pension and labour incomes rise across the quintiles, the rise for labour income is steeper. In Figure 11, we show the pension components across the quintiles. Once again, the importance of the social welfare pensions at the lower end of the distribution becomes evident. Turning to replacement rates in Figure 12, we see a pattern which mirrors the U-shaped relationship between occupational status and replacement rates shown above. The extremely high replacement rates in the first quintile should be treated with a high degree of caution because they arise in part from some very low reported labour earnings. The results in quintiles 2 to 5 are more meaningful. Supplementary pensions provide lower replacement rates for quintiles 2 and 3 compared with the top two quintiles. However, the increase in the replacement rate provided by the social welfare pensions is much more significant in quintile 2 and so the U-shape emerges as a result of the state social welfare pension.

**Figure 4: Analysis by labour earnings quintile**

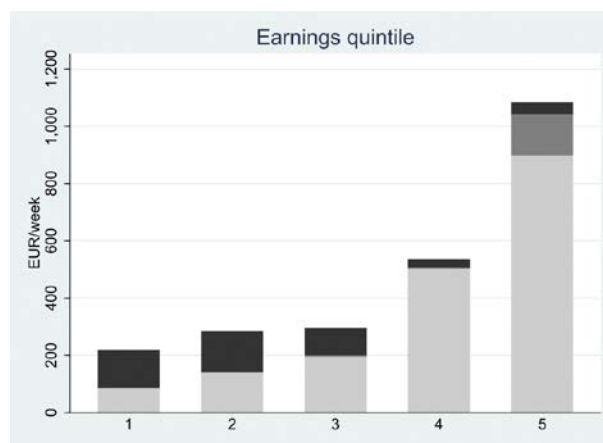
**a) Mean labour earnings and pension income**

Darker bar: labour earnings    Lighter bar: pension income



**b) Mean pension income, from different pensions**

Lightest bar: occupational pensions    Medium bar: private pensions    Darkest bar: social welfare pensions



**c) Mean replacement rate, from different pensions**

Lighter bar: supplementary pensions    Darker bar: social welfare pensions



As a final strand in our analysis of replacement rates, we use regression analysis to look at the various determinants in a multi-variate context. Following the approach above, we look at labour earnings and pension income also. The most striking point to emerge from Table 2 is the lack of statistically significant coefficients in the regression where the replacement rate is the dependent variable. While this is striking, it is not too surprising based on the findings above. The regression model is again showing how the pensions system seems to have an equalising effect across groups. For the regression with labour earnings as the dependent variable, familiar patterns are present such as higher earnings for third level graduates and for professionals. But as noted, these are not seen in the last regression.

Table 2: OLS Regression results

	<b>1</b>	<b>2</b>	<b>3</b>
	<b>Labour earnings</b>	<b>Pension income</b>	<b>Replacement Rate</b>
<b>female</b>	<b>-138.9</b>	<b>-121.1</b>	<b>18.9</b>
	-112.3	-110.0	-17.6
<b>Education: Primary/none (ref.)</b>	-	-	-
	-	-	-
<b>Education: Secondary</b>	<b>201.9</b>	<b>33.8</b>	<b>-2.6</b>
	-156.8	-153.5	-24.5
<b>Education: Third level/higher</b>	<b>414.1**</b>	<b>268.8</b>	<b>-5.1</b>
	-169.6	-166.1	-26.5
<b>Semi-skilled/Unskilled (ref.)</b>	-	-	-
	-	-	-
<b>Non-manual/Skilled manual</b>	<b>185.8</b>	<b>120.0</b>	<b>-29.1</b>
	-148.7	-145.7	-23.3
<b>Professional/Managerial/Technical</b>	<b>501.7***</b>	<b>236.5</b>	<b>-15.2</b>
	-152.5	-149.4	-23.9
<b>Public sector</b>	<b>-32.4</b>	<b>18.6</b>	<b>-15.2</b>
	-111.1	-108.8	-17.4
<b>Full-time</b>	<b>404.6***</b>	<b>230.2**</b>	<b>-18.7</b>
	-112.0	-109.6	-17.5
<b>Constant</b>	<b>172.7</b>	<b>94.0</b>	<b>105.4***</b>
	-176.4	-172.8	-27.6
<b>Observations</b>	<b>340</b>	<b>340</b>	<b>340</b>
<b>R-squared</b>	<b>0.152</b>	<b>0.065</b>	<b>0.017</b>

## Section 4: Conclusion

Our analysis has produced a number of key findings. First, when viewed in simple terms, our finding of a mean replacement rate of 78 per cent looks very positive. However, this overall value is partly the product of extremely high values at the lower end of the distribution and may be a function of low reported earnings immediately prior to retirement – possibly due to part-time work. The replacement rate values shown in Figure 4 across the second to fifth income quintiles are possibly more representative of actual replacement rates. Similarly, our findings of median replacement rates being generally in the 50 per cent range also provide more representative information.

The second key set of findings relates to the distribution of replacement rates as opposed to the levels. We have generally found the replacement rates are distributed more equally than incomes. Female replacement rates are higher as were those for lower occupational and education groups. However, it should be stressed that these results are driven by lower earnings. A third set of findings relates to the crucial role played by the social welfare pensions in generating the greater degree of equality in replacement rates.

A number of implications can be distilled from the findings. First, the people in the data that we observe retiring are from that generation where defined benefit schemes were more prevalent. This is also the group that was somewhat immune from the economic collapse of 2007/08. These factors lead to the question of whether future waves of retirees will have lower replacement rates and whether current retirees are part of a “golden generation” from a retirement perspective. The question is important because any weakening of policy interest based on relatively favourable outcomes for current retirees could disadvantage future retirees. In this context, there will be a need for the on-going monitoring of replacement rates as people retire. There is also a need to project future replacement rates for representative samples of the population.

The second implication arises from the material on the distribution of replacement rates, specifically the U-shaped pattern with respect to occupation levels and earnings. It appears that the social welfare pensions perform a strong and successful role in raising replacement rates at the lower end of the socioeconomic distribution and that supplementary pensions work well at the upper end. However, there is a middle group who seem to do less well on the metric of replacement rates. This pattern is a challenge for other dimensions of social policy where targeted state interventions are focused on lower socioeconomic groups and where higher groups can purchase the service in question (in this case pensions).

Third, the success of the social welfare pensions points to the need to protect this tool of social policy. The critical role of these pensions was shown in Nivakoski (2014) and has been shown here again.

Finally, we can return to the question of the implications of the findings for policy goals set in terms of replacement rates. The findings of very high replacement rates at the lower end of the earnings distribution prompts a question as to the meaning of a policy goal of achieving a single replacement rate target across the earnings distribution. If levels of income matter to people, as opposed to income ratios, then a policy stated as a single ratio might not lead to optimal outcomes. It might be more appropriate to think in terms of a sliding scale of replacement rate targets or for targets to be set in terms of income levels and not replacement rates. More broadly, and following MacDonald et al (2016), it might make sense to set policy on income in retirement in a framework that emphasises the



maintenance of living standard as opposed to income levels. Similarly, Brady (2010) talks about the need to replace consumption as opposed to income and shows the importance of taking into account variables such as savings and taxation, pre and post retirement, and also owner occupied housing. Whichever approach is taken, the results here suggest that the single replacement rate target is unlikely to capture the multiplicity of circumstances which pensions policy must aim to address.

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## Appendix

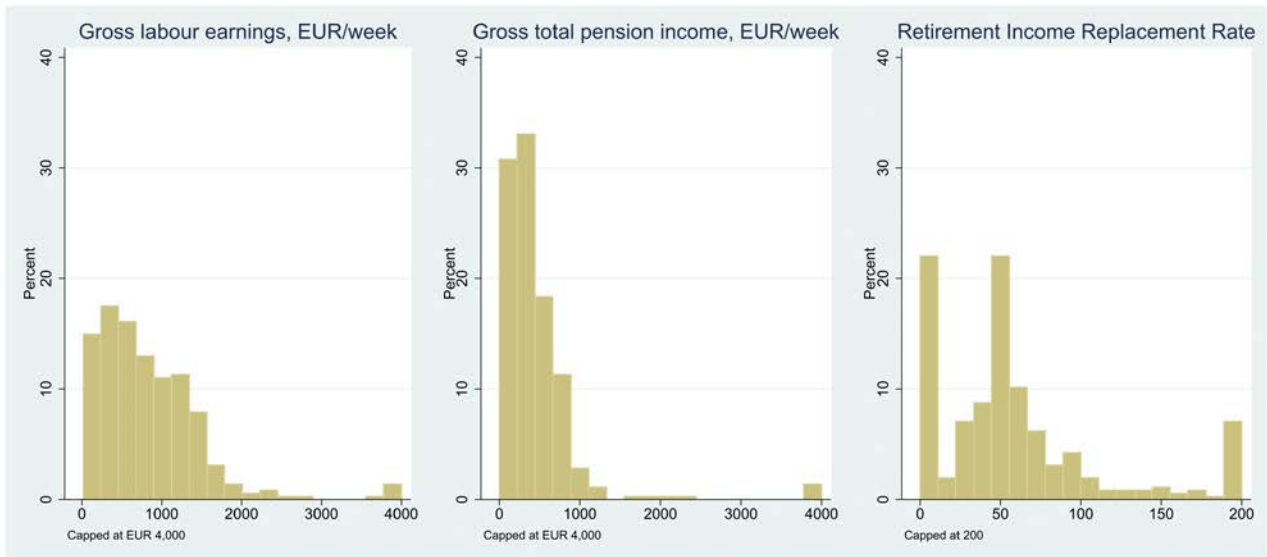
**Table A1: Means, medians and standard deviations of labour earnings (EUR per week, gross), pension income (EUR per week, gross) and Replacement Rates**

	Labour earnings			Total pension income			Replacement Rate			N
	Mean	Median	Sd	Mean	Median	Sd	Mean	Median	Sd	
<b>All</b>	899	700	1066	471	293	931	78	50	153	354
<b>Gender</b>										
Male	1051	900	1125	539	393	1072	63	50	82	146
Female	793	572	1012	422	239	818	89	49	187	208
<b>Education</b>										
Primary/none	483	425	328	277	230	202	86	66	82	55
Secondary	766	600	1107	372	256	645	83	49	182	142
Third/higher	1165	1025	1130	628	450	1235	71	47	143	157
<b>Location</b>										
Dublin	992	850	1025	539	300	1152	62	45	99	109
Other town/city	1034	675	1563	440	329	756	98	50	218	104
Rural	732	657	457	444	268	864	76	53	127	139
<b>Occupation type</b>										
Professional/Managerial/Technical	1188	1150	900	625	559	934	73	49	142	157
Non-manual/Skilled manual	718	500	1185	375	230	1085	68	50	103	119
Semi-skilled/Unskilled	472	423	320	236	234	133	93	52	197	64
<b>Employment sector</b>										
Private	782	500	1189	383	230	936	83	51	157	140
Public	976	863	972	528	398	926	75	50	150	214
<b>Part-time / Full-time</b>										
Part-time	552	340	918	268	225	260	92	56	156	134
Full-time	1110	950	1096	594	400	1148	70	48	151	220

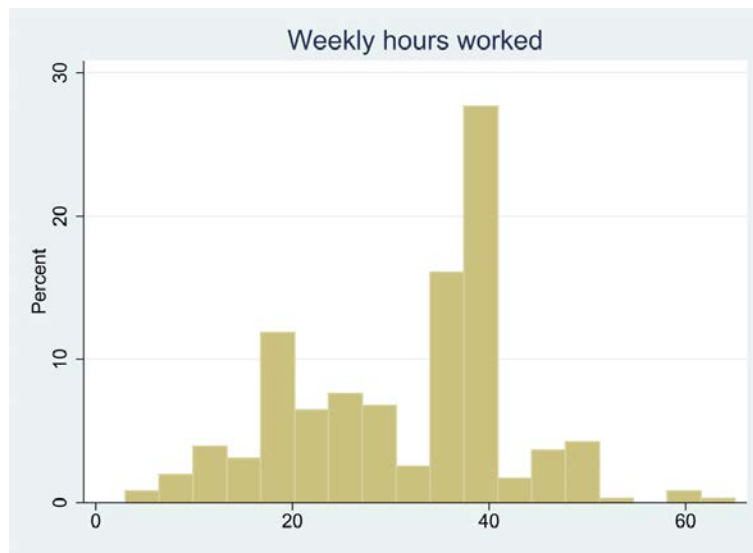
**Table A2: Means, medians and standard deviations of pension income from different sources (EUR per week, gross)**

	State welfare pensions			Occupational pensions			Private pensions			Total pension income			N
	Mean	Median	Sd	Mean	Median	Sd	Mean	Median	Sd	Mean	Median	Sd	
<b>All</b>	89	0	116	353	114	838	28	0	466	471	293	931	354
<b>Gender</b>													
Male	96	0	130	438	207	1093	5	0	31	539	393	1072	146
Female	84	0	105	294	50	594	44	0	607	422	239	818	208
<b>Education</b>													
Primary/none	178	228	115	95	9	194	5	0	33	277	230	202	55
Secondary	101	0	122	266	37	659	5	0	31	372	256	645	142
Third/higher	47	0	88	523	425	1060	57	0	698	628	450	1235	157
<b>Location</b>													
Dublin	68	0	102	468	150	1168	3	0	24	539	300	1152	109
Other town/city	109	0	121	327	125	773	5	0	32	440	329	756	104
Rural	91	0	120	288	43	517	65	0	742	444	268	864	139
<b>Occupation type</b>													
Professional/Managerial/Technical	51	0	101	513	500	677	61	0	699	625	559	934	157
Non-manual/Skilled manual	95	0	113	277	0	1099	3	0	23	375	230	1085	119
Semi-skilled/Unskilled	166	225	115	69	0	123	0	0	4	236	234	133	64
<b>Employment sector</b>													
Private	130	165	125	251	0	946	3	0	26	383	230	936	140
Public	63	0	102	421	300	753	44	0	598	528	398	926	214
<b>Part-time / Full-time</b>													
Part-time	105	54	109	162	0	268	2	0	16	268	225	260	134
Full-time	80	0	119	470	286	1026	44	0	590	594	400	1148	220

**Figure A1: Distribution of labour earnings, pension income, and Replacement Rates**



**Figure A2: Distribution of weekly hours worked (pre-retirement)**



Year	Number	Title/Author(s)
2017		
	574	Sea bass angling in Ireland: A structural equation model of catch and effort <i>Gianluca Grilli, John Curtis, Stephen Hynes and Paul O'Reilly</i>
	573	Ireland's international trade and transport connections <i>Martina Lawless and Edgar Morgenroth</i>
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	563	Pike ( <i>Esox lucius</i> ) stock management in designated brown trout ( <i>Salmo trutta</i> ) fisheries: Anglers' preferences <i>John Curtis</i>
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