How international comparisons help to understand population aging: Lessons from SHARE and its sister studies

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Paper for the 20th International Panel Data Conference, Tokyo, 10 July 2014

Abstract

The Survey of Health, Ageing and Retirement in Europe (SHARE) is a unique multidisciplinary and cross-national panel database of ex ante harmonized micro data on health, socio-economic status and social and family networks covering most of the European Union and Israel. SHARE covers 21 countries and is harmonized with similar data sets in the US (HRS), England (ELSA), Japan (JSTAR), China (CHARLS), Brazil (ELSI), South Korea (KLOSA), and India (LASI) which permits global international comparisons of health, economic and social outcomes. We show that data such as SHARE can be instrumental in shedding light on the many prejudices about aging.

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1. Introduction

Population aging is one of the great societal challenges of the 21 century. Beginning in the 1990s, this trend mostly affected wealthy countries but is coming up in poorer nations due to their declining fertility rates. According to Eurostat, the rate of older people (65 years and above) in Europe, in relation to persons in their working age, is expected to almost double from 17 percent in 2010 to 30 percent in 2060[1]. This is unparalleled in human history and poses big challenges to the welfare state. In 2060, for every one working person there will be one retired person. While the demographic trends and its two main causes (low fertility and increasing life expectancy) are clear, not enough is known about consequences and implications of population aging and its manageability through public policy. Understanding how the aging process will affect all of us and disentangling the influences of different cultures, histories and polices is an important task for researchers in anthropology, demography, economics, epidemiology, gerontology, history, and sociology in order to turn the challenges of population aging into opportunities.

In response to the European Commission's strong interest in obtaining scientific evidence on population aging in its member states, the Survey of Health, Ageing and Retirement in Europe (SHARE) was created as a longitudinal survey infrastructure by and for researchers from multiple disciplines[2]. While its development started only in 2002, SHARE has already become one of the crucial pillars of the European Research Area. Since 2012, it is the first ever European Research Infrastructure Consortium (ERIC), with a new legal status and many of the advantages of major international organizations, as well as a long-term perspective up to 2024. The ultimate goal is to provide high-quality micro-level panel data of economic, social and health factors that accompany and influence aging processes at the individual and societal level. In addition to its multidisciplinary and longitudinal nature, SHARE was set up to be a cross-national enterprise to enable researchers investigating how different European welfare state regimes moderate and mediate consequences and implications of population

aging. The data from Europeans aged 50 and over from 18 European countries and Israel are provided free of charge to the scientific community.

Two more features make SHARE a highly valuable source for genuine cross-cultural comparisons. First, SHARE is closely modeled after and constantly harmonized with its sister studies HRS in the US and ELSA in the UK. This model has sparked and informed exciting new survey research on aging all over the world, e.g., Japan (JSTAR), China (CHARLS), Brazil (ELSI), South Korea (KLOSA), and India (LASI) which puts SHARE into a truly global perspective. Second and as opposed to these global sister surveys, SHARE in itself is a multi-national survey. The SHARE interview is ex-ante harmonized and all aspects of the data generation process, from sampling to translation, from fieldwork to data processing, have been conducted according to strict quality standards. Maintaining this ex ante harmonization in spite of national differences and decentralized funding poses great scientific and governance challenges.

The remainder of this article is structured as follows. We will first document coverage and panel frequency before we introduce the panel and life history questionnaires as well as methodological innovations.[3] We then summarize usage of the data and present several examples which shed light on the many prejudices about aging, especially about health, productivity and cognition around and after retirement.[4]

2. Population coverage

After four waves of SHARE more than 150 000 interviews have been conducted with about 86 000 respondents aged 50 and over and their potentially younger partners in 19 countries (Austria, Belgium, Switzerland, Czech Republic, Germany, Denmark, Estonia, Spain, France, Greece, Hungary, Ireland, Israel, Italy, Netherlands, Poland, Portugal, Sweden, Slovenia; see Figure 1). Since then, Croatia and Lithuania have joined.

Figure 1: SHARE countries

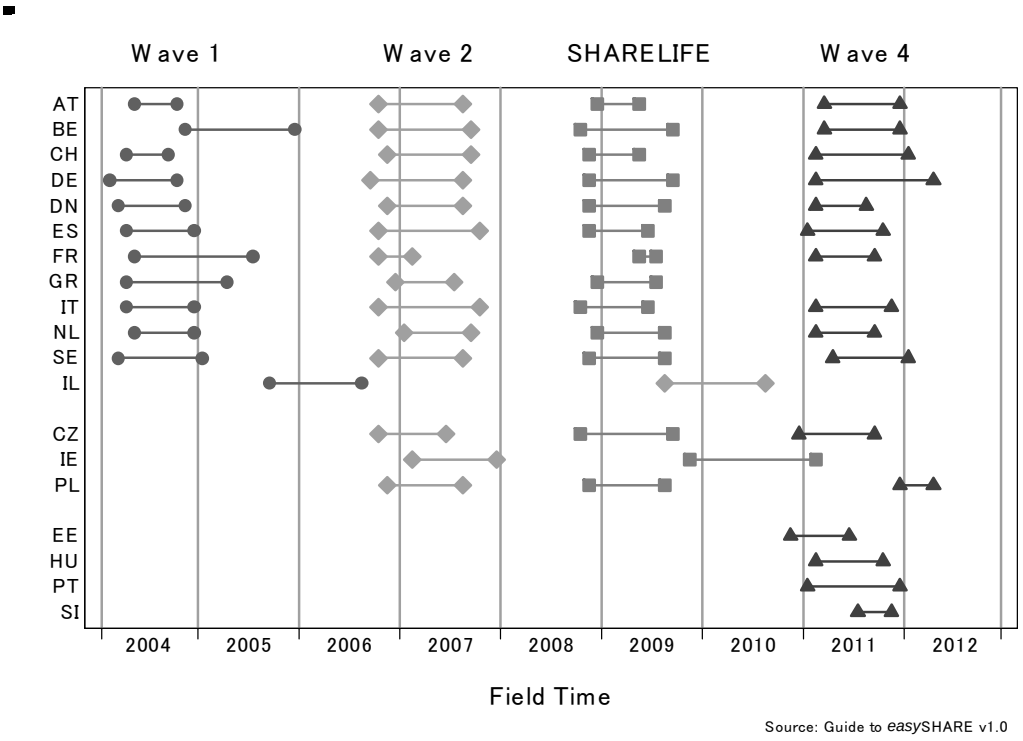
The SHARE target population consists of all persons born 1954 or earlier in wave 1 (2004/05), 1956 or earlier in wave 2 (2005/06), and 1960 or earlier in wave 4 (2010/11), who have their regular domicile in the respective SHARE country. A person is excluded if she or he is incarcerated, hospitalized, or out of the country during the entire survey period, unable to speak the countries' language(s) or has moved to an unknown address. In addition, current partners living in the household are interviewed regardless of their age. All SHARE respondents that were interviewed in any previous wave are part of the longitudinal sample. They are traced and re-interviewed if they moved within the country (for more information see the SHARE methodology volumes[5,6,7]).

SHARE is a multinational survey, which involves differences in sampling resources between countries. Consequently, sample frames are chosen in accordance with the best available frame resources in the country to achieve full probability sampling. Most SHARE countries have access to population registers. SHARE provides sampling design weights to compensate for unequal selection probabilities of the various sample units. Without such weights it is not possible to obtain unbiased estimators of population parameters of interest.

3. Frequency of panel waves

Figure 2 gives an overview of the countries participating in each wave of SHARE and additionally shows the field times. Despite the complexity of the survey instrument and partially de-centralized funding, most countries managed to stick to the schedule of having a SHARE data collection every second year. The major exceptions are the later fieldwork periods in Israel in Wave 1 and 2 and, due to funding problems, in Poland in Wave 4. Also, due to lack of sufficient funding following the economic crisis, Greece could not take part in the fourth wave, but will join again in coming waves. After merging the Irish SHARE study with TILDA, the Irish LongituDinal Study on Ageing[8], there will be no stand-alone SHARE in Ireland after Wave 3. However, TILDA has taken over substantial parts of the SHARE questionnaire into their study.

Figure 2: Country wave field time overview



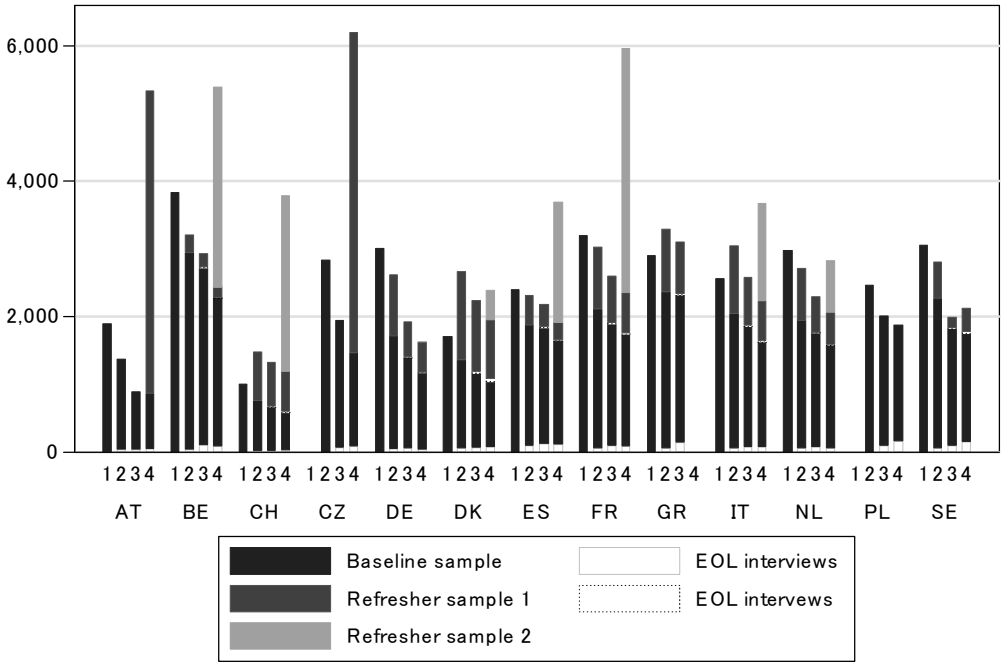
The gross samples for the initial wave in 2004 were locally drawn in each of the 12 participating countries. They have been based on sampling frames which acknowledged for country specific circumstances such as the availability of register information, need for screening, expected response rate, etc. This has resulted in more than 50 000 addresses overall. Response rates in the first wave, defined as the proportion of selected households including at least one eligible person from whom an interview was successfully obtained, were about 62

percent on average. In total, 31 115 interviews were conducted. Existing variation in performance over countries was for the most part consistent with previously known patterns from other international surveys. Cooperation at the individual level was only slightly lower than at the household level. Conditional on household participation an interview could, on average, be obtained from more than 85 percent of eligible household members.

In the second wave of SHARE, three new countries entered the study. Response rates for the new countries were on average very similar to Wave 1 (about 61 percent). Additionally, refreshment samples were drawn to increase net sample size and compensate for attrition in the longitudinal sample. Here, response rates were on average a little lower than in the first wave (54 percent). Individual retention with regard to the longitudinal part of the sample was about 73 percent. Starting in Wave 2, end-of-life interviews on deceased respondents were administered to relatives or other close persons to the deceased. In total, 34 415 Wave 2 interviews plus 533 end-of-life interviews (EOL) were released, including 18 742 longitudinal interviews. For the third wave, the SHARELIFE study, no additional households were sampled. 26 836 interviews and 1 139 EOL interviews were conducted in panel households, including 1 158 first interviews with new or previously non-cooperating spouses. The resulting individual retention rate was about 77 percent. In Wave 4, net sample size was substantially increased by including four new countries and drawing refreshment samples in most of the established countries. Altogether, 58 489 interviews, of which 21 566 were longitudinal, and 1 110 EOL interviews were released. Based on preliminary calculations, response rates in the baseline (56 percent) and refresher samples (49 percent) were on average lower than in previous waves. In this respect SHARE is no exception to the general decline in response rates in face-to-face surveys in Europe and worldwide[9]. The average retention rate was 81 percent.

Figure 3 gives an overview of the released interviews by country, wave, and sample. It shows the currently available data. Some more interviews were conducted in each country, which have not yet been successfully matched and are therefore not included. The bars in Figure 3 also distinguish between the regular SHARE interview and the end-of-life interviews (EOL) interviews.

Figure 3: Overview of released samples



In addition the baseline samples of the first data collections in Israel (N=2,598), Estonia (N=6,828), Hungary (N=3,076), Portugal (N=2,080), and Slovenia (N=2,756) are released.

4. Variables in the SHARE panel

Covering the key areas of life, namely health, socio-economics and social networks, SHARE includes a great variety of information: health variables, physical measures and biomarkers, psychological variables, economic variables, and social support variables as well as social network information. While the regular waves of SHARE, such as Waves 1, 2 and 4, deal with the respondents' current living conditions, Wave 3 (SHARELIFE) was conducted as a retrospective survey in order to collect information about the respondents' life histories.

The interviewers used computer assisted personal interviewing (CAPI) to collect most of the data in all waves. In addition self-administered questionnaires (drop-off) were handed out in Wave 1, 2 and 4 after completion of the CAPI. If respondents deceased, EOL interviews were conducted face-to-face (CAPI) or by telephone (CATI) with a proxy, collecting the information regarding the respondent's last year of life. Proxy interviews were also used when respondents were not able to do an interview, for example due to health reasons.

Even though SHARE is a panel survey with a stable core questionnaire over time, innovative research questions, physical measurements or modules have been incorporated in each wave. For example, in Wave 2, two physical measurements – peak flow and chair stand – were

added (see next section for details). In Wave 4 a completely new module – the social networks module based on a name-generator approach – has been implemented to learn more about the social connectedness of respondents. Table 1 gives a short summary of panel questionnaire topics.

Table 1: Variables collected in SHARE Waves 1, 2 and 4)

Questionnaire Modules	*Examples*
Coverscreen	Year and month of birth, sex, household composition
Demographics	Education, marital status, country of birth & citizenship, parents & siblings
Physical Health	Self-rated health, diseases, weight & height, (I)ADL limitations [(instrumental) activities of daily living]
Behavioural Risks	Smoking & alcohol, nutrition, physical activity
Cognitive Function	Self- rated reading & writing skills, orientation, word list learning immediate & delayed recall, verbal fluency & numeracy
Mental Health	Depression scales (Euro-D & CES-D), quality of life (CASP-12)
Health Care	Doctor visits, hospital stays, surgeries, forgone care, out of pocket payments
Employment and Pensions	Employment status, individual income sources (public benefits, pensions), job, work quality
Children	Number & demographics of children
Social Support	Help and care given and received
Financial Transfers	Money/gifts given and received
Housing	Owner (mortgages, loans & value), tenant (payments), type and features of building
Household Income	Income sources all household members
Consumption	Expenditures for food, goods, services, ability to make ends meet
Assets	Bank and pension accounts, bonds, stock and funds, savings
Activities	Voluntary work, clubs, religious organizations, motivations
Expectations	Expected inheritances, life expectancy, future prospects
Interviewer Observations	Willingness to answer, understanding of questions, type of building, neighborhood
New modules after Wave 1	
Since Wave 2: End-of-Life	Death reasons and circumstances
In Wave 4: Social Networks	Ego-centered network, contact, emotional closeness, geographical distance, satisfaction with network

To assure an easy and fast entry into cross-national data and high convenience while working with the data, it is necessary that certain variables are readily provided, especially those that allow a valid comparison between countries, such as for example, the International Standard Classification of Education (ISCED). Besides internationally standardized variables, SHARE datasets provide further generated variables that ease or enhance working with SHARE data

as well as different kinds of weights and multiple imputations (see the documentation at www.share-project.org/data-access-documentation/).

SHARELIFE retrospective life histories. In SHARELIFE, retrospective data with respect to childhood living circumstances, partners, children, accommodation, employment, socio-economic and health conditions as explicated in Table 2 were collected with the help of a "Life History Calendar" similar to the one applied in ELSA[10]. The combination of the SHARELIFE with SHARE and ELSA data thus gives a detailed picture of the current status of individuals in Europe with a view across their entire life courses[11].

Table 2: Retrospective information collected in SHARELIFE (Wave 3)

Questionnaire Modules	*Examples*
Start of the Interview	Year and month of birth, sex
Children History	Pregnancies, births, children characteristics, maternity leave
Partner History	Living arrangements, marriages, divorces
Accommodation History	Residences (country, region), moves, types of accommodation, ownership
Childhood Circumstances (Age 10)	Accommodation features, number of books, school performance
Work History	Employment status, job characteristics, income
Work Quality	Effort, demand, control, job circumstances
Disability Benefits	Disability leaves, work reduction, disability pension
Financial History	Investments in stocks, funds, insurance uptake, retirement savings
Health History	Hospital stays, illnesses, diseases, current self-rated health
Health Care History	Vaccinations, doctor visits, preventive check-ups, health behaviors
General Life	Periods of happiness, stress, financial hardship, hunger, persecution, oppression
Interviewer Observations	Willingness to answer, understanding of questions, type of building, neighborhood

Physical measurements and biomarkers. Until today, physical measurements and biomarkers were mostly taken in smaller, non-representative clinical studies. In the last couple of years more and more large-scale surveys added physical measurements and biomarkers to their program since standard health questions in surveys are often subject to the respondents' own interpretation (of the question), own evaluation or perception (of health status), and own knowledge (of health status). The value of subjective health measurements is undeniable, but some research questions require objective measurements. Biomarkers enable researchers to validate respondents' self-reports and therefore to study the amount and determinants of under-, over-, and misreporting in large-scale population surveys. Biomarkers can help to

understand the complex relationships between social status and health, and allow to identify pre-disease pathways, since physiological processes are often below the individual‘s threshold of perception. From the first wave on, SHARE combined self-reports on health with physical performance measurements. Dried blood spots have been collected in Germany during Wave 4. A full-scale collection of dried blood spots in all countries is planned for Wave 6. An overview over the health measures in SHARE can be found in Table 3.

Table 3: Overview of physical measurements and biomarkers in SHARE

Performance measures	Wave 1	Wave 2	Wave 3	Wave 4
Grip strength	Yes	yes	Yes	Yes
Lung strength (peak flow)	-	yes	-	Yes
Walking speed	Yes	yes	-	-
Chair stand	-	yes	-	-
Biomarkers (Germany only)				
Height (measured)	-	-	-	Yes
Waist circumference	-	-	-	Yes
Blood pressure (seated)	-	-	-	Yes
Dried blood spots				
HbA1c	-	-	-	Yes
C-reactive protein	-	-	-	Yes
Total cholesterol	-	-	-	Yes

Linking survey and administrative data. Survey data can cover a wide range of topics. However, the information provided by respondents is often incomplete or inaccurate. Administrative data on the other hand are much more complete and accurate since they are process-generated. The disadvantage of administrative data is that the information is limited to certain topics only. Linking survey data with administrative data is a way to combine the best of both worlds. SHARE thus cooperates with the German Pension Fund (DRV) and has linked the German survey data with administrative data held by the DRV in a pilot study in the third wave of SHARE. The administrative data consists of two parts: The first part is longitudinal and includes socio-demographic characteristics (such as age, sex, number and age of children, and education) and detailed information about the working history as well as all activities which generate public pension entitlements. That data is implemented as a panel data base beginning at age 14 which provides that information on a monthly base. The second part is cross sectional and only available for retirees. Included is information on the calculation of the pension benefits. The two datasets are updated every year[12]. The project of

linking SHARE survey with administrative data continues in wave 5 and will be expanded to five additional SHARE countries, namely Austria, Estonia, Italy, the Netherlands and Sweden.

5. Research using SHARE and its sister studies

The unique key design feature of SHARE – combining interdisciplinary and ex-ante harmonized cross-national comparability in a longitudinal setting -- has sparked a vast range of multidisciplinary comparative research projects, with findings published in more than 700 articles to date, see www.share-project.org for a full list of publications and findings.

One very prominent topic of interest to epidemiologists are health inequalities which are more pronounced in the US than across Europe, in terms of different health measures as well as all kinds of socio-economic distinctions[13,14,15,16,17].However, the odds of successful aging also vary considerably within and across European countries[18], depending, for example, on the level of social inequality[19].

Cognitive aging is one specific aspect studied intensely here[20] which seems to be closely linked to (early) retirement: People who leave the labor force experience higher cognitive decline than their counterparts [21,22] – a fact that has been called "mental retirement" [23] and which appears to be related to the stimulation at the work place and its anchoring function for social exchange. Furthermore, family care and support are important indicators for active and healthy aging: Even though family members seem to be close all over Europe[24,25], there are distinct differences between the countries: The more social policy expenditures, the more likely parents and children support each other on an day-to-day basis[26,27].

The "historical laboratory" character of the SHARE is exploited in many studies on the effects of welfare state policies on health, socio-economic status, and well-being after age 50, partially explaining the stunning North-South gradients in many dimensions. Examples of policies range from health insurance coverage to maternity leave and early retirement and disability insurance. Density of medical doctors appears to improve health across European regions; generous maternity leave appears to be a two-sided sword often reducing mothers' retirement income; the uptake of early retirement and disability benefits appears to be related to incentives created by the national insurance systems much more than to individual health and age.

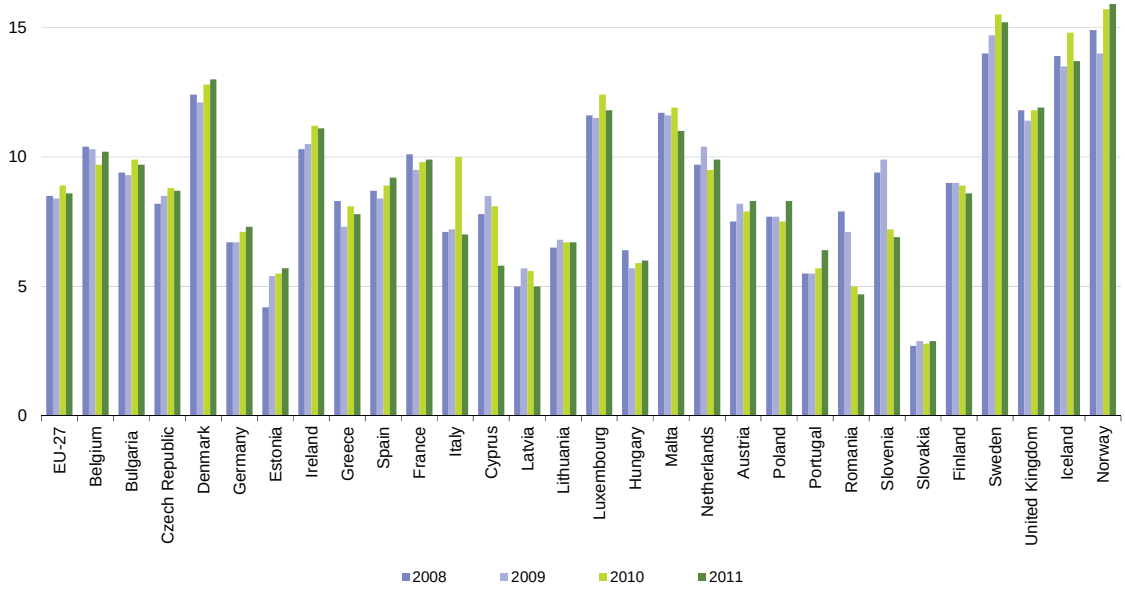
A recent strand of publications looks into the influences of early life conditions and life-course events on well-being in old age based on the SHARELIFE data. Early life circumstances such as childhood health and socio-economic status matter until old age – in terms of socio-economics, health and life satisfaction[28]. Examples are spells of unemployment which leave scars even decades later, and – particularly striking – the tremendously negative effects of World War II and its associated persecution on health, well-being and income of today's survivors[29,30,31]. New wave 4 data are now used to disentangle the influences of the economic crisis on healthy aging and intergenerational solidarity in different European countries, showing negative effects of the crisis on old age well-being as well as the pronounced links between personal social networks and all different aspects of life in old age[32].

6. Does declining health limit the capacity to work at older ages?

It is a myth that old people are too sick to work until or after current statutory retirement ages, mostly 65. While there is no doubt that normal human aging is associated with progressive reductions in the function of many organs from their peak in early adulthood, the impact of these physiological changes on the capacity of individuals to function in society is quite modest[33]. The common exaggeration of the diminished function of older persons is due in part to archaic views of the elderly which overlook the significant compression of morbidity that has occurred over the past decades[34]. This holds notwithstanding that this past trend cannot be simply projected into the future, at least in the US.[35]

Figure 4 shows the disability-free life expectancy in Europe, defined as the time until a first disability incurs which respondents in the EU-SILC data self-report as "limiting activities that people usually do".

Figure 4: Disability-free life expectancy

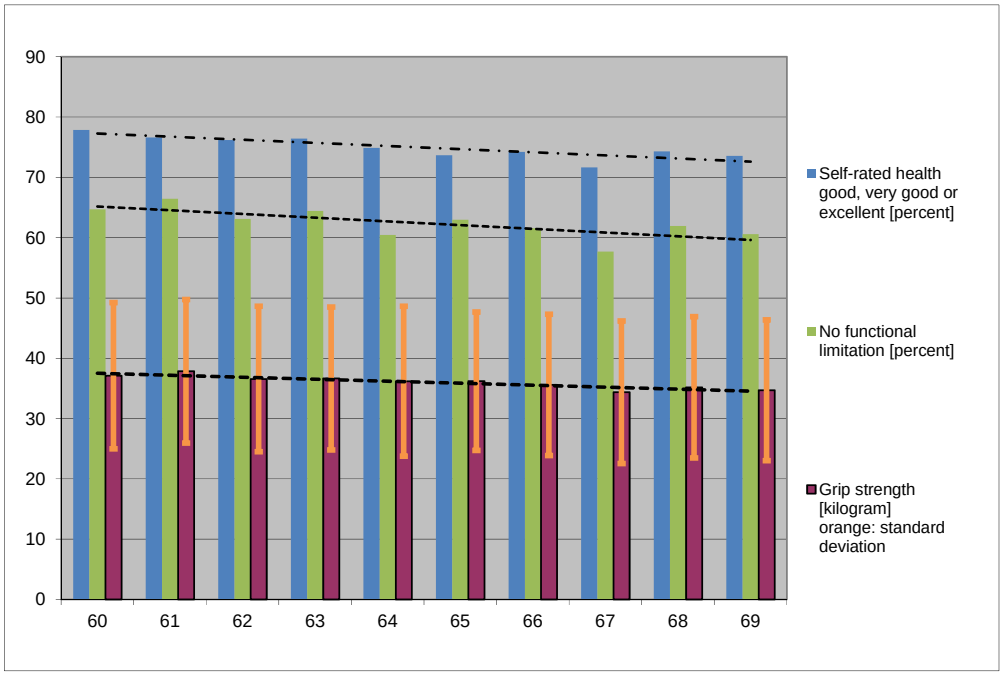


Source: Eurostat (2013)[36]

Two observations are noteworthy. First, in most countries disability-free life expectancy has increased. Second, for the EU on average and also for the three countries considered in the macro model, disability-free life expectancy is higher than the average retirement age, in Italy by 2.3 years, in France even by 3.6 years.

Figure 5 gives a more detailed picture by age and measures health in three degrees of subjectivity: self-assessed health (in 5 categories from excellent to poor); self-reported limitations in 10 different daily activities; and grip strength measured in kilogram. The figure is based on the Survey of Health, Aging and Retirement in Europe (SHARE). As opposed to the myth, older people in the SHARE countries perceive themselves as relatively healthy and perform well on the basis of both objective and subjective measurements. Although there is a decline in health between ages 60 and 69, it is much smaller than the variation within each age group (shown as error bars for the grip strength measure). At age 69, there are about 7 percentage points more individuals affected by activity limitations than at age 60; shifting the retirement age from 65 to 67 years would therefore imply that only about 1.5 percentage points more workers have at least one activity limitation.

Figure 5: Subjective and objective health measures in Europe, age 60-69



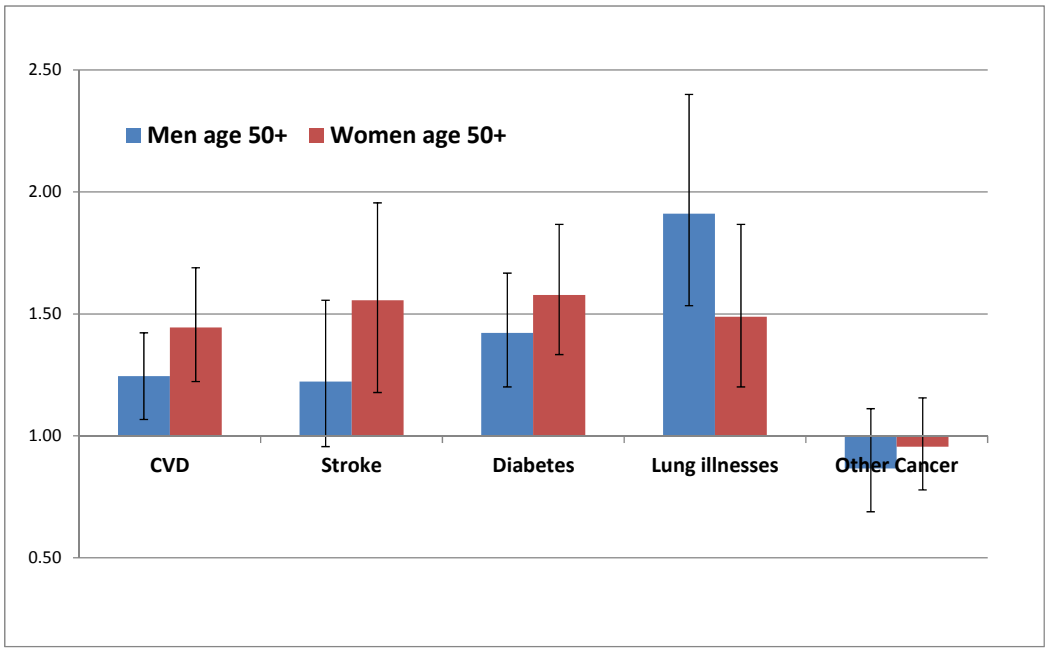
Source: Own computation based on SHARE

This evidence leads to several conclusions. First, health is not the primary cause of retirement in Europe. Second, shifting the retirement age by two years is not bound to fail due to health problems. Third, and more generally, however, fixed retirement ages are not reasonable. People with health problems need to retire earlier, whereas most people could easily work longer. A flexible retirement system with early exit routes governed by a mixture of incentives (including actuarial adjustments) and disability pathways (including medical exams) would be the most appropriate way to deal with these differences.

Some of these differences are clearly related to socio-economic status. Figure 6, again based on SHARE data, shows the log-odds of certain diseases by education, where educational status is divided into three groups (no high-school degree, in between, college degree). While the existence of a socio-economic gradient is clearly visible, the causal pathways behind this gradient are complex. It is noteworthy that illnesses associated with health behaviors (diabetes and lung cancer in Figure 6) exhibit particularly large gradients, while other cancers show none. We know that health behavior is strongly correlated with education[37,38]. This finding thus mirrors the role education plays in other social contexts, e.g., that the economic returns from education in the labor market and the health benefits associated with additional years of schooling have both expanded sharply over time. Another pathway is related to the work

environment and work stress[39,40]. Again, this means that one needs to take care of a better work environment at much earlier ages than shortly before retirement.

Figure 6: Relative frequencies of illnesses by education in Europe



Source: Avendano et al. (2005)[41]

7. Is retirement really bliss?

This is another belief which strongly impedes pension reform. There are serious doubts, however. On the one hand, an immediate benefit from early retirement is the receipt of income support without the necessity to continue working, enabling individuals to enjoy more leisure. Moreover, early retirement relieves workers who feel constrained in their place of work, whether due to stressful job conditions or to work-impeding health problems. For such individuals, early retirement should manifest itself in an improvement of well-being and, potentially, also health.

On the other hand, however, early retirement might also be harmful, because individuals who stop working may lose a purpose in life. This might, in turn, decrease subjective well-being and mental health. Research on these issues is complicated by the fact that the measures of well-being and health which are commonly available in general purpose surveys may suffer from justification bias[42]. That is, early retirees may report worse health in order to justify their

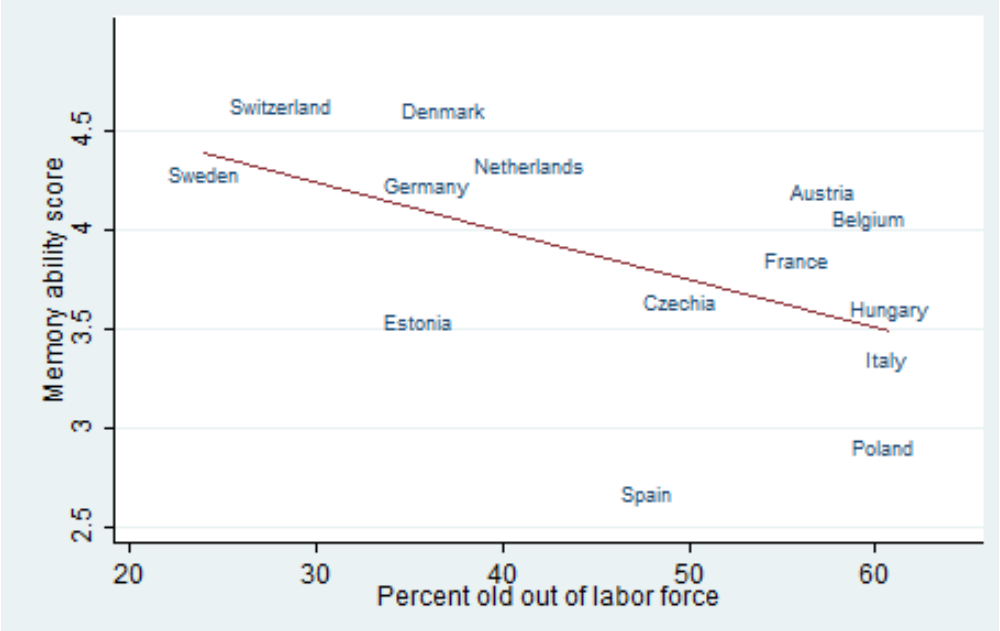
early exit from the workforce. Moreover, early retirement is not an exogenous outcome, but is likely to be related to ill health and lower cognitive abilities. For example, persons in bad health are likely to retire earlier but also to report worse life satisfaction. Finally, those that hope or believe that life satisfaction will increase after retirement are more likely to retire at any age. Cause and effect are entangled in many ways.

The separation of selection effects and reverse causality from the genuine impacts of early retirement on well-being and health requires advanced econometric techniques which tend to make results controversial. The econometric problem is to find a counterfactual value for well-being and health had a person not taken early retirement. The usual instruments for identifying such a counterfactual are policy changes in early retirement rules, such as changes in the pensionable age or changes in the actuarial adjustments. Internationally comparable data are useful in this respect, as they provide institutional variation across countries and the necessary counterfactuals. Moreover, panels which include data on health and well-being in earlier stages of life are important because such information can be used in conditioning variables which reduce selectivity bias.

Börsch-Supan and Jürges (2006)[43], using the German Socio-Economic Panel data, found that individuals were less happy in the year of early retirement than in the years before and after retirement. This holds after purging selection effects thanks to a large set of conditioning variables measured before retirement. Moreover, individuals generally attained their pre-retirement satisfaction levels relatively soon after retirement. Hence, the early retirement effect on well-being appears to be negative and short-lived rather than positive and long-lasting, similar to what occurs in the set point model of happiness.

A seminal paper by Adam, Bonsang, Perelman et al. (2007)[44] based on SHARE found that cognition—measured mainly by memory abilities such as delayed word recall—declined during retirement. Figure 7 shows an updated version of the aggregate correlation, including wave 4 data. This controversial finding has sparked an entire new strand of literature. While there are a few papers with the opposite result[45,46], most studies confirm the early[47,48,49]. They also show that the negative effect on cognition increases with the time in retirement. For a given age, early retirees suffer more from cognitive decline than later retirees, even after correcting for selection and reverse causality effects. An internationally comparable data set such as SHARE is essential for this research because it contains instruments such as the eligibility age for early and normal retirement or similar institutional characteristics that contain individual variation.

Figure 7: Cognition and early retirement



Source: Own computation based on SHARE. The R-squared of the correlation is 28%.

Research is now proceeding to look for the deeper reasons behind these findings. One causal pathway is a direct one: skills must be used, otherwise they get lost[50],[51]. Another pathway hinges on the anchoring function of employment. Work, even if unpleasant and arduous, provides social contacts. Even disliked colleagues and a bad boss appear to be better than social isolation because they provide cognitive challenges which keep the mind active and healthy.[52,53]

8. Conclusions

Due to their harmonization, the SHARE data and their international sisters encompass a worldwide "historical laboratory" to assess the effects of different policies on health, socio-economic status, and well-being after age 50.

To date, more than 700 SHARE based publications assess the chances and challenges of individual and societal aging by exploiting the links between health, economic, and social conditions over the life course observable in SHARE.

Among the key findings is a European North-South gradient in many more dimensions than previously documented. In addition to the well-known income gradient, the health and well-

being differences between North and South contradict mortality data and folklore about healthy Mediterranean life style.

SHARE has sparked an entire new area of research by revealing a strong correlation between early retirement and the loss of cognitive abilities, social contacts, and well-being.

Equally impressive are findings that the large international differences in the uptake of early retirement and disability benefits are much stronger correlated with economic incentives than with health and age.

Acknowledgments

During the first three waves, the SHARE data collection has been primarily funded by the European Commission through the 5th framework programme (QLK6-CT-2001- 00360 in the thematic programme Quality of Life), through the 6th framework programme (SHARE-I3, RII-CT- 2006-062193, COMPARE, CIT5-CT-2005-028857, SHARELIFE, CIT4-CT-2006-028812) and through the 7th framework programme (SHARE-PREP, 211909, SHARE-LEAP, 227822). Starting with Wave 4, SHARE has changed to a decentralized funding model and became an international organization ("SHARE-ERIC") funded by its member countries.

Substantial additional funding comes from the US National Institute on Aging (U01 AG09740-13S2, P01 AG005842, P01 AG08291, P30 AG12815, Y1-AG-4553-01, OGHA 04-064, IAG BSR06-11, R21 AG025169). The German Federal Ministry of Education and Research (BMBF) is funding the Munich-based international coordination of SHARE (AZA 01UW0908) while the EU Commission finances all coordination elsewhere (SHARE-M4, 261982). We gratefully acknowledge these as well as all national funding sources (see www.share-project.org for a full list of funding institutions).

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