# Cohorts' Working Life Expectancies and Working Years Lost in 21 European Countries

## Abstract

Across Europe, extending working lives has been a central policy goal for more than two decades. Working life expectancy (WLE) and working years lost (WYL) are well-suited demographic indicators for assessing countries' progress towards achieving this goal. This article first reviews all available estimates of WLE and WYL for European countries. It then uses the largest available micro-level data – the European Labour Force Surveys (n > 10 million) – to estimate and project WLEs and WYL for cohorts of men and women aged 55–64 and 65–74 in 21 European countries. The results show that WLEs have generally increased, most rapidly in Central and Eastern Europe and in Western Europe. Northern European countries reach the highest levels of WLEs. However, country and gender differences remain large, especially when WLEs are adjusted for working hours. Correlational analyses suggest that working years have been gained primarily from successive cohorts losing fewer working years to retirement. The remaining WYL to retirement, to inactivity among women, and to unemployment in Southern Europe will be the main barriers to extending working lives over the coming years.



**Keywords:** Working life expectancy; Working years lost; Extending working lives; Europe

## Introduction

The extension of working lives – through higher labour market participation of older workers and later retirement – is widely viewed as an effective and necessary means of containing the adverse consequences of population ageing for social security systems. Since the 1990s and in most European countries, this has motivated a variety of reforms including gradual adjustments of statutory retirement ages, pension benefits and eligibility criteria as well as structural changes in pension system architectures (Hinrichs 2021). Despite growing concerns about the ability of some groups to remain in employment at older ages, the extension of working lives remains a core policy objective (OECD 2023). The aim of this article is to provide comparative evidence on European countries' progress towards achieving this goal.

A key challenge for comparative research on extending working lives, however, lies in the social variability of late working life trajectories. Theoretically and empirically, research has shown that the entry into retirement is best understood as a process rather than singular event and may involve multiple transitions into and out of employment before individuals eventually leave the labour market (Byles et al. 2013; Han & Moen 1999). In fact, transitions from full-time work to full-time retirement have become just one among several retirement pathways: Older individuals may work, become unemployed and re-enter part-time employment while drawing on a partial pension before leaving employment completely. Some countries have even introduced policies to explicitly promote this "flexibility" through "partial", "phased" or "gradual" retirement or "bridge employment" (Henkens & van Solinge 2021; Scherger 2021). This complicates the measurement of extending working lives, that is too often based on static conceptions of labour market exits.

In this context, interest has recently increased in using demographic measures to examine levels and trends in extending working lives. Working life expectancy (WLE), a measure originally proposed by Wolfbein (1949), and the complementary measure of working years lost (WYL) have been highlighted as particularly useful (Dudel et al. 2023). WLE and WYL are defined as the remaining lifetime an average individual of a certain age can be expected to spend in employment or in different activities outside the labour market, respectively. Both measures have advantages over more commonly used indicators such as crude employment rates, average effective retirement ages or sequences of income or work states. First, in line with a life course perspective, both WLE and WYL create aggregates of the working life trajectories in a population and thereby capture the accumulation of the time spent in and out of employment throughout later life, while requiring only cross-sectional data. Second, WLE and WYL can be adjusted for various prevalence rates so that, for example, differences in longevity or average working hours between population groups can be taken into account. Third, unlike other, more common indicators, WLE and WYL account for the age structure of the underlying population. These advantages make WLE and WYL well suited for comparative analyses and informative about the progress towards and variability in extending working lives.

Against this background, the contribution of this article is twofold. First, it reviews and identifies gaps in all available earlier estimates of WLE and WYL in European countries. Second, it uses the largest available data to estimate, for the first time, WLEs and WYL to retirement, unemployment, and inactivity from age 55 to 64 and 65 to 74 in 21 European countries. Following recent work by Dudel et al. (2023), the estimates are adjusted for mortality and working hours to allow for valid comparisons between countries, cohorts, and men and women with different longevity levels and working time arrangements. It is the first comparative study to take a cohort-level perspective on levels and trends in WLEs and WYL across Europe.

## Background

### Towards Extending Working Lives in Europe

Recent decades have seen a variety of policy reforms aimed at increasing older worker's labour market participation and postponing retirement (Hinrichs 2021). How these reforms affect later life employment and retirement outcomes is typically examined in the framework of push-, pull-, and retention-factors (De Preter et al. 2013; Kohli 1991). Accordingly, labour market exits are not just the result of financial incentives, as often assumed in economic models, but of how various labour market and institutional factors jointly dis- or encourage employment in later life. The rise of early retirement during the 1970s, for example, is explained through the expansion of push- and pull-factors. The former refer to changes in labour demand, for example as a result of macro-economic downturns, that may limit employment opportunities for elderly workers. On the firm-level, seniority-wages or 'labour shedding' strategies may also 'push' older workers out of work. Pull-factors, on the other hand, refer to financial incentives for entering retirement created by welfare state programmes including through generous pension benefits or early exit schemes that 'pull' workers into retirement (Ebbinghaus 2006). The reduction of early exits and the rise in employment participation in later life since the mid-1990s are explained by the weakening of push- and pull-factors and a simultaneous strengthening of retention-factors. The latter refer to policies that discourage retirement entries such as stricter eligibility criteria, higher statutory retirement ages, and lower replacement rates as well as to investments in older workers' employability through life-long learning or measures against ageism at the workplace (Ebbinghaus & Hofäcker 2013; Hofäcker et al. 2016). By implication, the framework predicts that countries with weak pull- and push- and strong retention-factors will show high levels of WLE and few WYL.

In the European context, considerable variation exists in the relative strength of push-, pull-, and retention-factors. Current statutory normal retirement ages, for example, range from 62 in France to 67 in Italy, Greece, Denmark and Iceland (European Commission 2021). In most countries, however, normal retirement ages have been gradually lifted or tied to the population's life expectancy as in Finland or the Netherlands (OECD 2021). In line with EU-wide objectives, there have also been attempts to equalise men's and women's retirement ages in most European countries (Carone et al. 2016; European Commission 2021). Moreover, reforms aimed at retrenching public pension expenditure have adjusted benefit calculations, for example by linking benefits to average lifetime rather than highest earnings or by introducing demographic indexing into pension calculations. Similarly, the conditions for receiving a full pension have been changed, for example by raising the required contribution years (Hinrichs 2021). In order to promote longer employment participation, some countries also encourage the "flexibilisation" of retirement, including through partial, phased or gradual retirement schemes or bridge employment (Dingemans et al. 2017; Henkens & van Solinge 2021; Scherger 2021). Sweden, for example, has no fixed retirement entry age so that individuals may retire and receive a partial pension from age 62 (as of 2020) but earn more pension benefits for each additional year spent in employment. In other countries, such as Germany, older individuals can start to draw on a partial pension but further raise their pension claims by working part-time beyond the statutory retirement age.

Many European countries have also implemented major structural reforms to further reduce pull-effects of their pension systems. Following a rise in early retirement during the 1970s and 1980s, early retirement schemes have been largely abolished or severely restricted (Ebbinghaus 2006). Several countries have expanded the role of private funded pensions and of defined contribution principles and notional accounts in public pay-as-you-go systems, most drastically in Central and Eastern Europe, but also in Sweden and Italy (Ebbinghaus 2015). These institutional reforms along with parametric adjustments in benefit levels, eligibility criteria and statutory age thresholds have markedly weakened the pull-effects of pension systems and contributed to higher old-age employment across Europe (Boissonneault et al. 2020; Kuitto & Helmdag 2021).

Next to features of national pension systems, changing macroeconomic and labour market conditions can exert major push and retention effects on older employees. High levels of unemployment, rigid labour markets and high labour costs reduce the (re-)employment chances of older workers, as in Southern and Central and Eastern Europe during the financial and economic crises of the 2010s (Blossfeld et al. 2006; Dudel et al. 2018). In contrast, the retention of older workers can be achieved through active labour market policies, as in many of the Northern European countries, or through 'market-induced maintenance' via low levels of public assistance for non-employed groups, as in the UK and Ireland (Blossfeld et al. 2006; Kuitto & Helmdag 2021). Changing labour market structures, more generally, have contributed to higher employment participation of older workers, especially women, including through improved working conditions, changing occupational structures and decreasing demand for physical jobs (e.g., Moen et al. 2016a). Moreover, research has pointed to the growing role of employers in retaining older employees, for instance, by establishing anti-ageism measures and offering life-long learning opportunities or flexible working time arrangements (Qvist 2023).

**Changing Pathways to Retirement**

The various changes in push-, pull- and retention-factors have consequences for the retirement pathways that are prevalent among different population groups (Blossfeld et al. 2006; Hofäcker et al. 2016; Radl 2013). Retiring at the normal retirement age and receiving a regular old-age pension remains a common but not the only pathway to retirement, and longer periods spend in and transitions between disability, inactivity or unemployment form alternative routes for exiting the labour market (Blossfeld et al. 2006; Fasang 2010; Han & Moen 1999). Empirically, it is debated whether and to what extent the de-standardisation of retirement pathways has generally progressed and results are often only available for short time periods and single countries (e.g., Calvo et al. 2018; Riekhoff 2018, 2019; Sanderson and Burnay 2017; Tang and Burr 2015). However, most studies show a growing variation in the timing of individuals' final labour market exit that is increasingly stretched over longer age ranges from premature exits via disability or unemployment to partial retirement and continued work beyond retirement age (Sanderson & Burnay 2017; Turek et al. 2022).

Changes in the prevalence of different retirement pathways are often the (unintended) consequence of reforms aimed at restricting retirement options. Early on, Casey (1989) has highlighted the issue of "instrument substitution", whereby individuals, who may otherwise have retired, switch to other welfare programmes when regular retirement routes are closed. Empirical studies have shown that adjustments of retirement ages often lead to the substitution of retirement with unemployment or disability pension schemes (e.g., Rabate and Rochut (2020) for France; Inderbitzin et al. (2016) for Austria; Geyer and Welteke (2017) for Germany). In a comparative study, Riekhoff et al. (2020) find that the take-up of disability pensions increases when early retirement options are restricted, particularly in countries where disability schemes were well-established as in Northern and Western Europe. In Southern and some of the Central and Eastern European countries, where older workers were exposed to the economic downturns of the 2010s, reductions in early retirement were accompanied by rising unemployment in older age groups. For comparative analyses, it is therefore important to consider changes in employment participation along with changes in the different pathways through which individuals may enter retirement.

Moreover, the different retirement pathways are not equally accessible to all population groups (Buchholz et al. 2011; Radl 2013). Gender, in particular, has been identified as a major dimension of inequalities in later life employment patterns (Moen et al. 2016a; Turek et al.

2022). Although older women's labour market participation has increased, women retire earlier than men and show lower levels of labour market attachment in later life in most (but not all) European countries (Commission 2020). These differences can be attributed to the institutional gendering of retirement pathways (Madero-Cabib et al. 2023; Ní Léime et al. 2020). Statutory retirement ages, for example, are usually gender-biased, despite efforts to equalise retirement ages across the EU. Tax systems can similarly suppress female employment participation throughout the life course, as in the case of spouses' joint taxation in Germany (Fasang et al. 2013). Further, early retirement schemes are more accessible to men as they often require long contribution histories and sufficient earnings (Ebbinghaus 2006). Gender inequalities also emerge from disadvantages that accumulate over the life course. Due to 'motherhood penalties' and traditional gender roles, women often remain inactive or re-enter employment through part-time work after more common and longer career breaks (Madero-Cabib 2015; Moen et al. 2016b; Tang & Burr 2015). Part-time work at the end of one's career, which is most common among women in Northern and Western Europe, is also linked to earlier retirement transitions (Hess et al. 2018). Occupational segregation earlier in life may also add to these gender gaps by making women's labour market position more vulnerable and limiting their access to different retirement pathways (Radl 2013).

In this context, where changing push-, pull- and retention-factors have altered which and to whom different retirement pathways are available, WLE and WYL are well-suited indicators because they capture how population groups accumulate time in different forms of (non-)employment throughout their late working lives (Dudel et al. 2023).

## Prior Estimates of WLEs and WYL

Prior studies have estimated WLEs and WYL for several countries and population groups. Table 1 lists the available estimates for European countries which were retrieved through a systematic literature search (see Appendix A for details). Taken together, the 38 studies concur in three general findings.

[Table 1 here.]

A first general finding of the comparative evidence is that WLEs differ between countries, which is not surprising and in line with the discussion in the previous section. Out of all 38 studies, eight examine WLEs in more than one country. In the two studies with the largest samples and longest time period, Loichinger and Weber (2016) and Weber and Loichinger (2022) report upward trends in period-level WLEs at ages 50 and 60 from the mid-1990s onwards. Despite rising WLEs within most countries, both studies report significant differences in WLEs between countries that remain large and stable over time. Countries in Central and Eastern and, to a lesser extent, Southern Europe stand out as having the lowest and, in part, stagnating or even declining WLEs, whereas Western and Northern European countries show the highest levels of WLEs. These results confirm earlier findings by Hytti (2009) and are in line with more recent estimates by Ophir (2022) and Boissonneault and Rios (2021) who find similar patterns when WLEs are adjusted for the participation in (un-)paid work and for health conditions, respectively.

A second general finding is that of persistent social disparities in both WLE and WYL. All studies disaggregate estimates between population groups and find significant disparities regardless of the data and estimation techniques used. For example, all except for three studies consider differences in WLE of WYL between men and women, and find that men's WLEs exceed women's in all countries and years. 13 studies estimate WLEs for different education groups, and similarly find that better educated groups show persistently higher WLEs than less educated population groups in all countries and years (e.g., J. Tetzlaff et al. 2022 for Germany; Weber and Loichinger 2022 for 26 EU countries; Robroek et al. 2020 for the Netherlands). Further factors that are considered are occupational characteristics as well as health conditions. Generally, individuals in professional, non-manual occupations and better health show higher WLEs compared to those in routine or manual occupations or in worse health conditions (e.g., Dudel et al. 2023 for Germany; Schram et al. 2021 for Finland; Lorenti et al. 2019 for Italy). Only six studies estimate the WYL to different non-employed states. Most notably, the studies by Dudel et al. (2018) and Lorenti et al. (2019) estimate period-level WYL to retirement, inactivity, and unemployment for Spain and Italy during and after the Great Recession, and find that the WYL to unemployment and inactivity increased sharply during that period, especially among men in manual occupations.

A third general finding in the literature is that adjustments for health and working conditions reveal further inequalities in WLEs. Sperlich et al. (2023), for example, use German survey data to show that while WLEs have generally increased over time, the proportion of late working life spent in good health has remained stable. Similarly, the studies by Parker et al. (2020) and de Wind et al. (2018) find that working in bad health throughout later life has become more widespread in England and the Netherlands, respectively. At the same time, an earlier study by Lievre et al. (2007) concludes that healthy WLEs across 12 European countries were below the total number of years individuals had been expected to be in good health, indicating potential to further prolong working lives. More recent research has turned to considering working conditions, including precariousness, (un-)paid work and working hours, and has unveiled the central role of gender in shaping these outcomes. For Spain, for example, Lozano and Rentería (2019) can show that women's gains in WLEs can be largely attributed to a rise in precarious employment. Moreover, in a study of 17 European countries, Ophir (2022) finds that when unpaid care work is considered in the estimation of WLEs, gender differences at age 50 are drastically reduced. Using survey data for Germany, Sperlich et al. (2023) and Dudel et al. (2023) are the only studies that adjust WLEs for working hours. Both find larger gender disparities in WLEs when working hours are taken into account. Also, while men's gains in WLE are found to be the result of rising labour market participation, women's gains are attributed to both rising employment participation and longer working hours.

Although the available evidence largely converges on the main findings discussed above, several drawbacks have to be noted. First, studies differ both in the age brackets as well as the estimation techniques that are used for the analysis, making it difficult to compare estimates across studies. Second, all except for two studies adopt a period-perspective on changes in WLE and WYL. Such period-level estimates are sensitive to short-term fluctuations and require assumptions about the stationarity of age-specific prevalence rates (Leinonen et al. 2018; Luy et al. 2020). Third, only few studies examine WLEs or WYL in more than one country, likely due to data limitations. Related to this, most comparative studies rely on aggregate employment data that are only available for large age intervals (e.g., age 59 to 64), which limits the analysis to the period-level and can require the interpolation of employment rates at single ages (e.g., Loichinger and Weber 2016). A final limitation is that few studies, and no comparative study, adjust the estimates for differences in mortality or working hours, which further limits the comparability across countries and population groups that differ in longevity levels and the prevalence of different working time models. The following analysis aims to fill these gaps.

## Data and Methods

### Data and Sample

The analysis draws on two data sources. First, the European Labour Force Surveys (LFS) made available as Scientific Use File by Eurostat (2022). The LFS contain harmonised micro-level data from labour market surveys conducted annually in all 27 EU member states as well as in Iceland, Norway, Switzerland, and the United Kingdom. The data were collected during each country's membership in or affiliation with the EU, resulting in varying periods of coverage of up to 39 years between 1983 and 2021. The second data source are gender-, cohort-, and age-specific mortality rates from the Human Mortality Database (HMD) (2023). The two data sources were joined to create a dataset that includes men and women aged 55 to 64 during each country's survey period in which the required variables were included in the questionnaire. The age range 55 to 64 was chosen to include as many cohorts as possible with the available data. Also, most statutory retirement ages in Europe are at age 65 or below and the employment rates beyond age 65 are low in most of the included countries and cohorts.

To construct the working sample, the data were restricted to country-cohort observations in which all country-cohort-gender-age combinations contain at least 100 observations and less than 10% of observations miss information in one or more of the relevant variables. Moreover, five countries (CZ, IE, IS, NL, SK) were excluded because age is only available in five-year intervals, and Cyprus and Croatia were excluded because only one cohort met the inclusion criteria. This results in a final sample size of 10,212,091 person-year observations in 21 countries and, depending on the country, a coverage of cohorts born between 1928 and 1966.

Table A2 in the Appendix provides sample statistics, and Table A3 presents the detailed number of observations in each country-cohort.

## Variables

The analyses are based on five variables. AGE is derived from persons' birth year and the year of the interview and refers to the age completed within a given year. GENDER distinguishes between individuals self-identifying as male or female. ACTIVITY STATE indicates whether a person is currently employed, unemployed, retired, or inactive. Being employed refers to any form of paid employment in the given week or absence from work for certain reasons (annual leave, sickness, maternity leave, etc.) and a certain period of time. Individuals are unemployed if they are not employed but are actively seeking employment. Being retired or otherwise inactive (e.g., due to domestic tasks, sickness, care responsibilities, or other personal reasons) are self-defined states used for individuals who are neither employed nor unemployed. Importantly, if an individual self-defines as being retired or inactive but works for pay in a given week, they are nevertheless treated as being employed. This is to identify persons who may draw on their old-age pension but continue to work for pay. WORKING HOURS refers to the hours a person usually works per week in their main job. The variable is normalised to take values raging from 0 for not-employed persons to 1 for persons working full-time of 40 hours or more per week (Dudel et al. 2023; Leinonen et al. 2022). Lastly, the mortality rates from the HMD are converted into the SURVIVAL RATE for each cohort, gender and age from 55.

## Estimating WLE and WYL

WLEs and WYL are estimated using a modified version of Sullivan's (1971) method (Dudel et al. 2023). As discussed in the introduction, a key advantage of both measures is that they can be adjusted for various prevalence rates in order to allow for valid comparisons between countries, cohorts, and men and women. For the analysis, all estimates of WLE and WYL are adjusted for survival rates to account for differences in longevity. Also, aWLEs are presented that are additionally adjusted for cohorts' average working hours to account for the large differences in working time arragements across Europe and over time.

Firstly, to estimate WLEs adjusted for mortality, employment rates at each age are calculated for men and women in each cohort and country. To adjust for mortality, the employment rate at each age are weighted by the respective survival rate. For example, if 80% of all individuals at a given age are working, but only 90% of a cohort survive until that age, the contribution of that age to the WLE estimate is 0.8 x 0.9 = 0.72 years. This adjustment ensures that the lower survival in some cohorts and countries is reflected by lower WLEs (e.g., the probability of survival from age 55 for Latvian men born in 1937 is 74.4% at age 64 compared to more than 99% survival for women at age 56 in most later cohorts). The adjusted rates are then simply summed to estimate the mortality-adjusted WLE over the 10-year interval from age 55 to 64.

Secondly, to estimate WLEs adjusted for mortality and working hours (aWLE), the employment rate at each age is additionally weighted by the average (normalised) weekly hours worked at that age (see Dudel et al. 2023; Sperlich et al. 2023). Unlike WLE, aWLE are expressed in full-time equivalent (FTE) years. This adjustment is crucial to account for large gender differences in part-time employment (e.g., more than 60% of Dutch women working part-time in 2020 compared to less than 2% of Bulgarian men). For example, if 80% of all individuals are working at a given age, but the average working hours are only 60% of the full-time equivalent (FTE) of 40 hours, the contribution of that age to the aWLE estimate is 0.8 x 0.6 = 0.48 (full-time-equivalent) years. Again, the adjusted rates are then simply summed to estimate the mortality- and working-hour-adjusted WLE over the 10-year interval from age 55 to 64.

Thirdly, to estimate WYL to retirement, unemployment and inactivity, the prevalence of each state at each age is calculated and weighted by the respective survival rate. As for the other measures, these adjusted rates are then summed to estimate the mortality-adjusted WYL to each of the three labour market states from age 55 to 64.

For birth cohorts that were only partially observed when the last survey rounds were conducted, WLEs, aWLEs and WYL were completed based on the projection method used by Leinonen et al. (2018) and Dudel and Myrskylä (2020), which simply carries the last observed rates forward for missing age groups. For example, since the cohort born in 1958 is only observed until they reach age 63, the prevalence and survival rates (and average working hours) at the missing age 64 are drawn from the previous cohort born in 1957, and so forth until only age 55 is observed for cohort 1966. These projections have to be interpreted cautiously, especially for the youngest cohorts, because they assume that the last observed rates remain constant.

For all estimates, 95% confidence intervals are calculated based on the sampling variance of the prevalence rates and working hours (Jagger et al. 2006; Villavicencio et al. 2021). Each observation is weighted using the person-level weights provided in the LFS data. Cohorts are combined in two-year intervals to reduce fluctuations.

In a final step, to examine to what extent WLEs are related to the WYL to different labour market exit pathways, the associations between intra-cohort changes in (a)WLEs and each of the three measures of WYL are estimated based on the following regression specification:

$$\Delta WYL_{i,t} = \beta_0 + \beta_1 \Delta WLE_{i,t} + \beta_2 WLE_{i,t-1} + \beta_3 WYL_{i,t-1} + \alpha_i + \gamma_t + \epsilon_{i,t} \quad (1)$$

The main variables of interest – $\Delta$WLE and $\Delta$WYL – are first-differenced to examine the association of intra-cohort changes rather than of absolute levels and to rule out spurious correlations due to the variables' non-stationarity (Box-Steffensmeier et al. 2014). $\beta_1$ then expresses the association of a one-year change in WLE and the respective change in aWLE or WYL between two successive birth cohorts. Substantively, the coefficient indicates to what extent gains (or losses) in WLE are linked to simultaneous (gains or) losses in different labour market exit pathways. Each model includes the lagged absolute levels of the main dependent and independent variables as well as country ($\alpha_i$) and cohort ($\gamma_t$) fixed effects. The projected estimates for partially-observed cohorts are excluded from the regression models.

All steps of the analysis were conducted in R and can be replicated with the scripts available here [link to GitHub repository].

## Results

### Working Life Expectancies

Figures 1 shows the estimated WLEs adjusted for mortality. Figure 2 shows the estimated aWLE, which are adjusted for both mortality and working hours. Dashed lines indicate that the estimates are based on projections for partially observed cohorts. For better legibility, countries are arranged in four regional groupings.

[Figure 1 here.]

Most evidently, both WLEs and aWLEs differ between countries and by gender and vary across birth cohorts. The highest absolute level of WLEs of around 8 years was reached by men from the youngest birth cohorts in Sweden and Denmark as well as in Switzerland. Countries in Northern Europe also show the highest aWLE of around 7.6 FTE years among men, which lies well above all other countries and cohorts. Among women, the highest levels of WLE can be seen in Sweden and Estonia with more than 7 years and aWLEs of around 6.5 years. The lowest levels of male WLE and aWLE are reached in Slovenia and Hungary in the 1941/42 cohort (2.8 years) and for women, with less than 1 year, among the oldest cohorts in Belgium. However, as countries differ with regard to the number of cohorts that are sufficiently covered by the available data, older cohorts in other countries may have shown even lower (a)WLEs.

[Figure 2 here.]

While WLE and aWLE vary markedly over time, most countries show a clear upward trend for both measures across successive cohorts, especially in Hungary, Germany, Poland, and Austria. Women in Germany, for instance, show a gain in WLE of around 4 years from the first cohort born in 1935/1936 to the last fully observed cohorts. However, adjusting the estimated WLE for working hours lowers this gain to only around 3 FTE years. Also, for men, the majority of countries reach the highest levels of WLEs and aWLEs among the youngest cohorts, with the exception of Greece and Portugal, two countries that were severely hit by the economic hardships of the 2010s (Dudel et al. 2018; Lorenti et al. 2019).

Adjusting WLEs for working hours generally reduces the estimates, particularly for women. For example, in the youngest birth cohorts in Switzerland, women's aWLEs are nearly two years lower than their WLEs. This is not surprising because many Swiss women work less than 40 hours per week. While WLEs lie at lower levels in most Southern, Central and Eastern European countries, the gaps between women's WLE and their aWLE are much smaller. Among men in most countries and cohorts, the differences between WLE and aWLE are generally at or lower than 1 year.

However, even though men and women continue to differ in the absolute level of (a)WLEs, gender gaps appear to have generally narrowed across birth cohorts. The largest gender differences can be seen among the oldest cohorts, for example in Greece with 3.5 years between the unadjusted WLEs of men and women born in 1927/1928. Similarly, the oldest cohorts in Switzerland, Italy and the United Kingdom show large gender gaps in aWLE of around 3.6 FTE years. Only in some of the Northern European countries men and women do not differ in (a)WLEs, and only Estonian and Latvian women from the youngest cohorts reach slightly higher WLEs than men.

Lastly, the projected estimates provide a varied picture for the (a)WLEs of the youngest, partially observed cohorts. Assuming that the last observed prevalence rates remain constant, countries in Central and Eastern Europe and, to a lesser extent, Southern Europe will likely continue the previous upward trends in (a)WLEs, whereas Northern and Western European countries stagnate at the comparably high levels reached by the last fully observed cohorts.

**Working Years Lost**

Figures 3 to 5 present the trends in WYL to retirement, unemployment, and inactivity. All estimates are adjusted for differences in countries' and cohorts' mortality.

Figure 3 shows large reductions in previously high levels of WYL to retirement for cohorts born throughout the 1940s and 1950s. These trends are most pronounced in Eastern Europe followed by several countries in Western and Southern Europe such as Austria and Portugal. At the same time, the WYL to retirement remain at a persistently low level in other countries, notably the United Kingdom and Switzerland as well as all Northern European countries. Interestingly, other than for the (a)WLEs presented above, changes in WYL to retirement across successive cohorts appear to follow similar trends for men and women within countries, even though absolute gender gaps remain large in the majority of cohorts and countries.

[Figure 3 here.]

Next, Figure 4 presents the WYL to unemployment. Overall, the number of working years lost to unemployment is low, remaining constant between 0 and 1 years and, due to the large confidence intervals, indistinguishable from 0 for most countries and cohorts. Exceptions to this pattern are the cohorts of men and women in Southern Europe born from 1950 onwards, which were exposed to the Great Recession during their late working lives and reach considerable levels of WYL to unemployment of around 1 to 2 years.

Lastly, Figure 5 displays the WYL to inactivity, which refers to different non-employment states such as inactivity due to domestic and care work, sickness or personal and family reasons. Most evidently, there have been marked reductions in the WYL to inactivity across cohorts, particularly for women in Western and Southern Europe as well as for men from the oldest cohorts in Belgium and Southern Europe. For example, Belgian women born in 1927/1928 spent more than 7.7 years in inactivity, while those born in 1957/1958 spent less than 1.5 years being inactive: a reduction of more than 6 years. Northern European countries, on the other hand, show low and gradually declining levels of WYL to inactivity ranging from 3.3 years (Norwegian men born in 1939/1940) to 0.5 years (Swedish women born in 1955/1956). In most of the Central and Eastern European countries, men and women lose between 0 and 2.5 working years to inactivity. Compared to the other two measures of WYL, gender gaps are more pronounced in the WYL to inactivity and reach up to 6 years for cohorts born in Spain throughout the 1930s.

[Figure 4 here.]

[Figure 5 here.]

**Associations Between Changes in (a)WLEs and WYL**

Table 2 shows the results from regression models of the associations between changes in WLEs, working-hours-adjusted aWLEs and the three measures of WYL. Negative coefficients indicate that a rise in WLE is associated with fewer WYL, likely as a result of successful reductions in the respective labour market exit pathway.

For men, the large and highly significant first coefficient indicates that a one-year increase in WLE is almost fully reflected in a one-FTE-year rise in aWLE. This is not surprising as most men work full-time and working-hours-adjusted aWLEs do therefore not differ substantially from the unadjusted WLE (as evident in Figures 1 and 2). The second coefficient is also large and highly significant, but indicates a negative relationship between changes in WLEs and the WYL to retirement. This implies that, on average within countries and cohorts, a reduction in WYL to retirement is linked to an equivalent gain in WLE. The next coefficient is smaller and indicates that changes in WLEs are negatively associated with relatively smaller changes in the WYL to unemployment. In other words, reductions in the WYL to unemployment are only partially linked to simultaneous gains in WLE. Finally, the fourth coefficient shows that cross-cohort changes in WLE are not significantly related to changes in the WYL to inactivity, which is not surprising as the WYL to inactivity are at a low and constant level for men in most countries and cohorts.

[Table 2 here.]

A similar pattern can be observed for women, although the coefficient for WYL to unemployment turns insignificant. The first coefficient is positive and highly significant, but slightly smaller than for men, which indicates that gains in WLE do not translate into equal gains in working-hours-adjusted aWLE because many women work less than full-time. Moreover, changes in WLE for women do not seem to be significantly associated with changes in WYL, with the exception of the WYL to retirement. Similar to men, the large and significant coefficient indicates that increases in WLE are associated with equal reductions in WYL to retirement. Surprisingly, the last coefficient is also small and insignificant even though women in some countries have seen drastic reductions in inactivity along with rising WLEs. This suggests that, at least on average within all cohorts and countries, the activation of women does not directly translate into higher employment participation throughout later life.

Taken together, these associations suggest that gains in WLE are mainly a function of fewer WYL to retirement, both among men and women. Large and highly significant coefficients indicate that reductions in the WYL to retirement, which constitutes the most prevalent exit pathway in most countries and cohorts, translate into nearly equal gains in (a)WLE. At the same time, reductions in WYL to unemployment and to inactivity appear to be not or only weakly linked to simultaneous gains in WLE.

### Comparison to Prior Estimates

Comparing the results in this article to estimates from prior studies is difficult due to different the age ranges and operationalisations of labour market activities that are used in the literature.

Most studies also take a period perspective and do not apply adjustments for mortality or average working hours, which makes it difficult to validly compare the estimates. Dudel et al. (2023) is the only study that provides cohort-level and working-hours-adjusted WLEs from age 55 to 64 in Germany. For men born in 1955, they report WLEs of 7.3 FTE years, which is slightly higher than the estimates in this study of 6.9 FTE years for the same birth cohort. For women, they report WLEs of 4.8 FTE years, which also lies slightly above the 4.5 FTE years found in this study. Two studies, Leinonen et al. (2018) and Dudel and Myrskylä (2020), report WLEs on the cohort-level for Finland and the United States. Similar to this study, they find upward trends in WLEs from age 50 and project a stagnation of these trends among the younger Babyboomer cohorts. Moreover, the country differences in WLEs found in this study are similar to period-level analyses (e.g., Weber and Loichinger 2022), which, however, likely overestimate WLEs compared to cohort-level studies (Leinonen et al. 2018) and do not consider the considerable variation in mortality and working hours across countries and over time.

**Comparison to Age Group 65 to 74**

The data and technique employed in this study can further be used to compare the development of WLEs and WYL in different age groups. A key policy concern in recent years has been to raise the employment participation of individuals beyond retirement age. Eurostat (2023b) reports that in 2022, 8.6% of men and 4.2% of women aged 65 or older engaged in paid employment, although mostly in part-time jobs. Studies have also pointed to a large number of older individuals who engage in ‘bridge employment’ schemes, i.e., who receive their old-age pension but continue to work for pay (e.g., Beehr and Bennett 2015). Using SHARE data for 2011, Dingemans et al. (2017) report that more than 15% of men aged 60 to 74 in the Czech Republic, Denmark, Estonia, Sweden, Switzerland, the Netherlands, and more than 15% of women in Estonia, Sweden, and Switzerland participate in bridge employment. As argued above, WLEs and WYL are arguably more appropriate than crude participation rates to measure the extension of working lives beyond retirement age, especially when computed on the cohort-level and when adjusted for mortality and working hours.

To examine WLEs and WYL beyond the typical retirement age of 65, Figures A1 to A5 in the Appendix show analyses for cohorts of men and women aged 65 to 74 along with the sample statistics in Tables A4 and A5. Generally, WLEs in this older age range are low and reach at most 2.5 years for men in Portugal born in 1935/36 and 2.1 years for women in Estonia born in 1953/54. Most countries and cohorts show constant WLEs of around 1 year, and adjusting WLEs for working hours further reduces the estimates to less than 1 year or to a level indistinguishable from 0. With regard to WYL, retirement is the most prevalent activity, while unemployment and inactivity are effectively non-existent. Only in some older cohorts and among women in Southern European countries, notably Spain, Greece, and Italy, most working years are lost to inactivity. In sum, these estimates do not confirm a broad trend towards working beyond retirement age, with exceptions among the most recent cohorts in some Northern, Central and Eastern European countries.

## Discussion and Conclusion

This article used micro-level data from the European Labour Force Surveys to estimate (a)WLEs and WYL to retirement, unemployment, and inactivity for cohorts of men and women aged 55 to 64 and 65 to 74 in 21 European countries. In contrast to most previous studies, the article provides these estimates on the cohort- rather than period-level and adjusted for mortality and average working hours. These adjustments are crucial for comparisons across cohorts, countries, and by gender and reveal large disparities in countries' progress toward extended working lives. The main findings can be summarised as follows.

The first main finding is that, in line with earlier studies (e.g., Loichinger and Weber 2016; Weber and Loichinger 2022), WLEs have increased in most countries over time, even though marked differences persist both between countries and by gender. The cohort-level perspective in this study reveals that the rise in WLEs can be considered a long-term structural trend among real cohorts rather than driven by short-term demographic or economic fluctuations (Dudel et al. 2018; Leinonen et al. 2018). The analysis also confirms, for a large number of countries and cohorts, that adjustments for working hours uncover even larger gender disparities in WLE as well as less pronounced gains in the adjusted WLEs of women (Dudel et al. 2023). Future studies of WLEs should similarly account for differences in working time arrangements (as well as longevity levels) among older population groups, particularly with the emergence of bridge employment and partial retirement options (Henkens & van Solinge 2021).

The second main finding is that the WYL to retirement and to inactivity have drastically decreased in most countries, particularly among younger cohorts and women. These reductions can likely be attributed to the paradigmatic shift in policy from promoting early retirement toward extending working lives (Boissonneault et al. 2020; Kuitto & Helmdag 2021). However, despite a general reduction in WYL and variations across countries, retirement and inactivity remain the principal barriers to extended working lives among the youngest cohorts. Interestingly, gender gaps in the WYL to retirement and to unemployment are smaller than for WLEs or the WYL to inactivity, likely due to the more restrictive eligibility criteria for accessing these exit pathways. While most earlier analyses have focused on WLEs, these findings underscore that those who are not employed in later life accumulate time in various other states including, but not limited to, retirement. Whether individuals 'lose' working years to retirement, unemployment or inactivity should guide measures aimed at activating these groups.

The third main finding is that rising WLEs are, at least on average across countries and cohorts, significantly associated with equal reductions in WYL to retirement, and among men, fewer WYL to unemployment but not with reductions in the WLY to unemployment and inactivity. In line with earlier studies, these simple associations indicate that the rising labour market activation of older populations has mainly been the result of restrictions on labour market exits via early retirement (Boissonneault et al. 2020). However, although the joint analysis of 21 countries indicates that changes in WLEs are or are not linked to changes in the different WYL, more complex substitution and spill-over effects between the different retirement pathways have likely occurred within single countries and cohorts (Kuitto & Helmdag 2021).

These findings lead to important questions concerning the remaining levels of WYL, which are substantial among the most recent cohorts in many countries. Despite large gains in (a)WLEs, no country comes close to full employment in the 55-to-64 age group, and WLEs remain well below most countries' statutory retirement ages. The projected estimates suggest that the WLEs and WYL of the 'baby boomer' cohorts will mostly stagnate at levels reached by older cohorts. This is concerning in view of the sustainability of public pension systems. At the same time, it is important to consider the manifold factors that may limit progress towards 'fuller' working lives (Phillipson 2019). These include, among others, inequalities in health and the ability to work, family and care obligations, as well as "sticky" age norms and negative attitudes towards further increases of statutory retirement ages (e.g., Hess et al. 2021; Radl 2012). Equally important are potentially negative consequences of policy efforts to increase WLE by restricting retirement options. Unless accompanied by investments in employability and exceptions for some groups, these policies may not lead to rising WLEs, but will likely have negative effects on the well-being of certain population groups. It remains an open question in which ways the policy goal of extending working lives can be reconciled with concerns about fairness and inequality.

This article has some shortcomings and could be extended in several ways. First, the article could not assess the levels and changes of WLEs and WYL across different sub-populations due to data limitations. Apart from gender, education and occupational characteristics as well as other family- or health-related factors should be further explored from a comparative perspective as dimensions of inequality in WLEs and WYL. Another related extension could be to incorporate activity states beyond the four states used in this study, for example, by examining the expected lifetime spent in precarious employment or in care work (e.g., Ophir 2022). Second, following earlier studies by Dudel et al. (2023) and others, the article examined two relatively short age ranges in later life. A worthwhile extension would be to estimate WLEs and WYL for larger age ranges as some groups who started to work early in life may also leave the labour market relatively earlier but still accumulate high levels of WLE across the entire life course. Third, the associations between changes in WLE and WYL likely hide considerable variation in the relationships between the different measures within countries. Longitudinal data and other methodological approaches (e.g., via Markov modelling of transition probabilities) would be required to identify the exact flows between different labour market exit pathways and gains or losses in WLE.

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## Tables

Table 1: Prior estimates of working life expectancy (WLE) and working years lost (WYL) for European countries.

| No. | Estimate(s) | Stratification variable(s) | Region(s) | Year(s) / Cohort(s) | Data | Reference |
|---|---|---|---|---|---|---|
| 1 | WLE (period-level, age 50+) | Gender, Occupation | United Kingdom | 2003–2018 | ELSA | Chungkham et al. 2023 |
| 2 | WLE adjusted for working hours and WYL (cohort-level, ages 55 to 64 and 65 to 74) | Gender, Education, Occupation | East-/West-Germany | 1941–1955 | German Microcensus | Dudel et al. 2023 |
| 3 | WLE and WYL (period-level, ages 30 to 62, persons w/ sickness absence) | Usage of full- or part-time sickness absence | Finland | 2007–2017 | Population register data | Hartikainen et al. 2023 |
| 4 | (Un-)Healthy WLE adjusted for working hours (period-level, ages 50 to 64) | Gender, Education | Germany | 2001–2020 | GSOEP | Sperlich et al. 2023 |
| 5 | Cancer-free WLE (period-level, age 18+, 50+, 60+) | Gender, Education | Germany | 2006-08, 2011-13, 2016-18 | Insurance data | F. Tetzlaff et al. 2023 |
| 6 | WLE (period-level, age 15+) | Gender | 27 EU countries | 2002–2022 | EU-LFS | Eurostat 2023a |
| 7 | (Healthy) WLE (period-level, age 18+, 50+, 60+) | Gender, Health status | Germany | 2002–2018 | GSOEP | Heller et al. 2022 |
| 8 | (Un-)Healthy WLE (period-level, ages 50 to 65) | Health status | Finland | 2000, 2017 | Health 2000, FinHealth 2017 | Laaksonen et al. 2022 |
| 9 | WLE adjusted for working hours (period-level, ages 45 to 63) | Gender, Pension receipt | Finland | 2005–2018 | Population register data | Leinonen et al. 2022 |
| 10 | (Healthy) WLE (period-level, ages 50 to 75) | Gender, Occupation, Health status | United Kingdom | 2002–2013 | ELSA | Lynch et al. 2022a |
| 11 | (Healthy) WLE (period-level, ages 50 to 75) | Gender | United Kingdom | 2015–projections | HSE | Lynch et al. 2022b |
| 12 | WLE (in (un-)paid work) (period-level, age 50+) | Gender, Employment intensity | 17 EU countries | 2015 | SHARE | Ophir 2022 |
| 13 | WLE (period-level, ages 55 to 66) | Gender, Education, Health condition | Netherlands | 2010–2018 | STREAM | Schram et al. 2022 |
| 14 | WLE (period-level, ages 18 to 69) | Gender, Education | Germany | 2006-08, 2011-13, 2016-18 | Insurance data | J. Tetzlaff et al. 2022 |
| 15 | WLE (period-level, ages 60 to 69) | Gender, Education | 26 EU countries | 2004–2017 | SHARE | Weber and Loichinger 2022 |
| 16 | (Un-)Healthy WLE (period-level, ages 51 to 65) | Gender, Health condition, Countries' Active Ageing Index | 11 EU countries | 2002-07, 2008-13, 2014-17 | ELSA, SHARE | Boissonneault and Rios 2021 |
| 17 | WLE (period-level, ages 50 to 63) | Gender, Health condition, Occupational class, Workload | Finland | 2004–2014 | Population register data | Schram et al. 2021 |
| 18 | (Healthy) WLE (period-level, age 50+) | Gender, Education, Region, Occupational class | United Kingdom | 2002–2013 | ELSA | Parker et al. 2020 |
| 19 | WLE (period-level, ages 30 to 60 | Gender, Occupations' physical demand | Denmark | 2014–2017 | Population register data | Pedersen et al. 2020 |
| 20 | WLE and WYL (period-level, ages 16 to 66 | Gender, Education | Netherlands | 2001–2015 | Population register data | Robroek et al. 2020 |
| 21 | WLE and WYL (period-level, ages 15 to 99 | Gender, Occupation, Region | Italy | 2003–2013 | LoSaI | Lorenti et al. 2019 |
| 22 | WLE (in precarious employment) (period-level, age 16+, 50+) | Gender, Employment status, Precariousness | Spain | 1986–2016 | ES-LFS (micro-level) | Lozano and Rentería 2019 |
| 23 | WLE (period-level, ages 30 to 55) | Gender, Health condition | Finland | 2006–2014 | Population register data | Sirén et al. 2019 |
| 24 | WLE (with disability) (period-level, ages 55 to 68) | Gender, Education | Netherlands | 1992–2016 | LASA | van der Noordt et al. 2019 |
| 25 | (Un-)Healthy WLE (period-level, ages 55 to 65) | Gender, Education | Netherlands | 1992–2016 | LASA | de Wind et al. 2018 |
| 26 | WLE and WYL (period-level, ages 15 to 64) | Gender, Occupation | Spain | 2004–2013 | CWLS | Dudel et al. 2018 |
| 27 | WYL (period-level, 25 to 63) | Gender, Education | Finland | 2005–2014 | Population register data | Laaksonen et al. 2018 |
| 28 | WLE (period- and cohort-level, age 50+) | Gender, Occupational class | Finland | 1989–2012 / 1938–1953 | Population register data | Leinonen et al. 2018 |
| 29 | WLE (period-level, ages 55 to 65) | Gender, Membership in retirement scheme, Self-rated health | Denmark | 2008 | DANES | Pedersen and Bjorner 2017 |
| 30 | WLE (period-level, age 50+) | Gender, Education | 26 EU countries | 1983–2013 | EU-LFS (aggregated) | Loichinger and Weber 2016 |
| 31 | WYL (period-level, 50 to 65) | Gender | Portugal | 2001–2013 | EpiReumaPt | Laires et al. 2015 |
| 32 | WLE (period-level, ages 50 to 65) | Disability | 8 EU coutries | 1994–2001 | ECPS | Wubulihasimu et al. 2015 |
| 33 | WLE (period-level, ages 16 to 65) | Gender, Education, Disability, Initial employment state | United Kingdom | 2002–2004 | UK-LFS (micro-level) | Butt et al. 2009 |
| 34 | WLE (period-level, age 15+) | Gender | 27 EU countries | 2001, 2005 | EU-LFSs (micro-level) | Hytti 2009 |
| 35 | WLE (period-level, ages 16 to 65) | Gender, Education, Disability, Initial employment state | United Kingdom | 2002–2004 | UK-LFS (micro-level) | Butt et al. 2008 |
| 36 | Healthy WLE (period-level, ages 50 to 70) | Gender | 12 EU countries | 1995–2001 | ECPS | Lievre et al. 2007 |
| 37 | WLE (period-level, ages 16 to 64) | Gender | Finland | 1980–2001 | Population register data | Nurminen et al. 2005 |
| 38 | WLE (period-level, age 54+) | Gender | Finland | 1981, 1985, 1992 | Work Ability Surveys | Nurminen et al. 2004 |

Table 2: Association of intra-cohort changes in (a)WLEs and WYL by gender.

| **Female population** | (1) $\Delta$aWLE | (2) $\Delta$WYL (Retire.) | (3) $\Delta$WYL (Unemp.) | (4) $\Delta$WYL (Inactivity) |
|---|---|---|---|---|
| $\Delta$WLE | $0.989^{***}$ | $-1.007^{***}$ | $-0.107^{*}$ | $-0.069$ |
| | (0.009) | (0.100) | (0.054) | (0.054) |
| $R^2$ | 0.989 | 0.669 | 0.124 | 0.635 |
| Country-cohort obs. | 161 | 161 | 161 | 161 |

| **Male population** | (5) $\Delta$aWLE | (6) $\Delta$WYL (Retire.) | (7) $\Delta$WYL (Unemp.) | (8) $\Delta$WYL (Inactivity) |
|---|---|---|---|---|
| $\Delta$WLE | $0.899^{***}$ | $-0.915^{***}$ | 0.016 | $-0.148$ |
| | (0.023) | (0.121) | (0.049) | (0.113) |
| $R^2$ | 0.930 | 0.537 | 0.046 | 0.219 |
| Country-cohort obs. | 181 | 181 | 181 | 181 |

Notes: Own calculations. Standard errors in parentheses are corrected for serial correlation (Beck and Katz 2011). All models include country- and cohort-fixed-effects and control for the absolute levels of the lagged WLE and dependent variable. Data do not include projected estimates.

*p $>$ .05; ***p $>$ .001

## Figures

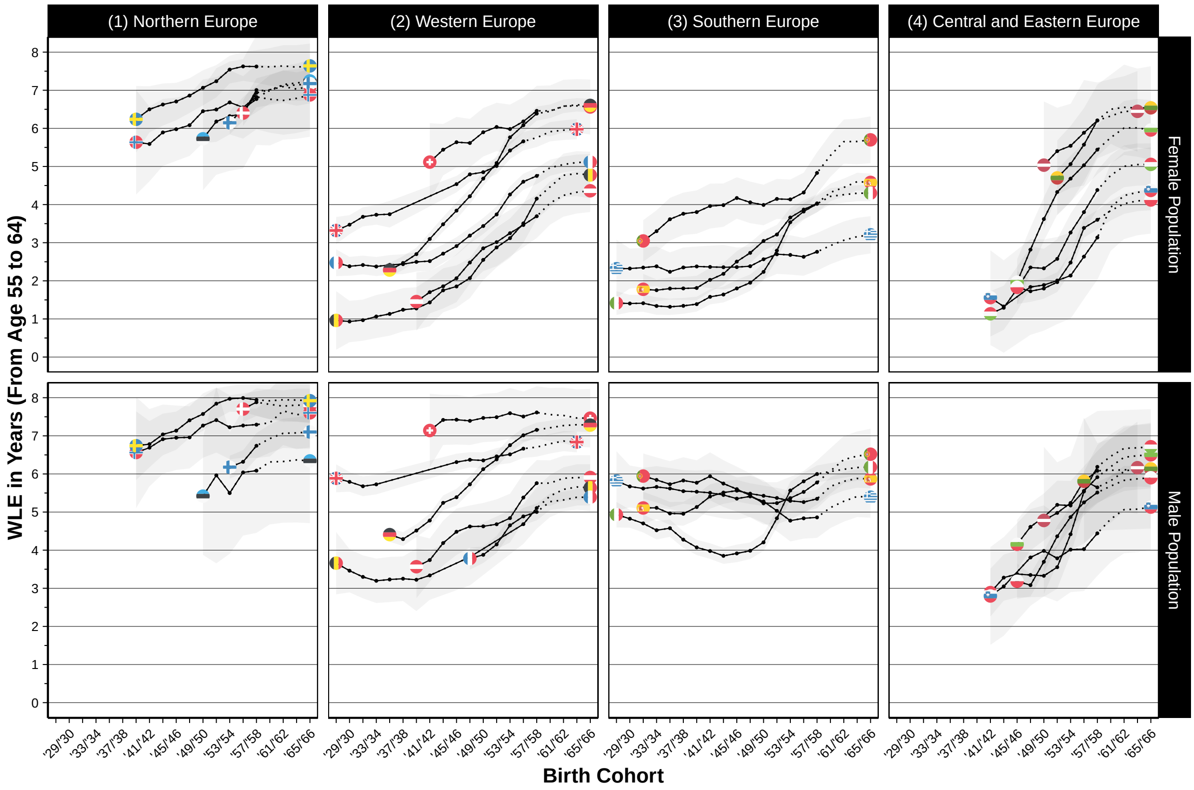


Figure 1: Cohort-level working life expectancies adjusted for mortality. Notes: Own calculations based on data from EU-LFS and HMD. Shaded areas are 95% confidence intervals.

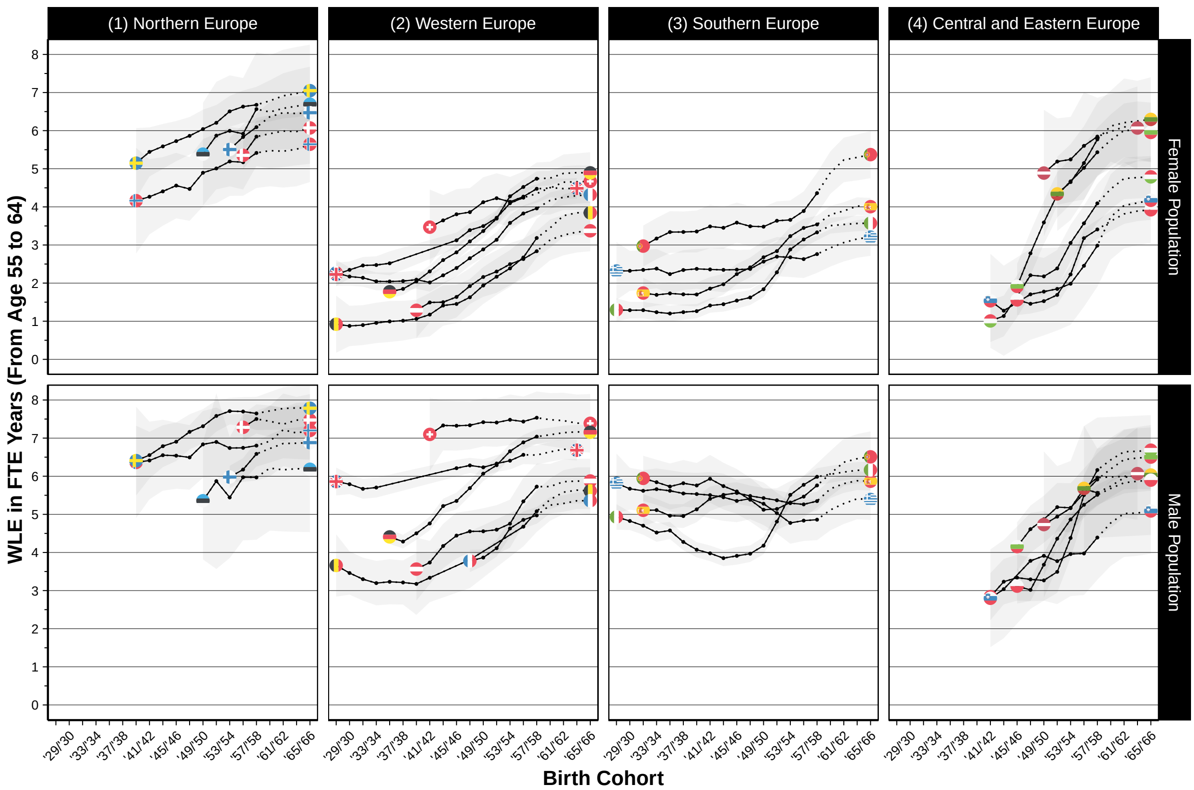


Figure 2: Cohort-level working life expectancies adjusted for mortality and working hours. Notes: Own calculations based on data from EU-LFS and HMD. Shaded areas are 95% confidence intervals.

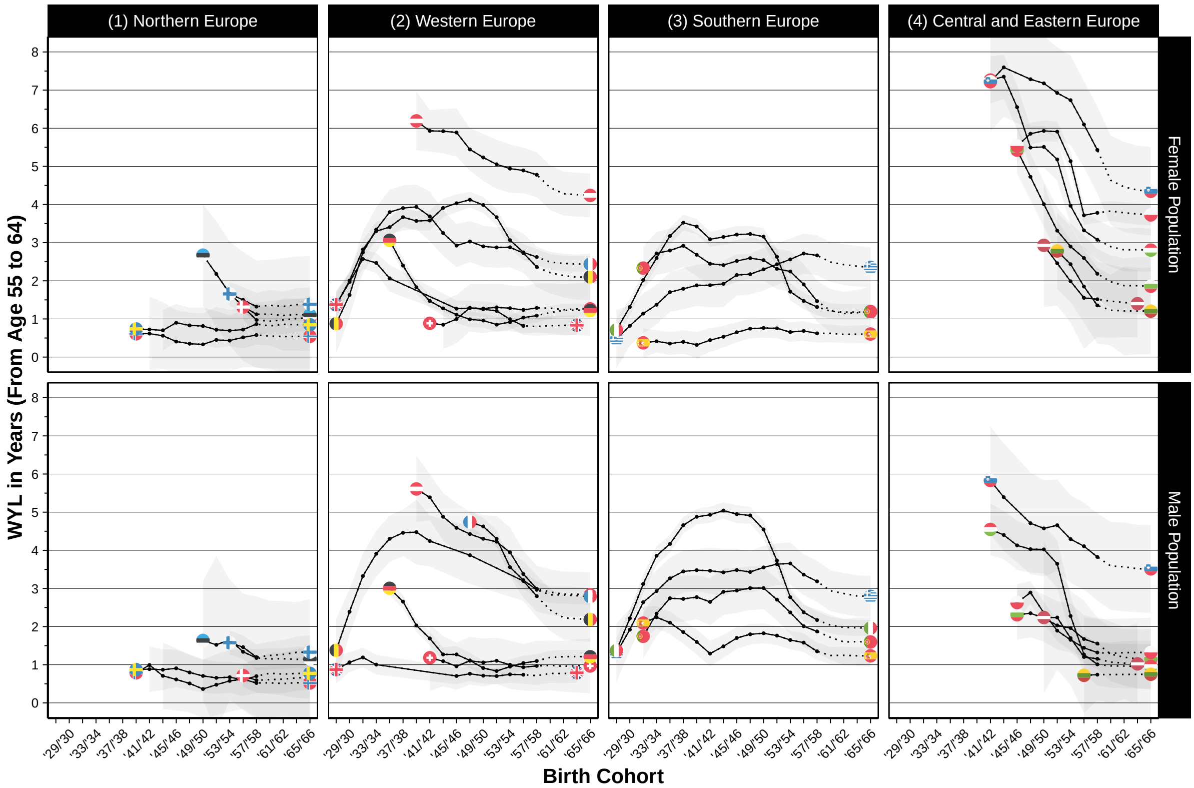


Figure 3: Cohort-level working years lost to retirement adjusted for mortality. Notes: Own calculations based on data from EU-LFS and HMD. Shaded areas are 95% confidence intervals.

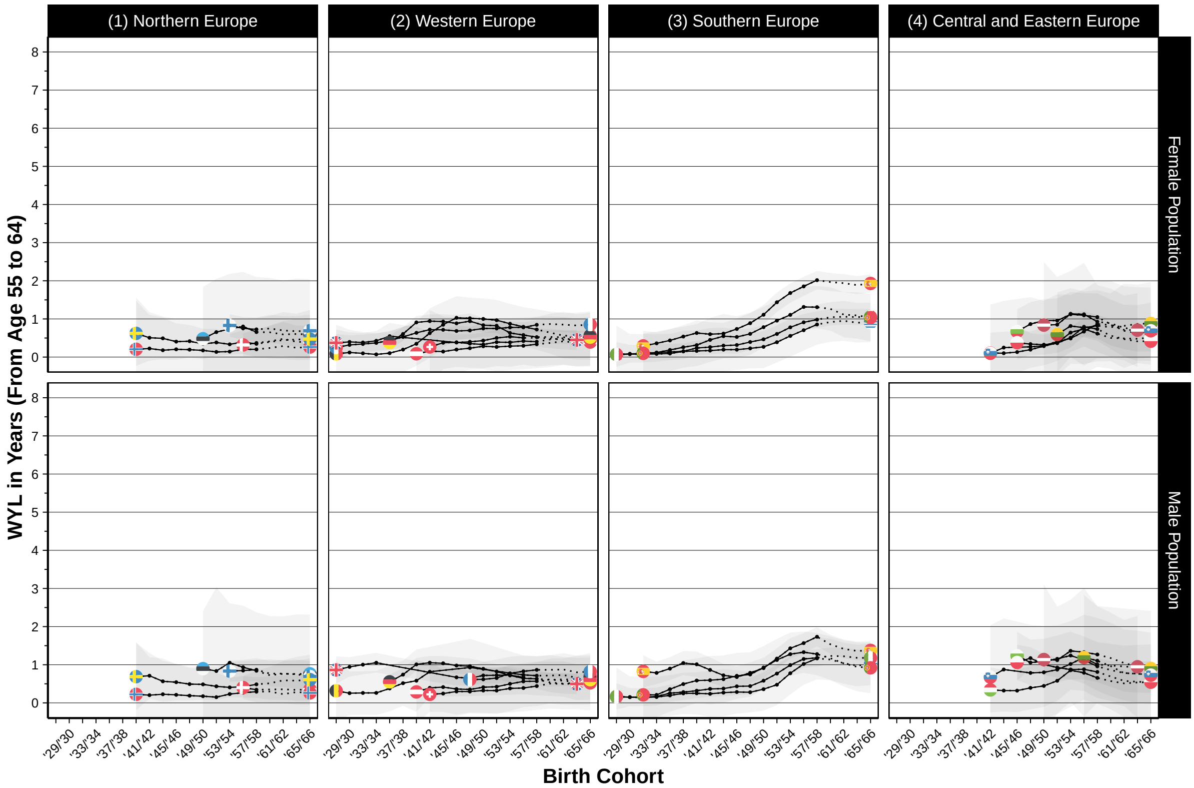


Figure 4: Cohort-level working years lost to unemployment adjusted for mortality. Notes: Own calculations based on data from EU-LFS and HMD. Shaded areas are 95% confidence intervals.

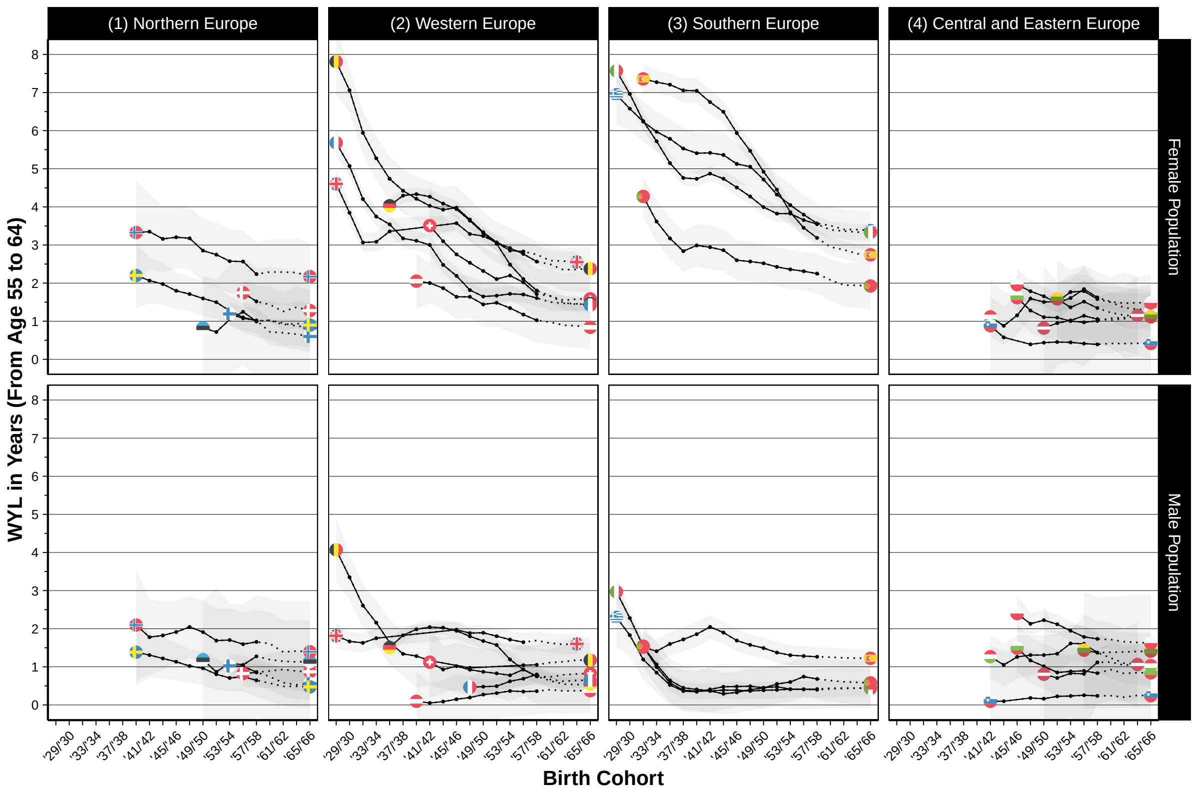


Figure 5: Cohort-level working years lost to inactivity adjusted for mortality. Notes: Own calculations based on data from EU-LFS and HMD. Shaded areas are 95% confidence intervals.

# Appendix

### Details on the Literature Review

The literature review was conducted in January 2024 using the SCOPUS and ProQuest literature databases based on the following search terms: “work* li* expectanc*” OR “lab* force expectanc*” OR “lab* market li* expectanc*” OR “duration of working li*” OR “length of work* li*” OR “active life expectanc*” OR “work* years lost” OR “lost work* years” OR “years of work* life lost” as well as manual searches in the reference list of each article and the systematic review by Shiri et al. (2021). No date or country restrictions were applied. However, only studies that provided original estimates of WLE or WYL for European countries were considered. See Shiri et al. (2021) for an earlier review of different measures and estimates of WYL, including from non-European countries.

**Details on the Construction of the ACTIVITY STATE Variable**

The ACTIVITY STATE variable is defined based on respondents' current employment status ("EMPSTAT" in the EU-LFS data). If a respondent is currently not employed, the self-defined main activity status ("MAINSTAT") is used. However, this variable includes missing values for around 16,1% of observations in the 55 to 64 age range. In these cases, respondents' ACTIVITY STATE is inferred from their answers to three other survey questions (see Table A1), namely the main reason for not searching for employment ("SEEKREAS"), the main reason for not wanting to work ("WANTREAS"), and the main reason for leaving the last job or business ("LEAVREAS").

Table A1: Survey items used to construct respondents' ACTIVITY STATE.

| ACTIVITY STATE | EMPSTAT | MAINSTAT | SEEKREAS | WANTREAS | LEAVREAS |
|---|---|---|---|---|---|
| Employed | Employed | | | | |
| Unemployed | Unemployed | No suitable job is available | | | A fixed-term job has ended |
| | | Awaiting recall to work (lay-off) | | | Dismissal or business closed for economic reasons |
| Retired | | Retired | | Retirement | Retirement |
| Inactive | | Student, pupil | Education or training | Education or training | Education or training |
| | | Fulfilling domestic tasks | Care responsibilities | Care responsibilities | Care responsibilities |
| | | Unable to work due to long-standing health problems | Own illness or disability | Own illness or disability | Own illness or disability |
| | | Compulsory military or civilian service | Other family reasons | Other family reasons | Other family reasons |
| | | | Other personal reasons | Other personal reasons | Other personal reasons |
| | | Other | Other reasons | Other reasons | Other reasons |

**Sample Statistics**

Table A2: Survey and sample statistics (age group 55 to 64).

| Nb. | Country | Survey years | Total observations | Included observations* | Included birth cohorts* | One or more missings (% in included cohorts) | Missing activity status (% in included cohorts) | Missing working hours (% in included cohorts) |
|---|---|---|---|---|---|---|---|---|
| 1 | Austria (AT) | 1995 - 2021 | 490.096 | 461.865 | 1940 - 1966 | 0,3% | 0,0% | 0,3% |
| 2 | Belgium (BE) | 1983 - 2021 | 371.042 | 253.833 | 1928 - 1966 | 3,2% | 0,0% | 3,2% |
| 3 | Bulgaria (BG) | 2000 - 2021 | 171.673 | 132.109 | 1945 - 1966 | 4,1% | 0,1% | 4,1% |
| 4 | Switzerland (CH) | 1996 - 2021 | 208.337 | 190.921 | 1942 - 1966 | 0,4% | 0,4% | 0,1% |
| 5 | Cyprus (CY) | 1999 - 2021 | 94.482 | | | | | |
| 6 | Czech Republic (CZ)** | 1997 - 2021 | 356.784 | | | | | |
| 7 | Germany (DE) | 1983 - 2021 | 1.534.115 | 1.192.926 | 1935 - 1966 | 0,1% | 0,1% | 0,0% |
| 8 | Denmark (DK) | 1983 - 2021 | 400.045 | 131.664 | 1955 - 1966 | 0,3% | 0,0% | 0,3% |
| 9 | Estonia (EE) | 1997 - 2021 | 64.110 | 46.018 | 1949 - 1966 | 2,4% | 0,0% | 2,4% |
| 10 | Greece (EL) | 1983 - 2021 | 927.917 | 841.679 | 1928 - 1966 | 0,3% | 0,0% | 0,3% |
| 11 | Spain (ES) | 1986 - 2021 | 709.055 | 583.055 | 1932 - 1966 | 2,0% | 0,3% | 1,7% |
| 12 | Finland (FI) | 1995 - 2021 | 188.919 | 65.899 | 1953 - 1965 | 3,5% | 0,0% | 3,5% |
| 13 | France (FR) | 1983 - 2021 | 1.342.920 | 1.054.715 | 1928 - 1966 | 1,0% | 0,0% | 1,0% |
| 14 | Croatia (HR) | 2002 - 2021 | 109.157 | | | | | |
| 15 | Hungary (HU) | 1996 - 2021 | 728.237 | 687.691 | 1941 - 1966 | 2,8% | 0,0% | 2,8% |
| 16 | Ireland (IE)** | 1983 - 2021 | 586.109 | | | | | |
| 17 | Iceland (IS)** | 1995 - 2021 | 36.019 | | | | | |
| 18 | Italy (IT) | 1983 - 2021 | 2.176.312 | 1.948.901 | 1928 - 1966 | 0,6% | 0,0% | 0,5% |
| 19 | Lithuania (LT) | 1998 - 2021 | 156.710 | 67.749 | 1951 - 1961, 1963-1964, 1966 | 8,4% | 0,0% | 8,4% |
| 20 | Luxembourg (LU) | 1983 - 2021 | 117.184 | | | | | |
| 21 | Latvia (LV) | 1998 - 2021 | 79.424 | 45.135 | 1950 - 1954, 1956 - 1963 | 0,9% | 0,0% | 0,9% |
| 22 | Netherlands (NL)** | 1983, 1985, 1987 - 2021 | 495.545 | | | | | |
| 23 | Norway (NO) | 1995 - 2021 | 98.476 | 87.565 | 1940 - 1966 | 0,7% | 0,0% | 0,6% |
| 24 | Poland (PL) | 1997 - 2021 | 816.065 | 750.220 | 1946 - 1966 | 0,2% | 0,1% | 0,2% |
| 25 | Portugal (PT) | 1986 - 2021 | 511.762 | 470.193 | 1931 - 1966 | 2,4% | 0,0% | 2,4% |
| 26 | Romania (RO) | 1997 - 2021 | 630.070 | | | | | |
| 27 | Sweden (SE) | 1995 - 2021 | 730.236 | 716.173 | 1940 - 1966 | 0,2% | 0,0% | 0,2% |
| 28 | Slovenia (SI) | 1996 - 2021 | 187.764 | 168.348 | 1941 - 1944, 1947 - 1966 | 0,0% | 0,0% | 0,0% |
| 29 | Slovakia (SK)** | 1998 - 2021 | 282.657 | | | | | |
| 30 | United Kingdom (UK) | 1983 - 2019 | 575.617 | 315.432 | 1928 - 1935, 1945 - 1964 | 1,7% | 0,4% | 1,3% |
| | Total | | 15.176.839 | 10.212.091 | | 1,0% | 0,0% | 0,9% |

Notes: Data presented include individuals aged 65 to 74 and cohorts that have completed these ages during the respective survey years.
*Inclusion criteria are more than 100 observations and less than 10% missings in each country-gender-cohort-age combination.
**Country fully excluded because age is only available in five-year bins.

Table A3: Detailed observation counts (age group 55 to 64).

| **Country** | **'27/'28** | **'29/'30** | **'31/'32** | **'33/'34** | **'35/'36** | **'37/'38** | **'39/'40** | **'41/'42** | **'43/'44** | **'45/'46** | **'47/'48** | **'49/'50** | **'51/'52** | **'53/'54** | **'55/'56** | **'57/'58*** | **'59/'60*** | **'61/'62*** | **'63/'64*** | **'65/'66*** | **Total** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Austria (AT) | | | | | | | 9.982 | 22.985 | 25.827 | 26.869 | 40.588 | 45.483 | 44.250 | 44.523 | 48.679 | 49.551 | 40.732 | 31.982 | 21.273 | 9.141 | 461.865 |
| Belgium (BE) | 10.088 | 19.485 | 20.127 | 18.473 | 16.160 | 13.729 | 9.087 | 10.043 | 6.932 | 9.192 | 17.980 | 13.769 | 14.367 | 13.218 | 22.839 | 19.418 | 14.259 | 8.301 | 4.642 | 1.812 | 253.833 |
| Bulgaria (BG) | | | | | | | | | | 21.018 | 21.703 | 22.437 | 16.061 | 11.011 | 11.207 | 10.162 | 7.894 | 5.687 | 3.475 | 1.454 | 132.109 |
| Switzerland (CH) | | | | | | | | 4.627 | 12.232 | 14.267 | 17.384 | 18.376 | 18.887 | 19.627 | 21.203 | 20.434 | 17.265 | 13.406 | 9.091 | 4.122 | 190.921 |
| Germany (DE) | | | | | 86.520 | 93.574 | 104.964 | 95.882 | 68.375 | 42.842 | 42.184 | 55.248 | 63.964 | 89.749 | 114.190 | 118.427 | 97.321 | 71.781 | 39.102 | 8.803 | 1.192.926 |
| Denmark (DK) | | | | | | | | | | | | | | | 37.044 | 34.307 | 25.539 | 17.820 | 11.787 | 5.167 | 131.664 |
| Estonia (EE) | | | | | | | | | | | | 5.816 | 4.748 | 6.305 | 7.246 | 7.236 | 6.071 | 4.663 | 2.794 | 1.139 | 46.018 |
| Greece (EL) | 18.420 | 38.923 | 40.520 | 40.311 | 38.363 | 32.910 | 28.730 | 28.178 | 32.846 | 52.475 | 64.998 | 68.950 | 74.291 | 69.997 | 71.171 | 59.906 | 46.989 | 31.397 | 16.721 | 4.003 | 841.679 |
| Spain (ES) | | | 23.741 | 48.254 | 45.134 | 40.755 | 33.833 | 44.078 | 46.639 | 45.657 | 43.655 | 40.437 | 27.072 | 28.305 | 28.715 | 29.195 | 23.913 | 17.444 | 11.288 | 4.940 | 583.055 |
| Finland (FI) | | | | | | | | | | | | | | 15.397 | 14.540 | 12.994 | 9.824 | 7.217 | 4.355 | 1.572 | 65.899 |
| France (FR) | 9.677 | 19.681 | 20.586 | 20.067 | 19.260 | 18.434 | 17.569 | 17.012 | 22.723 | 30.578 | 72.662 | 115.626 | 125.702 | 135.136 | 135.354 | 110.786 | 85.976 | 56.498 | 27.493 | 3.572 | 1.054.715 |
| Hungary (HU) | | | | | | | | 28.466 | 41.263 | 47.556 | 64.528 | 83.448 | 82.514 | 83.424 | 85.145 | 66.466 | 47.569 | 30.701 | 18.309 | 8.302 | 687.691 |
| Italy (IT) | 40.639 | 74.505 | 69.315 | 59.289 | 55.432 | 56.143 | 62.577 | 76.913 | 97.243 | 115.123 | 161.627 | 177.539 | 168.492 | 162.220 | 162.439 | 152.099 | 122.388 | 90.952 | 59.511 | 25.094 | 1.948.901 |
| Lithuania (LT) | | | | | | | | | | | | | 9.325 | 9.306 | 14.817 | 15.528 | 9.905 | 3.969 | 4.066 | 833 | 67.749 |
| Latvia (LV) | | | | | | | | | | | | 4.470 | 10.448 | 9.644 | 4.070 | 7.596 | 5.433 | 2.758 | 716 | | 45.135 |
| Norway (NO) | | | | | | | 2.724 | 7.027 | 8.527 | 9.597 | 10.219 | 9.690 | 6.724 | 6.880 | 6.851 | 6.383 | 5.111 | 3.895 | 2.618 | 1.319 | 87.565 |
| Poland (PL) | | | | | | | | | | 17.528 | 59.275 | 85.484 | 103.017 | 111.259 | 116.392 | 102.560 | 72.919 | 44.110 | 26.448 | 11.228 | 750.220 |
| Portugal (PT) | | | 16.414 | 14.535 | 12.426 | 11.425 | 11.402 | 14.998 | 22.503 | 30.421 | 37.577 | 45.691 | 47.982 | 46.758 | 47.214 | 41.207 | 31.846 | 22.591 | 12.276 | 2.927 | 470.193 |
| Sweden (SE) | | | | | | | 5.184 | 18.172 | 37.371 | 58.642 | 76.995 | 91.116 | 91.522 | 92.068 | 82.253 | 66.816 | 46.189 | 28.743 | 14.870 | 6.232 | 716.173 |
| Slovenia (SI) | | | | | | | | 6.489 | 9.187 | | 14.672 | 19.030 | 20.266 | 20.780 | 20.945 | 20.037 | 14.984 | 11.206 | 7.381 | 3.371 | 168.348 |
| United Kingdom (UK) | 17.653 | 33.751 | 32.834 | 30.677 | 8.418 | | | | | 33.510 | 38.153 | 31.420 | 27.224 | 22.057 | 19.289 | 15.458 | 11.546 | 7.682 | 3.413 | | 315.432 |
| Total | 96.477 | 186.345 | 223.537 | 231.606 | 281.713 | 266.970 | 286.052 | 374.870 | 431.668 | 555.275 | 784.200 | 934.030 | 956.856 | 997.664 | 1.071.603 | 966.566 | 743.673 | 512.803 | 301.629 | 105.031 | 10.212.091 |

Notes: *Cohort only partially observed and used for projections.

Table A4: Survey and sample statistics (age group 65 to 74).

| Nb. | Country | Survey years | Total observations | Included observations* | Included birth cohorts* | One or more missings (% in included cohorts) | Missing activity status (% in included cohorts) | Missing working hours (% in included cohorts) |
|---|---|---|---|---|---|---|---|---|
| 1 | Austria (AT) | 1995 - 2020 | 370.846 | 220.009 | 1940-1954 | 0,2% | 0,0% | 0,2% |
| 2 | Belgium (BE) | 1983 - 2020 | 292.949 | 182.086 | 1928-1956 | 1,1% | 0,2% | 0,9% |
| 3 | Bulgaria (BG) | 2000 - 2020 | 157.000 | 43.271 | 1945-1956 | 1,1% | 0,1% | 1,0% |
| 4 | Switzerland (CH) | 1996 - 2020 | 173.751 | 70.656 | 1945-1956 | 0,1% | 0,1% | 0,0% |
| 5 | Cyprus (CY) | 1999 - 2020 | 72.288 | | | | | |
| 6 | Czech Republic (CZ)** | 1997 - 2020 | 266.732 | | | | | |
| 7 | Germany (DE) | 1983 - 2020 | 1.185.006 | 244.531 | 1947-1955 | 8,7% | 8,7% | 0,0% |
| 8 | Denmark (DK) | 1983 - 2020 | 214.665 | 90.910 | 1942-1956 | 0,8% | 0,2% | 0,5% |
| 9 | Estonia (EE) | 1997 - 2020 | 51.795 | 20.529 | 1942-1943; 1947-1954 | 1,5% | 0,0% | 1,5% |
| 10 | Greece (EL) | 1983 - 2020 | 838.303 | 599.138 | 1929-1945; 1947-1954 | 0,2% | 0,1% | 0,1% |
| 11 | Spain (ES) | 1986 - 2020 | 592.687 | 151.424 | 1940-1955 | 4,0% | 3,4% | 0,6% |
| 12 | Finland (FI) | 1995 - 2020 | 129.299 | 72.756 | 1940-1956 | 1,4% | 0,0% | 1,4% |
| 13 | France (FR) | 1983 - 2020 | 1.041.953 | 558.192 | 1928-1929; 1939-1955 | 1,1% | 0,8% | 0,3% |
| 14 | Croatia (HR) | 2002 - 2020 | 94.690 | | | | | |
| 15 | Hungary (HU) | 1996 - 2020 | 632.702 | 366.203 | 1941-1955 | 0,9% | 0,2% | 0,7% |
| 16 | Ireland (IE)** | 1983 - 2020 | 447.336 | | | | | |
| 17 | Iceland (IS)** | 1995 - 2020 | 25.428 | | | | | |
| 18 | Italy (IT) | 1983 - 2020 | 1.913.060 | 1.506.337 | 1928-1955 | 0,2% | 0,0% | 0,2% |
| 19 | Lithuania (LT) | 1998 - 2020 | 117.741 | 66.885 | 1943-1955 | 2,7% | 0,1% | 2,6% |
| 20 | Luxembourg (LU) | 1983 - 2020 | 84.056 | | | | | |
| 21 | Latvia (LV) | 1998 - 2020 | 71.329 | 18.693 | 1943-1944;1947-1953 | 0,4% | 0,2% | 0,2% |
| 22 | Netherlands (NL)** | 1983, 1985, 1987 - 2020 | 191.540 | | | | | |
| 23 | Norway (NO) | 1995 - 2020 | 67.935 | 15.748 | 1947-1956 | 4,0% | 3,1% | 0,9% |
| 24 | Poland (PL) | 1997 - 2020 | 587.989 | 343.357 | 1942-1945; 1947-1954 | 2,0% | 2,0% | 0,1% |
| 25 | Portugal (PT) | 1986 - 2020 | 436.708 | 354.554 | 1931-1956 | 1,9% | 0,0% | 1,9% |
| 26 | Romania (RO) | 1997 - 2020 | 593.109 | | | | | |
| 27 | Sweden (SE) | 1995 - 2020 | 282.553 | 227.057 | 1940-1956 | 0,3% | 0,1% | 0,3% |
| 28 | Slovenia (SI) | 1996 - 2020 | 130.303 | 73.990 | 1941-1945; 1947-1954 | 0,1% | 0,1% | 0,0% |
| 29 | Slovakia (SK)** | 1998 - 2020 | 227.067 | | | | | |
| 30 | United Kingdom (UK) | 1983 - 2019 | 485.847 | | | | | |
| | Total | | 11.776.667 | 5.226.326 | | 1,4% | 0,9% | 0,4% |

Notes: Data presented include individuals aged 65 to 74 and cohorts that have completed these ages during the respective survey years.
*Inclusion criteria are more than 100 observations and less than 10% missings in each country-gender-cohort-age combination.
**Country fully excluded because age is only available in five-year bins.

Table A5: Detailed observation counts (age group 65 to 74).

| **Country** | **’27/’28** | **’29/’30** | **’31/’32** | **’33/’34** | **’35/’36** | **’37/’38** | **’39/’40** | **’41/’42** | **’43/’44** | **’45/’46** | **’47/’48*** | **’49/’50*** | **’51/’52*** | **’53/’54*** | **55/’56*** | **Total** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Austria (AT) | | | | | | | 24.468 | 42.787 | 35.526 | 16.068 | 37.553 | 29.014 | 20.863 | 13.730 | | 220.009 |
| Belgium (BE) | 3.526 | 11.396 | 11.636 | 12.002 | 14.001 | 17.309 | 20.234 | 17.902 | 18.460 | 17.862 | 16.742 | 11.810 | 6.990 | 4.127 | 1.615 | 182.086 |
| Bulgaria (BG) | | | | | | | | | | 10.885 | 10.838 | 9.392 | 6.429 | 3.994 | 1.733 | 43.271 |
| Switzerland (CH) | | | | | | | | | | 19.744 | 18.463 | 13.393 | 9.851 | 6.218 | 2.987 | 70.656 |
| Germany (DE) | | | | | | | | | | | 83.369 | 74.692 | 53.965 | 28.104 | 4.401 | 244.531 |
| Denmark (DK) | | | | | | | | 4.891 | 10.263 | 14.110 | 17.041 | 14.450 | 13.510 | 11.223 | 5.422 | 90.910 |
| Estonia (EE) | | | | | | | | 1.439 | 1.197 | | 5.628 | 5.392 | 4.124 | 2.749 | | 20.529 |
| Greece (EL) | 15.832 | 28.456 | 32.871 | 40.304 | 53.207 | 61.570 | 70.663 | 64.590 | 61.117 | 34.528 | 59.363 | 43.212 | 32.240 | 17.017 | | 599.138 |
| Spain (ES) | | | | | | | 15.572 | 20.521 | 23.754 | 24.732 | 23.287 | 18.567 | 13.350 | 9.099 | 2.542 | 151.424 |
| Finland (FI) | | | | | | | 5.615 | 10.052 | 9.312 | 12.003 | 12.877 | 10.020 | 6.931 | 4.259 | 1.687 | 72.756 |
| France (FR) | 17.411 | 7.090 | | | | | 32.910 | 55.351 | 91.323 | 101.479 | 106.768 | 82.136 | 53.768 | 24.889 | 2.478 | 558.192 |
| Hungary (HU) | | | | | | | | 65.623 | 64.150 | 56.538 | 57.912 | 51.341 | 37.705 | 24.630 | 8.304 | 366.203 |
| Italy (IT) | 26.053 | 51.731 | 67.923 | 90.034 | 109.616 | 134.889 | 165.975 | 155.669 | 145.598 | 144.858 | 160.883 | 123.782 | 86.017 | 53.529 | 15.833 | 1.506.337 |
| Lithuania (LT) | | | | | | | | | 13.468 | 12.828 | 13.011 | 11.951 | 8.737 | 5.852 | 1.038 | 66.885 |
| Latvia (LV) | | | | | | | | | 5.608 | | 5.690 | 4.754 | 1.997 | 644 | | 18.693 |
| Norway (NO) | | | | | | | | | | | 5.446 | 4.256 | 3.073 | 2.018 | 955 | 15.748 |
| Poland (PL) | | | | | | | | 26.211 | 54.931 | 29.191 | 79.390 | 67.774 | 51.846 | 34.014 | | 343.357 |
| Portugal (PT) | | | 15.593 | 21.955 | 27.908 | 33.894 | 39.033 | 36.978 | 39.057 | 40.621 | 35.541 | 29.630 | 20.106 | 11.520 | 2.718 | 354.554 |
| Sweden (SE) | | | | | | | 13.306 | 33.674 | 43.231 | 46.438 | 36.042 | 26.062 | 16.848 | 8.760 | 2.696 | 227.057 |
| Slovenia (SI) | | | | | | | | 13.217 | 12.833 | 5.107 | 13.799 | 12.606 | 9.842 | 6.586 | | 73.990 |
| Total | 62.822 | 98.673 | 128.023 | 164.295 | 204.732 | 247.662 | 387.776 | 548.905 | 629.828 | 586.992 | 799.643 | 644.234 | 458.192 | 272.962 | 54.409 | 5.226.326 |

Notes: *Cohort only partially observed and used for projections.

## Cohort-level Working Life Expectancies and Working Years Lost for Age Group 65 to 74

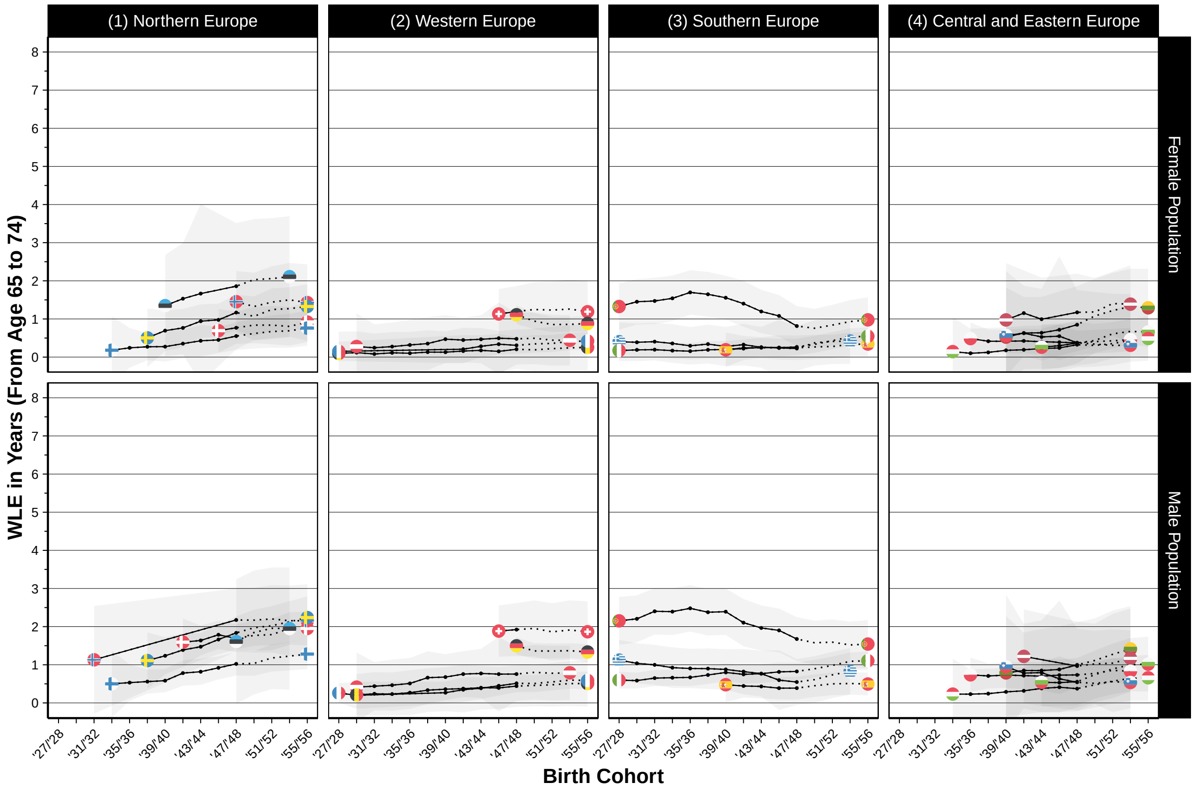


Figure A1: Cohort-level working life expectancies adjusted for mortality for age group 65 to 74. Notes: Own calculations based on data from EU-LFS and HMD. Shaded areas are 95% confidence intervals.

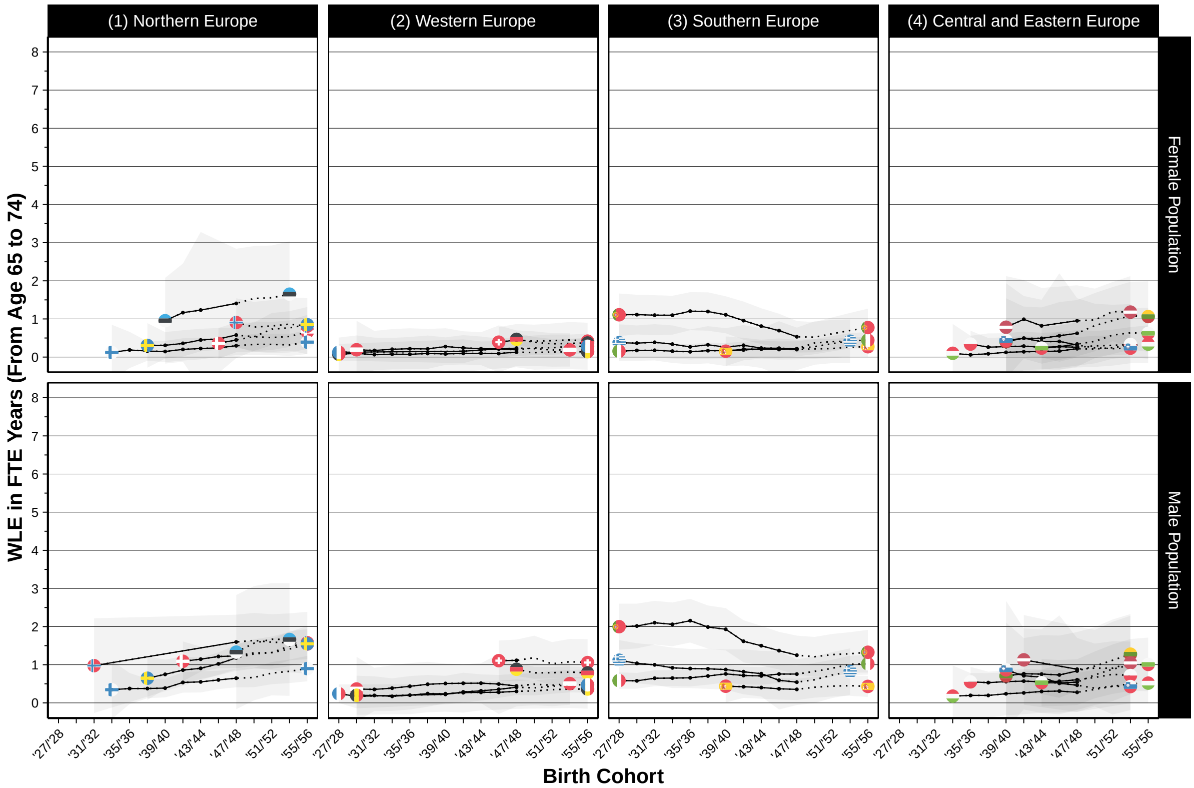


Figure A2: Cohort-level working life expectancies adjusted for mortality and working hours for age group 65 to 74. Notes: Own calculations based on data from EU-LFS and HMD. Shaded areas are 95% confidence intervals.

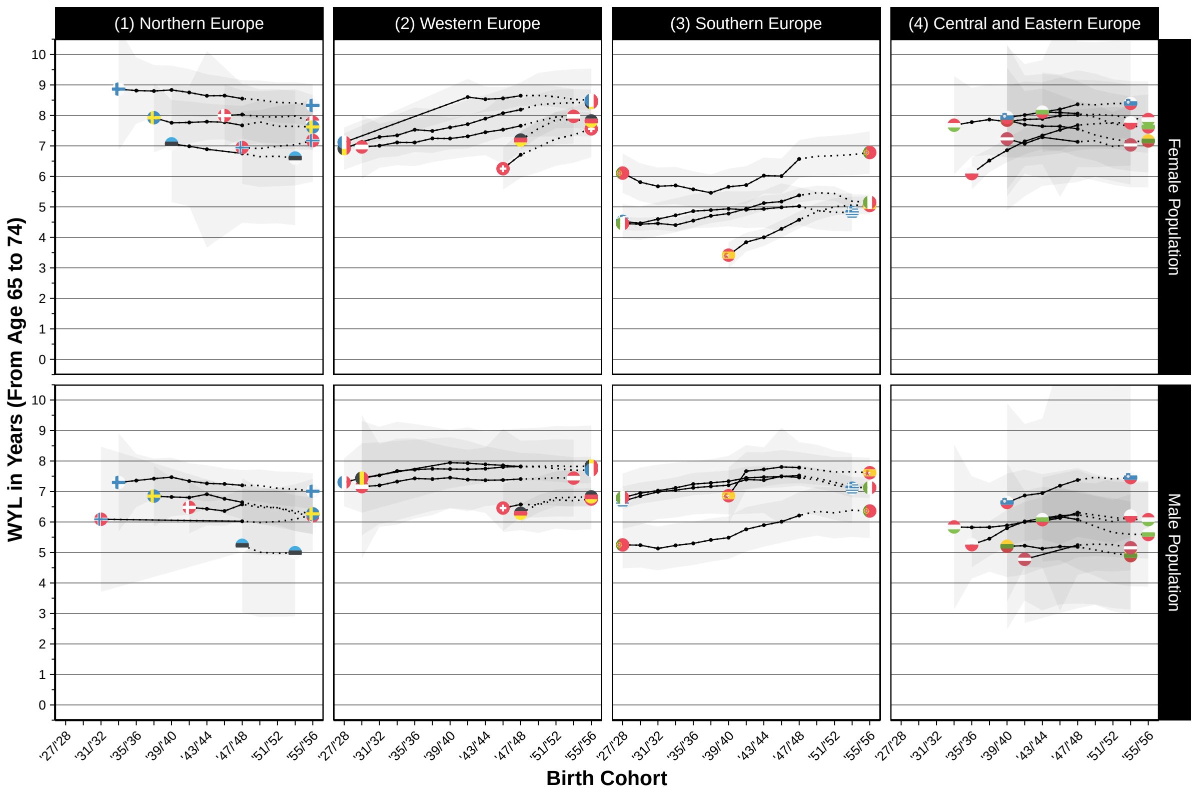


Figure A3: Cohort-level working years lost to retirement adjusted for mortality for age group 65 to 74. Notes: Own calculations based on data from EU-LFS and HMD. Shaded areas are 95% confidence intervals.

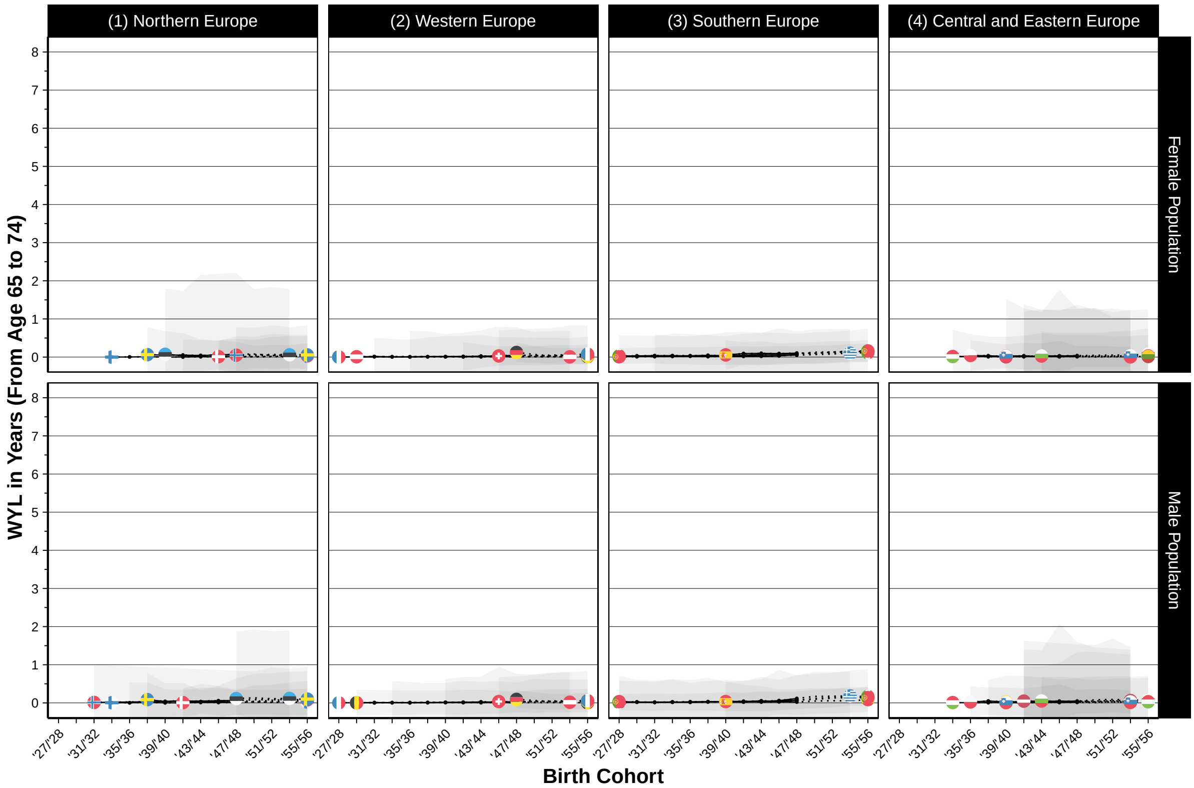


Figure A4: Cohort-level working years lost to unemployment adjusted for mortality for age group 65 to 74. Notes: Own calculations based on data from EU-LFS and HMD. Shaded areas are 95% confidence intervals.

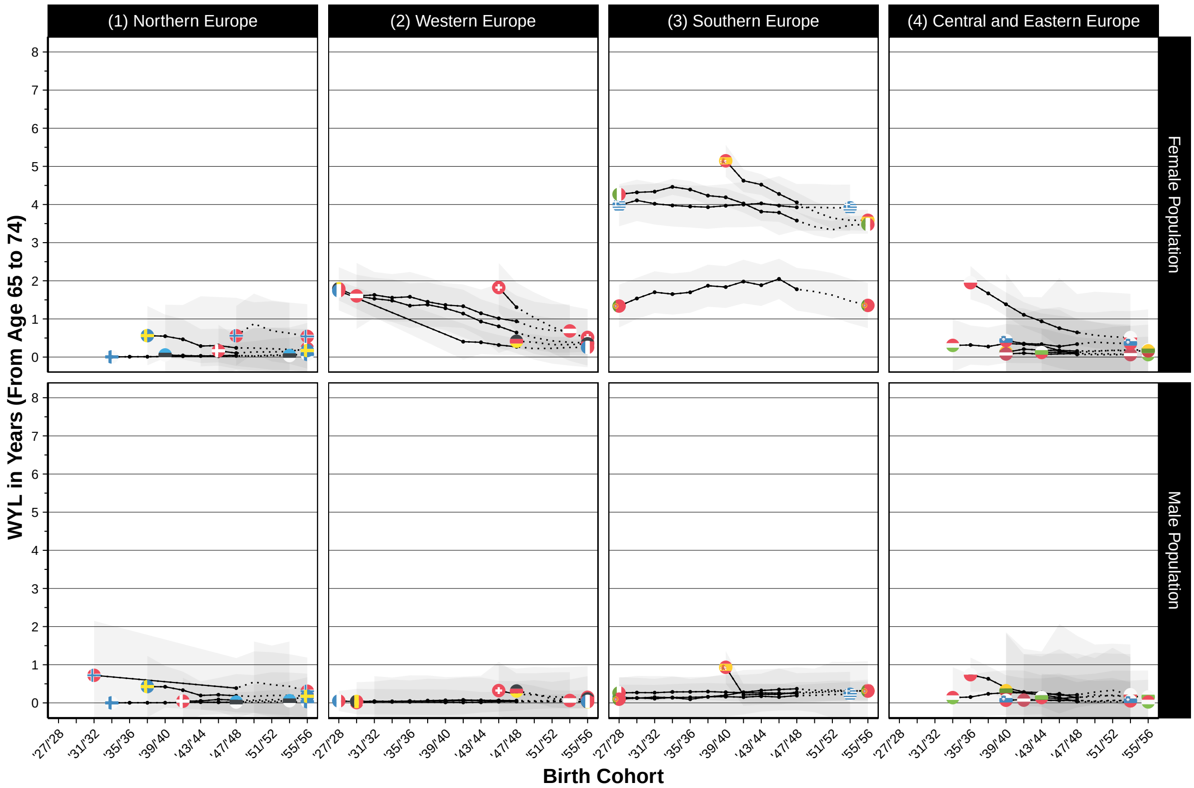


Figure A5: Cohort-level working years lost to inactivity adjusted for mortality for age group 65 to 74. Notes: Own calculations based on data from EU-LFS and HMD. Shaded areas are 95% confidence intervals.