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Working life and retirement expectancies at age 50 by social class: period and cohort trends and projections for Finland

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Objectives: The balance between time spent in work and in retirement underlie the long-term sustainability of the social security system. We examined socioeconomic differences in how increasing longevity is distributed between labor market statuses in Finland.

Methods: We used register data and the Sullivan method to analyze life expectancy at age 50 spent in different labor market statuses in the period 1989–2012 and for cohorts born in 1938–1953. We projected future mortality and labor market participation for partially observed cohorts.

Results: Both working life expectancy at age 50 and the share of remaining life spent in work have increased across periods succeeding the recession of the early 1990s and across successive cohorts. The trends were similar across the social classes, but there were large level differences: for the most recent period and the youngest cohort, male and female manual workers were expected to spend 3.6–3.7 years less in work, 1.7–4.7 years less in statutory retirement and 3.2–3.9 years more in other non-employment than upper non-manual employees.

Discussion: The increasing share of remaining life at age 50 spent at work implies that that pressure on the sustainability of the welfare system is not as severe as commonly thought.

Key terms: Life expectancy, Labor market participation, Longevity, Socioeconomic position, Trends, Projections

INTRODUCTION

Promotion of employment among older people is a key component of active ageingstrategies attempting to respond to challenges of population ageing (Foster & Walker 2015; Gonzales et al. 2015). Extending the length of working life would alleviate the economic burden caused by an increasing old-age dependency ratio (OECD 2006, 2013). Understanding past trends and future prospects of how increasing longevity is distributed between work and retirement helps to assess the influence of the ongoing demographic changes on the sustainability of the social protection system and labor market dynamics. Time spent in work and its share of the total life years have been addressed through the calculation of working life expectancies. Terminology regarding the expected remaining work years at a given age have been used somewhat ambiguously referring to the time spent either in employment (Nurminen et al. 2005; Millimet et al. 2010; Nurminen 2012) or in the labor force (Hayward & Grady 1990; Denton et al. 2010). In this study the concept of *work* is used to refer to being in paid employment and belonging to the *labor force* to an economically active status, i.e. including both employment and unemployment.

Previous research indicates that gains in period life expectancy in the past decades have mainly contributed to additional years later in life and less so to economically active years, resulting in declines in the share of remaining life that is spent in the labor force (Eggleston & Fuchs 2012). Moreover, Finnish findings indicate that there was a sharp decline in the working life expectancy in the first half of the 1990s (Hytti & Nio 2004; Nurminen et al. 2005), but the trend is likely to have been similar also in other countries experiencing the economic recession. More recently working life (Hytti & Nio 2004; Vogler-Ludwig 2009; Nurminen 2012) and labor force (Hytti & Valaste 2009; Denton et al. 2010) expectancies have begun to increase in many Western countries. These increases have been larger for women who have originally had lower employment participation than men (Vogler-Ludwig 2009; Denton et al. 2010; Nurminen 2012). In Finland women's employment has been relatively high, and since the second half of the 2000s working life expectancy at age 50 has actually been higher for women than for men (Nurminen 2012).

Working life expectancies also increase with higher education, and this difference is still notable at older ages (Millimet et al. 2010; Nurminen 2012). Time spent unemployed or outside the labor force at working ages is consequently longer among those with lower education (Nurminen 2012). However, these findings have been restricted to partial life expectancies including only working ages. Little is thus known of socioeconomic differences in the total remaining years spent in

retirement. Differences in the distribution of life years between work and retirement may cause inequalities between population groups in their contribution to and benefit from the pension insurance system. Even though those in lower socioeconomic positions typically have higher risks of early retirement and other work exit (Schuring et al. 2013), the total time spent in non-employment is likely to be shorter due to higher mortality. Socioeconomic differences in mortality persist until old age (Huisman et al. 2013), resulting in large differences in remaining life expectancy around the age of statutory retirement (Shkolnikov et al. 2008; Cambois et al. 2011; Majer et al. 2011; Kalwij et al. 2013). Socioeconomic differences in the share of the total remaining life expectancy that is spent in work also remain unclear. Early studies from the USA (Hayward & Grady 1990) and Finland (Kaprio et al. 1996) have followed up male cohorts born in the early 20th century, and found that the economically active shares of the total life expectancies were highest among those in higher socioeconomic positions. However, less is known of future prospects for cohorts reaching retirement age in more recent decades.

Most prior work on how increasing longevity is distributed between various labor market statuses has used the period perspective that describes the experience of a hypothetical or "synthetic" cohort. It includes those who are alive in a certain calendar year and thus merges the experience of a large number of real birth cohorts. The period perspective thus answers the question "what would happen to a real cohort if it experienced throughout its life the mortality and labor market participation rates that prevail in a particular period". This approach is sensitive to short-term variation in the mortality and participation rates, which may be good or bad depending on the goal of the analysis. The focus on periods is often motivated by the difficulty of obtaining longitudinal data that would be suitable for cohort analysis and by the challenges related to forecasting, or completing information for partially observed cohorts (Vogler-Ludwig 2009: Denton et al. 2010; Nurminen 2012). The cohort perspective describes the life course experience of a real birth cohort, and is arguably more natural than the period perspective. However, it averages the mortality and labor market participation rates over decades. Therefore the cohort perspective is not useful for analyzing current economic and mortality conditions. On the other hand, the cohort perspective is useful for assessing and understanding likely future trends by giving a reasonable answer to questions such as "how many years a person aged 50 can be expected to work and live". The period perspective provides a reasonable answer to such a question only if the current conditions prevail in the future, which often is known to be an unrealistic assumption. Period calculations do not account for future increases in longevity and are therefore likely to underestimate the remaining life years of actual cohorts that are now entering retirement (Denton et al. 2010). For these reasons the cohort and period perspectives

are not expected to provide similar results; rather, the results are expected to provide different but complementary views.

Little is thus far known about how increasing longevity is distributed between work, retirement and other non-employment, particularly with regard to cohort trends and variation by socioeconomic position. Furthermore, whether changes over time or differences between population groups in working life expectancy is mainly attributable to differences in the mortality or employment rates remains unclear. We used longitudinal Finnish register data to estimate how life expectancy at age 50 has changed over the period 1989–2012 and over the birth cohorts 1938–1953 by social class. For the period perspective we used the Sullivan method to investigate how increasing longevity is divided between work, unemployment, disability retirement, other early retirement, statutory retirement and other activity outside the labor force. We also decomposed the key results for working life expectancies into contributions arising from mortality and employment differences. For the cohort perspective we completed the information of partially observed cohorts by using the Lee-Carter method for mortality and by applying the most recent observed experience for labor market participation.

METHODS

Study population and measurements used during follow-up

We used administrative register data comprising a nationally representative 11% random sample of the Finnish population between the end of 1988 and 2007. An additional random sample of deceased individuals was added to cover 80 per cent of all deaths during that period. Because of the different sampling probabilities in the two strata, we used analytic weights in all the analyses. The data include annual information on socio-demographic factors, labour market participation and mortality available until the end of 2012. The sampling and data linkage was carried out by Statistics Finland using personal identification codes (permission TK-53-339-13). We followed up those aged 50+ in the period 1989–2012 including 9 995 202 person years.

We used the most recent recorded information on occupational social class (SES) available in five-year intervals between 1970 and 2005 as well as annually between 2008 and 2012. The classes were: 1) upper non-manual employees, 2) lower non-manual employees, 3) manual workers, 4) entrepreneurs and 5) others or unknown.

For labor market status and age, we used the status at the beginning of each year (measured at the end of the previous year) as an estimate for the whole year. Labor market status was based on information on main economic activity and types of pensions received. It was divided into 1) work, 2) unemployment, 3) statutory retirement (old-age pension), 4) disability retirement, 5) other early retirement and 6) other (being outside the labor force for other reasons than retirement). Work included both full- and part-time paid employment. Employed part-time pensioners were thus classified as being at work. The unemployed included those registered as active job seekers. . At the beginning of the study period in 1989, the age limit for the statutory old-age pension was 65 with the exception of certain occupation-specific retirement ages. Since 2005, it has been possible to retire flexibly between the ages of 63 and 68. Over the study period it has also been possible to receive old-age pensions already at the age of 60 (62 since 2005), which nevertheless reduces the accured pension permanently. Disability pensions may be granted on the grounds of a medically confirmed reduction in work ability due to illness for persons under the statutory retirement age (Finnish Centre for Pensions & the Social Insurance Institution of Finland 2014). The category "other early retirement" mainly includes unemployment pensions and special pensions for farmers. In unknown cases of retirement type (3% or less of all pensions depending on the study year), those aged 65 or more (63 or more in 2005–2012) were included in the category of statutory retirement and the rest in the category "other early retirement".

The availability of data defines the cohorts that we could analyze. The labor market participation follow-up started in the year 1989. Therefore the oldest cohort for which we could calculate labor market participation since age 50 was that born in 1938. The follow-up ended in 2012 when the 1938 birth cohort was aged 73; thus for this cohort information on labor market participation was complete. For cohorts up to and including the 1947 birth cohort, which was aged 64 in 2012, the data on participation was also essentially complete. For the 1948–1953 birth cohorts, this data was partially missing (for the cohort 1953 starting from age 59 and for the cohort 1948 starting from age 64). We included these cohorts in our analysis by completing the missing labor market participation data using information on previous cohorts (see the Methods section for details).

Statistical methods

We calculated age-specific mortality rates at ages 50 and above for each sex-SES strata in each calendar year from 1989 to 2012. We used the Sullivan (1971) method to calculate period life expectancy at age 50 and to attribute the remaining years to different labor market categories for the

sex-SES strata. The Sullivan method combines standard period life tables and period information on labor market distributions by single years of age. It is most often used in the calculation of healthy life expectancy, but it can as easily be used to study other phenomena (e.g., Preston et al. 2001). We calculated 95% confidence intervals for the expectancies by taking sampling variance in the rates of both labor market participation and mortality into account (Jagger et al. 2006).

For the cohorts born in1938–1953, we carried out essentially the same calculations using the diagonal of the age-period patterns - which define the cohort experience - of mortality and labor market participation. However, since these cohorts were only partially observed at the end of our follow-up in 2012 in terms of both mortality and labor market participation, we had to first complete the life tables and labor market distributions for each sex-SES sub-population within these cohorts. Labor market distributions were completed by borrowing information from the previous cohorts, that is, by keeping the last observed rates constant. For example for the 1948 cohort, the unobserved labor market participation at age 64 was completed using the labor market distribution of the 1947 cohort at age 64. This schema was used for all partially observed cohorts and separately for men and women and for different SES.

We completed the cohort mortality using the Lee-Carter method (Lee & Carter 1992). We estimated the Lee-Carter model $\log[m(x)] = a(x) + b(x)*k(t)$, where x refers to age, t refers to calendar year, and m(x) is mortality, for both men and women using population level mortality data at ages 50+ for the base period 1989–2012 obtained from the Human Mortality Database (2015). The key parameters of the Lee-Carter model are the age-schedule of log-mortality a(x), and the change in log-mortality, captured by b(x), with respect to changes in the overall mortality index k(t). We derived b(x) and k(t) using a Lee-Carter package for STATA (Wang 2000). In order to forecast with the Lee-Carter model, we linearly extrapolated the index k(t) into the future. The age-schedule a(x) was based on the actual rates in the jump-off year, not those produced by the model, which corresponds to the Lee-Miller variant (Lee & Miller 2001) of the Lee-Carter model.

The Lee-Carter method produces an overall age-period pattern for future mortality among men and women. Taking the diagonal of the age-period pattern provides the required forecasted cohort mortality rates. However, these rates refer to the total population (by sex), not to SES-specific groups. We assumed the most simple scenario in which the future change in log-mortality for each SES-group is represented by the same population-level change b(x)*k(t), but with SES-specific

starting age-schedule a(x). This approach keeps the relative SES mortality differentials constant and results in smooth patterns in mortality from the observations to the forecasted period.

The difference in labor market expectancies between two populations in this study (for example, high versus low social classes, men versus women, or beginning versus end of the follow-up) is driven by two components: differences in the age-specific rates in both mortality and labour market participation. In order to understand which of these two components is driving the differences in working life expectancies, we decomposed the key period results into contributions arising from mortality and employment differences using a spreadsheet introduced by Andreev and Shkolnikov (2012).

RESULTS

Descriptive results

Socio-demographic distributions of the study population (Table 1) are presented for those aged 50–69 as there was little variation in labor market participation among those aged 70 and over. The distributions are presented for the start and end years (1989 and 2012) and for the year in the middle of the study period (2001). There were no clear trends in the age distribution between 1989 and 2012. Variation in the age distribution was mainly driven by the sizes of the birth cohorts.

[Table 1 about here]

Between 1989 and 2012 the proportions of non-manual classes increased, while the proportions of manual workers and entrepreneurs decreased. Manual workers, however, remained the most common class among men during the whole study period, whereas among women, lower non-manual employees became the largest class. These trends among women and men were the result of changes in the Finnish occupational structure from manual to non-manual occupations rather than changes in the classification of occupations. The decrease in entrepreneurs was explained by a decrease in self-employed farmers (results not shown).

Trends in the labor market distribution were largely influenced by the economic recession of the early 1990s due to which unemployment increased substantially. The influence of the recession was still visible in 2001, the percentage of unemployment being higher than in 1989 or in 2012. In 1989 the percentage of those in work was higher for men (47%) than for women (41%), but the recession

influenced men's employment more, leading to a convergence in the percentage of those in work between the sexes. In 2012 employment was already more common among women (53%) than among men (50%). The percentage of those retired due to both disability and other early retirement pathways decreased during the study period, whereas the percentage of statutory retirement was highest in 2012. Other activity, i.e. being outside the labor force for other reasons than retirement, became less common among women and more common among men during the study period.

Life expectancy spent in different labor market statuses

Figure 1 presents calculations for life expectancy spent in different labor market statuses by sex in calendar years 1989, 2001 and 2012 and for cohorts born in 1938, 1946 and 1953. [Tässä voisi aloittaa tasoista, sitten jatkaa trendeillä] The total life and statutory retirement expectancies were at much higher levels for women because of higher mortality among men. In the beginning of the study period in 1989, for example, the life expectancy at age 50 was 24.4 and 30.4 years and the retirement expectancy 10.5 and 15.9 years for men and women, respectively. These figures were at much higher levels in calculations based on the cohort than the period perspective. Already for the oldest cohort born in 1938, the total life expectancy was 30.0 and 35.9 years and the retirement expectancy 16.6 and 22.3 years for men and women, respectively. In contrast to the cohort perspective, the period calculations do not account for future decreases in mortality rates and therefore produce lower expectancies of remaining life years. Working life expectancy at age 50 was around seven to eight years for both men and women in the first calendar year (1989) and for the oldest cohort (1938). The expectancies of time spent in other labor market statuses were at much lower levels than those spent in work or statutory retirement.

[Tulosten käsittelyjärjestys voisi ehkä olla 1) total life exp, 2) working, 3) retirement, ja muista lyhyt maininta. En tehnyt tätä uudelleenjärjestelyä vielä]

[Figure 1 about here]

For both men and women, total life, working life and statutory retirement expectancies all increased independently of whether the changes were measured over calendar years or birth cohorts. Life expectancy at age 50 increased with 2.6–5.2 years (7–21%), working life expectancy with 1.2–2.5 years (15–34%) and statutory retirement expectancy with 2.5–5.6 years (11–54%), depending on sex and cohort versus period perspective. The total life and statutory retirement expectancies increased more for men than for women due to faster decline in mortality among men. In the most

recent calendar year (2012) and for the youngest cohort (1953) life expectancy at age 50 ranged between 29.6 and 38.5 years and the retirement expectancy between 16.1 and 24.7 years with the highest levels still observed for women as well as for the cohort calculations. The number of working years increased for both sexes but more for women and it exceeded the level observed for men during the study period. In both the most recent calendar year (2012) and for the youngest birth cohort (1953) women were expected to have around ten and men around nine remaining work years.

Disability retirement expectancy decreased with 1.1–1.5 years (36–47%) and other early retirement expectancy with 0.9–1.5 years (66–80%), depending on sex and the chosen perspective. Results for unemployment were more complex, with larger changes only being observed for the period calculations: unemployment expectancy was highest in the middle of the study period in 2001 with a one-year difference (around two-and-a-half-fold increase) compared to the beginning of the study period in 1989 for both men and women. For both sexes in the most recent calendar year (2012) and for the youngest birth cohort (1953) the expectancy of time spent in any other non-employment statuses than statutory retirement was around four years. Confidence intervals for the period expectancies are narrow and shown in Supplementary Tables 1 and 2.

Figure 2 presents annual trends in the working life expectancy, statutory retirement expectancy and expectancy of time spent in other statuses (unemployment, disability retirement, other early retirement and other activities outside the labor force) by sex and social class across calendar years and birth cohorts. The retirement expectancies were at much higher levels for the cohort than the period calculations, whereas the expectancies of years spent in work and other statuses were at relatively similar levels regardless of the chosen perspective. Overall, consistent trends were observed across successive birth cohorts, with increasing working life and statutory retirement expectancies and decreasing expectancies of time spent in other statuses. For period calculations the trends were similar and consistently increasing for retirement expectancy, but the working life expectancies fluctuated with economic conditions. The period working life expectancies decreased until the mid-1990s, after which they began to increase. The trend was opposite for the period expectancies of time spent in other statuses. For both the period and the cohort calculations, the increasing years in statutory retirement and the decreasing years in other non-employment statuses partly canceled each other out. As a result the years in work generally increased more than the years spent outside of work.

[Figure 2 about here]

There was little variation in these trends by social class but large differences in levels. For example, for the most recent calendar year (2012) and the youngest cohort (1953) working life expectancy was 3.6–3.7 years lower and expectancy of time spent in other non-employment statuses than statutory retirement 3.2–3.9 years higher for manual workers than for upper non-manual employees, depending on sex and the cohort versus period perspective. For statutory retirement expectancy the magnitude of the social class difference varied by sex being among men 4.6–4.7 years and among women 1.7–2.0 years lower for manual workers than upper non-manual employees. This variation was due to larger socioeconomic mortality differences among men. The total number of years spent outside work was among men largest for upper non-manual employees (around one-and-a-half years difference) and among women largest for manual workers (around two years difference) (nämä SES-kontrastit on tärkeitä ja jotain lukujä pitäisi laittaa tekstiin). Numbers for the specific labor market expectancies by social class in selected calendar years and birth cohorts as well as confidence intervals for the period calculations are presented in Supplementary Tables 1–4.

Share of remaining life spent in work

Figure 3 presents the percentage of the total remaining life expectancy at age 50 that is spent in work by sex and social class across calendar years and birth cohorts. The patterns corresponded with the shapes of the trends for working life expectancies in Figure 2. Younger cohorts were consistently expected to spend a larger share of remaining life in work than older ones, whereas for the period calculations this share decreased during the early 1990s recession and started to increase only after the mid-1990s (Figure 3). The share of remaining life spent in work was consistently higher for the period than the cohort calculations, being around 30% for the most recent period and around 25% for the youngest cohort. Independently of the cohort versus period perspective, the share of remaining life spent in work has increased for the last 15–20 years or birth cohorts, despite steadily increasing life expectancy.

[Figure 3 about here]

The share of remaining life spent in work was slightly higher for men than for women due to a shorter life expectancy among men. Similar trends were observed in all social classes, but there were large and consistent differences in levels. For example, in year 2012 the share remaining life spent in work at age 50 was 35.2% and 33.4% among male and female upper non-manual employees and 28.5% and 24.3% among male and female manual workers, respectively. However, the increase in the share of remaining life spent in work across calendar years and birth cohorts was

particularly large among men from lower social classes leading to decreases in the difference between manual workers and non-manual employees from 13.2 to 6.7 percentage points between 1993 and 2012 and from 9.3 to 6.7 percentage points across the 1939–1953 birth cohorts [tätä ei välttämättä näe kovin hyvin kuviosta. Pitäisikö antaa joku luku paljonko ero on kaventunut.]. For the period results this was mainly driven by smaller increases in the total life expectancy and for the cohort results by a larger increase in the working life expectancy among men in lower classes (Supplementary Tables 1 and 3).

Decomposition of the difference in working life expectancy

In Table 2, the differences in the working life expectancy between different populations are decomposed into the contributions arising from differences in the mortality rate, on the one hand, and in the employment rate, on the other. In 1989 men had only less than one tenth of a year longer working life expectancy at age 50 than women: the contributions of lower mortality rates favoring women and higher employment rates favoring men cancelled each other out. In 2012 the working life expectancy was already almost one year longer for women than for men: the contribution of employment had reversed now favoring women, and this contribution had become even larger than that of mortality which was also still favoring women. Age-specific decomposition results indicated that in 2012 the employment rate contributed in the favor of women up to the age of 63 (results not shown).

[Table 2 about here]

Increases in the working life expectancy between 1989 and 2012 by over one year among men and over two years among women were mainly attributable to increases in employment (explaining 79% of the difference for men and 97% for women) and less so to decreases in mortality. Also the over three-and-a-half years higher working life expectancy observed for upper non-manual employees than for manual workers in 2012 was mostly attributable to differences in the employment rate between the classes (explaining 92% of the difference for men and 96% for women). This pattern was similar in preceding calendar years (results not shown). Furthermore, decomposition results for cohort data showed corresponding patterns with regard to group differences and changes over time (results not shown).

DISCUSSION

Main findings

Our findings indicate that both in a recent calendar period (year 2012) and for an actual cohort that is now approaching statutory retirement age (born in 1953), women are expected to have around ten and men around nine remaining work years at age 50. This is between one fourth to almost one third of the total remaining life years depending on sex and the period versus cohort perspective. The corresponding time spent in statutory retirement is between 16 and 25 years and that spent in other non-employment statuses around four years.

Looking at trends, we found that working life expectancies at age 50 have increased across periods that succeeded the recession of the early 1990s as well as across successive cohorts born between 1938 and 1953. These trends coincided with increases in statutory retirement expectancies and decreases in other non-employment mainly attributable to reductions in disability and other early retirement. Our findings on the trends in labor market expectancies are largely consistent with previous ones from different countries using period data (Hytti & Nio 2004; Nurminen et al. 2005; Hytti & Valaste 2009; Vogler-Ludwig 2009; Denton et al. 2010; Nurminen 2012). However, this study corroborates these findings and extends prior results to assess cohort patterns. Furthermore it decomposes changes to the attribution of changes in mortality and employment participation over the study period. We found that the increase in working life expectancy was mainly driven by increases in employment rates especially among women.

Increased employment participation among older people may be partly attributable to compression or postponement of morbidity: younger cohorts are able to work longer due to a delay in the onset of functional problems (Gordo 2011). Recent results from Denmark, for example, indicate that healthy life expectancy at age 50 has increased more than total life expectancy (Jeune et al. 2015). It has also been suggested that increasing longevity (Aísa et al. 2012; d'Albis et al. 2012) as well as a higher subjective life expectancy (Griffin et al. 2012) encourage individuals to retire later in terms of optimal division of remaining years into work and leisure. In the in Finnish context, however, the timing of retirement is strongly determined by age limits set by statutory pension schemes, thereby undermining the role of choice in retirement behavior. The observed increase in employment participation among older people is thus in addition to improved health also partly attributable to

policies restricting early retirement pathways since the 1990s (Tuominen 2007; Finnish Centre for Pensions & the Social Insurance Institution of Finland 2014).

We found that the share of remaining life at age 50 spent in work has increased consistently across the cohorts, and since the mid-1990s also across the periods. Even though the time spent in statutory old-age retirement has increased, this trend has been counterbalanced by decreasing disability and other early retirement, resulting in an increasing relative contribution of working life years to the total life expectancy. Therefore the gains in life expectancy do not necessarily have the largest contribution to additional economically inactive years, as suggested earlier (Eggleston & Fuchs 2012), but instead to additional years in gainful employment. However, the share of remaining life spent in work may not have increased as rapidly for younger as for older people, since the observed increases in working life expectancy have been mostly attributable to higher employment participation of older age groups (Nurminen 2012). There may also be variation in these trends by different countries (Eggleston & Fuchs 2012), depending on changes in a wide range of factors such as economic conditions, retirement policy as well as health and mortality.

We found that the share of remaining life spent in work was constantly higher for the period than the cohort calculations. The cohort perspective showed clearly higher levels of total life and statutory retirement expectancies. Our findings are line with a previous Canadian study that has assessed the differences between the period and cohort labor market expectancies: the period calculations are likely to largely underestimate the retirement expectancies because they do not account for future increases in longevity (Denton et al. 2010). Although period results are informative about contemporary mortality and labor market conditions, they do not necessarily reflect the experience of real birth cohorts. The cohort perspective may be considered more informative and significant in this context because it reflects the actual balance of work-related contributions of each generation to years in retirement, and thereby helps to assess future sustainability of the social security system.

Overall, our results indicate that trends have been similar by sex and social class. Women nevertheless have a higher level of working life expectancy at age 50 than men, and much higher retirement expectancy. We found that the difference in working expectancy is mostly driven by higher employment rates, but also because of lower mortality among women in working age. Men nevertheless spend a larger share of remaining life in work than women due to higher male mortality in retirement. We found large level differences also by social class as the upper classes

had the highest working life expectancy, statutory retirement expectancy as well as share of remaining life spent in work. Other studies have shown corresponding socioeconomic differences in period working life expectancies (Millimet et al. 2010; Nurminen 2012). Furthermore, previous findings based on older cohorts than those included in the present study have indicated that the economically active shares of the total life expectancies were highest for those in higher socioeconomic positions (Hayward & Grady 1990; Kaprio et al. 1996). Our findings further indicate that the majority of the social class difference in working life expectancy is driven by lower employment rates among those in lower social classes, whereas the contribution of mortality differences is negligible.

Shorter working life expectancy among those with a low socioeconomic position is likely to be partly explained by problems of employment, health and work ability: we found these groups to have the highest unemployment and disability retirement expectancies. Also previous findings indicate that those in lower social classes spend more years with poor health and disabilities between ages 50 and 64 (Cambois et al. 2011). Socioeconomic differences in employment participation may also be partly driven by varying economic incentives for work and retirement (Bratberg 1999; Aísa et al. 2012).

Methodological considerations

The method used to complete the labor market participation data for the most recent birth cohorts assumes that there are no trends in the age-specific rates: that is, the labor market participation of a cohort at a given unobserved age is the same as the previous cohort's observed rates. Our method forced the observed positive employment rate trends to level off, and it may therefore underestimate working life expectancies for the partially observed cohorts. However, previous sensitivity analyses with the same base data show that in short-term forecasting such as ours, the results are not sensitive to the trend assumption in the employment rates (Mysrkylä et al. 2013). Also sensitivity analyses from other sources indicate that assumptions regarding labor force participation and mortality generally have only small effects on the results even if participation rates were projected from the age of 50 (Denton et al. 2010). We observed each cohort at least to the age of 58.

Forecasting future mortality in the cohort analyses is another source of uncertainty in the results. We used the Lee-Carter model to linearly extrapolate mortality into the future based on age-specific mortality rates derived from the Human Mortality Database for men and women living in Finland in the base period of the study between 1989 and 2012. Analyzing future social class differences in

mortality by birth cohort is beyond the scope of this study, so we assumed the most simple scenario which keeps the relative mortality differences by social class constant during the forecasted period.

[kai tässä pitäisi mainita kuolleisuusennusteet myös. Kommentti lee-carterista, ja SES-erojen pysymisestä vakiona]

Conclusion

The cohort analyses reveal that the period perspective strongly overestimates the share of remaining life at age 50 that is spent working, suggesting that assessments based on period approaches may be overly optimistic. However, according to both the period and the cohort perspectives, there is an increasing trend in the share of remaining life spent in work. Longevity is thus contributing more to the time spent in work than in retirement, which relieves the pressure on the sustainability of the social security system. The trend is consistent among both men and women and across the social classes. However, there are large differences in levels as women have more of both work and retirement years than men, and those in higher social classes have more years in work and statutory retirement, but less years in early retirement and other non-employment than those in lower social classes.

REFERENCES

Aísa R, Pueyo F, Sanso M. Life expectancy and labor supply of the elderly. Journal of Population Economics 2012;25:545-568.

d'Albis H, Lau SHP, Sanchez-Romero M. Mortality transition and differential incentives for early retirement. Journal of Economic Theory 2012;147:261-283.

Andreev EM, Shkolnikov VM. An Excel spreadsheet for the decomposition of a difference between two values of an aggregate demographic measure by stepwise replacement running from young to old ages. MPIDR Technical Report TR-2012-002. Rostock: Max Planck Institute for Demographic Research, 2012. Available at: http://www.demogr.mpg.de/en/projects_publications/publications_1904/mpidr_technical_reports/an_excel_spreadsheet_for_the_decomposition_of_a_difference_between_two_values_of_an_aggregate_4591.htm (accessed 28 January 2015)

Bratberg E. Disability Retirement in a Welfare State. Scand J of Economics 1999;101:97–114.

Cambois E, Laborde C, Romieu I, Robine JM. Occupational inequalities in health expectancies in France in the early 2000s: Unequal chances of reaching and living retirement in good health. Demographic Reasearch 2011;25:407-435.

Denton FT, Feaver CH, Spencer BG. Cohort Working Life Tables for Older Canadians. Canadian Studies in Population 2010;37:175-206.

Eggleston KN, Fuchs VR. The New Demographic Transition: Most Gains in Life Expectancy Now Realized Late in Life. J Econ Perspect 2012; 26:137–156.

Finnish Centre for Pensions (ETK), The Social Insurance Institution of Finland (KELA) (2014). Statistical yearbook of pensioners in Finland 2013. Helsinki: ETK and KELA.

Foster L, Walker A. Active and Successful Aging: A European Policy Perspective. The Gerontologist 2015;55:83-90.

Gonzales E, Matz-Costa C, Morrow-Howell N. Increasing Opportunities for the Productive Engagement of Older Adults: A Response to Population Aging. The Gerontologist 2015 Epub ahead of print.

Gordo LR. Compression of morbidity and the labour supply of older people. Applied Economics 2011;43:503–513.

Griffin B, Hesketh B, Loh V. The influence of subjective life expectancy on retirement transition and planning: A longitudinal study. Journal of Vocational Behaviour 2012;81:129-137.

Hayward MD, Grady WR. Work and Retirement Among a Cohort of Older Men in the United States, 1966-1983. Demography 1990;27:337–356.

Huisman M, Read S, Towriss CA, Deeg DJH, Grundy E. Socioeconomic Inequalities in Mortality Rates in Old Age in the World Health Organization Europe Region. Epidemiol Rev 2013 Epub ahead on print.

Human Mortality Database. University of California, Berkeley (USA), and Max Planck Institute for Demographic Research (Germany). Available at www.mortality.org or www.humanmortality.de (data downloaded on 16 January 2015).

Hytti H, Nio I. Monitoring the employment strategy and the duration of active working life. Social security and health research: working papers 38/2004. The Social Insurance Institution, Finland.

Hytti H, Valaste M. The average length of working life in the European Union. The Social Insurance Institution of Finland, Online working papers 1/2009.

Jagger C, Cox B, Le Roy S, EHEMU. Health Expectancy Calculation by the Sullivan Method. 3rd Edition. EHEMU Technical Report September 2006. Available at: http://www.eurohex.eu/pdf/Sullivan_guide_final_jun2007.pdf (accessed 23 March 2012)

Jeune B, Eriksen ML, Andersen-Ranberg K, Brønnum-Hansen H. Improvement in health expectancy at ages 50 and 65 in Denmark during the period 2004–2011. Scand J Public Health 2015 Epub ahead on print.

Kalwij AS, Alessie RJ, Knoef MG. The association between individual income and remaining life expectancy at the age of 65 in the Netherlands. Demography 2013;50:181–206.

Kaprio J, Sarna S, Fogelholm M, Koskenvuo M. Total and occupationally active life expectancies in relation to social class and marital status in men classified as healthy at 20 in Finland. J Epidemiol Community Health 1996;50,653-660.

Lee, R.D. and Carter, L.R. (1992) "Modeling and Forecasting U.S. Mortality." Journal of the American Statistical Association 87(419): 659-671.

Lee, R. and Miller, T. (2001) "Evaluating the Performance of the Lee-Carter Method for Forecasting Mortality". Demography 38(4):537-549.

Majer IM, Nusselder WJ, Mackenbach JP, Kunst AE (2011). Socioeconomic inequalities in life and health expectancies around official retirement age in 10 Western-European countries. J Epidemiol Community Health 65:972-979

Millimet DL, Nieswiadomy M, Slottje DJ. Detailed Estimation of Worklife Expectancy for the Measurement of Human Capital: Accounting for Marriage and Children. Journal of Economic Surveys 2010;24:339-361.

Myrskylä M, Leinonen T, Martikainen P. Life expectancy by labor force status and social class: Recent period and cohort trends and projections for Finland. Finnish Centre for Pensions Working Papers 02/2013.

Nurminen M (2012). Working-life expectancy in Finland: trends and differentials 2000–2015. A multistate regression modeling approach. Finnish Centre for Pensions, Reports, 03/2012.

Nurminen MM, Heathcote CR, Davis BA, Puza BD (2005). Working life expectancies: the case of Finland 1980–2006. Journal of the Royal Statistical Society: Series A (Statistics in Society) 168:567–581.

OECD (2006). Live longer, work longer. Ageing and employment policies.

Preston SH, Heuveline P, Guillot M (2001) Demography: Measuring and modeling population processes. Oxford: Blackwell Publishing.

Schuring M, Robroek SJW, Otten Ferdy WJ, Arts CH, Burdorf A. The effect of ill health and socioeconomic status on labor force exit and re-employment: a prospective study with ten years follow-up in the Netherlands. Scand J Work Environ Health 2013;39:134-143.

Shkolnikov VM, Scholz R, Jdanov DA, Stegmann M, von Gaudecker H-M. Length of life and the pensions of five million retired German men. European Journal of Public Health 2008;18:264–269.

Sullivan DF. A single index of mortality and morbidity. HSMHA Health Rep 1971;86(4):347-54.

Tuominen E (2007). The role of pension policy in promoting longer working careers of older people. Finnish Centre for Pensions, Working Papers, 2007:3.

Vogler-Ludwig K (2009). Monitoring the duration of active working life in the European Union. Final Report. Study for the European Commission Employment, Social Affairs and Equal Opportunities DG Unit D1. Economix. Munich: Research & Consulting, 19.8. 2009.

Wang D. Modeling mortality data using the Lee–Carter model. Stata Technical Bulletin 2000;57:15-17. Available at http://www.stata.com/products/stb/journals/stb57.html (Accessed 14 January 2015)

Table 1. Distribution (%) of key characteristics of the study population in the period 1989–2012 restricted to men and women aged 50–69

	MEN				WOMEN			
	Year 1989	Year 2001	Year 2012	Average 1989–2012	Year 1989	Year 2001	Year 2012	Average 1989–2012
Age								
50–54	29.2	36.2	25.9	30.7	25.7	34.0	25.3	28.6
55–59	27.4	25.7	26.7	27.2	25.3	25.0	26.4	26.2
60–64	24.9	20.8	27.3	23.4	25.5	21.4	27.4	23.9
65–69	18.4	17.3	20.1	18.7	23.5	19.6	21.0	21.3
Social class								
Upper non-manual	11.7	16.0	18.2	15.7	8.3	12.5	16.1	12.3
Lower non-manual	15.0	17.8	18.0	17.0	30.7	39.8	45.8	39.1
Manual	48.8	45.8	44.2	46.0	42.3	33.2	25.8	33.3
Entrepreneur	23.2	18.6	17.0	19.5	17.3	12.7	9.7	13.4
Other/unkown	1.2	1.8	2.6	1.8	1.4	1.9	2.5	2.0
Labor market status								
Work	46.7	47.7	50.4	46.1	40.8	46.4	53.2	44.8
Statutory retirement	17.8	20.5	25.3	21.1	23.8	23.5	26.1	24.4
Unemployment	2.5	8.8	7.7	7.8	2.3	8.4	5.7	6.8
Disability retirement	21.0	15.0	11.5	16.6	17.3	12.7	9.5	14.0
Other early retirement	10.7	5.5	2.1	6.0	10.5	5.7	2.6	6.4
Other	1.4	2.4	3.1	2.3	5.3	3.4	3.1	3.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

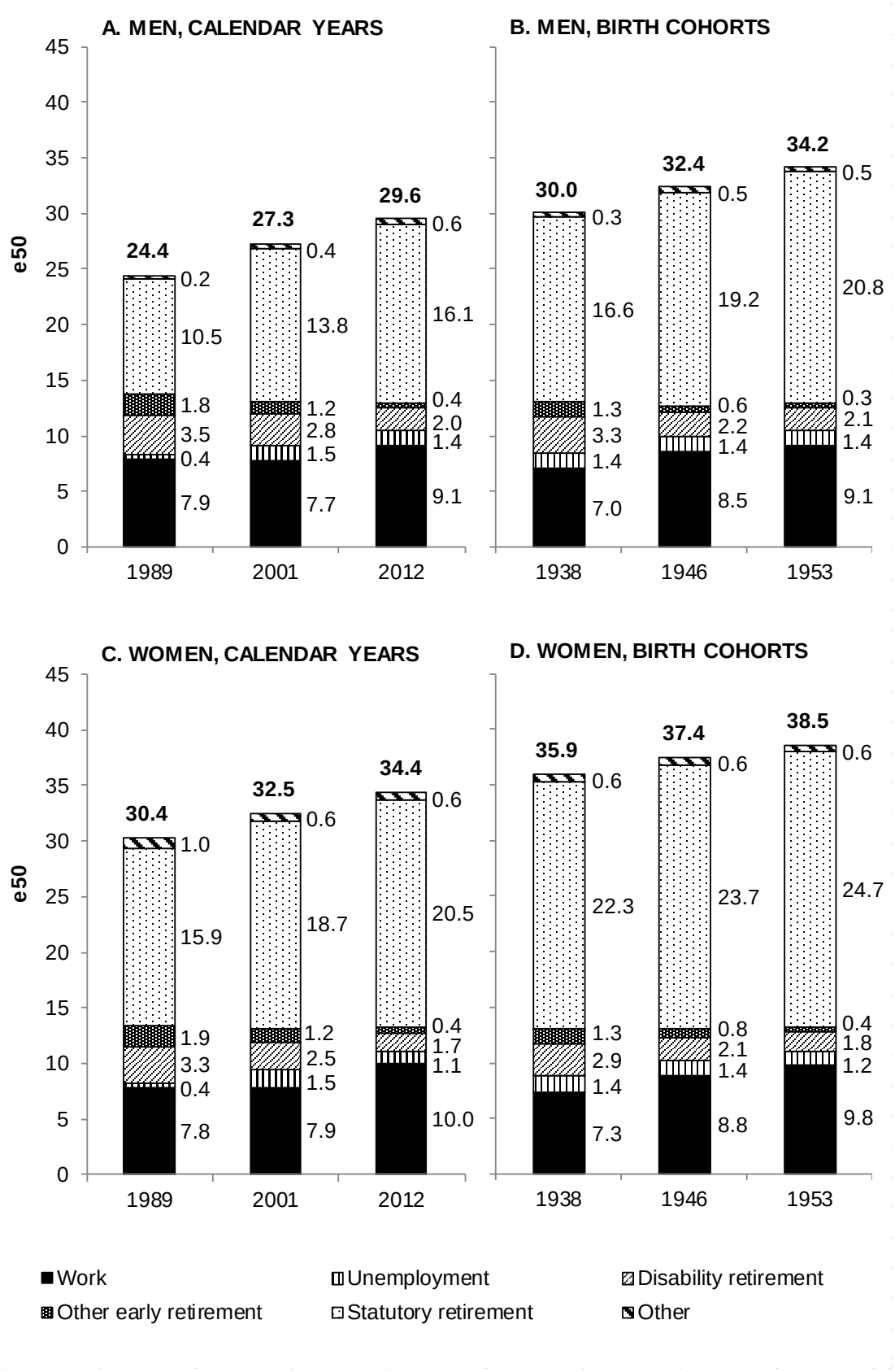

Figure 1. Total life expectancy at age 50 (above the bars) divided into years spent in different labor market statuses (beside the bars) by sex in selected calendar years and birth cohorts

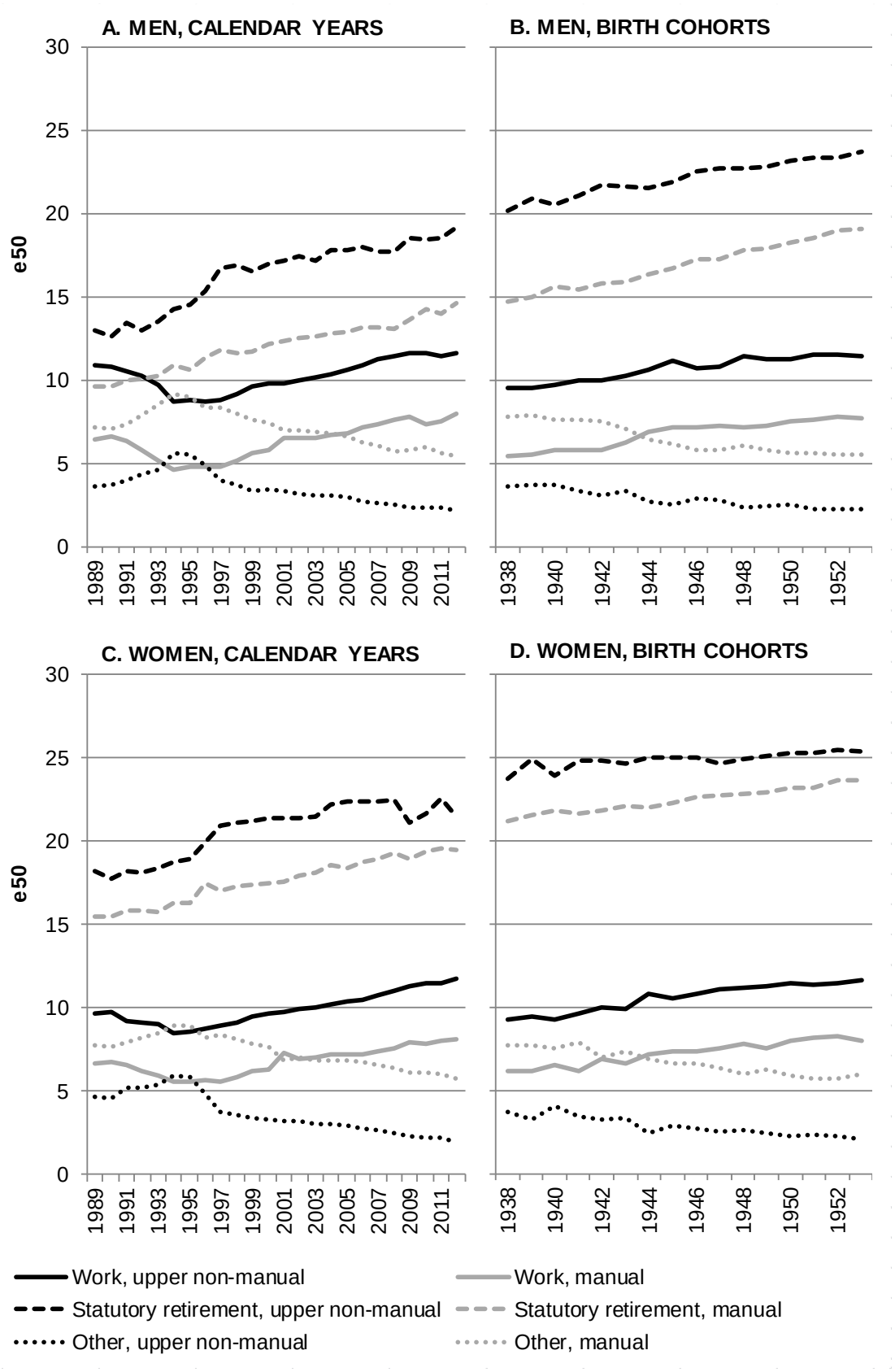

Figure 2. Period and cohort calculations for life expectancy at age 50 spent in different labor market statuses by sex and social class

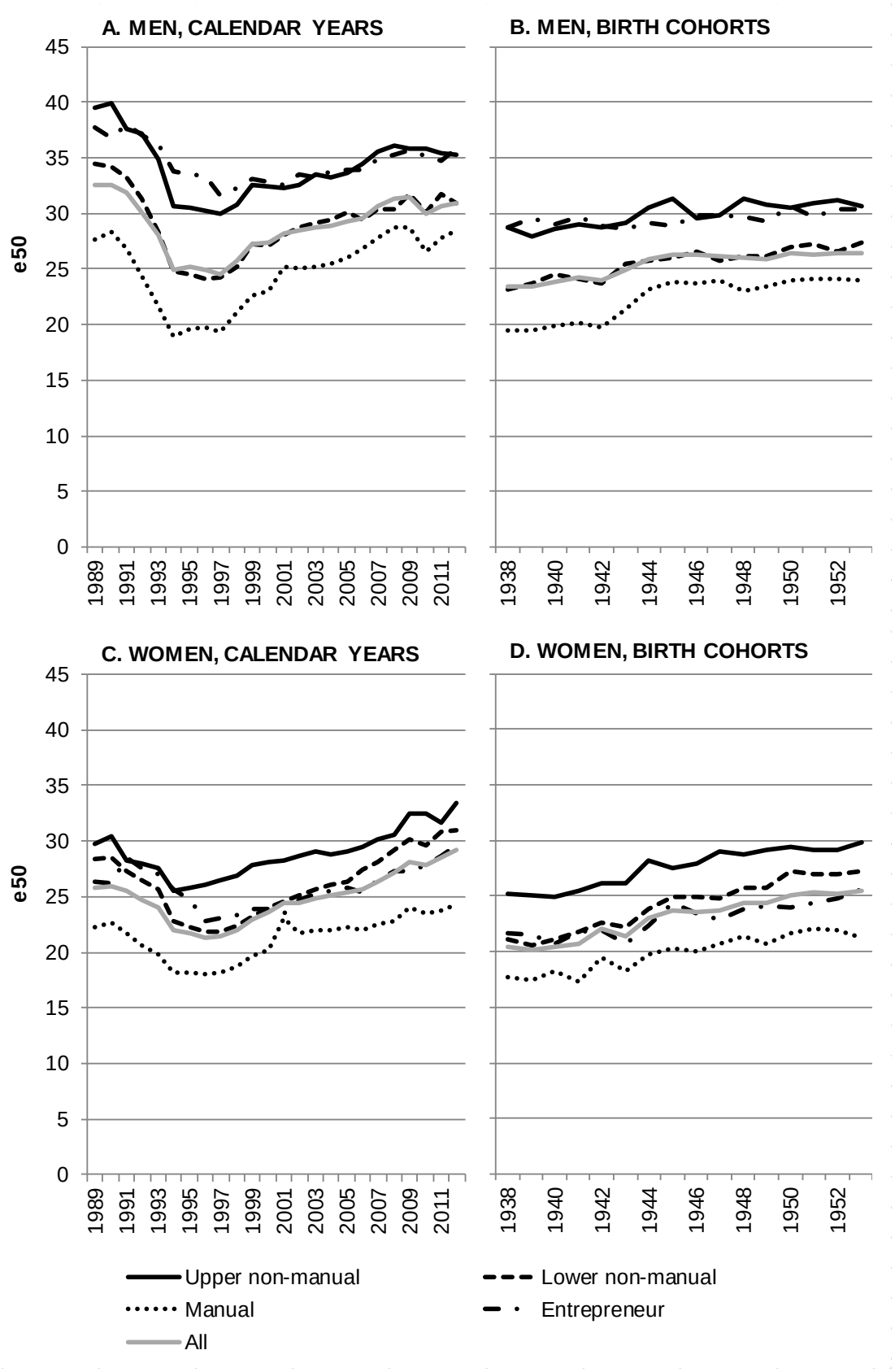

Figure 3. Period and cohort calculations for the percentage of the total life expectancy at age 50 spent in work by sex and social class

Table 2. Decomposition of the difference in the working life expectancy at age 50 observed between two populations

	Comparison populations (former - latter):					
Components contributing to the difference in working life expectancy	Women and men, 1989	Women and men, 2012	2012 and 1989, men	2012 and 1989, women	Upper non-manual and manual men, 2012	Upper non-manual and manual women, 2012
Mortality rate	0.34	0.23	0.27	0.07	0.30	0.13
Employment rate	-0.43	0.65	0.95	2.12	3.35	3.50
Total difference	-0.09	0.89	1.21	2.19	3.65	3.63