Internationally comparable measures of individual social security wealth in SHARE Wave 4

Michele Belloni, Ludovico Carrino, Cristina Elisa Orso, Raluca Elena Buia, Danilo Cavapozzi, Giacomo Pasini, Agar Brugiavini

Internationally comparable measures of individual Social Security Wealth in SHARE Wave 4[1]

By

Michele Belloni, Ludovico Carrino, Cristina Elisa Orso, Raluca Elena Buia,

Danilo Cavapozzi, Giacomo Pasini, Agar Brugiavini

Ca' Foscari University of Venice

Abstract

The release 5.0.0. of SHARE Wave 4 includes among the generated variables two measures of individual accrued social security wealth. Those measures are available for retirees and workers, and are the first attempt of computing and deliver to the scientific community a set of internationally comparable measures of pension wealth computed for a large number of countries. This working paper describes in detail the procedure, the data and the assumptions needed to obtain such measures.

Keywords: social security wealth, international comparability, lower bound

1

1. INTRODUCTION

The aim of the 7th framework programme funded project "Multinational Advancement of Research Infrastructures in Ageing (SHARE – M4)" was to maintain the European added value of the Survey of Health, Ageing and Retirement in Europe by means of a long series of tasks. Among others, the project ambition was to facilitate the measurement of material well-being in times of rapid demographic change with its complex implications for old-age income provision.

In order to achieve this goal, the SHARE data were re-organized to provide the necessary information about individuals' career paths. Brugiavini et al (2013) describes in details the main outcome of this work, i.e. the first release of the publicly available Job Episodes Panel. Later on, contextual variables on pension institutions, including old age and early retirement social security eligibility rules, were linked to the first release of the Job Episode Panel according to individual-and-time-specific characteristics such as the country of residence, date of birth, households' composition and employment history. This led to the second release of the publicly available job episodes panel, described in Antonova et al (2014). Individual life trajectories, matched with time-varying pension rules, lead to different pension wealth. In order to understand the role of different legislations in shaping pension adequacy, inequality and (re)distribution of resources over the life cycle and across countries, we constructed two summary measures of current and future pension rights for respondent in SHARE Wave 4. The new generated variables are distributed to the scientific community in the release 5.0.0. of SHARE Wave 4.

These are lower bound measures of *first–pillar* social security wealth (SSW henceforth) for individuals who in SHARE Wave 4 declared to be either a retiree or a worker. The SSW of retirees has been computed exploiting information on the self-reported pension amount received and is available for all countries included in Wave 4. The SSW of workers relies on a variety of retrospective information regarding both/either individuals' working career and residence, which is obtained from the Job Episode Panel. For this reason, the SSW of workers could be computed only for those countries and individuals participating to both Wave 3 (SHARELIFE) and Wave 4. Table 1 summarizes the country coverage of the generated SSW variables for both retirees and workers.

A key issue when constructing individual SSW for workers in Wave 4 from retrospective data is that the Job Episode Panel provides information on net of taxes earnings, while pension rules are often computed on the basis of gross of taxes bases. Therefore, considering the difficulty of grossing up wages especially when they refer to periods far in the past, we generate two versions of the SSW. We called these two variables *SSW_nw* and *SSW_gw* respectively. The former is based on net wages earned by individuals during their working career. The latter is based on their approximately grossed-up wages, and additionally takes into account minimum pension benefits

2

whenever the individual is entitled to that benefit. Note that since no information from the Job Episode Panel was required to compute the SSW for retirees, the two variables *SSW_nw* and *SSW_gw* are equal for this group.

Table 1: Countries selection for computation of Social Security Wealth

Country	Code	In SHARELIFE?	In Wave 4?	SSW available for:
Austria	11	✓	✓	retirees & workers
Germany	12	✓	✓	retirees & workers
Sweden	13	✓	✓	retirees & workers
Netherlands	14	✓	✓	retirees & workers
Spain	15	✓	✓	retirees & workers
Italy	16	✓	✓	retirees & workers
France	17	✓	✓	retirees & workers
Denmark	18	✓	✓	retirees & workers
Switzerland	20	✓	✓	retirees & workers
Belgium	23	✓	✓	retirees & workers
Czech republic	28	✓	✓	retirees & workers
Poland	29	✓	✓	retirees & workers
Hungary	32		✓	retirees
Portugal	33		✓	retirees
Slovenia	34		✓	retirees
Estonia	35		✓	retirees

The availability of an internationally comparable measure of Social Security Wealth is a new tool for applied researchers. The computation of the SSW measures included in the release 5.0 of SHARE Wave 4 required a massive integration between life-history micro-data and contextual information summarizing the evolution in the last century of the pension system characteristics of SHARE countries. Clearly, a number of assumptions have been made to deal with such a complex normative situation, measurement errors and missing data. Researchers should be aware of the potential, but also of the limitations of these variables.

This paper explains in detail how alternative data-sources have been combined as well as what are the assumptions underlining the generated SSW variables. Section 2 describes SSW formulas and main computational assumptions common to workers and retirees. Section 3 provides more details on the computation of SSW for retirees while Section 4 describes the computation of SSW for workers, also providing country-specific details.

2. SSW FORMULAS AND MAIN ASSUMPTIONS

We define the SSW for retirees as follows:

$$SSW_i = \sum_{j=a}^{\Omega} P_{i,j}\, \pi(j|a)(1+r)^{a-j}$$

Where i is the individual, a is her/his age at the time of the interview, Ω is the maximum attainable age and $\pi(.)$ are conditional survival probabilities according to current life tables and r is a financial discount rate.

P is the self-reported public old age pension benefit. This variable is annualized and net of pension income taxation. More details on P are provided in section 3. Conditional survival probabilities π are country- and gender-specific, refer to year 2009 and are taken from the Human Mortality Database (HMD, 2013). The discount rate r is set to 2 percent (OECD, 2013).

Future pensions $P_{i,j} = P_{i,a}(1+g)^{j-a}$ for $j=a+1\ldots \Omega$ - where g is the real wage growth rate for indexation - are assumed to be price indexed, i.e. $g=0$ with the exceptions of Switzerland, Czech Republic and Estonia. In these cases we assume $g=0.02$ (OECD, 2013b; OECD, 2013).[2]

We define the SSW for workers as follows:

$$SSW_i = \sum_{j=R}^{\Omega} \hat{P}_{i,j}(R)\, \pi(j|a)(1+r)^{a-j}$$

where $\hat{P}(R)$ is the computed public old age pension benefit assuming that the individual will retire at current age a from the labor market and will start receiving pension income from the old age retirement age R. $\hat{P}(R)$ represents therefore the annual pension benefit (net of pension income and payroll taxation, see later). If insurance or/and contribution conditions are met, but the age requirement (and residence) is not, then, $SSW_i > 0$ since the individual will be paid a pension at future age (starting from the old age retirement age). If instead eligibility conditions in terms of insurance or contributory years are not met at the time of the interview, then the SSW is not computed. We assume that individuals will continue to reside in the country they currently reside until they reach the old age retirement age to evaluate eligibility whenever this information is

---

[2] Czech Republic: pensions are regularly adjusted every year according to at least 100% of the development of the price index and by at least one third of the increase of average real wages if the increase is between 2 and 5 percent (MISSOC 1-7-2010); Switzerland: benefits are adjusted every two years. Pensions in payment are indexed 50% to prices and 50% to nominal earnings (OECD, 2013); Estonia: pensions in payment are indexed to 20% consumer prices and 80% contribution revenues annually each April (MISSOC 1-7-2010). For Estonia, we further assume growth contribution revenues is equal to growth of earnings.

relevant. The old age retirement age R is an institutional variable that can depend on individual demographic characteristics besides country specific pension legislation. This variable is included in the second release of the Job Episode Panel (*ret_age*). Note that survivor benefits are not accounted for in the above formulas.

We rely on *Mutual Information System on Social Protection* tables (MISSOC, version July 2010) to define the appropriate pension rules for each country. Pension amounts depend often on labor market (and sometimes residential) histories. Retrospective information such as lifetime or more generally past wages, insurance and contribution years and/or residential information are obtained from the job episodes panel based on SHARELIFE until 2008. Data for years 2009 and 2010 are recovered from SHARE Wave 4. From the same wave, we also recover additional household level information such as number of children and marital status. See Table 2 for a more precise definition of timing for each dataset.

Table 2: Timing

Country and language	Code	Earnings in SHARELIFE refer up to:	Years for which earnings are n.a. (to be imputed)	WAVE 4 (interview year)	Public pensions and earnings refer to:
Austria	11	2008/09	2009	2011	2010
Germany	12	2008/09	2009/10	2011/12	2010/11
Sweden	13	2008/09	2009	2011	2010
Netherlands	14	2008/09	2009	2011	2010
Spain	15	2008/09	2009	2011	2010
Italy	16	2008/09	2009	2011	2010
France	17	2009	-	2011	2010
Denmark	18	2008/09	2009	2011	2010
Switzerland (German)	20	2008/09	2009	2011	2010
Switzerland (French)	21	2008/09	2009	2011	2010
Switzerland (Italian)	22	2008/09	2009	2011	2010
Belgium (French)	23	2008/09	2009	2011	2010
Belgium (Flemish)	24	2008/09	2009	2011	2010
Czech republic	28	2008/09	2009	2011	2010
Poland	29	2008/09	2008/09	2009/10	2011/12
Hungary	32	-	-	2011	2010
Portugal	33	-	-	2011	2010
Slovenia	34	-	-	2011	2010
Estonia	35	-	-	2010/11	2010/11

A key step for the computation of $\hat{P}(R)$ is the reconstruction of individuals' working career including lifetime wages. SHARELIFE reports – for each job episode – the self-reported after taxes

5

first monthly wage; it also reports after taxes last monthly wage for the main job spell. From this data, we fill in missing wages within each job spell assuming that wages are constant in real terms. Any assumption on individuals' wage profiles is necessarily discretionary. We chose a conservative assumption regarding wage profiles within job spells to be sure at least about the direction of the bias with respect to the unknown true wage profile: taking this approach our SSW measures (especially *SSW_nw*) represent an underestimation of actual SSW.

An important issue for the computation of old age pensions is taxation. Taxation issues arise twice. First, whenever benefits are earnings related, one should consider as the appropriate computational basis wages that are gross of income taxes as well as the employee part of payroll taxation (while this basis does not include the quota of payroll taxes paid by the employer). As said above, self-reported wages in SHARELIFE are net of taxes. A necessarily approximate procedure to gross up individuals' wages has been applied: this procedure is described in the Section 4 of this paper. The employee quota of payroll taxation has been retrieved from the corresponding variable included in the Job Episode Panel (*contrib_employee*). Our grossing up procedure may introduce a bias in the income distribution of the sample. For this reason, as outlined in the introduction, we release two versions of the SSW for workers[3]:

- ➢ *SSW_nw:* we do not apply any grossing up procedure and compute the pension benefit $\hat{P}(R)$ on the basis of net wages as reported in SHARELIFE.
- ➢ *SSW_gw:* we do apply a procedure to recover wages that are gross of income and payroll taxation. We then compute the pension benefit on the resulting wages. $\hat{P}(R)$ is given by the maximum between the computed pension and the minimum pension (whenever the latter institution exists in the country). This variable, by construction, is larger or equal than *SSW_nw*.

SSW measures are expressed in 2010 euros for all countries.

Note finally that both versions of SSW are net of *pension* income and payroll taxes: we apply tax rules existing in each country in 2010 to recover net pensions. This allows comparing SSW computed for workers with SSW obtained for retirees. More details on SSW of workers are reported in Section 4.

---

[3] These variables are equal for retirees, since they are based on self-reported pension amounts.

3. SOCIAL SECURITY WEALTH OF RETIREES: DETAILS

In order to compute *P* (the self-reported public old age pension benefit) in equation (1) we:

- consider only public old age benefit according to what is defined as category "1" in the country-specific list in question EP071 ("Please look at card 23. Have you received income from any of these sources in the year [{previous year}]? Code all that apply");

- combine information from question EP078 ("After taxes, about how large was a typical payment of your public old age pension? It is an ordinary typical-regular payment, excluding any extras, such as bonuses, 13th month etc.") and EP074 ("What period did that payment cover? 1. One week, 2. Two weeks, 3. Calendar month/4 weeks, 4. Three months/13 weeks, 5. Six months/26 weeks, 6. Full year/12 months/52 weeks, 97. Other (specify)").

- assume that the individual has received payments for the whole year, i.e. we do not consider shorter payments periods if the individual retired during the interview year. As said above, we compute annualized pension income. Annualized means an equivalent of 12 monthly payments.

- do not consider lump sum payments (EP081, EP082) including 13th month; do not exploit the imputed variable *ypen* since it groups old age and early retirement; do not account for unfolding brackets.

4. SOCIAL SECURITY WEALTH OF WORKERS: DETAILS

4.1 COMMON TO ALL COUNTRIES

Two important variables are typically needed in order to compute pension benefits for workers: the number of insurance/contributory years on the one hand and the pensionable wages (i.e., those representing the basis of the computation) on the other hand. To obtain such information, we combine data from the job episodes panel with data from Wave 4.

Insurance years usually include years in employment, unemployment, childcare periods, sickness benefits, and military service. To compute insurance years, we proceed as follows:

- For the years up to 2008 we use information on the working status and country of residence from the job episodes panel; for the subsequent years (2009, 2010), we use data from SHARE Wave 4;

- When computing insurance years, for most of the analyzed countries full-time and part-time jobs are considered equivalent. However, this is not always the case. In Wave 4, the question about working full- or part-time is substituted by the number of worked hours per week (EP012_ "Total contracted hours per week in this job: What are your total basic or contracted hours each week in this job, excluding meal breaks and any paid or unpaid overtime?"). In this case, we assume that individuals working less than 35 hours per week are part-time workers.

As regards the computation of contributory years accrued at the end of 2010, we take into account all working spells including those in which the individual resided and/or worked abroad (in SHARELIFE the latter information is not available, but it can be inferred from the currency in which the wage is expressed). In order to impute the working status of respondents in 2009 we use SHARE Wave 4 and combine the information from EP010_ ("Start of current job (year)") and EP050_ ("Year last job ended"). In particular, we sum up:

- the total number of full time working years;
- 0.5 times the total number of part time working years;
- the number of years in unemployment (depending on specific country-regulations);

We do not consider episodes of self-employment because we do not have information on conversion rules of accrued rights between employment and self-employment funds.

To compute pensionable wages in some countries it is necessary to know wages throughout individuals' entire working career. For this purpose, we use the information provided in the job episodes panel where respondents report their first monthly wage at the beginning of each working spell, the last wage of the main job spell and their current monthly wage (in 2008, if they are still working). In order to fill in the annual wages in each year up to 2009 we proceed as follows:

1. We convert all wages in 2010 real local currencies using the appropriate Consumer Price Index (CPI)[4];
2. We take the first real wage of each working spell from the Job Episode Panel and impute it to all the subsequent years until a new wage is reported. We use this method for all the wages until 2009. For 2009, wages are imputed rolling over the 2008 wages.
3. In some countries, nominal wages are the basis to compute pension benefits (e.g. Germany, where lifetime nominal wages are updated using official indexes). In these cases, we apply

---

[4] For detailed information on this procedure, see Trevisan et al., 2011.

the change in the Consumer Price Index on the first-wage of each working spell to generate a nominal-wage variable which is varying within each spell.

4. Finally, for each year, we multiply monthly amounts by 12 to obtain annual wages.

Wages for 2010 are directly obtained from SHARE Wave 4 (the generated variable *ydip* "Annual earnings from employment"). This variable is expressed in euro for all the countries. Therefore, we convert the annual employment earnings in the local currency for those countries that do not have joined the euro-zone by using conversion rates by the Central European Bank in July 2010.

As mentioned in section 2, nominal and real wages are net of taxes. In order to obtain their gross value we introduce a grossing up procedure. We define the gross wage for workers as follows (we drop the individual index for simplicity):

$$GW_{c,t} = \frac{NW}{1 - ATI_{c,t} - PCRE_{c,t}}$$

where *NW* is the individual net wage (at time t), ATI is the average income tax rate in country *c* at time *t* (OECD historical data), and *PCRE* is the pension contribution rate paid by the employee (*contrib_employee*, a contextual variable included in the job episodes panel).

We made two important assumptions on wages:

- They are considered constant in real terms within each working spell, while nominal wages change with inflation within each spell;

- In case the variable *first wage* in the job episodes panel is missing, wages of that employment spell are excluded from the computation of pensionable wages. Note, however, that employment spells for which wages are missing do count for the computation of insurance and contribution years.

Other general assumptions we have introduced are:

- We ignored pension credits accrued during periods of child caring, university education and military service;

- We ignored the upper-bound limit of earnings taken into consideration in the calculation of pension contributions since we were not able to recover these historical time series for each country; this seems to be a rather weak limitation given the way we reconstructed individuals' lifetime income;

- We assumed that all married individuals have independent spouses. This allows us not to model regulations depending on dependent spouses: again, this is in the spirit of obtaining a

lower bound to SSW since conditional on lifetime income and contribution history, pension of dependent spouses is typically higher than pension of independent spouses. This assumption is relevant in particular for Belgium and Spain;

- No premium for late retirement (if it exists) is taken into account for working individuals older than the statutory retirement age. We assume they retire in 2010;

- We assume that respondents will reach eligibility for old-age pension in the country in which they reside at the time of the interview in Wave 4 (2010).

- Pension benefits are computed according to the rules of the country where the respondent resided when she was interviewed in Wave 4 as if he/she had always worked and lived within that country.

- For the computation of pensionable earnings, we only consider wages that respondents earned when residing and working in the country in which they reside in 2010.

4.2 COUNTRY SPECIFIC

This section provides information on country-specific pension rules, based on the MISSOC taxonomy (MISSOC, 2010) and on other relevant literature. We also summarise all the country-specific assumptions implemented in order to build the SSW variables. Where not specified, all the monetary amounts are expressed in real terms of €2010 and correspond to the pension rules in place in 2010.

4.2.1 Austria:

General pension rules:

- The statutory retirement age was set to 65 for males and 60 for females;

- The factors determining eligibility to pension are: the amount of income, the duration of the insurance period, and the age of the individual at the moment in which he/she claims the pension;

- As regards the calculation of benefits, the procedure is the following: 1.78% (per insurance year) of the calculation base is credited to the pension account; calculation base is the average of the (devalued) earned income of the best 20 insurance years. For insurance years, we refer to employment, unemployment, maternity, sickness, national services, military service periods.

- The minimum period of membership to qualify for pension benefits corresponds to 15 insurance years, since 1980, or 15 contributions years or 25 insurance years. To obtain full pension, 45 insurance years are required.

- The minimum pension for a single individual amounts to €783.99 per month, while couples are assigned €1,175.45 for the entire household.

Specific notes:

- Details on definition of insurance years are taken from http://www.sozialversicherung.at/

- As for the minimum pension for couples, we assign half of the minimum value (€587.72) to each eligible individual living with a spouse in a household.

- Pension calculation requires information on earnings during each insurance year. While for working years these earnings are generally known, for unemployment/education/sick leave periods they are assumed to be equal to 0.

4.2.2 Belgium:

General pension rules:

- The statutory retirement age for males and females in Belgium was set to 65 years;

- The factors determining eligibility to pension are the life-time earnings (the reference salary S), the duration of insurance and the family status. In particular, for each working year, a pension share is granted according to the formulas:

  P = S x 0.6 x 1/45 for single or married individuals without a dependent spouse;
  P = S x 0.7 x 1/45 for married individuals with a dependent spouse.

- The reference salary S corresponds to a fixed amount (€12,892.42, real terms 2010) for working years prior to 1 January 1955; gross earnings without upper limit for working years between 1955 and 1980; gross earnings limited to the ceiling of €47,171.84 (real terms in 2010).

- The guaranteed minimum pension for a complete career (at least 45 years of contributions) corresponds to €15,068.27 for individuals living in couple (the amount is given to the households as a whole, and assumes the spouse to be dependent) or to €12,058.41 for singles. This amount is reduced proportionally for those who have less than 45 years of contributions, while no minimum pension is assigned if such number of years is lower than 16.

- The maximum pension benefit results from the annual earnings ceiling for the calculation base. The maximum for employees on 1 July 2010 is €28,132.81 per year (household level), and €22,506.25 per year (single person).

Specific notes:

- Due to the lack of information on the spouse's dependency condition, which is a criteria entering both the pension's calculation and the minimum pension's calculation (OECD, 2013b), as already explained we consider every individual as a single, thus accordingly selecting the minimum and the maximum pension benefits. Again, this ensures potential approximations lead to an underestimated value of SSW.

- Maximum pension: coherently with the strategy followed for the minimum pension, we cap the yearly pension level at €22,506.25, which is the maximum pension level for single pensioners.

4.2.3 Czech Republic

General pension rules:

- The statutory retirement age was set to 62 years and 2 months for males, while for females depends on the number of children raised. Specifically, if the woman has:
  a) no children: 60 years and 8 months;
  b) 1 child: 59 years and 8 months;
  c) 2 children: 58 years and 8 months;
  d) 3 or 4 children: 57 years and 8 months;
  e) 5 or more children: 56 years and 8 months.

- The factors determining eligibility to pension are the amount of earnings and number of insured years.

- The minimum period of membership corresponds to 26 years of insurance at retirement age or at least 16 years at the age of 65.

- The pension benefit consists of two distinct elements: a flat-rate monthly amount (*Základní složka*), and a percentage amount (*Procentní cást*). The percentage amount is based on an earnings-related component, the Personal Assessment Base (*Osobní vymerovací základ*), and on the number of insurance years. For each insurance year, 1.5% of the personal assessment base is allocated to the Percentage amount of the pension benefit. The Personal Assessment Base is computed taking into account the average gross earnings since 1985.

- As regards the minimum pension for the Basic Amount (*Základní složka*), it corresponds to a flat-rate of CZK 2,170 (€84) per month, while for the Percentage Amount (*Procentní cást*) it is equal to CZK 770 (€30) per month.

Specific notes:

- In order to compute the retirement age, we account for the number of children an individual had in 2010, and round the resulting statutory retirement age at its nearest integer.

- In order to compute the pension amount, life-time earnings must be indexed to the average wage dynamics. For this purpose, we use official institutional data on nominal average-wages (*Průměrný plat*) from the *Český statistický úřad* (Czech Institute of Statistics), and elaborated by investia.cz (http://www.investia.cz/prumerna-mzda).

4.2.4 Denmark

General pension rules:

- The statutory retirement age for males and females in Denmark was set to 65 years;

- The factor determining eligibility to pension is the duration of residence in Denmark between the ages of 15 and 65.

- With reference to the calculation of pension benefits, the basic pension ranges from 1/40 of an annual amount of DKK 65,376 (€8,777) per year of residence between the ages of 15 and 65 up to a maximum of 40/40.

- The minimum annual benefit is equal to €219.425, while the maximum amounts to €8,777.

Specific notes:

- We assume that individuals younger than 65 in 2010 will continue to reside in the country until they reach old-age retirement age (65)

4.2.5 France

General pension rules:

- The statutory retirement age for males and females in France is 60 years.

- The factors determining eligibility to pension are the years of insurance, the annual average salary, and the year of birth.

- The pension amount is calculated according to the formula: R * t * n/162, where R is the Reference salary, t is the pension rate, n is the insurance period.

- The pension rate is based on the age of the insured person and the number of years of contributions. Its maximum is 50%, and this rate is reduced if years of insurance are lower than the determined thresholds (between 40 and 41 years, depending on the birth cohort). A pension rate of 50% is given at every individual aged 65 or older.

- The insurance period is 150 quarters for insured born in 1943 or previously. 160 quarters for generations born after 1947.

- The annual minimum and maximum pension are fixed at, respectively, €7,147 and €17,310.

Specific notes:

- As for the pension rate, the regulation states that, if the maximum insurance years amount is not reached, the rate decreases from a maximum of 5% per year (for generations before 1944), to a minimum of 2.5% (for generations after 1952). In absence of information on the reduction implemented for individuals born between 1944 and 1952, we assume that such reduction-rate lowers linearly by a factor of 0.25 percentage points per year. I.e., the reduction rate is 5% for generations born before 1944, 4.75% for those born in 1944, 4.5% for the 1945 cohorts, and so on, down to a reduction rate of 2.5% for 1953 cohorts (or younger).

- Regarding the insurance period, in absence of institutional information for the cohorts birth between 1943 and 1947, we assume a gradual increase from 150 (for those born in 1943) to 160 quarters (for 1948 cohorts or younger).

4.2.6 Germany

General pension rules:

- The statutory retirement age for males and females in Germany was set to 65 years; for individuals born in 1963 or later, the retirement age was set to 67 years unless they reached 45 years of insurance.

- The factors determining eligibility to pension are the amount of income, the duration of the insurance period and the age of the individual at the moment of claiming the benefit.

- The pension benefit is calculated according to the formula:

Pension= *PER*1,0*AR*

Where *PER* is the ratio between actual earnings and average national earnings in that year, corrected with '*Zugangsfaktor*'. The maximum salary taken into account is €66,000, while '*Zugangsfaktor*' corresponds to 3.6% for each year of retirement before statutory retirement

age, and +6% for each year of working after the statutory retirement age. *AR* is equal to €27.20 per month for each insurance year for old *Laender,* and €24.13 for new *Laender*.

- The minimum period of membership to qualify for pension benefits is 5 years.

Specific notes:

- Calculation of pension in Germany requires, among other factors, to compare each year individual' self-reported earnings with national average earnings in the same year. Data on national average earnings (differentiated between East- and West Germany) are recovered from BMAS (*Bundesministerium für Arbeit und Soziales*), since 1950.

- Calculation of Personal Remuneration Points requires information on earnings during each *insurance* year. While for working years earnings are known, for unemployment/ education/sick leave years they are not known, and they are assumed to be equal to 0.

- Pension base is different for those who receive the pension in East or West Germany provinces. In absence of NUTS1 information for Germany, we recover the East/West information from Wave 3 and tabulate variable ho044 from Wave 4: "did you change the residence from the last wave". Since only a very small group of individuals moved between 2008 and 2010, we assume that East/West Germany residence in 2010 corresponds to residence in 2008.

4.2.7 Italy

General pension rules:

- After the pension reforms introduced in the nineties, in Italy there are three different ways of computing the pension benefits, based on the number of years of contributions that the individuals have achieved up to the end of 1995.
  - o For those individuals having at least 18 years of contributions in 1995 the pension benefits are computed according to a DB system. The amount of the pension is composed of two elements. The first part, quote A, is computed based on the average wage of the last five years of contributions previous to retirement and on the number of years of contributions achieved by the end of 1992. The second part, quote B, takes into consideration the average wage of the last 10 years of contributions and the number of years of contributions after 1992.
  - o For the individuals that started working before the end of 1995 but had less than 18 years of contributions at that date, the pension is computed using a mixed system: (i) DB for the years up to 1996 (computed again as quote A for the working years up to

1992 + quote B for the contribution years between 1992 and 1996); (ii) DC system for the years after 1996.

- o For the persons that started to work only after 1996 the benefits are computed according to a NDC system.

- The years of contribution**:** according to the Italian rules, when establishing the eligibility of the individuals for the retirement, the years worked part-time are equivalent to the full-time ones. Differently, in order to compute the pension benefits, the years worked part-time are to be considered only in proportion to the number of hours actually worked with respect to a full-time job.

- The amount of the minimum pension, representing the threshold up to which the pension is increased for the individuals with very low pension benefits, should depend on the additional income (from other sources) of the individual if single and on the total income of both spouses for the married individuals.

- There is no minimum pension for those individuals who fall entirely under the new NDC system.

Specific notes:

- The years of contribution were computed using the Job episodes panel information on the history of the working career. Specifically, we created and used two variables:
    - o one that counted the number of years in which the individual worked either part-time or full time, for the eligibility;
    - o a second variable that considered only 0.5 years for each working year in part-time regime and 0 for the years of self-employment (while considering 1 year of contributions only for each working year in full time dependent jobs). This variable was used in order to compute the pension benefits for the individuals that were subject to the DB system.

- We filled in the requirements for old age retirement for 2010 using the information from INPS (the National Social Security Institute, www.inps.it). We considered old age retirement as the unique pathway to retirement, hence nobody can retire before the legal age for old age retirement. We ignored the possibility to retire using the early retirement path.

- Minimum pension: due to the difficulties in computing these amounts we considered every individual as single and lacking other income.

4.2.8 Netherlands:

General pension rules:

- The statutory retirement age for males and females was set to 65 years.

- The factors determining eligibility to pension are the duration of the insurance period, and the family status. The years of insurance are calculated from the age of 15.

- With reference to the calculation of the pension benefit, the amount changes on the basis of the household composition:

  -in case of single person, the amount is €1,022.85 per month;

  -for single parent with a child aged up to 18, the monthly amount is €1,295.62;

  -married or unmarried individuals (both aged 65 and over) sharing a household receive €701.49 per month/ person.

  -for pensioners with a partner aged less than 65 the amount is €1,022.85 in case the pension took effect before 01/02/1994; the pension benefit changes in case the pension took effect from 01/02/1994 (€701.49).

- Full pension is payable if the applicant reaches 50 insurance years. For every year without insurance, 2% of the full pension is deducted.

Specific notes:

- We assume that individuals younger than 65 in 2010 will continue to reside in the country until they reach old-age retirement age (65)

4.2.9 Poland

General pension rules:

- In Poland, the old pension system was complemented in 1999 by the new system, which applied to individuals born after 1949. The statutory retirement age is 60 years old for women and 65 for men.

- The factors determining eligibility to pension are the amount of income, and the age of the insured person at time of award of pension.

- Rights acquired under the old system, i.e., for those individuals who started working before 1999, were converted to the new system by the creation of a so-called "initial capital" at year 1999. Such amount is calculated to deliver the same pension benefit as the old system formula (adjusted for age and contribution years), if everyone had retired on the last day of the old system (Chłoń-Domińczak and Góra, 2006).

- Under the new system, the pension benefit corresponds to the accumulated pension accounts, divided by the individual life expectancy at retirement-age. The accounts are generated through contributions from earnings that are credited to individuals' notional accounts. The contributory rates are 12.22% for workers born after 1968, and 19.52% for workers born between 1949 and 1968.

- All the accrued contributions are revaluated through a notional interest rate which has been defined as 100% of the growth of the covered wage bill, and no less than price inflation. This notional interest rate is applied retrospectively to accounts from the year 2000, as well as to the "initial capital" in 1999, if any.

- The maximum pension is defined as the 100% of the reference wage, which has a twofold definition: it is the average wage either over 10 consecutive years selected from among the 20 years previous to retirement, or over the best 20 years of any insurance period. The ceiling is set at the 250% of the national average wage.

Specific notes:

- Since only 4 respondents in our sample from Poland who were working in 2010 and present in Wave 3 come from cohorts before 1949, we calculated the pension benefits for everybody according to the new legislation

- We assumed that the contributory rates applicable to the 4 individuals in our sample who were born before 1949 were the same as the rates implemented for cohorts born between 1949 and 1968. We also assume that individuals do not choose funded-tiers.

- In order to compute the "initial capital" at 1999, we followed the legislation's formulas and parameters, detailed in Chłoń-Domińczak and Góra (2006).

- The notional interest rate is built with data on nominal gross-wages growth from the OECD database.

- The maximum pension is defined as the average wage of the best 20 years of any insurance period. In order to implement the ceiling, we recovered data on the national average wage from the OECD database.

- We compute the maximum pension as the 100% of the "reference wage". Such figure corresponds either to the average wage among the best 20 years of any insurance period. The ceiling is set at 250% of the national average wage, which was 40054 zloty in 2010 (data from OECD average annual wage), thus the ceiling corresponds to 100135 zloty.

- We assume that individuals who do not meet requirements in terms of contributory years for minimum pension receive no pension whatsoever.

- Calculation of the pension includes <u>unisex</u> average life expectancy at the age of retirement, which is 65 for men and 60 for women. Since complete information on remaining life expectancy is not known, we approximated the remaining life expectancy at the moment of retirement, as shown in the Table 3.

Table 3: Life expectancy in Poland

Retirement year	Life expectancy at retirement age, by gender and retirement age					
	Male, 60	Female, 60	Overall, 60	Male, 65	Female, 65	Overall, 65
2010	17.8 (**)	23.1(*)	20.4	14.4(*)	19.9(**)	17.2
Between 2010 and 2020 (linear approximation)	+0.06 for each year	+0.09 for each year	+0.08 for each year	+0.06 for each year	+0.09 for each year	+0.08 for each year
2020	18.4	24.0(*)	21.2	14.9(*)	20.8	18
Between 2020 and 2030 (linear approximation)	+0.06 for each year	+0.09 for each year	+0.08 for each year	+0.06 for each year	+0.09 for each year	+0.08 for each year
2030	19	24.9(*)	22	15.6(*)	21.7	18.8

* see http://www.oecd-ilibrary.org/finance-and-investment/pensions-at-a-glance-2011_pension_glance-2011-en
** see UN data at http://esa.un.org/unpd/wpp/Excel-Data/mortality.htm

4.2.10 Sweden

General new pension rules (after the 1994 reform), which apply entirely for individuals born after 1954. They do not apply for cohorts born in 1937 or earlier, while their degree of application decreases proportionally between birth years 1937 and 1954.

- The National public pension in Sweden, after the 1994 reform, consists of three elements: the income-based pension *inkomstpension* (financed on a pay-as-you-go basis), the premium pension (funded), and the guaranteed (minimum) pension. We ignore the premium pension scheme, due to the unknown nature and gains of the individually-chosen pension funds.

- Retirement age is flexible and starts from age 61. There is no minimum period of membership for the income-based pension.

- The pension benefit is calculated by dividing the accumulated pension assets by an annuity factor depending on the average life expectancy for a cohort, on the age of retirement for an individual and on a ""norm"" for (expected) increase of average wages.

- The contributory rate for the unfunded pension (in % of earnings) was 18.5% until 1994, 16.5% between 1995 and 1998, and is 16% from 1999 onward (see also Palmer, 1998).

- The full minimum pension is granted, after the age of 65, to individuals who resided in Sweden or in another EU/EEA country for at least 40 years. The minimum pension is differentiated according to individual marital status, and it is higher for the unmarried claimants. For each year of residence less than 40, the amount is reduced by 1/40.

- Accrued pension rights are indexed annually according to the development of average wages.

Pre-reform rules apply entirely for individuals born in 1937or earlier. They do not apply for cohorts born in 1954 or later, while their degree of application rises proportionally between 1937 and 1954.

- The pre-reform public pension system in Sweden (Palmer, 1998) combined a flat-rate universal benefit, the *folkpension* (FP) differentiated by individuals' marital status, with an earnings-related benefit (*Allmänna tilläggspension* or ATP).

- Benefits in the ATP system were based on an individual's 15 years of highest earnings, required 30 years of covered earnings for a full pension, and replaced 60 percent of average earnings—based on the highest 15 years—up to a ceiling.

- Individuals with no or very low ATP benefits received an additional benefit, the pension supplement, which was about 50 percent of the FP benefit.

- For individuals born between 1937 and 1954, the pension benefit is a weighted average of the benefit calculated with the old and the new rules.

Specific notes:

- Since the minimum pension can be obtained from the 65th year of age, we assume that retirement age is 65 for all respondents who are 65 or less. Those who are older than 65 are supposed to immediately retire in their current age in 2010

- The income-index and annuity factors needed for pensions' computation are taken from http://secure.pensionsmyndigheten.se/AktuellaBelopp.html. In particular, the income-index is available since 1960. Earnings previous to this year are indexed to inflation up to 1960, then revaluated using the income-index up to 2010.

- Minimum pensions amount detailed in the MISSOC are already "individual" amounts. Therefore, for an unmarried person, it corresponds to SEK 90,312, while for a married person it is SEK 80,560.

- The *folkpension* corresponds to 78.5% of the base amount if the recipient is married, 96% if unmarried. This means that *folkpension* in 2010 is, respectively, SEK 33,284 or SEK 40,704.

4.2.11 Spain

General pension rules:

- The statutory retirement age for males and females in Spain is set to 65 years.
- The factors determining eligibility to pension are the amount of income, the duration of the contribution period, and the age of the individual at the moment in which he/she claims the pension.
- The maximum annual pension is equal to €29,594.4, in case of 12 monthly payments; the maximum amount reaches €34,526.80 in case of 14 monthly payments.

  The minimum annual benefit relies on the individual's age and the family status. For persons aged 65 and over, its amount is €587.80 for single-person households, €725.20 or €557.50 for married beneficiaries, according to whether or not the spouse is dependent. Individuals aged less than 65 receive €549.80 for single-person households, €679.70 or €519.50 for married beneficiaries, according to whether or not the spouse is dependent.

- The minimum period of membership to qualify for pension benefits corresponds to 15 years of contributions out of which 2 in the 15-years period immediately prior to retirement. To draw full pension benefit, 35 insurance years are required.

Specific notes:

- The minimum pension amount (*Pensión mínima*) depends on individuals' marital status and on whether or not the spouse is dependent. As done elsewhere in this paper, all the married individuals are assumed to have an independent spouse. Therefore, the minimum pension is €587.80 for single-person households, €557.50 for married beneficiaries.

4.2.12 Switzerland

General pension rules:

- The statutory retirement age was set to 65 years for males, 64 years for females.
- The factors determining eligibility to pension are lifetime earnings.
- Concerning the calculation of benefits, the procedure is the following: if the average lifetime earnings are less than the threshold of 41,040 CHF (€29,739), the pension amount will be equal to 10,123 CHF (€7,335) plus 2.16% of the average lifetime earnings. In case the lifetime earnings exceed 41,040 CHF (€29,739 euro), the benefit will be 14,227 CHF (€10,309) plus 1.33% of average lifetime earnings. Benefits are reduced on a pro-rata basis for missing contribution years.

- The maximum annual pension benefit is equal to 27,360 CHF (€19,826); regarding married individuals, the maximum pension for a couple is 150% of the maximum amount for a single individual.

- The minimum annual pension benefit is 13,680 CHF (€9,913).

- Males receive full pension benefit with 44 years of contributions, while females need 43 contributory years.

Specific notes:

- We apply the maximum annual pension ceiling of CHF 27,360. Yet, we ignore the condition that the cumulate pension for 2 individuals living together cannot exceed the 150% of the maximum pension for a single individual.

REFERENCES

Antonova, L., L. Aranda, G. Pasini and E. Trevisan. 2014. "Migration, family history and pension: the second release of the SHARE Job episodes panel". *SHARE Working Paper Series* 18-2014.

Brugiavini, A., D. Cavapozzi, G. Pasini and E. Trevisan. 2013. "Working life histories from SHARELIFE: a retrospective panel", *SHARE Working Paper Series* 11-2013.

Chłoń-Domińczak, A., and Góra, M. 2006. "The NDC System in Poland: Assessment after Five Years", in "Pension Reform. Issues and Prospects for Non-Financial Defined Contribution (NDC) Schemes ", eds. R. Holzmann and E. Palmer, The International Bank for Reconstruction and Development, The World Bank, Washington.

HMD, 2013, www.mortality.org

Investia.cz: http://www.investia.cz/prumerna-mzda

MISSOC. 2010. Mutual Information System on Social Protection, MISSOC Comparative Tables Database http://www.missoc.org/MISSOC/INFORMATIONBASE/COMPARATIVETABLES/MISSOCDATABASE/comparativeTableSearch.jsp

OECD. 2013. Pensions at a glance 2013, OECD and G20 indicators, Chapter: Methodology and assumptions: http://www.keepeek.com/Digital-Asset-Management/oecd/finance-and-investment/pensions-at-a-glance-2013/methodology-and-assumptions_pension_glance-2013-11-en#page1

OECD. 2013b. Pensions at a glance 2013, OECD and G20 indicators, Chapter: Gross pension wealth, http://www.oecd-ilibrary.org/finance-and-investment/pensions-at-a-glance-2013/gross-pension-wealth_pension_glance-2013-18-en

Orange Report Annual Report of the Swedish Pension System. 2011. Pensions Myndicheten.

Osterreichische Sozialversicherung: http://www.sozialversicherung.at/

Palmer, E. 1998. "The Swedish Pension Reform Model: Framework and Issues." Stockholm: National Social Insurance Board.

Trevisan, E., Pasini, G. and Rainato, R. 2011. "Cross-Country Comparison of Monetary Values from SHARELIFE", *SHARE Working Paper Series* 02-2011.