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Health, Work Capacity, and Retirement in Sweden

Per Johansson, Lisa Laun, and Mårten Palme

One of Sweden's former Prime Minister Fredrik Reinfeldt's most controversial statements during his time in office between 2006 and 2014 was that the sustainability of Sweden's welfare state depends on the ability of the workforce to prolong their active time in the labor market. He added that people in the future should prepare themselves to stay in the workforce until age seventy-five. This question was put high on the policy agenda, and a government committee was appointed to suggest measures to delay the labor market exit (see Statens Offentliga Utredningar 2013).

Policy initiatives to delay retirement have also been implemented. The minimum mandatory retirement age increased from age sixty-five to sixty-seven in 2001. In 2007, an additional earned income tax credit and a payroll tax reduction were introduced for workers older than age sixty-five, with the purpose of increasing labor supply at older ages. Laun (2012) shows that these reforms seem to have increased labor force participation past age sixty-five.

One of the main issues in the subsequent public policy debate was to what extent the health status of the population would allow a delayed retirement age. Although life expectancy has increased rapidly over the last couple of

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decades, skeptics pointed out that the development of self-reported health is less unambiguous and that one can even see a slight deterioration in some health measures, such as the share of people with obesity (BMI > 29.9).[1]

This chapter investigates what available microdata can tell us about whether or not and to what extent older workers in Sweden have the health capacity to extend their work lives. To address this question, we use two different methods. The first one estimates how much people with a given mortality rate today would work if they were to work as much as people with the same mortality rate worked in the past. This approach builds on the work by Milligan and Wise (2012). The calculations we make are based on plots of the relationship between employment and mortality over time. We use employment data from the LOUISE data set, administered by Statistics Sweden, and mortality data from the Cause of Death Register, administered by the Swedish Board of Health and Welfare. We focus on men and women age fifty-five to sixty-nine in 2009 and compare them to their counterparts in terms of mortality during the period 1985–2008 in this analysis.

The second method uses a regression framework and estimates how much people with a given level of health could work if they were to work as much as their younger counterparts in similar health. This approach builds on the work by Cutler, Meara, and Richards-Shubik (2012). We use data from the Survey of Health, Ageing and Retirement (SHARE) to estimate the relationship between health and employment for younger workers age fifty to fifty-four, and use these estimates together with the characteristics of older workers age fifty-five to seventy-four to predict the older individuals' ability to work based on health.

Finally, we document potential heterogeneity in health capacity across education groups. We look at changes in the development of self-assessed health by age between 1991 and 2010. In particular, we study if there are different developments in different quartiles in the distribution of educational attainment measured as number of years of schooling.

The results show that the increase in employment between the years 1998 and 2009 among men has been very similar to the decrease in the mortality rate. However, since 1985, there has been a decrease in the employment rate among men in the age group fifty-five to sixty-nine corresponding to more than three years at a constant mortality rate. Among females there has been no change in the employment rate in the age group fifty-five to sixty-nine between 1985 and 2009 at a constant mortality rate, primarily due to the general increase in the female labor force participation rate. Our analysis of health and employment among older workers shows very large potentials for increased employment of older workers. Finally, our results show no empirical evidence for increased health inequality in Sweden since the early 1990s.

1. See Socialstyrelsen (2013) for an overview.

The chapter is organized as follows: We first document the recent development of labor force participation and health in Sweden. Section 10.2 presents the results from the Milligan-Wise method and section 10.3 those from the Cutler et al. method. Section 10.4 presents the results on heterogeneity in the development of health across education groups. Finally, section 10.5 concludes.

10.1 Trends in Labor Force Participation and Health in Sweden

Figure 10.1 presents the development of labor force participation rates for men between 1963 and 2014 in different age groups. The figure shows that the labor force participation rate has varied substantially over time and differently for different age groups. The most dramatic development has been in the age group sixty to sixty-four. For this group, participation fell from 85 percent in the early 1960s to 55 percent in the late 1990s. Since then, the labor force participation rate increased consistently to above 70 percent in 2014. The developments in the other age groups forty-five to fifty-four and fifty-five to fifty-nine have followed a similar pattern, but have been less dramatic.

For men older than age sixty-five, there was a marked decline in labor force participation rates until the mid-1970s. The decline in the age group sixty-five to sixty-nine can primarily be attributed to the change in the normal retirement age from sixty-seven to sixty-five. In recent years, since the mid-1990s, there has been a trend towards a higher labor force participation

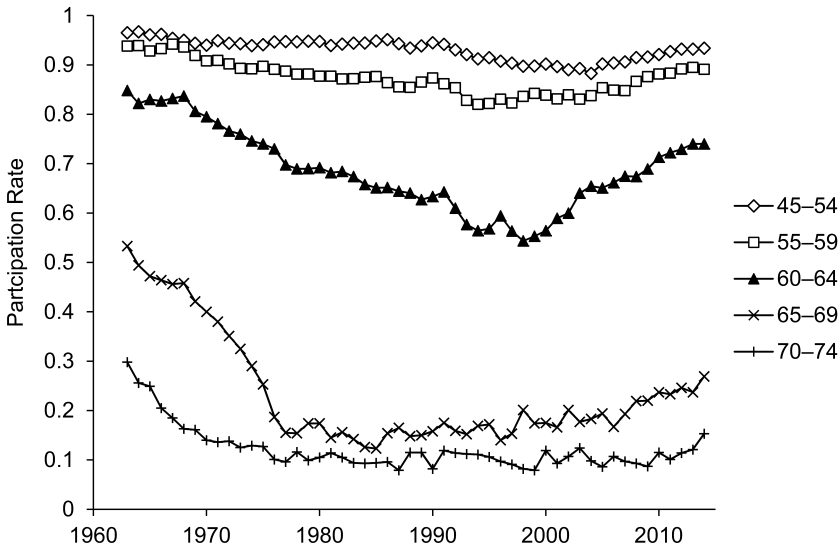

Fig. 10.1 Men's labor force participation by age group (1963–2014)
Source: Swedish Labor Force Survey, Statistics Sweden.

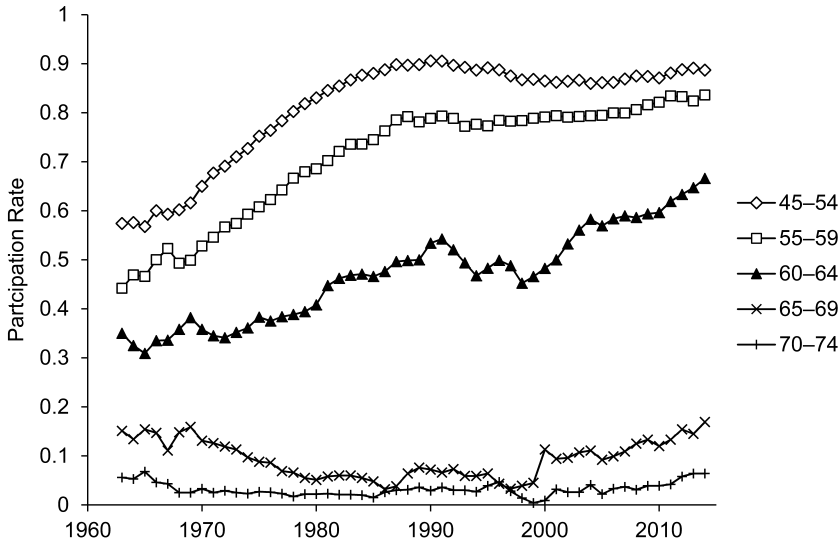

Fig. 10.2 Women's labor force participation by age group (1963–2014)
Source: Swedish Labor Force Survey, Statistics Sweden.

rate in the age group sixty-five to sixty-nine. In 2014 it was almost 27 percent, which is more than double compared to the rate in the mid-1980s.

Figure 10.2 shows the trends of labor force participation among women. Compared to men, there is a very different development. For the two youngest age groups, forty-five to fifty-four and fifty-five to fifty-nine, there was a dramatic increase in labor force participation from the early 1960s until the early 1990s. Since then the rates have been quite stable at 90 and 80 percent, respectively. For women age sixty to sixty-four, there has been a steady increase in labor force participation, except for a period in the 1990s. In 2014, participation in this age group was almost 67 percent. As for men, there is an increase in labor force participation rates for the age group sixty-five to sixty-nine, although on a slightly lower level.

Figure 10.3A presents the trends in mortality for men age fifty to seventy-four between 1985 and 2010. The mortality data comes from the Cause of Death Register administered by the National Board of Health and Welfare. There is a trend toward lower mortality rates over the entire period under study. In 1985, the mortality rate of men age fifty-five is about 0.8 percent. In 2009, that mortality rate is not reached until age sixty-one.

Figure 10.3B presents self-assessed health by age for men age fifty to seventy-four in 1991, 2000, and 2010, based on the Swedish Level of Living Survey (LNU). This survey is managed by the Stockholm Institute of Social Research (SOFI) at Stockholm University and contains data on socioeconomic characteristics and information on living conditions obtained through

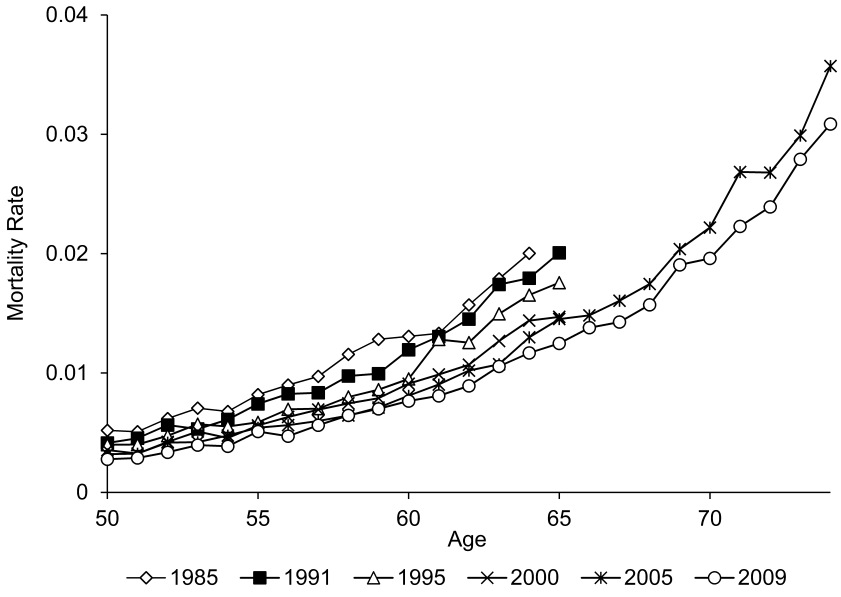

Fig. 10.3A Mortality for men age fifty to seventy-four (1985–2010)
Source: Swedish Cause of Death Register.

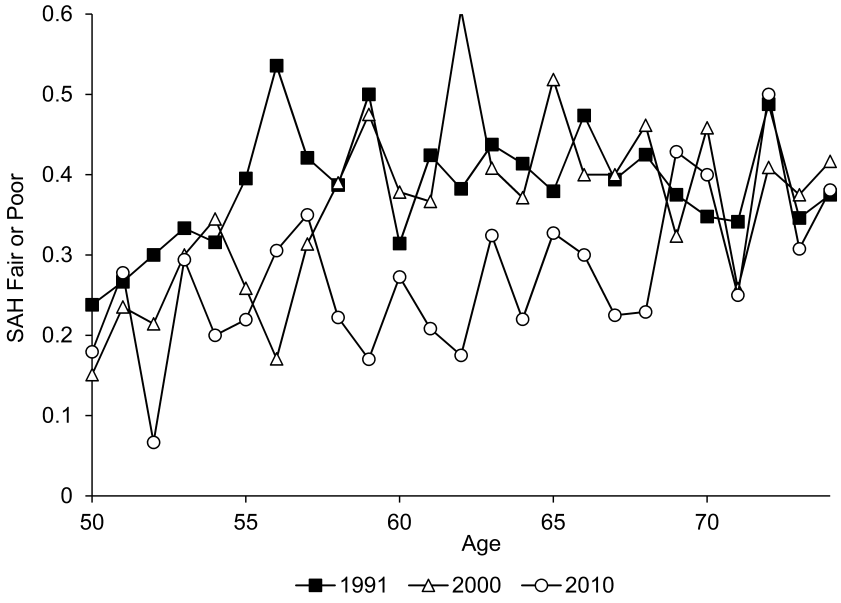

Fig. 10.3B Self-assessed health fair or poor for men age fifty to seventy-four (1985–2010)
Source: Swedish Level of Living Survey (LNU).

interviews along with register data for individuals age sixteen to seventy-four and permanently living in Sweden. The sample size is about 6,000 individuals, about 0.1 percent of the Swedish population in the age interval under study.

The series show the fraction of the population reporting fair or poor health. There is an age gradient in self-assessed health, with an increasing share of individuals reporting fair or poor health as they age. The main message in figures 10.3A and 10.3B is that there is a trend toward improved self-assessed health. Between 1991 and 2000, there are improvements primarily in younger ages, below age fifty-eight. Between 2000 and 2010, on the other hand, the improvement in health primarily occurs in older ages, above age fifty-eight. The average share reporting fair or poor health declined from around 0.4 on average to around 0.25 above age sixty between 2000 and 2010, which is a quite substantial improvement over the last decade.

10.2 Estimating Health Capacity to Work Using the Milligan-Wise Method

Using a methodology suggested by Milligan and Wise (2012), we calculate how much people with a given mortality rate today would work if they were to work as much as people with the same mortality rate worked in the past. Advantages with using mortality data—rather than other measures of health that may be more related to an individual's work capacity—are that it can be very accurately measured and that it is available across countries, which facilitates comparisons.

The mortality data in this analysis comes from the Cause of Death Register administered by the National Board of Health and Welfare. Employment data is taken from the LOUISE (or SYS) register, administered by Statistics Sweden. An individual is defined as employed if, in a given year, he or she has labor income above one price base amount.

The period we consider is 1985 through 2009. The restriction in historic time is given by the availability of data on employment. The data covers individuals up to age sixty-four for the period 1985–1989, to age sixty-five for the period 1990–2000, and to age sixty-nine for the period 2001–2009. We calculate age-specific averages of the data on mortality and employment in three years: 1985, 1995, and 2009. The analysis displays the employment rate at each level of mortality for specific time periods and compares the curves across time.

Figures 10.4A and 10.4B present the results on the employment-mortality curves for men and women, respectively, in 1985 and 2009. Figure 10.4A shows that even though the employment rate, as we saw in figure 10.1, has increased slightly between 1985 and 2010, it has been far from enough to offset the rapid growth in life expectancy for men in order to maintain the relation between mortality and employment. For women, however, figure 10.4B shows that the employment growth actually has kept up with the reduced mortality rate since the two curves essentially coincide.

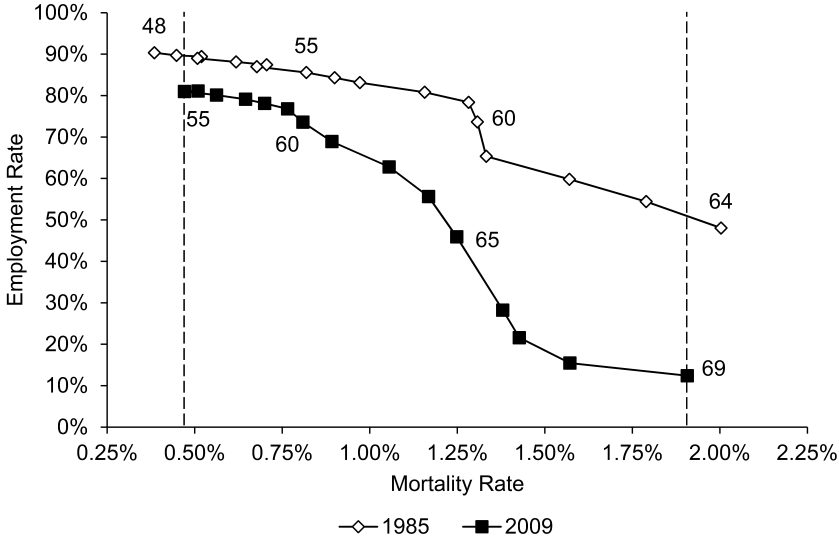

Fig. 10.4A Mortality and employment in 1985 and 2009 (men)

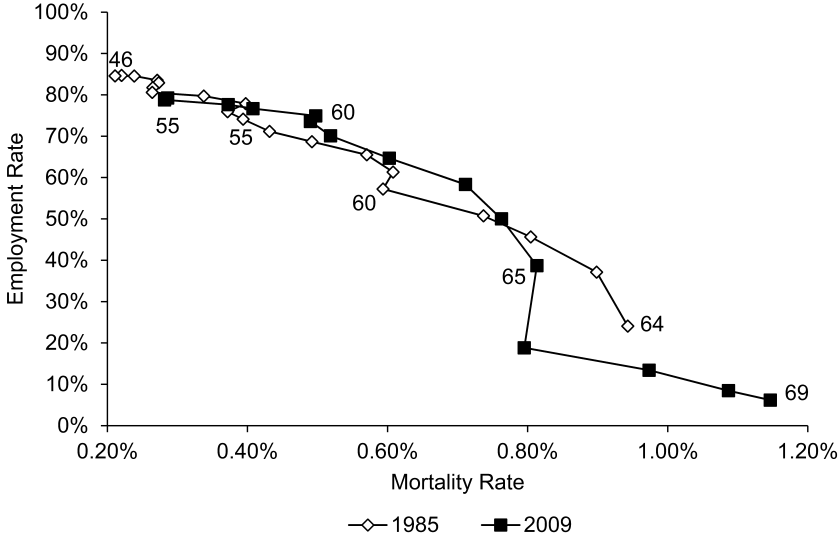

Fig. 10.4B Mortality and employment in 1985 and 2009 (women)

Table 10.1A presents the results from asking how much more men age fifty-five to sixty-nine in 2009 could have worked if they had worked as much as men with the same mortality rate worked in 1985. Table 10.1B shows the corresponding estimates for women. An additional 7.86 percentage points of men could have worked at age fifty-five, which generates on

Table 10.1A **Additional employment capacity in 2009 using 1985 employment-mortality relationship (percent, men)**

Age	Mortality rate in 2009	Employment rate in 2009	Employment rate at same mortality rate	Additional employment capacity
55	0.51	81.11	88.97	7.86
56	0.47	80.99	89.62	8.63
57	0.56	80.12	88.56	8.44
58	0.65	79.11	87.92	8.81
59	0.70	78.11	86.76	8.65
60	0.77	76.80	86.11	9.31
61	0.81	73.58	85.68	12.10
62	0.89	68.91	84.43	15.52
63	1.06	62.79	82.08	19.29
64	1.17	55.64	80.60	24.96
65	1.25	45.91	79.05	33.14
66	1.38	28.22	64.25	36.03
67	1.43	21.58	63.14	41.56
68	1.57	15.45	59.77	44.32
69	1.91	12.40	50.93	38.53
Total years		8.61		3.17

average 0.0786 additional work years (one additional year for 7.86 percent of the fifty-five-year-olds). Similarly, an additional 8.63 percentage points of men at age fifty-six could have worked for one more year.

If we repeat this analysis for each age through age sixty-nine and cumulate the amounts, we get a total potential additional employment capacity of 3.17 years for men. This is equivalent to integrating between the two curves from one vertical line, indicating the starting age, to the next vertical line, indicating the last age group included in figure 10.4A. The average amount of employment between ages fifty-five and sixty-nine in 2009 is 8.61 years. This implies that an additional 3.17 years would represent an almost 37 percent increase over the ages fifty-five to sixty-nine.

Table 10.1B shows the results from a corresponding exercise on data for females. Due to the age restrictions described earlier, the estimates can only be obtained for women between ages fifty-five and sixty-six in 2009. The mortality counterpart in 1985 for women ages sixty-seven to sixty-nine was older than age sixty-four, and therefore not included in our data. For men, the mortality gain was large enough between 1985 and 2009 for the mortality counterpart to be age sixty-four or younger in 1985, which is covered by the data and enables us to compare all ages.

As is evident from the estimates in table 10.1B, there is a much more modest predicted gain in labor force participation for women compared to men: only a 0.02 years gain corresponding to 0.3 percent of the employment rate in the age interval. Some of the gender difference can be attributed to the

Table 10.1B **Additional employment capacity in 2009 using 1985 employment-mortality relationship (percent, women)**

Age	Mortality rate in 2009	Employment rate in 2009	Employment rate at same mortality rate	Additional employment capacity
55	0.29	79.25	80.33	1.08
56	0.28	78.79	80.38	1.59
57	0.37	77.63	75.84	–1.79
58	0.41	76.67	73.01	–3.66
59	0.50	74.92	68.45	–6.47
60	0.49	73.55	68.76	–4.79
61	0.52	70.09	67.59	–2.50
62	0.60	64.66	56.83	–7.83
63	0.71	58.33	51.89	–6.44
64	0.76	50.01	48.79	–1.22
65	0.81	38.68	44.84	6.16
66	0.80	18.82	46.33	27.51
67	0.97	13.40		
68	1.09	8.46		
69	1.15	6.17		
Total years		7.89		0.02

fact that we were unable to include the age group sixty-seven to sixty-nine. However, the main background to this difference is the exceptional increase in female labor force participation rates that happened in the 1970s and 1980s and affected the birth cohorts that now are in the age groups fifty-five to sixty-nine. Since our focus in this study is to assess the potentials for prolonged work lives, the historical increase in the female labor force participation disturbs the comparison, making our method less suitable for the female subsample.

The Milligan-Wise method implicitly assumes that all gains in decreased mortality can be translated into additional work capacity. This is a strong assumption. It can be the case that decreased mortality is achieved through prolonged life, but with lost work capacity. A simple way to take this possibility into consideration is to assume that, say, two-thirds of the gain in decreased mortality is translated into prolonged work capacity by simply multiplying the figure above by two-thirds and arriving at an estimate of 2.11 years rather than 3.17 years for men.

Another question is which years to choose for comparison. As can be seen in figure 10.1, the break in the trend toward decreased labor force participation among older men since the early 1960s happened in the mid-1990s. In figures 10.5A and 10.5B, we replicate the analysis from figure 10.4A and 10.4B but use data from 1995, when the labor force participation started to increase, instead of 1985.

From the data shown above we know that the mortality rate was lower in

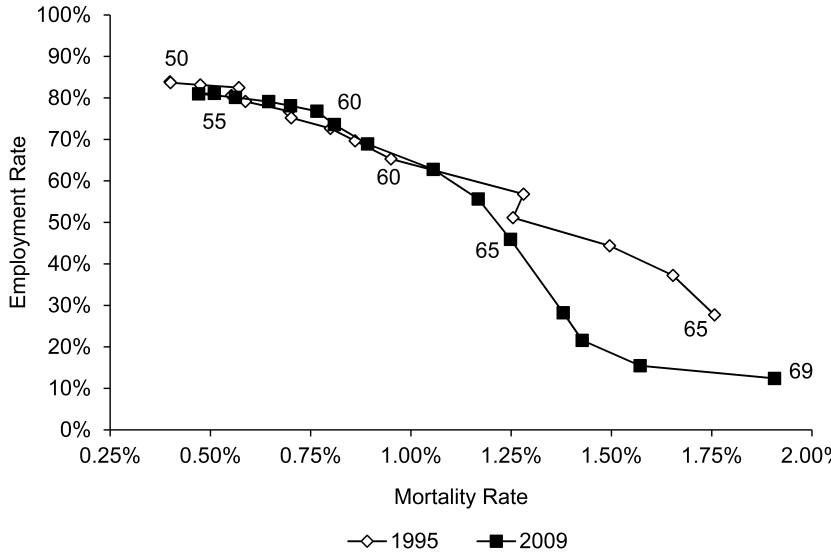

Fig. 10.5A Mortality and employment in 1995 and 2009 (men)

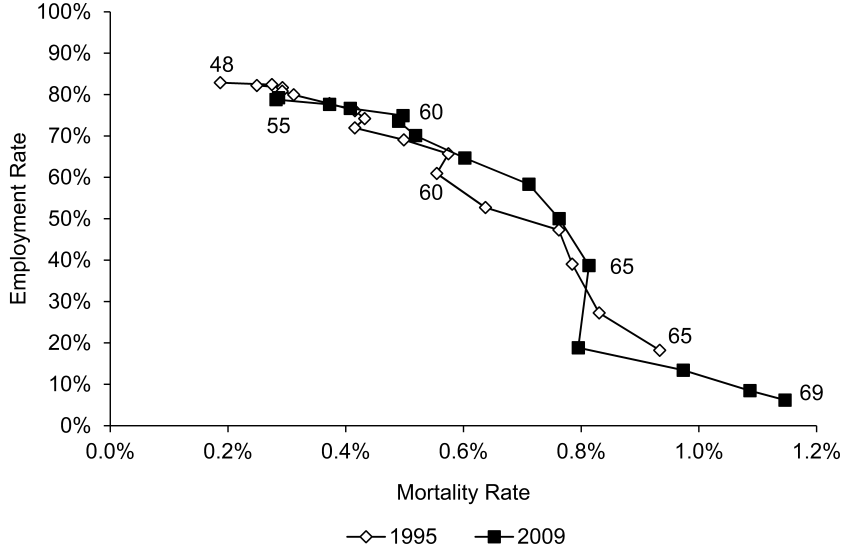

Fig. 10.5B Mortality and employment in 1995 and 2009 (Women)

2009 than in 1995 at all ages and the employment rate was higher in 2009 than in 1995. The fact that the curves for the two periods in figure 10.5A lie very close to each other suggest that the employment increase for men is large enough to keep up with the decreased mortality. For men in the very oldest ages, however, with the highest mortality rates and the lowest employ-

ment rates, there is a slight divergence between the curves. For women, figure 10.5B shows that the curves again lie very close to each other, implying that the increase in employment was proportional to the mortality gains between the two years.

Figure 10.6 presents the estimated additional employment capacity in 2009 as a function of the comparison year used, for males and females, respectively. Because of the age restriction described above, it is not always possible to obtain a comparable employment estimate for all ages up to age sixty-nine in 2009. This will slightly affect the comparison over time, but the patterns should still be informative.

For males, the estimated additional employment capacity is small compared to all years in the period between 1998 and 2009, since the mortality decrease is accompanied with an employment increase during this era. However, compared to years in the 1985–1990 period, the estimated additional capacity is substantial. As noted above, the situation for females is very different because there is an effect across cohorts toward a higher labor force participation rate.

We also use data on self-assessed health (SAH) and activity limitation (cannot run 100 meters) from the Swedish Level of Living Survey (LNU) to measure subjective health in 1991, 2001, and 2010, respectively. The total sample size is 0.1 percent of the Swedish population ages sixteen to seventy-five, that is, about 6,000 individuals. This means that we have around thirty-five to sixty men for each one-year birth cohort in ages fifty-five to seventy-five. Figures 10.7 and 10.8 present the results from the approach

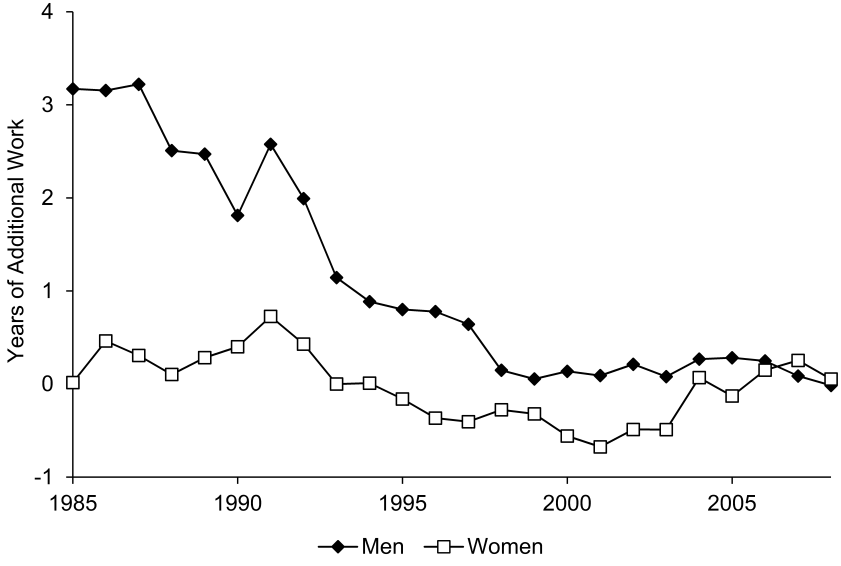

Fig. 10.6 Estimated additional employment capacity in 2009 by year of comparison for men and women

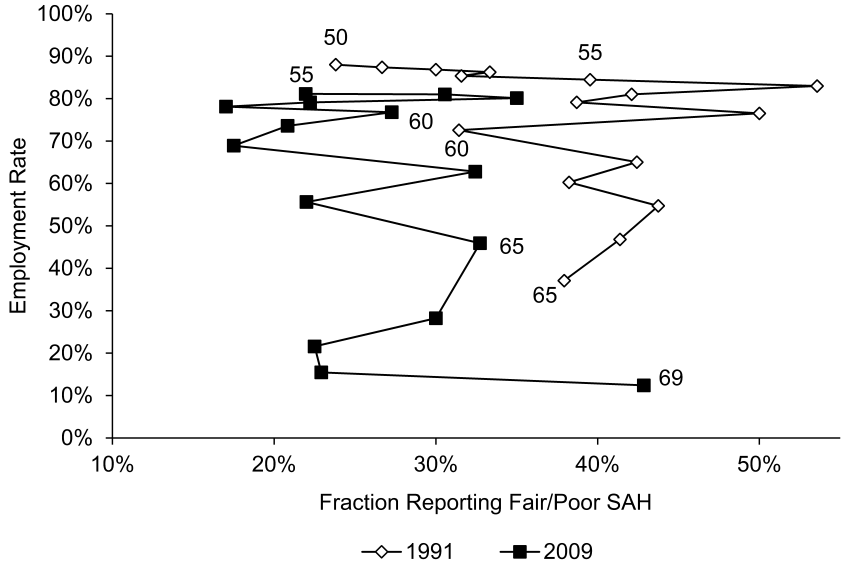

Fig. 10.7A Self-assessed health (share reporting fair or poor) and employment in 1991 and 2009 (men)

Source: Statistics Sweden and the Level of Living Survey. SAH for year 2009 is in fact from year 2010.

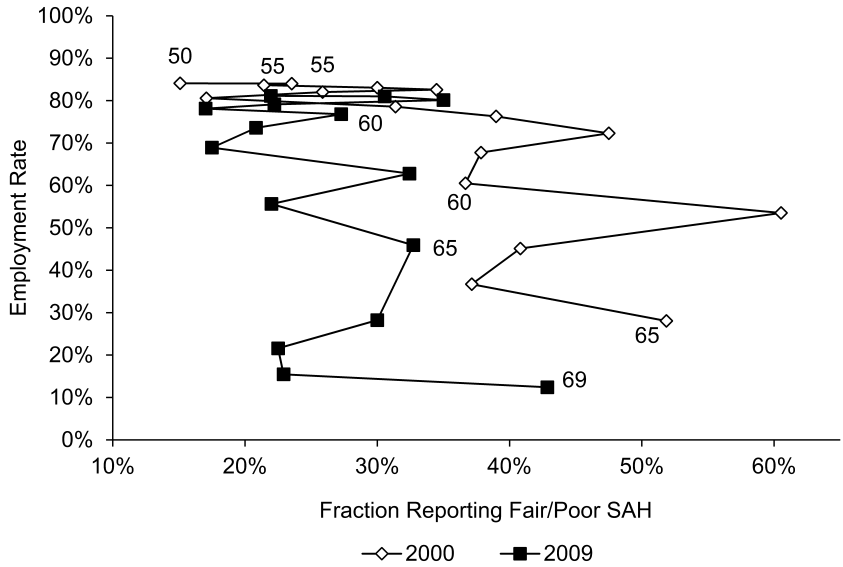

Fig. 10.7B Self-assessed health (share reporting fair or poor) and employment in 2000 and 2009 (men)

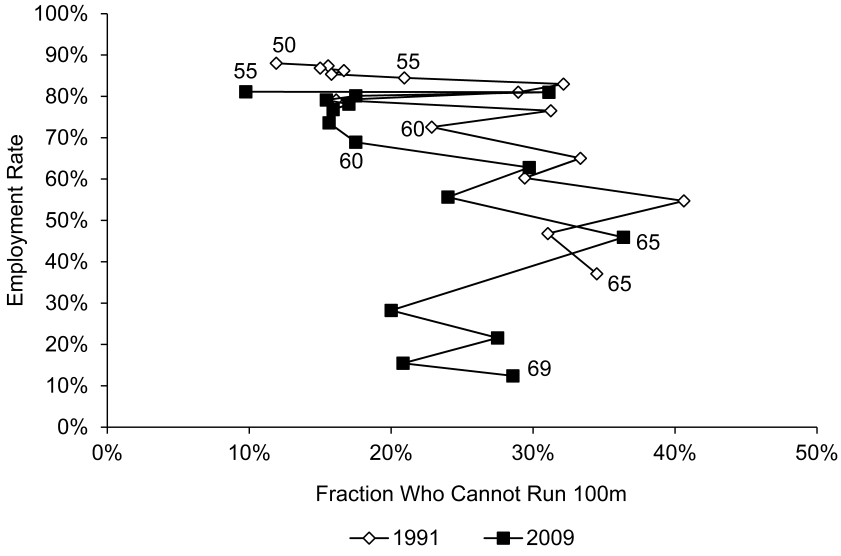

Fig. 10.8A Activity limitation (share who cannot run 100m) and employment in 1991 and 2009 (men)

Source: Statistics Sweden and the Level of Living Survey. Activity limitation for year 2009 is in fact from year 2010.

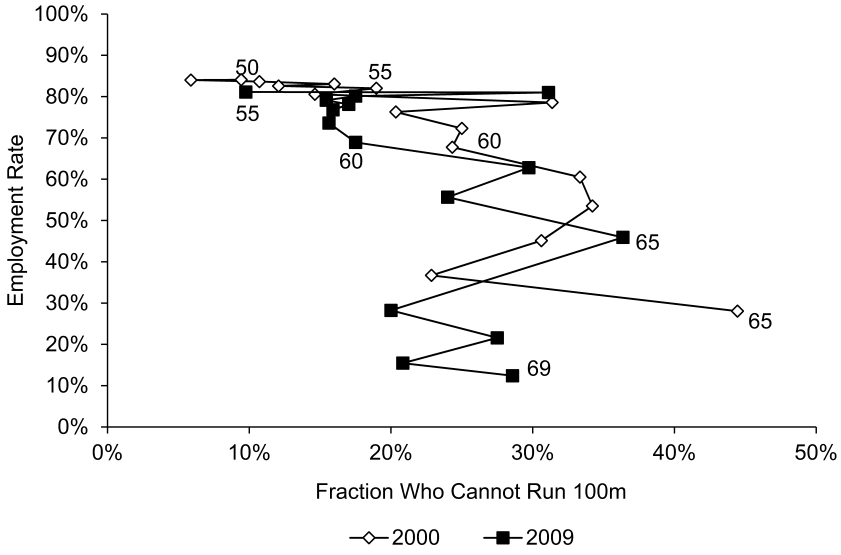

Fig. 10.8B Activity limitation (share who cannot run 100m) and employment in 2000 and 2009 (men)

Source: Statistics Sweden and the Level of Living Survey. Activity limitation for year 2009 is in fact from year 2010.

used in figures 10.4A and 10.4B with SAH and activity limitation in place of mortality. Whereas the employment data is for 2009, the subjective health data is from 2010. The horizontal axis shows the share of individuals who report themselves to be in fair or poor health (figure 10.7) and the share who report that they cannot run 100 meters (figure 10.8).

As the sample size for each age is small, the graphs are quite noisy. However, the same pattern of health improvement over time is seen as shown for mortality in figures 10.4A and 10.4B. For example, in 1991, 40 percent of fifty-five-year-olds were in fair or poor health, as compared to 22 percent of fifty-five-year-olds in 2009. The equivalent figures for activity limitations are 21 percent in 1991 and 10 percent in 2009.

In short, estimates based on the Milligan-Wise method suggest a significant amount of additional work capacity for men. We estimate that the additional capacity from ages fifty-five to sixty-nine is 3.17 years using the 1985 employment-mortality curve as a comparison, or 0.8 years compared to 1995. For women, however, this method suggests that the additional work capacity is limited when using previous cohorts as a benchmark. The results also suggest that the largest potential for additional employment capacity can be found among the oldest, primarily older than age sixty-five. This is due to the large drop in employment after age sixty-five that cannot be related to a sudden change in health status of older individuals.

10.3 Estimating Health Capacity to Work Using the Cutler et al. Method

In this section we investigate the work capacity of older workers by asking how much they would work if they work as much as their younger counterparts in similar health. The method we use was originally suggested by Cutler, Meara, and Richards-Shubik (2012). The analysis is done in two steps. First, we estimate the relationship between health and employment for a sample of workers whose decision to exit from the labor market is driven by health considerations rather than preferences for leisure. We use the age group fifty to fifty-four, since previous research (see, e.g., Johansson, Laun, and Palme 2016) has shown that workers in this age group almost exclusively use the disability insurance program or sickness insurance for their labor market exit. This age group is also far from being able to claim benefits from the public old age pension program at age sixty-one. Second, we use the coefficients from the estimated regressions and the actual characteristics of individuals age fifty-five to seventy-four to predict the older individuals' ability to work based on health.

The data used in the analysis is taken from the Survey of Health, Ageing and Retirement in Europe (SHARE). We use wave 1, wave 2, wave 4, and wave 5, conducted in 2004, 2007, 2011, and 2014, respectively. The numbers of observations are 2,997; 2,711; 1,945; and 4,531. The SHARE survey collects rich data on health, as well as data on employment and demographics and is therefore well suited for this analysis.

We estimate the following linear probability model:

$$\text{Employment} = \beta_0 + \beta_1 \text{health}_i + \beta_2 X_i + \varepsilon_i,$$

where Employment is a dummy equal to 1 if the individual is employed; health is a vector of health measures that we describe in detail below; and X is a vector of nonhealth personal characteristics, such as educational attainment and marital status. We estimate this equation using ordinary least squares (OLS).

In an alternative specification the health vector is summarized and replaced by a single index value. We follow the method suggested by and described in Poterba, Venti, and Wise (2013). They use the first principal component of twenty-seven questions in the US Health and Retirement Survey (HRS), including self-reported health diagnoses, functional limitations, medical care usage, and other health indicators. Not all of these questions are included in the SHARE survey. For the sake of comparability we use the set of twenty-four variables that is also used in the chapter 12 of this volume. Each individual's index value is transformed to a percentile score. This means that the coefficient for the index value can be interpreted as the effect of moving 1 percentage point in the health distribution on employment probability.

Our analysis relies on three key assumptions:

1. Health is exhaustively measured by our health measure, that is, there are no unmeasured or omitted dimensions of health. An important implication of this assumption is that the health measures should be consistent across ages. That is, for example, the SAH measures should not be given an interpretation relative to a peer group of similar age as the respondent.

2. The health-employment relationship is independent of age, that is, the relation estimated for the younger individuals (age fifty to fifty-four) applies for the older ones (age fifty-five to seventy-four).

3. Exit from the labor market is determined by health reasons only. Nonhealth-related retirement among our sample of younger individuals would cause a downward bias in the estimate of health on retirement. The choice of a relatively young age group helps with avoiding this problem.

Tables 10.2A and 10.2B present summary statistics for the male and female samples, respectively. The employment rate of men falls from 89 percent at ages fifty to fifty-four to 84 percent at ages fifty-five to fifty-nine, 70 percent at ages sixty to sixty-four, 13 percent at ages sixty-five to sixty-nine, and 4 percent at ages seventy to seventy-four. Employment rates for women are slightly lower in each age group: 84 percent at ages fifty to fifty-four, 80 percent at ages fifty-five to fifty-nine, 60 percent at ages sixty to sixty-four, 8 percent at ages sixty-five to sixty-nine, and 1 percent at ages seventy to seventy-four. As expected, health measures decline with age. The share of men in poor or fair health rises from 8 percent at ages fifty to fifty-four to 24 percent at ages seventy to seventy-four. As in most surveys, women report

Table 10.2A Summary statistics, pooled SHARE samples (men)

	Age group				
	50–54	55–59	60–64	65–69	70–74
Employed	0.89	0.84	0.70	0.13	0.04
Health, poor	0.02	0.04	0.04	0.04	0.06
Health, fair	0.06	0.12	0.14	0.14	0.18
Health, good	0.30	0.28	0.33	0.34	0.34
Health, very good	0.32	0.29	0.28	0.28	0.22
Health, excellent	0.29	0.28	0.20	0.20	0.20
Physical limitations (= 1)	0.09	0.11	0.12	0.18	0.17
Physical limitations (> 1)	0.06	0.11	0.15	0.15	0.20
ADL any	0.04	0.03	0.06	0.06	0.08
IADL any	0.01	0.01	0.02	0.02	0.04
CESD (depression index)	0.01	0.04	0.02	0.04	0.03
Heart	0.04	0.08	0.11	0.16	0.19
Stroke	0.01	0.03	0.03	0.04	0.06
Psychological problems	0.13	0.02	0.08	0.02	0.14
Lung diseases	0.02	0.02	0.05	0.07	0.09
Cancer	0.01	0.04	0.02	0.04	0.03
High blood pressure	0.15	0.23	0.34	0.42	0.42
Arthritis	0.03	0.04	0.05	0.05	0.04
Diabetes	0.04	0.06	0.12	0.15	0.14
Back pain	0.40	0.41	0.37	0.36	0.35
Weight, under	0.00	0.00	0.00	0.00	0.00
Weight, over	0.47	0.31	0.34	0.32	0.28
Weight, obese	0.24	0.43	0.44	0.43	0.44
Smoker, former	0.43	0.52	0.64	0.67	0.72
Smoker, current	0.51	0.63	0.70	0.70	0.73
Education, HS grad	0.21	0.15	0.10	0.09	0.07
Education, some college	0.25	0.15	0.13	0.12	0.13
Education, college	0.34	0.23	0.15	0.09	0.07
Married	0.68	0.56	0.43	0.45	0.41
N	394	719	823	850	706

worse SAH, despite having lower mortality rates: 14 percent report fair or poor health in the age group fifty to fifty-four and 27 percent at ages seventy to seventy-four.

As for the SAH measures, several indicators for functional limitation and diagnoses reflect health deterioration by age. The share of men with more than one limitation on their physical activity increases from 6 percent at ages fifty to fifty-four to 20 percent at ages seventy to seventy-four. The corresponding values for women are 16 and 32 percent. The share with limitations in instrumental activities of daily living (IADLs) shows a similar trend, although on a much lower level, rising from 1 to 4 percent for men. The corresponding shares for women are 3 and 4 percent. Diagnoses such

Table 10.2B Summary statistics, pooled SHARE samples (women)

	Age group				
	50–54	55–59	60–64	65–69	70–74
Employed	0.84	0.80	0.60	0.08	0.01
Health, poor	0.03	0.05	0.05	0.04	0.06
Health, fair	0.11	0.14	0.16	0.16	0.21
Health, good	0.30	0.30	0.31	0.33	0.37
Health, very good	0.31	0.26	0.26	0.26	0.24
Health, excellent	0.25	0.24	0.22	0.20	0.12
Physical limitations (= 1)	0.15	0.18	0.16	0.19	0.22
Physical limitations (> 1)	0.16	0.22	0.25	0.26	0.32
ADL any	0.04	0.05	0.07	0.07	0.09
IADL any	0.03	0.03	0.03	0.02	0.04
CESD (depression index)	0.02	0.03	0.03	0.05	0.05
Heart	0.03	0.05	0.06	0.10	0.13
Stroke	0.00	0.02	0.03	0.02	0.04
Psychological problems	0.30	0.26	0.11	0.02	0.06
Lung diseases	0.02	0.05	0.05	0.07	0.08
Cancer	0.02	0.03	0.03	0.05	0.05
High blood pressure	0.19	0.26	0.29	0.37	0.45
Arthritis	0.04	0.09	0.11	0.11	0.11
Diabetes	0.05	0.05	0.06	0.07	0.09
Back pain	0.45	0.46	0.49	0.42	0.45
Weight, under	0.01	0.01	0.01	0.01	0.02
Weight, over	0.23	0.23	0.23	0.26	0.26
Weight, obese	0.31	0.45	0.47	0.45	0.44
Smoker, former	0.38	0.50	0.57	0.60	0.62
Smoker, current	0.56	0.62	0.75	0.77	0.79
Education, HS grad	0.19	0.14	0.12	0.10	0.08
Education, some college	0.21	0.14	0.12	0.14	0.13
Education, college	0.34	0.27	0.15	0.10	0.07
Married	0.62	0.51	0.40	0.36	0.32
N	565	954	959	1,010	719

as the share with high blood pressure rises from 15 percent at age fifty to fifty-four to 42 at age seventy to seventy-four for men.

Tables 10.3A and 10.3B show the results from our regressions. Table 10.3A shows the results from the specification where we have included all health indicators separately in the regression models and table 10.3B shows the results where we have summarized the health indicators in health indices. The estimates show highly significant effects of the subjective health indicators on the probability of being employed, in particular, for males. Men in fair (poor) health are 18 (57) percentage points less likely to be employed than those reporting excellent health. The corresponding estimates for women are 27 and 28. Having IADL limitations lowers men's (women's)

Table 10.3A Employment regressions, all healthvariables

	Men 50–54		Women 50–54	
Variable	Coefficient	Std. err.	Coefficient	Std. err.
Health, very good	0.02	0.04	–0.01	0.04
Health, good	–0.04	0.04	–0.10	0.04***
Health, fair	–0.18	0.07***	–0.27	0.06***
Health, poor	–0.57	0.11***	–0.28	0.10***
Physical limitations (= 1)	–0.10	0.05*	0.01	0.04
Physical limitations (> 1)	–0.02	0.07	–0.11	0.05**
ADL any	–0.10	0.08	–0.22	0.08***
IADL any	–0.44	0.18***	–0.33	0.09***
CESD (depression index)	0.08	0.17	–0.13	0.09
Heart	0.06	0.07	–0.08	0.09
Lung disease	0.06	0.20	0.36	0.19*
Stroke	–0.04	0.01***	0.00	0.01
High blood pressure	0.04	0.04	0.03	0.04
Arthritis	0.09	0.09	0.06	0.07
Diabetes	–0.02	0.07	0.02	0.07
Back pain	0.01	0.03	0.04	0.03
Weight, over	0.00	0.03	–0.04	0.04
Weight, obese	0.07	0.05	0.01	0.04
Smoker, former	0.08	0.04**	0.07	0.04*
Smoker, current	0.10	0.04***	0.03	0.04
Education, mandatory	0.01	0.05	0.02	0.05
Education, some college	0.02	0.05	–0.03	0.05
Education, college/univ.	0.05	0.05	0.05	0.05
Married	0.08	0.03**	0.04	0.03
N	393		564	

Note: "Health, excellent" excluded category.
***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 10.3B Employment regressions, PVW health index

	Men 50–54		Women 50–54	
Variable	Coefficient	Std. err.	Coefficient	Std. err.
PVW index	0.003	0.001***	0.004	0.001***
Education, mandatory	0.046	0.057	0.042	0.061
Education, some college	0.066	0.056	–0.016	0.060
Education, college grad	0.101	0.055*	0.079	0.057
Married	0.113	0.037***	0.022	0.038
N	333		457	

***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

employment by 44 (33) percentage points. Having activities of daily living (ADL) limitations limits women's activity with 22 percentage points.

The results shown in table 10.3B are obtained from the index version of the model. The results show that the Poterba, Venti, and Wise (PVW) index works very well for summarizing the health information in the data, since the coefficient for the index is estimated with high precision. A 10-percentage-point increase in the index (e.g., being at the 60th rather than 50th percentile of health) raises the probability of employment by 3 percentage points for men and 4 percentage points for women.

Table 10.4 reports the results from a simulation where we have used the two versions of our model to predict employment for five-year age groups in the age interval fifty-five to seventy-five for males and females, respectively. To facilitate interpretation of the results we report key outcomes in figures 10.9 and 10.10. Since the estimation of the model using the PVW index turned out so well, and predictions from a parsimonious specification is preferred, we present the predictions from the model using the PVW index in figures 10.9 and 10.10.

The health index model predicts the share of men (women) employed to be 88 (82) percent at ages fifty-five to fifty-nine, 84 (80) percent at ages sixty to sixty-four, 83 (80) percent at ages sixty-five to sixty-nine, and 81 (76) percent at ages seventy to seventy-four. This decline can, of course, be attributed to the deterioration of health by age. The share of men (women) that is actually working declines more rapidly with age than do our predictions, from 83 (81) percent at ages fifty-five to fifty-nine to 70 (62) percent, 15 (8) percent, and 4 (1) percent in the older age groups. For the males (females) the capacity is 4.95 (1.22) percent at ages fifty-five to fifty-nine, 13.59 (18.08) percent at ages sixty to sixty-four, 68.05 (71.37) percent at ages sixty-five to sixty-nine, and 76.74 (75.20) percent at ages seventy to seventy-four.

A concern often heard in the public policy debate is that low-educated blue-collar workers with physically demanding jobs are less able to postpone their exit from the labor market for health reasons. To examine this argument more closely, we will look at heterogeneous effects by dividing the sample into two groups: those with a high school (HS) education or more and those without a high school education (< HS).

Our simulations of work capacity by education group and gender are shown in tables 10.5A and 10.5B and in figures 10.11 and 10.12. The results show very small differences in both actual and predicted share working for both males and females between the two groups with high and low educational attainments, respectively.

10.4 Changes in Self-Assessed Health by Education Level over Time

In this section we investigate the changes in self-assessed health (SAH). We use data from the Swedish Level of Living Survey (LNU), briefly described

Table 10.4 **Simulation of work capacity**

	Use all health variables				Use PVW health index			
Age group	*N*	Actual % working	Predicted % working	Estimated work capacity (%)	*N*	Actual % working	Predicted % working	Estimated work capacity (%)
				Men				
55–59	719	83.87	90.38	6.40	542	83.03	87.98	4.95
60–64	823	69.50	89.08	19.58	617	70.34	83.93	13.59
65–69	849	12.94	89.49	76.54	662	14.50	82.56	68.05
70–74	703	4.11	88.08	83.95	540	4.26	81.00	76.74
				Women				
55–59	953	80.19	83.56	3.29	712	80.76	81.98	1.22
60–64	959	60.38	83.56	23.18	695	62.30	80.38	18.08
65–69	1,010	7.52	83.53	76.00	764	8.25	79.62	71.37
70–74	719	0.97	80.41	79.43	569	0.86	76.06	75.20

Note: Actual working in all health and PVW models vary due to differences in sample sizes.

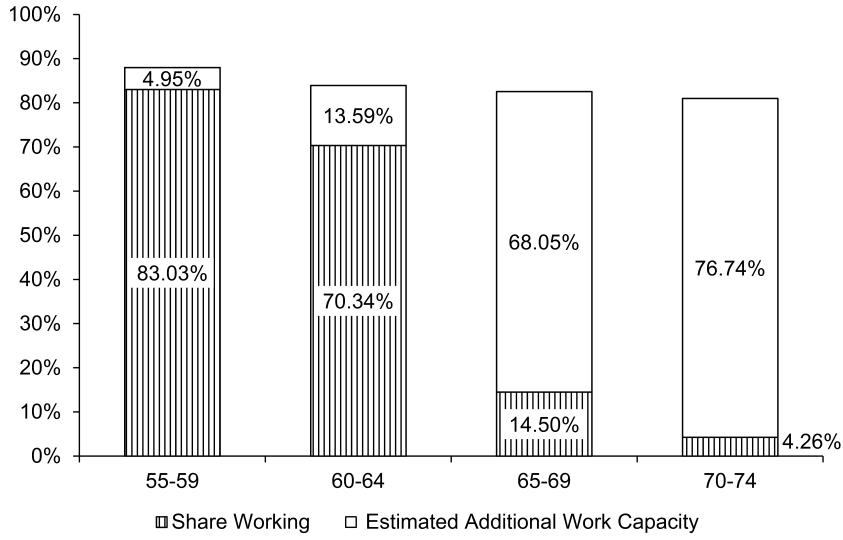

Fig. 10.9 Share of SHARE men working and additional work capacity by age

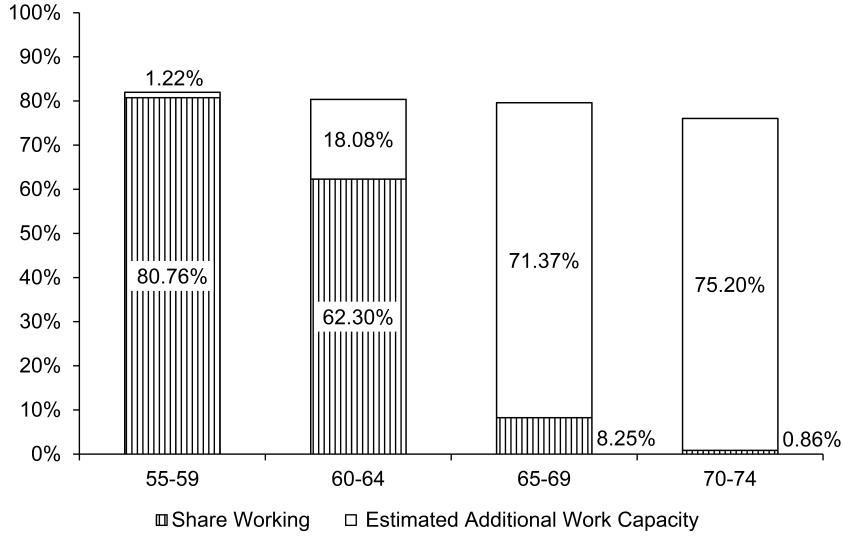

Fig. 10.10 Share of SHARE women working and additional work capacity by age

in section 10.1. In addition to the overall development we will look at the development by educational group separately, considering the fact that in Sweden, like in most other developed countries, there has been a substantial increase in the average educational attainment across birth cohorts. This implies that the selection into educational levels may have changed.

Table 10.5A Work capacity by education (single regression, men)

	All health variables			PVW model		
Education	Actual % working	Predicted % working	Estimated % WC	Actual % working	Predicted % working	Estimated % WC
			Age 55–59			
< High school	81.88	88.41	6.53	79.14	82.96	3.82
HS or college/univ.	87.13	93.64	6.18	87.12	93.26	6.14
			Age 60–64			
< High school	69.98	88.67	18.69	71.76	80.01	8.25
HS or college/univ.	68.26	90.15	21.89	67.86	90.83	22.97
			Age 65–69			
< High school	13.17	88.87	75.68	15.29	79.44	64.15
HS or college/univ.	12.09	91.77	79.68	12.36	91.04	78.68
			Age 70–74			
< High school	4.81	87.85	83.02	5.22	78.35	73.13
HS or college/univ.	1.38	88.93	87.54	1.45	88.71	87.26

Note: Actual percent working in all health and PVW models vary due to differences in sample size.

Table 10.5B Work capacity by education (single regression, women)

	All health variables			PVW model		
Education	Actual % working	Predicted % working	Estimated % WC	Actual % working	Predicted % working	Estimated % WC
			Age 55–59			
< High school	77.02	82.88	5.72	76.28	79.01	2.73
HS or college/univ.	84.90	84.58	–0.31	84.70	84.58	–0.11
			Age 60–64			
< High school	59.40	83.82	24.42	61.37	78.90	17.53
HS or college/univ.	63.04	82.84	19.80	64.05	83.16	19.11
			Age 65–69			
< High school	7.78	83.30	75.52	9.14	78.16	69.01
HS or college/univ.	6.69	84.27	77.57	6.14	83.05	76.91
			Age 70–74			
< High school	0.69	80.71	80.01	0.45	75.67	75.22
HS or college/univ.	2.10	79.18	77.07	2.17	77.32	75.15

Note: Actual percent working in all health and PVW models vary due to differences in sample size.

Figure 10.13 shows the development of the average number of years of schooling along with the first and third quartiles by birth cohort groups for those born by the end of the nineteenth century to those born in 1980. There is a steady increase, with an accelerating path for at least the average, starting with those born in the early 1940s. Over the entire period shown in the graph, the average number of years of schooling increases from about 6.5 to 15 years.

Figure 10.14A shows self-assessed health by age between ages fifty and seventy-five for the survey years 1991, 2000, and 2010. The sample size for

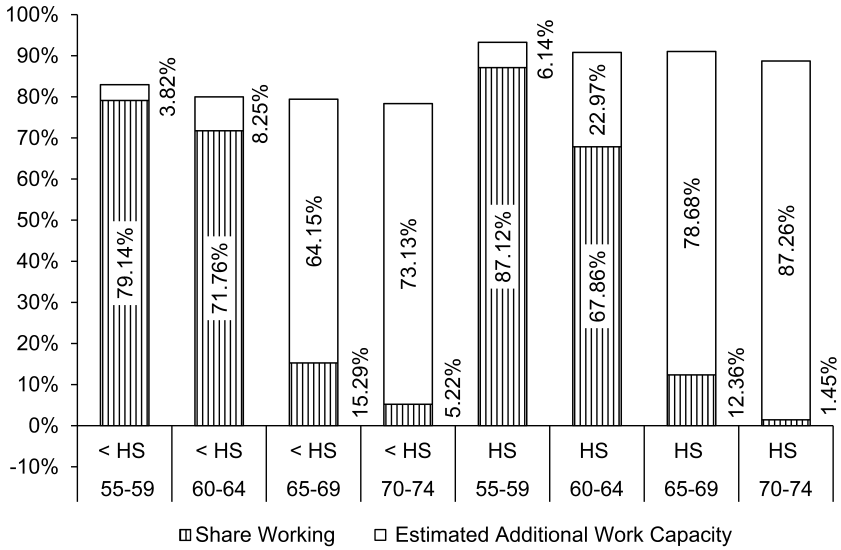

Fig. 10.11 Share of SHARE men working and additional work capacity by age and education

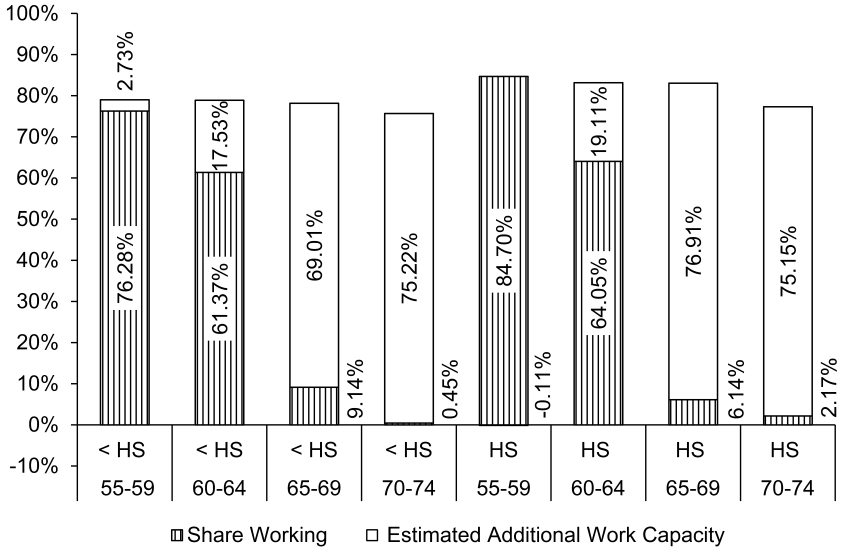

Fig. 10.12 Share of SHARE women working and additional work capacity by age and education

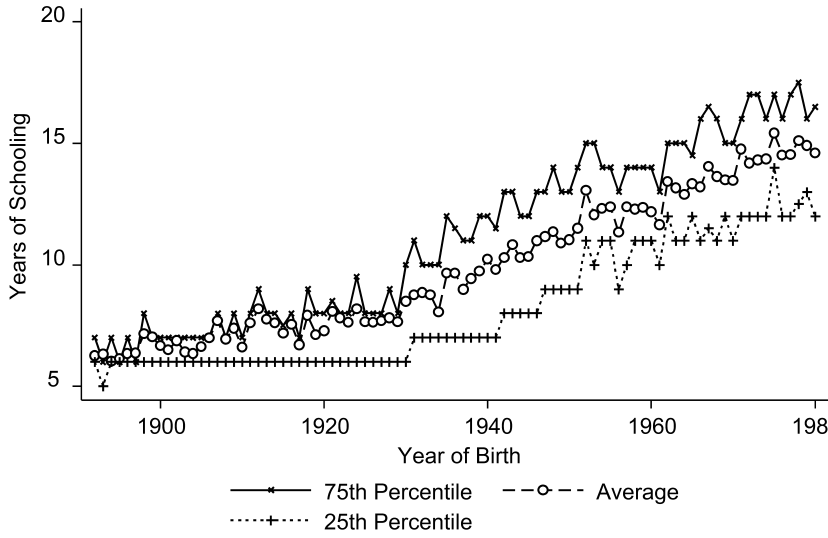

Figure 10.13 The development of average number of years of schooling along with the first and the third quartiles by year of birth

Source: Swedish Level of Living Survey.

each one-year age group is quite limited (between fifty and one hundred). The graphs are therefore noisy, and we have added smoothed graphs to ease comparisons. The upper panel shows the results for both gender groups combined and the lower ones for males and females separately.

As expected, figure 10.14A shows a decline in SAH with age. For the 2010 sample, around 25 percent of the fifty-year-olds reported poor or fair health compared to above 40 percent of the seventy-five-year-olds. More interestingly, figure 10.14A also shows a marked improvement in SAH primarily between 2000 and 2010. When splitting up the graphs in separate ones for males and females in the lower panel of figure 10.14A, it can be seen that the improvement is primarily attributed to males in the age group sixty to seventy.

In figure 10.14B we break up the data by quartile of number of years of schooling. Since the sample sizes are smaller in each education quartile than for the overall sample, we only present the smoothed graphs. The graphs show that the development is very similar within each education group: the 1991 and 2000 graphs are very similar, but there is a marked improvement reflected in the 2010 graphs. That is, the improvements in SAH seem to be equally shared between the four education groups and we find no evidence of increased health inequality in that dimension.

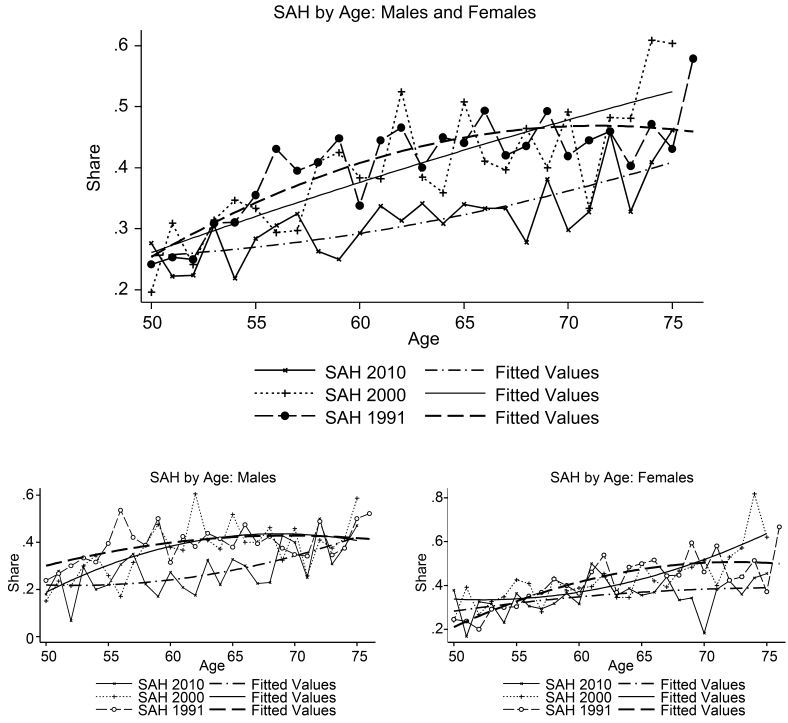

Fig. 10.14A Share reporting fair or poor health by age in 1991, 2000, and 2010 (overall and by gender groups, respectively)

Source: Swedish Level of Living Survey.

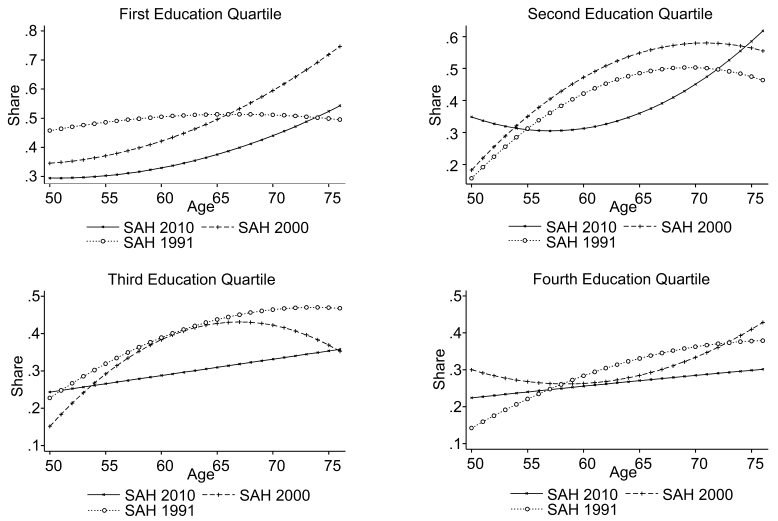

Fig. 10.14B Share reporting fair or poor health by age in 1991, 2000, and 2010 (each panel reports separate results for quartiles by years of schooling)

Source: Swedish Level of Living Survey.

10.5 Discussion and Conclusion

The Swedish history of labor force participation since the early 1960s shows big changes and great differences between the gender groups. For men there was a large decline in labor force participation rates until the late 1990s and since then a sharp increase in labor force participation rates. The development in the age group between sixty and sixty-four has been most pronounced. In this group the LFP rates decreased from about 85 percent to 55 percent in the mid-1990s and have since then increased to almost 75 percent. For females the development has been dominated by the great increase in female labor force participation that took place between the mid-1960s and 1980. However, the labor force participation in the age group sixty to sixty-four has continued to increase since then, and is now on a level of above 65 percent.

The research question for this chapter is to investigate whether or not there are potentials, with respect to health and work capacity of the population, for extending this trend toward delayed retirement further. We use two different methods. First, a method originally suggested by Milligan and Wise (2012), which calculates how much people would participate in the labor force today compared to a particular point back in time at a constant mortality rate, considering the fact of a continuously decreasing mortality rate. Second, the Cutler, Meara, and Richards-Shubik (2012) method, which asks how much people would participate in the labor force if they would work as much as the age group fifty to fifty-four at a particular level of health.

Given the methodological differences, the results obtained from using the two methods, respectively, are not really comparable. They should be viewed as complements rather than substitutes. The Cutler et al. method suggests a potential increase of labor force for men (women) in the age group sixty to sixty-four of 19.6 (23.2) percent, using the specification when all health indicators are included, and on 13.6 (18.1), using the PVW index specification. The Milligan-Wise method suggests that the labor force participation rate for men could increase in the age group sixty to sixty-four by on average 16.2 percent if the labor force participation rate in 2014 would have been the same as in 1985 at a constant mortality rate. For females, given the great increase in female labor force participation across cohorts, the increased labor force participation rate has kept pace, and even increased slightly more, than the corresponding decrease in the mortality rate over this era in the age group sixty to sixty-four.

Finally, section 10.5 shows that the trend toward improved population health reflected in lower mortality rates also applies to self-assessed health between the years 2000 and 2014. We did not find any evidence suggesting that there is an increase in health inequality measured as differences in self-assessed health between different quartiles in the distribution of educational attainments.

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