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Work Capacity at Older Ages in the Netherlands

Adriaan Kalwij, Arie Kapteyn, and Klaas de Vos

8.1 Introduction

Male employment rates at older ages in the Netherlands started falling in the early 1970s, reaching a historical low around the mid-1990s. Since then, the trend has reversed and male employment rates at older ages have continued to increase (OECD 2015). Pension policy is likely to have played a key role in these trends. Early retirement schemes introduced since 1980 enabled workers to retire before the normal retirement age of sixty-five. Reforms of that policy have resulted in less generous early retirement schemes from the mid-1990s onward (Euwals et al. 2009; Kapteyn and de Vos 1999). In addition, policy reforms regarding disability and unemployment insurance are likely to have played a role as well (de Vos, Kapteyn, and Kalwij 2012; Kalwij, de Vos, and Kapteyn 2015). The trends in the Netherlands are in line with developments in many other OECD countries where social security programs and pension schemes in the past two decades have been redesigned to create stronger incentives for continued work at older ages (Gruber and Wise 2004; Wise 2012).

A recent pension reform aimed at keeping people in employment at older ages in the Netherlands has been to increase the normal retirement age. Up until 2012 the normal retirement age was sixty-five. It is now projected to increase gradually to sixty-six in 2018 and sixty-seven in 2021. After that

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the normal retirement age will be further raised in line with increases in population life expectancy, up to age seventy and three months. The normal retirement age is the age at which one starts receiving social security benefits, so that an increase in the retirement age induces many workers to postpone retirement until they reach the normal retirement age. Another institutional factor of importance is a recent new pension law meant to tackle the problem of low funding ratios of pension funds resulting from the 2007–2008 financial crisis, a continuing increase in life expectancy, and low interest rates. In response to these low funding ratios, most pension funds have not fully adjusted their pension benefits and entitlements for price inflation, while some have applied nominal cuts. It is expected that the new pension law will reduce financial risk for the pension funds at the cost of reducing benefits of future retirees compared to current retirees. Since more than 90 percent of workers are covered by an occupational pension scheme, it is likely to affect the decision of when to stop working.

While one may argue that the institutional settings have by and large determined the above-mentioned major trends in male employment rates at older ages, the health of older workers will determine to what extent the most recent reforms can further increase employment rates at older ages. For this reason we aim to provide in this chapter an estimate for the Netherlands of the additional work capacity at older ages (fifty to seventy-four) accounting for the health of individuals in this age group. For this purpose we follow the two methodologies as outlined in the introduction of this volume. The first methodology is referred to as the Milligan and Wise method (Milligan and Wise 2012). This method groups people by gender, year, and age and uses the mortality rate as an indicator for health to answer the following question: *How much could older people of a certain age, and in a specific year, work if they worked as much as people in the past with the same mortality rate?*

To answer this question, we use data on mortality from the Human Mortality Database[1] and Statistics Netherlands,[2] and employment rates from administrative surveys.

The second methodology is referred to as the Cutler, Meara, and Richards-Shubik method (Cutler, Meara, and Richards-Shubik 2012). This method uses individual-level survey data on peoples' health status to answer the following question: *How much would older people of certain age, and in a specific year, work if they worked as much as younger people (age fifty to fifty-four) with the same health?*

To answer this question one needs a measure of health. We will return to that later. We use data from the Dutch branch of the Survey of Health, Ageing and Retirement in Europe (SHARE-NL).

In addition, we use a third method that uses the age-year specific mortality rates of the Milligan and Wise method as an additional health indica-

1. http://www.mortality.org/.
2. http://www.cbs.nl.

tor when applying the Cutler, Meara, and Richards-Shubik method. We have also considered an additional method where we would use answers to a five-point self-assessed health question (from "excellent" to "poor") to gauge increases in work capacity, using data from the CentERpanel, which has been asking health questions since 1993.[3] It turns out that, in contrast with the other health measures, the self-assessed health (SAH) variable does not show any clear trend over the past couple of decades. This may simply reflect that people's standards of what it means to be in good health have evolved over time, which would invalidate the use of SAH as a comparison yardstick across time.

The chapter proceeds as follows: Section 8.2 describes the main historical trends in employment and health during the past four decades. Section 8.3 presents results for the Milligan and Wise method, while section 8.4 presents the results for the Cutler, Meara, and Richards-Shubik method. Section 8.5 presents results of the third method in which we use age-year specific mortality rates. Section 8.6 discusses the main findings and concludes.

8.2 Historical Trends in Employment and Health

Figure 8.1 shows the decrease in male employment rates at older ages in the Netherlands from the 1970s onward. Particularly in the early eighties, generous early retirement schemes provided a strong incentive to retire at ages younger than the state pension age of sixty-five. Many of those who were not entitled to early retirement had access to slightly less generous but still attractive disability and unemployment insurance programs. Around the mid-1990s the employment rate of people age sixty to sixty-four reached its lowest point. Over time, various policy reforms were introduced to limit the number of persons taking the disability and unemployment routes to retirement. Moreover, early retirement schemes were first made more actuarially fair, and later on by and large abolished. As a result, the trend of ever-decreasing employment rates of older males has reversed since about 1995. Nowadays, the employment rate of males age sixty to sixty-four is at the same level as at the end of the seventies when the early retirement schemes were first introduced. Figure 8.2 shows that the female employment rates in the age groups fifty to fifty-four and fifty-five to fifty-nine have increased over the entire observation period. The profound societal changes underlying these trends, which gave women a more equal share in the distribution of socioeconomic responsibilities, eventually increased the employment rate of sixty- to sixty-four-year-old women in the last decade of the observation period.

One will note that the graphs for the employment rates of men and women age sixty-five to sixty-nine start in 1995. Before 1995, employment

3. Information on this data set can be found at http://www.centerdata.nl/en/databank/centerpanel-data-0.

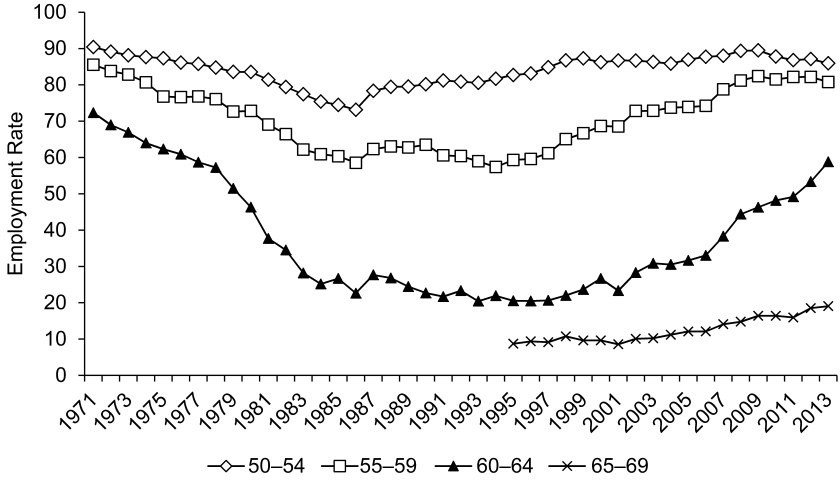

Fig. 8.1 Men's employment rates, ages fifty to fifty-four, fifty-five to fifty-nine, sixty to sixty-four, and sixty-five to sixty-nine (1971–2013)

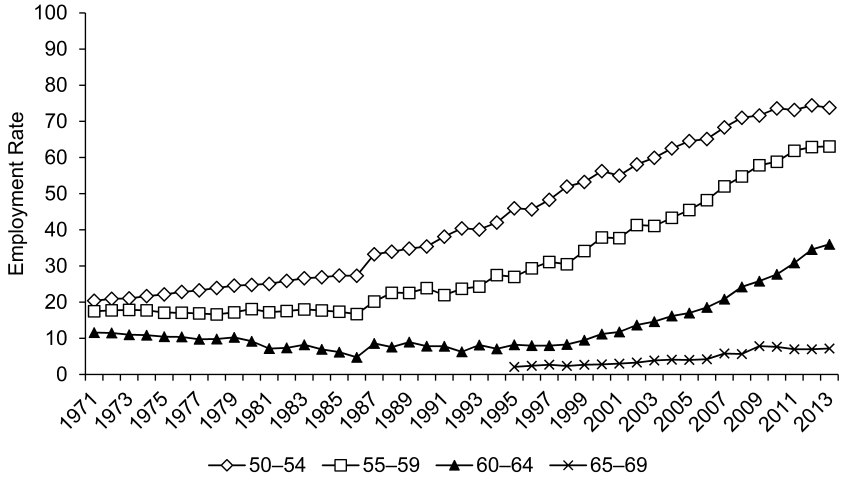

Fig. 8.2 Women's employment rates, ages fifty to fifty-four, fifty-five to fifty-nine, sixty to sixty-four, and sixty-five to sixty-nine (1971–2013)

of individuals over age sixty-five was not separately recorded, as it was felt that so few in that age bracket were working that it was not worth recording their numbers. Gradually employment rates in this age category are increasing, not as fast as in, for instance, the United States (Maestas 2010; Maestas and Zissimopoulos 2010; Coile, Milligan, and Wise, chapter 12, this volume), but nevertheless noticeable. Among males the employment rate has reached 20 percent.

Figure 8.3A shows the decrease in male mortality rates over time, which

can be used to assess the increased work capacity of the older age groups. Roughly speaking, mortality at age fifty-four in the beginning of the observation period equals mortality at age sixty-four in recent years, and the mortality rate at age fifty-nine in the early 1970s was about the same as the mortality at age sixty-nine in the early 2010s. To the extent that the employment rate of sixty-nine-year-olds in 2010 is lower than the employment rate of fifty-nine-year-olds in 1970, this could imply potential extra work capacity.

While figure 8.3A implies a clear improvement in the health of older men, figure 8.3B shows a much less clear pattern for men's self-assessed health

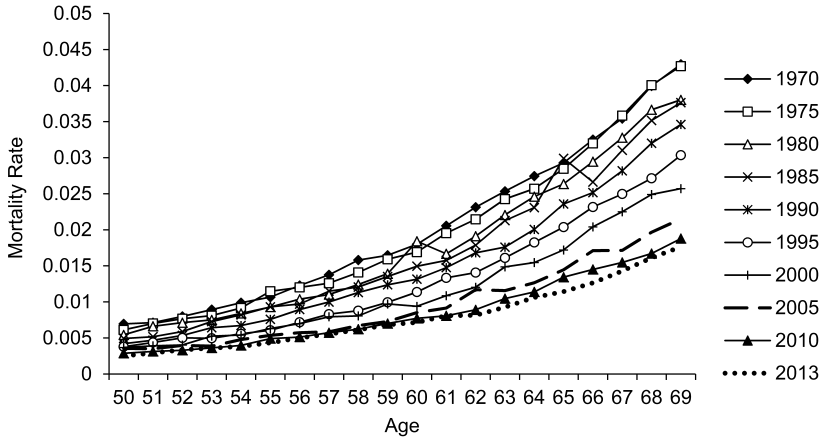

Fig. 8.3A Men's mortality by age for selected years

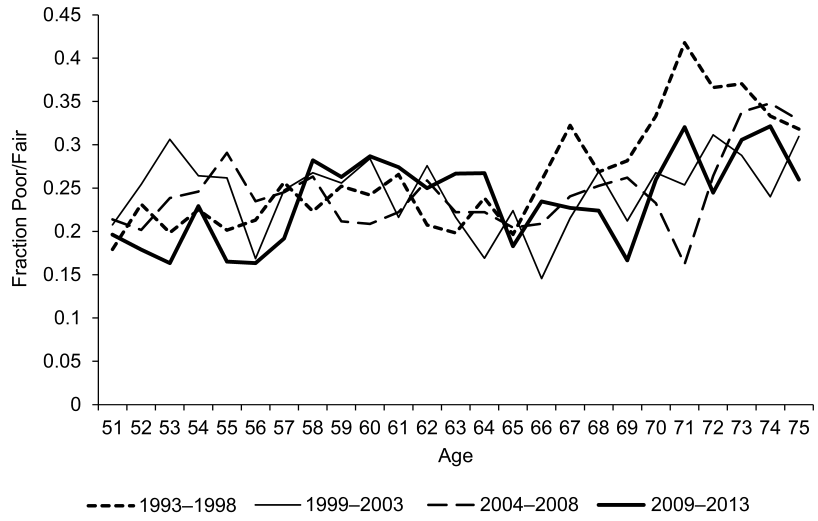

Fig. 8.3B Men's self-assessed health (SAH) by age (1993–2013)

(SAH). One explanation for the absence of a clear age gradient up to age seventy is that people may adjust their standard of what good health means, or they may assess their own health in comparison with the health of their peers. If the health of the population increases, individual SAH therefore need not necessarily increase. As noted before, the data on SAH are taken from a different and a much smaller data set, the CentERpanel, which has information on about 2,000 individuals per year from 1993 onward.

8.3 Work Capacity: Milligan and Wise Method

We implement the Milligan and Wise method for the period 1981–2010. We use population mortality data from the Human Mortality Database and Statistics Netherlands. We compute employment rates by age, gender, and year using the Income Panel Study of the Netherlands ([IPO] Inkomens Panel Onderzoek; CBS 2009). The IPO is an administrative database of individual incomes collected by Statistics Netherlands from official records such as tax records, population registry, institutions that pay out (insurance) benefits, and the department of housing (because of rent subsidies). Data are available for the years 1981, 1985, 1989–2010. The IPO is a representative sample of the Dutch population of, on average, about 95,000 individuals per year. Most important for our study is that IPO contains data on the labor market status for each member of the household in which a sample individual lives. Statistics Netherlands assigns a labor market status to an individual based on the largest income component. An individual is defined to be in employment if the largest share of his or her income is from labor income, including income from self-employment. The IPO contains no information on levels of education, and our selected sample consists of men age fifty to sixty-nine.[4]

Figure 8.4 plots employment rates and mortality rates (by age year) for men in 1981 and 2010. It shows that for all ages male employment rates at a given mortality rate are higher in 1981 than in 2010. This suggests that people with the same health work less in 2010 than in 1981 and that from a health perspective there is unused work capacity. The difference is fairly small at younger ages and much larger in the older age groups. Thus it appears that unused work capacity is concentrated in the higher age groups.

Figure 8.5 shows that this unused work capacity in 2010 is much smaller when we compare it with the employment and mortality figures for 1995. Still, there appears some unused work capacity at higher levels of mortality if we take 1995 as a base. Interestingly, figure 8.1 shows a steep increase in men's employment rates between 1995 and 2010. Figure 8.5 implies that this increase has been barely enough to keep up with the decrease in mortality that would justify that more people work.

4. There are few employed men age seventy to seventy-four in the sample. Due to data confidentiality rules, we are not allowed to present these numbers.

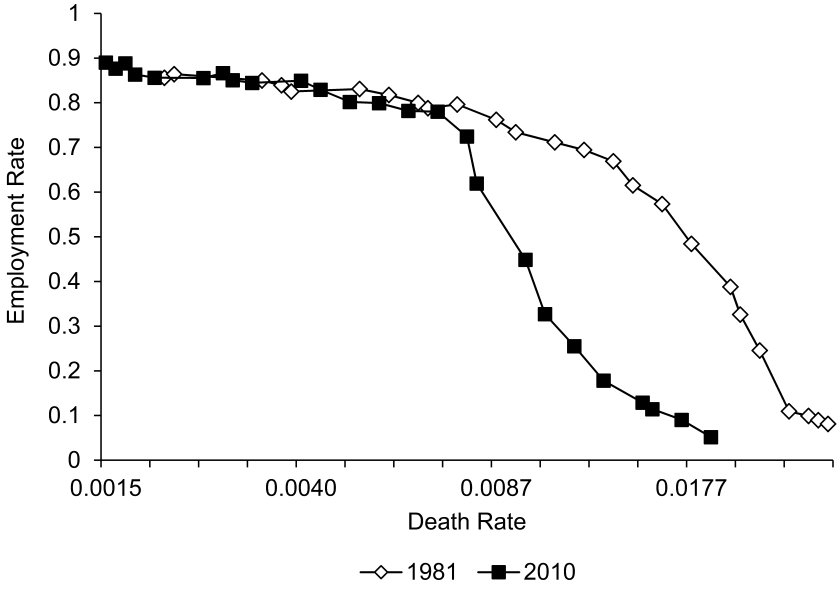

Fig. 8.4 Men's employment versus mortality (2010 vs. 1981)

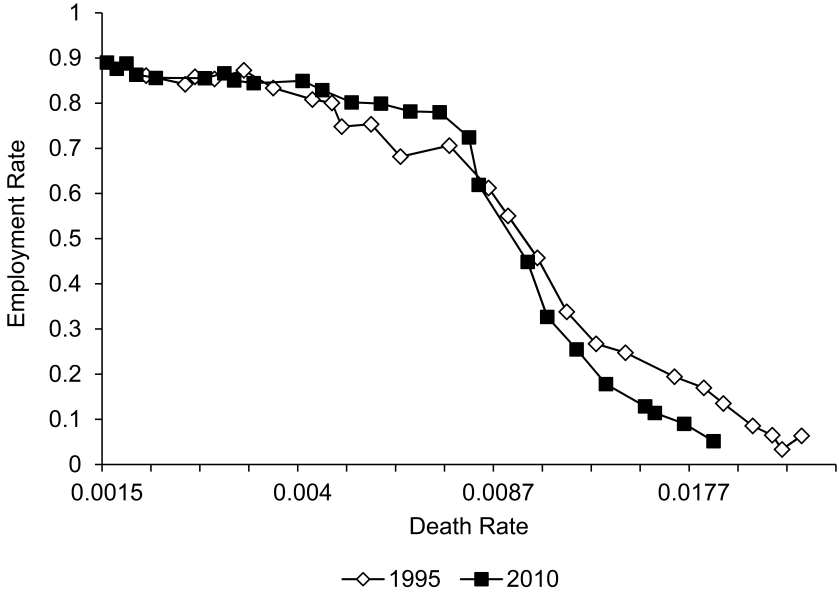

Fig. 8.5 Men's employment versus mortality (2010 vs. 1995)

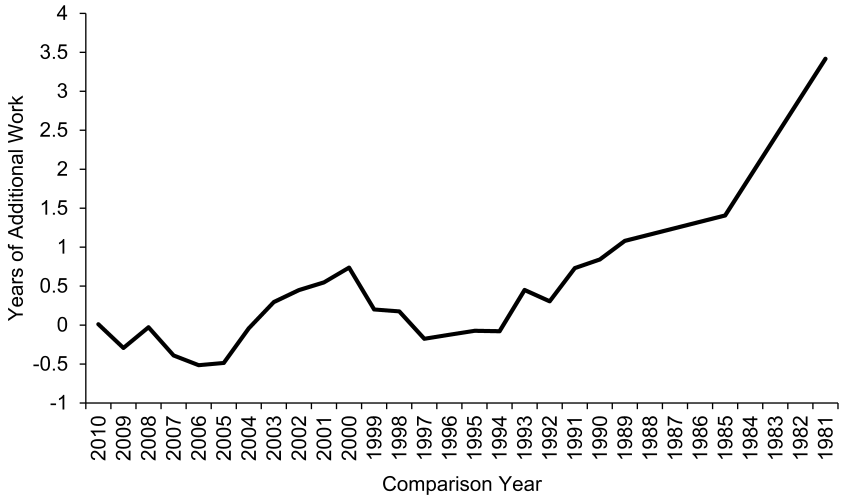

Fig. 8.6 Estimated additional employment capacity at ages fifty to sixty-nine for men by year of comparison

Figure 8.6 shows the estimated additional work capacity in 2010 for men at ages fifty to sixty-nine for different comparison years. For example, the last observation for 1981 is essentially the difference between the two lines in figure 8.4. This difference turns out to be a total of 3.5 years of work. Reading figure 8.6 from right to left, for the comparison years after 1981 the additional work capacity decreases as fewer people at a given mortality rate are employed. Obviously, for this method the year that is taken as a base is crucial. For the comparison years after about 1994 the additional work capacity in 2010 hovers around zero, and this in part is caused by employment rates keeping up with the health improvements in the population (i.e., decreasing mortality over time). By construction, the additional work capacity is zero in 2010.

Table 8.1 provides a more detailed breakdown of the calculation of additional work capacity by age, taking 1981 as a base. It shows considerable additional work capacity at older ages when comparing the years 1981 and 2010. The additional work capacity exceeds 10 percentage points for all ages above sixty and peaks at almost 50 percentage points at age sixty-five. In 2010 the employment rate of sixty-five-year-old men was 18 percent. In 1981, the employment rate of persons with the same mortality rate as sixty-five-year-old men in 2010 was 67 percent. These numbers should be interpreted as indicative rather than as exact estimators of extra work capacity. Other characteristics of the sixty-five-year-olds without employment (e.g., a possible lack of appropriate skills) in 2010 might make it difficult for them to find gainful employment.

Table 8.1 **Additional employment capacity in 2010 using the 1981 employment-mortality relationship**

Age	Death rate in 2010 (%)	Employment rate in 2010 (%)	Employment rate in 1981 at the same death rate (%)	Additional work capacity (%–points)
50	0.29	85.54	84.97	–0.56
51	0.31	86.62	84.97	–1.64
52	0.33	85.05	84.97	–0.07
53	0.36	84.44	84.97	0.53
54	0.40	84.94	83.91	–1.03
55	0.49	82.90	83.07	0.17
56	0.51	80.18	83.07	2.89
57	0.57	79.91	81.75	1.84
58	0.62	78.18	79.98	1.80
59	0.70	78.00	79.63	1.63
60	0.77	72.44	76.18	3.75
61	0.81	61.91	76.18	14.27
62	0.89	44.85	73.41	28.55
63	1.05	32.68	71.14	38.46
64	1.14	25.51	69.44	43.94
65	1.34	17.80	66.91	49.11
66	1.45	12.88	57.33	44.45
67	1.55	11.42	57.33	45.91
68	1.67	9.03	48.42	39.40
69	1.88	5.16	38.80	33.64
50–69		11.19	14.66	3.47

Note: Additional work capacity is the difference between the fourth and third columns.

8.4 Work Capacity: Cutler, Meara, and Richards-Shubik Method

Individual-level data are drawn from the Survey of Health, Ageing and Retirement in Europe (SHARE), a harmonized, multidisciplinary, and representative cross-national panel survey covering the fifty and older population in twenty European countries. We use the Dutch branch of SHARE (SHARE-NL). The Dutch waves were conducted in 2004, 2007, 2011, and 2013.[5] SHARE includes information on socioeconomic status (e.g., employment, income, and education), health (e.g., self-reported subjective health and doctor diagnosed conditions, physical and cognitive functioning, and behavioral risks), and psychological conditions (e.g., mental health, well-being, and life satisfaction).

5. These are the first, second, fourth, and fifth waves of SHARE. The third wave of SHARE is not comparable with these selected waves as it contains mainly retrospective information about respondents' lives.

Table 8.2A Summary statistics, men

	Age group				
	51–54	55–59	60–64	65–69	70–74
Employment	0.847	0.749	0.344	0.037	0.011
Excellent health (SAH)	0.153	0.169	0.145	0.115	0.089
Very good health (SAH)	0.215	0.179	0.186	0.165	0.164
Good health (SAH)	0.460	0.450	0.418	0.453	0.406
Fair health (SAH)	0.148	0.174	0.211	0.230	0.287
Poor health (SAH)	0.024	0.029	0.039	0.037	0.055
One physical limitation	0.088	0.113	0.118	0.143	0.147
> 1 physical limitation	0.119	0.132	0.156	0.144	0.197
ADL limitations	0.037	0.042	0.054	0.046	0.047
IADL limitations	0.052	0.064	0.073	0.065	0.106
Depressed (CESD-scale > 0)	0.788	0.746	0.677	0.695	0.730
Ever experienced heart problems	0.052	0.081	0.118	0.154	0.193
Ever experienced stroke	0.018	0.034	0.029	0.022	0.053
Ever experienced lung disease	0.047	0.048	0.075	0.055	0.084
Ever experienced cancer	0.024	0.031	0.035	0.058	0.075
Ever experienced high blood pressure	0.178	0.195	0.265	0.290	0.343
Ever experienced arthritis	0.030	0.040	0.056	0.061	0.070
Ever experienced diabetes	0.049	0.066	0.093	0.138	0.134
Underweight (BMI < 18.5)	0.003	0.002	0.007	0.001	0.006
Overweight (25 < BMI < 30)	0.473	0.504	0.492	0.467	0.495
Obese (BMI > 30)	0.124	0.135	0.150	0.177	0.134
Former smoker	0.660	0.697	0.722	0.752	0.758
Current smoker	0.301	0.264	0.212	0.202	0.158
Low educated (ISCED 1 and 2)	0.390	0.404	0.452	0.484	0.548
Median educated (ISCED 3)	0.292	0.269	0.241	0.254	0.223
High educated (ISCED 4 and 5)	0.318	0.327	0.307	0.262	0.229
Born abroad	0.230	0.461	0.541	0.565	0.587
Married	0.821	0.859	0.884	0.865	0.875
Occupational pension fund participant	0.712	0.753	0.774	0.845	0.835
PVW health index	62.244	59.806	56.524	54.300	49.333
Number of observations	708	967	1,073	951	641

Notes: SAH: self-assessed health; (I)ADL: (Instrumental) Activity of Daily Living; physical limitations are related to walking several blocks, lifting or carrying something, pushing or pulling something, climbing stairs, stooping, kneeling or crouching, getting up from chair, reaching/extending arms up, sitting two hours, and picking up a coin; CESD: Center for Epidemiologic Studies Depression; BMI: Body Mass Index; ISCED: 1997 International Standard Classification of Education.

For our analysis we select individuals age fifty to seventy-four and, after removing observations with missing information on key variables (about 25 percent), our final sample consists of 2,373 men (4,340 year observations) and 2,725 women (5,178 year observations). Tables 8.2A and 8.2B present summary statistics. The level of education is defined according to the 1997 International Standard Classification of Education ([ISCED]; MEA 2011). ISCED 1–2 will be referred to as a low level of education, ISCED

Table 8.2B Summary statistics, women

	Age group				
	51–54	55–59	60–64	65–69	70–74
Employment	0.650	0.522	0.234	0.018	0.009
Excellent health (SAH)	0.168	0.140	0.142	0.124	0.093
Very good health (SAH)	0.193	0.167	0.151	0.139	0.131
Good health (SAH)	0.431	0.428	0.461	0.452	0.465
Fair health (SAH)	0.169	0.218	0.202	0.248	0.275
Poor health (SAH)	0.039	0.047	0.044	0.037	0.036
One physical limitation	0.120	0.147	0.162	0.178	0.162
> 1 physical limitation	0.234	0.248	0.261	0.271	0.338
ADL limitations	0.047	0.053	0.047	0.053	0.081
IADL Limitations	0.128	0.137	0.130	0.140	0.191
Depressed (CESD-scale > 0)	1.335	1.269	1.206	1.213	1.228
Ever experienced heart problems	0.027	0.048	0.065	0.068	0.075
Ever experienced stroke	0.011	0.021	0.019	0.028	0.051
Ever experienced lung disease	0.057	0.080	0.068	0.085	0.073
Ever experienced cancer	0.045	0.041	0.065	0.056	0.066
Ever experienced high blood pressure	0.197	0.231	0.283	0.295	0.400
Ever experienced arthritis	0.071	0.103	0.102	0.112	0.121
Ever experienced diabetes	0.055	0.066	0.082	0.085	0.098
Underweight (BMI < 18.5)	0.013	0.012	0.013	0.012	0.013
Overweight (25 < BMI < 30)	0.345	0.348	0.359	0.370	0.380
Obese (BMI > 30)	0.162	0.180	0.186	0.191	0.166
Former smoker	0.615	0.599	0.570	0.487	0.426
Current smoker	0.280	0.249	0.194	0.150	0.128
Low educated (ISCED 1 and 2)	0.438	0.527	0.604	0.648	0.741
Median educated (ISCED 3)	0.301	0.224	0.181	0.183	0.152
High educated (ISCED 4 and 5)	0.261	0.249	0.215	0.169	0.106
Born abroad	0.264	0.477	0.583	0.605	0.584
Married	0.804	0.848	0.818	0.778	0.704
Occupational pension fund participant	0.574	0.554	0.475	0.450	0.375
PVW health index	52.361	49.772	49.822	48.123	44.369
Number of observations	982	1,219	1,266	969	742

Notes: SAH: self-assessed health; (I)ADL: (Instrumental) Activity of Daily Living; Physical limitations are related to walking several blocks, lifting or carrying something, pushing or pulling something, climbing stairs, stooping, kneeling or crouching, getting up from chair, reaching/extending arms up, sitting two hours, and picking up a coin; CESD: Center for Epidemiologic Studies Depression; BMI: Body Mass Index; ISCED: 1997 International Standard Classification of Education.

3 as medium level of education, and ISCED 4–5 as a high level of education. Labor force status is self-reported by respondents. We distinguish between employment (including self-employment) and nonemployment. A health index is constructed based on self-assessed health limitations such as self-assessed limitations of activities of daily living and self-reported health status. Health has many dimensions and we follow Poterba, Venti, and Wise (2013) to construct a measure of general health using a principal

Table 8.3A Employment regressions, all health variables

	Men 50–54		Women 50–54	
Variable	Coefficient	Std. error	Coefficient	Std. error
Very good health (SAH)	–0.0216	0.0389	0.0430	0.0448
Good health (SAH)	–0.0715	0.0350*	–0.0461	0.0401
Fair health (SAH)	–0.1810	0.0497*	–0.1404	0.0561*
Poor health (SAH)	–0.4309	0.0914*	–0.2531	0.0909*
One physical limitation	0.0012	0.0435	0.0188	0.0438
> 1 physical limitation	–0.0960	0.0451*	–0.1200	0.0423*
ADL limitations	0.0367	0.0671	–0.0852	0.0719
IADL Limitations	–0.1989	0.0574*	–0.0496	0.0473
Depressed (CESD-scale > 0)	–0.0117	0.0120	–0.0192	0.0122
Ever experienced heart problems	0.0554	0.0537	–0.0905	0.0857
Ever experienced lung disease	0.0907	0.0571	–0.0424	0.0598
Ever experienced stroke	–0.1468	0.0893	0.0457	0.1301
Ever experienced cancer	–0.0109	0.0767	0.0037	0.0656
Ever experienced high blood pressure	0.0190	0.0331	0.0137	0.0352
Ever experienced arthritis	0.0027	0.0711	–0.1004	0.0566
Ever experienced diabetes	0.0176	0.0568	–0.0946	0.0638
Underweight (BMI < 18.5)	–0.3808	0.2232	–0.1583	0.1190
Overweight (25 < BMI < 30)	0.0056	0.0259	–0.0126	0.0305
Obese (BMI > 30)	0.0150	0.0405	–0.0763	0.0414
Former smoker	–0.0499	0.0280	–0.0242	0.0323
Current smoker	–0.0407	0.0301	–0.0136	0.0356
Low educated (ISCED 1 and 2)	–0.0747	0.0292*	–0.0353	0.0327
High educated (ISCED 4 and 5)	0.0020	0.0299	0.0877	0.0365*
Born abroad	–0.0941	0.0282*	–0.0085	0.0313
Married	0.1617	0.0319*	–0.0872	0.0352*
Occupational pension fund participant	0.1406	0.0265*	0.2859	0.0279*
Constant	0.8023	0.0499*	0.7089	0.0582*
No. obs.	708		982	

Notes: SAH: self-assessed health; (I)ADL: (Instrumental) Activity of Daily Living; Physical limitations are related to walking several blocks, lifting or carrying something, pushing or pulling something, climbing stairs, stooping, kneeling or crouching, getting up from chair, reaching/extending arms up, sitting two hours, and picking up a coin; CESD: Center for Epidemiologic Studies Depression; BMI: Body Mass Index; ISCED: 1997 International Standard Classification of Education.

*Significant at the 5 percent level.

components analysis. The weights corresponding to the first principal component are used to construct a health index. The index values are next transformed into percentiles, where 0 is worst health and 100 is best health. In the tables we refer to this index as the PVW health index. Table 8.2A and 8.2B report summary statistics for the men and women in our sample. In line with what is known from the literature, these statistics show, for example, that fewer women than men are employed, women are on average unhealthier than men, and health worsens with age.

To assess work capacity we first estimate an employment equation by

Table 8.3B Employment regressions, PVW health index

	Men 50–54		Women 50–54	
Variable	Coefficient	Std. error	Coefficient	Std. error
PVW health index (0–100)	0.0035	0.0005*	0.0049	0.0005*
Low educated (ISCED 1 and 2)	–0.0762	0.0297*	–0.0470	0.0325
High educated (ISCED 4 and 5)	0.0054	0.0307	0.0993	0.0365*
Born abroad	–0.1032	0.0285*	–0.0252	0.0311*
Married	0.1849	0.0317*	–0.0748	0.0350*
Occupational pension fund participant	0.1626	0.0268*	0.3002	0.0279*
Constant	0.4123	0.0467*	0.2806	0.0482*
No. obs.	708		982	

*Significant at the 5 percent level.

gender for individuals age fifty to fifty-four as outlined in Coile, Milligan, and Wise (chapter 12, this volume). At these ages employment is unlikely to be influenced by retirement incentives. The employment model is estimated using two empirical specifications. The first specification includes all health limitations as explanatory variables. The results are presented in table 8.3A. The second specification, referred to as the PVW health index in the tables with results, excludes all health limitations variables and includes the abovementioned health index. The results of the second specification are presented in table 8.3B. Apart from health variables, educational attainment, marital status, whether born abroad, whether covered by an occupational pension scheme, and survey year are controlled for. Table 8.3A shows that most health limitations have no significant effect on the employment probability. It is mainly SAH that is associated with the employment probability, and the estimated coefficients suggest that men and women who assess their health as fair or poor are less likely to be employed compared to men and women who assess their health as excellent or very good. The effects of the levels of education show that low-educated men and women are less likely to be employed than high-educated men and women. Finally, men and women who are participants in an occupational pension fund are more likely to be employed.

The estimation results of the employment equations using only individuals age fifty to fifty-four are used to predict employment at later ages. These predictions are in the columns with the heading "Predicted working" in table 8.4. The difference between the actual and predicted percentage working is our estimated additional work capacity. The differences in additional work capacity implied by the results of the model with all health variables (table 8.3A) and the results of the model with the PVW health index (table 8.3B) are minimal. Figures 8.7 and 8.8 summarize the main findings based on table 8.3B. Graphs based on table 8.3A would be virtually identical. Figure

Table 8.4 **Simulations of work capacity**

	Use all health variables				Use PVW health index			
Age group	No. obs.	Actual working (%)	Predicted working (%)	Estimated additional work capacity (% points)	No. obs.	Actual working (%)	Predicted working (%)	Estimated additional work capacity (% points)
				Men				
55–59	967	74.9	82.9	8.0	967	74.9	82.8	7.9
60–64	1,073	34.4	81.9	47.5	1,073	34.4	81.2	46.8
65–69	951	3.7	82.3	78.6	951	3.7	80.7	77.1
70–74	641	1.1	78.8	77.7	641	1.1	78.3	77.2
				Women				
55–59	1,219	52.2	61.7	9.5	1,219	52.2	61.7	9.5
60–64	1,266	23.4	59.1	35.7	1,266	23.4	58.6	35.2
65–69	969	1.8	57.5	55.7	969	1.8	56.6	54.8
70–74	742	0.9	53.7	52.7	742	0.9	52.0	51.1

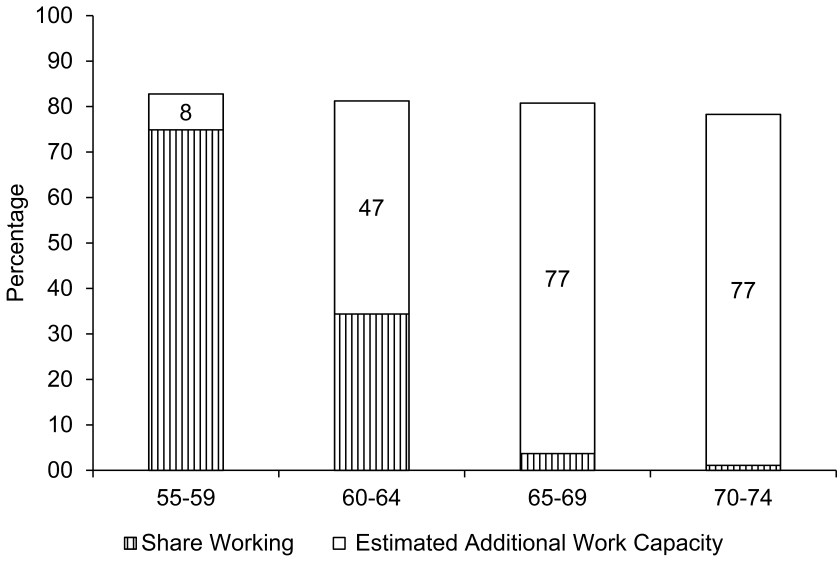

Fig. 8.7 Share of men working and additional work capacity by age

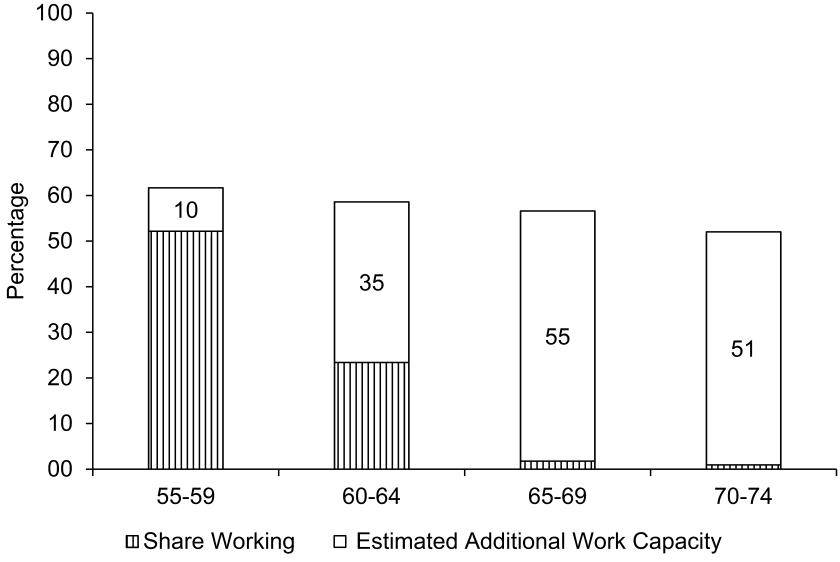

Fig. 8.8 Share of women working and additional work capacity by age

Table 8.5A **Work capacity by education (regression by education group)**

	Men, all health variables model			Men, PVW health index model		
Education	Actual working (%)	Predicted working (%)	Estimated additional work capacity (% points)	Actual working (%)	Predicted working (%)	Estimated additional work capacity (% points)
			Age 55–59			
ISCED 1–2	66.8	73.2	6.5	66.8	73.7	7.0
ISCED 3	74.6	85.3	10.7	74.6	85.3	10.7
ISCED 4–5	85.1	94.3	9.1	85.1	92.0	6.9
			Age 60–64			
ISCED 1–2	27.6	73.6	45.9	27.6	73.8	46.2
ISCED 3	37.8	85.4	47.6	37.8	84.6	46.8
ISCED 4–5	41.6	93.1	51.5	41.6	90.7	49.0
			Age 65–69			
ISCED 1–2	3.7	74.9	71.2	3.7	74.0	70.3
ISCED 3	3.7	85.5	81.8	3.7	84.4	80.7
ISCED 4–5	3.6	95.2	91.6	3.6	90.8	87.2
			Age 70–74			
ISCED 1–2	1.1	71.0	69.9	1.1	71.7	70.5
ISCED 3	1.4	83.3	81.9	1.4	81.8	80.4
ISCED 4–5	0.7	94.3	93.6	0.7	89.1	88.4

Notes: ISCED 1–2: low level of education; ISCED 3: medium level of education; and ISCED 4–5: high level of education.

8.7 shows that the estimated additional work capacity for men is 8 percent at ages fifty-five to fifty-nine; it increases to 77 percent at ages sixty-five to sixty-nine and seventy to seventy-four. For women, figure 8.8 shows that the estimated additional work capacity is somewhat lower at older ages and about 51 percent at ages seventy to seventy-four.

Tables 8.5A and 8.5B differentiate the calculations by level of education: the employment regressions are estimated separately by education group, and the resulting additional work capacity percentages are calculated separately for persons with low, medium, and high levels of education. These results are summarized in figures 8.9 and 8.10 and show that the additional work capacity increases with the level of education, especially in the age groups older than sixty-five. Notably, the differences between the results on the basis of the employment regression using all health variables and the results using the PVW index are again only marginal.

Tables 8.6A and 8.6B present comparable results where the employment equation is estimated in a single regression, but the estimated additional work capacity is differentiated by level of education. Generally speaking, the results are comparable to those in tables 8.5A and 8.5B, although a some-

Table 8.5B Work capacity by education (regression by education group)

Education	Women, all health variables model			Women, PVW health index model		
	Actual working (%)	Predicted working (%)	Estimated additional work capacity (% points)	Actual working (%)	Predicted working (%)	Estimated additional work capacity (% points)
			Age 55–59			
ISCED 1–2	41.4	55.7	14.3	41.4	55.4	14.0
ISCED 3	56.0	58.1	2.0	56.0	60.9	4.9
ISCED 4–5	71.4	77.6	6.2	71.4	76.6	5.2
			Age 60–64			
ISCED 1–2	18.4	55.4	37.0	18.4	53.4	35.0
ISCED 3	29.7	57.5	27.8	29.7	61.1	31.4
ISCED 4–5	32.0	73.0	41.0	32.0	73.9	41.9
			Age 65–69			
ISCED 1–2	1.9	54.2	52.3	1.9	52.2	50.3
ISCED 3	1.1	58.6	57.5	1.1	60.2	59.1
ISCED 4–5	1.8	74.5	72.7	1.8	75.6	73.8
			Age 70–74			
ISCED 1–2	0.5	51.6	51.0	0.5	49.2	48.6
ISCED 3	2.7	57.6	55.0	2.7	58.0	55.4
ISCED 4–5	1.3	72.3	71.0	1.3	74.4	73.1

Notes: ISCED 1–2: low level of education; ISCED 3: medium level of education; and ISCED 4–5: high level of education.

what lower additional work capacity is estimated for men and a somewhat higher working capacity for women.

8.4.1 Sensitivity Analyses

As mentioned before, table 8.3A shows that it is mainly SAH that is associated with the employment probability. Several studies have argued that SAH is likely to suffer from various sources of bias. One often mentioned possibility is that nonworking individuals justify their nonemployment status by reporting worse than actual health (e.g., Bound 1991). To investigate the importance of possible biases in SAH, we also construct a health index excluding SAH. Table 8.7 presents the implications for the estimates of additional work capacity. The column headed "PVW health index" repeats the findings reported in table 8.4. The results in the next column, which is based on a health index excluding SAH, are rather similar to those in the previous column. It may also be argued that many of the other health variables such as ADLs suffer from measurement error (e.g., Flores and Kalwij 2013). Hence, we have also used a more restrictive set of health variables that are less likely to suffer from measurement error to construct the PVW health

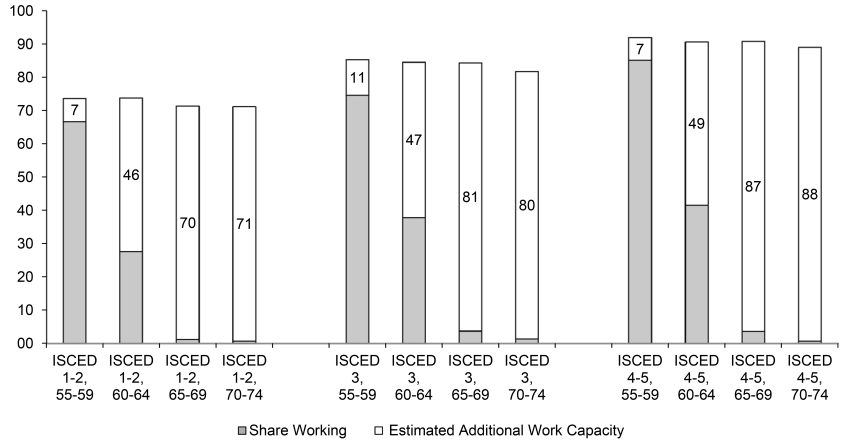

Fig. 8.9 Share of men working and additional work capacity by age and education

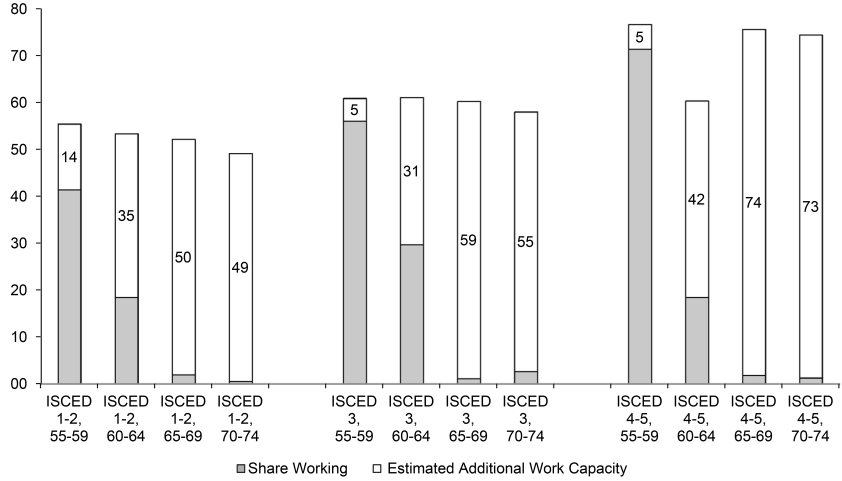

Fig. 8.10 Share of women working and additional work capacity by age and education

index. As it turns out, the results based on a health index that includes severe chronic conditions, BMI and grip strength, are again very close to those in the other two columns (not reported here).[6]

Finally, we construct an index obtained by regressing SAH on the objec-

6. Grip strength has not been used for the PVW health index. It is measured in the survey at most twice for each hand. Grip strength is defined as the maximum grip strength measurement. We also control for missing grip strength as these are mostly due to very frail people who are not capable, or very hesitant, of squeezing a grip-strength dynamometer.

Table 8.6A **Work capacity by education (single regression)**

Education	Men, all health variables model			Men, PVW health index model		
	Actual working (%)	Predicted working (%)	Estimated additional work capacity (%–points)	Actual working (%)	Predicted working (%)	Estimated additional work capacity (%–points)
			Age 55–59			
ISCED 1–2	66.8	74.1	7.3	66.8	74.8	8.1
ISCED 3	74.6	85.4	10.7	74.6	85.8	11.2
ISCED 4–5	85.1	91.7	6.6	85.1	90.1	5.0
			Age 60–64			
ISCED 1–2	27.6	74.8	47.2	27.6	75.1	47.5
ISCED 3	37.8	86.1	48.3	37.8	85.1	47.2
ISCED 4–5	41.6	89.0	47.4	41.6	87.3	45.7
			Age 65–69			
ISCED 1–2	3.7	76.3	72.6	3.7	75.3	71.6
ISCED 3	3.7	86.5	82.8	3.7	84.6	80.8
ISCED 4–5	3.6	89.1	85.5	3.6	87.1	83.4
			Age 70–74			
ISCED 1–2	1.1	73.3	72.1	1.1	73.7	72.6
ISCED 3	1.4	83.3	81.9	1.4	81.7	80.3
ISCED 4–5	0.7	87.6	86.9	0.7	85.8	85.1

Notes: ISCED 1–2: low level of education; ISCED 3: medium level of education; and ISCED 4–5: high level of education.

Table 8.6B **Work capacity by education (single regression)**

Education	Women, all health variables model			Women, PVW health index model		
	Actual working (%)	Predicted working (%)	Estimated additional work capacity (%–points)	Actual working (%)	Predicted working (%)	Estimated additional work capacity (%–points)
			Age 55–59			
ISCED 1–2	41.4	53.9	12.5	41.4	53.8	12.3
ISCED 3	56.0	61.9	5.8	56.0	62.6	6.5
ISCED 4–5	71.4	77.9	6.5	71.4	77.6	6.2
			Age 60–64			
ISCED 1–2	18.4	52.3	33.9	18.4	51.5	33.0
ISCED 3	29.7	62.1	32.4	29.7	62.3	32.6
ISCED 4–5	32.0	75.4	43.4	32.0	75.5	43.5
			Age 65–69			
ISCED 1–2	1.9	50.9	49.0	1.9	49.7	47.8
ISCED 3	1.1	61.7	60.6	1.1	61.0	59.9
ISCED 4–5	1.8	78.1	76.2	1.8	78.1	76.2
			Age 70–74			
ISCED 1–2	0.5	48.9	48.3	0.5	47.0	46.4
ISCED 3	2.7	61.0	58.4	2.7	59.6	56.9
ISCED 4–5	1.3	76.4	75.1	1.3	76.4	75.1

Notes: ISCED 1–2: low level of education; ISCED 3: medium level of education; and ISCED 4–5: high level of education.

Table 8.7 **Work capacity using alternative health indices**

	No. obs.	Actual working (%)	Additional work capacity: PVW health index (as in table 8.4) (%–points)	Additional work capacity: PVW health index, excluding SAH (%–points)	Additional work capacity: SAH-based health index (%–points)
			Men		
55–59	967	74.9	7.9	8.4	7.9
60–64	1,073	34.4	46.8	47.5	47.2
65–69	951	3.7	77.1	77.7	77.4
70–74	641	1.1	77.2	78.1	77.9
			Women		
55–59	1,219	52.2	9.5	9.8	9.9
60–64	1,266	23.4	35.2	35.4	34.5
65–69	969	1.8	54.8	55.2	53.5
70–74	742	0.9	51.1	50.5	—

Notes: SAH-based health index: based on predictions of an SAH-ordered probit model and includes severe conditions, BMI and grip strength variables as covariates. For this index, the predictions for working turned out to be negative for women age seventy to seventy-four and this result has been omitted.

tive health indicators (e.g., Bound et al. 1999). We estimate an ordered probit model in which the SAH categories are related to severe chronic conditions (BMI and grip strength). The SAH-based health index is next used to predict additional work capacity and these results are reported in the last column of table 8.7. Again, these results are rather close to those in the preceding two columns

These analyses show that the results are insensitive to the choice of health variables and to the way these are combined in indices for the explanation of employment. In all variants we obtain large estimates of additional work capacity. We will discuss this result further in section 8.6.

8.5 Work Capacity: A Combination of the Methods of Milligan and Wise, and Cutler, Meara, and Richards-Shubik

The additional work capacity based on the Cutler, Meara, and Richards-Shubik method (section 8.4) is about 50 percent higher than that based on the Milligan and Wise method (section 8.3). It is likely that this difference results from inherent differences between the two methods. For instance, the additional work capacity based on the Milligan and Wise method depends on the comparison year that ideally should be a year of full employment. For the Netherlands, the comparison year 1981 was a time of high unemployment and not of full employment. Hence, one may expect an underestimation of additional work capacity when using 1981 as a comparison year. The additional work capacity based on the Cutler, Meara, and Richards-Shubik method may be an overestimate under two scenarios: (a) if the health vari-

ables we choose do not vary with age (as is the case with SAH; figure 8.3B shows that SAH is essentially flat until age sixty-five and increases only slowly after that) or (b) if the health variables in our data set are noisy so that their influence on employment is attenuated. Clearly, if measured health does not vary with age then our estimates will imply that people at older ages will have the same work capacity as younger workers. If the included health variables only have a weak relation with employment, then their deterioration with age will have only a weak estimated effect on work capacity.

To obtain further insight into these issues we combine the two methods of Milligan and Wise, and Cutler, Meara, and Richards-Shubik and refer to it as the third method. The third method consists of adding age-year specific mortality rates to the employment models that we estimated when applying the Cutler, Meara, and Richards-Shubik method in section 8.4. The mortality rates are the same ones we used when applying the Milligan and Wise method of section 8.3. The main idea behind the third method is that it may take into account unobserved health limitations on an aggregate level that are not captured by the PVW health index or by the individual health indicators.

Table 8.8 shows that a higher mortality rate is associated with lower employment. The association is strong; a doubling of the mortality rate would result in about a 12-percentage-point lower employment rate for men and about a 23-percentage-point lower employment rate for women. Based on the results of table 8.8 we once again predict additional work capacity at ages fifty-five to seventy-four, and these results are reported in table 8.9. The results in the column headed "PVW health index" have been copied from table 8.4. In the next column we present results without including the PVW health index and only (log-) mortality in the employment equations. Such a model could be interpreted as a parametric version of the Milligan

Table 8.8 **Employment regressions, PVW health index and mortality rate**

	Men 50–54		Women 50–54	
Variable	Coefficient	Std. error	Coefficient	Std. error
PVW health index (0–100)	0.0035	0.0005*	0.0049	0.0005*
Low educated (ISCED 1 and 2)	–0.0788	0.0296*	–0.0531	0.0323
High educated (ISCED 4 and 5)	0.0022	0.0306	0.1044	0.0362*
Born abroad	–0.0939	0.0287*	–0.0090	0.0311
Married	0.1945	0.0318*	–0.0625	0.0349
Occupational pension fund participant	0.1627	0.0267*	0.2880	0.0279*
log-mortality rate (age-year specific)	–0.1719	0.0716*	–0.3397	0.0854*
Constant	–0.5565	0.4062	–1.7148	0.5039*
No. obs.	708		982	

*Significant at the 5 percent level.

Table 8.9 Work capacity including mortality rates by year, age, and gender

		Additional work capacity			
	No. obs.	Actual working (%)	PVW health index (as in table 8.4) (% points)	Mortality as health indicator (% points)	PVW health index and mortality (% points)
			Men		
55–59	967	74.9	7.9	–1.1	–0.2
60–64	1073	34.4	46.8	29.7	31.0
65–69	951	3.7	77.1	50.8	53.0
70–74	641	1.1	77.2	41.3	43.7
			Women		
55–59	1219	52.2	9.5	–3.3	–3.6
60–64	1266	23.4	35.2	7.1	8.5
65–69	969	1.8	54.8	12.9	15.0
70–74	742	0.9	51.1	—	—

Notes: For women age seventy to seventy-four, the predictions for working sometimes turned out to be negative and these results have been omitted from the table.

and Wise method. Estimated additional work capacity is much lower than predicted in the preceding column and closer to those reported in table 8.1 (Milligan and Wise method). In the last column, additional work capacities are predicted based on the estimation results of table 8.8. They show that the additional work capacity for men age sixty-five to sixty-nine is about 53 percentage points. At these ages for women, additional work capacity is about 15 percentage points and is considerably lower than for men while they work less and are relatively healthier. This outcome is the direct result of the fact that in table 8.8 the effect of mortality on employment is much higher for women than for men. This higher coefficient implies that labor supply of women is much more elastic with respect to health than that of men. The results in the final two columns of table 8.9 are fairly similar. They both show that for men predicted additional work capacity declines with age after age sixty-five.

8.6 Conclusions

Both the results of the Milligan-Wise and the Cutler-Meara-Richards-Shubik approach to calculate additional work capacity at older age groups suggest that the potential employment rates of older workers in the Netherlands by far exceed the actual employment rates. The Milligan-Wise approach shows that, in comparison to 1981, considerably fewer persons with the same mortality rate were working in 2010. The Cutler-Meara-Richards-Shubik approach shows that, given their health, the employment rates of older persons could be much higher than is currently the case.

Our preferred set of results is based on a combination of the Milligan-Wise and Cutler, Meara, and Richards-Shubik approaches and consists of an extension of the latter approach with (aggregate) mortality as an additional health indicator. We find that for men, additional work capacity is about 31 percentage points at ages sixty to sixty-four, increases to 53 percentage points at ages sixty-five to sixty-nine, and is reduced to about 44 percentage points at ages seventy to seventy-four. For women, additional work capacities are much lower at all ages.

The interpretation of the results is not quite straightforward. The calculations ignore the potential effect of work on health. The literature on the effect of retirement on health is not clear cut, although in our reading of the literature retirement is probably beneficial for one's health (Kalwij, Knoef, and Alessie 2013; Coe and Zamarro 2011; Bloemen, Hochguertel, and Zweerink 2013; Kuhn, Wuellrich, and Zweimueller 2010; Hernaes et al. 2013). By the same token, this would suggest that (at least for some occupations) working longer may have a negative effect on health. This possibility has implications for both the Milligan-Wise and the Cutler-Meara-Richards-Shubik methods, and as well the third method that combines both approaches. To see why, consider both approaches one by one.

Assume for the sake of argument that retirement (or rather not working) is good for health. The Milligan-Wise approach is based on keeping health (or rather mortality) constant and then calculating how much one can work. Imagine as a counterfactual that individuals keep working and their health deteriorates as a result (possibly at an increasing rate when one gets older). By the logic of that approach, their work capacity will fall and hence the additional capacity will be less than forecast. One can also make the same point in a different way. Suppose that the decrease in mortality observed over the last couple of decades is largely the result of the fact that people have been able to work less. Then, inducing them to go back to work would increase mortality again. We do not consider the latter case likely, but it seems reasonable to assume that estimated additional work capacity is an upper bound of the real additional work capacity for the reasons given.

The argument with respect to the Cutler-Meara-Richards-Shubik approach is similar. This approach relates work at ages fifty to fifty-four to observed employment and then uses that to forecast employment based on observed health at later ages. If individuals would actually work at these later ages and their health were to deteriorate as a result, predicted additional work capacity would be less than predicted. Thus, also in this case, it may be safe to take the estimates as upper bounds on true additional work capacity.

As we have argued in section 8.5, even if work has no negative effect on health, the Cutler-Meara-Richards-Shubik approach is very likely a severe overestimation of additional work capacity. This comes about because some of the subjective variables hardly vary with age, so that the approach essentially assumes that people at all ages have the same work capacity. The more objective variables vary more with age, but their predictive value for work at

fifty to fifty-four is reduced due to measurement error and potential reporting bias (e.g., of ADLs). So if the latter variables deteriorate with age, their predicted effect on employment is attenuated.

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