# Evolvement of a household's income after retirement

## A microeconomic study into French and Spanish households


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**Abstract**

Replacement rates are an effective way to analyze how income evolves following the retirement of an individual as the ratio of pre- and post-retirement income. Individuals generally live in a multi-person household, which should be taken into consideration in the study of replacement rates. Several European countries have committed themselves to reform their pension system with the objective to reign in public spending. The present study analyzes how household income evolves following the retirement of a household member to describe the current situation that households face. It does so by means of the EU SILC dataset, which is microeconomic and longitudinal data. It finds that household income falls following the retirement of a household member, however that households can maintain their standard of living based on a threshold for replacement rates advanced by previous authors.

**Key words:** replacement rate EU SILC poverty inequality household income France Spain pension system reform

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## 1. Introduction

Every three years, the Social Protection Committee and the European Commission compile a Pension Adequacy report with the aim to analyze how the different pension systems in the Member States in the European Union (EU) evolve both on their own and alongside each other. They do so because principle 15 of the European Pillar of Social Rights underlines the right to a dignified old age and links this to the right of an adequate pension. In this Pillar of Social Rights, policy makers pledge to improve and render fairer the welfare systems within the EU. The report advances that "[p]ensions protect older persons from poverty and ensure that their incomes do not fall excessively upon exiting employment" (European Commission and Social Protection Committee (SPC), 2021, p. 21). One metric that examines the evolvement of income upon retirement is the replacement rate, which has similarly been used as a metric in the Pension Adequacy report. The replacement rate is defined by the OECD "as the individual net pension entitlement divided by net pre-retirement earnings, taking into account personal income taxes and social security contributions paid by workers and pensioners." It could therefore be seen as a measure of the fall in income upon exiting employment for retirement.

The 2021 Pension Adequacy report stresses that older people (aged 65 and over) make up one-fifth of the total population of the European Union, a proportion that is only set to rise in the coming decades (p. 25). This thesis will therefore examine how certain Member States currently fare at ensuring that the incomes of retirees within their borders do not fall excessively upon exiting employment. It is however not just the income of retirees that should be the focus of such research. As MacDonald and Moore (2011) raise, "[e]conomic welfare is likely best evaluated at a household level rather than at the level of the individual [to recognize] that families serve as a mechanism for the pooling and sharing of income and

consumption" (p. 7). It is for this reason that this study concentrates on the household income and not the individual income, even though the individual replacement rate has traditionally been the focus of the OECD.

This thesis subsequently examines different socio-economic variables on both the individual retiree's as well as their respective household level to predict factors that could influence the household replacement rate. Overall, it aims to give a microeconomic empirical analysis of how the income of households evolves following the retirement of a member. This is relevant to anticipate how policy makers could assure that individuals who currently save for their pension can do so in an optimal way. Hinrichs (2021) namely proclaims that the main objective of recent pension reforms in Europe has been to contain the rise of *public* pension spending, thereby placing a larger burden for pension saving on the individual. Because the dataset used for the analysis covers the years 2017 to 2020, the study can be considered a study into the current state of affairs to build on for future policy.

Similar studies have been undertaken that use the Survey of Health, Ageing, and Retirement in Europe (SHARE) database (Tur-Sinai & Spivak, 2021; Garibay, Srakar, Bartolj & Sambt, 2022). This thesis will make use of the EU SILC database to focus more on poverty and social inclusion. Section 2 sets out the population that is examined and for what reason. Section 3 touches upon the dataset used. Section 4 goes into the methodology that is employed by means of different subsections. These subsections delve into the procedure and the variables used, as well as the ultimate research sample and models to predict the evolvement of the household. Additionally, attention is devoted to the validity of the study. Section 5 reveals descriptive findings. Section 6 shows the estimated results of different models into socio-economic factors on both the individual and the household level, and their effect on post-retirement household income. The thesis ends with a discussion of the findings and concluding remarks.

## 2. Population

EU Member States are encouraged to coordinate their national economic policies within the framework of the Eurozone and receive yearly recommendations by the European Council for possible reforms to do so (Sénécat, 2023). The European Council is an intergovernmental European institution that coordinates policy between the Member States and sets out the EU's general political direction and priorities. In its recommendation of 2019, pensions were mentioned most notably in recommendations to France and Spain. Compared to other countries in the Eurozone, public expenditure on pension in Spain and France is moreover than the average when considered as a percentage of GDP. This is illustrated in figure 1. Above all, both countries have in the years following 2019 shown their commitment and determination to reform their respective pensions systems. It is for this reason that a study into how their pension systems currently fare is relevant.

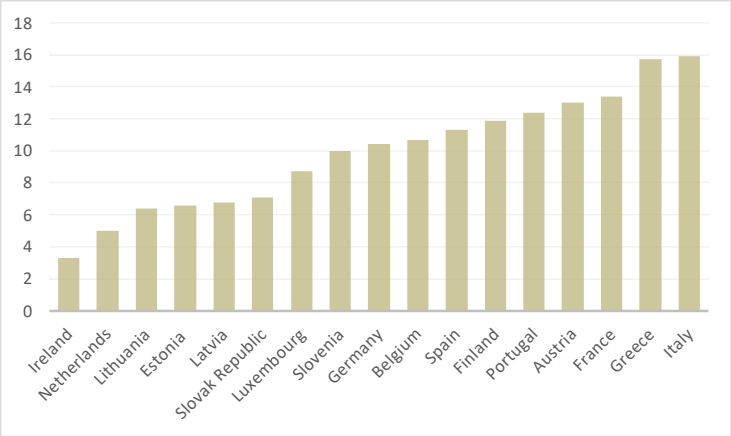


**Figure 1** Public expenditure on pensions in the Eurozone, % of GDP in 2019. Source: OECD

### 2.1 France

Even though the Council concludes that in the coming fifty years, the percentage that France will spend on pensions relative to its gross domestic product will remain stable at 13,8% (in

projections up to 2070), the recommendation comments on the many different pension systems that coexist within the current system. It recommends to "reform the pension system to progressively unify the rules of the different pension regimes, with the view to enhance their transparence, fairness and effectiveness" (European Council, 2019a, p. 4). As Sénécat explains, the issue of unifying the different pension systems to one universal pension system was already on the agenda of the French government before the recommendation by the European Council was released, however the reform was postponed in 2020 because of the Covid-19 pandemic (Sénécat, 2023).

### 2.2 Spain

The Spanish government decided in 2018 to index pensions to the consumer price index (instead of a special index that led to indexation in previous years and that fell short of the headline inflation rate), in order to preserve pensioners' purchasing power (EC & SPC, 2021, p. 61). This was lauded by the Pension Adequacy Report to maintain the living standards of older people and lower their risk of falling into poverty, however the recommendation by the European Council questions the sustainability of this measure in the context of government finances (European Council, 2019b, p. 4; Pérez & Pellicer, 2020). Government spending on pensions is first set to rise to 16,2 of GDP by 2050 before going down to 13,9% of GDP by 2070 (AIReF, 2023, p. 80).

### 2.3 Observational replacement rates

Given both countries' commitment to reforming their pension system in order to render it fairer, it is therefore worth examining what the current state of affairs is.

**Table 1**: net theoretical replacement rates, base case (40 years' uninterrupted career ending with the standard pensionable age), men and women average earners, retiring in 2019[1]

| | **BE** | **BG** | **CZ** | **DK** | **DE** | **EE** | **IE** | **EL** | **ES** | **HR** | **FR** | **IT** | **CY** | **LV** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Men* | 75.5 | 61.9 | 62.4 | 65.3 | 57.8 | 35.0 | 57.9 | 79.5 | 98.1 | 55.5 | 76.2 | 79.4 | 66.0 | 59.7 |
| *Women* | | | | | | | 55.8 | | | | | | 63.0 | |
| | **LT** | **LU** | **HU** | **MT** | **NL** | **AT** | **PL** | **PT** | **RO** | **SI** | **SK** | **FI** | **SE** | |
| *Men* | 52.5 | 99.5 | 87.2 | 78.1 | 101.2 | 83.6 | 71.6 | 95.8 | 85.3 | 60.3 | 67.4 | 62.3 | 55.2 | |
| *Women* | 52.3 | | | | | 84.4 | 60.6 | | 81.7 | 66.3 | | | | |

*Source: OECD and Member States; in some countries (e.g., Belgium) the assumed 40-year career does not give the right to a full pension.*

Table 1 reveals that Spain has a high individual replacement rate of almost 100%. This indicates that post-retirement income for the individual is almost similar to pre-retirement income. This stands in contrast to France, where the average individual at the base case can anticipate a replacement rate of 76,2%. Even though lower than Spain, this is still within the range that scholars argue helps retirees maintain their standard of living, because they similarly have less expenses related to children or work, as well as no need anymore to save for retirement (Antler & Kahane, 1987; Scholz & Seshadri, 2009; Munnell & Soto, 2005).

## 3. Data

The study for this thesis takes data from the European Union Statistics on Income and Living Conditions (EU SILC) dataset, which covers data on income, poverty, social exclusion, and living conditions in the EU. It is a harmonized dataset based on household surveys that are collected annually by the statistical offices of the EU member states. The dataset used for this study covers the years 2017 to 2020, which provides a four-year period of data. EU SILC collects information from a representative sample of households and individuals across the EU, which ensures that the data is statistically reliable and representative of the population by means of different weight variables. Moreover, it provides both data for cross-sectional as

[1] as cited in EC & SPC, 2021, pp. 67 - 68

well as longitudinal studies. The EU SILC user guide explains that "[l]ongitudinal data refer to individual/household changes over time, observed periodically over a four-year period (or more years if a longer duration panel is used)" (p. 15).

The dataset consists of four different files. Each file contains a pre-defined set of variables which covers different topics and a set of survey units. Two files focus on the household as the survey unit and either register their characteristics or include the data of the survey. The other two files focus on the individual members of the household as the survey unit and likewise register their characteristics or include data on the different pre-defined variables. Data merging and aggregation is possible based on the key variables of the year of the survey, the country, and on both a household and personal identification number (Eurostat, 2021, pp. 27 – 28).

Given the longitudinal nature of the dataset, the dataset has a rotational component for the sample to represent the target population for every year (since the population is bound to change every year). The EU SILC user guide explains the rotational component by means of the following figure.

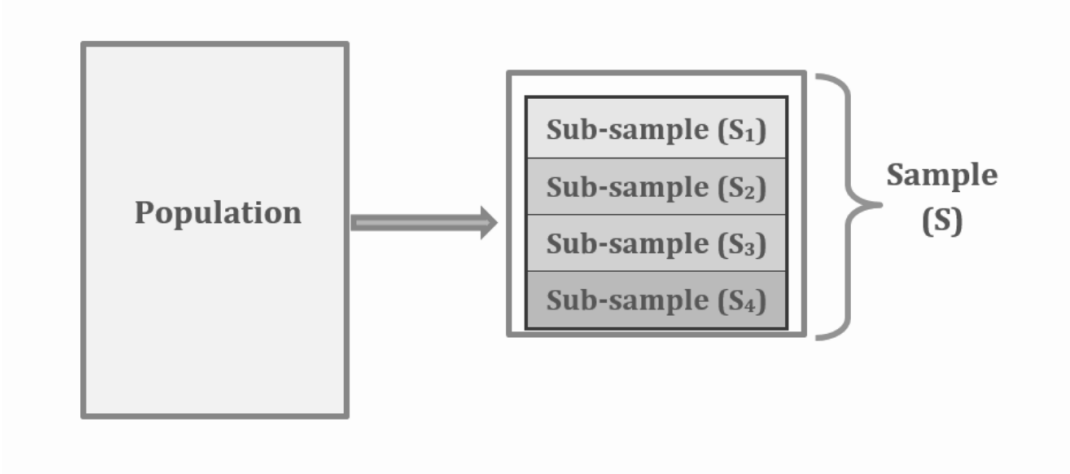


**Figure 2** Rotational design of the sample, as cited in Eurostat, 2021, p. 65

The user guide explains that each year, one of the four replications from the previous year is dropped and that a new one is added. In their words: "Between year T and T+1 the sample overlap is 75% (in the absence of attrition); the overlap between year T and year T+2 is 50%; and it falls to 25% from year T to year T+3, and to zero for longer intervals." (Eurostat, 2021, p. 65).

## 4. Methodology

This study follows a similar approach to the longitudinal empirical analysis as the comparative study into replacement rates by Aviad Tur-Sinai and Avia Spivak's *How Generous are Societies Toward Their Elderly? A European Comparative Study of Replacement Rates, Well-Being and Economic Adequacy* (2021). The analysis is divided into two periods. In the first period, a member of the household changes their activity status to retirement. The income of the household before and after this change in the activity status is subsequently compared by means of the replacement rate, which is the "ratio of the post-retirement income to the pre-retirement income" (Tur-Sinai & Spivak, 2021, p. 74).

### 4.1 Procedure

In order to detect which households would be relevant for the analysis, households are selected based on individuals' most recent change in activity status in the first period. This change took either place since the last survey collection or in the last twelve months for the first year of data collection (Eurostat, 2009, p. 199). Because individuals can change in activity status at any time of the year, it is important to note that the surveys are collected in December, because it is considered the end of the income reference period (Eurostat, 2021, p. 249). Since data are collected in December, that means that the individual wholly worked in 2017 when they changed activity status in 2018. Similarly, the income that is observed for

2018 is actually of the last 12-month period, i.e. 2017 (Eurostat, 2009, p. 39). Thus, the income that appears in 2018, that corresponds to 2017, is the income of a year of total employment. Likewise, the income that appears in survey year 2020, that corresponds to 2019 in a similar fashion as explained in the previous paragraph, is the income of a year in which the individual was wholly retired. It is for this reason that survey year 2018 is chosen for period 1 and survey year 2020 is chosen for period 2.

The data used for this study is an aggregate of two countries, France and Spain, with four files, two household and two individual data files, for two years, 2018 and 2020. The data is first aggregated separately for each country, and only at the last stage the two different datasets are appended. The fundamental variable in the sample is the one on most recent change in activity status. It is located in one of the individual data files, the so-called p-file, and serves as the starting point of the aggregation. If the individual responded to this variable in survey year 2018 that they changed their activity status to retired, they are considered in the research sample. Based on their personal identification number, they are matched to individuals that were observed in 2020 as well. All other observations will be dropped. As is explained in section 3 on Data, the overlap between 2018 and 2020 is assumed to be 50%.

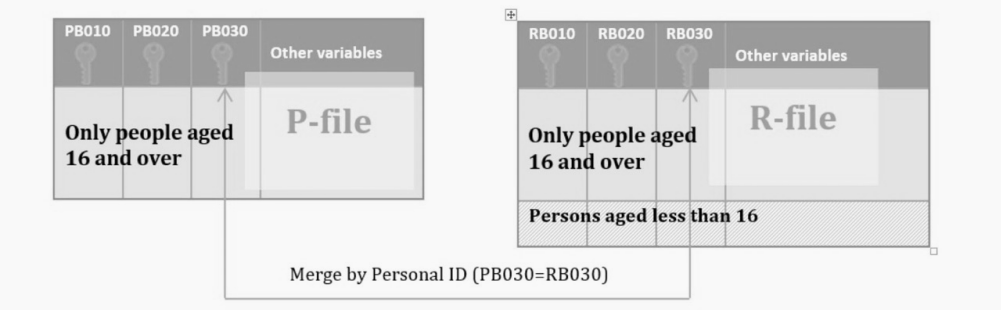


**Figure 3** Merger of personal files, as cited in Eurostat, 2021, p. 28

The individuals from the sample can subsequently be matched to other answers they have provided to the survey, which are listed in the r-file, by means of their personal identification

number. Whereas the p-file covers topics related to education, labor, or health, the r-file includes among others variables on the weight which would grant the sample external validity. This is further discussed in sections 4.2.4 and 4.3.1.

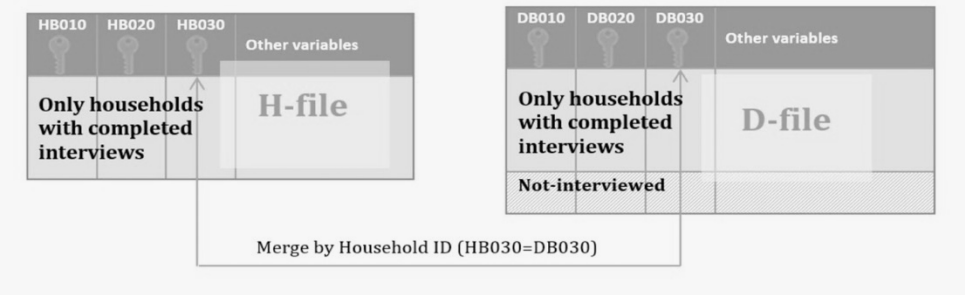


**Figure 4** Merger of household files, as cited in Eurostat, 2021, p. 27

Observations on individuals in both personal files include their household identification number. As a result, they can be matched relatively well to a merged file on household data. The topics of these household files "relate, among other things, to total household income (gross and disposable), gross income components at household level, housing and non-housing related areas, non-monetary household deprivation indicators, physical and social environment, dwelling type, tenure status, housing conditions and costs" (ibid.).

### 4.2 Variables

The study investigates household income in light of socio-economic characteristics on a household as well as on an individual retiree's level. Variables that are included in the dataset delve therefore into household income; characteristics such as age, education and health of the retiree; the size and finances of the household; and the weight of the individuals in order to ascribe external validity to the results obtained in the study. In table 2, the division into periods and years of the different variables is shown.

**Table 2** Division of survey year and study period

| | |
|---|---|
| 2017 | Income reference period, period 1 |
| 2018 | Survey year, period 1 |
| 2019 | Income reference period, period 2 |
| 2020 | Survey year, period 2 |

**Table 3** Variables used divided into survey years and research periods

| Period 1 | Period 2 |
|---|---|
| 2018 | 2020 |
| Equivalized household income (income of 2017) | Equivalized household income (income of 2019) |
| Age | Age |
| Highest education attained | Highest education attained |
| Most recent change of activity status | Years worked |
| Years worked | Self-rated health |
| Self-rated health | Household size |
| Permanent job contract | Equivalized household size |
| Household size | Single person household |
| Single person household | Income quintile |
| Equivalized household size | Homeownership |
| Income quintile | Ability to keep home warm |
| Homeownership | Late home payments |
| Ability to keep home warm | Late utility payments |
| Late home payments | Late loan payments |
| Late utility payments | Capacity to face unexpected expenses |
| Late loan payments | Financial support received |
| Capacity to face unexpected expenses | Financial support given |
| Financial support received | Weight |
| Financial support given | Children |

### 4.2.1 Dependent variable

The dependent variable for the study will be the equivalized household income in period 2. It is a continuous variable expressed in euros as the total gross disposable household income from the income reference period, which for period 2 is 2019. The variable is constructed by Eurostat: the total gross disposable household income for the reference period is divided by an equivalized household size variable, while taking into account a within-household non-response factor (Eurostat, 2009, p. 137). The equivalized household size is likewise constructed by Eurostat and defined as

**Equation 1**

$$1 + 0.5 * (HM_{14+} - 1) + 0{,}3 * HM_{13-}$$

Where HM14+ is the number of household members aged 14 and over (at the end of income reference period) and HM13- the number of household members aged 13 or less (at the end of income reference period)

This definition reflects the weight that Eurostat attributes to household members younger than fourteen years old and those older than fourteen years old. The household income for period 2 is in 2017 euros (which corresponds with period 1), with an inflation rate of 2,38% in Spain and 2,97% in France between 2017 and 2019 (OECD, 2023c).

### 4.2.2 Explanatory variables

Explanatory variables focus on the socio-economic characteristics of the household member that retires in period 1 and of the household as a whole.in both period 1 and period 2. Variables on the individual included in the dataset are either continuous, such as age or years worked; categorical, such as highest education attained; or dichotomous, such as self-rated health or permanent job contract (Kuivalainen, 2020; Crystal, Shea & Krishnaswami, 1992;

Robertson-Rose, 2019; Lhing, Nanseki & Takeuchi, 2013). Highest education attained focuses on all household members of 16 years and older and is either primary education or less[2]; lower secondary; upper secondary[3]; or tertiary education as highest level attained (respectively =100, 200, 300 or 500). For self-rated health, the individual responded that their health was very good, good, fair, bad, or very bad (respectively =1, 2, 3, 4, and 5). These responses are combined into a dichotomous variable that the respondent's self-rated health was good (=1) or bad (=0).

On the household level, variables focus on demographic or financial characteristics. They are continuous, such as on the size or equivalized size of the household or the amount of children; factorial, such as the income quintile to which the household pertains; or dichotomous, focused on economic characteristics that do (=1) or do not (=0) apply (Battistin et al., 2009; Mínguez, 2017). On both levels, the equivalized household income for period 1 is used as a continuous variable in euros.

### 4.2.3 Variable on retirement

Central to the procedure is the variable that captures whether an individual retired, which is included in the variable on most recent change in the individual's activity status. The reference period for this variable is either since the last interview or in the last twelve months before the first year of data collection (Eurostat, 2009, p. 199). If there is more than one change in the activity status, the most recent change is recorded in the survey. Even though the variable has twelve values, only three are of interest for the study: they capture a change in retirement from either employment, unemployment, or another inactive activity status. This variable is included for period 1, which corresponds to survey year 2018.

[2] The values pre-primary and primary and the values upper secondary and post-secondary/non tertiary are combined
[3] The values pre-primary and primary and the values upper secondary and post-secondary/non tertiary are combined

### 4.2.4 Variable on longitudinal weight

The variable on weight is included in period 2, which corresponds to survey year 2020, because ultimately the study is focused on household with a member who retired in period 1 and these are observed in period 2. The weight is constructed by Eurostat (2009) on an individual basis for all current household members (of any age) and former household members (p. 32). It takes into account a longitudinal set of three years, for (Y-2) to Y, i.e. 2018 and 2020. In section 4.3.1, the thesis goes further into the longitudinal weight variable and the problem it poses to the external validity of the study.

### 4.2.5 Internal validity

To be consistent, this study follows the approach by the Initiative for Socio-Economic Analysis and Knowledge Foundation to still regard the income as the same period as the other variables (iseak, n.d.). This ensures that in the responses for both survey years, the household member who retired was either fully employed or fully retired, as has been explain in section 4.1 on the procedure of the study. Similarly, in line with Tur-Sinai and Spivak (2021), a lagged or leaped variable on self-rated health could prevent endogeneity or causation between the household income variable and the self-rated health of the retiree, because bad health of the retiree might impact the earnings of the household (p. 76).

The structure of different income reference periods and survey years does hinder possible explanatory effects of variables from period 2 (survey year 2020), yet alleviates possible interference of effects due to the Covid-pandemic, which hit Europe severely in the spring of 2020.

### 4.3 Research sample

The study focuses on households where a household member enters retirement in period 1 in order to study the evolution of the household income in period 2. This is done for the countries Spain and France. The weight variable explained in section 4.2.4 allows for making inference about the population from the sample, because it accounts for unequal probabilities of sample selection and/or factors in non-response to the survey request (Prasad et al., 2017, p. 47). In the case of France, the sample consists of 6 282 individuals with a weight of 61 900 000 individuals. This compares to an official census of the French population in 2020 of 67 500 000 individuals (OECD, 2023d). The sample on Spain consists of 10 127 individuals with a weight of 44 300 000 individuals, compared to 2020 census data of 47 400 000 individuals (OECD, 2023d). Combined, the sample has a total of 16 409 individuals.

**Table 4** Number of respondents in samples, divided into weighted/unweighted and full/sub sample

| | Individuals | Households | Households with retiree |
|---|---|---|---|
| France | 6 282 | 2 763 | 68 |
| Spain | 10 127 | 3 836 | 62 |
| Total | 16 409 | 6 599 | 130 |

The focus of the study is on the household and not on the individual. The sample of France consists of 2 763 households and combined with the Spanish sample of 3 836, this brings the total sample of households to 6 599. In the household sample, 130 households were identified where a household member retired in survey year 2018 (period 1) and where the household was equally respondent in survey year 2020 (period 2).

### 4.3.1 External validity

When the sample is restricted to the analysis of households with certain characteristics, the study focuses on an unweighted sample instead of the weighted one. In the words of Gardeazabal and Polo-Muro (2022), "[f]ailing to account for sampling weights amounts to losing representativeness" (p. 576). This study follows their solution to compare descriptive statistics of the weighted and unweighted samples, which in the occurrence of similarity provides some external validity to the estimates of the study.

For both countries, households in the unweighted sample had similar characteristics to those in the weighted sample. Household size was found to be smaller however (on average closer to two members compared to almost three in the weighted sample for France and three member compared to two and a half for Spain) and with double the proportion of single person households for both countries. The households in the unweighted sample tend to have more members of older age and are more often the owner of the home they live in. Other characteristics are generally similar between the weighted and unweighted samples, as well as the equivalized household incomes.

In the case of the variable on equivalized household income, it is found to be higher in France compared with Spain and the within-country variance in France is likewise larger.

**Table 5** Comparison of weighted and unweighted full sample of France

| | Weighted sample | | | | Unweighted sample | |
|---|---|---|---|---|---|---|
| Variable | Mean | Std. dev. | Min | Max | Mean | Std. dev. |
| *Period 1* | | | | | | |
| Homeownership | 0,344 | 0,475 | 0 | 1 | 0,405 | 0,491 |
| Ability to keep home warm | 0,942 | 0,234 | 0 | 1 | 0,936 | 0,246 |
| Late home payments | 0,021 | 0,142 | 0 | 1 | 0,017 | 0,129 |
| Late utility payments | 0,019 | 0,136 | 0 | 1 | 0,016 | 0,125 |
| Late loan payments | 0,004 | 0,059 | 0 | 1 | 0,004 | 0,063 |
| Capacity to face unexpected expenses | 0,675 | 0,468 | 0 | 1 | 0,693 | 0,461 |
| Household size | 2,928 | 1,410 | 1 | 9 | 2,283 | 1,249 |
| Equivalized household size | 1,819 | 0,561 | 1 | 4,3 | 1,564 | 0,516 |
| Equivalized household income | 25 052,01 | 22 361,61 | -440 400 | 451 470 | 25 864,03 | 22 253,69 |
| Financial aid given | 0,072 | 0,258 | 0 | 1 | 0,065 | 0,247 |
| Financial aid received | 0,076 | 0,264 | 0 | 1 | 0,071 | 0,257 |
| Single person household | 0,147 | 0,354 | 0 | 1 | 0,310 | 0,463 |
| *Period 2* | | | | | | |
| Homeownership | 0,368 | 0,482 | 0 | 1 | 0,425 | 0,495 |
| Ability to keep home warm | 0,942 | 0,234 | 0 | 1 | 0,938 | 0,242 |
| Late home payments | 0,014 | 0,119 | 0 | 1 | 0,014 | 0,118 |
| Late utility payments | 0,018 | 0,133 | 0 | 1 | 0,015 | 0,122 |
| Late loan payments | 0,003 | 0,053 | 0 | 1 | 0,002 | 0,047 |
| Capacity to face unexpected expenses | 0,715 | 0,451 | 0 | 1 | 0,733 | 0,443 |
| Household size | 2,976 | 1,428 | 1 | 9 | 2,276 | 1,262 |

| | Weighted sample | | | | Unweighted sample | |
|---|---|---|---|---|---|---|
| Variable | Mean | Std. dev. | Min | Max | Mean | Std. dev. |
| Equivalized household size | 1,850 | 0,575 | 1 | 4.3 | 1,564 | 0,526 |
| Equivalized household income | 25 315,88 | 15 544,36 | -43 040 | 336 970 | 24 770,81 | 16 036,99 |
| Financial aid given | 0,125 | 0,331 | 0 | 1 | 0,118 | 0,322 |
| Financial aid received | 0,068 | 0,251 | 0 | 1 | 0,060 | 0,238 |
| Single person household | 0,137 | 0,344 | 0 | 1 | 0,316 | 0,465 |
| *Number of household members with max education* | | | | | | |
| Primary or less | 0,195 | 0,486 | 0 | 3 | 0,206 | 0,480 |
| Lower secondary | 0,296 | 0,549 | 0 | 3 | 0,263 | 0,513 |
| Upper secondary | 0,810 | 0,818 | 0 | 4 | 0,718 | 0,766 |
| Tertiary | 0,625 | 0,784 | 0 | 4 | 0,523 | 0,719 |
| *Number of* | | | | | | |
| males in household | 1,443 | 0,978 | 0 | 5 | 1,097 | 0,858 |
| *Number of household members in age* | | | | | | |
| 5 or less | 0,200 | 0,514 | 0 | 4 | 0,110 | 0,380 |
| From 6 to 15 | 0,537 | 0,873 | 0 | 6 | 0,289 | 0,661 |
| From 16 to 25 | 0,403 | 0,729 | 0 | 4 | 0,247 | 0,575 |
| From 26 to 35 | 0,243 | 0,570 | 0 | 3 | 0,191 | 0,506 |
| From 36 to 45 | 0,397 | 0,677 | 0 | 2 | 0,262 | 0,567 |
| From 46 to 55 | 0,462 | 0,713 | 0 | 2 | 0,346 | 0,629 |
| From 56 to 65 | 0,318 | 0,615 | 0 | 2 | 0,350 | 0,624 |
| 65 or older | 0,390 | 0,703 | 0 | 3 | 0,481 | 0,726 |

**Table 6** Comparison of weighted and unweighted full sample of Spain

| | Weighted sample | | | | Unweighted sample | |
|---|---|---|---|---|---|---|
| Variable | Mean | Std. dev. | Min | Max | Mean | Std. dev. |
| *Period 1* | | | | | | |
| Homeownership | 0,506 | 0,500 | 0 | 1 | 0,555 | 0,497 |
| Ability to keep home warm | 0,910 | 0,286 | 0 | 1 | 0,906 | 0,292 |
| Late home payments | 0,009 | 0,093 | 0 | 1 | 0,007 | 0,082 |
| Late utility payments | 0,015 | 0,122 | 0 | 1 | 0,012 | 0,110 |
| Late loan payments | 0,004 | 0,067 | 0 | 1 | 0,004 | 0,060 |
| Capacity to face unexpected expenses | 0,654 | 0,476 | 0 | 1 | 0,662 | 0,473 |
| Household size | 3,132 | 1,294 | 1 | 13 | 2,576 | 1,247 |
| Equivalized household size | 1,949 | 0,557 | 1 | 6 | 1,713 | 0,544 |
| Equivalized household income | 17 229,18 | 11 844,45 | -8 401,014 | 143 734,2 | 17 422,28 | 12 353,49 |
| Financial aid given | 0,067 | 0,250 | 0 | 1 | 0,071 | 0,257 |
| Financial aid received | 0,034 | 0,182 | 0 | 1 | 0,033 | 0,179 |
| Single person household | 0,093 | 0,290 | 0 | 1 | 0,215 | 0,411 |
| *Period 2* | | | | | | |
| Homeownership | 0,519 | 0,500 | 0 | 1 | 0,568 | 0,495 |
| Ability to keep home warm | 0,905 | 0,294 | 0 | 1 | 0,906 | 0,292 |
| Late home payments | 0,011 | 0,105 | 0 | 1 | 0,009 | 0,095 |
| Late utility payments | 0,015 | 0,123 | 0 | 1 | 0,014 | 0,119 |
| Late loan payments | 0,007 | 0,084 | 0 | 1 | 0,006 | 0,074 |
| Capacity to face unexpected expenses | 0,664 | 0,473 | 0 | 1 | 0,662 | 0,473 |
| Household size | 3,119 | 1,317 | 1 | 10 | 2,540 | 1,250 |
| Equivalized household size | 1,948 | 0,569 | 1 | 4,7 | 1,700 | 0,548 |

| | Weighted sample | | | | Unweighted sample | |
|---|---|---|---|---|---|---|
| Variable | Mean | Std. dev. | Min | Max | Mean | Std. dev. |
| Equivalized household income | 18 201,57 | 11 777,98 | -36 233,2 | 161 999,2 | 17 992,94 | 11 891,62 |
| Financial aid given | 0,079 | 0,269 | 0 | 1 | 0,086 | 0,280 |
| Financial aid received | 0,041 | 0,199 | 0 | 1 | 0,039 | 0,195 |
| Single person household | 0,098 | 0,297 | 0 | 1 | 0,227 | 0,419 |
| *Number of household members with max education* | | | | | | |
| Primary or less | 0,471 | 0,776 | 0 | 4 | 0,466 | 0,733 |
| Lower secondary | 0,590 | 0,822 | 0 | 5 | 0,504 | 0,749 |
| Upper secondary | 0,528 | 0,732 | 0 | 4 | 0,440 | 0,673 |
| Tertiary | 0,701 | 0,856 | 0 | 4 | 0,598 | 0,793 |
| *Number of* | | | | | | |
| males in household | 1,606 | 0,960 | 0 | 7 | 1,281 | 0,892 |
| *Number of household members in age* | | | | | | |
| 5 or less | 0,167 | 0,469 | 0 | 4 | 0,104 | 0,367 |
| From 6 to 15 | 0,442 | 0,755 | 0 | 5 | 0,281 | 0,619 |
| From 16 to 25 | 0,415 | 0,703 | 0 | 4 | 0,276 | 0,586 |
| From 26 to 35 | 0,305 | 0,586 | 0 | 4 | 0,228 | 0,515 |
| From 36 to 45 | 0,445 | 0,713 | 0 | 3 | 0,337 | 0,639 |
| From 46 to 55 | 0,539 | 0,752 | 0 | 3 | 0,417 | 0,679 |
| From 56 to 65 | 0,449 | 0,721 | 0 | 3 | 0,423 | 0,692 |
| 65 or older | 0,499 | 0,779 | 0 | 4 | 0,578 | 0,784 |

### 4.4 Regression model

The study analyses empirically the evolution of household income following the retirement of a household member, taking into account different socio-economic characteristics on an individual and household level. This evolution is done through semilog regression models in which the coefficients measure the relative change in the dependent variable for a relative and/or absolute change in the explanatory variables (Mariel, 2022a, p. 10).

**Equation 2**

$$ln\ household\ income_{i,t=2} = \alpha + \beta_1\ ln\ household\ income_{i,t=1} + \beta_2\ X'_{i,t} + u_i$$

$\beta_1$ captures the income elasticity between the first period and the second period and $\beta_2$ captures the semi-elasticity of the variables on either individual or household level with respect to household income in the second period (Mariel, 2022a, pp. 10 - 11). Because the model deals with households at only two given points in time, robust standard errors are used to adjust for heteroskedasticity. The study follows the example of Tur-Sinai and Spivak (2021) in the use of Ordinary Least Squares (OLS) regression models.

## 5. Descriptive findings

The income of the household before and after a member retired is compared by means of the replacement rate, which is the "ratio of the post-retirement income to the pre-retirement income" (Tur-Sinai & Spivak, 2021, p. 74). Replacement rates are found to be higher in Spain than in France, however the French rate is higher on a household level than on the net theoretical individual level as had been shown in figure 1. The Spanish household replacement rate is lower than the net theoretical individual replacement rate. The sample used for the descriptive findings is unweighted and focuses on households with a retiree.

**Table 7** Replacement rates of equivalized household income, total and by country

| | Mean replacement rate | Median replacement rate |
|---|---|---|
| Total | 0.871 | 0.971 |
| France | 0.829 | 0.927 |
| Spain | 0.924 | 0.957 |

Figure 5 shows that there is much variance within the two countries, with some households having a replacement rate of over 5. These can be considered outliers, because upon closer inspection they concern households where new members with additional income moved into the household in period 2. The large majority of the households has a replacement rate below 1 and does not improve in income upon the retirement of a household member.

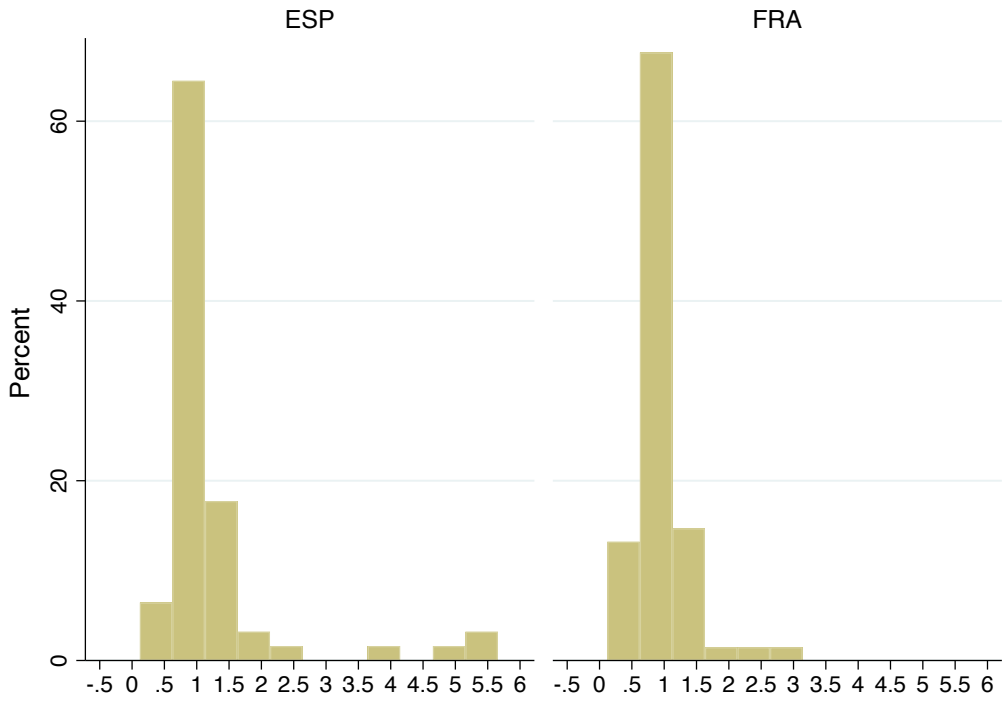


**Figure 5** Equivalized household income replacement rates, by country

The households in which a member retires in period 1 are mostly in the upper quintile of the population for both countries. This reduces starkly after retirement, which suggests that the household income went down in period 2. France even records a large increase for these households in the lower two quintiles of the population.

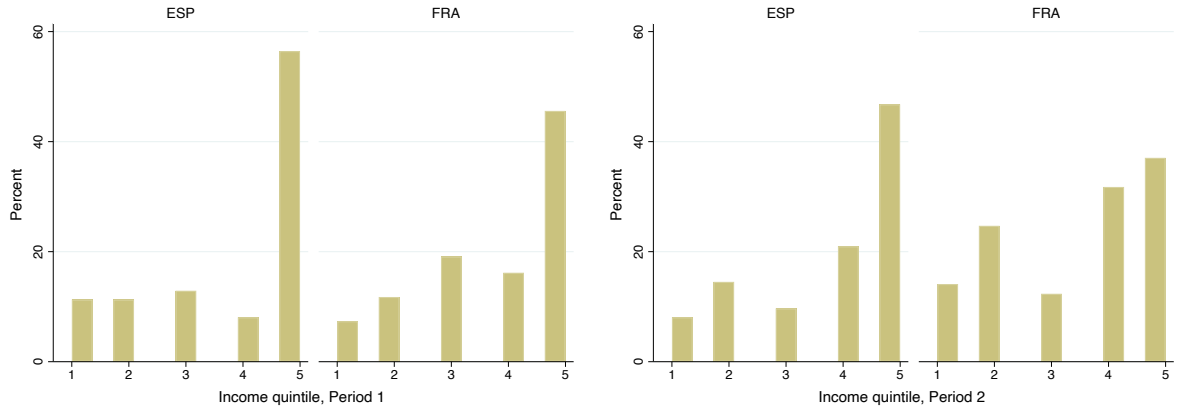


**Figure 6** Income quintiles of households in which member retires in period 1

On average, the retiree is 63 years old before retirement with a standard deviation of three years. There are however observations where the retiree is 79 years old in the first period. On average, retirees worked 39 years before retirement with a standard deviation of 7 years (and two missing values). These findings are in line with the 'base case' scenario that was reported by the Pension Adequacy report 2021 and outlined in table 1. The large majority of the retirees reported good health in the first period and a smaller but still majority enjoyed a permanent job contract. Almost a third of the retirees had attained tertiary education. The choice for a binary variable on tertiary education is based on findings by Kart, Longino, and Ullman (1989), who found a higher proportion of persons with tertiary education among well-off elderly persons than among the general elderly population (as cited in Crystal, Shea & Krishnaswami, 1992, p. 214). It might therefore be a good predictor for income in period 2. Almost a fifth of the retirees lived alone before they retired and a small majority is male.

**Table 8** Descriptive statistics on socio-economic traits of individual retiree

| Variable | Obs | Mean | Std. dev. | Min | Max |
|---|---|---|---|---|---|
| Age, Period 1 | 130 | 63,492 | 3,491 | 55 | 79 |
| Spain | 130 | 0,477 | 0,501 | 0 | 1 |
| Self-rated health, Period 1 | 130 | 0,915 | 0,279 | 0 | 1 |
| Tertiary education | 130 | 0,285 | 0,453 | 0 | 1 |
| Single person household, Period 1 | 130 | 0,215 | 0,413 | 0 | 1 |
| Male | 130 | 0,562 | 0,498 | 0 | 1 |
| Years worked | 128 | 38,859 | 7,410 | 10 | 55 |
| Permanent job, Period 1 | 130 | 0,708 | 0,457 | 0 | 1 |

**Table 9** Descriptive statistics, socio-economic traits households with one retiree in period 2

| Variable | Obs | Mean | Std. dev. | Min | Max |
|---|---|---|---|---|---|
| Homeownership, Period 1 | 130 | 0,685 | 0,467 | 0 | 1 |
| Ability to keep home warm, Period 1 | 130 | 0,915 | 0,279 | 0 | 1 |
| Late utility payments, Period 1 | 130 | 0,008 | 0,088 | 0 | 1 |
| Capacity to face unexpected expenses, Period 1 | 130 | 0,815 | 0,390 | 0 | 1 |
| Financial aid given, Period 1 | 130 | 0,046 | 0,211 | 0 | 1 |
| Financial aid received, Period 1 | 130 | 0,015 | 0,124 | 0 | 1 |
| Children in household, Period 2 | 130 | 0,015 | 0,124 | 0 | 2 |
| Spain | 130 | 0,477 | 0,501 | 0 | 1 |

Before one household member retires, households in the sample were in the majority owners of their home[4], they were able to keep their home warm and they did not have late utility payments. Similarly, they were able to face unexpected expenses and did not receive financial aid. Nor did many give financial aid. A fraction of the households where one

[4] The owner of the accommodation should be a member of the household. A person is owner if he possesses a title deed independently if the house is fully paid or not. If for instance the accommodation is provided by a relative (such as by parents to their children) who is not a member of the household, then one of the other categories should be ticked, depending on whether or not rent is paid by this household (Eurostat, 2009, p. 77).

member has retired still had children in the household. More of the households in the sample hail from France than from Spain.

**Table 10** Income equation, Period 2, dependent variable: ln(income, Period 2) OLS regression on unweighted subsample of households with a retiree

| | Model 1 | Model 2 | Model 3 | Model 4 |
|---|---|---|---|---|
| Ln income, Period 1 | 0,541*** | 0,559*** | 0,522*** | 0,541*** |
| | (0,06) | (0,06) | (0,06) | (0,06) |
| Age, Period 1 | 0,338* | 0,300 | 0,260 | |
| | (0,19) | (0,19) | (0,20) | |
| Age squared, Period 1 | -0,003* | -0,003 | -0,002 | |
| | (0,00) | (0,00) | (0,00) | |
| Spain | | 0,133** | 0,136* | 0,082 |
| | | (0,06) | (0,07) | (0,06) |
| Self-rated health, Period 1 | | | 0,027 | |
| | | | (0,08) | |
| Tertiary education | | | 0,078 | |
| | | | (0,06) | |
| Single person household, Period 1 | | | -0,082 | |
| | | | (0,10) | |
| Male | | | -0,069 | |
| | | | (0,07) | |
| Years worked | | | | 0,048* |
| | | | | (0,03) |
| Years worked squared | | | | -0,001** |
| | | | | (0,00) |
| Permanent job, Period 1 | | | | 0,081 |
| | | | | (0,08) |
| Constant | -5,889 | -4,645 | -2,904 | 3,883*** |
| | (6,30) | (6,40) | (6,57) | (0,68) |
| R-squared | 0,592 | 0,604 | 0,615 | 0,605 |
| N | 130 | 130 | 130 | 128 |

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

## 6. Estimation

The study is an empirical analysis to grasp what might influence the household income in the period after one member retires. It analyzes this relationship both on the individual level of the retiree as well as on the household level. The first linear regression into household income consists of four models that examine household income elasticity as well as the effects of demographic, social and economic characteristics of the member who retires in period 1 (see table 10). Squared variables on age and years worked are included in the regression to account for a possible non-linear relationship with the dependent variable.

Overall, all models exhibit an estimated household income elasticity between the first and the second period of over 0,5. The first model shows a slightly significant yet large positive result for the retirement age of the household member. It suggests that for every year that the member of the household does not yet retire, the household income in the second period increases with 34%! The longer the member waits with retirement, the smaller this effect becomes however as suggests the negative significant coefficient of age squared. The inclusion of the variable of residency in Spain renders the variable on age insignificant. The coefficient of the variable on Spain suggests that households where the member who retires resides in Spain have a household income that is 13% higher than their French counterparts. Model 2 only has a slightly higher R squared than model 1, which suggests that the variables on age and residency do not explain variance in the regression model. Model 3 similarly only slightly raises the variance explained and shows that none of the individual characteristics of the retiree are significant explanatory variables. Model 4 shows similar results as model 1 with respect to years worked. It suggests that for every year the retiree has worked longer before retirement, household income post-retirement is 4,8% higher, an effect that decreases the higher the number of years worked. Given that the R squared for this model is similar to

the previous models, years worked is presumably neither a good estimator for household income in the second period.

**Table 11** Income equation, Period 2, dependent variable: ln(income, Period 2) OLS regression on unweighted subsample of households with a retiree

| | Model 1 |
|---|---|
| Ln income, Period 1 | 0,547*** |
| | (0,07) |
| Homeownership, Period 1 | 0,061 |
| | (0,07) |
| Ability to keep home warm, Period 1 | -0,150 |
| | (0,10) |
| Late utility payments, Period 1 | -1,452*** |
| | (0,16) |
| Capacity to face unexpected expenses, Period 1 | 0,170** |
| | (0,08) |
| Financial support given, Period 1 | 0,243 |
| | (0,24) |
| Financial support received, Period 1 | -0,037 |
| | (0,18) |
| Children, Period 2 | -0,623 |
| | (0,65) |
| Spain | 0,039 |
| | (0,06) |
| Constant | 4.459*** |
| | (0.70) |
| R-squared | 0.659 |
| N | 130 |

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

The second regression model investigates social, demographic and economic characteristic on the household level where one member retires in period 1 and their effect on household income in period 2. Variables on late home and late loan payments were excluded from the model, due to collinearity. As is expected, income elasticity in this model is similar to the previous models in table 10. Economic characteristics are found to be significant estimators of household income in the second period. If a household has late utility payments in the first period, household income in the second period is estimated to drop by three quarters.[5] That a household reports in the first period that they have the capacity to face unexpected expenses in the period pre-retirement predicts a positive effect of 18% on household income in the second period.

For more external validity for these results, the regressions are replicated based on the household identification number of the retiree in period 1 in the weighted sample. Weights are attributed to individuals and not to households, however in the occurrence of similarity, it may provide some external validity to the estimates of the study. The results of these regression models are shown in table 12 and 13 and indeed appear to be relatively similar to the results based on the unweighted sample.

[5] The coefficient of -1,436 is too large to still assume it equals a proportional change in the dependent variable. Based on Thornton and Innes (1989), the proportional change in the dependent variable is computed as *exp*(-1,452) – 1 = - 0,76.

**Table 12** Income equation, Period 2, dependent variable: ln(income, Period 2) OLS regression on weighted (sub) sample of retired individuals in period 1

| | Model 1 | Model 2 | Model 3 | Model 4 |
|---|---|---|---|---|
| Ln income, Period 1 | 0,542*** | 0,559*** | 0,523*** | 0,541*** |
| | (0,06) | (0,06) | (0,06) | (0,06) |
| Age, Period 1 | 0,347* | 0,310 | 0,269 | |
| | (0,20) | (0,20) | (0,21) | |
| Age squared, Period 1 | -0,003* | -0,003 | -0,003 | |
| | (0,00) | (0,00) | (0,00) | |
| Spain | | 0,127** | 0,124* | 0,082 |
| | | (0,06) | (0,07) | (0,06) |
| Self-rated health, Period 1 | | | 0,017 | |
| | | | (0,08) | |
| Tertiary education | | | 0,067 | |
| | | | (0,07) | |
| Single person household, Period 1 | | | -0,084 | |
| | | | (0,10) | |
| Male | | | -0,079 | |
| | | | (0,07) | |
| Years worked | | | | 0,048* |
| | | | | (0,03) |
| Years worked squared | | | | -0,001** |
| | | | | (0,00) |
| Permanent job, Period 1 | | | | 0,081 |
| | | | | (0,08) |
| Constant | -6,490 | -5,225 | -3,400 | 3,913*** |
| | (6,69) | (6,81) | (7,01) | (0,68) |
| R-squared | 0,594 | 0,605 | 0,615 | 0,606 |
| N | 130 | 130 | 130 | 128 |

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

**Table 13** Income equation, Period 2, dependent variable: ln(income, Period 2) OLS regression on weighted (sub) sample of retired individuals in period 1

| | Model 1 |
|---|---|
| Ln income, Period 1 | 0,547*** |
| | (0,07) |
| Homeownership, Period 1 | 0,061 |
| | (0,07) |
| Ability to keep home warm, Period 1 | -0,150 |
| | (0,10) |
| Late utility payments, Period 1 | -1,452*** |
| | (0,16) |
| Capacity to face unexpected expenses, Period 1 | 0,170** |
| | (0,08) |
| Financial support given, Period 1 | 0,243 |
| | (0,24) |
| Financial support received, Period 1 | -0,037 |
| | (0,18) |
| Children, Period 2 | -0,623 |
| | (0,65) |
| Spain | 0,033 |
| | (0,06) |
| Constant | 4.488*** |
| | (0.68) |
| R-squared | 0.659 |
| N | 130 |

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

## 7. Discussion

Although results were largely similar between weighted and unweighted samples, estimates of the regression models proved inconclusive due to large standard errors. Further research to gain insight into socio-economic characteristics that might influence household income evolvement following retirement might take note of two issues that arise following pooling of data and variables.

The study followed the example of the longitudinal empirical analysis by Tur-Sinai and Spivak (2021). They pooled the dependent variable for the pre- and post-retirement periods and made use of OLS regression models instead of a fixed effect (panel) model, because they argue that the dependent variable is only constructed on the basis of two years' data (Tur-Sinai & Spivak, 2021, p. 82). Contrary to OLS, a fixed effects model includes an additional variable that captures all unobserved, time-constant factors that affect the dependent variable (Mariel, 2022b, p. 3). Pooled OLS runs the risk to be biased and inconsistent if the unobserved effect and the explanatory variables are correlated. Further research could therefore include an additional time-constant variable.

The study similarly made use of pooling in the construction of the research sample. Following adjustment for external validity, the samples on France and Spain were combined into one sample of households where a member retires in period 1. Even though regression models included a variable on the effect of country residence, Hassler and Thadewald (2003) argue that a bias may arise due to heterogeneity of other country-specific parameters. They contend moreover that even in the absence of heterogeneity, pooled estimation may emerge nonsensical.

Descriptive statistics revealed that on average for both countries, household income fell following the retirement of a household member. Scholars have shown that this fall in

income is unlikely to impact the standard of living for these households, because their expenditure falls correspondingly (Antler & Kahane, 1987; Scholz & Seshadri, 2009; Munnell & Soto, 2005)

## 8. Conclusion

All interpretations of pension adequacy are based on the same two qualities: to prevent poverty and/or social exclusion and to maintain a standard of living similar to the one of the active stage of life (Alonso-Fernandez et al., 2018, p. 166). This evolvement in income is relevant to study in order for policy makers to reform their pension systems in the most optimal way. Household income is more relevant than individual income to study, because spending decisions and pooling of income. The study investigates possible predictors for the evolvement of household income after the retirement of a household member. Descriptive findings showed income falls for the household following the retirement of a household member and that these household become poorer relative to the rest of society. Estimations into possible predictors proved to be inconclusive due to large standard errors and collinearity. The study has recommended different strategies to that could improve the models.

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This study was mainly made possible by Casilda Lasso de la Vega who from the start was willing to embark on a study into pension adequacy with me, even though neither of us had any prior knowledge of this field. She was very engaged, patient and above all empathetic with me during the months that were assigned to writing this thesis. Oihana Aristondo Etxeberria was already in possession of the EU SILC dataset used and was of great and swift help in the design of the procedure. Ainhoa Vega Bayo already had experience with the

difference in the survey year and the income reference period that is employed in the EU SILC dataset and was proactive in further information on the matter. Javier Gardeazabal considered a solution to lent external validity to the results, even though the weight could not be utilized as intended by Eurostat. Petr Mariel provided clear handouts on econometrics to EAP master students.

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The responsibility for all conclusions drawn from the data lies entirely with the author(s).