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# Health Capacity to Work at Older Ages
## Evidence from Spain

Pilar García-Gómez, Sergi Jiménez-Martín, and Judit Vall Castelló

### 9.1 Introduction

There are large concerns about the sustainability of social security systems due to population aging among developed countries, and Spain is not an exception. Spain has one of the lowest fertility rates in Europe (below 1.4, according to Eurostat [Lanzieri 2013]), while life expectancy at birth was the highest in 2012 at 82.5 years compared to an average EU-28 of 79.2 (OECD

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2014). In a similar vein, life expectancy at age sixty-five has been improving over time; in 1960 men age sixty-five expected to live 13.1 more years, while the expectations were 18.7 in 2012 (García-Gómez, Jiménez-Martín, and Vall Castelló 2012; OECD 2014). This trend is expected to continue in the coming decades (European Commission 2012).

In parallel, there was a tendency in the 1980s and early 1990s toward reducing employment participation of older workers (Gruber and Wise 1999, 2004; Boldrin, Jiménez-Martín, and Peracchi 1999, 2004). The decreasing trends were reversed in the mid-1990s, but employment participation rates have remained considerably lower than the ones observed in the late 1970s (see, for example, García-Gómez, Jiménez-Martín, and Vall Castelló 2012). There is a large body of literature that shows that financial incentives have an effect on employment decisions (Gruber and Wise 2004), but bad health has also been found to hamper labor force participation of (older) workers (García-Gómez 2011; Cervini-Pla and Vall Castelló 2015). Therefore, it remains an extremely relevant policy question whether future social security reforms have room to increase the labor market involvement of older individuals, and whether there is latent work capacity among Spanish older workers.

In this chapter, we aim to provide a first set of estimates to whether there is health-related unused work capacity among Spanish older workers. We do so following two alternative methods and focusing on employment as our measure of work capacity. First, we use the method proposed by Milligan and Wise (2015) and estimate that in 2010 individuals age fifty-five to sixty-nine would have worked an additional 7.08 years if they would have worked as much as individuals with the same mortality rates in 1976. Second, we use individual-level data from the Survey of Health, Ageing and Retirement in Europe and the method suggested by Cutler, Meara, and Richards-Shubik (2012) to estimate that work capacity increases over 60 percent once the normal retirement age of sixty-five kicks in. We are nonetheless cautious with our conclusions as these results hinge upon somewhat strong assumptions.

The rest of the chapter is organized as follows. Section 9.2 illustrates trends in labor force participation and their relation with trends in subjective and objective health measures. Section 9.3 simulates gains of work capacity of older workers using the Milligan-Wise method, while estimates using the Cutler-Meara- Richards-Shubik method are presented in section 9.4. In section 9.5 we analyze the evolution over time of poor health by education quartiles. Finally, section 9.6 concludes.

## 9.2 Trends in Labor Force Participation and Health

As in many industrialized countries, labor force participation in Spain has changed substantially in the last decades. We use data from the Spanish Labor Force Survey (*Encuesta de Población Activa* [EPA]) to illustrate

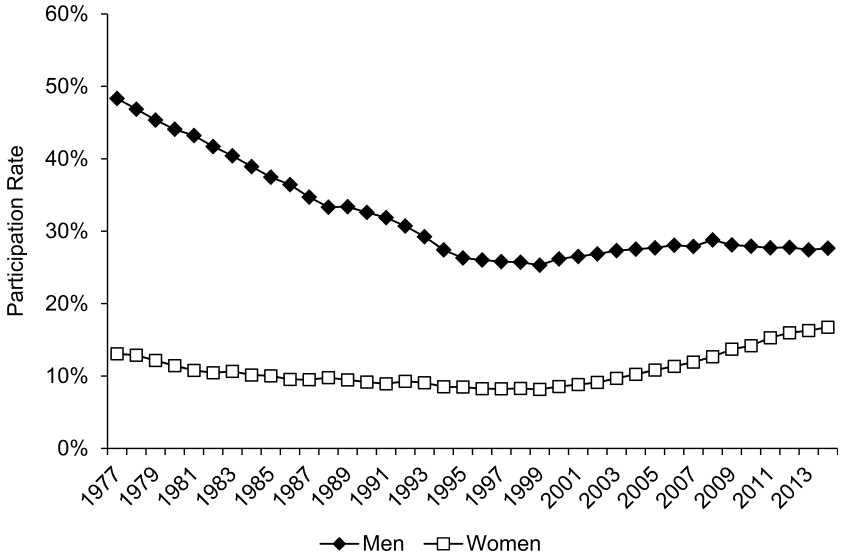


**Fig. 9.1 Labor force participation by gender, ages fifty-five and older (1977–2014)**
*Source:* Spanish Labor Force Survey.

trends in labor force participation since 1977. The EPA is a rotating quarterly survey carried out by the Spanish National Institute that contains detailed information on labor market behavior, education, and household characteristics of approximately 180,000 individuals every quarter. In particular, it asks every individual about her labor market status the week prior to the interview. We use this information to estimate average annual participation rates combining data from all quarters in a given year. Figure 9.1 plots the evolution of labor force participation for men and women at least fifty-five years of age in Spain since 1977 and figure 9.2 shows the evolution of labor force participation for men and women at least sixteen years of age in the same period. We can see in figure 9.1 that there was a steep decline in the labor force participation of men at least fifty-five years of age between 1977 and the mid-1990s; while 48 percent of men at least fifty-five years of age were in the labor force in 1977, only 25 percent stayed in the labor force during the 1990s. This declining trend was slightly reversed at the turn of the century. However, the participation rate was only 28 percent in 2014, which still represents a much lower value than in 1977. This decrease in labor market participation since the late 1970s is substantially explained by the incentives provided by social security institutions (Boldrin, Jiménez-Martín, and Peracchi 1999). In Spain, legislation promoting early retirement has had a large effect on the number of early retirees, particularly during the 1970s and 1980s (Boldrin, Jiménez-Martín, and Peracchi 2001). In addition, the

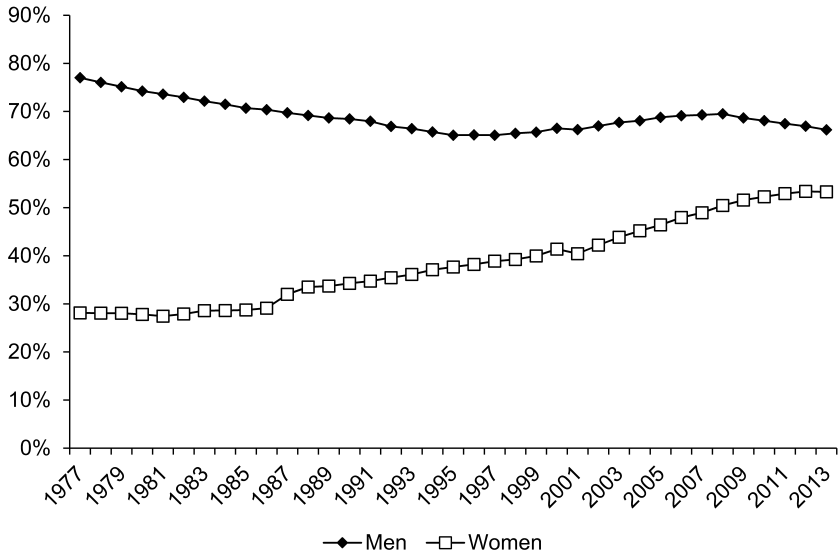


**Fig. 9.2 Labor force participation by gender, ages sixteen and older (1977–2014)**
*Source:* Spanish Labor Force Survey.

importance of other exit routes for individuals approaching retirement, such as unemployment or disability insurance, have also been documented in the literature, particularly for the group of individuals at least fifty-five years of age (Jiménez-Martín and Vall Castelló 2009; García-Gómez, Jiménez-Martín, and Vall Castelló 2012).

Several competing phenomena can be behind the reversal of this downward trend in male participation (and especially employment) since the late 1990s. Part of the reversal of this trend can be attributable to the effects of business cycle conditions, changes in the legislation, increasing levels of education, and the increase in the inflow of immigrants, which have, typically, higher participation rates than native Spanish people (Congregado, Golpe, and van Stel 2011; Aragón, de la Fuente, and Rocha 2009; Cuadrado et al. 2007).[1]

The evolution of labor market behavior of women is markedly different from that of men (see figures 9.1 and 9.2). First, labor market participation for women at least fifty-five years of age remained fairly constant between 1977 and 2001 at around 10 percent. Second, there is a remarkable increase in the participation rates in the last fifteen years, so participation is currently higher than it was during the late 1970s (figure 9.1). The steady increase in

1. Immigrants are typically younger than age fifty-five when they first arrive in the country. In any case, as the highest immigration inflow in Spain occurred in the late 1990s, some of those immigrants have already crossed the age fifty-five threshold.

the last fifteen years in labor force participation of older females relates to the overall trend in labor force participation of women (see figure 9.2). Similar to other developed countries, labor market participation of women has experienced a steady and continuous increase, from 28 percent in 1977 to 53 percent in 2014. We find that trends in labor market participation of men and women have been converging, although there is still a substantial gap in 2014: 53 percent of women participate in the labor market compared to 66 percent of men. This increase is concentrated among young women, mainly driven by a substitution of low-educated older women by more educated younger generations (Boldrin, Jiménez-Martín, and Peracchi 2001). As the increase in female participation rates are mainly driven by cultural changes regarding the role of women in society, and not by changes in the incentives provided by the social security schemes, we focus on males in the rest of the chapter.

### 9.2.1 Labor Force Participation and Health of Males

We now turn to revise the evolution of two health measures, mortality and self-assessed health, for Spanish males age fifty to seventy-five. Several factors have been identified as determinants of the evolution of population health such as the health care system, individual behavior, and social environment, among others. We use data from the Human Mortality Database (HMD) and the Spanish National Health Survey (ENS) to analyze the evolution of both mortality and self-reported health in the last thirty years. The Spanish National Health Survey (ENS) is a set of nationwide, cross-sectional surveys that collect information on health, health care use, lifestyles, and socioeconomic characteristics of the Spanish population. Figure 9.3 plots the age profile of self-assessed health and mortality for males in 1987, 1993, and 2006. Self-assessed health is obtained from ENS and shows the percentage that rate their general health as fair or poor, while mortality rates by age are obtained from HMD. Figure 9.3 shows that, as expected, health (measured both by self-assessed health and mortality) deteriorates with age. We also see that the large gains in mortality obtained during the last decades have been concentrated among the elderly. A reduction in mortality would translate in an increase in the population able to work if these changes go hand in hand with an improvement of the health of the population in the working age. The international evidence is inconclusive regarding whether changes in mortality are translated into a compression or expansion of morbidity (Klijs, Mackenbach, and Nusselder 2009). The evidence shown in figure 9.3 also points out that the self-reported health of the older Spanish has improved over time: in 1987, 51 percent of men age sixty-five reported having fair to poor health, while this proportion falls to 46 percent in 1993, and to 41 percent in 2006. This improvement in self-reported health over time is observed specially among men age fifty-eight to seventy.

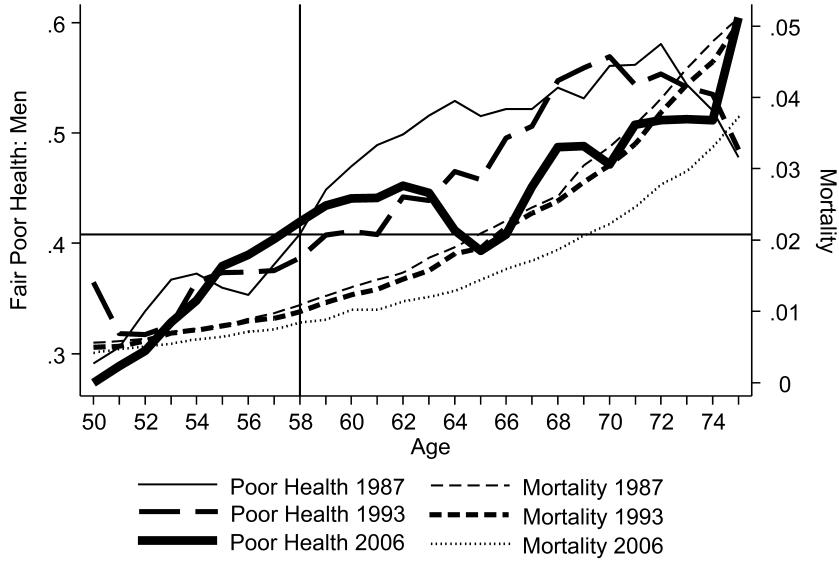


**Fig. 9.3 SAH and mortality for men age fifty to seventy-five (1987 to 2006)**
*Source:* Own elaboration from data from the Human Mortality Database and the Spanish National Health Survey.

Summing up, the last decades have witnessed a decrease in older mens' labor force participation and, at the same time, an improvement in the general health of men in their sixties. Thus, in what follows, we examine how much older Spanish men could work today if they experienced the relationship between health and employment of earlier years, that is, what is the unused health capacity to work.

## 9.3 Health Capacity to Work using the Milligan-Wise Method

We begin our analysis following the methodology first developed by Milligan and Wise (2015). The aim of this method is to get an estimate of the ability to work at older ages by comparing the relationship between mortality and employment in some previous period to the relationship between employment and mortality now. Thus, the idea is to get the potential employment possibilities of current cohorts if they worked as much as individuals that exhibited the same mortality rate almost thirty years ago. Once we get this potential employment (for a given mortality rate) estimate, its difference with respect to the current employment rate constitutes an estimate of the additional work capacity for current cohorts.

This method implicitly assumes that mortality is a good proxy for health and that the relationship between health and mortality has remained moderately stable during this thirty-year period. Despite the potential limitations

behind these assumptions, we have chosen to use mortality as our proxy of health (rather than a measure more directly related to ability to work such as self-assessed health or prevalence of limiting health problems) for several reasons. First, the use of mortality data allows cross-country comparison of the estimates, while self-reported measures are subject to reporting bias across countries (Jürges 2007; Milligan and Wise 2012). Second, mortality data is available yearly for a long period of time, while self-assessed health is only available for the years 1987, 1993, 1995, 1997, 2001, 2003, and 2006 (in the National Health Survey, which, in turn, has a smaller number of observations if we want to have self-assessed health at each age). Last, although mortality represents a more extreme event in life than a change in self-assessed health, Milligan and Wise (2012) show that, within countries, improvements in self-assessed health show a very similar evolution than improvements in mortality.

We use data for mortality from the Human Mortality Database for years 1976 to 2010 and data for employment from the Labour Force Survey from the National Institute of Statistics in Spain also for the years 1976 to 2010. We consider only men in our analysis due to the late incorporation of Spanish women in the labor market, which would make our analysis much more difficult to interpret.

We plot the relationship between employment and mortality for Spanish men in two different periods: 1976–1980 and 1991–1995 in figure 9.4 and

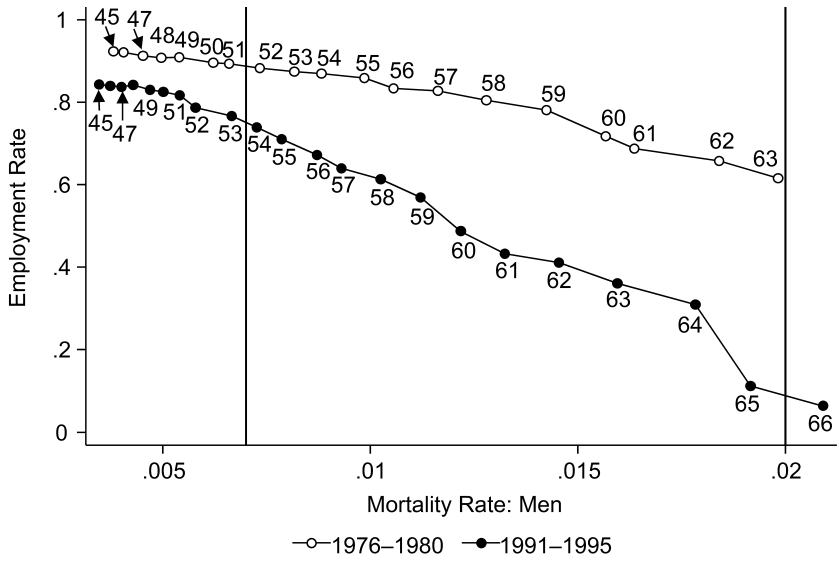


**Fig. 9.4 Employment versus mortality (1976–1980 versus 1991–1995)**

*Source:* Own elaboration from data from the Human Mortality Database and the Spanish Labor Force Survey.

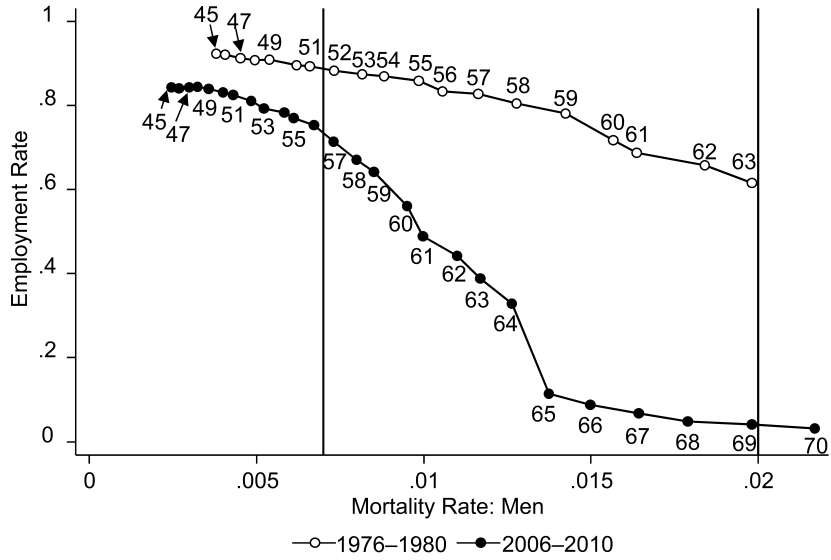


**Fig. 9.5 Employment versus mortality (1976–1980 versus 2006–2010)**
*Source:* Own elaboration from data from the Human Mortality Database and the Spanish Labor Force Survey.

1976–1980 and 2006–2010 in figure 9.5.[2] We can see that for a given mortality rate employment is lower in the two latter periods compared to the earlier one. For example, the employment rate at 0.7 percent mortality rate (first vertical line plotted in figures 9.4 and 9.5) is 89 percent in 1976–1980, 77 percent in 1991–1995, and 71 percent in 2006–2010. Similarly, at a 2 percent mortality rate (second vertical line plotted in figures 9.4 and 9.5), the employment rate in 1976–1980 was around 60 percent, in 1991–1995 around 10 percent, and in 2006–2010 around 3 percent. One of the reasons behind these large differences is that each of these mortality rates are also reached at later ages. For instance, the 2 percent mortality rate is reached at sixty-three years old in 1976–1980, but the same mortality rate is achieved at age sixty-five and a half in 1991–1995, and at age sixty-nine in 2006–2010. As mentioned before, this goes in line with observed increases in life expectancy.

Therefore, following the Milligan-Wise method, we estimate that, at a 2 percent mortality rate, if men in 2006–2010 would have worked as much as men in 1976–1980, the employment rate in 2006–2010 would have been 57 percentage points higher (observed employment rate is 3 percent, while the employment rate in 1976–1980 was 60 percent, that is, a difference of 57 percentage points). In other words, men in 2006–2010 age sixty-nine (with

2. We pool data for those five years for employment and mortality and calculate average employment and average mortality rate at each age.

a mortality rate of 2 percent) would have worked 57 percentage points more than men in 1976–1980 with the same mortality rate, which they achieved at age sixty-three.

We follow this same logic (but for single years and single ages) to estimate the additional employment capacity in 2010 using the relationship between employment and mortality from 1976. The results are shown in table 9.1 for men in each age from fifty-five to sixty-nine in 2010. In order to calculate the additional employment capacity, we proceed as follows. First, we take the mortality rate for men age fifty-five in 2010 and go back to the employment rate of men in 1976 that had the same mortality rate than the fifty-five-year-olds in 2010. Once we have this (equal-mortality) employment rate, we subtract it from the current employment rate for fifty-five years old in 2010 to estimate the additional work capacity for men age fifty-five in 2010. The third column of table 9.1 reports the employment rate in 2010, while the employment rate in 1976 at the same mortality rate can be found in the fourth column. Thus, as can be seen in the last column (first row) of table 9.1, men age fifty-five in 2010 could have worked an additional 18.8 percent, which is translated into 0.18 additional years of work on average. If we perform the same estimation for the older individuals included in our sample, we can see that men age sixty-nine in 2010 could have worked an additional 0.69 years of work.

If we repeat this calculation for each age from fifty-five to sixty-nine

**Table 9.1** **Additional employment capacity in 2010 using 1976 employment-mortality relationship**

| Age | Death rate in 2010 (%) | Employment rate in 2010 (%) | Employment rate in 1976 at same death rate (%) | Additional employment capacity (%) |
|---|---|---|---|---|
| 55 | 0.58 | 73.6 | 92.4 | 18.8 |
| 56 | 0.65 | 71.7 | 91.1 | 19.4 |
| 57 | 0.71 | 67.7 | 90.3 | 22.6 |
| 58 | 0.75 | 62.9 | 89.9 | 27.0 |
| 59 | 0.84 | 61.8 | 89.4 | 27.6 |
| 60 | 0.87 | 52.2 | 89.4 | 37.2 |
| 61 | 0.93 | 44.7 | 89.1 | 44.4 |
| 62 | 1.07 | 40.6 | 86.3 | 45.7 |
| 63 | 1.11 | 34.7 | 84.5 | 49.8 |
| 64 | 1.22 | 29.4 | 84.3 | 54.9 |
| 65 | 1.32 | 9.2 | 82.8 | 73.6 |
| 66 | 1.44 | 7.9 | 81.6 | 73.7 |
| 67 | 1.57 | 5.1 | 79.0 | 74.0 |
| 68 | 1.63 | 4.6 | 74.6 | 70.0 |
| 69 | 1.79 | 3.7 | 72.8 | 69.2 |
| Total years | | 5.7 | | 7.08 |

and we sum up all the additional work capacity, we get a total additional employment capacity of 7.08 years of work (last column of table 9.1). We can compare this number with the average amount of employment of 5.7 years observed among Spanish males age fifty-five to sixty-nine in 2010 (see third column of table 9.1, last row). Thus, we can observe that, in Spain, the estimated additional capacity to work is much larger than the current average amount of employment for men age fifty-five to sixty-nine. However, notice that the legal normal retirement age in Spain is sixty-five years old and most Spanish men do actually retire at this age (or earlier). This is different in other countries, like the United States, where it is quite common to work after the normal retirement age. This fact implies that the estimated additional capacity to work increases by 20 percentage points from 54.9 percent at age sixty-four to 73.6 percent at sixty-five, as employment drops from almost 30 percent (at sixty-four) to 9.2 percent (at sixty-five) and the mortality rate in 2010 of individuals age sixty-five years old (1.32 percent) is reached at a much lower age in 1976 with an employment rate as high as 82.8 percent.

Labor market conditions have gone through important changes during the time period of analysis (from 1976 to 2010). Therefore, the estimated additional employment capacity depends to a great extent on the year that we choose as the baseline year. In the analysis shown in table 9.1, 1976 was the baseline year used to calculate the additional work capacity for individuals in 2010, but one could perform the same exercise choosing a different base year. We therefore repeat the exercise using all years from 1976 until 2009 as base year in order to provide a sensitivity measure of the robustness of our results to the specification chosen. Figure 9.6 plots the cumulate additional employment capacity for men age fifty-five to sixty-nine in 2010 compared to a baseline year that ranges from 1976 to 2009. We see that the largest estimated value corresponds to the value for the baseline year 1976 (7.08, as shown in table 9.1).

Using mortality as our health measure allows us to make use of very detailed information over a long time period as well as to compare the results across several countries. However, it also assumes that the additional years of life can be used to work, which may not be the case if individuals are not healthy enough to continue working. However, as figure 9.3 shows, self-assessed health has also improved during this period, especially among individuals age sixty or older. This result is similar to the evolution of self-assessed health reported for other countries in this volume.

The advantages of using mortality data are larger in countries like Spain in which longitudinal or large cross-sectional health surveys are not available. The sample size of the Spanish National Health Survey limits the analysis based on single ages, and changes in the questions asked prevent comparison based on other measures of health-like limitations in daily activities. Despite these limitations, we perform a similar analysis using two measures

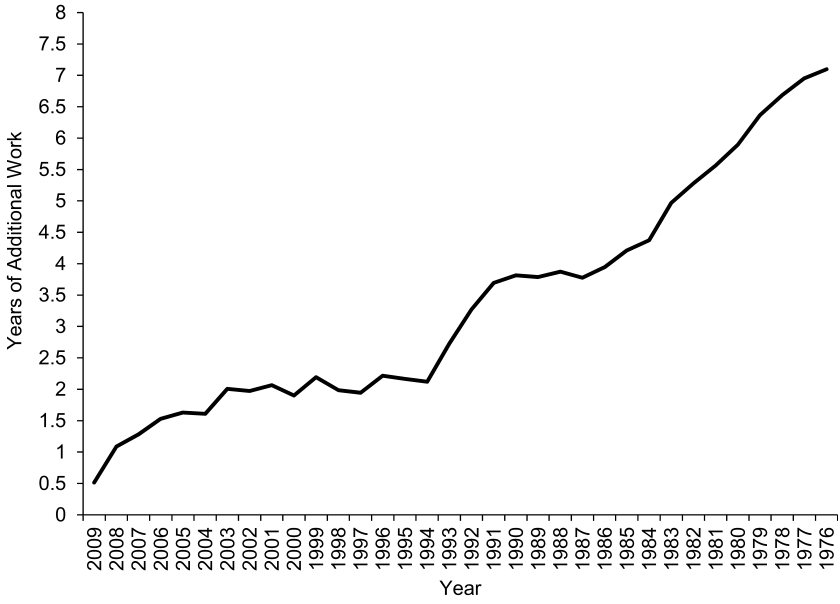


**Fig. 9.6 Estimated additional employment capacity by year of comparison**
*Source:* Own elaboration from data from the Human Mortality Database and the Spanish Labor Force Survey.

of subjective health to assess the robustness of the previous conclusions to measures that can better capture work limitations.

Figure 9.7 plots the relationship between self-assessed health and employment in 1987 and 2006 for individuals age forty-five to seventy years old, while figure 9.8 plots the relationship between work limitations[3] and employment for the same group of individuals and years. As before, employment is taken from the Spanish Labour Force Survey. As we need to calculate both employment rates as well as self-assessed health (and work limitations) at each age for the two survey years (1987 and 2006), the number of observations for the health variables at each age can be relatively small and, thus, the estimates are quite unstable[4]. For this reason, we apply a smooth transformation of the two health variables averaging the level of the current age with the level of the previous and next age.

3. More specifically, work limitations correspond to answering "yes" to at least one of the following two survey questions: (a) During the last twelve months, did you suffer a disease or illness that limited your principal activity (work, study, house work, etc.)?; and (b) During the last two weeks, did you have to reduce your principal activity for at least half a day for any of the symptoms or pains described before?

4. For example, the number of observations varies from 120 (minimum value) for age seventy to 289 (maximum value) for age forty-five in the survey of 1987, and from 113 (minimum value) for age sixty-eight to 235 (maximum value) at age forty-five for the survey of 2006.

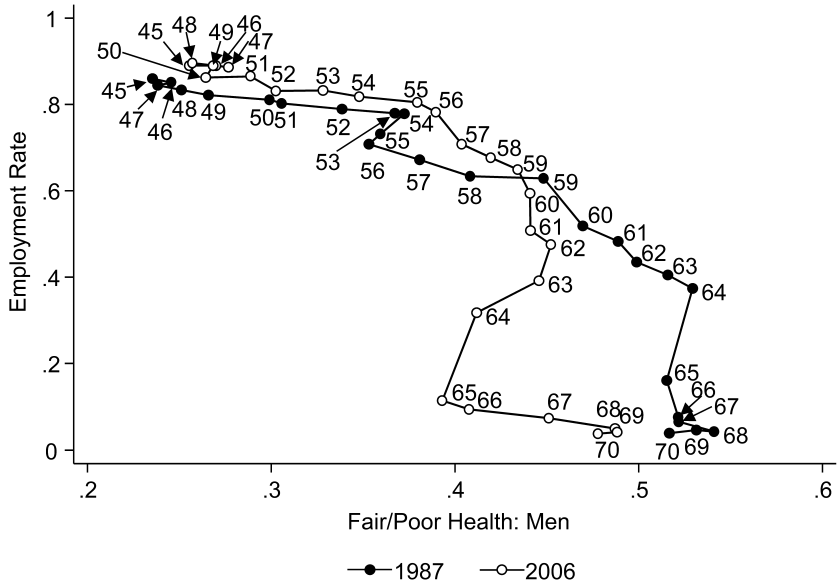


**Fig. 9.7 Employment versus SAH (2006 vs. 1987)**

*Source:* Own elaboration from data from the Spanish National Health Survey and the Spanish Labor Force Survey.

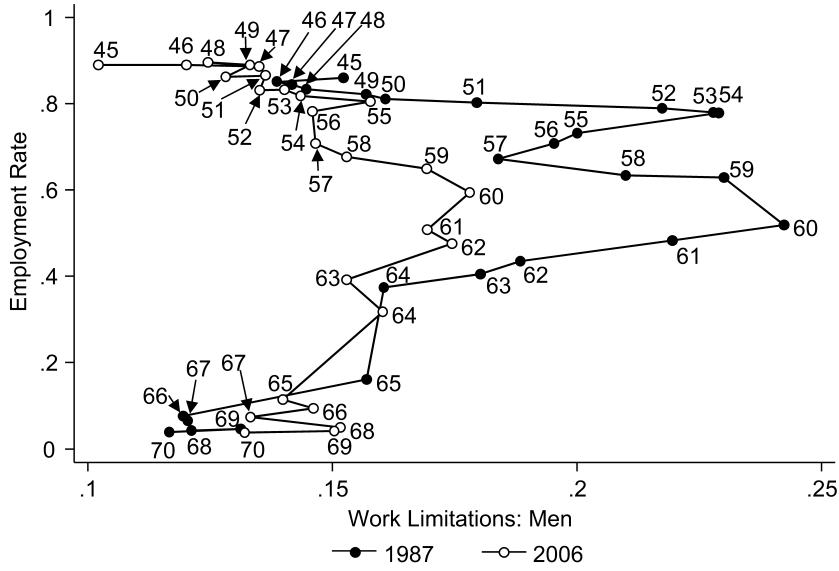


**Fig. 9.8 Employment versus activity limitations (2006 vs. 1987)**

*Note:* Own elaboration from data from the Spanish National Health Survey and the Spanish Labor Force Survey.

We see that the percentage of men that reports their health to be at best fair and the percentage that reports being limited for work does not change between 1987 and 2006 for those age forty-five to fifty-five (figures 9.7 and 9.8) However, both health measures improve in 2006 compared to 1987 for men at least fifty-five years of age. Figures 9.7 and 9.8 also illustrate that employment falls sharply at the normal retirement age of sixty-five.

To summarize, using the Milligan-Wise method we estimate an additional capacity to work of 7.08 years from ages fifty-five to sixty-nine in 2010 with respect to equal-mortality values in 1976. This value is larger than the observed employment capacity of 5.7 years for men age fifty-five to sixty-nine in 2010. The finding of a bigger estimated additional capacity to work than the current observed capacity to work is somewhat counterintuitive and unexpected. However, in the Spanish labor market context, this is mainly explained by the strong decrease in employment at the normal retirement age of sixty-five years old for Spanish men. For example, in 2010 employment is observed to decrease by 20 percentage points (from 29.4 percent to 9.2 percent) from age sixty-four to age sixty-five for men in Spain.

## 9.4 Health Capacity to Work using the Cutler, Meara, and Richards-Shubik Method

We also estimate the capacity to work using information from younger workers in the same year to estimate the relationship between health and employment as suggested by Cutler, Meara, and Richards-Shubik (2012). We first estimate a regression on employment decisions controlling for a large number of individual and health characteristics of individuals age fifty to fifty-four. Then, we use the estimated coefficients to predict the employment probabilities of older workers using their current explanatory variables (current health and individual characteristics). The novelty of this method is to use the estimates from individuals (baseline group) that are presumably not affected by social security benefits as they are years away from the normal and early retirement age.

We use individual data from the Survey on Health, Ageing and Retirement in Europe (SHARE) for wave 1 (2004–2005), wave 2 (2006–2007), wave 4 (2010–2011), and wave 5 (2013). SHARE is a multidisciplinary cross-national panel that contains detailed information on sociodemographic characteristics, health and labor status, among others, for a representative sample of the population age fifty and older in Europe. We pool information from the four waves mentioned above, and have a sample of 4,684 men and 5,466 women age fifty to seventy-four.

We estimate regressions of the following form:

$$\text{Employment} = \beta_0 + \beta_1 \text{health}_{it} + \beta_2 X_{it} + \varepsilon_{it}, \quad (1)$$

where Employment is a dummy equal to 1 if the individual is employed and health is a comprehensive set of health measures: (a) dummy variables

**Table 9.2A Summary statistics, men**

| | Age group | | | | |
|---|---|---|---|---|---|
| | 50–54 | 55–59 | 60–64 | 65–69 | 70–74 |
| Employed | 0.74701 | 0.66869 | 0.41682 | 0.06256 | 0.00961 |
| Health_exc | 0.07910 | 0.06984 | 0.03676 | 0.04356 | 0.03088 |
| Health_vgood | 0.28060 | 0.22773 | 0.19133 | 0.14950 | 0.12247 |
| Health_good | 0.44627 | 0.45749 | 0.44581 | 0.44554 | 0.42812 |
| Health_fair | 0.12985 | 0.17915 | 0.23186 | 0.25941 | 0.31842 |
| Health_poor | 0.06418 | 0.06478 | 0.09425 | 0.10099 | 0.10011 |
| Mobilit2 | 0.16269 | 0.22470 | 0.29689 | 0.37624 | 0.43497 |
| ADLany | 0.03731 | 0.04352 | 0.04995 | 0.07921 | 0.09808 |
| IADLany | 0.05821 | 0.04656 | 0.08577 | 0.11782 | 0.13220 |
| Eurod | 1.57187 | 1.73077 | 1.77843 | 1.81205 | 1.93069 |
| Heartat | 0.05357 | 0.06539 | 0.08937 | 0.13708 | 0.14665 |
| Stroke | 0.00446 | 0.01006 | 0.03010 | 0.03550 | 0.02763 |
| Cholester | 0.22917 | 0.24849 | 0.29069 | 0.29882 | 0.27418 |
| Lungdis | 0.03720 | 0.03924 | 0.06115 | 0.09172 | 0.09458 |
| Cancer | 0.00149 | 0.00604 | 0.00188 | 0.00690 | 0.01275 |
| Highblpr | 0.19048 | 0.24044 | 0.30386 | 0.38856 | 0.41233 |
| Arthritis | 0.19048 | 0.24044 | 0.30386 | 0.38856 | 0.41233 |
| Diabetes | 0.03869 | 0.06439 | 0.08278 | 0.12525 | 0.12327 |
| Osteopor | 0.00595 | 0.00905 | 0.00376 | 0.00394 | 0.00638 |
| Alzheimer's | 0.00149 | 0.00604 | 0.00188 | 0.00690 | 0.01275 |
| Back | 0.19494 | 0.21429 | 0.21919 | 0.24063 | 0.24973 |
| Asthma | 0.00744 | 0.00704 | 0.01223 | 0.00986 | 0.01169 |
| Underweight | 0.00448 | 0.00000 | 0.00192 | 0.00101 | 0.00323 |
| Overweight | 0.47982 | 0.50154 | 0.51631 | 0.51558 | 0.51832 |
| Obese | 0.18087 | 0.21392 | 0.18138 | 0.19900 | 0.19289 |
| Smokerform | 0.26339 | 0.30584 | 0.38852 | 0.41716 | 0.47078 |
| Smokecurr | 0.37463 | 0.32490 | 0.23113 | 0.19524 | 0.15672 |
| Educ_lessthHS | 0.64030 | 0.65231 | 0.72683 | 0.79715 | 0.85297 |
| Educ_hs | 0.17910 | 0.17026 | 0.11902 | 0.08359 | 0.05946 |
| Educ_collegemore | 0.17164 | 0.17231 | 0.15220 | 0.11417 | 0.08324 |
| Married | 0.79762 | 0.83702 | 0.85419 | 0.87870 | 0.86291 |
| No. obs. | 672 | 994 | 1,063 | 1,014 | 941 |

for different categories of self-assessed health (excellent, very good, good, fair, and poor); (b) mobility limitations (dummy variable if the individual has at least one arm function and fine motor limitations); (c) dummy variable if limited in any activity of daily living (ADLs); (d) dummy variable if limited in any instrumental activity of daily living (IADLs); (e) EUROD mental health index; (f) dummy variables for different health problems (AMI, stroke, cholesterol, lung disease, cancer, high blood pressure, arthritis, diabetes, osteoporosis, Alzheimer's, back pain, and asthma); (g) dummy variables that capture if the individual is underweight, overweight, or obese; and (h) smoking behavior (former or current smoker). Last, we control for

**Table 9.2B Summary statistics, women**

| | Age group | | | | |
|---|---|---|---|---|---|
| | 50–54 | 55–59 | 60–64 | 65–69 | 70–74 |
| Employed | 0.50921 | 0.40575 | 0.21891 | 0.03330 | 0.00720 |
| Health_exc | 0.07067 | 0.04710 | 0.02710 | 0.02511 | 0.01738 |
| Health_vgood | 0.25363 | 0.18671 | 0.15297 | 0.11839 | 0.07055 |
| Health_good | 0.41433 | 0.44155 | 0.41346 | 0.38475 | 0.34867 |
| Health_fair | 0.19458 | 0.25736 | 0.29983 | 0.33722 | 0.36810 |
| Health_poor | 0.06680 | 0.06728 | 0.10664 | 0.13453 | 0.19530 |
| Mobilit2 | 0.31462 | 0.38015 | 0.50175 | 0.56822 | 0.70829 |
| ADLany | 0.03872 | 0.05299 | 0.07605 | 0.07361 | 0.14944 |
| IADLany | 0.06389 | 0.09588 | 0.14773 | 0.16338 | 0.30911 |
| Eurod | 2.71724 | 2.75576 | 3.01157 | 3.03137 | 3.65263 |
| Heartat | 0.01838 | 0.02860 | 0.06376 | 0.07239 | 0.11236 |
| Stroke | 0.00387 | 0.00336 | 0.01223 | 0.01519 | 0.03371 |
| Cholester | 0.15184 | 0.24222 | 0.28734 | 0.32082 | 0.32482 |
| Lungdis | 0.02805 | 0.02523 | 0.03319 | 0.03664 | 0.05312 |
| Cancer | 0.00193 | 0.00168 | 0.00437 | 0.00983 | 0.01328 |
| Highblpr | 0.16731 | 0.23970 | 0.32052 | 0.44504 | 0.52809 |
| Arthritis | 0.16731 | 0.23970 | 0.32052 | 0.44504 | 0.52809 |
| Diabetes | 0.11896 | 0.14718 | 0.22620 | 0.23056 | 0.30950 |
| Osteopor | 0.01741 | 0.03448 | 0.05328 | 0.05094 | 0.06742 |
| Alzheimer's | 0.00193 | 0.00168 | 0.00437 | 0.00983 | 0.01328 |
| Back | 0.31915 | 0.32044 | 0.34847 | 0.36282 | 0.41267 |
| Asthma | 0.01354 | 0.00925 | 0.01135 | 0.01340 | 0.01634 |
| Underweight | 0.01265 | 0.00853 | 0.00527 | 0.00091 | 0.00103 |
| Overweight | 0.29572 | 0.37255 | 0.38016 | 0.40018 | 0.39917 |
| Obese | 0.17607 | 0.19693 | 0.22300 | 0.23519 | 0.24716 |
| Smokerform | 0.15184 | 0.14718 | 0.11790 | 0.07596 | 0.05312 |
| Smokecurr | 0.25194 | 0.16835 | 0.08392 | 0.05211 | 0.01738 |
| Educ_lessthHS | 0.63770 | 0.71931 | 0.81311 | 0.88370 | 0.90729 |
| Educ_hs | 0.18945 | 0.14335 | 0.08415 | 0.05220 | 0.04375 |
| Educ_collegemore | 0.16797 | 0.13219 | 0.09920 | 0.06136 | 0.04271 |
| Married | 0.84623 | 0.83011 | 0.80961 | 0.79267 | 0.69969 |
| No. obs. | 1,034 | 1,189 | 1,145 | 1,119 | 979 |

educational attainment and marital status and estimate this equation using linear probability model. Tables 9.2A and 9.2B for men and women, respectively, provide descriptive statistics for all the relevant variables for the different age groups, along with sample sizes. Table 9.2C includes a description of the variables displayed in tables 9.2A and 9.2B.

Sample size for individuals age fifty to fifty-four (see tables 9.2A and 9.2B) may not be large enough to precisely estimate all the coefficients for the large set of health conditions. Therefore, we also perform an alternative version of this regression model in which we create a single health index that combines the information provided by a set of health variables. We

**Table 9.2C Definition of variables in tables 9.2A and 9.2B**

| Variable | Definition |
|---|---|
| Employed | Dummy equal to 1 if the individual is employed |
| Health_exc | Dummy equal to 1 if the individual states to be in excellent health |
| Health_vgood | Dummy equal to 1 if the individual states to be in very good health |
| Health_good | Dummy equal to 1 if the individual states to be in good health |
| Health_fair | Dummy equal to 1 if the individual states to be in fair health |
| Health_poor | Dummy equal to 1 if the individual states to be in poor health |
| Mobilit2 | Dummy equal to 1 if the individual has at least one arm function and fine motor limitations |
| ADLany | Dummy equal to 1 if the individual has difficulty with an activity of daily living (ADL) |
| IADLany | Dummy equal to 1 if the individual has difficulty with an instrumental activity of daily living (IADL) |
| Eurod | EUROD mental health index |
| Heartat | Dummy equal to 1 if the individual ever experienced AMI |
| Stroke | Dummy equal to 1 if the individual ever experienced stroke |
| Cholester | Dummy equal to 1 if the individual ever experienced cholesterol |
| Lungdis | Dummy equal to 1 if the individual ever experienced lung disease |
| Cancer | Dummy equal to 1 if the individual ever experienced cancer |
| Highblpr | Dummy equal to 1 if the individual ever experienced high blood pressure |
| Arthritis | Dummy equal to 1 if the individual ever experienced arthritis |
| Diabetes | Dummy equal to 1 if the individual ever experienced diabetes |
| Osteopor | Dummy equal to 1 if the individual ever experienced osteoporosis |
| Alzheimer's | Dummy equal to 1 if the individual ever experienced Alzheimer's |
| Back | Dummy equal to 1 if the individual ever experienced back pain |
| Asthma | Dummy equal to 1 if the individual ever experienced asthma |
| Underweight | Dummy equal to 1 if the individual is underweight |
| Overweight | Dummy equal to 1 if the individual is overweight |
| Obese | Dummy equal to 1 if the individual is obese |
| Smokerform | Dummy equal to 1 if the individual is a former smoker |
| Smokecurr | Dummy equal to 1 if the individual is a current smoker |
| Educ_lessthHS | Dummy equal to 1 if the individual has less than high school education |
| Educ_hs | Dummy equal to 1 if the individual has high school education |
| Educ_collegemore | Dummy equal to 1 if the individual has college education or more |
| Married | Dummy equal to 1 if the individual is married |

follow Poterba, Venti, and Wise (2013) and construct a health index based on twenty-four health questions, including self-reported health diagnoses, functional limitations, and other health indicators. To do so, we first obtain the first principal component of these twenty-four indicators, which is subsequently used to predict percentile scores for each individual. Thus, the index has to be interpreted as higher values implying better health. Poterba, Venti, and Wise (2013) show that the health index is strongly related to mortality and future health events such as stroke and diabetes onset, though not to new cancer diagnoses.

**Table 9.3A Employment regressions, all health variables**

| | Men 50–54 | | Women 50–54 | |
|---|---|---|---|---|
| Variable | Coefficient | Std. error | Coefficient | Std. error |
| Health_exc | 0.240** | 0.101 | 0.215** | 0.0921 |
| Health_vgood | 0.153* | 0.0892 | 0.243*** | 0.0788 |
| Health_good | 0.213** | 0.0838 | 0.227*** | 0.0738 |
| Health_fair | 0.0646 | 0.0817 | 0.167** | 0.0713 |
| Mobilit2 | –0.194*** | 0.0504 | –0.0388 | 0.0382 |
| ADLany | 0.104 | 0.0972 | 0.0474 | 0.0967 |
| IADLany | –0.203** | 0.0799 | –0.142* | 0.0777 |
| Eurod | –0.0369*** | 0.00923 | –0.0182*** | 0.00670 |
| Heartat | –0.0289 | 0.0699 | 0.0176 | 0.112 |
| Stroke | 0.0711 | 0.216 | 0.405* | 0.232 |
| Cholester | 0.0525 | 0.0364 | 0.0464 | 0.0424 |
| Lungdis | –0.113 | 0.0815 | 0.192** | 0.0930 |
| Cancer | –0.0687 | 0.386 | –0.639* | 0.335 |
| Highblpr | –0.0534 | 0.0401 | –0.0109 | 0.0417 |
| Diabetes | –0.131 | 0.0864 | –0.0548 | 0.0527 |
| Osteopor | 0.0645 | 0.189 | –0.117 | 0.114 |
| Back | 0.0590 | 0.0418 | 0.00664 | 0.0369 |
| Asthma | 0.296* | 0.173 | –0.0473 | 0.127 |
| Underweight | –0.386* | 0.219 | –0.150 | 0.130 |
| Overweight | –0.00716 | 0.0335 | –0.0267 | 0.0341 |
| Obese | 0.0672 | 0.0449 | –0.0756* | 0.0426 |
| Smokerform | 0.0876** | 0.0389 | 0.0207 | 0.0426 |
| Smokecurr | –0.0583* | 0.0351 | 0.0604* | 0.0355 |
| Educ_hs | 0.0798** | 0.0404 | 0.126*** | 0.0395 |
| Educ_collegemore | 0.148*** | 0.0416 | 0.362*** | 0.0408 |
| Married | 0.0806** | 0.0376 | –0.149*** | 0.0408 |
| Constant | 0.569*** | 0.100 | 0.417*** | 0.0885 |
| No. obs. | 645 | | 1,005 | |
| *R*-squared | 0.294 | | 0.189 | |

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

Tables 9.3A and 9.3B show the results of estimating equation (1) for individuals age fifty to fifty-four, including either a large number of health variables (9.3A) or the health index (9.3B). Table 9.3C shows the factor loadings of the first principal component. All loadings are positive so that larger values of the first principal component represent worse health. The results are shown separately for men and women due to the potentially differential effect of the explanatory variables on employment for men and women. Overall, we find the expected sign of the association between health

**Table 9.3B Employment regressions, PVW health index**

| | Men 50–54 | | Women 50–54 | |
|---|---|---|---|---|
| Variable | Coefficient | Std. error | Coefficient | Std. error |
| Health index | 0.00570*** | 0.000653 | 0.00373*** | 0.000535 |
| Educ_hs | 0.106** | 0.0425 | 0.158*** | 0.0390 |
| Educ_collegemore | 0.187*** | 0.0430 | 0.390*** | 0.0404 |
| Married | 0.133*** | 0.0395 | –0.136*** | 0.0410 |
| Constant | 0.193*** | 0.0561 | 0.308*** | 0.0504 |
| No. obs. | 630 | | 970 | |
| *R*-squared | 0.169 | | 0.157 | |

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

**Table 9.3C First principal component index of health**

| Health measure | Wave 1 | Wave 2 | Wave 4 | Wave 5 |
|---|---|---|---|---|
| Difficulty walking several blocks | 0.2540 | 0.2601 | 0.2847 | 0.2832 |
| Difficulty lifting/carrying | 0.2962 | 0.2966 | 0.2961 | 0.3080 |
| Difficulty pushing/pulling | 0.2750 | 0.3048 | 0.2904 | 0.2978 |
| Difficulty with an ADL | 0.2431 | 0.2596 | 0.2687 | 0.2747 |
| Difficulty climbing stairs | 0.3086 | 0.3012 | 0.2895 | 0.2950 |
| Difficulty stooping/kneeling/crouching | 0.3072 | 0.3125 | 0.2977 | 0.3093 |
| Difficulty getting up from chair | 0.2895 | 0.2990 | 0.2868 | 0.3019 |
| Self-reported health fair or poor | 0.2827 | 0.2605 | 0.2423 | 0.2688 |
| Difficulty reaching/extending arms up | 0.2390 | 0.2422 | 0.2597 | 0.2622 |
| Ever experience arthritis | 0.1404 | 0.0983 | 0.1261 | 0.1071 |
| Difficulty sitting two hours | 0.1987 | 0.2333 | 0.2353 | 0.2293 |
| Difficulty picking up a coin | 0.1478 | 0.1501 | 0.1931 | 0.1785 |
| Back problems | 0.2268 | 0.1982 | 0.1851 | 0.1641 |
| Ever experience heart problems | 0.1286 | 0.1331 | 0.1292 | 0.1290 |
| Hospital stay | 0.1093 | 0.1273 | 0.1164 | 0.1363 |
| Doctor visit | 0.1014 | 0.0931 | 0.0813 | 0.0930 |
| Ever experience psychological problem | 0.2313 | 0.1980 | 0.2152 | 0.2220 |
| Ever experience stroke | 0.0808 | 0.0866 | 0.0816 | 0.0798 |
| Ever experience high blood pressure | 0.0406 | 0.0363 | 0.0285 | 0.0398 |
| Ever experience lung disease | 0.1000 | 0.1075 | 0.0770 | 0.0772 |
| Ever experience diabetes | 0.2269 | 0.1990 | 0.1967 | |
| BMI at beginning of observation period | 0.0841 | 0.0864 | 0.1001 | 0.0697 |
| Nursing home stay | 0.0347 | 0.0104 | 0.0315 | 0.0394 |
| Ever experience cancer | | 0.0670 | 0.0700 | 0.0982 |
| *N* | 2,165 | 1,967 | 3,088 | 5,787 |

and education and the probability of working for both men and women: more educated individuals and those in better health are more likely to be employed. However, there are some differences in the magnitude of the estimates between men and women. For example, the decrease in the employment probability is larger for men with mobility problems or depression compared to women, while having a college degree increases the employment probability of women twice that of men. On the other hand, we find an opposite sign for marital status: being married is associated with a higher employment probability for men but lower for women. The estimates using the health index are similar to the ones using the large set of health variables.

We use the estimates presented in tables 9.3A and 9.3B to predict employment probabilities for four age groups (fifty-five to fifty-nine, sixty to sixty-four, sixty-five to sixty-nine, and seventy to seventy-four). Table 9.4 shows these predictions and actual employment rates. The difference between the predicted and the observed percentage of individuals working in each group represents the estimated work capacity, also shown in table 9.4. We find that predicted employment decreases with age, but the decrease is very modest compared to the actual decrease, and this is independent of how health is included in the model. In fact, even the magnitude of the estimated work capacity is extremely similar in both cases. Therefore, the rest of the analysis is only shown using the estimates from the model that controls for health using the health index.

Figures 9.9 and 9.10 plot the percentage of men and women working in each age group as well as the estimated additional capacity to work for each age group and gender. We first note that both the actual and predicted probabilities of working are lower for women than for men for all age groups. This is not surprising as we are analyzing individuals over the age of fifty in the first decade of the twenty-first century, which correspond to the cohorts of 1960 and before for which women showed very low labor market participation rates. Furthermore, the actual percentage of individuals working in the age groups fifty-five to fifty-nine and sixty to sixty-four remains relatively high (67.7 percent and 42.6 percent for men and 41.3 percent and 22.4 percent for women). However, when the normal retirement age kicks in at age sixty-five, the actual percentage of individuals working drops substantially to 6.3 percent and 0.8 percent for ages sixty-five to sixty-nine and seventy to seventy-four for men (3.6 percent and 0.5 percent for women). Obviously, there is no health-related shock that affects individuals at age sixty-five so that the predicted percentage of individuals working is reduced smoothly over the ages of sixty to sixty-four, sixty-five to sixty-nine, and seventy to seventy-four. Therefore, when individuals reach the normal retirement age their actual employment decreases sharply while the predicted employment probabilities decrease relatively slower and, thus, the estimated capacity to work increases substantially from age sixty-five. That is, the additional capacity to work is estimated to be 5.4 percent (6.6 percent) for men (women)

**Table 9.4** **Simulations of work capacity**

| | Use all health variables | | | | Use PVW health index | | | |
|---|---|---|---|---|---|---|---|---|
| Age group | No. obs. | Actual % working | Predicted % working | Estimated work capacity (%) | No. obs. | Actual % working | Predicted % working | Estimated work capacity (%) |
| | | | | *Men* | | | | |
| 55–59 | 945 | 67.3 | 74.4 | 7.1 | 919 | 67.6 | 73.0 | 5.4 |
| 60–64 | 993 | 42.4 | 71.2 | 28.8 | 970 | 42.6 | 68.9 | 26.3 |
| 65–69 | 947 | 6.1 | 67.5 | 61.3 | 912 | 6.3 | 65.3 | 59.1 |
| 70–74 | 894 | 1.0 | 64.8 | 63.8 | 861 | 0.8 | 62.3 | 61.5 |
| | | | | *Women* | | | | |
| 55–59 | 1,147 | 40.9 | 47.5 | 6.6 | 1,109 | 41.3 | 47.9 | 6.6 |
| 60–64 | 1,109 | 22.1 | 42.4 | 20.3 | 1,049 | 22.4 | 43.1 | 20.7 |
| 65–69 | 1,056 | 3.4 | 39.2 | 35.8 | 1,006 | 3.6 | 39.7 | 36.1 |
| 70–74 | 931 | 0.8 | 34.8 | 34.0 | 862 | 0.5 | 36.2 | 35.7 |

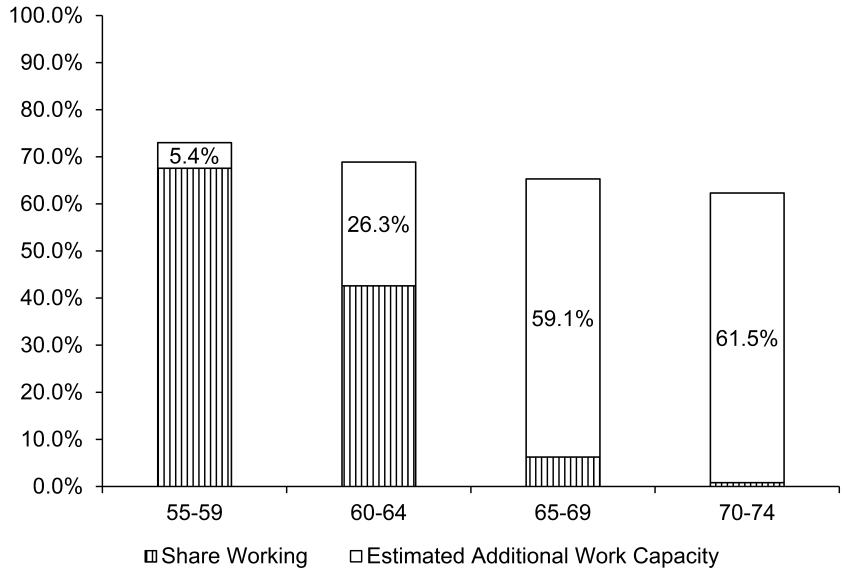


**Fig. 9.9 Share of men working and additional work capacity by age**

*Source:* Own elaboration from data from the Survey on Health, Ageing and Retirement in Europe.

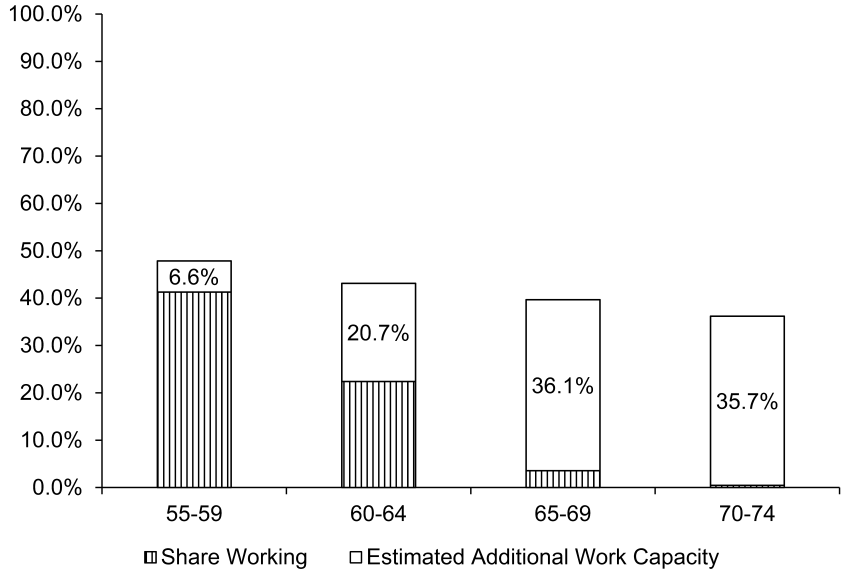


**Fig. 9.10 Share of women working and additional work capacity by age**

*Source:* Own elaboration from data from the Survey on Health, Ageing and Retirement in Europe.

ages fifty-five to fifty-nine, 26.3 percent (20.7 percent) for ages sixty to sixty-four, 59.1 percent (36.1 percent) for the age group sixty-five to sixty-nine, and 61.5 percent (35.7 percent) for ages seventy to seventy-four.

The work capacity is expected to be different for individuals with different educational attainment as labor opportunities may differ and a negative association between education and health has been found across the board. In addition, different health conditions may hinder employment opportunities differently depending on the educational attainment. Therefore, we provide estimates of the work capacity by education in two ways: (a) estimate separate regressions by education group to estimate work capacity for men and women (table 9.5A for men and 9.5B for women), and (b) use estimates shown in tables 9.3A and 9.3B to estimate work capacity for men and women (table 9.6A for men and 9.6B for women). We divide the sample in two groups based on educational attainment depending on whether they have or have not completed secondary education. In general, we see that higher-educated individuals show higher employment rates at each age group and gender but, at the same time, they also have higher estimated additional employment capacity as their health is better compared to low-educated individuals. However, there is an exception to this rule; lower-educated women age fifty-five to fifty-nine have a larger estimated additional capacity to work than high-educated women. This result is probably due to the fact that low-educated women at these ages show very low employment rates, although having a relatively good health status. Figures 9.11 and 9.12 plot the results of tables 9.5A and 9.5B for men and women, respectively, for the regressions using all health variables and a single regression for each educational group.

The Cutler, Meara, and Richards-Shubik method (Cutler, Meara, Richards-Shubik 2012) allows to estimate the health capacity to work using a group of contemporaneous individuals. Therefore we do not assume that labor market conditions are similar in different points in time as needed in the Milligan-Wise method (Milligan and Wise 2015). However, we still need to assume that individuals age fifty to fifty-four do not face any disincentive effects from the social security system to stop working. This seems a reasonable assumption for Spain as beneficial access to disability benefits kicks in at age fifty-five (in which benefits are increased from 55 to 75 percent of the regulatory base for partial disability) and early retirement schemes, which have been reformed over time, do not begin before age sixty. The only program that could pose a threat to this assumption is the unemployment benefit scheme, which includes an access to (permanent) unemployment subsidies for individuals age fifty-two or older until retirement (fifty-five after the last reform in 2013). However, this program gains in importance as the individual get closer to the early retirement age, especially after age fifty-five. Additionally, the Cutler et al. method also includes the implicit assumption that health affects employment decisions of individuals age fifty

**Table 9.5A** **Work capacity by education (regression by education group)**

| Education | Men, all health variables model | | | | Men, PVW model | | |
|---|---|---|---|---|---|---|---|
| | No. obs. | Actual % working | Predicted % working | Estimated work capacity (%) | Actual % working | Predicted % working | Estimated work capacity (%) |
| | | | | *Age 55–59* | | | |
| Low education | 600 | 62.1 | 67.9 | 5.8 | 62.5 | 65.9 | 3.4 |
| Medium edu. | 329 | 75.7 | 85.1 | 9.4 | 76.0 | 85.9 | 9.9 |
| | | | | *Age 60–64* | | | |
| Low education | 715 | 38.6 | 64.9 | 26.3 | 38.7 | 62.8 | 24.1 |
| Medium edu. | 285 | 49.3 | 82.6 | 33.3 | 50.0 | 83.7 | 33.7 |
| | | | | *Age 65–69* | | | |
| Low education | 737 | 4.2 | 62.7 | 58.5 | 4.2 | 60.8 | 56.6 |
| Medium edu. | 209 | 12.3 | 80.4 | 68.1 | 12.4 | 81.6 | 69.2 |
| | | | | *Age 70–74* | | | |
| Low education | 736 | 0.3 | 61.6 | 61.3 | 0.1 | 58.6 | 58.5 |
| Medium edu. | 135 | 5.1 | 77.5 | 72.5 | 4.4 | 81.0 | 76.5 |

**Table 9.5B** **Work capacity by education (regression by education group)**

| Education | Women, all health variables model | | | | Women, PVW model | | |
|---|---|---|---|---|---|---|---|
| | No. obs. | Actual % working | Predicted % working | Estimated work capacity (%) | Actual % working | Predicted % working | Estimated work Capacity (%) |
| | | | | *Age 55–59* | | | |
| Low education | 799 | 32.4 | 39.2 | 6.8 | 32.8 | 39.1 | 6.4 |
| Medium edu. | 322 | 62. | 67.6 | 5.6 | 62.1 | 69.6 | 7.4 |
| | | | | *Age 60–64* | | | |
| Low education | 856 | 17.9 | 36.6 | 18.7 | 18.2 | 36.8 | 18.6 |
| Medium edu. | 213 | 39.3 | 66.1 | 26.8 | 39.0 | 68.8 | 29.9 |
| | | | | *Age 65–69* | | | |
| Low education | 892 | 3.1 | 35.8 | 32.7 | 3.3 | 36.3 | 33.0 |
| Medium edu. | 132 | 5.1 | 62.3 | 57.2 | 5.3 | 66.4 | 61.1 |
| | | | | *Age 70–74* | | | |
| Low education | 785 | 0.7 | 33.1 | 32.4 | 0.4 | 34.0 | 33.6 |
| Medium edu. | 93 | 1.0 | 52.7 | 51.7 | 1.1 | 63.9 | 62.9 |

**Table 9.6A** **Work capacity by education (single regression)**

| Education | Men, all health variables model | | | | Men, PVW model | | |
|---|---|---|---|---|---|---|---|
| | No. obs. | Actual % working | Predicted % working | Estimated work capacity (%) | Actual % working | Predicted % working | Estimated work capacity (%) |
| | | | | *Age 55–59* | | | |
| Low education | 339 | 76.6 | 79.3 | 2.7 | 76.6 | 76.1 | –0.5 |
| Medium edu. | 636 | 62.2 | 71.5 | 9.3 | 62.2 | 70.9 | 8.6 |
| | | | | *Age 60–64* | | | |
| Low education | 280 | 51.6 | 76.8 | 25.1 | 51.6 | 73.2 | 21.6 |
| Medium edu. | 745 | 38.5 | 69.9 | 31.4 | 38.5 | 67.8 | 29.3 |
| | | | | *Age 65–69* | | | |
| Low education | 199 | 14.1 | 75.7 | 61.5 | 14.1 | 70.2 | 56.1 |
| Medium edu. | 782 | 4.3 | 66.9 | 62.7 | 4.3 | 65.6 | 61.3 |
| | | | | *Age 70–74* | | | |
| Low education | 136 | 5.1 | 72.1 | 67.0 | 5.1 | 68.8 | 63.7 |
| Medium edu. | 789 | 0.3 | 65.8 | 65.6 | 0.3 | 63.5 | 63.3 |

**Table 9.6B** **Work capacity by education (single regression)**

| Education | Women, all health variables model | | | | Women, PVW model | | |
|---|---|---|---|---|---|---|---|
| | No. obs. | Actual % working | Predicted % working | Estimated work capacity (%) | Actual % working | Predicted % working | Estimated work capacity (%) |
| | | | | *Age 55–59* | | | |
| Low education | 327 | 62.3 | 56.3 | –6.0 | 62.3 | 54.2 | –8.1 |
| Medium edu. | 838 | 32.4 | 45.5 | 13.1 | 32.4 | 47.9 | 15.5 |
| | | | | *Age 60–64* | | | |
| Low education | 211 | 39.8 | 54.7 | 14.9 | 39.8 | 53.6 | 13.7 |
| Medium edu. | 918 | 17.9 | 41.9 | 24.0 | 17.9 | 44.9 | 27.0 |
| | | | | *Age 65–69* | | | |
| Low education | 127 | 5.5 | 55.4 | 49.9 | 5.5 | 50.5 | 45.0 |
| Medium edu. | 965 | 3.1 | 40.8 | 37.7 | 3.1 | 44.0 | 40.9 |
| | | | | *Age 70–74* | | | |
| Low education | 89 | 1.1 | 49.1 | 48.0 | 1.1 | 49.2 | 48.1 |
| Medium edu. | 871 | 0.7 | 36.8 | 36.1 | 0.7 | 40.8 | 40.1 |

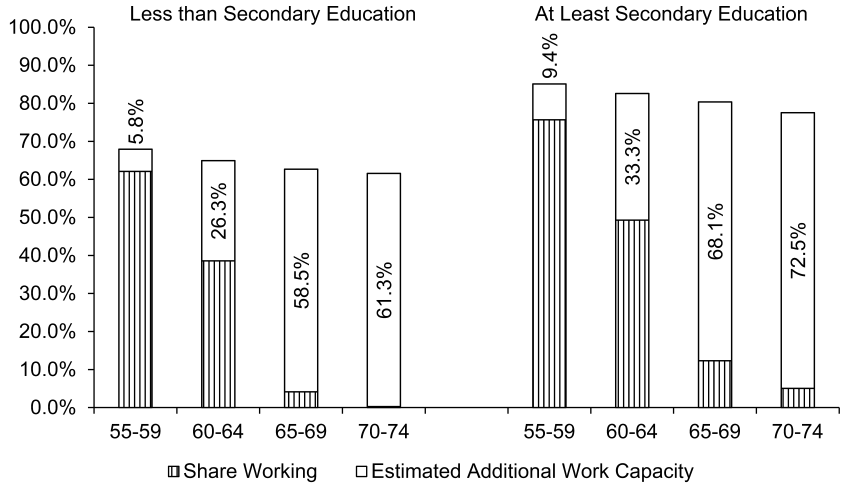


**Fig. 9.11 Share of men working and additional work capacity by age and education**

*Source:* Own elaboration from data from the Survey on Health, Ageing and Retirement in Europe.

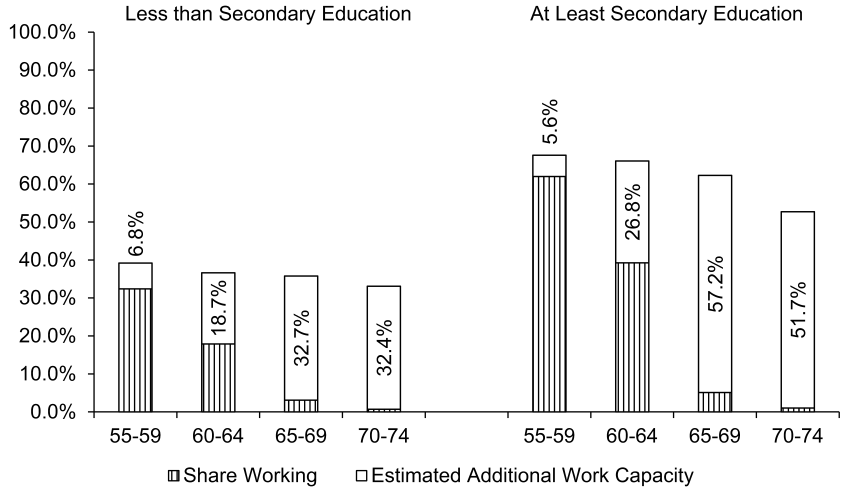


**Fig. 9.12 Share of women working and additional work capacity by age and education**

*Source:* Own elaboration from data from the Survey on Health, Ageing and Retirement in Europe.

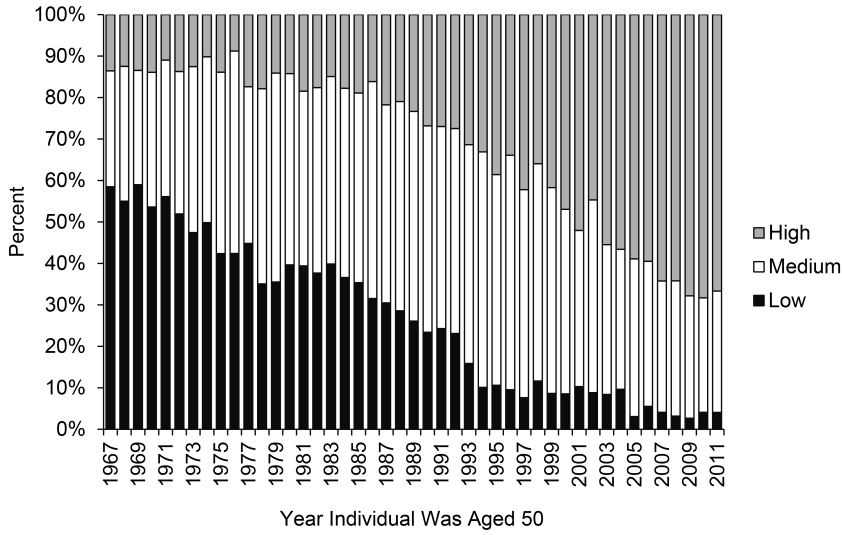


**Fig. 9.13 Distribution of years of education completed by cohort (by year cohort attained age fifty), men**

*Source:* Own elaboration from the Spanish Labor Force Survey.

*Note:* Low education refers to individuals who did not complete primary education. Medium education refers to individuals who have primary education completed, while high education refers to individuals who have completed secondary education and above.

to fifty-four in a similar way than those older than fifty-five. If older individuals are systematically concentrated in certain type of jobs for which negative health shocks represent a stronger limitation to work than younger individuals, then our results would be biased.

## 9.5 Changes in Self-Assessed Health by Education Level over Time

It is well established that education is correlated with health and mortality across the board (Cutler and Lleras-Muney 2010). Therefore, trends in self-assessed health and mortality can be (partly) driven by changes in educational attainment. In addition, jobs opportunities for a given level of education may change over time. In this section, we first illustrate how the educational attainment of the Spanish population age fifty has changed over time, and later illustrate the evolution of self-assessed health using comparable groups of education.

Figures 9.13 and 9.14 show the distribution of education completed by cohort and gender.[5] They clearly show that education accumulation has

5. Low education refers to individuals who did not complete primary education. Medium education refers to individuals who have completed primary education, while high education refers to individuals who have completed secondary education and above.

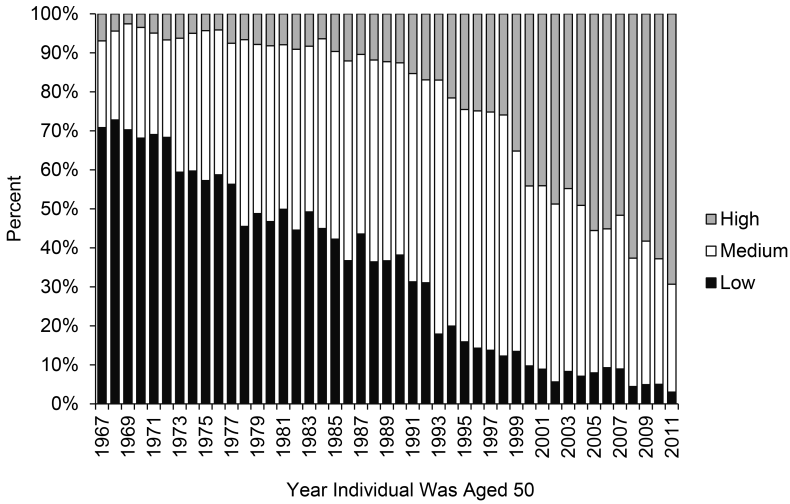


**Fig. 9.14 Distribution of years of education completed by cohort (by year cohort attained age fifty), women**

*Source:* Own elaboration from the Spanish Labor Force Survey.

*Note:* Low education refers to individuals who did not complete primary education. Medium education refers to individuals who have primary education completed, while high education refers to individuals who have completed secondary education and above.

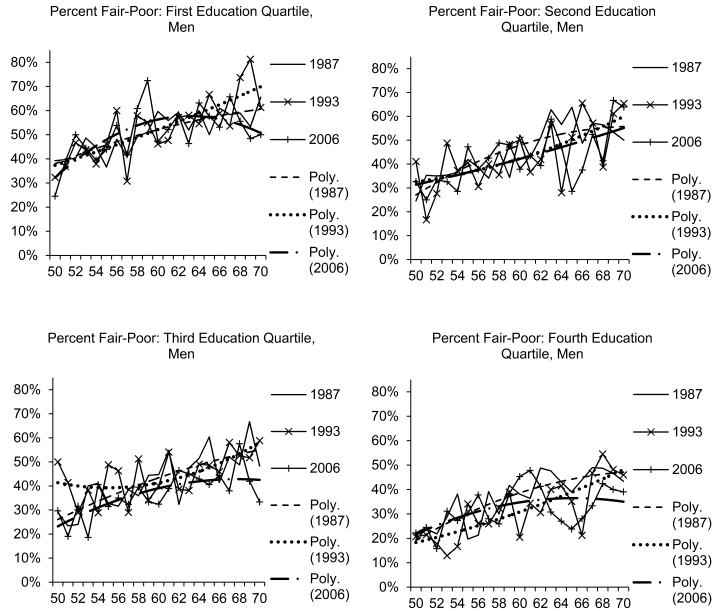


**Fig. 9.15 Evolution of fair/poor health by education quartile over time (men)**

*Source:* Own elaboration from data from the Spanish National Health Survey.

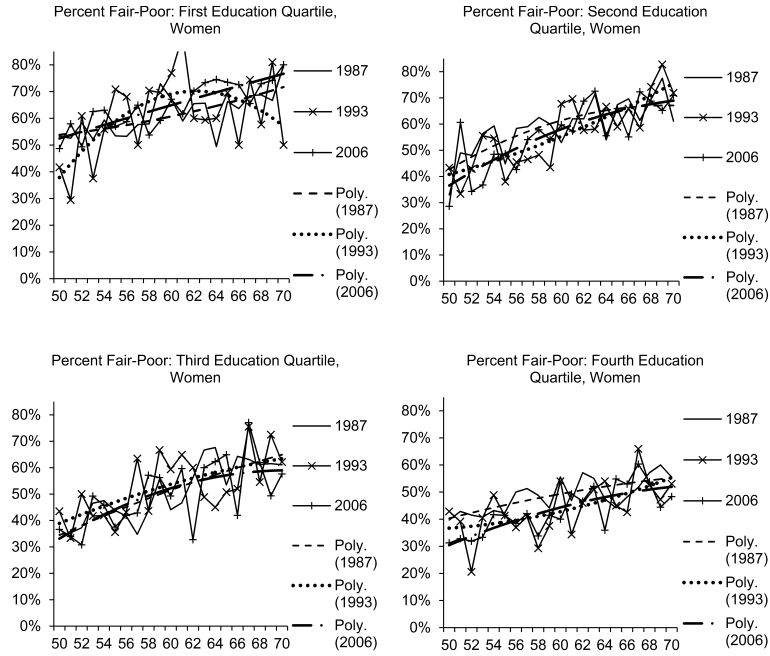


**Fig. 9.16 Evolution of fair/poor health by education quartile over time (women)**
*Source:* Own elaboration from data from the Spanish National Health Survey.

changed dramatically in the Spanish cohorts that turned age fifty between the late 1960s and the current years. While the older cohorts have very little education (a large majority, 60 and 70 percent for men and women, had only low education), the younger ones have much more education (60 percent of men and 70 percent of women that are age fifty in 2011 have high education).

Figures 9.15 and 9.16 present the evolution of the fraction having bad health by education quartile and gender in three periods of time (1987, 2003, and 2006). The fraction having bad health is defined as the fraction that declares having fair or poor self-assessed health. We find a clear decreasing gradient of the fraction having bad health by education quartile for both genders. Alternatively, the decreasing gradient over time is much less clear. Therefore, we find that the improvement in the health status of the population shown before seems to be driven by changes in the educational attainment of the Spanish population rather than by changes in the health status of individuals within a given education quartile.

## 9.6 Conclusion

One of the caveats behind any pension reform that extends the normal retirement age is whether workers are capable of working longer. In this

chapter we have explored whether Spanish workers have the health capacity to work longer using two alternative methods. First, we have estimated what would be the current level of employment if individuals with a given mortality rate today worked as much as individuals with the same mortality rate in the past. Second, we have used a contemporaneous younger cohort to evaluate the work capacity assuming that the same health problem hampers employment in the same way for the two groups of individuals. The conclusions from both analyses are similar: there is a large employment potential among the population age fifty-five to sixty-nine. In particular, using the Milligan-Wise method (Milligan and Wise 2014), we estimate an additional capacity to work of 7.08 years from fifty-five to sixty-nine in 2010 with respect to equal-mortality values in 1976. Similarly, using the Cutler-Meara- Richards-Shubik method (Cutler, Meara, Richards-Shubik 2012), we detect substantial gains that increase both with age (between 20 and 26 percent for individuals age sixty to sixty-four and between 36 and 61 percent for individuals age seventy to seventy-four) and the level of education.

There are several strong assumptions behind the analysis done in this exercise. Therefore, the results should be taken as an indication that there is potential employment capacity among the population older than fifty-five in Spain rather than as a conclusive result for policy purposes. Further research using more detailed employment and health information is needed before one could drive large policy reforms to increase participation rates at older ages.

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