Health Capacity to Work at Older Ages: Evidence from Italy

Agar Brugiavini, Ca’ Foscari University of Venice
Giacomo Pasini, Ca’ Foscari University of Venice and Netspar
Guglielmo Weber, University of Padova

June 30th 2015

Abstract:
Public programs that benefit older individuals, such as Social Security, may be changed in the future in ways that reflect an expectation of longer work lives. But do older Italians have the health capacity to work longer? This paper explores this question by asking how much older individuals could work if they worked as much as those with the same mortality rate in the past or as much as their younger counterparts in similar health. Using both methods, we estimate that there is significant additional capacity to work at older ages. We also explore whether there are differences in health capacity across education groups and whether health has improved more over time for the highly educated, using education quartiles to surmount the challenge of changing levels of education over time.

Acknowledgements:
This paper is part of the National Bureau of Economic Research’s International Social Security (ISS) Project, which is supported by the National Institute on Aging (grant P01 AG012810). The authors are indebted to Raluca Elena Buia for excellent research assistance. We also thank the members of the other country teams in the ISS project for comments that helped to shape this paper.

Population ageing in Italy poses some important challenges to the public pension system for three reasons: first, Italian public debt is particularly high (over 130% of GDP) given the low growth experienced in recent years; second, Italy has a low fertility rate, around 1.4 (its population is ageing from below); third, Italians life expectancy is among the highest in the world, and rising fast (its population is ageing from above). Given that the public pension system is fundamentally a PAYG system, this combination calls for a substantial increase in labor force participation at all ages (see Brugiavini and Peracchi, 2012). Part of this increase may be obtained by encouraging female labor force participation (that is still relatively low in Italy compared to the US, the UK or Northern Europe), and part may be achieved by drawing in foreign workers (who compensate for aging from below). But ageing from above calls for longer working lives – and the very low average effective retirement ages experienced in Italy until the end of last century suggest there are major gains to be achieved by moving in this direction.

In the light of the above it is not surprising that the public debate has focused on how to increase labor supply of workers in the age group 50 to 65 both by changing the incentives to retirement and by introducing tighter conditions to be eligible for a public pension. Pension reforms have been implemented over the last three decades including a radical reform that was introduced in 2011 to ensure sustainability of public debt.

Given that longevity is rising steadily an issue is whether older individuals will and can indeed work. In Italy as in many other countries there are numerous potential obstacles to longer working lives from the labor demand side. In a country with highly unionized labor markets and seniority based pay-scales it is common for older workers to be paid more than younger workers even though they are not necessarily more productive The recent reforms, which significantly postponed retirement for several workers without offering an easy transition out of the labor force, have made very clear that for older workers it can be very difficult to find work following a job loss. After the 2011 pension reform that raised minimum retirement age for some by a wide margin, several workers who had agreed on a separation from the firm expecting to shortly retire on a public pension fell into long-term unemployment. Hence labor demand conditions should be kept in mind when discussing the potential for extra employment related to the widely noted “unused capacity”. As pointed out by Brugiavini and Peracchi 2015, obviously health conditions also need to be taken into account and measured properly before drawing any conclusions on potential labor supply.

This chapter explores whether older Italians have the health capacity to extend their working lives.   As in other chapters, we use two methods to assess the capacity to work at older ages. The first method   proposes a counterfactual approach where the working capacity of workers characterized by a given mortality rate today is compared with the working capacity of people with the same mortality rate looking back in the past. The relevant relationship is described by graphical evidence of the employment rate versus the mortality rate over time, using data from the National Institute for Statistics (ISTAT), Eurostat and the Human Mortality Database from 1977 to 2010 (Milligan and Wise, 2012a). For this analysis we focus on men, as steadily increasing rates of women’s labor force participation over time make it difficult to interpret the results for women.

The second method exploits cross-sectional variability: if people with a given level of health were to work as much as their younger counterparts in similar health, how much could they work? (Cutler et al. 2012). We use data from the Survey on Health, Ageing and Retirement in Europe (SHARE) to estimate the relationship between health and employment for a sample of younger males and females, age 50 to 54, and use these estimates along with the actual characteristics of older individuals, age 55 to 74, to project the latter's capacity to work conditional on health.

An important objective of this Chapter is to uncover the actual determinants of the labor supply behavior of older Italians: health capacity to work may vary by education group. We first conduct the Cutler et al. analysis separately by education group and then show how self-assessed health has evolved over time by education. We take into account that average levels of education are rising over time by relying on education quartiles.

Our results suggest that there exists a "reserve" of additional health capacity to work at older ages, depending on the methodology and the base year this varies substantially. For the Milligan-Wise method, the amount of projected additional work capacity would be 7.4 years if we use the employment-mortality relationship that existed in 1977 as a basis for comparison and 2.6 years if we use 1995 as the base year instead. However, it should be stressed that this method implicitly assumes that all gains in life expectancy can translate into longer work lives. For the Cutler et al. method, we estimate that an additional fifty seven percent of men aged 60 to 64 and thirty-seven percent of women of the same age could be employed, relative to the share working today, based on their own health and the estimated relationship between health and employment for younger workers. Figures are even higher for older age groups, but estimates of this work gap are likely to be largely affected by the existence of a statutory retirement age at 65 (that has risen to 66 in 2015, and will rise further along with life-expectancy). We find similar estimates of work capacity across education groups for men and higher work capacity for more educated women.

The chapter is organized as follows: we first provide some brief background on trends in labor force participation and health in Italy; we then outline our methodology and present the results we obtain using our two main methods; finally we report the results of our estimation of changes in health over time by education group and discuss the findings.

I. Trends in Labor Force Participation and Health

The labor force participation rate for Italian men and women aged 55-64, though consistently lower than in U.S. and other developed countries, followed the same pattern in the last 35 years, as evident from Figures 1 and 2. For men age 55 to 64, participation fell from 60 percent in 1977 to a low of 42 percent in 2001 before rising again and reaching 56 percent by 2013. Labor force participation trends for women in the same age range look very different than those for men. Employment rates for women aged 55-64 remained constant around 14-15 percent until 2000, when it started to increase substantially reaching 34.7 percent in 2013, a threefold increase. Vice versa, employment rates of 65+ declined over the same period: 13.1 percent of men aged 65+ and 3.5 percent of women of the same age range where employed in 1977, the figures went down to 6.2 and 1.5 respectively in 2013. Reforms that interested the Italian Pension system since 1993 reduced substantially the incentives to retire early embedded in the pre-existing pension system, but this shift towards longer working life did not affect the 65+, despite the historically high life expectancy in Italy.

Figure 3 presents trends in mortality and health for men ages 50 to 75 over the past four decades, based on authors' calculations from the General Household Survey (ISTAT-Italian National Statistical Bureau Survey "Multiscopo") and the Human Mortality Database. This figures shows the well-known age gradient in mortality as well as the general trend over time towards lower mortality rates, which is quite remarkable in Italy. In 1990-94, men age 60 experienced an annual mortality rate of one percent, in the 2005-09 period, that mortality rate is not reached until age 65. Similarly, men age 68 in 1990-94 had a mortality rate of two percent, a rate that applied to men age 72 in 2005-09. , Improvements in self-assessed health (SAH) are not so evident from the figure, probably because the data is noisier and the time span is not long enough to appreciate such a change: unfortunately there are no population wide surveys in Italy where SAH is recorded earlier than 1993. Moreover, the Self Assessed health question changed from the 2008 wave: the 1 to 5 Likert scale was reversed and re-labeled. As a result, the ISTAT General Household Survey reports lower average SAH in more recent cohorts: roughly 40 percent of men age 60 report themselves to be in fair or poor health in 1995-99; in 2005-09, 40 percent of men aged 58 report to be in fair/poor health (at 60, 45 percent are in fair/poor health in these later periods). Looking at yearly data rather than 5-year aggregates, there is a clear shift from 2008 onwards towards fair and poor health due to the question change. Improvement in SAH are therefore underestimated compared to other studies in this volume.

A first general conclusion which can be drawn from Figure 3 is that that in Italy – as in many other countries - health deteriorates with age and that health (or at least life expectancy as recorded in the Human Mortality Database) at any given age has improved over time, while Figure 1 shows that older men's labor force participation fell until the beginning of 2000s and has been rising since then. In the analysis that follows, we effectively bring together these trends in labor force participation and health as we explore how much individuals today could work based on the employment-mortality patterns experienced by previous cohorts. .

II. Estimating Health Capacity to Work Using the Milligan-Wise Method

The first set of results builds on the methodology developed in Milligan-Wise (2012a) which looks at the relationship between mortality and employment that existed at an earlier point in time along with current mortality data to generate an estimate of individuals' ability to work at older ages. The counterfactual experiment is based on the idea that, other things being equal, in principle people today could work as much as people with the same mortality rate worked in the past. While mortality is not the best health measure to relate to productivity, it has several advantages: it is defined consistently across countries, data on mortality is available over a long period of time, for the entire population at single ages for single years. Since general data limitations on health are particularly severe in Italy, the measures of health-work capacity derived from mortality experienced by the Italian population are of special interest in this volume.

The mortality data used for this analysis comes the Human Mortality Database, the employment data is from two sources: the MARSS database provided by ISTAT for the period 1977-2003 and Eurostat from 1983 until 2012. Despite the different databases, figures 1 and 2 shows how the common periods overlap almost perfectly. The reason is that both datasets are based on the Labour Force Survey, therefore linking the two series is an innocuous assumption, which allows us to consider the period 1977 through 2010, with the start year chosen to correspond to that used in Milligan and Wise (2012a). The analysis is quite straightforward, as it requires mapping an employment-mortality curve, which displays the employment rate at each level of mortality for a given year, then repeating this for other years and making some calculations based on comparisons of the different curves. As noted earlier, we conduct this exercise for men only, as the large increases in women's labor force participation over time make it difficult to interpret the results for women.

Our approach is illustrated in Figure 4, which plots the employment-mortality curve for men in 2010 and in 1977. In 2010, the one-year mortality rate for 55-year-old men was about 0.5 percent, and the employment rate at this age was 82 percent. In 1977, 47-year-old men had a mortality rate of 0.5 percent. This reflects the mortality improvements over time discussed in the previous section. In 1977, the labor force participation for 47-year-olds was 94 percent. Thus, if men in 2010 had the same employment rate as did men in 1977 with the same mortality rate, the employment rate of 55 year-olds would have been 12 percentage points higher, 94 percent instead of 82 percent.

In Table 1, we extend this exercise through age 69, asking how much more men in 2010 could have worked over the age range 55 to 69 if they had worked as much as men with the same mortality rate worked in 1977. At age 55, an additional 12 percent of men could have worked, which generates an average 0.12 additional work years. At age 56, an additional 16 percent of men could have worked for an additional 0.16 work years. Repeating this analysis at each subsequent age through age 69 and cumulating the amounts, we arrive at a total potential additional employment capacity of 7.4 years. This is equivalent on the graph to integrating between the two curves from one vertical line to the next. As the average amount of employment between ages 55 and 69 in 2010 is 5.3 years, an additional 7.4 years would represent a massive 139 percent increase over the baseline years of work.

It is worth noting that this method implicitly assumes that all mortality gains can translate into additional work capacity. This may not be the case if workers are living longer but are not in good health in those additional years of life. The relationship between mortality and morbidity changes over time has been the subject of a number of recent studies. As noted above in Figure 3, we find that the share of individuals reporting themselves to be in fair or poor health at a given age has been steadily increasing over time.

A second concern is that an additional year of life does not necessarily translate into a full additional year of work. If we use the same benchmark as in other chapters, whereby the share of life spent in work should be two thirds of total life, one could multiply the figure above by two-thirds, arriving at an estimate of 4.9 years rather than 7.4 years (for simplicity, we do not make this conversion for the numbers reported below).

Another issue that arises in implementing this method is the choice of year to use for comparison to the present. In Figure 5, we replicate the analysis from Figure 4 but use 1995 as a comparison year rather than 1977. At every age, the mortality rate is lower in 2010 than in 1995, consistent with earlier discussions. However, employment rates are higher in 2010 than in 1995 – at age 62, for example, the employment rate was 30 percent in 2010 vs. 28 percent in 1995. Although employment at a given age has increased over time, it has not increased by enough to keep up with mortality increases, and for that reason the 1995 employment-mortality curve still lies above that for 2010, but the gap between the two curves is less than that between the 2010 and 1977 curves. Using 1995 as the comparison year, the estimated additional employment capacity from ages 55 to 69 is 2.6 years, which is substantially smaller than the estimate of 7.4 years that we obtain when we use 1977 as the comparison year.

In Figure 6, we show the estimated additional employment capacity as a function of the base year used. For base years close to 2010, the estimated additional employment capacity is small, as we are essentially asking, if men with a given mortality rate in 2010 worked as much as men with the same mortality rate did in, say, 2008, how much would they work; the difference between the two years is not large because neither mortality nor employment changes much over a short period of time. But as shown in the 1995 and 1977 examples, when we look back over a longer period of time, the estimated additional capacity is much larger. This is both because mortality has improved over time, as the 1995 example illustrates, and because employment rates today are lower than they were in the late 1970s and early 1980s (though higher than in the mid-1990s), as seen in the 1977 example.

To sum up, our estimates based on the Milligan-Wise method suggest a significant amount of additional work capacity for Italy, particularly if we take the 1970's as a benchmark. We estimate that the additional capacity from ages 55 to 69 is 7.4 years using the 1977 employment-mortality curve as a point of comparison, or 2.6 years using 1995 as the base year. To change the assumption that an additional year of life expectancy translates into an additional year of work capacity, one can apply a fractional factor to these estimates – using the logic that the share of life spent in work and retirement should remain roughly constant, for example, might suggest multiplying these values by two-thirds.

This method is also informative about the ability of older individuals to work at specific ages. This can be seen from Table 1, using 1977 as the comparison year. This analysis suggests that at ages 60-64, an additional 58 percent or so of men could be employed (as the table indicates that an additional 55.4 percent could be working at age 60, an additional 53.5 percent at age 61, an additional 57.8 percent at age 62, etc.); at ages 65-69, an additional 61.3 percent or so of men could be employed. These estimates can be compared to the results we generate using the next method.

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

We now turn to the second method of estimating health capacity to work, following Cutler et al. (2012). In this method, we address the following question: if older individuals in a given state of health worked as much as their younger counterparts, how much would they work? Implementing this method involves a two-step process. First, we run regressions to estimate the relationship between health and employment, using a sample of workers young enough that their employment decisions should not be affected by the availability of Social Security (public pension) benefits. We choose to focus on workers age 50-54, who are still many years away from old age pension eligibility and should also be too young to qualify for early retirement schemes: the age 54 cutoff is chosen for comparability with the other studies in this volume, even though a small selection of workers in Italy would in the past qualify for early retirement pensions even in their early 50s. For the second step, we combine the regression coefficients along with the actual characteristics of individuals aged 55 to 74 to predict the older individuals' ability to work based on health.

The data used in the analysis is the Survey of Health, Ageing and Retirement in Europe (SHARE). SHARE began in 2004 as a longitudinal study of individuals aged 50+ and their partners, with biannual interviews; in the years since, the study has been refreshed with younger cohorts in order to provide a representative survey of individuals above age 50. Currently data through 2012 (wave 5) is available; we use data from waves 1-2 and 4-5 in the baseline analysis, since wave 3 is a retrospective interview and does not allow to evaluate health transitions from wave 2 to wave 4. SHARE is ideally suited for a study such as this one because of the rich data on health, as well as data on employment and demographics. We use a sample of 573 male and 929 female person-year observations for the regressions; a further 4252 male and 4963 female person-year observations are used in our simulations of work capacity.

As in all other chapters, we estimate regressions of the following form:

$$Employment_i = \beta_0 + \beta_1 health_i + \beta_2 X_i + \varepsilon_i$$

where *employment* is a dummy equal to 1 if the individual is employed and *health* is a comprehensive set of health measures, including dummy variables for self-reported health status, limitations on physical activity, limitations on activities of daily living (ADLs) and instrumental activities of daily living (IADLs), individual health conditions, being over- or underweight, and being a current or former smoker. We also include variables for educational attainment and marital status. We estimate this equation as a linear probability model.

We estimate an alternative version of this regression model where the full set of health variables is replaced by a single health index value, as put forward in Poterba et al. (2013). The idea is to construct a health index based on 24 items, including self-reported health diagnoses, functional limitations, medical care usage, and other health indicators. To do so, one first obtains the first principal component of these indicators, which is the "weighted average of indicators where the weights are chosen to maximize the proportion of the variance of the individual health indicators that can be explained by this weighted average." The estimated coefficients from the analysis are then used to predict a percentile score for each respondent, referred to as the health index. An individual's health index value typically will vary by survey wave, as updated health information is incorporated.

It is worth noting some of the key assumptions underlying our analysis. First, we assume that there are no unmeasured or omitted dimensions of health. If there were, health might be declining more rapidly with age than reflected in the health variables we have, and our estimates of ability to work at older ages could be overstated. We address this concern by including a comprehensive set of health variables, as well as by using a health index that is likely a good reflection of overall health. Second, our approach implicitly assumes that the health-employment relationship that exists for younger individuals (age 50-54) is the same as that for older individuals (age 55-74). For example, if younger workers were concentrated in white collar jobs and older workers in blue collar jobs, then it might be easier for a younger worker with a health problem to continue working than it would be for an older worker with the same health issue; this would lead us to overstate the ability of older individuals to work. Finally, if there is a large amount of "discretionary" (non-health-related) retirement among our sample of younger individuals, we would estimate a lower health capacity to work than what might actually exist. We have chosen a relatively young sample for the estimation to try to avoid this problem.[1] There are other assumptions underlying our analysis, which we made mainly in other to improve efficiency of the estimates, or are specific to the Italian dataset. We will discuss them in detail at the end of this section.

Summary statistics for the male and female samples are shown in Tables 2a and 2b. The share of men that is employed falls from 85 percent at ages 50-54 to 65 percent at ages 55-59, 27 percent at ages 60-64, 5 percent at ages 65-69, and 2 percent at ages 70-74. Employment rates for women are 56 percent at ages 50-54, 37 percent at ages 55-59, 11 percent at ages 60-64, 2 percent at ages 65-69, and negligible at ages 70-74. The health measures show a decline in health with age. The share of men in fair or poor health rises from 16 percent at ages 50-54 to 45 percent at ages 70-74. Values for women are similar but slightly higher, 24 percent at ages 50-54 and 59 percent at ages 70-74. This reflects the known result that women live longer but report themselves to be in worse health.

Turning to some of the other health measures, the share of men with more than one limitation on physical activity rises from 22 percent at ages 50-54 to 51 percent at ages 70-74, while values for women are somewhat higher, 34 percent at ages 50-54 and 73 percent at ages 70-74.[2] The share of individuals with limitations in ADLs rises from 3 percent to 10 percent for men across the five age categories, and from 3 to 14 percent for women; the share with limitations in IADLs shows a similar trend, rising from 2 to 12 percent for men and from 6 to 22

[1] We also acknowledge that health may be endogenous in the regressions we run, if employment status has a causal effect on health.

[2] The full set of activities includes: 1. Walking 100 meters 2. Sitting for about two hours 3. Getting up from a chair after sitting for long periods 4. Climbing several flights of stairs without resting 5. Climbing one flight of stairs without resting 6. Stooping, kneeling, or crouching 7. Reaching or extending your arms above shoulder level 8. Pulling or pushing large objects like a living room chair 9. Lifting or carrying weights over 10 pounds/5 kilos, like a heavy bag of groceries 10. Picking up a small coin from a table.

percent for women.[3] Finally, the share of individuals with diagnosed medical conditions also rises with age. Back pain and high blood pressure are the most common ailments, rising for men from 31 and 21 percent at ages 50-54 to 40 and 46 percent at ages 70-74. Potentially more serious health conditions such as cancer and stroke also rise with age. The relevance of these statistics for our analysis is that they show that health deteriorates with age, so if our regressions suggest a strong relationship between health and employment, then the predicted share of individuals that is employed (estimated in the second step of our analysis) will decrease with age, as health declines.

Tables 3a and 3b display estimated regression parameters for the all health variables and health index versions of our model, respectively. Table 3a shows that there are statistically significant effects of some health variables on employment. For example, relative to men in excellent health, men in poor health are 39 percentage points less likely to be in employment. Some of the individual health conditions are associated with statistically significant decreases in the probability of employment of up to 32 percentage points, such as having experienced a heart attack or a stroke.

In the version of the model with the health index, Table 3b, the index is a statistically significant determinant of employment. Results from other papers in this volume confirm that the index functions well as a summary statistic for health. This evidence, coupled with the lack of significance of most of the health conditions in Table 3a, lead us to focus on the results from Table 3b in the discussion below.

[3] ADLs include: dressing, walking across the room, bathing, eating, and getting in/out of bed; IADLs include managing meals, groceries, and medication.

In Table 4, we report the results of our simulation exercise. This table shows, for men and women in 5-year age groups from age 55 to 74, the actual and predicted shares employed (the latter calculated as described above by combining the coefficients from the regression analysis and the characteristics of these individuals), and the difference between these, which we term the “estimated additional work capacity”. For ease of exposition, key values are also reported in Figure 9 and 10. Focusing on the health index results, we predict the share of men employed to be 86 percent at ages 55-59, 84 percent at ages 60-64, 81 percent at ages 65-59, and 80 percent at ages 70-74. These projections decline with age because health declines with age and our regression coefficients reflect a strong association between health and employment. However, the share of men that is actually working declines much more quickly with age than do our predictions, from 65 percent at ages 55-59 to 26 percent, 5 percent, and 2 percent in the older age groups. As a result, we estimate that additional capacity to work is substantial and rising sharply with age, from 21 percent at ages 55-59 (based on the fact that we predict that 86 percent of men will work but only 65 percent do) to 58 percent at ages 60-64, 77 percent at ages 65-69, and 70-74. Results using the model including the full set of health variables independently instead of the health index are quite similar. In terms of the results for women, both the predicted and actual share working are substantially lower than those for men, while the estimated work capacity numbers are lower in absolute terms and fairly constant but for the lower age group: 15 percent at ages 55-59, 38 percent for ages 60-64, around 44 percent across the other age groups.

It is useful to compare these results to those obtained using the Milligan-Wise method, where the analysis (done for men only) suggested that employment could be about 58 percentage points higher at ages 60-64 and about 61 percentage points higher at ages 65-69 if people today worked as much as people with the same mortality rate worked in 1977. These values are comparable to the 58 and 77 percent numbers found here. Given how different the two methods employed in this paper are, it is striking that they generate results of roughly similar magnitude, at least for ages up to 65.

Our estimates reflect population averages, and may mask substantial heterogeneity in the ability to work longer. In particular, less educated and lower income individuals may have less potential to extend their work lives because they are in worse health or have jobs where employment is more sensitive to health status. In the case of the Milligan-Wise analysis, it is unfortunately not possible to explore how the employment-mortality relationship has changed over time by education group or income group because Italian mortality records do not include that information. Bohacek et al (2015) use SHARE to estimate the education gradient in mortality dividing education level in to “low educated” and “high educated”. Despite the low sample sizes, results for countries where mortality records are available by educational level are consistent across the different data sources. As regards Italy, the authors find a relatively small education gradient for Italian men, and a somewhat larger premium for women

For the present analysis, however, we can estimate work capacity separately by education. We re-estimate the regression model separately by education group, which allows the relationship between employment and health to differ by education group – as might be the case, for example, if workers with less education are concentrated in blue-collar jobs where it is more difficult to continuing working once one experiences a health problem than it would be in the white-collar jobs held by more highly-educated workers.[4]

Our simulations of work capacity by education group are shown in Tables 5a and 5b and in Figures 11 and 12. Unfortunately, data limitations force us to define only two education groups: less than high school, and high school degree or more. The actual and predicted share working varies substantially by education group – for example, the actual and predicted share working among men ages 55-59 are 78 and 92 percent for those with a high school degree vs. 54 and 81 percent for less than high school. These differences lead to an estimated additional work capacity for men at ages 55-59, which is 13.6 percent higher for the poorly educated. There is no additional capacity in the 60-64 age group, while the sign of the difference is inverted for the older age groups: estimated work capacity is 9 percent higher for the more educated in the 65-69 and 11 percentage points higher for the 71-75. For women, there is a 1 percentage point difference by education level in the estimated work capacity in the younger age group: the less educated women aged 55-60 have an estimated work capacity of 15 percent, while the more educated of 14 percent. The difference in this age group, as in all the others, is on the level of both actual and predicted employment: among the women aged 55-59, 23 percent of the less educated are actually working versus 62 percent of the more educated. The predictions are 38 percent and 76 percent respectively. As we move to older age groups, actual employment rates fall while predicted employment rates remain basically constant in both education groups. The estimated work capacity rises first at 32 percent and

[4] We also generate results by education in a simpler way, continuing to use a common set of regression coefficients for all education groups but reporting the actual share working, predicted share working, and estimated additional work capacity separately by education group. The results of this exercise, which are shown in Tables 6a and 6b, are qualitatively similar to those in Tables 5a and 5b.

then stabilizes at 37 percent for the less educated, aged 60-64, 65-70 and 71-75 respectively, while it is 54 percent, 70 percent and 74 percent among the more educated in the three age corresponding age groups

As we mentioned earlier, the estimates we used to simulate work capacity of older cohorts are based on assumptions common to the other contributions of this book, and some additional assumptions specific to the Italian data. First and foremost, we pooled data from 2004, 2006, 2010 and 2012 to obtain a sample large enough to compute reliable estimates. The underlying assumption is that the relation between health and retirement decision remains constant over time. A first concern relates to Self-Assessed health, which is included both as an explanatory variable and as a component of the health index.: Since he subjective evaluation of own health may vary with age , the relation between self reported health and employment varies over time (waves). Hence we estimated both versions of the model excluding self-assessed health from the set of regressors: work capacities are virtually unaffected compared to the reported results. Yet, a second concern related to the choice of pooling data from different waves is that the economic crisis may have changed the relation between health and retirement for individuals aged 50-54 in 2010 and 2012. Therefore, we re-estimated the model based only on the pre-crisis period (waves 1 and 2). The sample size reduces dramatically: the regressions (reported in table A1) are run with at most 262 observations for males and 413 for females. This reduction leads to a loss of significance of the PVW health index, but in the regression which includes all health conditions taken separately most of the regressors which were significant in table 3a are still significant. Turning to estimated work capacity , using only waves 1 and 2 leads to flatter profiles by age: as an example, in the baseline estimations we estimated a 22 percent excess work capacity for males aged 55-59 using the PVW index estimations, rising to 58, 76 and 77 percent for the 60-64, 65-69 and 70-74 ages. Using only pre-crisis data, the figures are 32 percent, 62 percent, 75 and 77 percent respectively. A similar picture emerges looking at women, splitting by education or moving to estimates obtained including all health variables (tables A2 and A3).

The difference in estimated work capacity using only the first two waves may be attributed either to the changed economic conditions or to differential labor force participation across cohorts. The surge of the economic crisis may have induced individuals to postpone retirement and stay longer in the labor market, thus the observed higher estimated unused capacity observed when limiting the analysis to the pre-crisis sample can be the result of a lower average labor force participation. Such an effect is not separately identifiable from a cohort effect induced by the sampling scheme of SHARE: waves 4 and 5 include a refresher sample, which allows the survey to be representative of the entire over 50 European population in each interview year. As the panel sample ages, the new observations are mainly individuals from younger cohorts with a higher labour. Again, limiting the analysis to waves 1 and 2 leads to a lower average labour force participation. Finally, a third explanation is that the difference in estimated work capacity observed restricting the sample to waves 1 and 2 may simply reflect a lack of precision due to the limited sample size. In order to rule out the latter , we pooled samples of individuals from all SHARE countries observed in waves 1 and 2, we ran the same regression including a full set of country fixed effects, and obtained simulations for

Italy based on these estimates. Estimated work capacity are by and large unchanged compared to the estimates obtained using only the small Italian sample of waves 1 and 2.

A second point that may be particularly relevant for Italy is that the estimation sample includes individuals who never worked in their lives. Those individuals never faced a retirement decision, but they can define themselves as retired. The relation between health and being "retired" can be very different for this subset of individuals. While this is a negligible fraction of the surveyed population in United States, a substantial proportion of Italian women in the relevant cohorts never participated in the labor force. Excluding these women reduces the sample from 929 to 704 observations (table A4). The difference in sample size is much more limited for males. Excluding individuals who never worked allows us to include occupational dummies in the regression. Occupational dummies turn out to be significant for women, not for men. Nevertheless, the higher education dummy loses statistical significance in this specification for women. The PVW index, though still significant, is now estimated less precisely. Looking at table A5, we can observe that estimated work capacity for males is virtually unchanged, while it is substantially higher for older cohorts of women.

The overall impression is that our baseline estimates lead to conservative estimates of work capacity compared to alternative sets of results which account for the specific characteristics of Italy.

IV. Changes in Self-Assessed Health by Education Level Over Time

In this section, we show how SAH has evolved over time for those with different levels of socioeconomic status (SES) in Italy. We follow standard practice and use education as an indicator of life-long SES, and account for cohort differences in educational attainment by relating individual education to that of individuals born in the same year.

Figure 13 shows the distribution of educational attainment by birth cohort; data for men and women are aggregated in the figure, because results are similar for each sex. For cohorts reaching age 50 in 1995 (born in 1945), the median individual had a middle school degree and more than 75 percent of individuals had less than a high school education. This changes rapidly over time. By 2005, the median 50-year-old is still at the middle school level, but more than 40% of the individuals in the same cohort have a high school degree.

The horizontal lines on Figure 13 show how the education quartiles are defined. For the 1995 cohort of 50-year-olds, for example, the lowest quartile includes all of those with no or primary school education. The next quartile includes the rest of the primary school group and some of the middle school graduates. The 3rd quartile largely consists of those with a middle school degree, while the top quartile includes the remainder of high school graduates and everyone with some college or more education. In the 2005 cohort of 50-year-olds, the lowest quartile includes some middle school graduates and everyone with primary school, while the third quartile includes only vocational training and high school graduates. The key point is that the educational composition of the population changes over time, even in a relatively short time window as the one we consider. That is why we focus on education quartiles to have a consistent measure of the less and more educated.

In Figure 14, we plot the share of individuals who report themselves to be in fair or poor health by age for two different time periods, 1993-1999, and 2000-2007, separately by education quartile. The data for these figures comes from the ISTAT General Household Survey, and are aggregated over seven years for greater precision. The familiar negative relationship between age and health is evident from the figures, as is the fact that health is better among the higher education quartiles. What interests us particularly is the evolution of SAH over time across education quartiles. In the case of Italy, we do not find significant improvements in health over time in any educational quartile, but for older individuals in the first education quartile. This may be due to the relatively short time-period that we have data for: ISTAT General Household Survey report data on Self assessed health covering the period 1993-2012, but in the 2008 questionnaire the question changed limiting the comparable data to fourteen years in all, from 1993 until 2007.

V. Discussion and Conclusion

The Italian public pension system has undergone several reforms over the past quarter century aimed at increasing the effective retirement age and make the whole system of support to the older population sustainable in both short and long run. One of the features of these reforms has been an explicit link of public pension eligibility to life expectancy, on the assumption that working lives can be extended at a similar pace as longevity increases . Critics of these reforms have claimed that work beyond a certain age is made hard or even impossible by health deterioration and other physical impediments (such as limited mobility).

In this chapter we have used data from different sources (official statistics, Italian statistical office surveys as well as the Italian component of the Survey on Health, Ageing and Retirement in Europe) to assess the validity of this widely voiced criticism to the goal of longer working lives.

First of all, we have assessed how much individuals could work now if people with a given mortality rate today worked as much as those with the same mortality rate in the past. Next we have estimated how much individuals could work, if older individuals with a given health status worked as much as their younger (50-54) counterparts with the same health status. Both methods suggest substantial additional work capacity, of the order of a potential employment increase of 56-58 percent of the population at ages 60-64 and of 61-69 percent at ages 65-69. We have investigated the heterogeneity of work capacity, and found greater work capacity among more educated individuals as compared to the less educated, at least for individuals aged 60 or more.

References

Bohacek, R, L. Crespo, P. Mira and J Pijoan-Mas (2015) "The Educational Gradient in Life Expectancy in Europe: Preliminary Evidence from SHARE", in Börsch-Supan, A., H. Litwin, M. Mych and G. Weber (Eds.). First results book for the fifth wave of SHARE. Berlin: De Gruyter.

Bosworth, B. P. and K. Burke (2014). "Differential Mortality and Retirement Benefits in the Health and Retirement Study," Brookings Institution working paper.

Bound, John, Arline Geronimus, Javier Rodriguez, and Timothy A. Waidmann (2014). "The Implications of Differential Trends in Mortality for Social Security Policy," Michigan Center for Retirement Research Working Paper 2014-314.

Bound, John and Timothy Waidmann (2007). "Estimating the Health Effects of Retirement," Michigan Retirement Research Center working apper 2007-168.

Brown, Jeffrey R., Jeffrey B. Liebman, and Joshua Pollet (2002). "Appendix: Estimating Life Tables That Reflect Socioeconomic Differences in Mortality," in *The Distributional Aspects of Social Security and Social Security Reform*, Martin Feldstein and Jeffrey B. Liebman, eds. Chicago: University of Chicago Press.

Charles, Kerwin (2004). "Is Retirement Depressing? Labor Force Inactivity and Psychological Well-Being in Later Life," *Research in Labor Economics* 23: 269-299.

Congressional Budget Office (2010). *Social Security Policy Options.* Washington, D.C.

Crimmins, Eileen M., Mark D. Hayward, Aaron Hagedorn, Yasuhiko Saito, and Nicolas Brouard (2009). "Changes in Disability-Free Life Expectancy for Americans 70 Years Old and Older," *Demography* 46(3):627-646.

Crimmins, Eileen M. and Hiram Beltran-Sanchez (2010). "Mortality and Morbidity Trends: Is There Compression of Morbidity" *Journal of Gerontology: Social Sciences* 66B(1):75-86.

Cutler, David M., Ellen Meara, and Seth Richards-Shubik (2012). "Health and Work Capacity of Older Adults: Estimates and Implications for Social Security Policy," mimeo.

Cutler, David M., Kaushik Ghosh, and Mary Beth Landrum (2014). "Evidence for Significant Compression of Morbidity in the Elderly U.S. Population," in *Discoveries in the Economics of Aging*, David A. Wise, ed. Chicago: University of Chicago Press.

Hellerstein, Judith K., David Neumark, and Kenneth R. Troske (1999). "Wages, Productivity, and Worker Characteristics: Evidence from Plant-Level Production Functions and Wage Equations," *Journal of Labor Economics* 17(3): 409-446.

Johnston, David W. and Wang-Sheng Lee (2009). "Retiring to the Good Life? The Short-Term Effects of Retirement on Health," *Economic Letters* 103(1):8-11.

Lahey, Joanna N. (2008). "Age, Women, and Hiring: An Experimental Study," *Journal of Human Resources* 43(1):30-56.

Milligan, Kevin S. and David A. Wise (2012a). "Health and Work at Older Ages: Using Mortality to Assess the Capacity to Work Across Countries," NBER Working Paper 18229.

Milligan, Kevin S. and David A. Wise (2012b). "Introduction and Summary," in *Social Security Programs and Retirement Around the World: Historical Trends in Mortality and Health, Employment, and Disability Insurance Participation and Reforms*, David A Wise, ed. Chicago: University of Chicago Press.

Munnell, Alicia H. (2015). "The Average Retirement Age – An Update," Center for Retirement Research at Boston College Issue Brief Number 15-4, March.

National Commission on Fiscal Responsibility and Reform (2010). *The Moment of Truth: Report of the National Commission on Fiscal Responsibility and Reform*. Washington, D.C.: White House.

Olshansky, S. Jay, Toni Antonucci, Lisa Berkman, Robert H Binstock, Axel Borsch-Supan, John T Cacioppo, Bruce A Carnes, Laura L Carstensen, Linda P Fried, Dana P Goldan, James Jackson, Martin Kohli, John Rother, Yuhui Zheng, and John Rowe (2012). "Differences in Life Expectancy Due to Race and Educational Differences Are Widening and Many May Not Catch Up," Health Affairs 31(8):1803-1813.

Poterba, James, Steve Venti, and David A. Wise (2013). "Health, Education, and the Post-Retirement Evolution of Household Assets," paper prepared for the RAND Conference on Health, Aging, and Human Capital.

Snyder, Stephen E. and William N. Evans (2006). "The Effect of Income on Mortality: Evidence from the Social Security Notch," *The Review of Economics and Statistics* 88(3):482-495.

Waldron, Hilary (2007). "Trends in Mortality Differentials and Life Expectancy for Male Social Security-Covered Workers, by Socioeconomic Status," *Social Security Bulletin* 67(3).

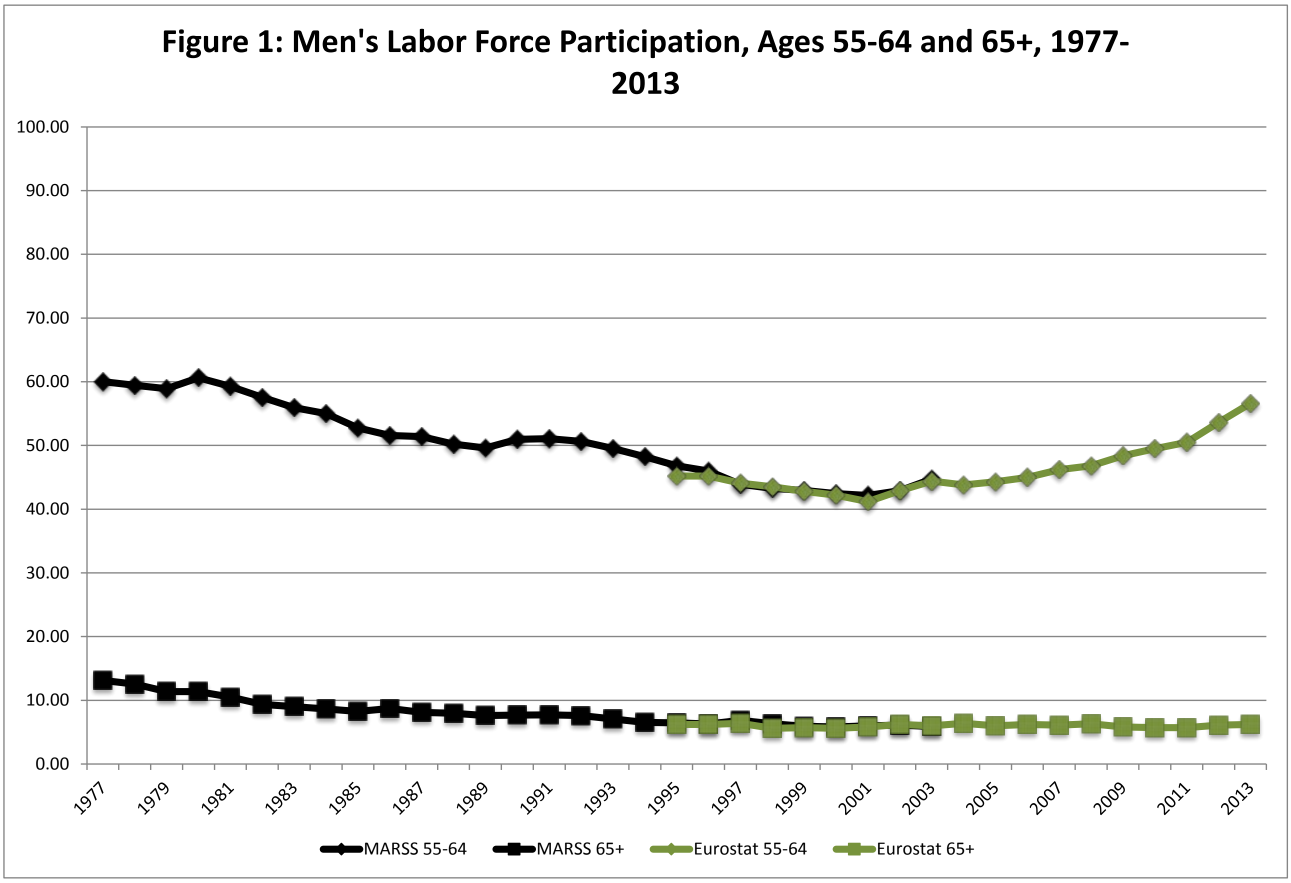


Figure 1: Men's Labor Force Participation, Ages 55-64 and 65+, 1977-2013
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
MARSS 55-64
MARSS 65+
Eurostat 55-64
Eurostat 65+

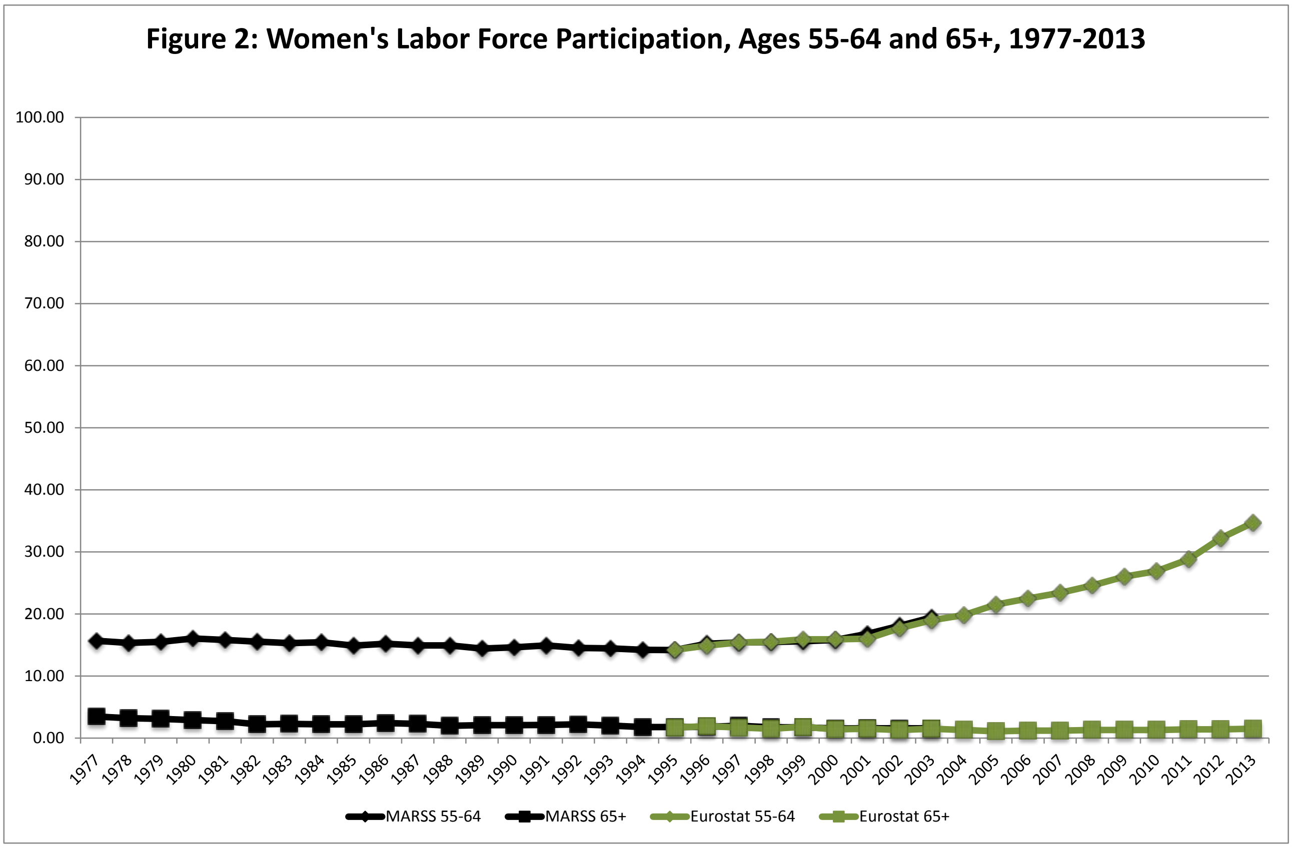
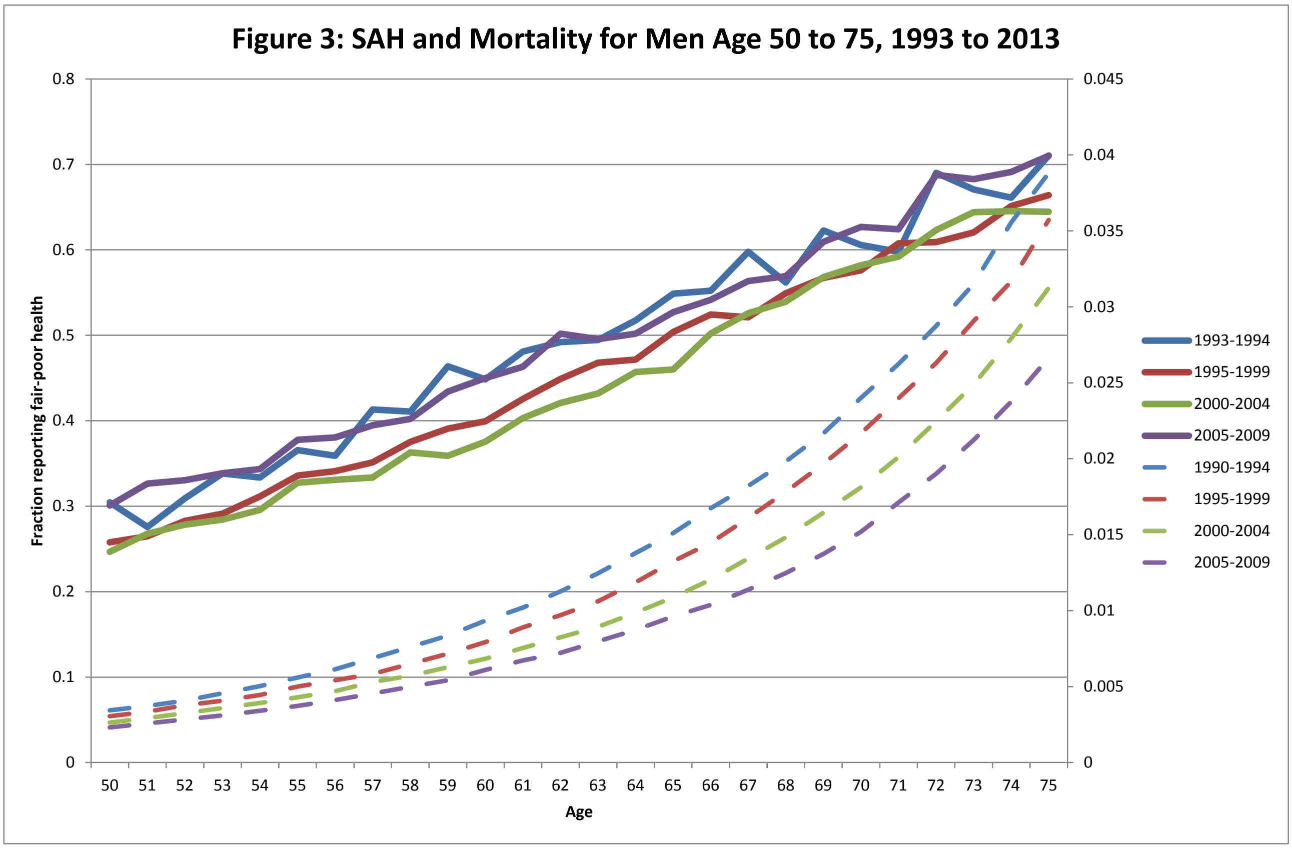
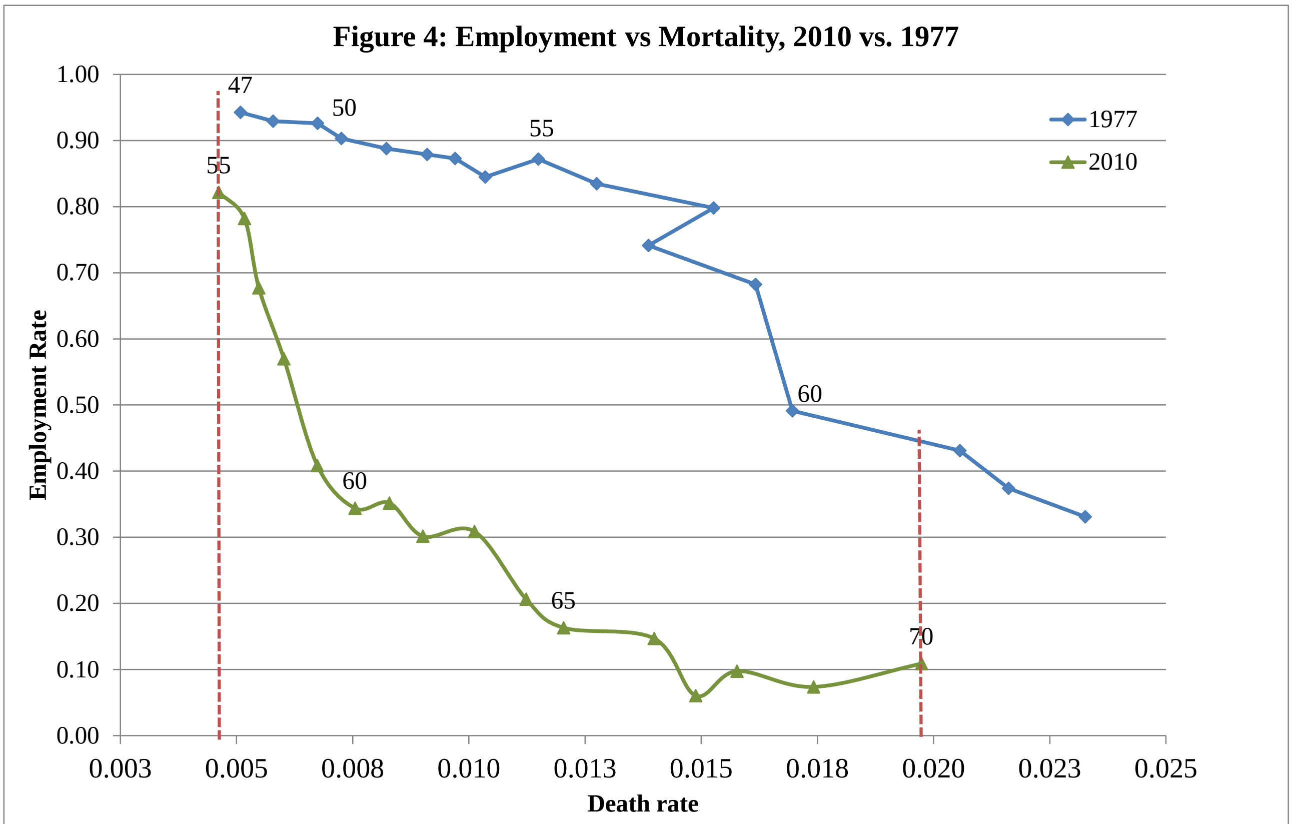
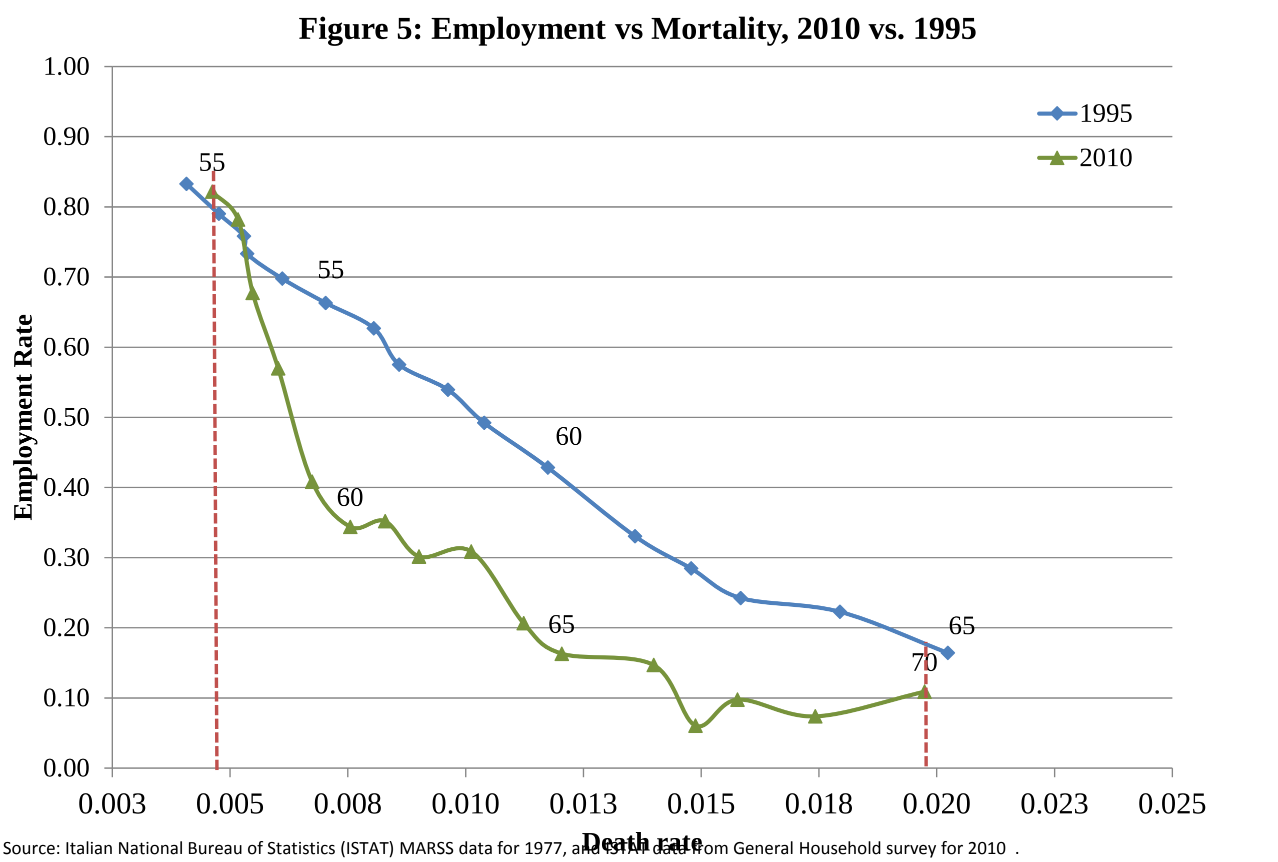


Figure 2: Women's Labor Force Participation, Ages 55-64 and 65+, 1977-2013
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
MARSS 55-64
MARSS 65+
Eurostat 55-64
Eurostat 65+





Source: Italian National Bureau of Statistics (ISTAT) MARSS data for 1977, and ISTAT data from General Household survey for 2010 .



Source: Italian National Bureau of Statistics (ISTAT) MARSS data for 1977, and ISTAT data from General Household survey for 2010 .

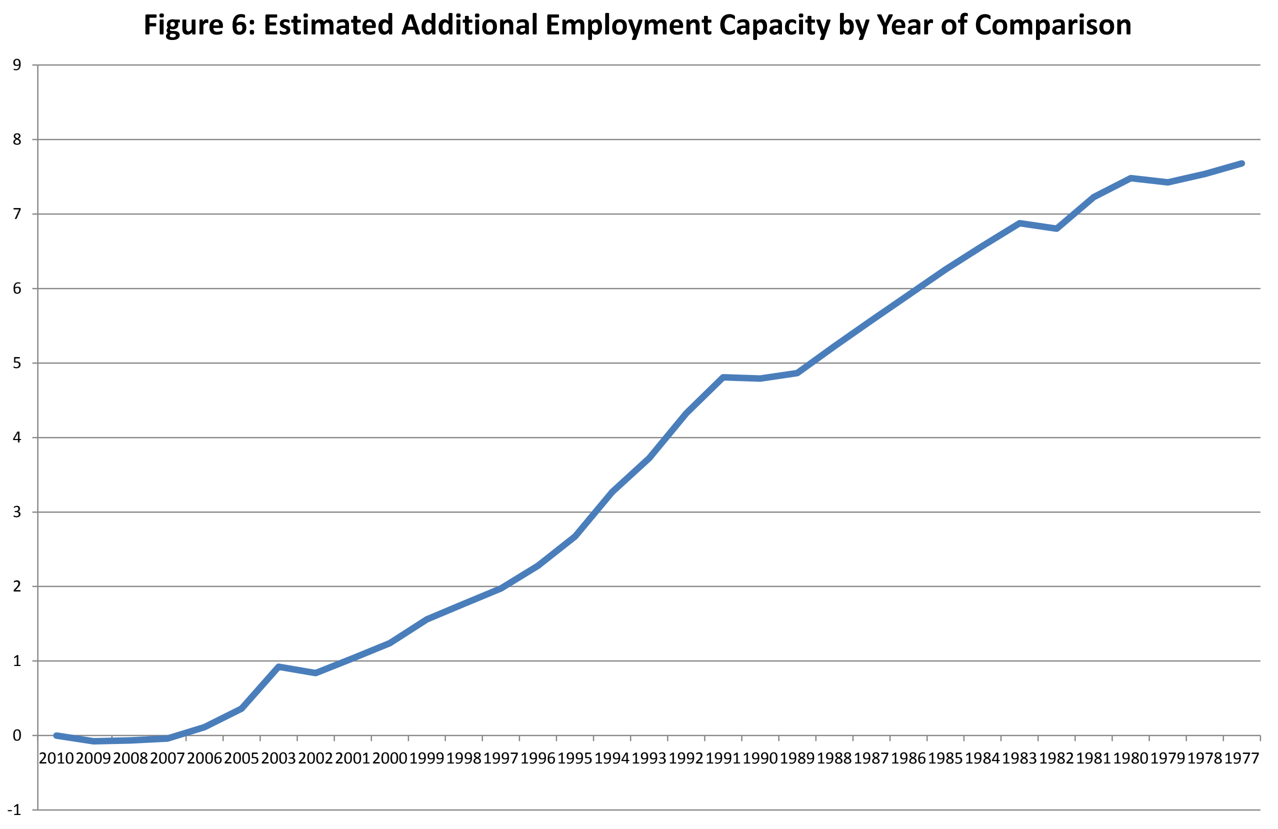


Figure 9: Share of Men Working and Additional Work Capacity, By Age

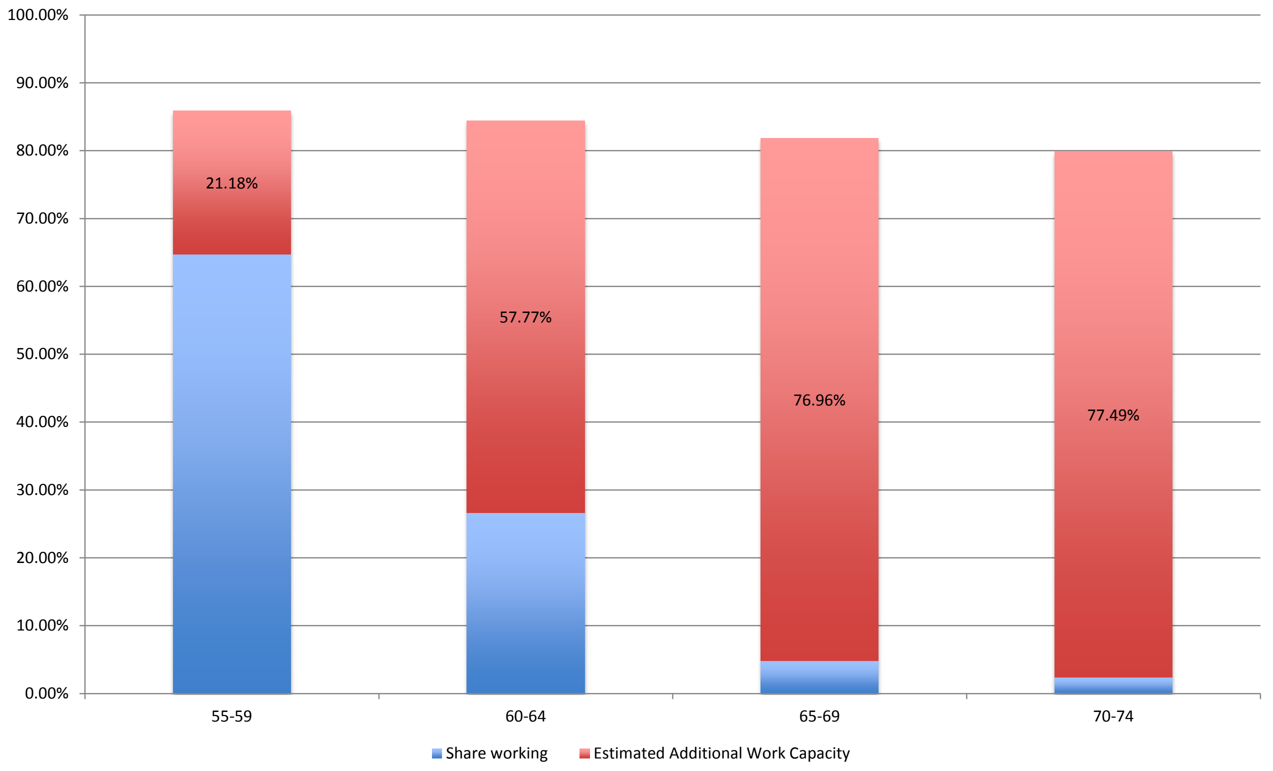
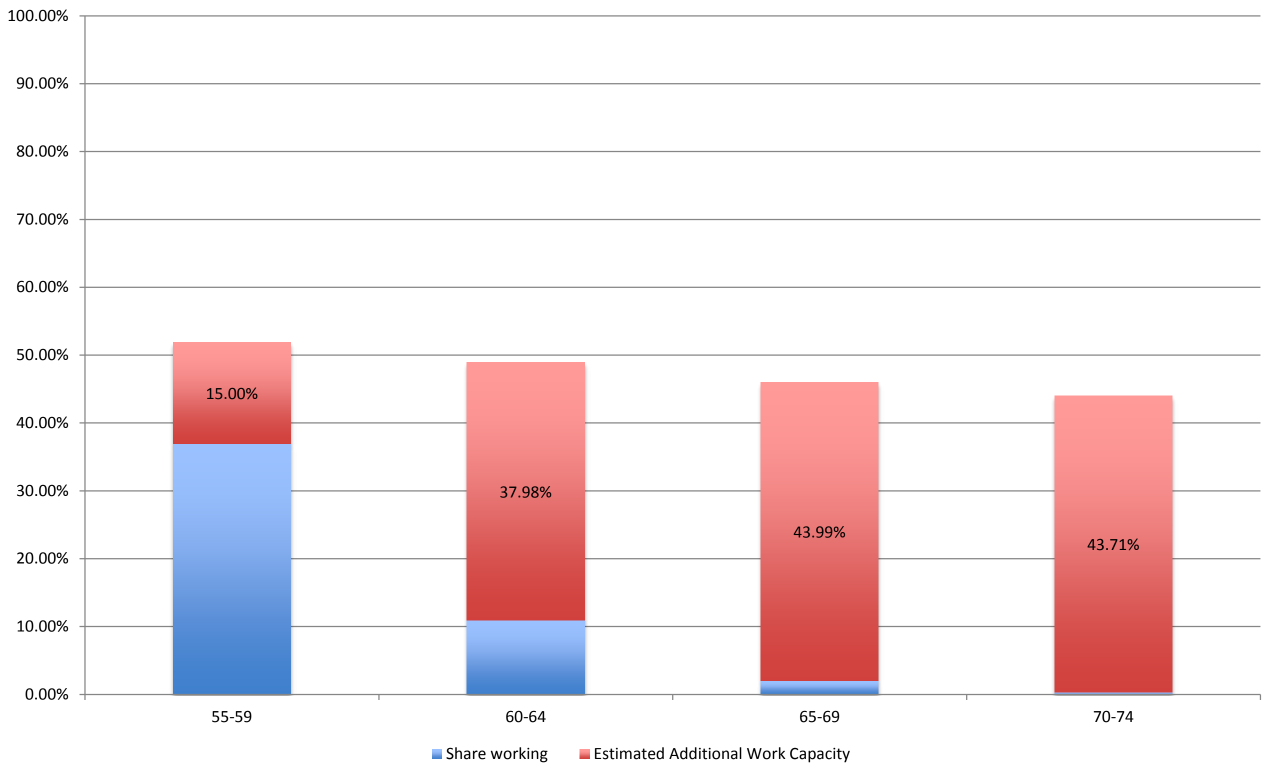


Figure 10: Share of Women Working and Additional Work Capacity, By Age



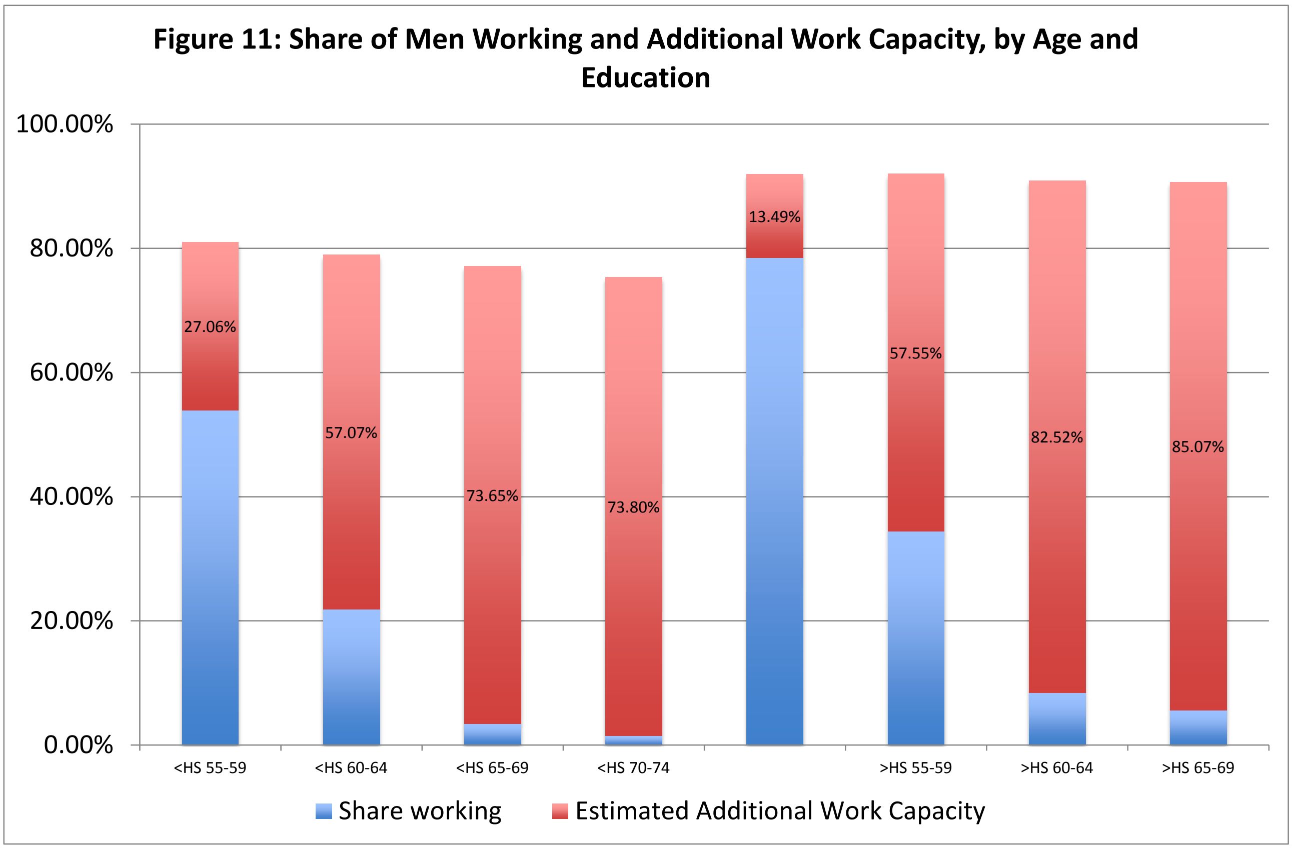


Figure 11: Share of Men Working and Additional Work Capacity, by Age and Education
100.00%
80.00%
60.00%
40.00%
20.00%
0.00%
27.06%
57.07%
73.65%
73.80%
13.49%
57.55%
82.52%
85.07%
<HS 55-59
<HS 60-64
<HS 65-69
<HS 70-74
>HS 55-59
>HS 60-64
>HS 65-69
Share working
Estimated Additional Work Capacity

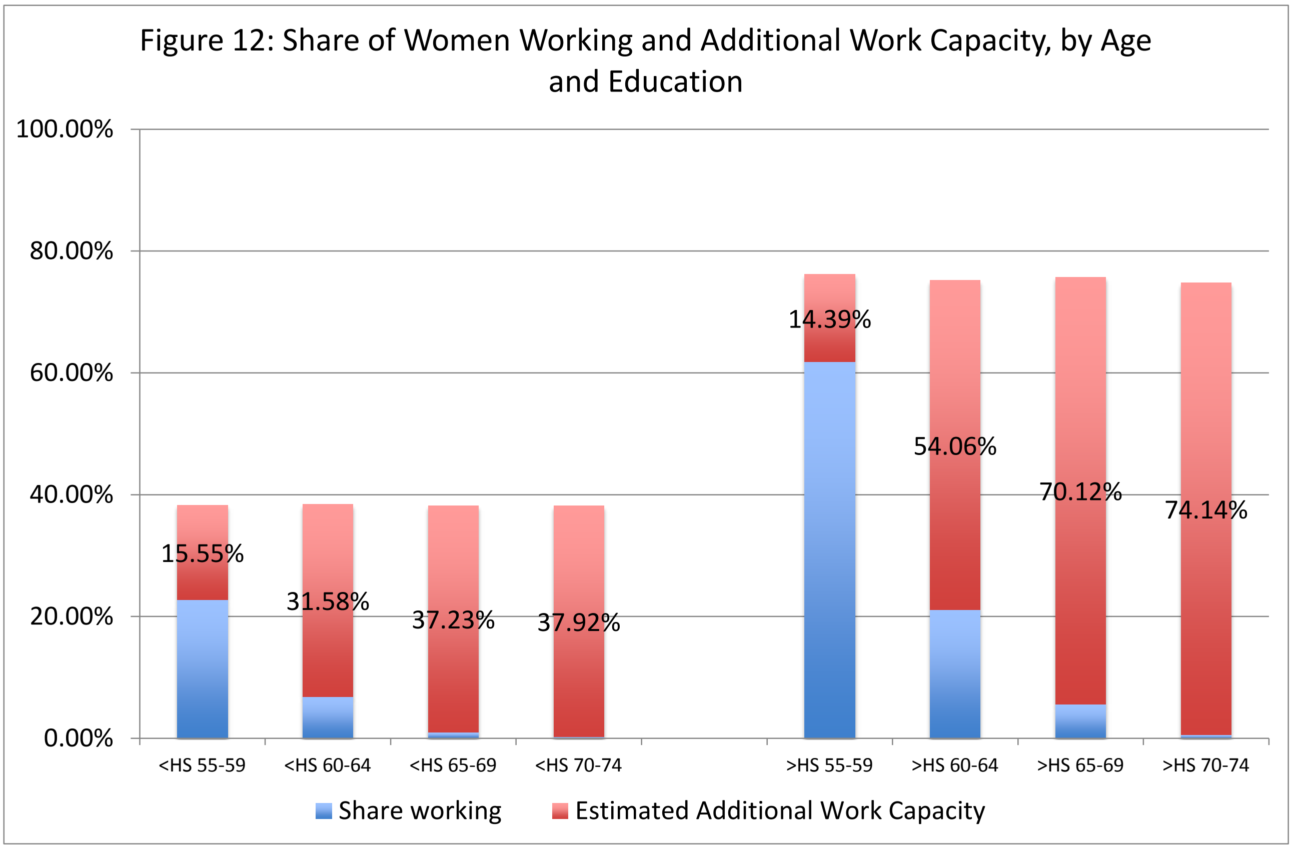


Figure 12: Share of Women Working and Additional Work Capacity, by Age and Education
100.00%
80.00%
60.00%
40.00%
20.00%
0.00%
15.55%
31.58%
37.23%
37.92%
14.39%
54.06%
70.12%
74.14%
<HS 55-59
<HS 60-64
<HS 65-69
<HS 70-74
>HS 55-59
>HS 60-64
>HS 65-69
>HS 70-74
Share working
Estimated Additional Work Capacity

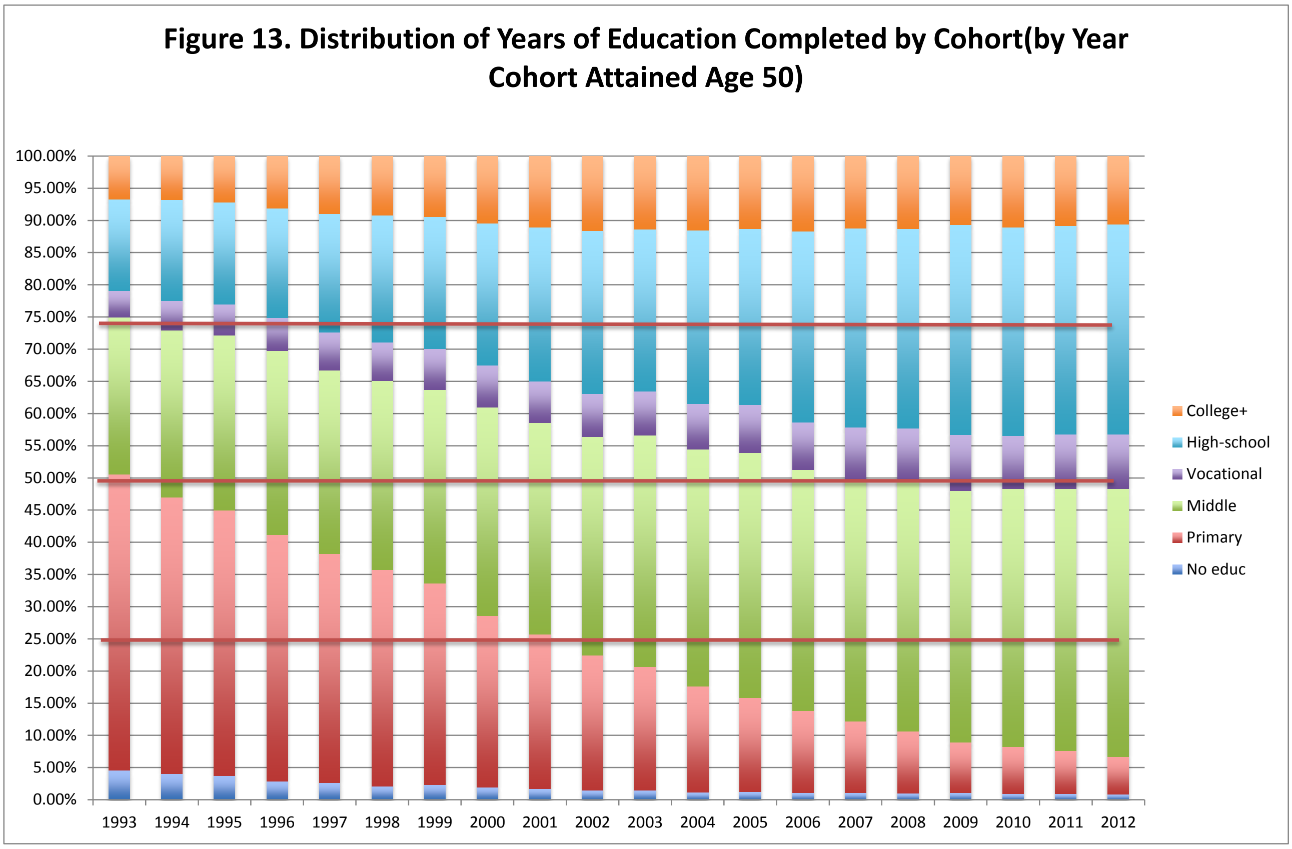
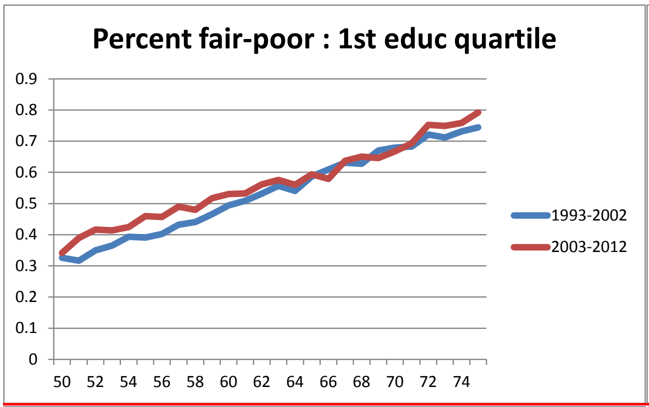
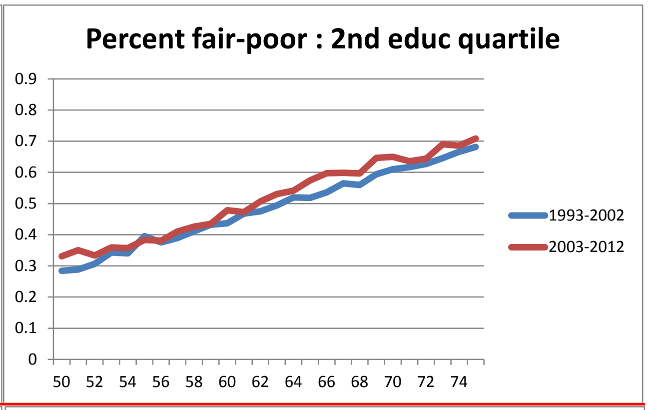
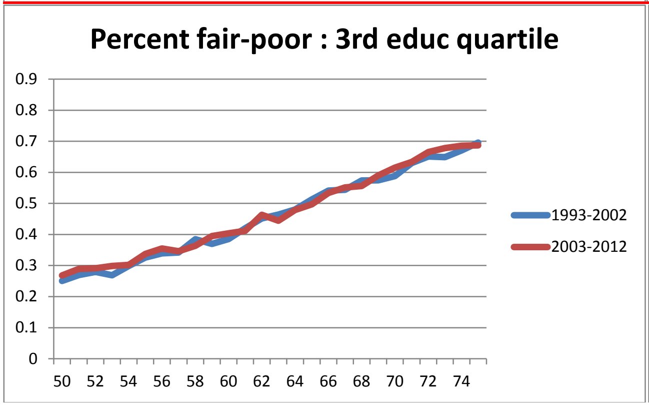
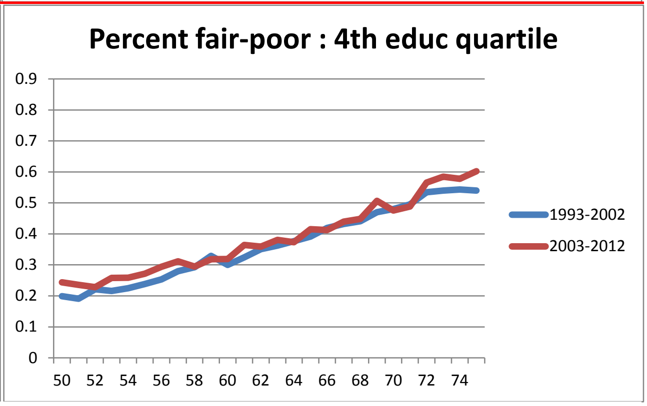


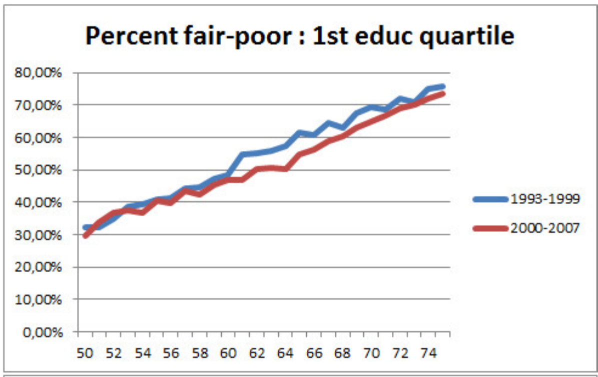
Figure 14: Percentage in fair or poor health by education quartile

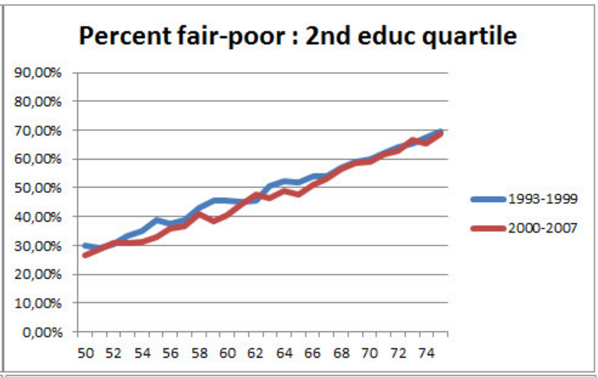

Percent fair-poor : 1st educ quartile
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
50 52 54 56 58 60 62 64 66 68 70 72 74
1993-2002
2003-2012

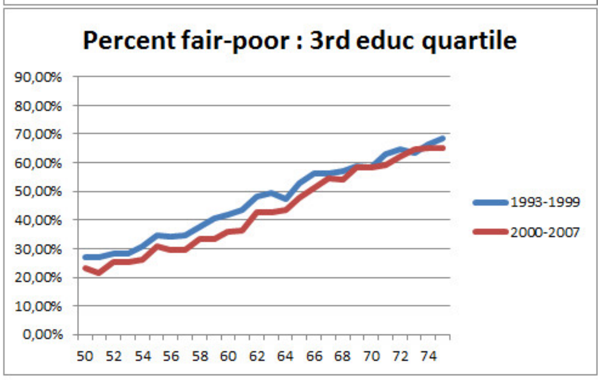

Percent fair-poor : 2nd educ quartile
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
50 52 54 56 58 60 62 64 66 68 70 72 74
1993-2002
2003-2012


Percent fair-poor : 3rd educ quartile
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
50 52 54 56 58 60 62 64 66 68 70 72 74
1993-2002
2003-2012


Percent fair-poor : 4th educ quartile
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
50 52 54 56 58 60 62 64 66 68 70 72 74
1993-2002
2003-2012


Percent fair-poor : 1st educ quartile
80,00%
70,00%
60,00%
50,00%
40,00%
30,00%
20,00%
10,00%
0,00%
50 52 54 56 58 60 62 64 66 68 70 72 74
1993-1999
2000-2007


Percent fair-poor : 2nd educ quartile
90,00%
80,00%
70,00%
60,00%
50,00%
40,00%
30,00%
20,00%
10,00%
0,00%
50 52 54 56 58 60 62 64 66 68 70 72 74
1993-1999
2000-2007


Percent fair-poor : 3rd educ quartile
90,00%
80,00%
70,00%
60,00%
50,00%
40,00%
30,00%
20,00%
10,00%
0,00%
50 52 54 56 58 60 62 64 66 68 70 72 74
1993-1999
2000-2007

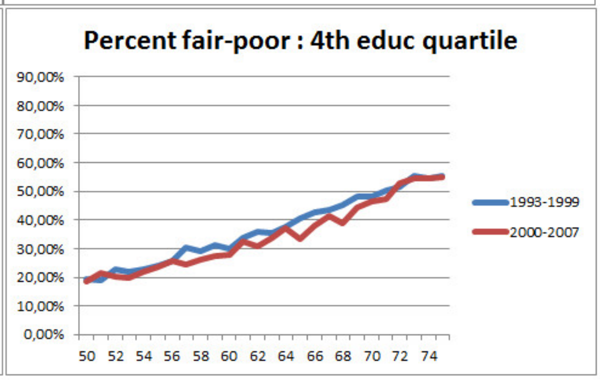

Percent fair-poor : 4th educ quartile
90,00%
80,00%
70,00%
60,00%
50,00%
40,00%
30,00%
20,00%
10,00%
0,00%
50 52 54 56 58 60 62 64 66 68 70 72 74
1993-1999
2000-2007

Table 1. Additional Employment Capacity in 2010 using 1977 employment-mortality relationship

Age	Deathrate 2010	Employment rate 2010	Employment rate 1977 corresponding to death rate of 2010	Additional employment capacity
55	0.00462	82.15%	93.98%	11.82%
56	0.00517	78.19%	94.10%	15.92%
57	0.00548	67.73%	93.51%	25.78%
58	0.00602	57.01%	92.84%	35.83%
59	0.00674	40.84%	92.61%	51.77%
60	0.00755	34.39%	89.85%	55.45%
61	0.00829	35.19%	88.70%	53.52%
62	0.00901	30.16%	87.98%	57.83%
63	0.01012	30.88%	85.48%	54.60%
64	0.01123	20.65%	86.55%	65.90%
65	0.01204	16.32%	85.57%	69.25%
66	0.01399	14.69%	74.64%	59.94%
67	0.01488	6.06%	78.23%	72.17%
68	0.01577	9.77%	73.36%	63.59%
69	0.01742	7.38%	48.35%	40.97%
Total years		5.31411		7.3434948

Table 2a: Summary Statistics, Men					
	Age group				
	50-54	55-59	60-64	65-69	70-74
in labour force	0.94	0.73	0.32	0.07	0.02
employed	0.85	0.65	0.27	0.05	0.02
health_exc	0.16	0.11	0.09	0.09	0.06
health_vgood	0.24	0.21	0.17	0.14	0.11
health_good	0.44	0.46	0.43	0.39	0.38
health_fair	0.14	0.17	0.24	0.30	0.34
health_poor	0.02	0.04	0.06	0.09	0.11
gali	0.15	0.22	0.27	0.38	0.44
mobilit2	0.22	0.26	0.33	0.42	0.51
mobilit3	0.04	0.07	0.10	0.17	0.22
ADLany	0.03	0.03	0.05	0.06	0.10
IADLany	0.02	0.03	0.05	0.08	0.12
eurod	1.87	1.88	1.94	2.26	2.39
heartat	0.04	0.06	0.09	0.13	0.16
stroke	0.01	0.02	0.02	0.04	0.04
cohlester	0.13	0.17	0.19	0.24	0.24
lungdis	0.03	0.04	0.05	0.07	0.12
cancer	0.01	0.02	0.03	0.03	0.04
highblpr	0.21	0.31	0.34	0.45	0.46
arthritis	0.06	0.09	0.14	0.18	0.20
diabetes	0.04	0.08	0.11	0.17	0.15
osteopor	0.00	0.01	0.01	0.01	0.02
alzheimer	0.00	0.00	0.00	0.01	0.01
back	0.31	0.36	0.38	0.41	0.40
asthma	0.02	0.01	0.01	0.01	0.04
underweight	0.00	0.00	0.00	0.00	0.00
overweight	0.49	0.50	0.54	0.54	0.52
obese	0.14	0.17	0.17	0.18	0.16
smokerform	0.22	0.31	0.36	0.43	0.46
smokecurr	0.34	0.30	0.27	0.19	0.14
educ_lessthHS	0.54	0.56	0.63	0.71	0.79
educ_hs	0.33	0.30	0.25	0.19	0.13
educ_somecollege	0.02	0.03	0.03	0.03	0.02
educ_collegemore	0.10	0.10	0.10	0.07	0.06
married	0.81	0.89	0.90	0.88	0.86
occ_bluecollar	0.30	0.34	0.35	0.41	0.43
occ_lowskill	0.12	0.13	0.11	0.13	0.14
occ_homemaker	0.00	0.00	0.00	0.00	0.00
pencov	0.78	0.81	0.89	0.91	0.93
Obs	**582**	**951**	**1086**	**1155**	**1060**

Table 2b: Summary Statistics, Women					
	Age group				
	50-54	55-59	60-64	65-69	70-74
in labour force	0.60	0.41	0.12	0.02	0.00
employed	0.56	0.37	0.11	0.02	0.00
health_exc	0.11	0.09	0.07	0.05	0.03
health_vgood	0.25	0.18	0.14	0.10	0.08
health_good	0.40	0.39	0.41	0.39	0.30
health_fair	0.20	0.27	0.30	0.35	0.42
health_poor	0.04	0.07	0.08	0.11	0.17
gali	0.26	0.31	0.37	0.45	0.55
mobilit2	0.34	0.44	0.52	0.61	0.73
mobilit3	0.13	0.18	0.25	0.33	0.46
ADLany	0.03	0.05	0.06	0.09	0.14
IADLany	0.06	0.07	0.12	0.14	0.22
eurod	2.76	2.89	2.97	3.20	3.50
heartat	0.03	0.03	0.05	0.08	0.10
stroke	0.01	0.01	0.02	0.02	0.03
cohlester	0.11	0.20	0.24	0.27	0.31
lungdis	0.02	0.04	0.03	0.05	0.08
cancer	0.04	0.04	0.04	0.05	0.05
highblpr	0.19	0.28	0.36	0.47	0.51
arthritis	0.15	0.22	0.27	0.29	0.35
diabetes	0.04	0.06	0.09	0.12	0.15
osteopor	0.03	0.07	0.08	0.09	0.11
alzheimer	0.00	0.00	0.00	0.00	0.01
back	0.39	0.46	0.53	0.54	0.60
asthma	0.02	0.02	0.02	0.02	0.02
underweight	0.02	0.01	0.01	0.01	0.02
overweight	0.31	0.35	0.37	0.40	0.39
obese	0.13	0.15	0.19	0.20	0.20
smokerform	0.16	0.19	0.18	0.14	0.14
smokecurr	0.23	0.21	0.15	0.13	0.08
educ_lessthHS	0.55	0.64	0.71	0.79	0.83
educ_hs	0.28	0.23	0.18	0.13	0.11
educ_somecolleg	0.05	0.04	0.03	0.03	0.02
educ_collegemo	0.11	0.09	0.07	0.05	0.03
married	0.84	0.85	0.82	0.76	0.67
occ_bluecollar	0.13	0.15	0.20	0.21	0.24
occ_lowskill	0.16	0.14	0.16	0.16	0.18
occ_homemaker	0.23	0.29	0.24	0.29	0.29
pencov	0.62	0.62	0.71	0.74	0.78
Obs	**950**	**1239**	**1377**	**1293**	**1054**

Table 3a: Employment Regressions, All Health Variables							
Regression results, all health variable							
Men 50-54				Women 50-54			
Variable	**Coefficient**	**Std. Err.**		**Variable**	**Coefficient**	**Std. Err.**	
health_vgooc	-0.0027963	0.0450401		health_vgooc	-0.01154	0.0537349	
health_good	-0.0357366	0.0421365		health_good	-0.0440044	0.0520982	
health_fair	0.0179017	0.057457		health_fair	-0.1476646	0.0637934	*
health_poor	-0.3956285	0.1174735	***	health_poor	-0.0476882	0.103544	
gali	0.00621	0.0470732		gali	-0.01848	0.0413692	
mobilit2	0.0345037	0.0421596		mobilit2	-0.007456	0.0402907	
mobilit3	-0.1197465	0.0849245		mobilit3	0.019925	0.0619281	
ADLany	-0.1827055	0.0983379		ADLany	0.1826312	0.0950687	
IADLany	0.0156022	0.1291905		IADLany	-0.128587	0.0705969	
eurod	-0.0072372	0.0085024		eurod	0.0030393	0.0069672	
heartat	-0.32572	0.075081	***	heartat	-0.232434	0.0966587	*
stroke	-0.2502123	0.1238323	*	stroke	-0.1769095	0.1581447	
cohlester	0.0649994	0.0417435		cohlester	0.059159	0.0494609	
lungdis	-0.0551577	0.0853323		lungdis	-0.0076064	0.1064158	
cancer	-0.2083396	0.1305645		cancer	-0.0302427	0.0838988	
highblpr	0.0682363	0.036363		highblpr	-0.0351173	0.0412672	
arthritis	-0.0650083	0.0623962		arthritis	-0.0317021	0.0493358	
diabetes	-0.1151052	0.0687045		diabetes	-0.0556606	0.0812915	
osteopor	0.2151785	0.3497488		osteopor	0.1128473	0.0861671	
alzheimer	0	(omitted)		alzheimer	0	(omitted)	
back	0.0156367	0.0336528		back	-0.0121109	0.0363815	
asthma	0.0077624	0.1107288		asthma	-0.2060506	0.1113404	
underweight	0.1425618	0.3274792		underweight	0.0453778	0.0976407	
overweight	0.0228613	0.0307923		overweight	0.010574	0.0348206	
obese	-0.086382	0.046327		obese	-0.0051111	0.0485021	
smokerform	-0.0298534	0.0366857		smokerform	-0.0147596	0.0425241	
smokecurr	0.0109978	0.0321436		smokecurr	0.0028155	0.0374073	
educ_lessthH	-0.0480685	0.030728		educ_lessthH	-0.2985075	0.0355432	***
educ_somecc	0.0738541	0.0947385		educ_somecc	0.1165309	0.0718489	
educ_college	0.0968185	0.0489755	*	educ_college	0.1404266	0.0531941	**
married	0.1602421	0.0364211	***	married	-0.1182389	0.0407717	**
_cons	0.7823552	0.0545357	***	_cons	0.8733383	0.0658992	***
Obs	**573**			**Obs**	**929**		

Table 3b: Employment Regressions, PVW index							
Men				Women			
Variable	Coefficient	Std. Err.		Variable	Coefficient	Std. Err.	
PVW	0.0023039	0.0006432	***	PVW	0.0015141	0.0005783	**
educ_lessthH	-0.0678761	0.0312367	*	educ_lessthH	-0.313796	0.0347359	***
educ_somecc	0.0930353	0.0967082		educ_somecc	0.0953992	0.0712775	
educ_college	0.1059622	0.0502291	*	educ_college	0.158097	0.0524523	**
married	0.1732822	0.0362254	***	married	-0.128778	0.0404193	**
_cons	0.5743938	0.0611288	***	_cons	0.7263795	0.0586581	***
Obs	**570**			**Obs**	**919**		

Table 4: Simulations of work capacity									
Use all health variables					Use PVW health index				
Age group	# Obs	% Actual working	% Predicted working	Estimated Work Capacity	Age group	# Obs	% Actual working	% Predicted working	Estimated Work Capacity
Men									
55-59	934	64.78%	84.93%	20.15%	55-59	927	64.72%	85.91%	21.18%
60-64	1046	26.48%	82.55%	56.07%	60-64	1036	26.64%	84.41%	57.77%
65-69	1114	4.85%	77.43%	72.58%	65-69	1111	4.86%	81.82%	76.96%
70-74	1016	2.37%	74.14%	71.78%	70-74	1010	2.38%	79.87%	77.49%
Women									
55-59	1220	36.80%	52.00%	15.19%	55-59	1206	36.90%	51.90%	15.00%
60-64	1340	10.90%	48.25%	37.35%	60-64	1328	10.93%	48.90%	37.98%
65-69	1266	1.98%	44.59%	42.61%	65-69	1257	1.99%	45.98%	43.99%
70-74	1020	0.29%	42.14%	41.85%	70-74	1009	0.30%	44.00%	43.71%

Table 5a: Work Capacity by Education (Regression by Education Group)							
Education	Men, All Health Variables Model				Men, PVW Model		
	Actual	Predicted	Estimated		Actual	Predicted	Estimated
	% Working	% Working	Work Capacity		% Working	% Working	Work Capacity
				Age 55-59			
less than HS	54.18%	80.08%	25.9%		53.93%	80.99%	27.1%
more than HS	78.33%	91.28%	13.0%		78.47%	91.96%	13.5%
				Age 60-64			
less than HS	21.65%	78.24%	56.6%		21.88%	78.95%	57.1%
more than HS	34.45%	89.70%	55.3%		34.46%	92.00%	57.5%
				Age 65-69			
less than HS	3.41%	74.21%	70.8%		3.43%	77.08%	73.6%
more than HS	8.41%	86.38%	78.0%		8.41%	90.93%	82.5%
				Age 70-74			
less than HS	1.50%	71.07%	69.6%		1.51%	75.31%	73.8%
more than HS	5.58%	86.76%	81.2%		5.61%	90.68%	85.1%

Table 5b: Work Capacity by Education (Regression by Education Group)							
Education	Women, All Health Variables Model				Women, PVW Model		
	Actual	Predicted	Estimated		Actual	Predicted	Estimated
	% Working	% Working	Work Capacity		% Working	% Working	Work Capacity
				Age 55-59			
less than HS	22.32%	37.08%	14.8%		22.76%	38.31%	15.6%
more than HS	62.65%	75.51%	12.9%		61.78%	76.18%	14.4%
				Age 60-64			
less than HS	6.91%	39.90%	33.0%		6.86%	38.45%	31.6%
more than HS	21.39%	78.78%	57.4%		21.11%	75.17%	54.1%
				Age 65-69			
less than HS	1.07%	37.15%	36.1%		1.01%	38.24%	37.2%
more than HS	5.34%	77.34%	72.0%		5.62%	75.74%	70.1%
				Age 70-74			
less than HS	0.25%	37.00%	36.7%		0.24%	38.16%	37.9%
more than HS	0.63%	80.32%	79.7%		0.61%	74.74%	74.1%

Table A1: Employment Regressions, All Health Variables							
Regression results, all health variable							
Men 50-54				Women 50-54			
Variable	**Coefficient**	**Std. Err.**		**Variable**	**Coefficient**	**Std. Err.**	
health_vgooc	-0.077	0.069		health_vgooc	-0.042	0.087	
health_good	-0.123	0.062	*	health_good	-0.092	0.082	
health_fair	0.023	0.087		health_fair	-0.263	0.099	**
health_poor	-0.520	0.182	**	health_poor	-0.091	0.159	
gali	0.017	0.071		gali	0.025	0.058	
mobilit2	0.106	0.063		mobilit2	0.024	0.055	
mobilit3	-0.197	0.120		mobilit3	0.035	0.090	
ADLany	-0.045	0.160		ADLany	0.417	0.140	**
IADLany	-0.323	0.186		IADLany	-0.116	0.093	
eurod	-0.008	0.014		eurod	0.018	0.010	
heartat	-0.346	0.098	***	heartat	-0.199	0.139	
stroke	0.048	0.349		stroke	-0.223	0.208	
cohlester	0.083	0.064		cohlester	0.097	0.075	
lungdis	-0.081	0.122		lungdis	0.003	0.122	
cancer	-0.172	0.190		cancer	-0.022	0.126	
highblpr	0.084	0.053		highblpr	-0.015	0.057	
arthritis	-0.022	0.079		arthritis	0.001	0.062	
diabetes	-0.286	0.106	**	diabetes	-0.093	0.152	
osteopor	0.165	0.371		osteopor	0.161	0.089	
alzheimer	0.000	(omitted)		alzheimer	0.000	(omitted)	
back	-0.004	0.051		back	-0.032	0.053	
asthma	0.062	0.117		asthma	-0.202	0.112	
underweight	0.000	(omitted)		underweight	0.012	0.200	
overweight	0.026	0.047		overweight	0.003	0.049	
obese	-0.023	0.066		obese	0.115	0.072	
smokerform	-0.134	0.056	*	smokerform	-0.043	0.063	
smokecurr	0.018	0.050		smokecurr	0.040	0.056	
educ_lessthH	-0.135	0.046	**	educ_lessthH	-0.468	0.052	***
educ_somecc	-0.045	0.173		educ_somecc	-0.051	0.103	
educ_college	0.067	0.071		educ_college	0.073	0.088	
married	0.110	0.054	*	married	0.015	0.061	
_cons	0.941	0.082	***	_cons	0.789	0.099	***
Obs	**262**			**Obs**	**413**		

Table A2: Employment Regressions, PVW index								
Men					**Women**			
Variable	**Coefficient**	**Std. Err.**			**Variable**	**Coefficient**	**Std. Err.**	
PVW	0.002	0.001			PVW	0.000	0.001	
educ_lesst~S	-0.112	0.046	*		educ_lesst~S	-0.457	0.050	***
educ_somec~	0.071	0.175			educ_somec~	-0.065	0.101	
educ_colle~e	0.109	0.074			educ_colle~e	0.118	0.087	
married	0.160	0.054	**		married	-0.025	0.059	
_cons	0.655	0.088	***		_cons	0.785	0.085	***
Obs	**260**				**Obs**	**407**		