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Healthy, Happy, and Idle
Estimating the Health Capacity to Work at Older Ages in Germany

Hendrik Jürges, Lars Thiel, and Axel Börsch-Supan

5.1 Introduction

In this chapter, we aim to answer a seemingly simple question for Germany: What is the proportion of older individuals who could work in the labor market if they wanted to and if they were not limited by poor health? In other words, what is the capacity to work at older ages, and after what

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is currently the statutory retirement age? The answer to this question is particularly relevant for the future of the German pay-as-you-go pension system. Not everybody who is retiring from work does so because he or she is too ill, physically or mentally. Many individuals retire simply because they can, that is, they have reached the age at which they become eligible for an early retirement benefit or a regular old age pension. Employers often seem to encourage the early labor force exit of their older staff because they believe that the higher salaries paid to older workers compared to younger workers do not always reflect higher productivity. Extending working lives by raising early and normal retirement ages, therefore, is arguably the single-most effective measure to increase the sustainability of the pension system. Each additional year that is worked affects the system dependency ratio on two counts: it reduces the numerator (those receiving pension benefits) and increases the denominator (those who finance pensioners' benefits).

This simple calculus was the main reason for the German government to gradually increase in 2007 the age of retirement from sixty-five to sixty-seven, similar to many other countries. This increase, fully implemented in the year 2029, will fairly exactly extend the working life in proportion to the increase in life expectancy and therefore compensate for one important cause of population aging, namely, the increase in longevity.

While this policy is rational from a sustainability point of view, the reform was not appreciated by the populace. The government failed to win reelection and seven years later, in 2014, elements of the reform were reversed by introducing a new early retirement option at age sixty-three without any actuarial adjustment to those workers who have accumulated at least forty-five years of contributions to the public pension system. Such contributions include own contributions (payroll tax on wages earned during dependent employment) and contributions by the government during periods of education, child care, and unemployment. The policy reversal was motivated by the hypothesis that these workers have particularly poor health because they worked so long.

This motivation is in stark contrast to the substantial improvements in population health over the past half century that are reflected in continuing increases in life expectancy. Hence, lack of work capacity due to poor health should not be the major obstacle to raise retirement ages. In fact, Börsch-Supan, Coppola, and Rausch (forthcoming) showed that those employees who are eligible for the new early retirement option at age sixty-three are not more likely to have poor health at the end of their working lives when measured by the days reported as sick leave. Rather, the contrary is the case. These are surprising results that contradict the originally claimed purpose of the legislation, namely, to help the underprivileged who worked especially long and hard during their lives and consequently suffered from extra burdens. Börsch-Supan, Alt, and Bucher-Koenen (2015) confirm this finding with the SHARE data also used in this chapter. Most notably, the eligible workers self-reported a significantly lower incidence of work disability.

More generally, looking at patterns of labor force participation in Germany—in particular, the large retirement hazard rates at salient ages sixty-three or sixty-five—it should be clear that retirement timing is often not driven by bad health. For each individual, health deteriorates through a series of health shocks, that is, discontinuous changes in health. At some point, the health shock can be so large that working is no longer possible. For the population as a whole these shocks aggregate to a smooth decline in average health as people get older—so that retirement for health reasons should also follow a smooth pattern. (At the extreme we have mortality. For each individual, dying is the ultimate health shock, but survival curves are smooth.)

Even if most people do not retire for health reasons, it is not clear how far working lives could reasonably be extended. Our chapter is a first attempt to answer this question for Germany. To be sure this is a descriptive, not a normative, exercise. To estimate work capacity among the older population, we follow two different empirical approaches with a similar logic: we estimate the link between health and labor force participation in a population whose employment patterns are not or hardly affected by the current retirement and social security legislation. Using these "pure health effects" on labor force participation, we extrapolate to today's population, which is affected by today's legislation, to learn how many could not work for health reasons and how many could still work, even beyond the current normal retirement age. Independent of the method used, we get similar results. As a lower bound for today's elders, we show that, if individuals were retiring exclusively for health reasons, more than half of the population could still work until age seventy.

One possible critique of our approach is that health is not equally distributed across socioeconomic groups, with poorer or less educated individuals being in worse health. Estimating average work capacity across the entire socioeconomic spectrum thus possibly overestimates the capacity to work among those workers. Where possible, we thus add estimates separately for different education groups, with education being one important component of socioeconomic status.

The chapter is structured as follows: In section 5.2, we describe trends in health and labor force participation in Germany since the 1960s. In sections 5.3 and 5.4, we use these long-term trends to estimate the capacity to work among today's elders compared to those up to forty years in the past. Using current survey data containing detailed health information, we simulate employment among older respondents using younger individuals' behavior as reference in section 5.5. In section 5.6, we provide a more detailed analysis of trends in health across education levels. Section 5.7 summarizes our research and discusses our findings.

5.2 Pension Reforms and Long-Term Trends in Health and Employment at Older Ages

In this section we provide some background to our empirical analysis by briefly describing long-term trends in mortality, morbidity, and labor force participation at older ages in Germany. Moreover, we relate broad trends in labor force participation to historical changes in the German pension system.

Figure 5.1 shows the trend in (log) annual mortality rates in (West) Germany at ages fifty-five to fifty-nine, sixty to sixty-four, and sixty-five to sixty-nine from 1960 to 2011. The graphs clearly show that mortality rates rise with age and that mortality is higher among men than women in any given age group. Mortality rates have been fairly stable in the 1960s, especially among men, but have fallen continuously between 1970 and 2000. For instance, mortality rates among sixty- to sixty-four-year-old men have roughly halved from 2.7 percent to 1.4 percent. Since 2000, the mortality decline appears to have flattened among women. In fact, in the group of sixty-five- to sixty-nine-year-old women, there is even a slight increase in mortality rates.

Figure 5.2 shows trends in self-reported morbidity between 1989 and 2009. These numbers are based on computations from the German Microcensus (an annual survey of a 1 percent sample of the population), which asks a few broad health questions at irregular intervals. Specifically, respon-

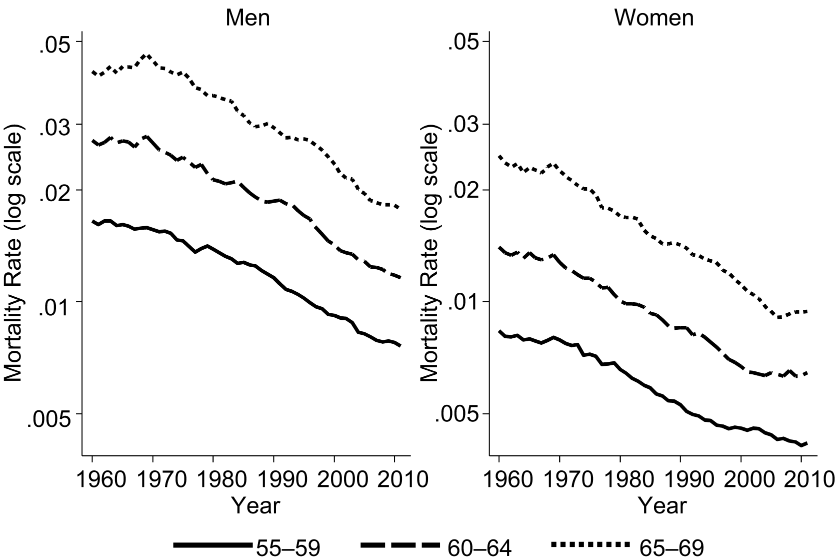

Fig. 5.1 Mortality rates at older ages, West Germany (1960 to 2011)
Source: Human Mortality Database.

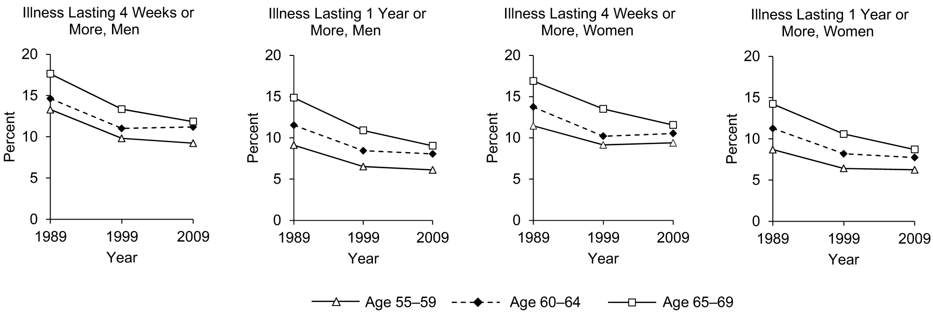

Fig. 5.2 Morbidity rates at older ages, Germany (1989–2009)
Source: Own computations from Microcensus.

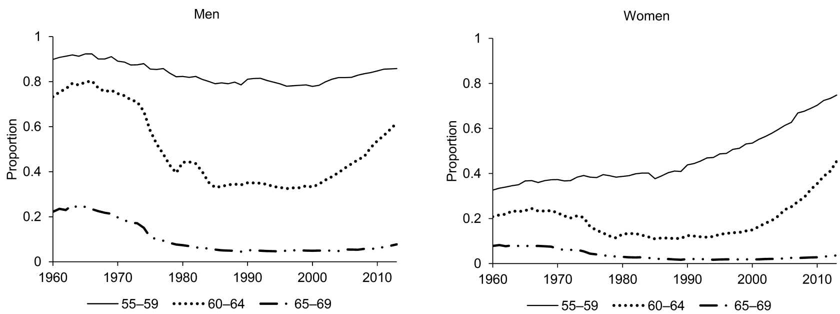

Fig. 5.3 Labor force participation rates at older ages, Germany (1960 to 2013)
Source: Microcensus.

dents are asked whether they currently suffer from any illness or condition, and if yes, how long they have suffered from this condition. We computed two summary measures of health from the answers to these questions: the prevalence of an ongoing condition that lasted at least one month, and the prevalence of long-term (> 1 year) illness (cf. Kemptner, Jürges, and Reinhold 2011). The data reveal similar prevalences among women and men and a clear age gradient. Older age groups are more likely to report suffering from long-term illness than younger age groups. Moreover, there is evidence of a steep decline in the prevalence of long-term illness between 1989 and 1999 among both sexes and all age groups. Parallel to flattening trends in mortality, the decline in the prevalence of long-term illness appears to have slowed down in the first decade of the twenty-first century.

Whereas health in terms of mortality or long-term illness has generally improved over time, the long-term trend of employment at older ages has virtually been a roller-coaster ride (see figure 5.3), especially in the group of sixty- to sixty-four-year-old men. Long-run trends in the employment of older women reflect secular changes in the role of women in the labor market, but the trend among men is clearly linked to the history of pension reforms. As explained in our previous work (e.g., Jürges et al. 2015), when the pay-as-you-go system was introduced in 1957, there was a single eligibility age for regular old age pensions: sixty-five for men and sixty for women. Earlier retirement was impossible unless one could prove a disability. In fact, in the 1960s, disability accounted for more than half of all entries into retirement among both men and women. This was the least generous period in terms of social security eligibility. About 90 percent of the fifty-five- to fifty-nine-year-old men, almost 80 percent of the sixty- to sixty-four-year-old men, and even more than 20 percent of the sixty-five- to sixty-nine-year-old men were working. Labor force participation rates among women were generally much lower, due to historical patterns of low female employment in general.

The year 1972 marked the beginning of a long phase of ever increasing generosity of the pension system that ended in the late 1980s. The 1972 reform introduced special provisions for early retirement of the long-term insured by providing old age pension benefits (without actuarially fair deductions) already at age sixty-three, given that workers had a minimum of thirty-five contribution years. Further, a special old age pension for disabled workers to be collected at age sixty-two (later at age sixty) with less stringent health requirements than disability pensions was introduced. As a result, labor force participation among sixty- to sixty-four-year-old men dropped quite dramatically from nearly 80 percent to 40 percent. The average retirement age dropped by more than two years, and the new retirement pathways substituted for the disability pathway into retirement among men age sixty and older. Further reforms that generally increased the generosity of the system followed during the 1980s. As a result, labor force participation among older workers was at a historical low throughout the 1990s.

In face of a looming demographic crisis, serious attempts to cut back on the generosity of the German pension system started in 1992. Pension benefits were anchored to net rather than to gross wages and actuarial adjustments of benefits to retirement age were introduced, albeit only gradually from 1998 onward. In 2004, the pension benefit indexation formula was modified to account for demographic developments. These reforms clearly left their mark on labor force participation among older individuals. Again, it is the sixty to sixty-four age group in which the effect was particularly salient. In this age group, participation rates have increased to more than 60 percent among men and nearly 50 percent among women in 2013.

Whether these positive trends will continue in the future is not clear, however. On the one hand, in 2007, a gradual increase in the normal retirement age from sixty-five to sixty-seven years (to be phased in between 2012 and 2029) was enacted. Retirement ages for other variants of old age pensions were increased as well (e.g., women's retirement ages were raised to match men's retirement ages). This should also give a boost to employment in the sixty-five to sixty-nine age group. On the other hand, as described in the introduction, Germany has entered yet another (transitory) phase of pension reforms. In 2014, an early retirement option at age sixty-three without actuarial adjustment was reintroduced for those with forty-five contribution years.

5.3 Estimating Work Capacity Using Long-Term Changes in Mortality

One important aim of this chapter is to provide estimates of work capacity for Germany that are comparable with those from other countries. In this section, we use age-specific mortality as an indicator of age-specific health or work capacity (Milligan and Wise 2012a). Mortality data provide information on population health that is consistently defined over time and across countries. Thus, they provide indicators of health that do not suffer from reporting bias and cross-cultural differences in response behavior that usually affect self-assessed health measures (e.g., Jürges 2007). On the downside, mortality is necessarily an imperfect indicator of health limitations relevant for work capacity as it does not reflect nonlethal conditions such as back pain or depression, which may have trends that are independent of mortality.

Bearing these limitations in mind, we estimate work capacity by looking at the relationship between mortality rates (as an age-year specific indicator of health) and employment rates at several points in time. Mortality rates increase and employment rates decrease with age, leading to a negative relationship between age-specific mortality rates and age-specific labor market participation rates in any given year. However, as shown below, the curvature of the mortality-employment relationship has changed greatly over time. General health as indicated by age-specific survival rates has generally increased, whereas the employment rates at the same ages have mostly decreased, except in recent years (see figures 5.1 and 5.3).

This implies that until recently, health and employment at any given age have moved in opposite directions over time. Given the same health status, individuals have become increasingly less likely to work. Based on these trends over time, we conduct a counterfactual analysis to estimate the potential ability of the current population to work at older ages. Specifically, we compare current employment rates with employment rates at earlier points in time, holding the mortality rate constant. In this way, we are able to assess the proportion of today's individuals whose health would allow them to work, if they worked as much as people with the same health status in the past.

We obtained age-specific mortality rates from the Human Mortality Database (HMD). We have computed average age-specific mortality rates at ages forty-five to seventy-five for four periods: 1968–1972, 1976–1980, 1989–1995, and 2005–2009. The choice of periods is motivated below. To these data we merged average age-specific employment rates for the same periods, which we computed from the (West) German Census 1970 (IPUMS database, Minnesota Population Center 2011) and selected years (1976, 1978, 1989, 1995, 2005, and 2009) of the German Microcensus. The Microcensus is the largest annually conducted household survey in Germany, and it has been carried out in West Germany since 1957 and East Germany in 1991. It covers a representative sample of 1 percent of the German population. Currently, some 370,000 households participate in the Microcensus every year. Specifically, we merged the employment rates in the 1970 census to the average 1968 to 1972 mortality rates, the average employment rates in 1976 and 1978 to the average mortality rates in 1976 to 1980, the average employment rates in 1989 to 1995 to the average mortality rates in 1989 to 1995, and the average employment rates in 2005 and 2009 to average mortality in 2005 to 2009.

Our choice of comparison periods is motivated by the history of the German pension system as described in the preceding section. We begin our analysis in 1970 as a highly relevant comparison period. It reflects the prereform phase that was also the least generous in terms of eligibility. The immediate consequences of the 1972 reform on the relationship between health (mortality) and employment are captured by the 1976–1980 period. The 1989–1995 period marks the turning point in terms of pension system generosity, and the most recent period 2005–2009 reflects the consequences of the reductions in generosity that followed. The analysis in this section exploits data that cover a fairly long time span. As we have shown in the preceding section, the employment of older women has followed long-run trends that reflect secular changes in the role of women in the labor market as much as they reflect the effect of pension reforms. Thus the following analyses are only performed for men.

Our approach is illustrated in figure 5.4. Using the most recent period (2005–2009) as the base period, we compare the mortality-employment curve in that period with the mortality-employment curve in a comparison period (here: 1970). It is instructive to compare the location of specific ages across time in this graph. Generally, data points in 2005–2009 are located south-west of those in 1970. This reflects smaller mortality rates and, simultaneously, smaller employment rates. As an example, 60 percent of men age sixty-three were working in 1970 and they had a nearly 3 percent chance of dying. In 2005–2009, only about 30 percent were working, whereas their mortality rate had also about halved to less than 1.5 percent.

We now compute the additional work capacity at some age in the base year as the vertical distance between the two curves at that age or mortality rate, respectively. For instance, in 2005–2009, the employment rate of sixty-three-year-old men was equal to 31 percent, and their mortality rate was 1.34 percent. In 1970, the employment rate of men who had the same mortality rate (and who were about fifty-six years old) was roughly 85 percent. Hence, if the same proportion of men in 2005–2009 had worked as much as men in

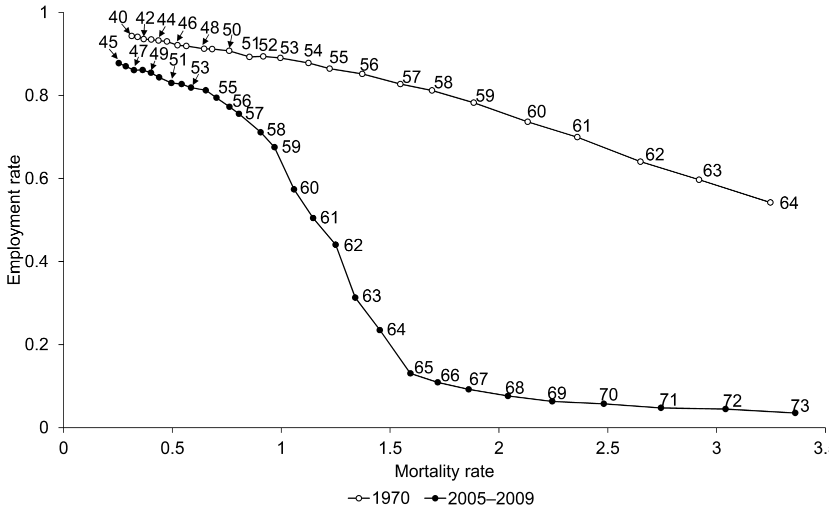

Fig. 5.4 Employment versus mortality (2005–2009 versus 1970)

Table 5.1 Additional employment capacity in 2005–2009 using 1970 employment mortality relationship

Age	Mortality rate in 2005–2009 (%)	Employment rate in 2005–2009 (%)	Employment rate in 1970 at same mortality rate (%)	Additional employment capacity (%)
55	0.70	79.5	91.1	11.6
56	0.76	77.3	90.7	13.5
57	0.81	75.6	90.0	14.5
58	0.91	71.1	89.4	18.3
59	0.97	67.5	89.2	21.6
60	1.06	57.	88.4	31.1
61	1.15	50.5	87.5	37.1
62	1.25	44.0	86.2	42.2
63	1.34	31.3	85.5	54.2
64	1.45	23.5	84.1	60.6
65	1.59	13.1	82.3	69.2
66	1.72	10.9	80.8	69.9
67	1.86	9.2	78.6	69.4
68	2.04	7.6	75.3	67.7
69	2.24	6.3	71.8	65.5
Total years		6.2		6.5

1970 with the same mortality rate, the employment rate of sixty-three-year-old men would have been 54 percentage points higher.

This calculation is repeated for every age from fifty-five to sixty-nine in the base period. The results are shown in table 5.1. Given the same mortality rates, we observe that employment was substantially higher in 1970 than in 2005–2009. At each mortality rate, the estimated additional employment capacity is positive and increases up to the statutory retirement age (sixty-five). We may translate these figures into additional years of work at each age. For instance, an estimated work capacity of 50 percent implies that sixty-three-year-old men in 2005–2009 would on average work 0.5 years more (at that age). Aggregating over all ages from fifty-five through sixty-nine gives the total number of additional years of work, which is equal to 6.5. Thus, if men in 2005–2009 would have worked as much as men in 1970 with the same health and if they retired at seventy, they would have worked 6.5 years more on average. Compared to actual years of employment at ages fifty-five to sixty-nine in 2005–2009 (6.2 years), this amounts to a doubling in years of work.

It is, of course, debatable whether improvements in survival rates translate fully into employment years. The question is whether the survival rates of a cohort are a good proxy for their general health. This may depend, for instance, on whether additional life years are spent in good or poor health. According to the morbidity-expansion hypothesis, increased life expectancy raises the number of unhealthy years, whereas the morbidity-compression hypothesis argues that health problems will be postponed to a shorter period at the end of life. Comparing measures of functional health collected in the German Socio-Economic Panel (SOEP) study in 1997 and 2010, Trachte, Sperlich, and Geyer (2014) find evidence for morbidity compression among the German older population. We also find that self-reported morbidity and mortality have followed similar trends over time (see section 5.2), which supports the use of mortality as proxy for morbidity. However, as we have documented in earlier research also using data from the German SOEP, secular trends in subjective health, such as health satisfaction (available since 1984) and self-reported general health (available since 1992) are more or less flat or rather inconsistent across age groups (see Börsch-Supan and Jürges 2012, figures 6 and 7). This finding is puzzling, however. First, self-rated health in the German SOEP has been shown to be predictive of future mortality, even controlling for other health measures (Jürges 2008). Thus, both measures of health are correlated on the individual level. Second, it is in contrast to findings for the United States, for instance, where self-rated health has moved in parallel to mortality over time (Milligan and Wise 2012b). We believe this evidence suggests that aggregate measures of self-rated health are not comparable over time, neither in the German SOEP (which provides the longest time series in self-rated health in Germany) nor among Germans in general. For this reason, our estimates of work capacity based on self-reported morbidity in section 5.4 should be interpreted cautiously.

Another notable point is that our estimates are sensitive to the choice of the comparison year. The year 1970 represents a peak in old age employment rates because it is unaffected by the later pension reforms that gener-

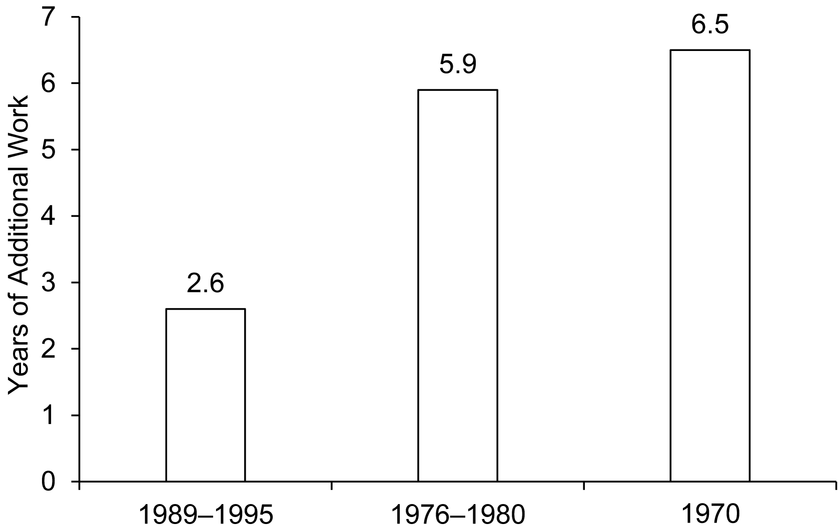

Fig. 5.5 Estimated additional employment capacity by year of comparisons

ally increased generosity and because the labor market was characterized by full employment. Later years represent employment in old age that is strongly affected by generous early retirement schemes. Therefore, employment rates in those later years do not measure the full health-related employment potential of the older population. Nevertheless, we repeated the previous calculations using the more recent comparison periods 1976–1980 and 1989–1995. We report the main results of these calculations in figure 5.5.

When 1989–1995 employment and mortality rates are used, the estimate of additional work capacity of today's workers equals only 2.6 years. This number is positive because of lower mortality/improved health, but it is driven down by the comparatively low old age employment rates in the 1990s. One can interpret these 2.6 years as the health-related gain in work capacity that could materialize even if today's pension system was as generous as the system in the 1990s. Using the late 1970s as a reference period, the estimated additional work capacity is 5.9 years, and thus much closer to our preferred estimates.

Table 5.2 summarizes our work-capacity estimates using different comparison years. It also provides an additional, yet important, interpretation of our findings. The employment rates in 1976–1980 and 1970 of men with the same mortality rates as those of men age sixty-five to sixty-nine in 2005–2009 roughly equals 65 percent and 78 percent, respectively. Thus, about two-thirds of men at these ages in 2005–2009 could work if they worked as much as men with the same health status—as measured by the probability of dying—in the past.

Table 5.2 **Additional employment capacity in 2005–2009 by comparison year and age group**

Age group	Mortality rate in 2005–2009 (%)	Employment rate in 2005–2009 (%)	Employment rate in comparison year at same mortality rate (%)	Additional work capacity (%)
		2005–2009 vs. 1989–1995		
55–59	0.83	74.2	84.2	10.0
60–64	1.25	41.3	63.0	21.7
65–69	1.89	9.4	28.7	19.3
		2005–2009 vs. 1976–1980		
55–59	0.83	74.2	91.9	17.7
60–64	1.25	41.3	85.2	43.9
65–69	1.89	9.4	65.3	55.9
		2005–2009 vs. 1970		
55–59	0.83	74.2	90.1	15.9
60–64	1.25	41.3	86.4	45.0
65–69	1.89	9.4	77.8	68.3

5.4 Estimating Work Capacity Using Long-Term Changes in Morbidity

We now turn to the relationship between self-reported morbidity and employment at various points in time. The common five-category self-assessed health measure is unavailable in the German Microcensus, and individual health information is not collected every year. From the available information, we therefore constructed the two indicators of self-reported morbidity already described in section 5.2 for 1989, 1999, and 2009. We choose the most recent year (2009) as the base year and compare the morbidity-employment curvature with the two earlier years. To obtain more precise estimates, the original morbidity data are smoothed using a three-year moving average in age. Figure 5.6 illustrates the morbidity-employment relationship for the base year 2009 and the comparison year 1989, and the two illness measures. The x-axis now represents the share of individuals reporting their respective health problem. This graph shows that health has improved over time. At each age, the morbidity curve in 2009 lies left to the morbidity curve in 1989. That is, the prevalence of self-reported illnesses is on average lower in 2009 than in 1989. A remarkable feature of the morbidity-employment curve is the almost vertical section at ages sixty to sixty-five. Thus, whereas health does deteriorate with age before age sixty and after age sixty-five, there is no change or even a rebound in the time between. Individuals' health seems to improve while employment rates decline. One possible explanation for this finding is that retirement actually improves health, but a deeper analysis must be left to future research.

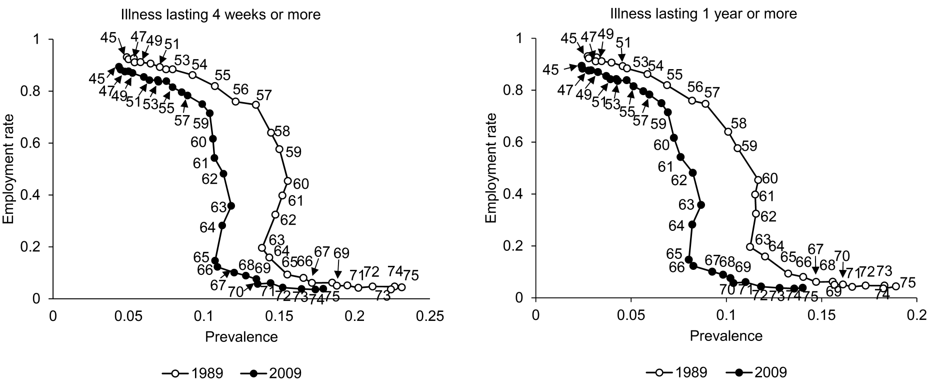

Fig. 5.6 Self-reported illness versus employment (2009 versus 1989)

Using again the vertical distance between the morbidity-employment curves in different periods, we estimated an additional work capacity, depending on the illness measure, of between 4.9 and 5.5 years. Due to the inverted S-shape of the morbidity-employment curves, there can be more than one possible employment rate at some ages/prevalences. Luckily, this applies only to very few data points at relatively high ages. In case this happened, we used the lowest employment rate so that our estimates provide some lower bound. Nevertheless, the five years of additional work capacity are substantially larger than the simulated additional 2.5 years of work calculated based on a comparable period of time (2005–2009 vs. 1989–1995) when using mortality to approximate health. Work-capacity estimates are again sensitive to the comparison year used. Whereas we obtain positive values when using 1989 as the comparison year, the estimates are practically zero when using 1999 (–0.5 and–0.2, respectively). This is not unexpected since, as we have seen in section 5.2, self-reported health has not improved as much between 1999 and 2009 as in the decade before, and labor force participation in 1999 was still largely affected by the generosity of the system and hence quite low.

5.5 Work-Capacity Estimates Using Health Changes across Age Groups

In this section, we estimate the health-related capacity to work using the approach suggested by Cutler, Meara, and Richards-Shubik (2012). The basic idea is to simulate the work capacity of older individuals based on their own health status and other characteristics using the estimated relationship between health and labor force participation of younger persons. This answers the question of how much older individuals would work if they faced the same retirement incentives as younger persons (eligible only for disability pensions), but given their own worse health level. Rather than assessing actual behavioral responses to, for example, stricter access to retirement pathways, we interpret our findings as additional work capacity above and beyond the observed employment rates.

This method basically involves two steps, a regression stage and a simulation stage. First, we estimate the relationship between employment and health, and other characteristics, of younger respondents. We choose individuals at ages fifty to fifty-four, who are not eligible for old age pensions, but can apply for disability insurance benefits. Second, we predict the labor force participation of older workers based on their actual health and characteristics using the coefficients from the regression stage. We do these calculations for individuals at ages fifty-five to fifty-nine, sixty to sixty-four, sixty-five to sixty-nine, and seventy to seventy-four.

We use the German subsample of the Survey of Health, Ageing and Retirement in Europe (SHARE) for the years 2004 to 2010 (see Börsch-Supan et al. [2013] for a description of SHARE). The SHARE data provide extensive health information at the individual level covering subjective and objective measures of physical and mental health. A major advantage of these measurements is their comparability to both the health assessments of other SHARE countries and the US Health and Retirement Study (HRS). Our estimation sample is a combined data set of the three panel waves (2004, 2006, and 2010), restricted to individuals age fifty to seventy-four. It includes approximately 1,600 men and 1,800 women, and the number of person-years roughly amounts to 2,700 and 3,000, respectively. The analysis in the regression stage is based on 399 male- and 526 female-year observations, at ages fifty to fifty-four.

The dependent variable in our regression models is a dummy variable that indicates whether a respondent currently works in the labor market, even if this is only for a few hours per week. As with any study that estimates the employment effects of health, it is important to measure the respondent's health status comprehensively. Therefore, we include a rich set of health indicators, such as self-rated health, physical limitations, limitations in activities of daily living (ADLs) and instrumental activities of daily living (IADLs), various medical conditions, weight problems, and smoking status. Furthermore, we control for the individual's marital status and a binary indicator of educational attainment, where we distinguish between low education (basic-track secondary school) and high education (intermediate or academic track secondary school).

Tables 5.3 and 5.4 report the summary statistics on dependent and independent variables for men and women, respectively. As expected, employment decreases with age, showing sharp declines in labor force participation rates particularly among individuals at ages sixty to sixty-four and sixty-five to sixty-nine. For example, the share of working men falls from 93 percent at ages fifty to fifty-four to 85 percent at ages fifty-five to fifty-nine, further

Table 5.3 SHARE summary statistics, men

	Age group				
Variable	50–54	55–59	60–64	65–69	70–74
Employed	0.93	0.85	0.40	0.05	0.01
SRH excellent	0.12	0.06	0.05	0.05	0.03
SRH very good	0.31	0.22	0.19	0.14	0.11
SRH good	0.33	0.40	0.41	0.45	0.45
SRH fair	0.20	0.24	0.27	0.28	0.33
SRH good	0.05	0.07	0.08	0.08	0.07
1 physical limitation	0.14	0.18	0.19	0.18	0.25
> 1 physical limitation	0.10	0.17	0.22	0.27	0.29
Any ADL limitations	0.03	0.07	0.08	0.10	0.12
Any IADL limitations	0.03	0.03	0.04	0.05	0.05
Euro-D depression score	1.39	1.42	1.53	1.42	1.57
Heart disease	0.06	0.09	0.12	0.14	0.20
Lung disease	0.04	0.04	0.06	0.07	0.06
Stroke	0.01	0.03	0.04	0.05	0.05
Psychiatric disorder	0.17	0.17	0.12	0.11	0.11
Cancer	0.02	0.03	0.04	0.06	0.06
Hypertension	0.21	0.34	0.37	0.41	0.49
Arthritis	0.06	0.09	0.09	0.10	0.11
Diabetes	0.08	0.10	0.11	0.14	0.15
Back pain	0.45	0.51	0.52	0.52	0.55
Underweight	0.00	0.00	0.00	0.00	0.00
Overweight	0.52	0.50	0.51	0.53	0.52
Obese	0.16	0.19	0.19	0.19	0.18
Current smoker	0.34	0.30	0.27	0.19	0.11
Former smoker	0.31	0.37	0.38	0.42	0.42
High education	0.63	0.59	0.51	0.45	0.41
Married	0.77	0.84	0.83	0.85	0.89
N	399	484	580	646	448

declines to 40 percent at ages sixty to sixty-four, and eventually to 5 percent at ages sixty-five to sixty-nine. A similar pattern is observed for women, although the employment rates are generally lower than among men. Women at ages sixty to sixty-four work substantially less than men of the same age. This can partly be explained by the availability of an "old age pension for women" during the observation period, which allowed female workers to retire before age sixty-five if they met certain requirements. Regarding health, we observe that the share of individuals reporting good, fair, or poor health is increasing with age, while the proportion of those in excellent or very good health declines. The same is true for most of the remaining health measures: the probability of reporting health problems rises with age. One notable exception is psychological problems. The probability of

Table 5.4 **SHARE summary statistics, women**

	Age group				
Variable	50–54	55–59	60–64	65–69	70–74
Employed	0.78	0.70	0.24	0.02	0.01
SRH excellent	0.10	0.07	0.04	0.03	0.02
SRH very good	0.29	0.21	0.15	0.13	0.08
SRH good	0.42	0.43	0.47	0.44	0.45
SRH fair	0.17	0.25	0.27	0.32	0.36
SRH good	0.03	0.05	0.07	0.08	0.09
1 physical limitation	0.17	0.17	0.20	0.19	0.20
> 1 physical limitation	0.14	0.26	0.30	0.41	0.47
Any ADL limitations	0.02	0.08	0.10	0.13	0.16
Any IADL limitations	0.02	0.05	0.04	0.07	0.06
Euro-D depression score	2.01	2.21	2.15	2.38	2.34
Heart disease	0.02	0.03	0.06	0.09	0.10
Lung disease	0.02	0.05	0.06	0.06	0.06
Stroke	0.01	0.02	0.02	0.02	0.04
Psychiatric disorder	0.24	0.23	0.24	0.20	0.14
Cancer	0.04	0.06	0.06	0.06	0.08
Hypertension	0.20	0.30	0.39	0.44	0.50
Arthritis	0.07	0.15	0.14	0.18	0.16
Diabetes	0.03	0.07	0.09	0.15	0.17
Back pain	0.50	0.58	0.55	0.58	0.65
Underweight	0.01	0.01	0.01	0.01	0.01
Overweight	0.31	0.35	0.42	0.40	0.44
Obese	0.15	0.17	0.17	0.21	0.21
Current smoker	0.21	0.20	0.15	0.09	0.07
Former smoker	0.20	0.22	0.20	0.14	0.13
High education	0.62	0.57	0.44	0.34	0.25
Married	0.79	0.78	0.81	0.75	0.69
N	526	640	632	631	421

being depressed decreases as individuals are getting older. This is consistent with the observation that subjective well-being or mental health generally improves at an advanced age (Blanchflower and Oswald 2008).

As to the measurement of health, one possible approach would be to include the full set of health indicators as explanatory variables. However, this procedure is prone to interpretation problems arising from multicollinearity and measurement error. For instance, in analyses not reported here, some fairly bad health events such as suffering a stroke were actually found to increase labor force participation. We therefore follow an alternative approach that presumably mitigates these issues. Specifically, we primarily use a health index proposed by Poterba, Venti, and Wise (2013), which is based on responses to twenty-four items covering the respondents' psychological well-being, physical health, and health-care utilization. The index is

Table 5.5 First principal component index of health based on SHARE Germany

Health measure	Wave 1	Wave 2	Wave 4
Difficulty walking several blocks	0.29	0.27	0.28
Difficulty lifting/carrying	0.24	0.30	0.31
Difficulty pushing/pulling	0.26	0.29	0.32
Difficulty with an ADL	0.28	0.28	0.29
Difficulty climbing stairs	0.30	0.30	0.30
Difficulty stooping/kneeling/crouching	0.30	0.30	0.28
Difficulty getting up from chair	0.29	0.30	0.28
Self-reported health fair or poor	0.30	0.28	0.28
Difficulty reaching/extending arms up	0.26	0.25	0.26
Ever experience arthritis	0.16	0.15	0.19
Difficulty sitting two hours	0.22	0.23	0.18
Difficulty picking up a coin	0.14	0.18	0.17
Back problems	0.20	0.18	0.16
Ever experience heart problems	0.13	0.13	0.11
Hospital stay	0.15	0.16	0.14
Doctor visit	0.10	0.09	0.07
Ever experience psychological problem	0.11	0.09	0.11
Ever experience stroke	0.13	0.13	0.12
Ever experience high blood pressure	0.15	0.12	0.10
Ever experience lung disease	0.10	0.07	0.07
Ever experience diabetes	0.11	0.13	0.12
BMI at beginning of observation period	0.10	0.08	0.10
Nursing home stay	0.11	0.08	0.07
Ever experience cancer	0.07	0.07	0.09
N	2,966	2,478	1,487

computed as the first principal component extracted from a principal component analysis using these twenty-four items. Table 5.5 displays the factor loadings of the first principal component in the German SHARE data. All loadings are positive, implying that larger values of the first principal component represent worse health. Functional limitations and self-rated health have the greatest weight. The first principal component is then converted into individual percentiles, so that higher values reflect better health (henceforth also denoted as PVW index). Thus, we can interpret the estimated health parameters as changes in the probability of working due to a percentile increase in the health index. Figure 5.7 displays the relationship between the health-index percentiles used in the regression and simulation analyses and age. Here, higher values indicate better health status. We observe that health continuously declines with age for both men and women, although women appear to be healthier than men on average.

The PVW approach as described above implies that the same health condition has the same effect on overall health and employment among younger and older respondents. However, there are several reasons why this may

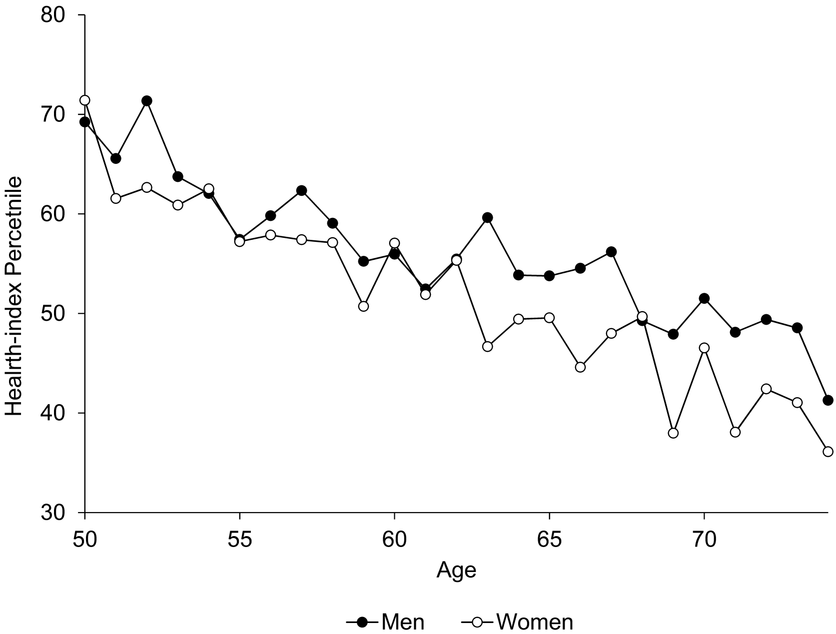

Fig. 5.7 Average health-index percentile by age and sex

not hold. Most importantly, the health indicators used here provide little information on the severity of health conditions. For instance, individuals may assess their own health relative to that of other people in the same age group (e.g., Groot 2000). Hence, a given condition of the same "objective" severity might have a stronger effect on self-perceived health and, hence, labor supply among young than among old respondents. Or, suffering from the same condition might have a stronger effect on overall health among older than among younger people. In the first case, the PVW index would underestimate the work capacity of older workers, and in the second case it would overestimate the work capacity. Furthermore, the PVW index that we use here for comparability includes self-rated health as the most important indicator. However, health might be endogenous in employment regressions. Younger workers may have financial incentives to report worse health to become eligible for disability benefits, or workers may report health problems to rationalize their work behavior (e.g., Bound et al. 1999). This could overestimate the impact of individual health on labor force participation.

To address both the measurement and endogeneity problem, we also computed for each individual an index of self-assessed health that is a linear combination of the detailed "objective" health measures mentioned above (we call this the SAH index). To be more precise, we estimated an ordered probit model of self-rated health (categories: excellent, very good, good, fair, poor) with the remaining health measures as explanatory variables (see, e.g., Jürges 2007). Each health variable is interacted with a dummy variable indicating whether the respondent belongs to one of the previously defined age groups to allow for differential effects of each health indicator on overall health. We then constructed the individual health index as the predicted linear index from the ordered probit model. Hence, we loosen the restriction that health means the same across age groups, and we reduce the endogeneity problem by instrumenting self-assessed health with arguably exogenous health variables.

To be consistent with the other chapters in this volume, our analysis primarily relies on the PVW index. We will also compare the results to the estimates obtained using both the full set of health measures and the SAH index as a robustness check. For the regression analysis of individuals age fifty to fifty-four, we estimate linear probability models of the following form:

$$E_{it}^{50\text{–}54} = \alpha + \beta \cdot H_{it}^{50\text{–}54} + \gamma \cdot X_{it}^{50\text{–}54} + \varepsilon_{it}, \quad (1)$$

where E_{it} is a binary variable indicating whether individual i is working in wave t; H_{it} represents respondent i's health status in t; X_{it} captures further control variables, and ε_{it} is a time-varying idiosyncratic error term. Equation (1) essentially represents a pooled panel regression.

In the second stage, we use the regression coefficients from equation (1) to predict the labor force participation and work capacity at older ages:

$$\widehat{E_{it}^{\,a}} = \hat{\alpha}^{50\text{–}54} + \hat{\beta}^{50\text{–}54} \cdot H_{it}^{a} + \hat{\gamma}^{50\text{–}54} \cdot X_{it}^{a}, \quad (2)$$

where $\widehat{E_{it}^{\,a}}$ is the predicted employment probability of individual i who belongs to age group a; H_{it}^{a} and X_{it}^{a} are the respective health measures and control variables; $\hat{\alpha}^{50\text{–}54}$, $\hat{\beta}^{50\text{–}54}$, $\hat{\gamma}^{50\text{–}54}$ are the estimated coefficients from the regression model in equation (1). Our estimation of work capacity relies on the assumption that the estimated coefficients identify the effect of poor health and other covariates on the probability of working, also for those belonging to older age groups if these older age groups faced the same (early) retirement incentives as the fifty to fifty-four age group.

Table 5.6 shows the regression results for individuals at ages fifty to fifty-four, separately for men and women. We find that the PVW health index is positively related to the probability of working. The estimated coefficient of the health index is equal 0.003 for both men and women. That is, moving up the health distribution by 1 percentile increases the probability of employment by 0.3 percentage points. Furthermore, individuals who have higher educational attainment are also more likely to work. Having completed an intermediate-track or academic-track secondary school raises the employment probability by about 6 (10) percentage points among men (women), compared to respondents with a basic-track secondary school degree. Being married is significantly and negatively related to labor force participation

Table 5.6 Employment regressions, PVW health index

	Men 50–54		Women 50–54	
Variable	Coefficient	Std. error	Coefficient	Std. error
PVW index	0.003	0.001***	0.003	0.001***
High education	0.062	0.026**	0.099	0.037***
Married	0.008	0.028	–0.117	0.044***
Wave 2	–0.011	0.025	–0.050	0.037
Wave 4	0.035	0.108	–0.068	0.130
Constant	0.706	0.042***	0.657	0.061***
N	399		526	

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

Table 5.7 Simulations of work capacity, PVW health index

Age group	No. obs.	Actual proportion working (%)	Predicted proportion working (%)	Estimated work capacity (%)
		Men		
55–59	484	84.7	91.6	6.9
60–64	580	40.3	90.4	50.1
65–69	646	5.4	89.1	83.7
70–74	448	1.1	88.2	87.1
		Women		
55–59	640	69.5	73.9	4.4
60–64	632	23.7	071.9	48.2
65–69	631	2.1	69.8	67.7
70–74	421	1.4	67.9	66.5

only among women. We obtain qualitatively and quantitatively similar results when we include the SAH index (details not shown).

Table 5.7 and figure 5.8 show the results of the simulation step, based on the PVW index. Table 5.7 shows for both men and women and each five-year age group the actual (observed) proportion working and the predicted proportion working. The estimated work capacity is calculated as the difference between the predicted and observed employment rates. The predicted employment rates for men are roughly 92 percent at ages fifty-five to fifty-nine, 90 percent at ages sixty to sixty-four, 89 percent at ages sixty-five to sixty-nine, and 88 percent at ages seventy to seventy-four. As expected, the predicted share of workers declines because health deteriorates with age and worse individual health is linked with lower employment rates. However, the decline in the projected proportion working is very small. This is also

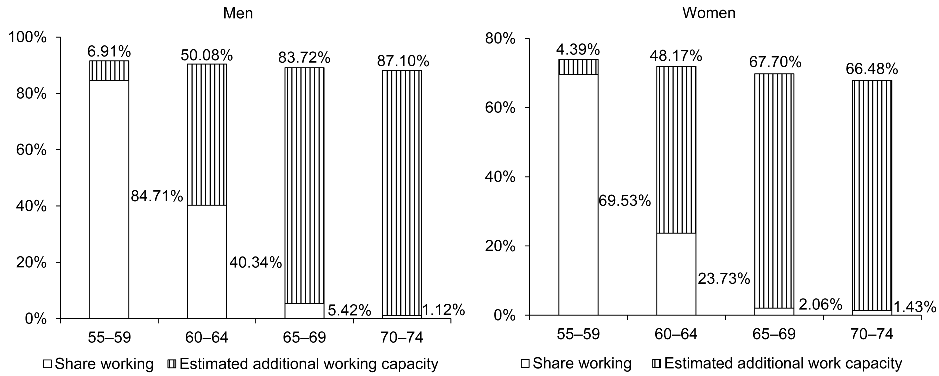

Fig. 5.8 Share of respondents working and additional work capacity by sex and age

true for women, albeit their predicted employment rates are lower at all age groups. Apparently the observed employment rates decline more rapidly with age than the predicted employment rates. This implies that the work-capacity estimates increase with age and become fairly large. For example, the additional work capacity of men is roughly 7 percent at ages fifty-five to fifty-nine (had they worked as much as men at ages fifty to fifty-four), 50 percent at ages sixty to sixty-four, 84 percent at ages sixty-five to sixty-nine, and 87 percent at ages seventy to seventy-four. Among women, the estimated additional work capacity follows the same pattern, but is somewhat smaller. When using the SAH index, which allows for larger effects of "nominal" health conditions on subjective health ratings, the estimate of additional work capacity at older ages is reduced by a few percentage points (see table 5A.1 in the appendix).

These numbers are similar to the mortality-based work-capacity estimates obtained in the previous section. Referring to table 5.2, the average additional employment for men at ages sixty to sixty-four and sixty-five to sixty-nine approximately amounts to 45 percent and 68 percent (using 1970 as the comparison year), respectively. The numbers in this section for the same age groups are equal to 50 percent and 84 percent. We think that these results are remarkably similar, despite the fact that we are using distinct methods and different measures of health status.

We conclude this section by allowing the relationship between health and employment, and health-related work capacity, to differ across socioeconomic groups. Specifically, we simulate the labor force participation of older workers separately by educational attainment (low vs. high education). There might be substantial education-related heterogeneity in the effect of health on employment, and thus work capacity. For instance, better-educated individuals are more likely to work at older ages per se, due to better health.

Furthermore, individuals with better education, or higher socioeconomic status, are more likely to recover from and survive medical conditions (e.g., Mackenbach et al. 2008). This is closely related to the observation that the better educated are also better at adhering to medical treatments (Goldman and Smith 2002), or are more likely to profit from innovations in medical technology (Glied and Lleras-Muney 2008). Generally, more schooling may improve the capacity to cope with illness. Higher-educated individuals are assumed to make better informed decisions about their health, have greater financial resources, or choose jobs that make it easier to adapt or accommodate to disabilities at the workplace (e.g., Lochner 2011).

To compute work capacity by education, we rely on the regression coefficients of the model estimated in the first step of the analysis, and compute the predicted percent working and the additional work capacity separately by education (single regression). In addition, we reestimate the regression models separately by education group (regressions by education group).

Figure 5.9 displays the simulation results by education, using the PVW index and the single-regression approach. Two patterns emerge: First, the estimated work capacity increases with age, irrespective of education and sex. Second, we find that the low educated have a higher work capacity than better-educated individuals at younger age groups (fifty-five to fifty-nine, sixty to sixty-four), whereas the high educated have higher work capacity estimates at older age groups (sixty-five to sixty-nine, seventy to seventy-four). We obtain similar relationships using the regression-by-education

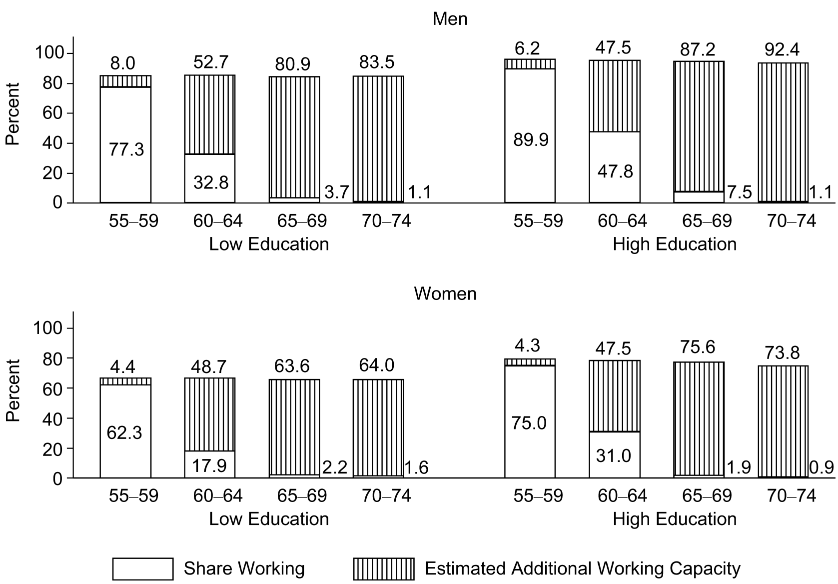

Fig. 5.9 Work capacity by education (single regression)

approach and alternative specifications of individual health (see tables 5A.3 and 5A.4 in the appendix). Although we find those differences across education groups, they are quite small and do not warrant dramatically different conclusions regarding work capacity.

5.6 Changes in Self-Reported Morbidity by Education Level over Time

In this section, we further assess the development of socioeconomic differences in health (and by extension, work capacity) over time. Individuals with higher socioeconomic status (SES) live longer and the social inequality in survival appears to have increased over time, also in Germany (e.g., Siegel, Vogt, and Sundmacher 2014). As discussed above, high-SES individuals may also have a higher propensity of recovering from and surviving severe medical conditions. These factors may contribute to socioeconomic differences in work capacity and other labor market outcomes at older ages.

For Germany, data on mortality by SES groups over time are unavailable. We therefore study trends in self-reported morbidity as used in the preceding sections. As an indicator of socioeconomic status, we use years of education. Direct information on years of education as such is not available in the Microcensus. But the data contain the highest secondary school degree as well as completed tertiary degrees and other occupation-related credentials. Following previous work (e.g., Jürges, Reinhold, and Salm 2011), we use this information, together with the number of years it usually takes to obtain a certain degree, to impute an individual's number of years in full-time education.

As a measure of socioeconomic status, education has some drawbacks when we study developments over time, or rather, across cohorts. As in many other countries, Germany has experienced strong improvements in educational opportunities in the past fifty years, and the proportion of workers with higher educational degrees increased substantially (Jürges, Reinhold, and Salm 2011). For instance, among men born in 1940, less than 15 percent had earned a high school diploma that would allow university entrance (*Abitur*). In contrast, among the 1980 cohort, nearly 35 percent of men earned this diploma. Obviously the Abitur must have become less selective in terms of sociodemographic background and/or ability over time, and of course this was the goal of the educational expansion in many developed countries in the second half of the last century. However, this implies that the survival rates and health outcomes by education group may not be comparable over time. As argued by Bound et al. (2014), the low educated in younger cohorts are possibly more negatively selected than their counterparts in older cohorts. In turn, this may bias the comparison of life expectancy and health across educational groups over time.

To address this problem, we use years-of-education quartiles rather than school-leaving certificates or the straight number of years of education to

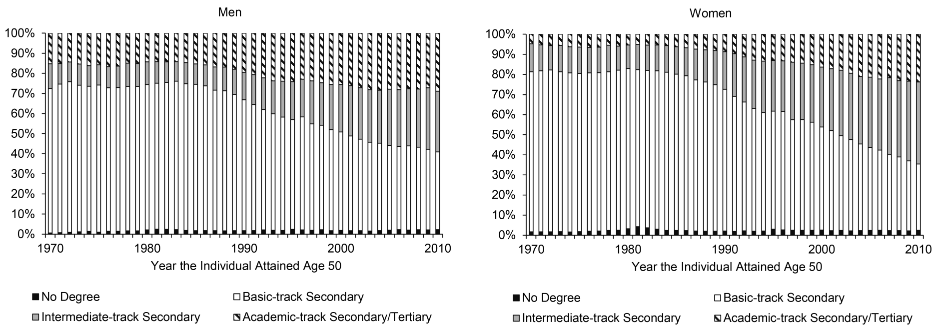

Fig. 5.10 Distribution of years of education completed by cohort (by year cohort attained age fifty)

group individuals. This approach provides consistent rankings along socioeconomic status that can be compared over time. The education quartile an individual belongs to is inferred from the individual's fractional rank in the years-of-education distribution of all individuals of the same age in the respective year. Thus, we obtain education quartiles that reflect the distribution of education years in a given cohort. As a consequence, we examine the health development in the same education quartile, although its composition in terms of degrees or years of schooling may have changed across cohorts (see figure 5.10). For instance, the highest education quartile among the older cohorts consists of university graduates as well as graduates from intermediary and high schools (academic track). Among the younger cohorts, there are almost exclusively university and high school graduates in the highest quartile.

Figures 5.11 and 5.12 show the evolution of self-reported chronic morbidity (> 1 year) by education quartile, for men and women, respectively. Since the original data are rather noisy, we also provide three-year (age) moving averages to obtain smoother estimates of the proportion of sick individuals at each age. As expected, the probability of illness rises with age. As already discussed in section 5.4, health deteriorates more slowly between age sixty and sixty-five than before or after.

More importantly, we find health improvements over time for each education quartile. That is, the prevalence of self-reported morbidity in more recent years usually lies below the 1989 figures at each age. Individuals in higher education quartiles have experienced disproportionate health improvements over time. The reduction in the probability of illness is lowest among those in the first education quartile. For example, between 1989 and 2009 the prevalence among men falls by 1.8 percentage points in the lowest education group, and by 3.1 percentage points in the highest education quartile.

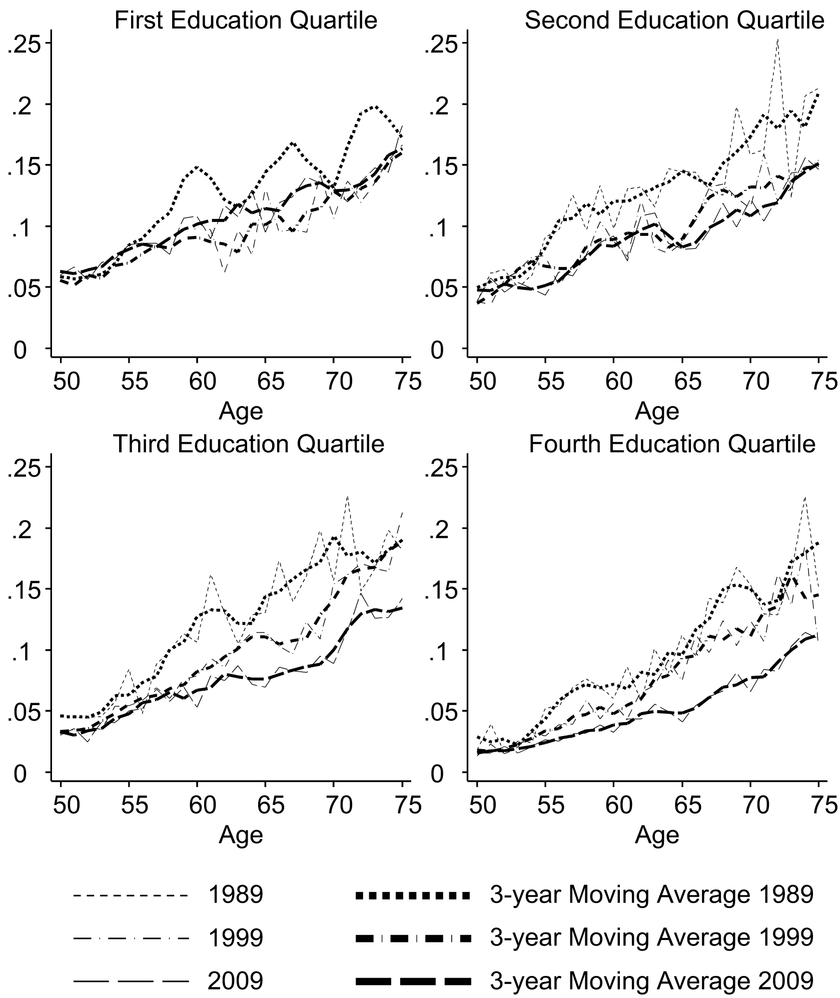

Fig. 5.11 Evolution of self-reported chronic illness (> 1 year) by education quartile (men)

5.7 Summary and Discussion

For half a century, mortality rates in Germany have declined at every age, and Germans today live longer on average than ever before. This seems to imply that Germans have become healthier, fitter, and increasingly capable to work in the labor market in their fifties, sixties, or even beyond, an assumption that is described by the popular quip "seventy is the new sixty." Put differently, the proportion of older workers who are limited by poor health continues to decrease, and extending working lives among those who

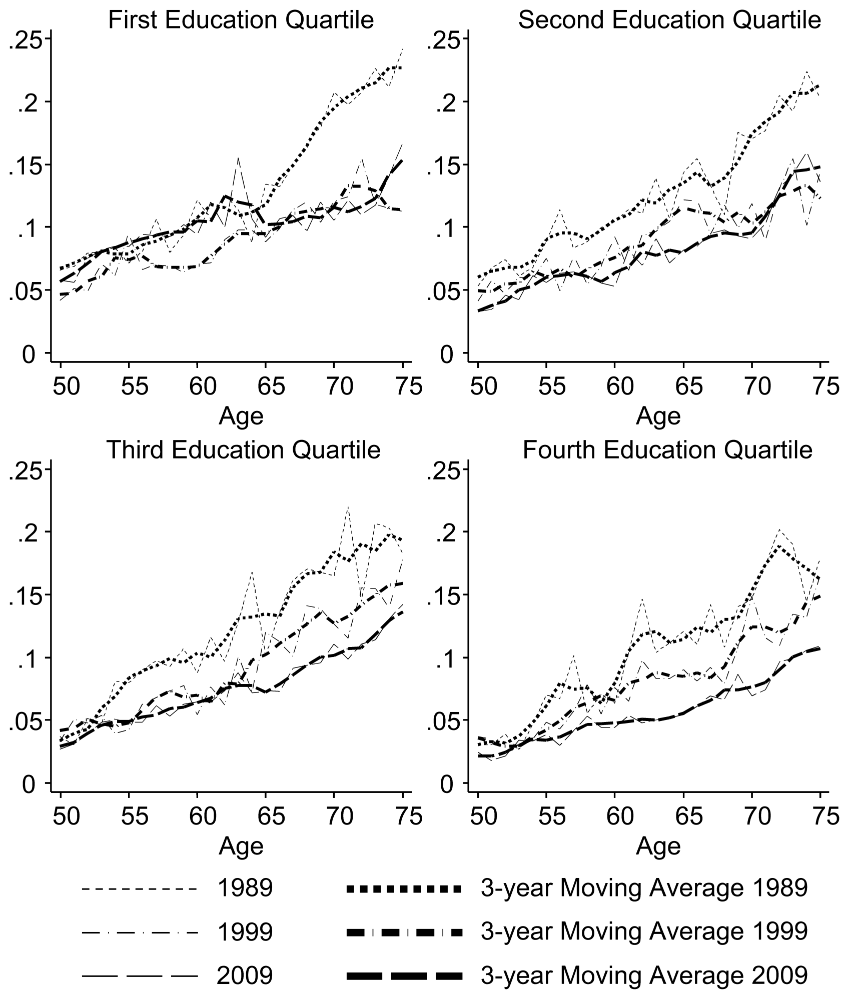

Fig. 5.12 Evolution of self-reported chronic illness (> 1 year) by education quartile (women)

have the capacity to work is arguably the best single measure to keep the German pay-as-you-go pension system financially afloat.

Obviously, extending working lives to a certain age is only sensible if a sizable proportion of the population would be able to work until that age. However, how many German workers could actually work until age sixty-seven, seventy, or even seventy-four is an open question, which to our knowledge has not yet been answered. The purpose of this chapter was to estimate the work capacity of the older population in Germany, that is, the proportion of elders who could still work in the labor market because they are not limited by poor health. For instance, we estimated the proportion of elders today who could still work by asking how many people in the past—who had the same health level (measured by the age-specific mortality rate) but who did not face the same early retirement incentives—were working. Our results show that older workers could work more than six years longer on average, and more than two-thirds of men could work until their seventieth birthday.

As an alternative approach, we used contemporary data and looked at the labor supply of individuals in their early fifties, who might have health problems that limit their ability to work but whose only early retirement option are disability pensions. Using the effect of poor health on labor force participation in this group, we simulated labor force participation in older age groups. This yields a counterfactual employment rate that would prevail if health deteriorates with age as it actually does, but under less generous retirement incentives. Here, we found even larger capacity to work among the older population. According to our calculations, more than 85 percent of men and nearly 70 percent of women could still work until they turn seventy.

To summarize, independent of the method used, we get large estimates for the capacity to work beyond the current normal retirement age. A fairly safe bet would be that today, if individuals were retiring exclusively for health reasons, more than half of the population could work until age seventy. Of course, increasing labor force participation thus far may seem unrealistic given that less than 5 percent of individuals of that age are working today. There are numerous reasons for retiring early, and poor health is certainly one of them, but the point we make in this chapter is that health is probably not the main reason, and the recent debate in Germany in which health is cited as an important reason to reduce retirement ages is not well supported by empirical evidence.

This leads us to stress an important point. We aimed at estimating the strength of the effect of poor health on retirement and wanted to know how many could work *if they wanted to*. Health, however, is not the only determinant of retirement. The large uptake of the new early retirement option at age sixty-three among healthy workers in Germany shows that the appreciation of leisure is at least an equally strong determinant of retirement as health.

Our analysis of work capacity and health is first and foremost descriptive. Turning to a normative view, we are not saying that everyone who can should work until age seventy. If workers' valuation of leisure increases as they become older, there is no economic reason to constrain their desire to retire as early or as late as they see fit as long as workers and their employers are willing to bear the financial implications. Theoretically, the German pension system already allows working past the "normal" retirement age, with a generous 6 percent increase in pension benefits per additional year worked, but very few workers make use of this option. Whether this is due to preferences for leisure, due to employer discrimination, or simply because it is the norm to retire as soon as one becomes eligible for an old age pension, is a topic for future work. In light of the results of the analysis in this chapter, it is likely not due to poor health.

Appendix

Table 5A.1 Simulations of work capacity, alternative health measures

		All health variables models			SAH index models		
Age group	No. obs.	Actual proportion working	Predicted proportion working	Estimated work capacity	Actual proportion working	Predicted proportion working	Estimated work capacity
				Men			
55–59	484	0.847	0.927	0.080	0.847	0.910	0.063
60–64	580	0.403	0.924	0.520	0.403	0.893	0.489
65–69	646	0.054	0.917	0.863	0.054	0.882	0.828
70–74	448	0.011	0.918	0.907	0.011	0.864	0.853
				Women			
55–59	640	0.695	0.728	0.032	0.695	0.740	0.045
60–64	632	0.237	0.701	0.464	0.237	0.720	0.483
65–69	631	0.021	0.691	0.670	0.021	0.706	0.686
70–74	421	0.014	0.664	0.649	0.014	0.688	0.674

Table 5A.2 Work capacity by education, PVW health index

	Men			Women		
Education	Actual proportion working	Predicted proportion working	Estimated work capacity	Actual proportion working	Predicted proportion working	Estimated work capacity
A. Single regression						
			Age 55–59			
Low	0.773	0.853	0.080	0.623	0.668	0.044
High	0.899	0.960	0.062	0.750	0.793	0.043
			Age 60–64			
Low	0.328	0.855	0.527	0.179	0.666	0.487
High	0.478	0.953	0.475	0.310	0.785	0.475
			Age 65–69			
Low	0.037	0.845	0.809	0.022	0.658	0.636
High	0.075	0.947	0.872	0.019	0.774	0.756
			Age 70–74			
Low	0.011	0.846	0.835	0.016	0.656	0.640
High	0.011	0.934	0.924	0.009	0.747	0.738
B. Regression by education						
			Age 55–59			
Low	0.773	0.910	0.138	0.623	0.695	0.072
High	0.899	0.951	0.052	0.750	0.762	0.012
			Age 60–64			
Low	0.328	0.903	0.575	0.179	0.699	0.520
High	0.478	0.947	0.469	0.310	0.745	0.435
			Age 65–69			
Low	0.037	0.890	0.853	0.022	0.695	0.673
High	0.075	0.941	0.865	0.019	0.729	0.710
			Age 70–74			
Low	0.011	0.897	0.885	0.016	0.698	0.682
High	0.011	0.935	0.924	0.009	0.709	0.699

Table 5A.3 Work capacity by education, all health variables models

Education	Men: Actual proportion working	Men: Predicted proportion working	Men: Estimated work capacity	Women: Actual proportion working	Women: Predicted proportion working	Women: Estimated work capacity
A. Single regression						
			Age 55–59			
Low	0.773	0.872	0.099	0.623	0.660	0.037
High	0.899	0.966	0.067	0.750	0.779	0.029
			Age 60–64			
Low	0.328	0.876	0.548	0.179	0.649	0.470
High	0.478	0.971	0.493	0.310	0.766	0.457
			Age 65–69			
Low	0.037	0.876	0.840	0.022	0.654	0.632
High	0.075	0.966	0.891	0.019	0.762	0.743
			Age 70–74			
Low	0.011	0.889	0.878	0.016	0.652	0.637
High	0.011	0.959	0.948	0.009	0.697	0.688
B. Regression by education						
			Age 55–59			
Low	0.773	0.922	0.149	0.623	0.668	0.044
High	0.899	0.945	0.046	0.750	0.763	0.013
			Age 60–64			
Low	0.328	0.928	0.601	0.179	0.650	0.470
High	0.478	0.941	0.463	0.310	0.754	0.444
			Age 65–69			
Low	0.037	0.919	0.882	0.022	0.683	0.661
High	0.075	0.938	0.863	0.019	0.732	0.713
			Age 70–74			
Low	0.011	0.938	0.927	0.016	0.640	0.624
High	0.011	0.943	0.932	0.009	0.718	0.709

Table 5A.4 **Work capacity by education, SAH index**

	Men			Women		
Education	Actual proportion working	Predicted proportion working	Estimated work capacity	Actual proportion working	Predicted proportion working	Estimated work capacity
A. Single regression						
			Age 55–59			
Low	0.773	0.844	0.072	0.623	0.671	0.048
High	0.899	0.955	0.057	0.750	0.793	0.043
			Age 60–64			
Low	0.328	0.844	0.517	0.179	0.672	0.492
High	0.478	0.940	0.463	0.310	0.781	0.472
			Age 65–69			
Low	0.037	0.838	0.801	0.022	0.670	0.648
High	0.075	0.935	0.860	0.019	0.778	0.759
			Age 70–74			
Low	0.011	0.829	0.818	0.016	0.666	0.650
High	0.011	0.914	0.903	0.009	0.753	0.743
B. Regression by education						
			Age 55–59			
Low	0.773	0.895	0.123	0.623	0.694	0.070
High	0.899	0.952	0.053	0.750	0.762	0.012
			Age 60–64			
Low	0.328	0.881	0.553	0.179	0.703	0.523
High	0.478	0.946	0.468	0.310	0.742	0.433
			Age 65–69			
Low	0.037	0.871	0.835	0.022	0.706	0.685
High	0.075	0.942	0.866	0.019	0.735	0.716
			Age 70–74			
Low	0.011	0.867	0.856	0.016	0.711	0.695
High	0.011	0.932	0.921	0.009	0.713	0.703

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