The distribution of pension wealth in Europe

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This version 01-Sep-2017

Abstract

Pension wealth is one of the key components to obtain an augmented measure of household wealth, and therefore studying the distribution of pension wealth contributes to the growing literature assessing wealth inequality. This is particularly important in countries with generous pensions. In this paper, pension wealth inequality is estimated in elderly households for 26 European countries in 2006 and 2014 by exploiting the cross-sections of the EU-SILC survey. Life tables by educational level (which captures socio-economic status SES), sex, cohort, country and year are estimated with auxiliary data in order to assess the role of life expectancy inequalities on pension wealth. The results indicate that differential mortality due to SES increases pension wealth inequality. In most of the countries this effect has decreased between 2006 and 2014, which means that SES inequalities in mortality are less important in explaining today's pension wealth inequality. Gini recentered influence function (RIF) regressions confirm the diminishing influence of tertiary education on pension wealth inequality. Finally, pension liabilities are also computed, revealing worrying levels of increasing implicit debt. This debt is larger than GDP in 14 countries.
Keywords: Pension wealth, Inequality, Europe, Mortality, Education, RIF regressions

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I thank the research assistance provided by Christian Miranda and the suggestions and remarks from Hitoshi Shigeoka and participants at the Financing Longevity Workshop at Stanford University.

1. Introduction

This paper seeks to discuss comparatively in Europe and over time, the distribution of pension wealth before and after including inequalities in life expectancy. The goal is to describe how pension wealth has evolved during the last years in Europe and to what extent inequalities in mortality affect pension wealth inequality. These results are compared with other measures describing the pension system in each country such as pension liabilities, pension generosity and the importance of voluntary pension plans. It could be the case that generous and costly pension systems are not necessarily more equalizing than less expensive pension systems.

In a context of rising economic inequality and pension schemes being challenged by rapid ageing, it is important to know which type of pension systems are more or less important in determining the level of pension wealth inequality. The comparative analysis offers the possibility to include countries with a different mix of compulsory, voluntary, public and private pension plans which may enrich the policy discussion.

Pension wealth is roughly defined as the present value of expected pensions and involves the use of discount rates and survival probabilities. Pension wealth is computed for the elderly households with at least one member receiving a pension in the countries participating in the European Union Statistics on Income and Living Conditions survey (EU-SILC) of 2007 and 2015, which corresponds to the income reference years 2006 and 2014. The sample size for the analysis is composed of 124,486 households observed in 26 countries.

Once pension wealth is estimated for each household, we compute inequality measures of pension wealth for all the 52 country-year points. The computation of pension wealth and its distribution is performed, first, with mortality estimates without distinguishing by socio-economic status (SES) and then with mortality estimates distinguishing by SES, which is captured with educational attainment. The difference between these results gives an idea about the size of the effect of differential mortality on the distribution of pension wealth. In this paper, the SES life tables are estimated for each country, sex, educational group and birth cohort group by utilizing information from the Wittgenstein Centre for Demography and Global Human Capital.

The results indicate an important role of life expectancy inequalities on the distribution of pension wealth in some countries (e.g. in Portugal, Cyprus, Greece and Spain), and an almost negligible role in most of the countries. However, it is observed that between 2006 and 2014 the influence of differential mortality on inequality has decreased. Interestingly, the national pension wealth (i.e. the actuarial liability) -a by-product of this study- is larger for almost all countries when its computation involves the use of specific SES mortality instead of general mortality. The size of this actuarial liability in 2014, as percentage of GDP, ranges between 55% in Lithuania and 182% in Italy; and it is larger than 100% in 14 out of 26 countries. A further analysis seeks to uncover the effects of some predictors of pension wealth inequality by using 'Gini recentered influence function' (Gini-RIF) regressions. This analysis confirms the diminishing influence of tertiary education on pension wealth inequality in the period of analysis.

The rest of the paper is organized as follows. Section 2 reviews the literature dealing with pension wealth estimation, section 3 presents the methodological approach to estimate pension wealth and inequality measures, and section 4 presents the results. Section 5 contains a further analysis to explore the determinants of pension wealth inequality by using RIF-Gini regressions, and finally section 6 presents some concluding remarks.

2. Studies on pension wealth

Standard measures of household wealth only include marketable wealth, i.e. the value of actual holdings such as savings, bonds, housing and loans, and sometimes the value of private pension balances. The expected income from pensions is generally unaccounted. However, this practice can mislead the analysis of wealth distribution because of the well-known crowding-out effects of public transfers on private wealth. Feldstein (1974) was one of the first authors to document the extension of the crowding-out effects and estimated that social security wealth reduces personal saving by 30%-50% in the U.S. Although these effects have been contested or confirmed in later studies, it is generally accepted that pension wealth reduces private savings. Recent evidence from the Survey of Health, Ageing and Retirement in Europe (SHARE) shows that pension wealth has a displacement effect of 17%-31% on household savings for the individuals aged 60 and more (Alessie *et al*. 2013).

Given that the levels of wealth observed today have been affected by the accumulation of social security contributions, it seems reasonable to include pension wealth in the measures of household wealth. This addition will, certainly, have consequences on the measurement of the distribution of wealth. In one of the first papers dealing with social security wealth inequality, Feldstein (1976) found that the Gini index of net wealth was 0.72, while the Gini index of augmented wealth (adding social security wealth) was 0.51. It is also important to consider public and private pensions in the computation of pension wealth. In this respect, public pensions are mostly Defined Benefit (DB), while occupational pension plans offer Defined Contribution (DC) pensions which can be publicly and/or privately managed. The former type of pensions are generally more equally distributed than the latter. Wolff (2015) illustrates this with US data of 2010 for the 47-64 years old households by showing that the Gini index of net wealth falls from 0.83 to 0.80 after private pension wealth is added, and it is further reduced to 0.66 with the inclusion of public (Social Security) pension wealth.

The relative size of pension wealth with respect to total wealth in the household can be considerable. For example, Frick and Grabka (2013) show that pension wealth amounts to 57% of the wealth of German retirees, while the rest is mostly composed of housing wealth. Crawford and Hood (2016), employing a sample of retirees aged 65-79 from the English Longitudinal Study of Ageing (ELSA), shows that private and public pension wealth represent about 19% and 22% of an augmented measure of household wealth that includes both types of pensions. They also show that the Gini index of household wealth falls from 0.524 to 0.489 after private pensions are included, and this is further reduced to 0.382 with the inclusion of public pensions.

Studies must rely on household surveys to compute pension wealth when administrative datasets are not available, which is always the case when one wants to perform cross-country analysis. For the retirees, the computation of pension wealth is much less complex because the benefit is reported by the individual. In the case of workers, some studies have employed various forms of statistical matching between survey information and social security data (Frick and Grabka 2013; Engelhardt and Kumar 2011) self-reported social security information (Wolff 2007) and self-reported retrospective and subjective information (Alessie *et al.* 2013).

Studies such as the ones by Frick and Grabka (2013), Wolff (2007) and Banks *et al.* (2005) define pension wealth as the present value of expected pension streams, which involves the use of discount rates and survival probabilities. Generally, the official life tables of the country are used to compute individual survival probabilities disaggregated by sex. However, other alternatives include the estimation of individual subjective survival rates (Gan *et al.* 2015, Bissonnette *et al.* 2014, Peracchi and Perotti 2014) and the estimation of life tables by socio-economic status such as in Brown *et al*. (2002). Mortality is highly correlated with socio-economic status and a number of studies show that individuals with higher socio-economic status live longer. Socio-economic status can be captured by a variety of outcomes such as education, occupation, lifetime income, current income and wealth. However the availability and quality of information limits the choice. It has been frequently found that education is an important predictor of mortality, i.e. higher educated individuals tend to live longer than lower educated individuals (Deaton and Paxson 2001). The reason is that education is a proxy of lifetime income, which means that people with more resources ten to live longer. Brown et al. (2002) compute differentiated life tables by using education as a proxy for socio-economic status.

3. Data and methods

The European Union Statistics on Income and Living Conditions survey (EU-SILC) is a high quality survey inquiring –with great detail- about income and key demographics of the households and their members. The survey is carried out yearly in all 28 countries belonging to the European Union plus Iceland, Norway and Switzerland. For the purpose of this paper, the available cross-sectional data correspond to the survey years 2007 and 2015, but the reference year in the survey is the immediate previous calendar year, and therefore the period of analysis is 2006 and 2014. Most of the countries have been surveyed since 2004, but in some countries the information related to gross pension values is only available from the survey year 2007 (i.e. reference year 2006). This is why the most distanced years with available information to study the evolution of pension wealth distribution are 2006 and 2014. The selection of 26 countries is based on the availability of information for 2006 and

2014. The sample size for the analysis is composed of a total of 124,486 households, being 58,482 observed in 2006 and 66,004 in 2014 (see Table 1)[1].

In order to simplify the computation of pension wealth and reduce the abuse of *ad-hoc* assumptions for active worker's pension wealth, the analysis is focused on elderly households where at least one member is receiving a pension. In this way, all households are approximately in the same section of the life-cycle, so that the inequality measures may be less affected by life-cycle effects (as it is done in Cowell et al. 2017). In particular, the sample is restricted to all households with at least one pensioner aged 60-79. Furthermore, a household is removed from the sample if the pensioner or his or her spouse is 80 or older. The reason is that age is top-coded at 80 in EU-SILC. Knowing the exact age is indispensable to assign a correct mortality estimate from the life table to the pensioner and pensioner's spouse.

It is assumed that future pensions keep their real value, i.e. future increases in pensions and inflation are balanced out. Similar to Frick and Grabka (2013) and Crawford and Hood (2016) the discount rate is assumed to be 2%, but instead of simply employing the expected life expectancy as the horizon to receive pensions, 'annuity prices' are computed for each individual. The individual annuity price is augmented with the one of the surviving spouse if the pensioner is married or living in legal consensual union. The computation use the official default surviving percentages of the holder's pension that is granted to the surviving spouse. More formally, the computation of pension wealth employs the following formula:

$$A_z = \sum_{t=0}^{M-z} \frac{p_{z,z+t}}{(1+r)^t} \qquad (1)$$

$$A_{z,y} = A_z + \theta \sum_{t=0}^{M-y} \frac{q_{y,y+t}(1-p_{z,z+t})}{(1+r)^t} \qquad (2)$$

$$W_z = A_{z,y} P \qquad (3)$$

[1] Two very large outliers for pension wealth were removed from UK (2006) and Romania (2014). For consistency, the single largest value of pension wealth was also removed from each country. Households with missing information on the variables of analysis were also removed from the sample.

The annuity price A_z is the necessary amount of capital, in present value, to finance a monetary unit of life pension for a single person at age *z*. $p_{z,z+t}$ is the probability of survival from age *z* to *z + t* according to life tables; *M* is the maximum survival age (assumed to be 110); *r* is the discount rate; *y* is the age of the pensioner's spouse and $q_{y,y+t}$ represents the probability of survival from age *y* to *y + t*. The fraction θ indicates the percentage of pension that a spouse will receive upon the death of the pensioner. $A_{z,y}$ is the annuity price for the individual that will be used to compute pension wealth. In order to consider cases of single and married individuals, the parameter θ will be either 0% or the official default percentage, respectively. The value of pension wealth is simply the product of the annuity price of the individual and the value of the yearly pension (equation 3). The pension wealth is computed for the pensioner and also for the spouse if she/he is a pensioner as well. Then, the pension wealth of the household is the sum of both pension wealth values. Given that the unit of analysis is the household, the pension wealth of other members of the household is also added into the pension wealth of the household.

Individual survival probabilities are specific by country, sex, age, year, educational level and birth cohort group and are estimated with information extracted from the database of human capital of the Wittgenstein Centre for Demography and Global Human Capital (see Lutz et al. 2014). This dataset contains the distribution of educational attainment (6 levels: no education, primary, incomplete primary, lower secondary, upper secondary and tertiary) by 5-year age groups, 5-calendar years from 1970 to 2100, sex and country). The procedure consists in 'extract' the number of individuals of a specific cohort-sex-country-education across years and regress a Gompertz function on the number of survival individuals (l_x) where age (x) is the predictor[2]. The following formula is used:

$$l_x = ke^{-e^{(s-cx)}} \qquad (4)$$

Then, a life table with a complete set of l_x variables is computed for ages between 0 and 110 (l_0 is normalized to 100,000 and l_{111} is assumed to be 0). This procedure is repeated for all the combinations of country, sex, education level and year. The education level 'incomplete

[2] For example, in 2015, the males aged 60-64 with primary education are observed in 1980 when they were aged 25-29, in 1985 when aged 30-34, in 1990 when aged 35-39, and so on. And they are also observed in 2020 when they will be 65-69, in 2025 when will be 70-74, etc. In this way, the estimated life tables take into account cohort differences.

primary is not used'. We use life table estimates for the population in years 2005 and 2015 which roughly correspond to the years observed in the sample of analysis. The number of estimated life tables is 26x2x5x2 = 520 (countries, sex, education levels and years).

A way to uncover the role of life expectancy inequalities on the distribution of pension wealth is computing pension wealth with SES specific mortality and compare it with a counterfactual distribution without utilizing SES specific mortality. This counterfactual distribution utilizes life tables estimated for the average individual without distinguishing by educational level. The degree of inequality of the distribution of pension wealth is measured with the Gini index. Although other inequality metrics exist, the Gini index is widely used and has some attractive properties. For example, this index is less affected by outliers and is bounded between 0 and 1. A score of zero implies complete equality, i.e. all individuals have the same level of pension wealth, and a score of 1 means complete inequality, i.e. only one individual owns the total of pension wealth.

It must be noted that the concept of pension used in EU-SILC and in this study corresponds to obligatory pensions (old age, survivor and disability) which are mostly public. EU-SILC also records the amount of a pension drawn from private pension plans, which are voluntary and are even treated as property income[3]. In the next sections the main analysis is performed for obligatory pensions, but it is also shown the effect of life expectancy inequalities on total pension wealth (i.e. obligatory plus voluntary pensions).

4. Results

Table 2 shows a substantial heterogeneity in the Gini indices computed for each country. For example, looking at the figures computed without SES mortality in 2014, the Gini is above 0.40 in Portugal, Cyprus and UK, while in Norway, Slovakia, Czech Republic and Estonia the index ranges between 0.26 and 0.30. An increase in the Gini index is observed for every country after including SES mortality in the computation of pension wealth. This means that

[3] These pensions "refer to pensions and annuities received, during the income reference period, in the form of interest or dividend income from individual private insurance plans, i.e. fully organised schemes where contributions are at the discretion of the contributor independently of their employers or government." (Eurostat 2013: p321).

differences in mortality due to SES generates more inequality in pension wealth (see column 3 and 6 of Table 2). For example, in 2014 the Gini index increases in Greece from 0.357 to 0.370 (3.9%) due to SES specific mortality, but this change is only 0.3% in Slovakia. Importantly, this effect has faded between 2006 and 2014 in most of the countries. Only in 6 countries (Sweden, Iceland, Denmark, Portugal, UK and Greece) the effect of SES on wealth inequality has increased between both years, although this increase has been very mild. The evolution of the effect of SES on pension wealth inequality for all countries can be easily observed in Figure 1. Austria and Norway are the countries that have experienced the largest reduction in the influence of SES on pension wealth inequality. SES mortality increased the Gini index of pension wealth of these countries by about 4% in 2006 but only 1% in 2014.

Paying attention to the Gini indices employing SES mortality (last column of Table 2) it is possible to observe that pension wealth inequality has fallen between 2006 and 2014 in 17 out of 26 countries. This reduction is considerable in Greece where the Gini index of pension wealth has decreased from 0.436 to 0.370, i.e. a reduction of 15.1%. This decrease is also important for France and Slovakia, down 10.4% and 8.5% respectively. Among the countries experiencing an increase in pension wealth inequality between both years, Latvia and Sweden are notable cases. In Latvia, the Gini has increased from 0.295 to 0.381 (up 29.1%), and in Sweden the increase has been from 0.321 to 0.369 (up 15.1%). In average, the drop in the Gini index between 2006 and 2014 is -4.9% (median is -4.2%) for the countries that experienced a decrease in inequality, while the average increase in the Gini index for the countries that experienced a rise in inequality is 8.1% (median is 4.7%).

The addition of voluntary pension plans into to the measure of pension wealth leads to more inequality in almost all the countries in both years of analysis, although the effect tend to be rather small (see Table 3). In 2006, the largest effect of voluntary pension plans into inequality are observed in Sweden and Spain, where the Gini index increases by 5.3% and 2.2%, respectively, after adding voluntary pensions plans into household pension wealth. In 2014, Spain and Sweden are again the countries showing the largest effects of voluntary pension plans on inequality. The addition of voluntary pension plans increases the Gini index of Spain and Sweden by 5.8% and 2.9%, respectively. By comparing columns 3 and 6 of Table 3, it is possible to observe an increasing contribution of voluntary pension plans into the rise of pension wealth inequality. A possible explanation for the positive relationship between pension plans and larger inequality is that these plans are generally taken up by households with larger incomes, while poorer households are too liquidity constrained to pot out for these plans and rely mostly on public pensions. Although the size of pension plans in the sample of analysis is small (a simple average of 0.18% of GDP) it is interesting to note a strong positive relationship between the size of the national voluntary pension plans and the contribution of these plans to the rise of pension wealth inequality in the country (the correlation is 0.59).

A by-product of the estimations of individual pension wealth is a type of pension liability measure. The sum of pension wealth across all individuals in a particular country and year indicates the total present value of all pensions, which is somewhat similar to the pension liability of the country. Of course, this value does not include pension wealth of individuals aged 80 or older neither pensioners younger than 60, so that the computed value of pension liability must be treated as a lower bound value. Table 4 reports the size of national pension wealth over GDP (pension liability) for each country and year and with and without SES specific mortality. In 8 countries out of 26, for year 2006, the actuarial liability is smaller when the computation involves the use of specific SES mortality instead of general mortality. The reduction or increase of pension liability due to SES mortality is not very large. This was between -4.5% and 2.8% of GDP in 2006. In the case of 2014, the inclusion of SES mortality increases pension liability in almost all countries. Only in Portugal and Spain the inclusion of SES mortality implies a mild decrease of 0.4% GDP in pension liability. From the comparison of both periods, it is clear that there is a stronger effect of SES in increasing pension liabilities.

The last column of Table 4 shows the evolution of pension liability between 2006 and 2014. In average, pension liability has increased by 29% of GDP, although the countries that have experienced the largest increases are Denmark (61.6%), Portugal (53.4%), Spain (49%), Norway (46.9%) and Greece (46.6%). Lithuania is the country with the smallest variation in pension liability, this is only 2.7% of GDP. Figure 2 depicts the relationship between pension wealth inequality and pension liability for 2014. A positive relationship (r=0.41) is uncovered between pension wealth inequality and pension liability, which may be interpreted as bad news because countries with larger expenditures on pensions are also, in average, more prone to suffer from pension wealth inequality[4].

Having the indicator of pension wealth inequality adds an extra dimension to compare pension systems in Europe. For example, in Figure 3 it is easy to observe which countries have evolved better in the period of analysis with respect to two dimensions: pension liabilities and inequality in pension wealth. All the countries to the left side of the figure have experienced a reduction in pension wealth inequality and the countries to the right side have experienced and increase. The higher the country is placed in the figure, the larger the increase in pension liability is. Although it is not possible to find and strict dominance order, it is possible to see some dominance relations. For example, a country like Poland have performed better than Estonia, UK, Luxembourg, Hungary and Sweden. Greece is one the countries with one of the largest reductions in pension wealth inequality but at the same time, pension liability has greatly increased. Latvia has the worst performance in pension wealth inequality but it does not fare too bad regarding the variation in pension liabilities.

5. Predictors of pension wealth inequality

The determinants of pension wealth inequality can be examined by using the 'Gini recentered influence function' (Gini-RIF) regressions (see Firpo et al. 2009 and Choe and Van Kerm 2014). Gini-RIF regressions consist of two stages. In the first stage, one computes the influence of each individual (or household) on the Gini index of pension wealth as a function of his pension wealth and of the distribution of pension wealth; this is the influence function (IF) calculation (Hampel 1974). Intuitively, individuals in the tails of the distribution will tend to have positive influence on inequality, i.e. increasing the Gini index, whereas individuals in the middle of the distribution will have negative influence, i.e. more of them will tend to reduce the Gini index. In the second stage, this computed Gini influence is regressed (with OLS) against some covariates of interest such as age groups, education and sex. For example, a positive coefficient for an age group covariate suggests that marginally increasing the share of this age group –and holding the distribution of all the other covariates constant- would lead to an

[4] A similar relationship occurs in 2006 as well (r=0.41).

increase in the Gini index. The size of this coefficient would indicate the size of the increase in the Gini index if all individuals would belong to that age group.

In a more formal way, let $v(F)$ be a statistic of interest (a function) calculated in the distribution F. In the analysis, the inequality metric is the Gini index but it could be the mean, median, the Atkinson index, a top income share, etc. The influence function of v is a function of income y and F and is defined as:

$$\mathrm{IF}(y;\nu,F) = \lim_{\epsilon \to 0} \frac{\nu((1-\epsilon)F + \epsilon\Delta_y) - \nu(F)}{\epsilon} \quad (5)$$

The IF captures the effect on $v(F)$ of an infinitesimal contamination of F at point mass y. Expressions for $IF(y; v; F)$ exist (or can be derived) for a wide range of statistics. See, for example, Essama and Lambert (2012) for a catalogue of IF relevant to income distribution analysis.

The complete results of the RIF-Gini regressions for each country and year are reported in Tables A1 and A2 of the Appendix, while Figures 4 and 5 cast the effects of two important predictors for pension wealth inequality. The dependent variable in the RIF-Gini regressions is the influence function (IF, previously estimated in a first stage) of each household in the Gini index of pension wealth. The covariates of the regression equation are the age groups 60-64, 65-69 and 70-74 (75-79 is the reference group), educational groups secondary education and tertiary education (primary education or less is the reference group), and the household categories 'single male pensioner', 'single female pensioner', both spouses are pensioners' (the reference group is 'only one pensioner within the couple'). The utilized measure of pension wealth only includes obligatory pensions and is computed with SES specific life tables.

Figure 4 plots the regression coefficients for the variable 'tertiary education' of the Gini-RIF regressions for 2006 and 2014 (reported in Table A1 and A2) divided by 100 and the Gini index of the corresponding country and year. These ratios are expressed in percentages. So, a figure of 1% means that an increase of 1% in the proportion of households with tertiary education in the country is associated with an increase of 1% in the Gini index of pension wealth inequality. In most of the countries the effect of tertiary education on inequality is positive, i.e. an increase in the share of households with this type of education increases pension wealth inequality. This occurs in 19 countries in 2006 and 18 countries in 2014. Only in Bulgary, Estonia, Hungary and Slovakia (all of them ex-communist countries) the effect of tertiary education on inequality has been negative in both years. In line with previous results regarding the diminishing effect of SES mortality on pension wealth inequality, it is also observed in Figure 4 a decline in the influence of tertiary education on pension wealth inequality in most of the countries between 2006 and 2014.

Figure 5 plots the regression coefficients for the variable 'female single pensioner'. The idea behind the selection of this variable is studying to what extent female single pensioners (mostly widows) drives up or down the level of pension wealth inequality. Females tend to live longer than their spouses, receive a lower pension, and given the reduction of mortality across cohorts, it is interesting to assess the evolution of the influence of female pensioners on pension wealth inequality. It is clear from Figure 5 that the share of households composed by a female single pensioner increases the level of inequality in both years, with the exception of Iceland and Denmark, Netherlands in 2014 and Ireland in 2006. Between both years this influence has strengthen in a number of countries (Spain, Belgium, Cyprus, Sweden and Estonia).

6. Conclusions

This paper studies pension wealth inequality in elderly households for 26 European countries in the period 2006-2014. The results reveal an important positive effect of life expectancy inequalities due to SES on the distribution of pension wealth. However, the strength of this effect weakens in the period of analysis. Pension liabilities are also computed for each country and year and they are useful to assess the role of mortality inequalities and the evolution of the implicit debt. The estimates shows evidence of a positive impact of mortality inequalities on the amount of pension liability and increasing levels of pension debt. Pension liability is larger than 100% of GDP in 14 countries.

For the assessment of the role of mortality inequalities on pension wealth inequality, a complete set of life tables by sex, cohort, educational level, country and year was estimated with auxiliary information from the human capital database of the Wittgenstein Centre for Demography and Global Human Capital. This procedure to estimate pension wealth inequality can easily be replicated for other periods and countries and, in this sense, it can add an extra dimension to study, classify and compare pension systems.

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Tables and Graphs

Table 1. Number of households in the sample

country	2006	2014	Total
Austria	1,962	1,817	3,779
Belgium	1,354	1,522	2,876
Bulgaria	1,801	2,159	3,960
Cyprus	944	1,303	2,247
Czech Republic	3,382	3,157	6,539
Denmark	1,172	1,845	3,017
Estonia	1,689	2,019	3,708
France	2,751	3,454	6,205
Greece	1,958	4,869	6,827
Hungary	3,119	3,081	6,200
Iceland	435	576	1,011
Ireland	1,750	1,514	3,264
Italy	7,183	6,026	13,209
Latvia	1,886	2,426	4,312
Lithuania	1,944	1,919	3,863
Luxembourg	787	897	1,684
Netherlands	2,200	2,407	4,607
Norway	1,071	1,614	2,685
Poland	4,336	4,105	8,441
Portugal	1,561	3,031	4,592
Romania	2,791	3,126	5,917
Slovakia	1,603	2,233	3,836
Slovenia	2,865	3,110	5,975
Spain	3,613	3,523	7,136
Sweden	1,575	1,626	3,201
United Kingdom	2,750	2,645	5,395
Total	58,482	66,004	124,486

Table 2. Gini indices of obligatory pension wealth

Country	2006			2014			% change 2014-2006	
	without SES mortality	with SES mortality	% change	without SES mortality	with SES mortality	% change	without SES mortality	with SES mortality
Austria	0.358	0.374	4.3%	0.361	0.365	1.1%	0.8%	-2.3%
Belgium	0.355	0.364	2.7%	0.339	0.345	1.8%	-4.3%	-5.1%
Bulgaria	0.338	0.343	1.4%	0.339	0.343	0.9%	0.3%	-0.1%
Cyprus	0.502	0.521	3.6%	0.476	0.492	3.3%	-5.2%	-5.6%
Czech Republic	0.268	0.269	0.5%	0.267	0.267	0.0%	-0.1%	-0.5%
Denmark	0.330	0.335	1.6%	0.350	0.356	1.9%	6.0%	6.3%
Estonia	0.267	0.269	0.9%	0.259	0.261	0.5%	-2.7%	-3.1%
France	0.362	0.372	2.8%	0.326	0.333	2.0%	-9.8%	-10.4%
Greece	0.422	0.436	3.3%	0.357	0.370	3.9%	-15.5%	-15.1%
Hungary	0.305	0.309	1.2%	0.322	0.323	0.5%	5.5%	4.7%
Iceland	0.341	0.347	1.9%	0.326	0.334	2.7%	-4.5%	-3.7%
Ireland	0.366	0.378	3.3%	0.384	0.393	2.6%	4.8%	4.0%
Italy	0.389	0.400	2.8%	0.383	0.393	2.6%	-1.7%	-1.8%
Latvia	0.291	0.295	1.2%	0.378	0.381	0.6%	29.9%	29.1%
Lithuania	0.297	0.302	1.8%	0.308	0.313	1.7%	3.7%	3.7%
Luxembourg	0.317	0.326	2.6%	0.342	0.348	1.8%	7.6%	6.7%
Netherlands	0.360	0.370	2.6%	0.375	0.381	1.8%	4.0%	3.2%
Norway	0.293	0.305	4.1%	0.296	0.299	1.0%	1.2%	-1.8%
Poland	0.346	0.353	2.0%	0.333	0.337	1.3%	-3.9%	-4.5%
Portugal	0.525	0.542	3.3%	0.489	0.506	3.4%	-6.9%	-6.8%
Romania	0.399	0.407	1.9%	0.384	0.389	1.4%	-3.8%	-4.2%
Slovakia	0.290	0.292	0.8%	0.267	0.267	0.3%	-8.0%	-8.5%
Slovenia	0.363	0.368	1.2%	0.340	0.343	1.0%	-6.4%	-6.6%
Spain	0.369	0.385	4.3%	0.361	0.375	3.8%	-2.2%	-2.7%
Sweden	0.320	0.321	0.2%	0.365	0.369	1.1%	14.1%	15.1%
United Kingdom	0.403	0.407	1.0%	0.404	0.408	1.1%	0.4%	0.4%

Note: The Gini indices of this table utilises pension wealth originated only from obligatory pensions.

Table 3. Gini indices of obligatory and total pension wealth

Country	2006			2014			% change 2014-2006	
	obligatory pension wealth	total pension wealth	% change	obligatory pension wealth	total pension wealth	% change	obligatory pension wealth	total pension wealth
Austria	0.374	0.378	1.1%	0.365	0.374	2.3%	-2.3%	-1.2%
Belgium	0.364	0.366	0.5%	0.345	0.348	0.8%	-5.1%	-4.9%
Bulgaria	0.343	0.343	0.0%	0.343	0.342	0.0%	-0.1%	-0.2%
Cyprus	0.521	0.519	-0.4%	0.492	0.494	0.5%	-5.6%	-4.7%
Czech Republic	0.269	0.270	0.4%	0.267	0.269	0.7%	-0.5%	-0.2%
Denmark	0.335	0.335	0.0%	0.356	0.356	0.0%	6.3%	6.3%
Estonia	0.269	0.269	0.0%	0.261	0.263	0.9%	-3.1%	-2.2%
France	0.372	0.372	0.0%	0.333	0.333	0.0%	-10.4%	-10.4%
Greece	0.436	0.436	0.1%	0.370	0.371	0.0%	-15.1%	-15.1%
Hungary	0.309	0.309	0.1%	0.323	0.323	0.0%	4.7%	4.6%
Iceland	0.347	0.347	0.0%	0.334	0.334	0.0%	-3.7%	-3.7%
Ireland	0.378	0.381	0.6%	0.393	0.397	0.8%	4.0%	4.2%
Italy	0.400	0.402	0.5%	0.393	0.393	0.0%	-1.8%	-2.3%
Latvia	0.295	0.295	0.0%	0.381	0.381	0.1%	29.1%	29.2%
Lithuania	0.302	0.302	-0.1%	0.313	0.314	0.2%	3.7%	3.9%
Luxembourg	0.326	0.326	0.1%	0.348	0.348	0.1%	6.7%	6.8%
Netherlands	0.370	0.371	0.3%	0.381	0.382	0.2%	3.2%	3.1%
Norway	0.305	0.308	1.1%	0.299	0.302	0.9%	-1.8%	-1.9%
Poland	0.353	0.353	0.0%	0.337	0.337	0.0%	-4.5%	-4.5%
Portugal	0.542	0.543	0.0%	0.506	0.511	1.0%	-6.8%	-5.9%
Romania	0.407	0.407	0.0%	0.389	0.389	0.0%	-4.2%	-4.2%
Slovakia	0.292	0.293	0.2%	0.267	0.268	0.1%	-8.5%	-8.6%
Slovenia	0.368	0.368	0.0%	0.343	0.344	0.2%	-6.6%	-6.5%
Spain	0.385	0.394	2.2%	0.375	0.396	5.8%	-2.7%	0.7%
Sweden	0.321	0.338	5.3%	0.369	0.380	2.9%	15.1%	12.5%
United Kingdom	0.407	0.408	0.2%	0.408	0.408	0.0%	0.4%	0.2%

Note: Pension wealth is computed with SES life tables. Total pensions include obligatory and voluntary pensions.

Table 4. Total obligatory pension wealth over GDP (in percentage)

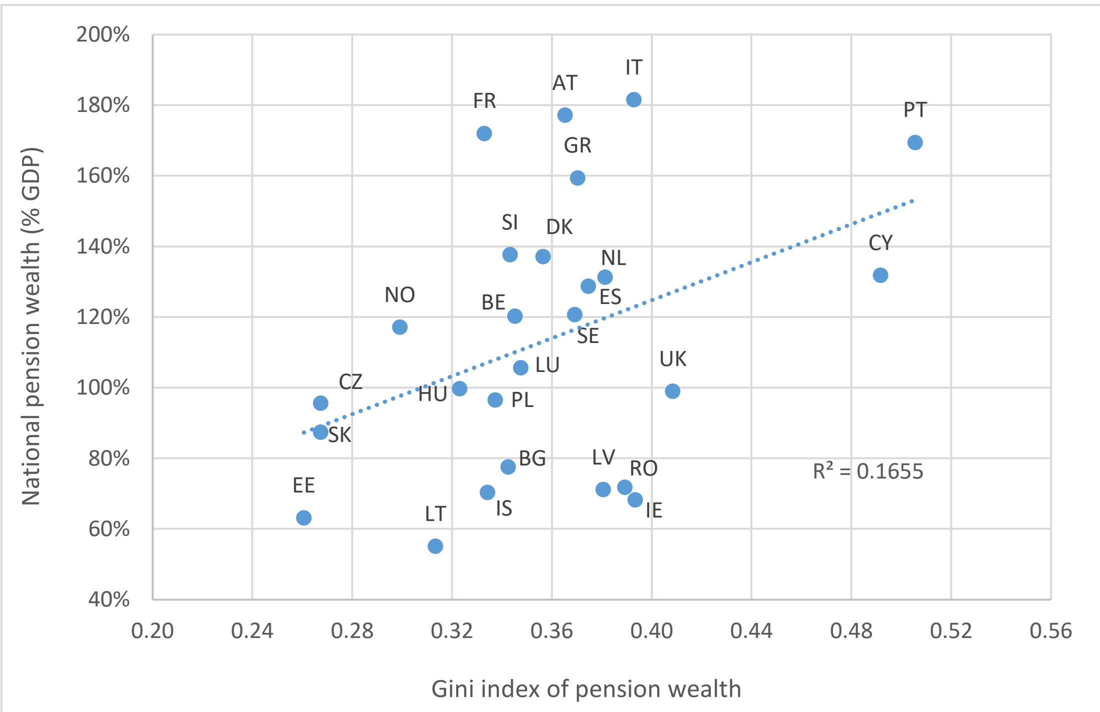
Country	2006			2014			variation 2014-2006	
	without SES mortality	with SES mortality	variation	without SES mortality	with SES mortality	variation	without SES mortality	with SES mortality
Austria	151%	148%	-3.6%	172%	177%	4.9%	24.5%	29.4%
Belgium	77%	78%	0.7%	117%	120%	2.8%	39.7%	42.5%
Bulgaria	53%	53%	0.9%	76%	78%	1.9%	22.3%	24.2%
Cyprus	90%	90%	0.4%	129%	132%	2.5%	39.1%	41.6%
Czech Republic	70%	71%	1.1%	92%	96%	3.4%	20.7%	24.1%
Denmark	74%	76%	1.3%	135%	137%	2.3%	59.3%	61.6%
Estonia	50%	52%	1.7%	61%	63%	1.7%	9.6%	11.3%
France	133%	133%	-0.1%	169%	172%	3.3%	36.1%	39.4%
Greece	113%	113%	-0.6%	159%	159%	0.7%	45.9%	46.6%
Hungary	78%	81%	2.2%	97%	100%	2.3%	16.8%	19.1%
Iceland	48%	45%	-3.0%	70%	70%	0.2%	25.5%	25.7%
Ireland	40%	41%	0.2%	67%	68%	1.2%	26.4%	27.6%
Italy	149%	148%	-0.7%	180%	182%	1.5%	32.1%	33.6%
Latvia	44%	45%	0.9%	69%	71%	1.8%	24.6%	26.4%
Lithuania	52%	52%	0.4%	54%	55%	1.5%	1.2%	2.7%
Luxembourg	89%	90%	0.5%	104%	106%	1.2%	14.6%	15.8%
Netherlands	101%	104%	2.3%	127%	131%	4.1%	23.7%	27.8%
Norway	75%	70%	-4.5%	116%	117%	1.3%	45.6%	46.9%
Poland	91%	92%	0.5%	95%	96%	1.6%	3.3%	4.8%
Portugal	118%	116%	-1.5%	170%	169%	-0.4%	53.8%	53.4%
Romania	49%	49%	0.6%	71%	72%	1.2%	21.2%	22.4%
Slovakia	69%	71%	2.1%	85%	87%	2.4%	13.6%	16.0%
Slovenia	108%	111%	2.8%	133%	138%	4.4%	22.2%	26.6%
Spain	83%	80%	-3.0%	129%	129%	-0.4%	49.4%	49.0%
Sweden	109%	109%	0.1%	118%	121%	2.4%	9.6%	12.0%
United Kingdom	82%	85%	2.4%	96%	99%	3.0%	11.5%	14.4%

Note: Pension wealth is computed with SES life tables.

Figure 1. Effects SES mortality on the Gini of pension wealth in 2006 and 2014

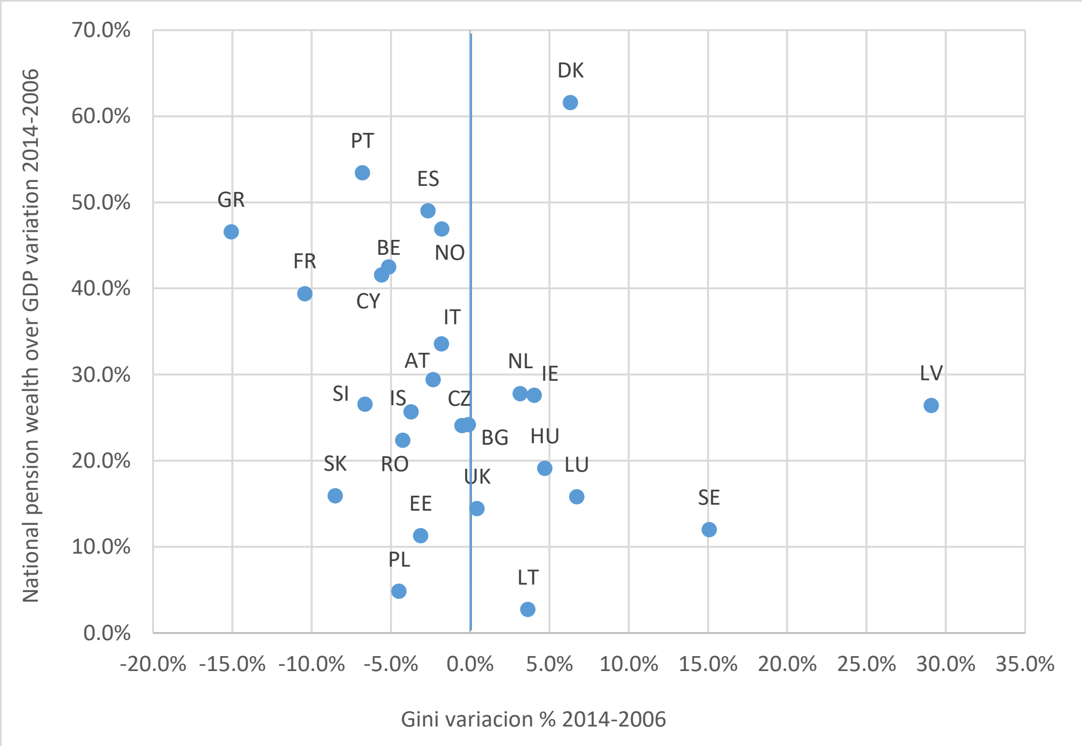
Note: The values in this figure correspond to the percentage variation between the Gini indices computed with and without SES specific mortality for each year ($Gini\_ses/Gini - 1$). These percentages are reported in column 3 and 6 of Table 2.

Figure 2. National pension wealth (as % of GDP) and pension wealth inequality in 2014



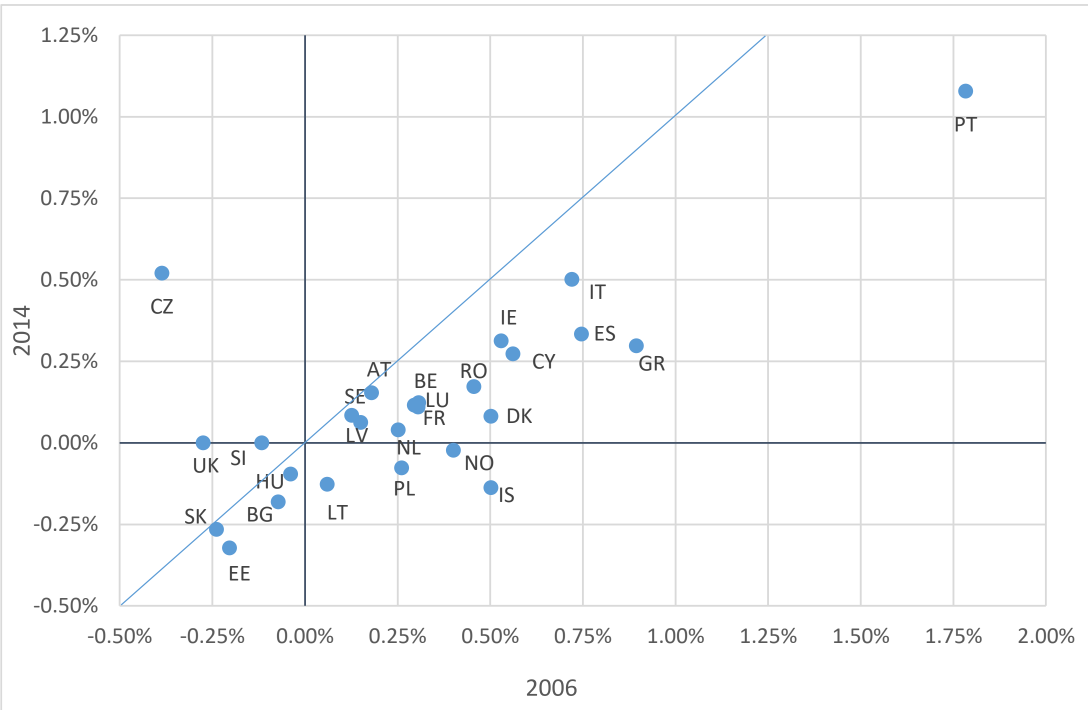
Note: Pension wealth is computed with SES life tables and only includes obligatory pensions.

Figure 3. Variation in national pension wealth and pension wealth inequality (2014-2006)



Note: Pension wealth is computed with SES life tables and only includes obligatory pensions.

Figure 4. Effects of tertiary education on the Gini of pension wealth



Note: The figure shows the coefficients for the tertiary education of the Gini RIF regressions for 2006 and 2014 (reported in Table 5 and 6) divided by 100 and the Gini index of the corresponding country and year. These ratios are expressed in percentages. So, a figure of 1% means that an increase of 1% in the proportion of households with tertiary education in the country is associated with an increase of 1% in the Gini index of pension wealth inequality. Pension wealth is computed with SES life tables and only includes obligatory pensions.

Figure 5. Effects of being 'female single pensioner' on the Gini of pension wealth

Note: The figure shows the coefficients for 'female single pensioner' of the Gini RIF regressions for 2006 and 2014 (reported in Table 5 and 6) divided by 100 and the Gini index of the corresponding country and year. These ratios and are expressed in percentages. So, a figure of 1% means that an increase of 1% in the proportion of 'female single pensioner' in the country is associated with an increase of 1% in the Gini index of pension wealth inequality. Pension wealth is computed with SES life tables and only includes obligatory pensions.

Appendix

Table A1. Gini RIF regression coefficients for pension wealth inequality in 2006

Country regression	age 60-64	age 65-69	age 70-74	single male pensioner	single female pensioner	spouses both pensioners	secondary education	tertiary education	constant	obs	R2
AT	-0.072***	-0.059***	-0.068***	0.065***	0.110***	0.037**	-0.019	0.067*	0.368***	1961	0.051
BE	-0.010	-0.045***	-0.057***	0.099***	0.056***	0.152***	-0.034***	0.111***	0.316***	1353	0.104
BG	-0.069***	-0.079***	-0.104***	0.122***	0.107***	0.027	-0.072***	-0.025	0.391***	1800	0.128
CY	0.155**	-0.073***	-0.042**	0.082	0.061	-0.029	0.067*	0.292***	0.432***	943	0.065
CZ	-0.069***	-0.094***	-0.090***	0.161***	0.097***	0.014	-0.109***	-0.104**	0.385***	3381	0.218
DK	0.087**	-0.010	-0.051***	-0.003	-0.012	-0.010	0.000	0.168***	0.317***	1171	0.106
EE	-0.078***	-0.075***	-0.066***	0.111***	0.007	0.080***	-0.066***	-0.055***	0.341***	1688	0.175
FR	-0.066***	-0.082***	-0.062***	0.058***	0.054***	-0.002	-0.035***	0.114***	0.403***	2750	0.068
GR	0.016	-0.060***	-0.076***	0.140***	0.142***	0.061**	0.018	0.390***	0.357***	1957	0.163
HU	-0.046***	-0.075***	-0.075***	0.097***	0.061***	0.044***	-0.076***	-0.012	0.361***	3118	0.082
IS	0.089**	0.061*	-0.024	0.011	-0.029	-0.070**	0.088***	0.174***	0.269***	434	0.109
IE	0.056*	-0.026	-0.051***	0.027	-0.002	-0.052	0.014	0.200***	0.362***	1749	0.082
IT	-0.008	-0.023**	-0.029***	0.070***	0.099***	0.041***	0.008	0.288***	0.337***	7182	0.069
LV	-0.052***	-0.056***	-0.072***	0.108***	0.020	0.101***	-0.065***	0.037	0.329***	1885	0.114
LT	-0.036**	-0.059***	-0.064***	0.129***	0.048**	0.071***	-0.057***	0.018	0.309***	1943	0.085
LU	0.054	-0.012	-0.031	0.125***	0.083**	-0.007	-0.044**	0.096**	0.294***	786	0.114
NL	0.013	-0.085***	-0.077***	-0.026	0.030	-0.055**	-0.053***	0.093***	0.436***	2199	0.088
NO	0.003	-0.033*	-0.054***	0.091***	0.092***	0.020	0.048	0.122*	0.213***	1070	0.060
PL	-0.003	-0.029***	-0.018**	0.113***	0.086***	0.093***	-0.035***	0.092***	0.285***	4335	0.053
PT	0.034	-0.030	-0.048***	0.114**	0.117***	0.043	0.051*	0.967***	0.420***	1560	0.323
RO	-0.031	-0.071***	-0.055***	0.094***	0.118***	0.082***	-0.116***	0.185***	0.418***	2790	0.153
SK	-0.074***	-0.107***	-0.089***	0.209***	0.117***	0.064***	-0.089***	-0.070***	0.347***	1602	0.154
SI	-0.078***	-0.072***	-0.081***	0.087***	0.121***	0.001	-0.121***	-0.043**	0.471***	2864	0.162
ES	0.030	-0.050***	-0.072***	0.070***	0.079***	0.051**	0.025*	0.287***	0.338***	3612	0.116
SE	0.072***	-0.012	-0.045***	-0.017	0.032	-0.035*	0.010	0.048***	0.316***	1574	0.057
UK	0.103***	-0.027*	-0.061***	-0.045	-0.111***	-0.114***	-0.218*	-0.112	0.685***	2749	0.083

*** $p<0.01$ ** $p<0.05$ * $p<0.10$. Each row contains the coefficients of OLS regressions by country. The dependent variable is the Influence Function (IF) of each household in the Gini index of pension wealth. The reference variable for age groups is 'age 75-79', for education is 'primary education' and for households is 'only one pensioner within the couple'. Pension wealth only includes obligatory pensions and is computed with SES life tables.

Table A2. Gini RIF regression coefficients for pension wealth inequality in 2014

Country regression	age 60-64	age 65-69	age 70-74	single male pensioner	single female pensioner	spouses both pensioners	secondary education	tertiary education	constant	obs	R2
AT	-0.030*	-0.038**	-0.044***	0.045**	0.095***	-0.008	-0.031	0.056	0.366***	1816	0.057
BE	-0.057***	-0.009	-0.048***	0.118***	0.087***	0.056***	-0.044***	0.038*	0.320***	1521	0.052
BG	-0.017	-0.035**	-0.076***	0.059***	0.042**	0.037*	-0.086***	-0.062***	0.413***	2158	0.029
CY	0.058	-0.036*	-0.047***	0.136**	0.075***	0.017	-0.018	0.134***	0.444***	1302	0.057
CZ	-0.069***	-0.077***	-0.073***	0.101***	0.052***	-0.013	0.135***	0.139***	0.166***	3156	0.137
DK	0.058*	-0.021	-0.056***	-0.002	-0.074***	-0.082***	-0.031**	0.029	0.436***	1844	0.046
EE	-0.013	-0.041***	-0.039***	0.104***	0.008	0.075***	-0.093***	-0.084***	0.333***	2018	0.119
FR	-0.004	-0.018	-0.022	0.065***	0.031**	0.029*	-0.085***	0.041**	0.355***	3453	0.058
GR	-0.018	-0.065***	-0.045***	0.097***	0.117***	0.100***	-0.056***	0.110***	0.333***	4868	0.117
HU	-0.034***	-0.034**	-0.051***	0.043**	0.002	0.034*	-0.067***	-0.031	0.395***	3080	0.023
IS	0.047	0.012	-0.009	0.056	-0.037	-0.039	-0.063	-0.046	0.395***	575	0.040
IE	0.033	0.006	-0.015	0.075***	0.046**	0.018	-0.009	0.123***	0.322***	1513	0.055
IT	0.010	0.001	-0.047***	0.056***	0.086***	0.049***	-0.049***	0.197***	0.358***	6025	0.069
LV	0.077***	0.016	-0.043***	0.080**	0.020	0.092**	-0.090***	0.032	0.379***	2425	0.044
LT	0.012	-0.012	-0.046***	0.085***	0.002	0.077***	-0.075***	-0.040**	0.349***	1918	0.068
LU	-0.041	-0.047*	-0.068***	0.050*	0.081***	0.032	-0.094***	0.040	0.382***	896	0.078
NL	0.117***	-0.062***	-0.061***	-0.019	-0.013	-0.092***	-0.077***	0.015	0.485***	2406	0.057
NO	-0.016	-0.044***	-0.054***	0.048**	0.045***	-0.031**	-0.036	-0.007	0.351***	1613	0.051
PL	-0.028***	-0.019**	-0.007	0.106***	0.051***	0.035***	-0.073***	-0.026*	0.351***	4104	0.064
PT	-0.042*	-0.041**	-0.071***	0.083***	0.094***	0.033	-0.016	0.545***	0.441***	3030	0.244
RO	-0.068***	-0.080***	-0.055***	0.083***	0.072***	0.048***	-0.148***	0.067*	0.491***	3123	0.156
SK	-0.086***	-0.100***	-0.093***	0.095***	0.019	-0.000	-0.122*	-0.071	0.441***	2232	0.098
SI	-0.092***	-0.064***	-0.048***	0.102***	0.087***	-0.021*	-0.036**	0.000	0.389***	3109	0.114
ES	0.013	-0.030***	-0.040***	0.060***	0.120***	0.091***	-0.018**	0.125***	0.315***	3522	0.095
SE	0.139***	0.018	-0.024**	0.035	0.045**	-0.041*	-0.046***	0.023	0.374***	1625	0.080
UK	0.135***	0.017	-0.013	0.015	-0.024	-0.044*	-0.095***	0.000	0.471***	2644	0.076

*** p<0.01 ** p<0.05 * p<0.10. Each row contains the coefficients of OLS regressions by country. The dependent variable is the Influence Function (IF) of each household in the Gini index of pension wealth. The reference variable for age groups is 'age 75-79', for education is 'primary education' and for households is 'only one pensioner within the couple'. Pension wealth only includes obligatory pensions and is computed with SES life tables.