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Konrad-Zuse-Strasse 1 · D-18057 Rostock · Germany · Tel +49 (0) 3 81 20 81 - 0 · Fax +49 (0) 3 81 20 81 - 202 · www.demogr.mpg.de

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The extension of late working life in Germany: trends, inequalities, and the East-West divide

Christian Dudel I dudel@demogr.mpg.de
Elke Loichinger
Sebastian Klüsener
Harun Sulak
Mikko Myrskylä

The extension of late working life in Germany: trends, inequalities, and the East-West divide

Christian Dudel[1*], Elke Loichinger[2], Sebastian Klüsener[2,3], Harun Sulak[2], Mikko Myrskylä[1,4]

1: Max Planck Institute for Demographic Research, Rostock, Germany
2: Federal Institute for Population Research, Wiesbaden, Germany,
3: Vytautas Magnus University, Kaunas, Lithuania
4: University of Helsinki, Finland
*: Corresponding author, email: dudel@demogr.mpg.de

Abstract: The extension of late working life has been proposed as a potential remedy for the challenges of aging societies. For Germany, surprisingly little is known about trends and social inequalities in the length of late working life. Here, we use data from the German Microcensus to estimate working life expectancy from age 55 onwards for the 1941-1955 birth cohorts. We adjust our calculations of working life expectancy for working hours, and present results for western and eastern Germany by gender, education, and occupation. While working life expectancy has increased across cohorts, we find strong regional and socioeconomic disparities. Decomposition analyses show that among males, socioeconomic differences are predominantly driven by variation in employment rates; whereas among women, variation in working hours is also highly relevant. Older eastern German women have longer working lives than older western German women, which is likely attributable to the GDR legacy of high female employment.

Keywords: Length of working life, working life expectancy, Germany, inequality, population ageing

Introduction

Extending the length of working life has been proposed as a potential remedy to the effects of population aging (e.g., European Commission 2010; OECD 2018), and has led to policy reforms in many high-income countries, including in Germany. The German population is among the oldest in the world, and the share of the population over age 67 – the prospective statutory retirement age by 2029 – is expected to further increase from 19% in 2018 to 26% in 2040 (Statistisches Bundesamt 2019). At the same time, the size of the German workforce is expected to decrease (Fuchs et al. 2018). This will put the German pay-as-you-go pension system under strain, as the number of pension recipients relative to the number of contributors will increase. In response to this trend, several pension reforms aimed at increasing labor force participation at older ages have been implemented in Germany.

Surprisingly little is known about how the length of working life has been developing in Germany, especially given the political interest in extending working life. The existing literature tends to focus on employment patterns in broad age groups, or on specific transitions during the life course, such as the transition from work to retirement. Analyzing patterns in broad age groups, such as the employment rate at ages 55 to 64, is problematic when studying trends, as these rates are influenced by the age composition of the population within this age range, and do not reflect individual working trajectories. Focusing on specific transitions like retirement might not accurately reflect the cumulative lifetime spent working, as factors such as unemployment before retirement and employment after reaching retirement age are not captured in this approach.

We use German Microcensus data for the years 1996 to 2019 to assess the levels, trends, and inequalities in the length of working life. We calculate the expected number of years spent in employment during ages 55 to 64 – or working life expectancy (WLE) – as the outcome, and adjust it for working hours (adjusted WLE; aWLE). We provide results by birth cohort for the 1941 to 1955 birth cohorts by gender, region (western vs. eastern Germany), education, and occupation. Previous literature did not adjust WLE for working hours. However, given the prominence of part-time work, particularly among women in western Germany, this adjustment is crucial to adequately capture gender inequalities. Distinguishing between western and eastern Germany acknowledges that the country was divided into West Germany and communist East Germany between 1949 and 1990. This division is still visible, including in differences in attitudes toward female employment and in women's labor force participation rates (Zoch 2021).

Our adjustment for working hours uses full-time work as a reference, and adjusts the number of years spent in employment downward based on the actual working hours relative to the full-time reference; e.g., working one year at 50% of a full-time schedule contributes half a year to aWLE. Our indicator thus answers the question of how many full-time equivalent years in total an average member of a certain birth cohort has worked between ages 55 and 64. aWLE captures all of the late working life course, unlike specific transitions or phases of the late working life course, such as the transition from work to retirement (Dudel & Myrskylä 2017). In the appendix, we also provide estimates of aWLE during the early retirement ages of 65 to 74.

We adopt a social stratification perspective, and report aWLE by education and occupation, and their intersections with gender and region. Policies aimed at increasing the length of working life have raised concerns, as it has been argued that such policies might amplify existing inequalities between older workers, and ignore the needs of disadvantaged groups (e.g., Hess et al. 2021; Krekula &

Vickerstaff 2020; Fisher et al. 2015). For instance, early retirement used to be an alternative to unemployment for low-qualified workers who lost their job before reaching the statutory retirement age. However, retiring early has become difficult, forcing some workers into unemployment (Phillipson 2019). aWLE allows us to accurately measure such social disparities in cumulative working lives. In addition, we use Kitagawa's (1955) decomposition technique to assess to what extent socioeconomic differences in aWLE are driven by employment rates or by working hours; and to what extent differences by gender and region can be explained by differences in education and occupation. Furthermore, we examine socioeconomic differentials in the lifetime spent in unemployment and in retirement or outside of the labor market.

This paper contributes to the literature in several ways. We provide the first in-depth study of WLE and social inequalities in WLE in Germany. WLE is an easy-to-understand measure used to assess how labor market inequalities accumulate. Moreover, to our knowledge, we are the first to adjust WLE for working hours. Germany is an interesting case for studying WLE trends due to the country's rapidly aging population and regional differences in labor market participation, particularly among women. Our analysis is based on a large, high-quality sample data set. As the households included in the sample were required to respond to most of the Microcensus questions, our results are not biased by unit and item non-response. Overall, our analysis sheds new light on trends and inequalities in employment trajectories in late working life in Germany.

Background

The institutional setting in Germany and late working life

To understand individual life course trajectories, it is important to conceptualize them embedded in their institutional context (DiPrete 2002). The institutional context moderates the impact of globalization and global trends, such as technological change, and it provides and restricts options for employers and employees (Hofäcker 2010). The length of working life, defined as the cumulative number of years spent in employment, depends on the institutional setting in several ways, including through the timing of retirement, but also through the time spent working before and – potentially – after reaching retirement age. In Germany, there have been three major institutional pathways to retirement, all of which have been affected by reforms (e.g., Hess et al. 2021; Romeo-Gordo & Sarter 2020): first, retiring upon reaching the statutory retirement age or collecting enough years of public pension insurance contributions; second, retiring early, sometimes following a period spent receiving unemployment benefits between leaving work and entering retirement; and, third, receiving disability pension benefits. These retirement pathways, as well as employment before and after retirement, will be discussed below.

The statutory retirement age of the German public pension system is a major threshold for employment of older workers in Germany. Many workers stop working upon reaching this age, often because their employment contract includes a clause that terminates the contract at this threshold (Börsch-Supan et al. 2019). Before 2000, the nominal retirement age was 65 for men, and was, de facto, 60 for women due to gender-specific regulations. Between 2000 and 2009, the retirement age for women was raised to the same level as that for men; i.e., to age 65. Between 2012 and 2029, the nominal retirement age is set to increase from 65 to 67 for both men and women. Specifically, men and women born in 1946 were the last cohort who reached retirement age at 65. For the cohorts born

from 1947 to 1958, the retirement age has been successively increasing by one month, such that individuals born in 1947 reached retirement age at 65 years and one month, and individuals born in 1958 will reach it at 66 years. For later cohorts, the retirement age will increase by two months per cohort, such that individuals born in 1964 will reach retirement age at 67 years.

Early retirement has become more restrictive through a series of reforms. Currently, workers can retire early at age 63 with reductions in pension benefits, or without reductions in benefits if the individual collected 45 years of pension system contributions (Hess et al. 2021). In the past, early retirement benefits were more generous. For instance, in West Germany in the 1980s, and with some restrictions until 2007, one pathway to retirement was leaving employment at age 58, receiving unemployment benefits for two years, and then retiring at age 60 (Buchholz et al. 2013).

Receiving disability pension benefits was a common pathway to retirement in the past, but it has become considerably less relevant today due to several reforms (Börsch-Supan & Ferrari 2019; Fasang 2010; Hagen et al. 2010; Börsch-Supan & Juerges 2011). Before the enactment of major reforms in 1984 (West Germany) and 2001, the requirements for collecting disability pension benefits were low. Moreover, it was possible to convert a disability pension into a regular old-age pension at age 60 without actuarial adjustments after 35 years of employment, making it a potential alternative to the unemployment-retirement pathway. However, the requirements for receiving disability pension benefits have become much stricter. The threshold for converting a disability pension into an old-age pension was increased from age 60 to age 63 in 2001, and to age 65 in 2012 (Hess et al. 2021).

While unemployment among older workers in Germany used to be high because of the abovementioned unemployment-retirement pipeline (Knuth & Kalina 2002), it has declined since the enactment of pension and labor market reforms in 2006, which made unemployment less attractive for older workers (Dlugosz et al. 2014). Also relevant for unemployment is that the German labor market is an insider-outsider market in which strong labor protections are tied to seniority (Bennet & Möhring 2015). Thus, dismissing older workers can be difficult. However, once older workers have been laid off, they may experience difficulties finding a new job, which can increase the length of their unemployment spells. In addition, older workers often face age discrimination (Büsch et al. 2009).

Working after reaching retirement age has become more common in recent years across high-income countries (Dingemans & Möhring 2019), including in Germany (Hofäcker & Naumann 2015). While employment levels among people over age 65 have been increasing continuously in Germany since 2000 (Larsen & Pedersen 2017), they remain low, and are lower than they are in other countries (Dingemans et al. 2017), and returning to work after retiring is uncommon (Hofäcker & Naumann 2015). In light of these findings, we focus our main analysis on late working life before retirement, and provide results for employment after reaching retirement age in the appendix.

Late working life in Germany: highly gendered, highly stratified

Social stratification becomes visible when we look at the conditions in which individuals experience major life course transitions, and the options they have for making these transitions (Radl 2013). The German labor market is highly stratified along several dimensions. Here, we focus on dimensions of social stratification that have been shown to be highly relevant for older workers (Visser et al. 2016): namely, gender, education, and occupation. We also study how gender interacts with the latter two dimensions (Radl 2013).

The German labor market is highly gendered, and the employment rates of women are still considerably lower than those of men, despite increasing constantly since the 1970s (BiB 2019). This is largely due to the German institutional setting favoring the male breadwinner model (Fasang 2010). The tax system incentivizes women to work part time or to leave the labor market (Fasang et al. 2013), and labor force participation is particularly low for women with children (e.g., Vlasblom & Schippers 2006). If women want to return to the labor market, they are confronted with the insider-outsider nature of the German labor market, which makes it difficult for them to return to work (Fasang et al. 2013).

In Germany, women retire earlier than men for several reasons. They often retire at the same time or shortly after their partner (Radl & Himmelreicher 2015; BiB 2020b), who is, on average, older. Moreover, women are more likely than men to provide informal care, and to leave the labor market and retire when providing care (Meng 2011; Schneider et al. 2001; Backhaus & Barslund 2021). Finally, women are less likely than men to work after retiring (Dingemans et al. 2017; Hokema & Scherger 2016).

Educational attainment and occupation are closely linked in Germany, and the occupational system is highly standardized with specialized certificates (Buchholz 2006). Access to vocational certificates and universities is dependent on educational attainment, creating strong links between school and work (Rözer & van de Werfhorst 2020). This system greatly restricts the options of individuals with low educational attainment, who are much more likely than individuals with higher educational attainment to be unemployed (Klein 2015). This is partly because they often work in shrinking sectors and occupations, such as manufacturing. Moreover, they may find it difficult to change occupations after a job loss due to the lack of a matching certificate (Murphy 2014; Buchholz 2006).

The educational and occupational inequalities among older workers are exacerbated by the fact that the vocational education system in Germany is aimed at younger people (Frerichs & Naegele 1997; Buchholz 2006). Combined with the reforms described above, this leads to lower qualified individuals having higher unemployment rates before retirement than highly qualified individuals (Buchholz et al. 2013). These workers also retire earlier (e.g., Himmelreicher et al. 2009), and have a higher risk of becoming disabled and receiving disability pension benefits (Hagen et al. 2010).

The legacy of the East-West divide

Since German reunification in 1990, there have been persistent East-West differences in labor market, retirement, and unemployment patterns (e.g., Hofäcker & Naumann 2015); as well as in gender relations (e.g., Zoch 2021; Fisher 2010) and in health (e.g., Kühn et al. 2019). After reunification, unemployment soared in eastern Germany, and it was particularly high among older workers, as there was a particular pathway from employment to retirement via unemployment that was only open to them (Ernst 1996; Buchholz et al. 2013): as these workers could retire early at age 60 with up to five years of prior unemployment, they had a de facto retirement age of 55. This age was increased to 57 in 1992, and since 1995, the retirement rules have been similar in eastern and western Germany.

Today, unemployment is generally higher in eastern than in western Germany, including among older workers (Steiner 2017). However, the East-West differences in unemployment rates have decreased somewhat since unification. Compared to western Germans, eastern Germans have a higher risk of retiring early or at the statutory retirement age (Hofäcker & Naumann 2015), and of receiving

disability pension benefits (Hagen et al. 2010). However, the gender gaps in work and retirement are much smaller in the East than in the West. Compared to their western counterparts, eastern German women are more likely to work full time, and are less likely to work part time or to be a housewife (Simonson et al. 2011). This is partly because motherhood has a smaller negative effect on employment in the East than in the West (Matysiak & Steinmetz 2008).

Working life expectancy: Measuring the length of working life

Working life expectancy (WLE) allows us to assess employment over the entire late working life course. WLE is defined as the average remaining lifetime spent in employment at a certain age; e.g., WLE at age 55. The concept of WLE is not new, with early references dating back at least 70 years (Wolfbein 1949). However, interest in WLE has increased in recent years (e.g., Dudel & Myrskylä 2020; Kadefors et al. 2019; Robroek et al. 2019). Alternative terms for WLE include (average) duration of working life, worklife expectancy, and labor market life expectancy (Hoem 1977; Loichinger & Weber 2016). WLE is based on a demographic perspective, and is analogous to concepts like life expectancy and healthy life expectancy. In this paper, we adjust WLE for the number of hours worked, and call the resulting measure aWLE, which shares most of the properties of WLE.

Because WLE captures complex trajectories and the whole of working life in a way that is easy to understand, it is a useful indicator of the state of labor markets and the sustainability of social security systems (Lorenti et al. 2018). Moreover, comparing WLE across socioeconomic groups can shed light on labor market inequalities, as it shows how labor market (dis)advantages can accumulate (Hayward & Lichter 1998). Finally, WLE is easy to understand, and is a less abstract outcome than probabilities, rates, or odds ratios. Methods and data for calculating WLE are readily available (see the next section).

WLE can be studied from a cohort perspective or from a period perspective (also see Leinonen et al. 2018). In the period perspective, data for one or a few years can be used to construct synthetic working trajectories, and to estimate the WLE arising from these synthetic trajectories. With this approach, the prevailing conditions in a given period can be summarized, and WLE can be estimated even when no complete working trajectories of actual cohorts are observed. However, the results are artificial in the sense in that they do not describe the real experiences of individuals. By contrast, the cohort perspective is based on real working trajectories, and thus provides a more realistic picture. The data demands are considerably higher for a cohort analysis than for the period perspective. However, the data used in this paper allow us to study aWLE by birth cohort.

Data and methods

Data and variables

We use data from the German Microcensus for the years of 1996 to 2019. The Microcensus is an annual survey conducted by the German Federal Statistical Office. It has been running since 1957 (until 1990 only in West Germany), and is a 1% sample of all German households. As participation in the survey is compulsory if a household is sampled, there is virtually no non-response. Moreover, there is no non-response for key items in the questionnaire, or it is negligible, as the participants are required to answer most questions. For an overview of the Microcensus, see Statistisches Bundesamt (2020a, 2017).

The key variables that we use to construct WLE are birth year and age, employment status, and working hours. For the questions on which these indicators are based, responses are compulsory. We consider the 1941 to 1955 birth cohorts. Thus, our sample covers cohorts born during the war and during the start of the baby boom, which began in Germany in the mid-1950s. Age is calculated for each individual as survey year minus year of birth, and is thus defined as the age reached during the year. We count individuals as employed or unemployed following the conventions of the International Labor Organization (ILO). Individuals count as employed if they are working at least one hour per week; and as unemployed if they are not employed, have been actively looking for work in the last four weeks, and are available to start work in the next two weeks. Individuals who are neither employed nor unemployed are classified as inactive. The working hours of an individual are captured through a question on the number of hours the respondent typically works in a week, including regular overtime (Statistisches Bundesamt 2020b).

We stratify our analysis by gender (men/women) and by region (eastern Germany/western Germany), as well as by educational attainment and (former) occupation. Educational attainment is classified based on a coarsened version of the International Standard Classification of Education (ISCED) of 1997 using three levels: lower secondary education only (ISCED levels 0 to 2), upper and post-secondary non-tertiary education (ISCED levels 3 to 4), and tertiary education (ISCED levels 5 to 6). While a more recent revision of the ISCED classification is available, we use the 1997 classification, as it can be consistently applied to all years we cover in the analysis, and using the more recent classification would essentially lead to the same assignment of educational levels to individuals. For occupation, we use the International Standard Classification of Occupations (ISCO) to distinguish four levels: elementary occupations and unskilled labor (ISCO 9), skilled workers (ISCO 4-8), technicians and associate professionals (ISCO 3), and professionals and managers (ISCO 1-2). For individuals who are no longer working, we use their former job to assign them an occupation.

Methods

To calculate WLE and to adjust it for working hours (aWLE), we use a modified version of Sullivan's method (1971). With this method, we can calculate population-level aggregates of individual trajectories. The main components are age-specific employment rates and age-specific average working hours measured in full-time equivalents. For each year-age-cohort combination, we calculate the employment rate as the number of individuals in employment divided by the total number of individuals, whereby we weight individuals with the person-level survey weights provided with the Microcensus. The adjustment for working hours is then achieved by weighting employment rates with the ratio of average actual work hours to 40 hours; e.g., if the average number of working hours is 30, the employment rate is multiplied by 0.75. Thus, assuming that a full-time work schedule is, on average, 40 hours per week, aWLE is reported in full-time equivalent years.

Based on adjusted employment rates, we calculate aWLE over 10-year age intervals by cohort. We focus on WLE for ages 55 to 64; i.e., aWLE in late working life. aWLE is estimated using the sum of the employment rates for ages 55 to 64 for each of the birth cohorts from 1941 to 1955. We have chosen to end WLE in late working life at age 64 and not at a higher age because although the statutory retirement age has increased to more than 65 years for some of the cohorts we cover, it has not yet reached age 66 for any of them. Moreover, employment levels after age 65 are rather low in Germany. However, additional results for the 65 to 74 age range are provided in the appendix (Figure A3).

We decompose socioeconomic differences in aWLE into two components using Kitagawa's (1955) method, and in two different applications. In the first application, the first component shows to what extent the differences between occupational and educational groups are driven by differences in employment rates, while the second component shows the relative contributions of working hours to the differences. For instance, the difference in aWLE between two groups could be two years, while the first component is 70%, and the second component is 30%. This would mean that 70% of the two-year difference is due to differences in employment rates between the two groups, while only 30% is due to differences in working hours. In the second application, we decompose differences in aWLE by gender and region into the differences due to combined employment rates and working hours conditional on education or occupation (component 1), and into the differences due to differences in educational or occupational composition (component 2). For example, the difference in aWLE between two groups could be three years, with 40% of this difference being due to differences in employment and working hours, i.e., to people with the same educational attainment in the two groups having different employment rates and working hours; and 60% of this difference being due to compositional differences, e.g., to people with high educational attainment making up a smaller share of one group than the other.

The SAS and R code for our analysis is available online here: https://osf.io/eb2qs/.

Results

Sample size and employment rates

For our estimates of WLE for the 55 to 64 age range, the smallest number of observations (person-waves) per cohort is for the 1945 cohort, for whom the data include 64,091 observations for men and women together. The cohort with the most observations is the 1941 cohort, with 108,306 observations. Generally, the number of observations per cohort roughly reflects the size of the cohort, with the cohorts born closest to the end of World War II being the smallest.

Before we turn to the WLE, we first show employment rates by age for the 55 to 64 age range for selected cohorts and subgroups (men and women in western and eastern Germany). The employment rate declines with age for all subgroups and cohorts, and is below 50% for all groups and cohorts at age 64 (Figure 1). The employment rate of the 1941 cohort declines almost linearly for all subgroups, and is below 20% at age 64, except among western German men. In contrast, for the 1955 cohort, the employment rate declines at a much slower pace. While the differences between the 1941 and 1955 cohorts are comparatively small at age 55, they are largest at age 62 for all groups, with the absolute difference ranging from 33 percentage points for western German men to 44 percentage points for eastern German women.

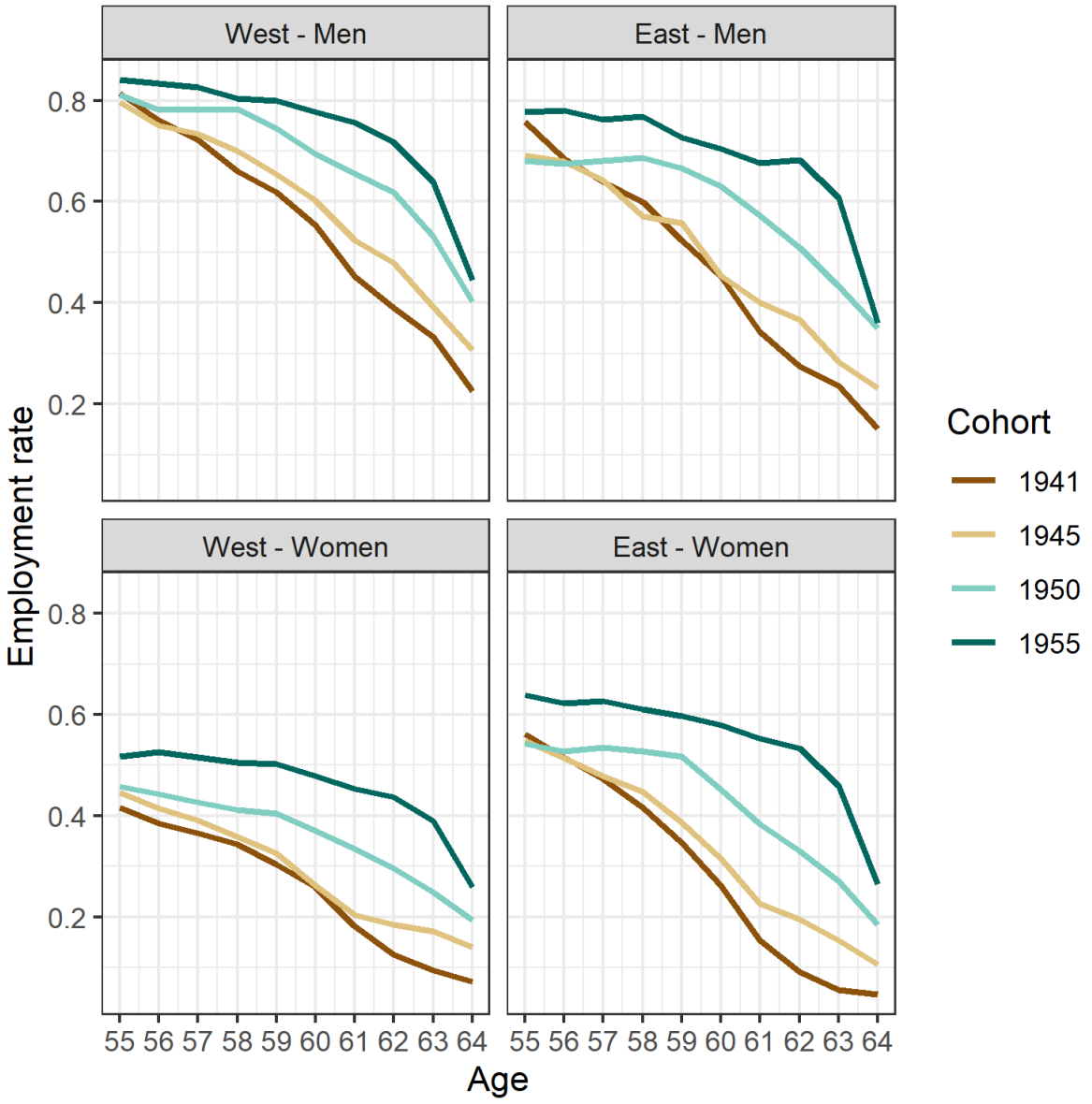

Figure 1: Age-specific employment rates from age 55 to age 64 by gender and region (western Germany/eastern Germany), and for selected birth cohorts (1941, 1945, 1950, 1955). Source: Microcensus, own calculations.

General trends in the length of late working life

Trends in working life expectancy adjusted for working hours (aWLE) in late working life (ages 55 to 64) are shown in Figure 2 as solid lines, by gender and region. Unadjusted WLE, which is more frequently reported in the literature, is shown as dashed lines. Both indicators can theoretically reach a maximum of 10 years for the analyzed age range. The solid blue line in the left-most panel of Figure 1 shows that men born in western Germany in 1941 could expect to work around 5.5 years in full-time equivalents during ages 55 to 64. Generally, all results for aWLE are measured in years in full-time equivalents. Western German men born in 1955 had an aWLE of 7.4 years, which implies an increase of aWLE of around 40% compared to the cohort of 1941. The 95% confidence intervals are shown as gray ribbons, and are generally narrow around the point estimates due to the large sample size for each cohort. Additional results for Germany in total and for both genders combined are provided in the appendix (Table A1 and Table A2).

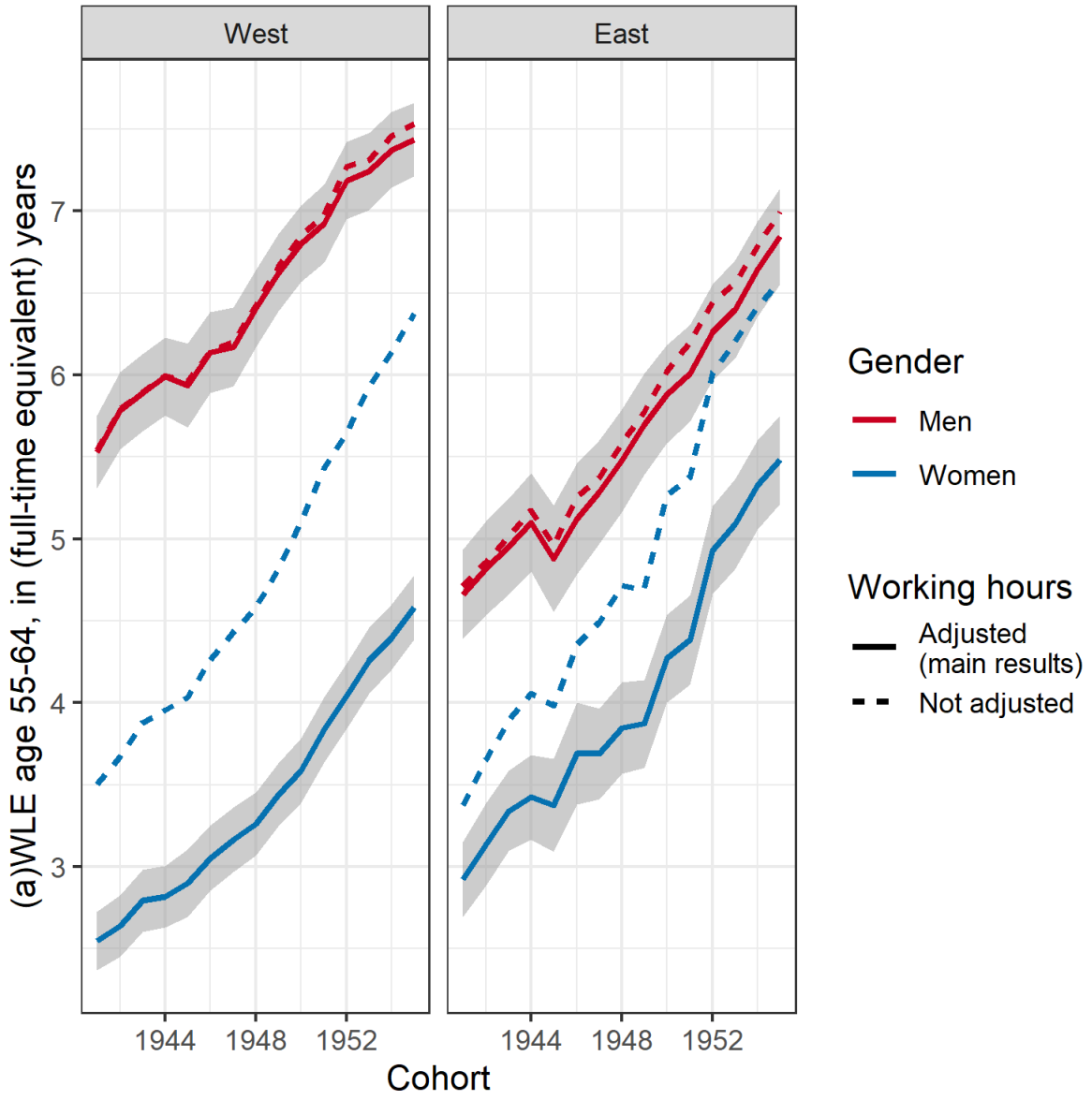

Figure 2: Adjusted working life expectancy (aWLE; solid line; measured in full-time equivalent years) in late working life (ages 55 to 64) in Germany by birth cohort (1941-1955), region (western/ eastern Germany) and gender. 95% confidence intervals shown as gray ribbons. Dashed lines show WLE not adjusted for working hours (measured in years). Source: Microcensus, own calculations.

Among the cohorts born between 1941 and 1955, the length of working life has been increasing for both men and women in both the East and the West. While the trend of increasing aWLE is rather consistent across subgroups, there are differences in the levels of WLE. For instance, in the most recent birth cohort covered in the analysis, aWLE is around 7.4 years for men in western Germany, while it is 4.6 years for women in western Germany. The gap in aWLE between men and women stays roughly constant in western Germany, and declines slightly in the east, from 1.7 years for the 1941 cohort to 1.4 years for the 1955 cohort.

While aWLE and WLE are rather similar, there are marked differences for women, with aWLE being considerably lower than WLE due to the high prevalence of part-time work among German women,

particularly in western Germany. This latter finding highlights the importance of taking working hours into account.

Comparing regional differences in aWLE by gender reveals that for men, the differences between western and eastern Germany have been relatively stable for most cohorts, with western German men generally having an advantage of 0.8 and 0.9 years, which has, however, decreased to 0.6 years for recent cohorts. For women, the differences between East and West are reversed, and have increased over time: compared to their western German counterparts, eastern German women born in 1941 could expect to work 0.4 more years, while those born in 1955 could expect to work 0.9 more years.

Educational inequalities

Figure 3 shows aWLE in late working life by education. Each level of education subsumes several levels of the ISCED 1997 classification: low educational attainment (ISCED levels 0-2), medium educational attainment (ISCED levels 3-4), and high educational attainment (ISCED 5-6). The 95% confidence intervals are again shown as gray ribbons.

Overall, aWLE has been increasing for all educational groups, at least when the 1941 and 1955 cohorts are compared. For instance, the aWLE of western German men with high educational attainment (ISCED 5-6) has increased by 1.3 years, from 7.1 years (1941 cohort) to 8.4 years (1955 cohort). For most other groups, the increase has been similar or higher, although there are some exceptions (see below). However, the levels of aWLE differ considerably between groups, and display a clear positive social gradient. For the 1955 cohort, the group with the highest aWLE are western German men with high educational attainment (8.4 years), while the group with the lowest aWLE are eastern German women with low educational attainment (2.8 years). This means that measured in full-time equivalents, highly educated western German men work more than three times as long as eastern German women with low educational attainment.

Comparing the aWLE by educational level within the regional and gender groups reveals that the differences are larger in the East than in the West, and that the differences between the high and the low educated have been increasing in the East, but have been changing little or not at all in the West. This finding be could at least partly driven by the fact that in the East, the lowest educational group is smaller and more selective. In eastern Germany, the difference in aWLE between the highest and the lowest educated men has increased from 3.2 years for the 1941 cohort to 4.1 years for the 1955 cohort. Among eastern German women, this difference has developed roughly similarly, from 2.9 years (1941) to 4.3 years (1955), respectively. Among eastern German men, the increase in this difference is mostly due to a decline in aWLE of 0.7 years among low educated men from the 1945 and 1946 cohorts to the 1947 and 1948 cohorts. Among the younger cohorts, aWLE has also steadily increased for the lower educated.

Comparing individuals with high education to individuals with medium education shows that the difference in aWLE declined, particularly among men in the West. For western German men, the difference in aWLE between high and medium educated individuals was 1.9 years for the 1941 cohort, while it was 1.2 years for the 1955 cohort.

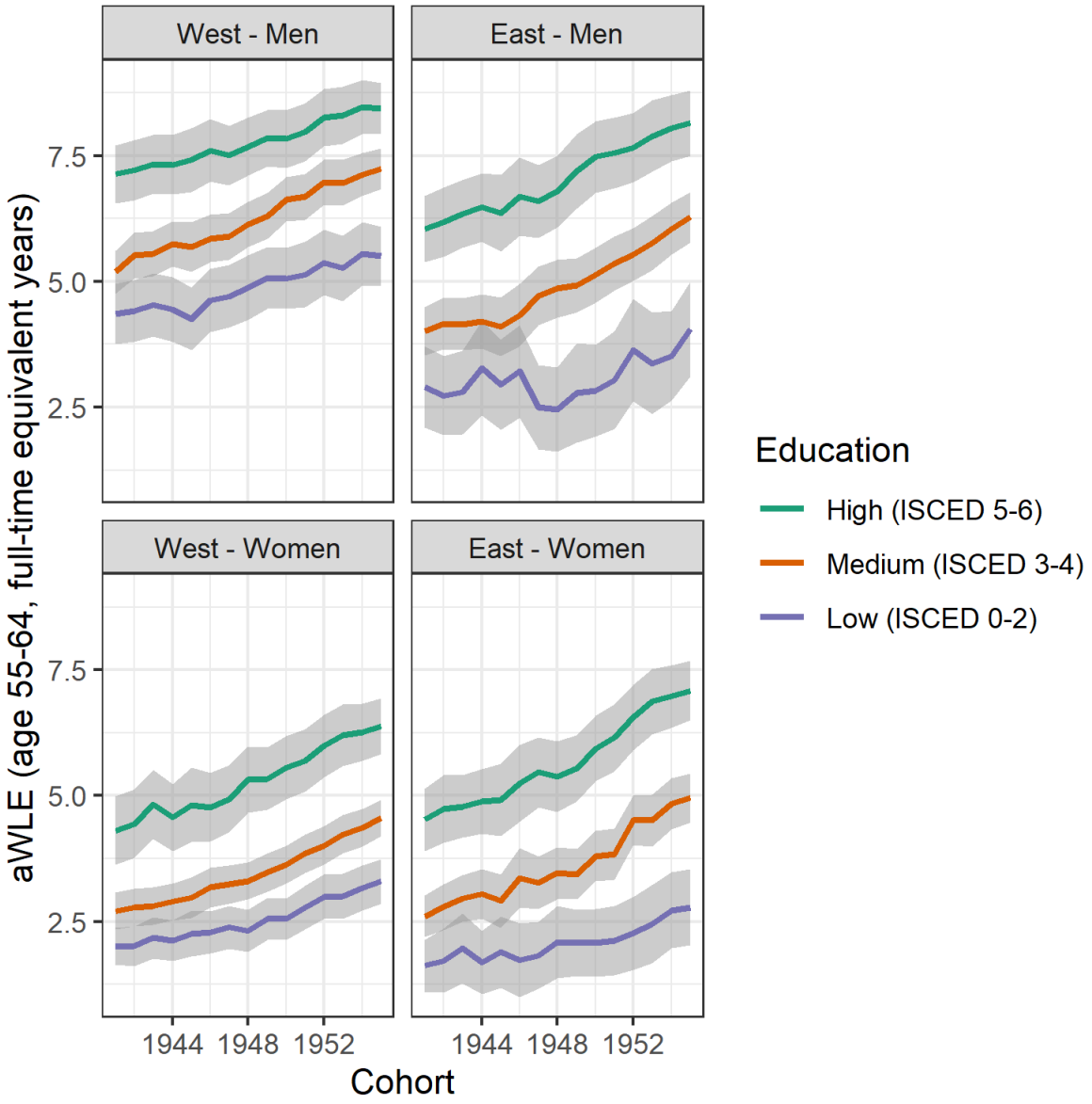

Figure 3: Adjusted working life expectancy (aWLE; measured in full-time equivalent years) in late working life (ages 55 to 64) by birth cohort (1941-1955), region (West, East), gender, and education according to the ISCED-97 classification. 95% confidence intervals shown as gray ribbons, with overlapping confidence intervals shown in a darker shade. Source: Microcensus, own calculations.

Occupational inequalities

The results for aWLE by occupation are shown in Figure 4, where we distinguish four occupational levels based on the ISCO classification: low occupational level (ISCO 9; elementary occupations/unskilled labor), medium-low occupational level (ISCO 4-8; skilled workers), medium-high occupational level (ISCO 3; technicians and associate professionals), and high occupational level (ISCO 1-2; professionals and managers).

aWLE has been increasing for all occupational groups in western and eastern Germany, and for both men and women. For example, the aWLE of eastern German women with medium-low occupation has doubled from 2.4 (1941 cohort) to 5.0 (1955 cohort). Several other groups have experienced a similarly steep increase in aWLE. However, the differences between occupational levels are again

rather large. For the 1955 cohort, western German men with a high occupational level have the highest aWLE, at 8.5 years; while eastern German women with a low occupational level have the lowest aWLE, at 3.2 years.

The occupational differences by gender and region are also marked, and have been increasing among men: while the difference between the lowest and the medium-low occupational level was 0.8 years for western German men of the 1941 cohort, it has increased to 1.9 years for the 1955 cohort. For eastern German men, these differences are 0.3 years (1941) and 2.0 years (1955), respectively.

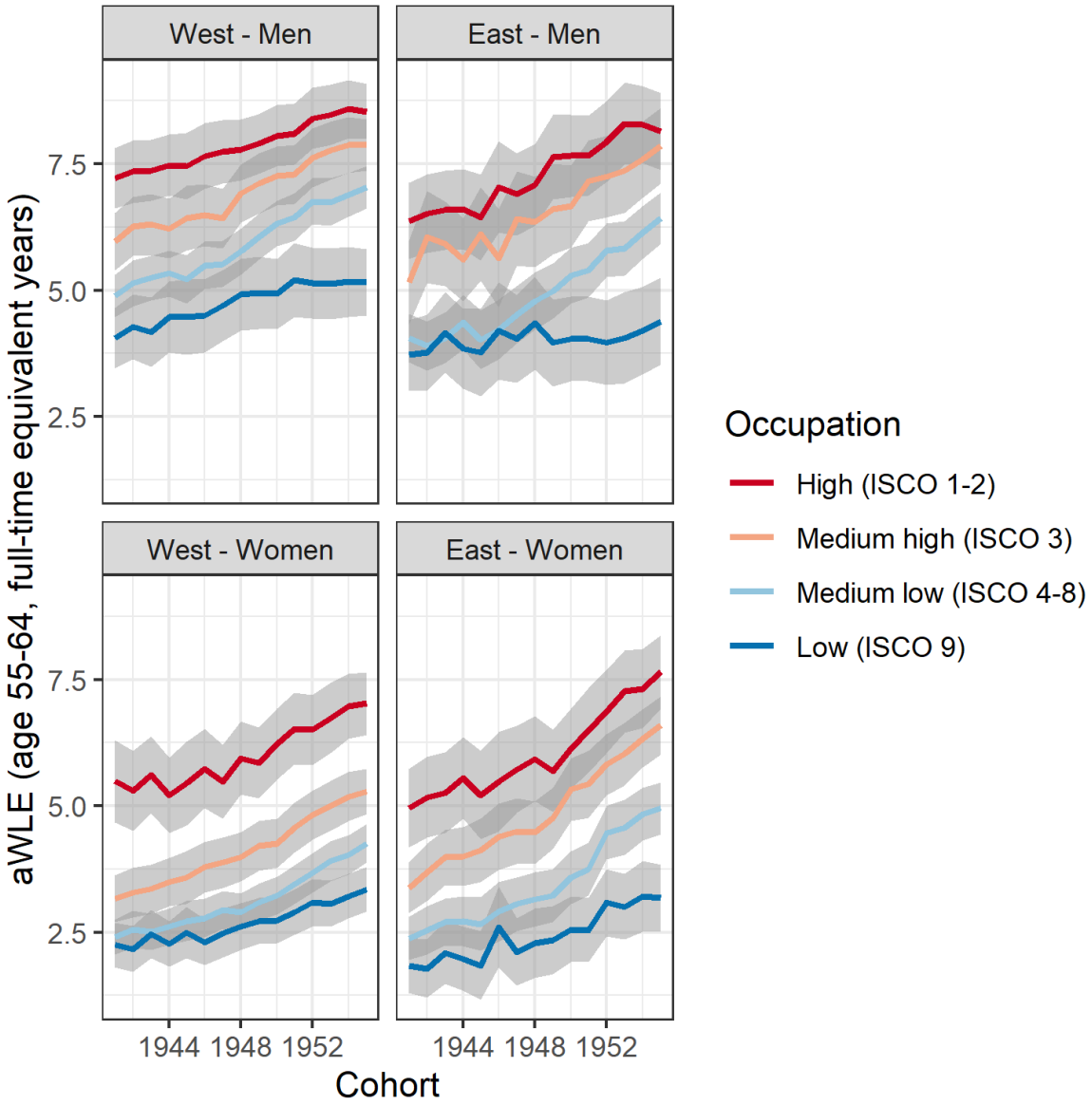

Figure 4: Adjusted working life expectancy (aWLE; measured in full-time equivalent years) in late working life (ages 55 to 64) by birth cohort (1941-1955), region (western/eastern Germany), gender, and occupation according to the ISCO classification. 95% confidence intervals shown as gray ribbons, with overlapping confidence intervals shown in a darker shade. Source: Microcensus, own calculations.

Where do the inequalities come from?

The results of the decomposition analysis showing the contribution of employment rates and the contribution of working hours to total group differences are shown in Table 1. The first part of the table uses western German men born in 1955 as the reference group, and shows for the remaining groups the differences in aWLE between them and western German men ("Difference" column; aWLE of the reference group minus aWLE of the comparison group), and the contribution of employment rates (Component 1) and of working hours (Component 2) to these differences. Not surprisingly, the differences between men in western and eastern Germany are largely driven by employment rates (88.6%), while the differences between women and men are mainly due to differences in working hours. In the West in particular, the differences between men and women are largely explained by differences in working hours (65%).

Table 1: Results of the first decomposition analysis, all based on the 1955 cohort. The "Difference" column shows the differences in aWLE between the reference group and the corresponding group (measured in full-time equivalent years). "Component 1" represents the relative contribution of employment rates to these differences, while "Component 2" shows the relative contribution of working hours to these differences. The first part of the table shows results using western German men as the reference; the second part uses western German men with high educational attainment as the reference; and the last part uses western German women with high educational attainment as the reference. Source: Microcensus, own calculations.

Gender	Region	Education	Difference (in years)	Component 1 (Employment)	Component 2 (Working hours)
Men	*West*	*Total*		(Reference)	
	East	*Total*	0.6	88.60%	11.40%
Women	*West*	*Total*	2.9	34.62%	65.38%
	East	*Total*	2.0	44.23%	55.77%
Men	*West*	*High (ISCED 5-6)*		(Reference)	
		Medium (ISCED 3-4)	1.2	87.78%	12.22%
		Low (ISCED 0-2)	2.9	84.14%	15.86%
	East	*High (ISCED 5-6)*	0.3	98.04%	1.96%
		Medium (ISCED 3-4)	2.2	84.78%	15.22%
		Low (ISCED 0-2)	4.4	87.68%	12.32%
Women	*West*	*High (ISCED 5-6)*		(Reference)	
		Medium (ISCED 3-4)	1.8	51.53%	48.47%
		Low (ISCED 0-2)	3.1	63.77%	36.23%
	East	*High (ISCED 5-6)*	-0.7	24.33%	75.67%
		Medium (ISCED 3-4)	1.4	85.14%	14.86%
		Low (ISCED 0-2)	3.6	81.38%	18.62%

The second and the third parts of Table 1 show the results by educational attainment. For men, highly educated western German men are used as the reference group; while for women, highly educated western German women serve as the reference. The results for men confirm the previous finding that the differences are largely driven by employment rates. For women, the results are more mixed. The finding that western German women with medium and low education have lower aWLE than the reference group is mainly driven by differences in working hours. Highly educated women in eastern Germany work 0.7 years more than their western German counterparts, and three-quarters of this

difference can be accounted for by working hours. In contrast, the differences between highly educated western German women and eastern German women with low and medium education are largely due to disparities in employment rates. The results by occupation are shown in the appendix, and are qualitatively similar (Table A3).

Table 2 shows the findings of our second decomposition analysis, which assesses to what extent inequalities by gender and region are driven by differences in employment/hours, or by differences in education and occupation. Additional descriptive results showing the distribution of education and occupation for each group can be found in the appendix (Figure A1 and Figure A2). The results are again for the most recent cohort (1955), and western German men are used as the reference. In the upper part of the table, the second component shows the impact of education; while in the lower part of the table, it shows the impact of occupation. Both education and occupation contribute little to the differences between western German men and women in western and eastern Germany. Their contributions to the differences between western and eastern German men are somewhat larger, particularly for occupation, but the total differences that need to be explained are small in this case.

Table 2: Results of the second decomposition analysis, all based on the 1955 cohort. The "Difference" column shows the difference in aWLE between the corresponding group and the reference group (measured in years). "Component 1" shows the relative contributions of combined employment rates and working hours, while "Component 2" shows the impact of differences in educational attainment (upper part of the table) and occupation (lower part).

Gender	Region	Difference (in years)	Component 1 (Employment/hours)	Component 2 (Educ./Occup.)
			Education	
Men	*West*		(Reference)	
	East	0.64	83.8%	16.2%
Women	*West*	2.76	88.4%	11.6%
	East	1.87	92.8%	7.2%
			Occupation	
Men	*West*		(Reference)	
	East	0.67	72.6%	27.4%
Women	*West*	2.63	90.7%	9.3%
	East	1.75	93.9%	6.1%

Table 3 shows the proportion of lifetime from age 55 to age 64 spent in employment, unemployment, and retirement or out of the labor market (economically inactive). These results are again based on the 1955 cohort, and the outcomes are presented by gender, region, and education. The findings by occupation are available in the appendix, and are qualitatively similar (Table A4).

Table 3: Proportion of lifetime spent in each of three states (employed, unemployed, retired/inactive) from age 55 to age 64 for the 1955 cohort, by gender, region, and education. Source: Microcensus, own calculations.

Gender	Region	Education	Employed	Unemployed	Retired/ Inactive
Men	*West*	*High (ISCED 5-6)*	84.7%	1.9%	13.4%
		Medium (ISCED 3-4)	74.1%	3.5%	22.5%
		Low (ISCED 0-2)	59.1%	6.5%	34.4%
	East	*High (ISCED 5-6)*	82.2%	3.9%	13.9%
		Medium (ISCED 3-4)	66.1%	8.2%	25.7%
		Low (ISCED 0-2)	45.2%	11.3%	43.5%
Women	*West*	*High (ISCED 5-6)*	77.0%	1.6%	21.4%
		Medium (ISCED 3-4)	64.5%	2.3%	33.2%
		Low (ISCED 0-2)	50.3%	3.4%	46.3%
	East	*High (ISCED 5-6)*	78.9%	3.0%	18.0%
		Medium (ISCED 3-4)	61.6%	7.7%	30.7%
		Low (ISCED 0-2)	39.0%	7.8%	53.2%

Almost all groups spend at least 50% of their late working life in employment, except eastern German men and women with low educational attainment. For these groups, a large share is spent in retirement or inactivity, while the smallest share is spent in unemployment. However, the share spent in unemployment is larger for these groups than for other groups; e.g., eastern German men with low educational attainment spent more than five times as long in unemployment than western German men with high educational attainment. More generally, for all groups, most of the lifetime not spent in employment is spent in retirement or inactivity, and only a small part is spent in unemployment.

Discussion

Main findings

Using data from the German Microcensus for the years 1996 to 2019 and studying the 1941-1955 birth cohorts, we analyzed inequalities in the length of working life at the population level. Expanding on previous literature, we adjusted working life expectancy for working hours, which we called aWLE. Our findings showed that aWLE by birth cohort has been increasing steadily in Germany across educational and occupational groups, for both men and women, and in eastern and western Germany. However, the differences in the aWLE levels found between socioeconomic groups are very large. Individuals in the group with the highest aWLE (western German men with high educational attainment) work, on average, three times as many years as individuals in the least advantaged group (eastern German women with low educational attainment). Moreover, while aWLE has been increasing for all groups, some have experienced slower growth than others, and are at risk of falling behind. This is particularly the case for men and women in eastern Germany with low educational attainment, and for men in both parts of the country working in elementary and unskilled jobs.

The steady increase in aWLE we found is consistent with trends in employment rates at older ages, which have increased steadily in Germany since 2000 (e.g., Buchholz et al. 2013). This steady increase

was likely caused, first, by the relatively strong performance of the German labor market in most of the years we covered; and, second, by pension and labor market reforms (Hess et al. 2021). However, it is difficult to attribute this increase to specific reforms, as there have been many overlapping changes (Steiner 2017). While changes in the composition of cohorts, such as increasing educational attainment, likely also contributed to these trends, other factors have played a role as well. For instance, while western German men, like the other groups, have seen a steady increase in aWLE, their educational attainment has changed only slightly for the cohorts we studied (see the appendix). The share of working life contributed at ages 65 to 74 has also been increasing, but at a low level, which shows that work at these ages is still not the norm, although it is becoming more common (see the appendix).

The gender gaps in aWLE we observed are as expected: men work more years than women, and differences in education or occupation are not major drivers of gender differentials. Generally, women's employment rates have been considerably lower than men's employment rates for several reasons. First, the German tax system favors the male breadwinner model. Second, women face difficulties re-entering the labor market after leaving work to raise children (Fasang et al. 2013). Moreover, while men usually work full time, women often work part time.

The aWLE of men is lower in eastern Germany than in western Germany because in the East, unemployment is higher and there is less demand for older workers (Hess 2016). However, the gender gap in aWLE is lower in the East than in the West, as eastern German women are more likely to work than their western counterparts (Simonson et al. 2011). In addition, eastern German women work more hours. Notably, differences in aWLE between the two regions have been decreasing slightly over the cohorts we studied, as labor market conditions have been improving in the East after a period of high unemployment in the 1990s (Schneider & Rinne 2019). For these reasons, aWLE (without distinguishing between gender) has been slightly higher in eastern Germany than in western Germany for recent cohorts (6.1 years vs. 6.0 years; see the appendix), which suggests that to increase the length of working life, women must be integrated into the labor market. Nevertheless, East-West differences persist, and could be interpreted as a legacy of the division of Germany: the youngest birth cohorts we observed were 35 years old at the time of the reunification, which means that all of the cohorts we studied were socialized in the GDR, where female full-time employment was much more common than it was in West Germany.

Our findings on educational and occupation differentials in aWLE in late working life indicate that higher educational attainment and higher occupational status are associated with higher aWLE. Thus, for several reasons, the higher risk of unemployment lower qualified individuals face in their late working life is not offset by staying in the labor market longer. First, the insider-outsider nature of the German labor market makes it difficult for unemployed older workers to find a job (Bennet & Möhring 2015). Second, it is still common for work contracts to terminate at the statutory retirement age (Börsch-Supan et al. 2019), which makes it difficult for some older people to work longer in the same job to compensate for past unemployment. Third, older people are often unable to continue working in physically demanding jobs. While our findings uncovered large socioeconomic differentials in unemployment, they also showed that the lifetime disadvantaged groups do not spend in employment is mostly spent in retirement or out of the labor market. Moreover, a substantial fraction of the socioeconomic differences in aWLE we observed among women are driven by differences in working hours.

Both education and occupation interact with gender and region not just in the level of aWLE, but also in its changes over time. For instance, compared to other groups, eastern German men and women with low education have low levels of aWLE that are increasing at a slower pace. Moreover, men in low skilled occupations in both eastern and western Germany have low aWLE, and are at risk of falling behind other groups if the trends we identified continue. The latter is likely due to structural and technological changes, which are affecting men in low skilled production occupations in particular (e.g., Oesch & Piccitto 2019); while the former is likely partly due to selection effects, as the group of individuals with low education has been shrinking, at least for women (see results in the appendix).

Comparing our findings to other studies of WLE is difficult, as they often use the period perspective, different age ranges, and different definitions of WLE. In particular, WLE is usually not adjusted for working hours. Restricting the calculations of unadjusted WLE to ages 55 and older for the United States, Dudel & Myrskylä (2020) found that men born in 1945 had a WLE of 7.3 years, while their female counterparts had a WLE of 6.4 years. Combining unadjusted WLE at ages 55 to 64 with unadjusted WLE at ages 65 to 74 for the 1945 cohort for all of Germany results in an unadjusted WLE of 7.0 years for men and 4.7 years for women. Thus, German men, but not German women, born in 1945 worked roughly as much as their US counterparts, which implies that the gender gap in WLE for the 1945 cohort is considerably larger in Germany than in the US. However, socioeconomic differences do not seem to be much larger in Germany than they are in other countries, although the comparability of the available results is limited. Leinonen et al. (2018) reported for Finland that the difference in unadjusted WLE at age 50 between manual workers and upper non-manual workers was four years, irrespective of gender. We found that unadjusted WLE at age 55 for German men born in 1945 was 9.2 years for those in professional and managerial positions (ISCO 1-2), and was around seven years for skilled workers (ISCO 4-8), resulting in a difference of roughly two years.

Methodological considerations

Our findings showed that adjusting the length of working life for working hours (aWLE) leads to drastically different results for women than those previously reported in the literature (WLE), at least in terms of levels. However, both aWLE and WLE focus on paid work. This ignores many other ways in which jobs differ, and it leaves out unpaid labor. Only very recent projects on WLE have started to explore how these aspects can be taken into account, including unpaid work (Ophir 2019), in-work poverty (Hale et al. 2020), and precarious employment (Lozano & Rentería 2019).

While our analysis has provided evidence on inequalities in aWLE at the population level, we did not study the mechanisms that cause these inequalities, and there are many other dimensions along which WLE could be (further) stratified. For instance, we did not further disaggregate occupations, and we did not examine the self-employed and public servants, two groups that are distinct from the rest of the workforce, as different rules and laws apply to them (e.g., Schils 2008).

Finally, our application of Sullivan's method is not without assumptions. We do not adjust for mortality differences between groups, as we lack data on mortality by education or occupation. Additional results in the appendix (Figure A4) indicate that this is likely not an issue, as adjusting aWLE for mortality changes the results only slightly, and the mortality differentials are in the same direction as the differences in employment (Luy et al. 2015). This means that accounting for mortality would not reverse the group differences we find but would likely exacerbate them.

Conclusions

The length of late working life has been increasing in Germany. At the same time, however, there are substantial inequalities in the length of working life, and some socioeconomic groups are at risk of falling behind. This is partly because recent labor market reforms have focused mainly on pull factors that make leaving the labor market attractive, and less on push factors that cause individuals to lose their employment and leave the labor market involuntarily (Buchholz et al. 2013). These reforms were mostly aimed at high performing men who could choose whether to work. Such a one-size-fits-all approach ignores the different experiences of other groups (Krekula & Vickerstaff 2020; Wildmann 2020). It will likely be challenging to design policies that extend working life while not putting an uneven burden on vulnerable groups. The pressure for additional reforms will increase as the Baby Boomer cohorts are reaching retirement age. However, the COVID-19 pandemic may have increased the inequalities between socioeconomic groups, which could make implementing additional reforms more challenging in the years to come.

References

Backhaus A., Barslund M. (2021). The effect of grandchildren on grandparental labor supply: evidence from Europe. *European Economic Review*, 137, 103817.

Bennet J., Möhring K. (2015). Cumulative (dis)advantage? The impact of labour market policies on late career employment from a life course perspective. *Journal of Social Policy*, 44, 213-233.

Börsch-Supan A., Ferrari I. (2019). Old-age Labor Force Participation in Germany: What Explains the Trend Reversal among Older Men? And What the Steady Increase among Women? In: Coile C. C., Milligan K., Wise D. A. (Eds.), *Social Security Programs and Retirement around the World: Working Longer*. Chicago: University Press, pp. 117-145.

Börsch-Supan A., Hanemann F., Beach B., Halimi D., Hurding S., van der Waal M., Watanabe D., Staudinger U. M. (2019). Older adults integration in the labour market: a global view. *Ageing & Society*, 1-19.

Börsch-Supan A., Juerges H. (2011). *Disability, pension reform and early retirement in Germany*. NBER Working Paper 17079.

Buchholz, S. (2006). Men's late career exits in West Germany. In: Blossfeld H.-P., Buchholz S., Hofäcker D. (Ed.), *Globalization, Uncertainty, and Late Careers in Society*. Abingdon: Routledge, pp. 55-78.

Buchholz S., Rinklake A., Blossfeld H.-P. (2013). Reversing Early Retirement in Germany. A Longitudinal Analysis of the Effects of Recent Pension Reforms on the Timing of the Transitions to Retirement and on Pension Incomes. *Comparative Population Studies*, 38(4), 881-906.

Bundesinstitut für Bevölkerungsforschung (2020a). Ältere Erwerbstätige. Available at https://www.demografie-portal.de/DE/Fakten/erwerbstaetigenquote-aeltere.html. Accessed on October 12, 2020.

Bundesinstitut für Bevölkerungsforschung (Ed.) (2020b). *Gemeinsam in die Rente? Ruhestand als Projekt für Zweiverdienerpaare*. Policy Brief, June 2020.

Büsch V., Dahl S. A., Dittrich D. A. V. (2009). An empirical study of age discrimination in Norway and Germany. *Applied Economics*, 41(5), 633-651.

Cahill K. E., Giandrea M. D., Quinn J. F. (2015). Retirement patterns and the macroeconomy, 1992–2010: The prevalence and determinants of bridge jobs, phased retirement, and reentry among three recent cohorts of older Americans. *The Gerontologist*, 55, 384–403.

Calvo E., Madero-Cabib I., Staudinger U. M. (2018). Retirement sequences of older Americans: Moderately destandardized and highly stratified across gender, class, and race. *The Gerontologist*, 58, 1166–1176.

Denton F. T., Feaver C. H., Spencer B. G. (2010). Cohort working life tables for older Canadians. *Canadian Studies in Population*, 37, 175–206.

Dingemans E., Henkens K., van Solinge H. (2017). Working retirees in Europe: individual and societal determinants. *Work, Employment and Society*, 31(6), 972-991.

Dingemans E., Möhring K. (2019). A life course perspective on working after retirement: What role does the work history play? *Advances in Life Course Research*, 39, 23-33.

DiPrete T. (2002). Life Course Risks, Mobility Regimes, and Mobility Consequences: A Comparison of Sweden, Germany, and the United States. *American Journal of Sociology*, 108(2), 267-309.

Dlugosz S., Stephan G., Wilke R. A. (2014). Fixing the Leak: Unemployment Incidence before and after a Major Reform of Unemployment Benefits in Germany. *German Economic Review*, 15, 329-352.

Dotti Sani G. M., Luppi M. (2020). Absence from Work after the Birth of the First Child and Mothers' Retirement Incomes: A Comparative Analysis of 10 European Countries. *Work, Employment and Society* (available online), 1-20.

Dudel C., Myrskylä M. (2017). Working Life Expectancy at Age 50 in the United States and the Impact of the Great Recession. *Demography*, 54(6), 2101-2123.

Dudel C., Myrskylä M. (2020). Cohort Trends in Working Life Expectancies at Age 50 in the United States: A Register-Based Study Using Social Security Administration Data. *Journals of Gerontology: Series B*, 75(7), 1504–1514.

Ebbinghaus, B. (2006). *Reforming Early Retirement in Europe, Japan and the USA*. Oxford: University Press.

Ernst J. (1996). Alterserwerbstätigkeit und Ruhestand in Ostdeutschland. *Arbeit*, 5(2), 201-222.

Esping-Andersen, G. (1990). *The Three Worlds of Welfare Capitalism*. Princeton: Princeton University Press.

European Commission (2010). Annual growth survey: Advancing the EU's comprehensive response to the crisis. Available at http://ec.europa.eu/europe2020/pdf/en_final.pdf. Accessed on July 7, 2020.

Fasang A. E. (2010). Retirement: Instituional Pathways and Individual Trajectories in Britain and Germany. *Sociological Research Online*, 15(2).

Fasang A. E., Aisenbrey S., Schömann K. (2013). Women's retirement income in Germany and Britain. *European Sociological Review*, 29(5), 968-980.

Fisher G. G., Ryan L. H., Sonnega A. (2015). Prolonged Working Years: Consequences and Directions for Interventions. In Vuori J., Blonk R., Price R. H. (Eds.), *Sustainable Working Lives*. Dodrecht: Springer, pp. 269-288.

Fisher P. (2010). Women and employment in East Germany: the legacy of GDR equality. *Journal of Social Welfare and Family Law*, 32(4), 401-409.

Frerichs F., Naegele G. (1997). Discrimination of Older Workers in Germany: Obstacles and Options for the Integration into Employment. *Journal of Aging & Social Policy*, 9(1), 89-101.

Fuchs J., Söhnlein D., Weber B., Weber E. (2018). Stochastic forecasting of labor supply and population: An integrated model. *Population Research and Policy Review*, 37, 33-58.

Haan P., Geyer J. (2015). Beschäftigungseffekte, fiskalische Effekte und Verteilungseffekte von Abschlägen auf den vorzeitigen Renteneintritt – Eine kausale ex-post Analyse der Rentenreform. Available at file:///C:/Users/CHRIST~1/AppData/Local/Temp/Projektbericht_2015-08.pdf. Accessed on June 24, 2021.

Hagen, C., Himmelreicher, R. K., Kemptner, D., Lampert, T. (2010). Soziale Unterschiede beim Zugang in die Erwerbsminderungsrente: eine Analyse auf Datenbasis von Scientific Use Files des Forschungsdatenzentrums der Rentenversicherung (FDZ-RV). RatSWD Research Note 44.

Hale J., Dudel C., Lorenti A. (2020). Cumulative disparities in the dynamics of working poverty for later-career U.S. workers (2002-2012). *Socius*, forthcoming.

Hall, P. A., Soskice, D. (2001). *Varieties of Capitalism: The Institutional Foundations of Comparative Advantage*. Oxford: Oxford University Press.

Hayward M. D., Grady W. R. (1990). Work and retirement among a cohort of older men in the United States, 1966-1983. *Demography*, 27, 337–356.

Hayward M. D., Lichter D. T. (1998). A life cycle model of labor force inequality: Extending Clogg's life table approach. *Sociological Methods & Research*, 26, 487–510.

Hess M. (2016). Germany: A successful reversal of early retirement? In *Delaying Retirement. Progress and Challenges of Active Ageing in Europe, the United States and Japan*. Springer, pp. 147-169.

Hess M., Naegele G., Bauknecht J. (2021). Pension and labour market policies and the situation of older workers in Germany. In Naegele, G., Hess, M. (Eds.), *Alte und neue soziale Ungleichheiten bei Berufsaufgabe und Rentenübergang*. Springer, pp. 69-98.

Himmelreicher R. K., Hagen C., Clemens W. (2009). Bildung und Übergang in den Ruhestand. Gehen Höherqualifizierte später in Rente? *Kölner Zeitschrift für Soziologie und Sozialpsychologie*, 61, 437-452.

Hoem J. M. (1977). A Markov chain model of working life tables. *Scandinavian Actuarial Journal*, 1977, 1-20.

Hofäcker, D. (2010). *Older Workers in a Globalizing World. An International Comparison of Retirement and Late-Career Patterns in Western Industrialized Countries*. Cheltenham: Edward Elgar.

Hofäcker D., Naumann E. (2015). The emerging trend of work beyond retirement age in Germany. *Zeitschrift für Gerontologie und Geriatrie*, 48(5), 473-479.

Hokema A., Scherger S. (2016). Working Pensioners in Germany and the UK: Quantitative and Qualitative Evidence on Gender, Marital Status, and the Reasons for Working. *Journal of Population Ageing*, 9, 91-111.

Human Mortality Database (2020). University of California, Berkeley (USA), and Max Planck Institute for Demographic Research (Germany). Available at www.humanmortality.de.

Kadefors R., Nilsson K., Östergren P.-O., Rylander L., Albin M. (2019). Social inequality in working life expectancy in Sweden. *Zeitschrift für Geriatrie und Gerontologie*, 52 (Supplement), 52-S61.

Kitagawa E. M. (1955). Components of a difference between two rates. *Journal of the American Statistical Association*, 50, 1168–1194.

Klein M. (2015). The increasing unemployment gap between the low and high educated in West Germany. Structural of cyclical crowding out? *Social Science Research*, 50, 110-125.

Knuth M., Kalina T. (2002). Early exit from the labour force between exclusion and privilege: unemployment as a transition from employment to retirement in West Germany. *European Societies*, 4, 393-418.

Köhler, H., Rochow, T., Schulze, E. (2001*). Bildungsstatistische Ergebnisse der Volkszählungen der DDR 1950 bis 1981. Dokumentation der Auswertungstabellen und Analysen zur Bildungsentwicklung*. Berlin: Max-Planck-Institut für Bildungsforschung, Studien und Berichte 69.

Krekula C., Vickerstaff S. (2020). The 'Older Worker' and the 'Ideal Worker': A Critical Examination of Concepts and Categorisations in the Rhetoric of Extending Working Lives. In Ní Léime A., Ogg J., Rašticová M., Street D., Krekula C., Bédiová M., Madero-Cabib I. (Eds.), *Extended Working Life Policies*. Springer, pp. 29-45.

Kühn M., Vogt T., Dudel C., Oksuzyan A. (2019). Trends in gender differences in health at working ages among West and East Germans. *Social Science & Medicine: Population Health*, 7, 100326

Larsen M., Pedersen P. J. (2017). Labor force activity after 65: what explains recent trends in Denmark, Germany, and Sweden? *Journal of Labour Market Research*, 50, 15-27.

Leinonen T., Martikainen P., Myrskylä M. (2018). Working life and retirement expectancies at age 50 by social class: Period and cohort trends and projections for Finland. *Journal of Gerontology, Series B*, 73, 302-313.

Loichinger E., Weber D. (2016). Trends in Working Life Expectancy in Europe. *Journal of Aging and Health*, 28, 1194-1213.

Lorenti A., Dudel C., Myrskylä M. (2018). The legacy of the Great Recession in Italy: a wider geographical, gender, and generational gap in working life expectancy. *Social Indicators Research*, 142, 283–303.

Lozano M., Rentería E. (2019). Work in Transition: Labour Market Life Expectancy and Years Spent in Precarious Employment in Spain 1986–2016. *Social Indicators Research*, 145, 185-200.

Luy M., Wegner-Siegmundt D., Wiedemann A., Spijker J. (2015). Life Expectancy by Education, Income and Occupation in Germany: Estimations Using the Longitudinal Survival Method. *Comparative Population Studies*, 40(4), 399-436.

Matysiak, A., Steinmetz, S. (2008). Finding Their Way? Female Employment Patterns in West Germany, East Germany, and Poland. *European Sociological Review*, 24(3), 331–345.

Meng A. (2011). Informal Caregiving and the Retirement Decision. *German Economic Review*, 13(3), 307-330.

Murphy E. C. (2014). Workers' movement out of declining occupations in Great Britain, Germany, and Switzerland. *European Sociological Review*, 30, 685-701.

Naegele G., Bauknecht J. (2019). Extending Working Liveds. In Walker A. (Ed.), *The Future of Ageing in Europe*. Dodrecht: Springer, pp. 107-142.

OECD (2018). Key policies to promote longer working lifes. Country note Germany 2007 to 2017. Available at https://www.oecd.org/els/emp/Germany%20Key%20policies_Final.pdf. Accessed on July 7, 2020.

Ophir, A. (2019). *Caring and Working Life Expectancy at 50: A Comparative Analysis of Gender Differences in Europe*. Paper presented at the PAA Annual Meeting 2019, Austin.

Oesch D., Piccitto G. (2019). The Polarization Myth: Occupational Upgrading in Germany, Spain, Sweden, and the UK, 1992–2015. *Work and Occupations*, 46(4), 441-469.

Phillipson C. (2019). ‚Fuller' or ‚extended' working lives? Critical perspectives on changing transitions from work to retirement. *Ageing & Society*, 39, 629-650.

Radl J. (2013). Labour Market Exit and Social Stratification in Western Europe: The Effects of Social Class and Gender on the Timing of Retirement. *European Sociological Review*, 29(3), 654-668.

Radl J., Himmelreicher R. K. (2015). The Influence of Marital Status and Spousal Employment on Retirement Behavior in Germany and Spain. *Research On Aging*, 37(4), 361-387.

Robroek S., Nieboer D., Järvholm B., Burdorf A. (2019). Educational differences in duration of working life and loss of paid employment: working life expectancy in the Netherlands. *Scandinavian Journal of Work, Environment & Health*, Online first.

Romeu-Gordo L., Sarter E. K. (2020). Germany. In Ní Léime Á., Ogg J., Rašticová M., Street D., Krekula C., Bédiová M., Madero-Cabib I. (Eds.), *Working Life Policies: International Gender and Health Perspectives*. Cham: Springer, pp. 271- 280.

Rözer J., van de Werfhorst H. G. (2020). Three Worlds of Vocational Education: Specialized and General Craftsmanship in France, Germany, and The Netherlands. *European Sociological Review*, available online.

Schneider H., Rinne U. (2019). The labor market in Germany,2000–2018. *IZA World of Labor*, 379.

Schneider T., Drobnic S., Blossfeld H.-P. (2001). Pflegebedürftige Personen im Haushalt und das Erwerbsverhalten verheirateter Frauen. *Zeitschrift für Soziologie*, 39, 362-382.

Simonson J., Gordo L. R., Titova N. (2011). Changing employment patterns of women in Germany: How do baby boomers differ from older cohorts? A comparison using sequence analysis. *Advances in Life Course Research*, 16(2), 65-82.

Sullivan D. F. (1971). A single index of mortality and morbidity. *HSMHA Health Reports*, 86, 347–354.

Statistisches Bundesamt (2017). Methodische Aspekte des Mikrozensus 2017 – Arbeitsmarkt. Available at https://www.destatis.de/DE/Themen/Arbeit/Arbeitsmarkt/Erwerbstaetigkeit/Methoden/Erlaeuterungen/mikrozensus-2017.html. Accessed on April 9, 2021.

Statistisches Bundesamt (2019). Bevölkerung im Wandel. Annahmen und Ergebnisse der 14. koordinierten Bevölkerungsvorausberechnung. Wiesbaden. Available at https://www.destatis.de/DE/Presse/Pressekonferenzen/2019/Bevoelkerung/pressebroschuere-bevoelkerung.pdf?__blob=publicationFile. Accessed on June 7, 2020.

Statistisches Bundesamt (2020a). Mikrozensus. Qualitätsbericht 2019. Available online, accessed on April 9, 2021.

Statistisches Bundesamt (2021). Anteil von Menschen im Rentenalter, die erwerbstätig sind, hat sich binnen 10 Jahren verdoppelt. Available at https://www.destatis.de/DE/Presse/Pressemitteilungen/2021/06/PD21_N041_12.html;jsessionid=3943A0C46B8F253A99B3F433990A1040.live742. Accessed on June 24, 2021.

Steiner V. (2017). The labour market for older workers in Germany. *Journal of Labour Market Research*, 50, 1-14.

Visser M., Gesthuizen M., Kraaykamp G., Wolbers M. H. J. (2016). Inequality among Older Workers in the Netherlands: A Life Course and Social Stratification Perspective on Early Retirement. *European Sociological Review*, 32(3), 370-382.

Vlasblom J. D., Schippers J. (2006). Changing dynamics in female employment around childbirth: evidence from Germany, the Netherlands and the UK. *Work, Employment and Society*, 20(2), 329-347.

Wildman J. M. (2020). Life-Course Influences on Extended Working: Experiences of Women in a UK Baby-Boom Birth Cohort. *Work, Employment and Society*, 34(2), 211-227.

Wolfbein S. L. (1949). The Length of Working Life. *Population Studies*, 3, 286-294.

Zoch G. (2021). Thirty Years after the Fall of the Berlin Wall – Do East and West Germans Still Differ in Their attitudes to Female Employment and the Division of Housework? *European Sociological Review*, 1-20.

Appendix

Cohort composition by education and occupation

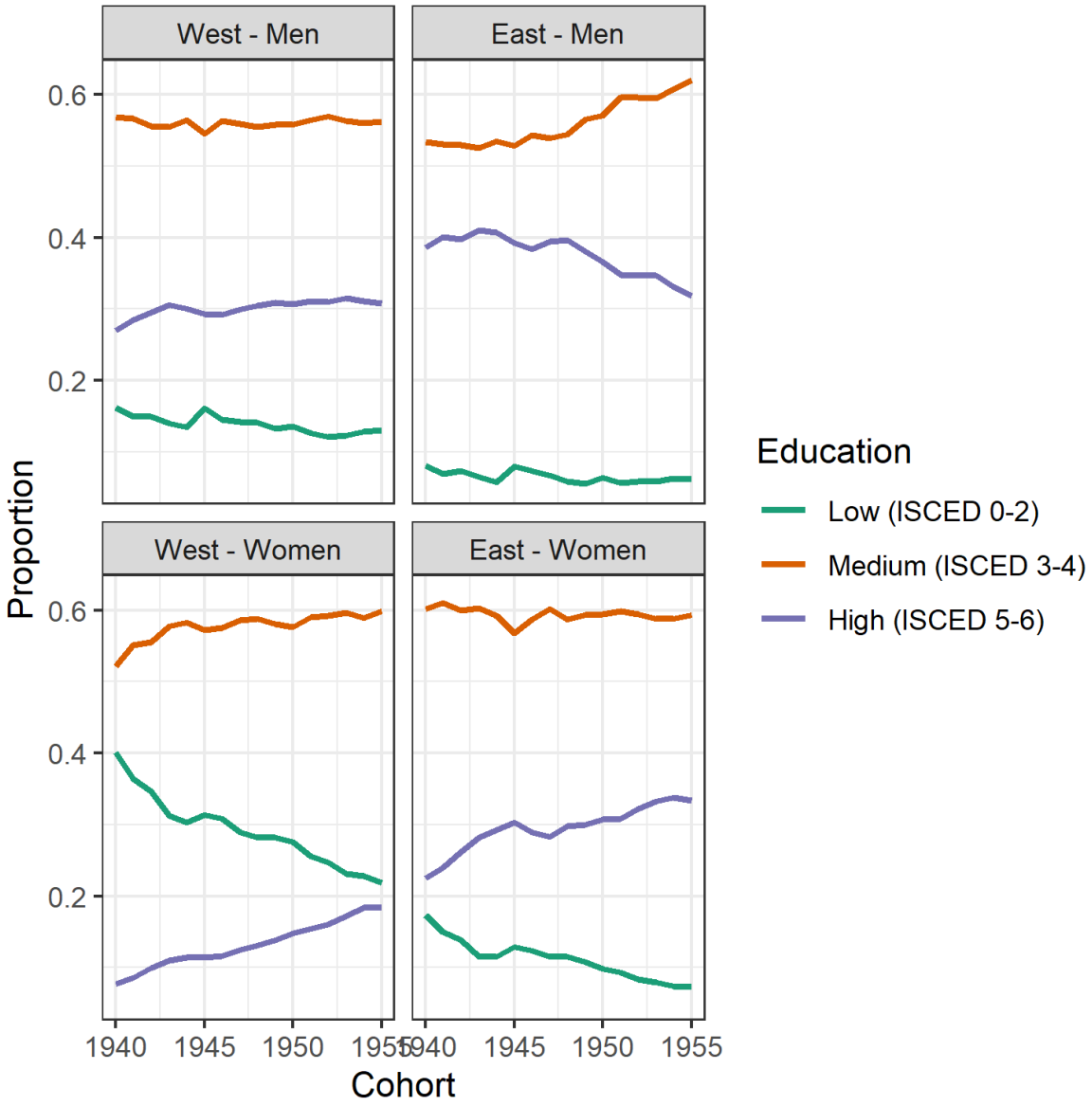

Figure A1: Educational attainment according to the ISCED-97 classification by birth cohort, region (West, East) and gender. Source: Microcensus, own calculations.

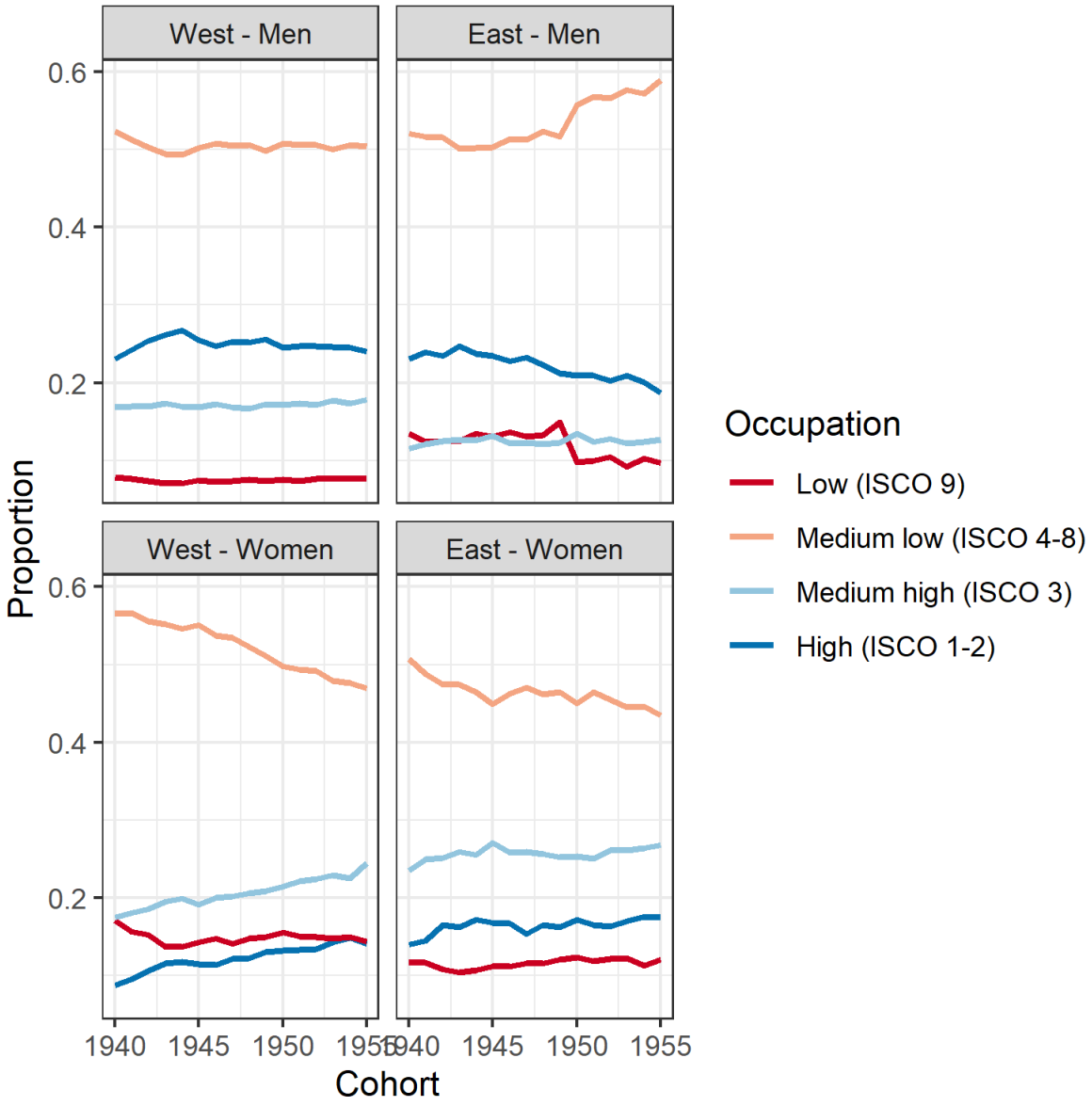

Figure A2: Occupation according to the ISCO classification by cohort, region (western/eastern Germany) and gender (total population). Source: Microcensus, own calculations.

These results show that for western German men, the composition by educational attainment and the composition by occupation were relatively stable for the cohorts we studied. However, for eastern German men, educational attainment was decreasing starting with the 1950 cohort (also see Köhler et al. 2001). For instance, of the eastern German men in our sample, around 40% of those born in the 1940s, but just 30% of those born in 1955, have tertiary education. By contrast, both eastern and western German women born more recently have higher educational attainment and occupational class levels than their older counterparts.

Results for Germany in total and for both genders combined

Table A1: Adjusted working life expectancy (aWLE; measured in full-time equivalent years) in Germany by gender and cohort (ages 55 to 64). Source: Microcensus, own calculations.

	Men			Women		
Cohort	aWLE (in years)	95% Confidence int.		aWLE (in years)	95% Confidence int.	
1941	5.3	5.1	5.5	2.6	2.5	2.8
1942	5.6	5.4	5.8	2.8	2.6	2.9
1943	5.7	5.5	5.9	2.9	2.7	3.1
1944	5.8	5.6	6.0	3.0	2.8	3.1
1945	5.7	5.5	6.0	3.0	2.8	3.2
1946	6.0	5.7	6.2	3.2	3.0	3.3
1947	6.0	5.8	6.2	3.3	3.1	3.5
1948	6.2	6.0	6.5	3.4	3.2	3.6
1949	6.4	6.2	6.7	3.5	3.3	3.7
1950	6.6	6.4	6.8	3.7	3.6	3.9
1951	6.7	6.5	7.0	4.0	3.8	4.1
1952	7.0	6.8	7.2	4.2	4.1	4.4
1953	7.1	6.8	7.3	4.4	4.3	4.6
1954	7.2	7.0	7.4	4.6	4.4	4.8
1955	7.3	7.1	7.5	4.8	4.6	5.0

Table A2: Adjusted working life expectancy (aWLE; measured in full-time equivalent years) for both genders combined by region and cohort (ages 55 to 64). Source: Microcensus, own calculations.

		Region	
Cohort	Total	West	East
1941	4.0	4.0	3.8
1942	4.2	4.2	4.0
1943	4.3	4.4	4.1
1944	4.4	4.4	4.2
1945	4.4	4.4	4.1
1946	4.6	4.6	4.4
1947	4.6	4.7	4.5
1948	4.8	4.8	4.6
1949	5.0	5.0	4.8
1950	5.1	5.2	5.0
1951	5.3	5.3	5.2
1952	5.6	5.6	5.6
1953	5.7	5.7	5.7
1954	5.9	5.8	6.0
1955	6.0	6.0	6.1

Results for ages 65-74

We also calculated adjusted WLE for ages 65 to 74 for the 1940 to 1945 cohorts; i.e., aWLE at (early) retirement ages. We chose age 74 as an upper threshold, as employment after age 74 is still extremely rare, despite the general trend of increasing rates of employment after the statutory retirement age. Due to the low occurrence of employment in this age interval, we can present the results by gender and region, but not broken down by education and occupation.

For estimates of WLE for ages 65 to 74, the number of observations ranged from 77,380 (1942 cohort) to 100,926 (1940 cohort), with the number of observations of other cohorts having values between these two numbers.

Figure A5 displays the results. Generally, aWLE is rather low, particularly compared to aWLE at ages 55 to 64. For women, there is a small increase. For men, the increase is rather large, even if it covers only a few cohorts: among western German, aWLE rises from 0.6 years for the 1940 cohort to about 0.9 years for the 1945 cohort, and thus increases by 30%. Still, for western Germans of the 1945 cohort, aWLE at ages 65 to 74 accounts for only 13% of the total aWLE at ages 55 to 74 among men and 11% among women, and thus for a small part of the total length of working life of older individuals. For eastern Germans, the contribution of aWLE is similarly low.

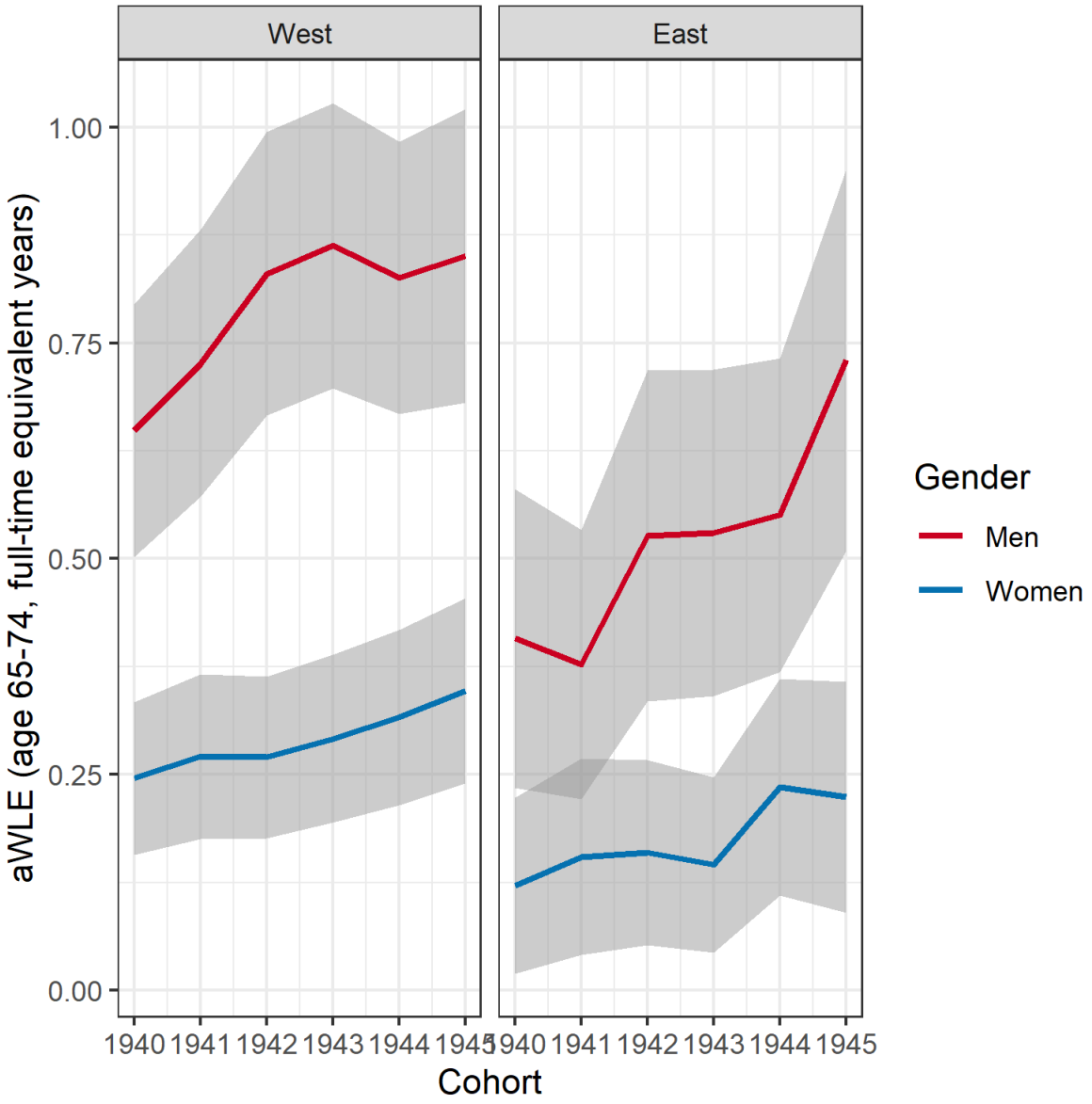

Figure A3: Adjusted working life expectancy during ages 65 to 74 in Germany by birth cohort (1940-1945), region (western/ eastern Germany) and gender. 95% confidence intervals shown as gray ribbons, with overlapping confidence intervals shown in a darker shade. Source: Microcensus, own calculations.

Decomposition results by occupation

Table A3: Results of the decomposition analysis, all based on the 1955 cohort. The "Difference" column shows the differences in aWLE between the corresponding group and the reference group, measured in years. "Component 1" shows the relative contributions of employment. "Component 2" shows the relative contributions of working hours. Source: Microcensus, own calculations.

Gender	Region	Occupation	Difference	Component 1	Component 2
Men	*West*	*High (ISCO 1-2)*		(Reference)	
		Medium high (ISCO 3)	0,66	93,0%	7,0%
		Medium low (ISCO 4-8)	1,50	83,5%	16,5%
		Low (ISCO 9)	3,39	61,1%	38,9%
	East	*High (ISCO 1-2)*	0,39	94,7%	5,3%
		Medium high (ISCO 3)	0,68	96,8%	3,2%
		Medium low (ISCO 4-8)	2,11	85,3%	14,7%
		Low (ISCO 9)	4,15	60,9%	39,1%
Women	*West*	*High (ISCO 1-2)*		(Reference)	
		Medium high (ISCO 3)	1,74	48,4%	51,6%
		Medium low (ISCO 4-8)	2,77	53,3%	46,7%
		Low (ISCO 9)	3,68	30,0%	70,0%
	East	*High (ISCO 1-2)*	-0,63	22,9%	77,1%
		Medium high (ISCO 3)	0,43	98,7%	1,3%
		Medium low (ISCO 4-8)	2,08	77,4%	22,6%
		Low (ISCO 9)	3,85	46,4%	53,6%

State occupancy by occupation

Table A4: Lifetime spent in each of three states at ages 55 to 64 for the 1955 cohort, by gender, region, and occupation. Source: Microcensus, own calculations.

Gender	Region	Occupation	Employed	Unemployed	Retired/ Inactive
Men	*West*	*High (ISCO 1-2)*	85,6%	1,8%	12,7%
		Medium high (ISCO 3)	79,5%	2,4%	18,1%
		Medium low (ISCO 4-8)	72,6%	3,9%	23,5%
		Low (ISCO 9)	63,4%	7,7%	28,9%
	East	*High (ISCO 1-2)*	82,4%	3,8%	13,8%
		Medium high (ISCO 3)	78,3%	5,1%	16,6%
		Medium low (ISCO 4-8)	67,3%	7,3%	25,3%
		Low (ISCO 9)	57,9%	14,2%	27,9%
Women	*West*	*High (ISCO 1-2)*	79,6%	1,0%	19,4%
		Medium high (ISCO 3)	69,7%	1,4%	28,9%
		Medium low (ISCO 4-8)	61,4%	2,7%	36,0%
		Low (ISCO 9)	63,9%	3,6%	32,5%
	East	*High (ISCO 1-2)*	81,4%	2,4%	16,2%
		Medium high (ISCO 3)	74,2%	3,8%	22,0%
		Medium low (ISCO 4-8)	60,6%	7,0%	32,5%
		Low (ISCO 9)	57,1%	8,8%	34,0%

aWLE corrected for mortality

Unlike standard applications of Sullivan's method, our analysis does not account for mortality, because for many subgroups in our analysis, no good survival estimates are available. The analyses shown in Figure A4 adjust aWLE for survival using life tables from the Human Mortality Database (2020). They yield results very similar to our main findings. This is not surprising, as mortality is generally rather low in the age range and years we cover. We expect this would also occur in the subgroup analysis. Moreover, for the group differentials in aWLE we find, we often expect that the mortality differentials would go in the same direction, and that accounting for them would increase the differences in aWLE. For instance, we find that higher educated men have higher aWLE than men with low educational attainment; Luy et al. (2015) reported similar differentials by education for men for survival.

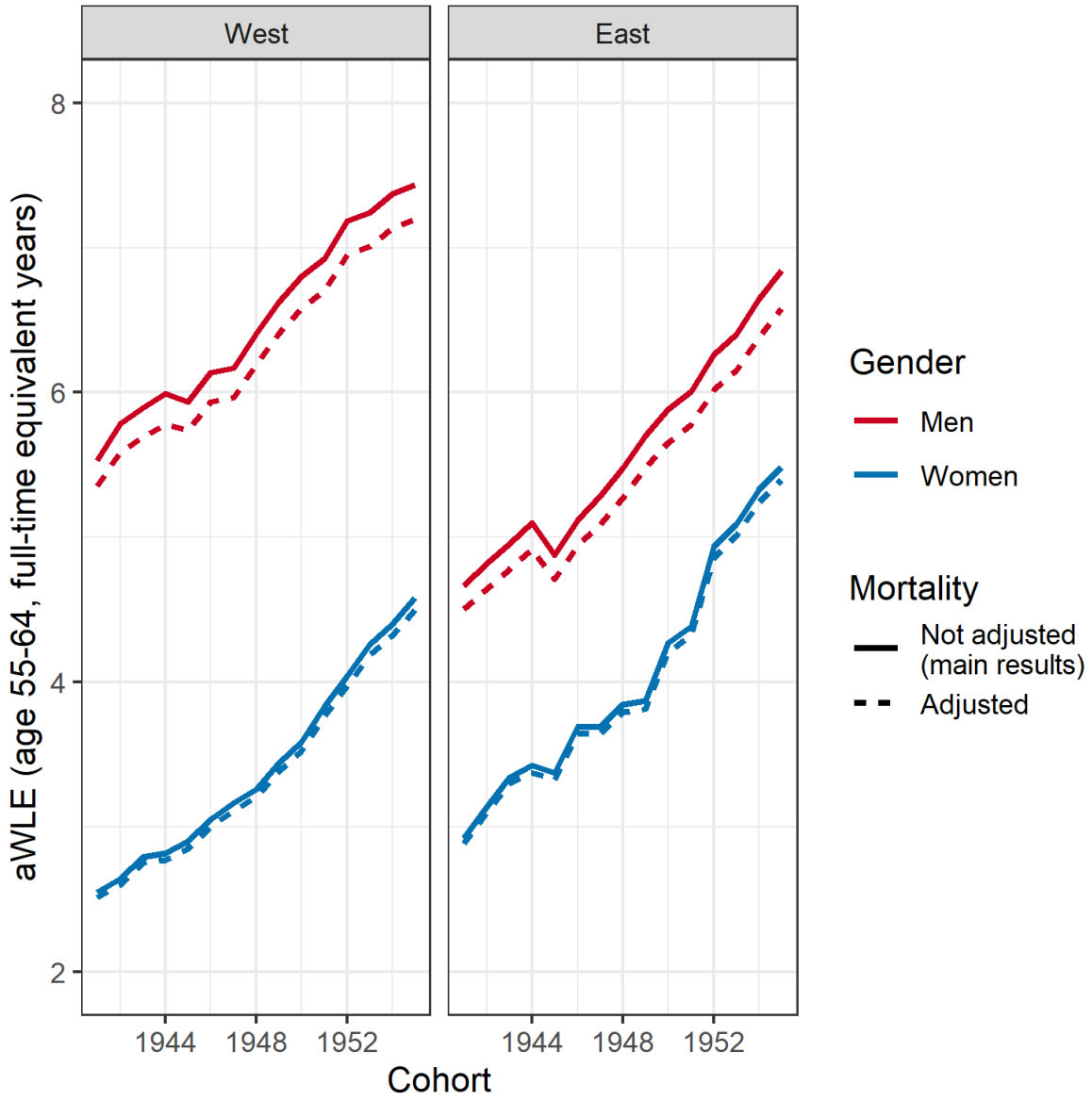

Figure A4: aWLE (ages 55 to 64) by region (western/ eastern Germany) and gender corrected for mortality (dashed lines) compared to the main estimates of aWLE presented in the text (solid lines). Source: Microcensus/HMD, own calculations.