



HAL
open science

Compression of Morbidity and the Labor Supply of Older People

Laura Romeu Gordo

► **To cite this version:**

Laura Romeu Gordo. Compression of Morbidity and the Labor Supply of Older People. *Applied Economics*, 2009, 43 (4), pp.503. 10.1080/00036840802599941 . hal-00582218

HAL Id: hal-00582218

<https://hal.science/hal-00582218>

Submitted on 1 Apr 2011

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Compression of Morbidity and the Labor Supply of Older People

Journal:	<i>Applied Economics</i>
Manuscript ID:	APE-07-0046.R2
Journal Selection:	Applied Economics
Date Submitted by the Author:	23-Oct-2008
Complete List of Authors:	Romeu Gordo, Laura; The German Centre of Gerontology (DZA)
JEL Code:	J14 - Economics of the Elderly < J1 - Demographic Economics < J - Labor and Demographic Economics, J21 - Labor Force and Employment, Size, and Structure < J2 - Time Allocation, Work Behavior, and Employment Determination/Creation < J - Labor and Demographic Economics, I12 - Health Production: Nutrition, Mortality, Morbidity, Disability, etc. < I1 - Health < I - Health, Education, and Welfare
Keywords:	Compression of morbidity, Disability, Older workers



Compression of Morbidity and the Labor Supply of Older People

Laura Romeu Gordo†

The German Centre of Gerontology (DZA)

Abstract

This paper tests whether there is evidence of compression of morbidity using HRS data and analyzes the effects of this on the labor supply of older people. We find younger cohorts to suffer less from functional problems than older cohorts at given ages. Furthermore, we observe that instrumentalized disability has a negative effect on labor force participation. According to the cohort analysis and the multivariate analysis, it can be concluded that individuals will be able to work longer because of the delay in the onset of disability problems.

JEL Classification Number: J14 J21 I12.

Key Words: Compression of morbidity, disability, older workers.

†Contact Address: The German Centre of Gerontology (DZA). Manfred-von-Richthofenstr. 2, 12101 Berlin.
Tel: +49-(0)30260740-24. Fax: +49-(0)307854350. E-mail: Laura.Romeu-Gordo@dza.de

1 Introduction

In recent decades there have been major changes in the age composition of the population in most of the OECD countries. Increases in life expectancy have compensated for the decrease in birth rates, causing population growth and increases in the average age of the population.

On average across the OECD countries, life expectancy at birth has increased by over 8 years since 1960. These increases in life expectancy are the result of the reduction in mortality rates due to improvements in medical care, better lifestyles and improved living conditions. At the same time, there has been a significant decrease in fertility rates throughout the OECD, in some countries falling below replacement levels. The average fertility rate³ across OECD countries in 1960 was 3.2 children per woman, while in the year 2000 it was 1.6 children per woman. As a result of the increasing life expectancies and the decreasing fertility rates, the proportion of older individuals has increased considerably in most of the OECD countries. This tendency has triggered considerable debate about the necessity of reforms in the pension systems with contribution schemes. Furthermore, these trends in longevity lead to other important questions: what are the health consequences of the increase in longevity? Are increases in life expectancy translated into increases in morbidity?

Knowing the health consequences of increases in life expectancy has important policy implications. First, if morbidity in older ages is changing, it is necessary to adapt the social and health care services in order to deal with the changing demand⁴. Second, if the

³ For women aged 15-49. Source: OECD.

⁴ Zweifel et al. (1999) argue that what is determining in terms of health care expenditure is the proximity of death and not the age at which death occurs, so aging of the population will not have major effects on aggregate health care expenditures.

1
2
3 onset of severe health problems is delayed, this may have an impact on the labor supply
4
5 of older people. Recently, the necessity of increasing the retirement age in order to
6
7 compensate for the increase of the ratio between individuals receiving public pensions
8
9 and contributors has been under discussion. Improvement in the health status of older
10
11 people may also help to increase the labor supply of older people before and after the
12
13 legal retirement age.
14
15

16
17 The impact of increases in life expectancy on health has traditionally been analysed in
18
19 medical literature (Crimmins and Saito, 2001; Freedman et al. 2002; Fries, 1980; Fries,
20
21 2003; Manton et al., 1997; Manton and Gu, 2001). However, there is an increasing
22
23 interest on this topic in the economic literature since it has very important economic
24
25 implications (Lakdawalla and Philipson, 2001; Bhattacharya et al., 2004). While recent
26
27 studies analyse the consequences of increasing longevity on health care costs, until now
28
29 there has not been evidence of how compression of morbidity affects the labor supply of
30
31 older people.
32
33
34
35
36
37
38

39 2 Health consequences of increases in life expectancy

40
41 As pointed out in the introduction, people are living longer. The question is whether the
42
43 delay in death implies longer periods of morbidity for the individuals.
44
45

46
47 There are three major hypothesis dealing with this question. The first one is the
48
49 expansion of morbidity hypothesis (Gruenberg, 1977; Kramer, 1980), which argues that
50
51 the decline in mortality is translated into an increase in morbidity. It has been argued
52
53 that health policy has focused on preventing death without preventing morbidity. Most
54
55 efforts have been focused on reducing fatal diseases like cardiovascular diseases,
56
57 smoking-related respiratory illnesses and cancers. The consequences of these
58
59
60

1
2
3 achievements is that the death rates of the younger olds (younger than 80) are
4 decreasing. However, since the proportion of individuals older than 80 is increasing
5 there is a higher proportion of the population affected by diseases which usually appear
6 in older ages and which are usually related to disability problems⁵.
7
8
9

10
11
12 The compression of morbidity hypothesis argues that the decline in mortality is not
13 necessarily associated with an increase in morbidity. Fries (1980) argued that if the onset
14 of chronic illness (typical for later life) is postponed and if this postponement is greater
15 than increases in life expectancy, then the lifetime burden of illness could be reduced.
16
17
18 The consequence of this trend would be a reduction in the cumulative lifetime
19 morbidity.
20
21
22

23
24
25
26 The third hypothesis (Manton, 1982) suggests a sort of status quo. There is a decline in
27 mortality in younger ages, and at the same time, there is a decrease in the incidence and
28 progression of chronic diseases.
29
30
31

32
33
34 These three hypotheses are represented in figure 1. The reference point in this figure is
35 the hypothetical present situation of a representative individual in which the onset of
36 morbidity occurs at age 55 and death occurs at age 76. In a context of expansion of
37 morbidity, the period of morbidity is longer, given that the onset of morbidity does not
38 change (55 years) but the death is delayed (80 years). In a situation of status quo, the
39 onset of both morbidity and death are delayed (60 and 81 years respectively). In this
40 case the total period of morbidity remains unchanged with respect to the reference
41 situation. Finally, in a context of compression of morbidity, the onset of both morbidity
42 and death are delayed (65 and 78 years). However, the delay in the onset of morbidity is
43 larger than the delay of death, causing a reduction of the total period of morbidity.
44
45
46
47
48
49
50
51
52
53
54
55
56

57
58 ⁵ Like osteoarthritis, depression, isolation, Alzheimer.
59
60

1
2
3 Increasing awareness of these issues has led to the development of population specific
4 indicators. For example, the concept of health expectancy, which combines mortality
5 and morbidity aspects. Health expectancy is an extension of the concept of life
6 expectancy to measure the expectation of years of life lived in various health states
7 (Mathers, 1996; Robine et al., 1996). The most widely used of the health expectancy
8 indicators is disability-free life expectancy.
9

10
11
12
13
14
15
16
17
18 The concept of disability (or limited functional capacities) is very important when
19 considering older ages. Disability increases with age (especially after 80) and implies
20 that these individuals are dependent on others in order to carry out ordinary activities.
21
22 Furthermore, when comparing different cohorts, disability is a more reliable indicator
23 than chronic diseases, since the debilitating effects of chronic conditions may change
24 from cohort to cohort (Costa, 2002). At the same time, according to the epidemiological
25 literature, disability summarizes the differential cohort accumulation of health effects of
26 lifetime exposures (Manton et al., 1997).
27
28
29
30
31
32
33
34
35

36
37 In the disability literature, a distinction is made between severe and moderate disability
38 (Jacobzone et al., 2000). 'Severe disability' includes individuals with problems carrying
39 out Activities of Daily Living (ADL) such as eating, dressing and getting in and out of
40 bed. Severe disability is usually associated with the need for personal help, either at
41 home or in institutions. 'Moderate disability' includes individuals experiencing
42 problems in carrying out Instrumental Activities of Daily Living (IADL) such as
43 shopping, daily financial accounting or preparing meals. The trends in the prevalence of
44 disability have been the instruments most used in order to test whether or not there has
45 been compression of morbidity in recent decades (e.g. Jacobzone et al., 2000; Freedman
46 et al., 2002; Crimmins et al., 1997; Vita and Campion, 1998 and Manton and Gu, 2001).
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3 In the following section, we test the hypothesis of compression if morbidity using
4 differences between cohorts. We want to analyze whether younger cohorts suffer less
5 from functional problems than older cohorts at given ages.
6
7
8
9

10 11 12 13 3 Is compression of morbidity occurring? 14

15 16 3.1 Health differences between cohorts 17

18 Individuals of different cohorts are faced with different health technologies over the
19 course of their life. For example, we expect an individual aged 70 today to have a
20 different health status if compared to an individual who was 70 years old 20 years ago,
21 due to the different circumstances in which these individuals live.
22
23
24
25
26

27 In this section, we intend to analyze, using data from the HRS⁶ (Health and Retirement
28 Study), whether there are differences between cohorts, and more concretely, whether
29 younger cohorts suffer less from functional problems than older cohorts at a given age.
30
31
32
33
34
35 We argue that this would be prima facie evidence of compression of morbidity.⁷
36

37 The HRS is a panel survey carried out in the United States of individuals aged 50 and
38 above and their spouses. The panel was started in 1992 and is repeated every two years.
39
40
41
42 The objective of the panel is to support research on retirement, health insurance, saving
43 and economic well-being.
44
45

46 The RAND Center for the Studying of Ageing has developed what is called the RAND
47
48 HRS Data files, which is a processed collection of variables derived from the Health and
49 Retirement Study (HRS) (St. Clair et al., 2003). In the RAND version of the HRS, all
50
51
52

53
54 ⁶ Concretely, the first 5 waves of the RAND version of the HRS.

55 ⁷ The delay in the onset of functional problems might be also evidence of what we have defined in the last
56 section as *Status Quo*, where the delay in the onset of health problems is equal to the delay in death.
57 However, since we are comparing birth cohorts which are close we don't expect large delays in longevity
58 and therefore, we consider significant delays in the onset of health problems as prima facie evidence of
59 compression of morbidity.
60

1
2
3 information is summarized in 5 waves, after merging the second wave of the HRS cohort
4 (started in 1994) and the first wave

5
6
7 of the AHEAD cohort, which was started in 1993.

8
9
10 In the HRS, 4 different cohorts are interviewed: the initial HRS cohort, with individuals
11 born between 1931 and 1941; the AHEAD cohort with individuals born before 1924; the
12 children of depression cohort (CODA) born between 1924 and 1930, and finally the war
13 baby (WB) cohort with individuals born between 1942 and 1947.

14
15
16 The HRS offers very rich information on health status and functional problems (Fallace
17 and Herzog, 1995). It also includes very complete information about difficulties in
18 Activities of Daily Living (ADLs) and Instrumental Activities of Daily Living (IADLs).

19
20
21 Our objective is to compare ADLs and IADLs measures for different cohorts at given
22 ages. Unfortunately, it is not possible to compare the functional status of every cohort at
23 every age since the panel is not long enough. However, we can compare two different
24 cohorts for every age group. In figure 2 we can see the age groups in which different
25 cohorts are comparable.

26
27
28 RAND has constructed yearly ADL and IADL indexes based on the functional
29 information contained in the HRS, which are the usual indexes used in the empirical
30 literature. However, we propose to use cumulative ADL and IADL indexes. The reason
31 for using such cumulative indicators and not yearly indicators is that in this way, we
32 capture in only one indicator the average functional difficulties suffered by the
33 individual during the period in which he or she is
34 observable for us. The idea of cumulative disability has been already used and validated
35 in the medical literature (Vita and Campion, 1998).

1
2
3 For the construction of the cumulative ADL index, we first selected the following ADLs
4 items: difficulties in bathing, dressing, eating, getting in and out of bed and walking
5 across the room. We added up these (0/1) variables and divided the sum by the number
6 of items (5). Next, we added up this result across waves for every individual, correcting
7 for the number of waves in which the individual was present in the panel⁸.
8
9

10
11 In order to homogenize the sample of our analysis, it would be interesting to analyze all
12 individuals who reach a certain age. Functional problems rise significantly before death,
13 and having individuals in the sample who die before a certain age may lead to an
14 overrepresentation of persons with functional problems. However, since the panel is not
15 long enough, such a selection is not possible.
16
17

18
19 Figure 3 shows the mean of the cumulative ADL index by age for the different cohorts.
20 The AHEAD cohort (born before 1924) and the CODA cohort (born between 1924 and
21 1930) can be compared in two of the age groups considered (70-74 and 75-79). For both
22 age groups, the disability mean for the individuals born between 1924 and 1930 was
23 significantly lower. By comparing the CODA cohort (born between 1924 and 1930)
24 with the HRS cohort (born between 1931 and 1941) for the age group 65-69, we can see
25 that in this case again the younger cohort (HRS) has a lower disability mean than the
26 older cohort. Finally, by comparing the HRS cohort (born between 1931 and 1941) with
27 the War Babies cohort (born between 1942 and 1947) for the age groups 50-54 and 55-
28 59, we observe that the HRS has a higher disability mean.
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49

50
51 Summarizing, by comparing the different cohorts, we observe that the younger cohorts
52 suffer less from functional problems than the older cohorts.
53
54
55

56
57
58 ⁸ We repeat this calculation for every wave, so that this cumulative measure changes for every age at
59 which the individual is observable.
60

1
2
3 In figure 4 we carry out the same analysis for the cumulative IADL index. This index
4 was constructed in a similar way to the cumulative ADL index. The 5 IADLs items
5 selected were: difficulties in phoning, managing money, taking medication, shopping for
6 groceries and preparing hot meals. Again, we observe that older cohorts have more
7 functional problems than younger cohorts, with the exception of the War Babies (born
8 between 1942 and 1947), who have higher disability means than the preceding cohort.
9

10
11 Based on the analysis of both disability indicators, we can conclude that older cohorts
12 seem to be worse off. Therefore, there is prima facie evidence of compression of
13 morbidity. However, we also observe that War Babies are not always better off than the
14 preceding cohort. This shows that although there is a general trend of reduction of
15 morbidity, this reduction is not equal for every cohort due to the different health
16 technologies with which individuals are faced over the course of their life. One plausible
17 explanation for the results obtained for the War Babies is the argument offered by Case
18 et al. (2002)⁹. According to the authors, health in childhood is determined by household
19 income. Furthermore, this relationship becomes more pronounced as children grow
20 older.
21

22
23 As a result, children in poor households are more likely to have worse health in
24 adulthood than children from households with higher income. Individuals belonging to
25 the War Babies cohort were probably exposed to adverse economic situations which
26 may have affected their health not only in childhood but also at older ages.
27

28
29 Finally, we complete the analysis of compression of morbidity with a further exercise.
30
31 Up to now we have used the mean of the cumulative ADL and IADL indexes to test
32 whether there are differences between cohorts. Now, we analyze whether the proportion
33

34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
⁹ See also Almond et al. (2004).

1
2
3 of individuals with no functional problems and the percentage of individuals with high
4 functional problems at given ages change between cohorts. Analyzing the percentage of
5 individuals with no functional problems (ADL) we find no evidence of compression of
6 morbidity since there are no significant differences between cohorts in the percentage of
7 individuals with no functional problems. However, analyzing the percentage of
8 individuals with high functional problems (cumulative ADL index higher than 0.2), we
9 do find evidence of compression of morbidity, since younger cohorts have lower
10 percentages of individuals with high functional problems.
11
12
13
14
15
16
17
18
19
20
21

22 These results, together with the conclusions obtained from the analysis of the mean
23 differences between cohorts, lead us to the following overall conclusion: there is
24 evidence of compression of morbidity in the sense that younger cohorts have on average
25 fewer functional problems than the older ones at given ages¹⁰.
26
27
28
29
30
31

32 Furthermore, the percentage of individuals with high functional problems in carrying out
33 ADLs is lower for younger cohorts. However, after this descriptive analysis we do not
34 find evidence of a reduction of the percentage of individuals with no functional
35 problems. Although we will not analyze this specific result in detail we note its
36 importance in terms of policy recommendations.
37
38
39
40
41
42
43
44
45

46 4 Compression of morbidity and labor supply

47 4.1 Theoretical framework

48
49 In the last section, we concluded that there is evidence of compression of morbidity in
50 the sense that younger cohorts have on average fewer functional problems than the older
51
52
53
54

55
56
57 ¹⁰ These results coincide with the results obtained in the medicine literature (Crimmins and
58 Saito, 2001; Freedman et al., 2002; Fries, 2003; Manton and Gu, 2001).
59
60

1
2
3 ones at given ages. This result has important policy implications since the social and
4 health care needs of the elderly change with time, and adequate responses must be given
5
6 to these changing needs.
7
8

9
10 Furthermore, there is another important implication, which is how labor supply responds
11 to these changes in health status. Given the increase in the proportion of individuals 65
12 and older the need of an increase in the retirement age has recently been the topic of
13 discussion. The improvement of the health status of older people is a factor that may
14 help to increase employment rates of individuals before and after the legal retirement
15 age.
16
17

18 As known from the literature (e.g. Costa, 1996; Sickles and Yazbeck, 1998; Blau et al.,
19 2001; Wilson, 2001; Mete and Schultz, 2002; Miah and Wilcox-Gök, 2007), there is an
20 important link between labor force participation and health, especially in the elderly.
21 This relationship has been shown to be endogenous and this aspect has conditioned the
22 empirical works dealing with this topic.
23
24

25 The endogeneous relationship between the two variables derives from two sources. First,
26 there is a double causal relationship between health and labor force participation.
27 Individuals' decision to work at older ages may be affected by health but at the same
28 time, work may have an effect on health. Second, individual unobserved factors may be
29 associated with both the likelihood of working and with having a particular health status.
30
31

32 Although most of the empirical works conclude that good health has a positive effect on
33 labor force participation at older ages, from a theoretical point of view, the relationship
34 between health and labor supply is not trivial. In order to better understand the
35 relationship between the two variables, we describe next the model developed by Currie
36 and Madrian (1999). In this model, individuals derive utility from health, leisure and
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3 other commodities. By investing time and other health inputs in order to produce health,
4
5 individuals reduce the total time being sick, which increases the total available time for
6
7 leisure and market activities. At the same time, hours of work are necessary in order to
8
9 increase the available income which allows the acquisition of material health inputs and
10
11 other commodities from which individuals also derive utility.
12
13

14
15 The intertemporal utility function of the consumers is:
16

$$17 \quad \sum_{t=1}^T \left(\frac{1}{1+\lambda} \right)^t U_t \quad (1)$$

18
19 where, λ is the discount rate. U_t is defined by:
20
21

$$22 \quad U_t = U(H_t, C_t, L_t; X_t, u_t, \varepsilon_{1t}) \quad (2)$$

23
24 where H is the stock of health, C is consumption of other goods and L is leisure. X is a
25
26 vector of exogenous factors affecting preferences, u_1 is a vector of permanent factors
27
28 affecting individual preferences, and ε_1 denotes shocks to preferences. Each individual
29
30 maximizes his or her utility subject to the following constraints:
31
32
33
34
35

$$36 \quad H_t = H(H_{t-1}, M_t, TH_t; V_t, u_2, \varepsilon_{2t}) \quad (3)$$

37
38 This restriction is the health production function where M are material health inputs and
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100
101
102
103
104
105
106
107
108
109
110
111
112
113
114
115
116
117
118
119
120
121
122
123
124
125
126
127
128
129
130
131
132
133
134
135
136
137
138
139
140
141
142
143
144
145
146
147
148
149
150
151
152
153
154
155
156
157
158
159
160
161
162
163
164
165
166
167
168
169
170
171
172
173
174
175
176
177
178
179
180
181
182
183
184
185
186
187
188
189
190
191
192
193
194
195
196
197
198
199
200
201
202
203
204
205
206
207
208
209
210
211
212
213
214
215
216
217
218
219
220
221
222
223
224
225
226
227
228
229
230
231
232
233
234
235
236
237
238
239
240
241
242
243
244
245
246
247
248
249
250
251
252
253
254
255
256
257
258
259
260
261
262
263
264
265
266
267
268
269
270
271
272
273
274
275
276
277
278
279
280
281
282
283
284
285
286
287
288
289
290
291
292
293
294
295
296
297
298
299
300
301
302
303
304
305
306
307
308
309
310
311
312
313
314
315
316
317
318
319
320
321
322
323
324
325
326
327
328
329
330
331
332
333
334
335
336
337
338
339
340
341
342
343
344
345
346
347
348
349
350
351
352
353
354
355
356
357
358
359
360
361
362
363
364
365
366
367
368
369
370
371
372
373
374
375
376
377
378
379
380
381
382
383
384
385
386
387
388
389
390
391
392
393
394
395
396
397
398
399
400
401
402
403
404
405
406
407
408
409
410
411
412
413
414
415
416
417
418
419
420
421
422
423
424
425
426
427
428
429
430
431
432
433
434
435
436
437
438
439
440
441
442
443
444
445
446
447
448
449
450
451
452
453
454
455
456
457
458
459
460
461
462
463
464
465
466
467
468
469
470
471
472
473
474
475
476
477
478
479
480
481
482
483
484
485
486
487
488
489
490
491
492
493
494
495
496
497
498
499
500
501
502
503
504
505
506
507
508
509
510
511
512
513
514
515
516
517
518
519
520
521
522
523
524
525
526
527
528
529
530
531
532
533
534
535
536
537
538
539
540
541
542
543
544
545
546
547
548
549
550
551
552
553
554
555
556
557
558
559
560
561
562
563
564
565
566
567
568
569
570
571
572
573
574
575
576
577
578
579
580
581
582
583
584
585
586
587
588
589
590
591
592
593
594
595
596
597
598
599
600
601
602
603
604
605
606
607
608
609
610
611
612
613
614
615
616
617
618
619
620
621
622
623
624
625
626
627
628
629
630
631
632
633
634
635
636
637
638
639
640
641
642
643
644
645
646
647
648
649
650
651
652
653
654
655
656
657
658
659
660
661
662
663
664
665
666
667
668
669
670
671
672
673
674
675
676
677
678
679
680
681
682
683
684
685
686
687
688
689
690
691
692
693
694
695
696
697
698
699
700
701
702
703
704
705
706
707
708
709
710
711
712
713
714
715
716
717
718
719
720
721
722
723
724
725
726
727
728
729
730
731
732
733
734
735
736
737
738
739
740
741
742
743
744
745
746
747
748
749
750
751
752
753
754
755
756
757
758
759
760
761
762
763
764
765
766
767
768
769
770
771
772
773
774
775
776
777
778
779
780
781
782
783
784
785
786
787
788
789
790
791
792
793
794
795
796
797
798
799
800
801
802
803
804
805
806
807
808
809
810
811
812
813
814
815
816
817
818
819
820
821
822
823
824
825
826
827
828
829
830
831
832
833
834
835
836
837
838
839
840
841
842
843
844
845
846
847
848
849
850
851
852
853
854
855
856
857
858
859
860
861
862
863
864
865
866
867
868
869
870
871
872
873
874
875
876
877
878
879
880
881
882
883
884
885
886
887
888
889
890
891
892
893
894
895
896
897
898
899
900
901
902
903
904
905
906
907
908
909
910
911
912
913
914
915
916
917
918
919
920
921
922
923
924
925
926
927
928
929
930
931
932
933
934
935
936
937
938
939
940
941
942
943
944
945
946
947
948
949
950
951
952
953
954
955
956
957
958
959
960
961
962
963
964
965
966
967
968
969
970
971
972
973
974
975
976
977
978
979
980
981
982
983
984
985
986
987
988
989
990
991
992
993
994
995
996
997
998
999
1000

50 The budget constraint is:
51
52

$$53 \quad C_t + P_t M_t + (A_{t+1} - A_t) = Y_t \quad (4)$$

where P is the price vector of the health material inputs, A denotes assets and Y is total income. The different income sources are unearned income (I), labor income (WTW) and interest derived from assets (rA):

$$Y_t = I_t + W_t T W_t + r A_t \quad (5)$$

The time constraint is:

$$L_t + T H_t + T W_t + S_t = 1 \quad (6)$$

where TW is working time and S is sick time which at the same time depends on the health stock:

$$S_t = S(H_t, u_3, \varepsilon_{3t}) \quad (7)$$

where u_3 is a vector of individual factors determining illness, and ε_{3t} are shocks that cause illness.

There are different possible effects of health on labor supply (Benjamin et al., 2003): health status determines the time an individual spends sick and therefore, determines the total time available for market (TW , TH) (and non-market (L)) activities. Poor health may also affect the marginal rate of substitution between leisure and health increasing the 'marginal disutility for work', in this way reducing the labor supply. A negative health shock may also have a negative effect on productivity, which may be translated into lower wages. A reduction in wages has income and substitution effects on labor supply, so that the net effect is not clear. Ill-health may increase the necessity of increasing material health inputs (M) which could increase labor supply due to an adverse income effect. Furthermore, ill-health may have an effect on non-labor income (I), depending on how non-labor income is obtained.

1
2
3 At the same time, labor supply affects health in different ways. First, labor supply
4 determines labor income, which at the same time determines the income available to
5 purchase material health inputs. Furthermore, labor supply also determines the time
6 available to produce time health inputs. Labor supply could also be considered as a
7 direct input in the health production function, especially when considering jobs which
8 are physically demanding and when analyzing the effects of labor supply on mental
9 health.

10
11 According to this theoretical framework, there is no clear net effect of health on labor
12 supply given the endogenous relationship between the two variables, although in the
13 empirical literature it has been shown that ill-health negatively affects labor
14 participation.

15
16 In the next subsection we carry out an empirical analysis of the effects of functional
17 (ADL and IADL) problems on labor participation, correcting for endogeneity. If
18 functional problems have a negative effect on labor participation after controlling for
19 other covariates and for endogeneity, we will expect compression of morbidity to have a
20 positive effect on the employment rates of older people.

21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 **4.2 Empirical analysis**

45
46 In this section, we analyse how disability affects labor participation, and where
47 individuals are participating in the labour force, what the effect on the number of hours
48 worked is. When including disability as a explanatory variable it must be taken into
49 account that there is a possible endogenous relationship between disability and labor
50 participation and between disability and number of worked hours. The most commonly
51 used method to overcome the problem of endogeneity is IV (Instrumental Variables).

The endogenous disability model for labor participation consists of a two-equation system:

$$LP_i = F(X_{1i}\alpha_1 + D_i\alpha_2) + \varepsilon_i \quad (8)$$

$$D_i = Z_i\beta_1 + X_{1i}\beta_2 + \mu_i \quad (9)$$

where LP is labor participation, X_{1i} is a vector of exogenous variables, D_i is disability and Z_i are the instruments. The endogenous disability model for the number of hours worked can be defined as following:

$$WH_i = X_{2i}\gamma_1 + D_i\gamma_2 + \eta_i \quad (10)$$

$$D_i = Z_i\beta_1 + X_{2i}\beta_2 + \mu_i \quad (11)$$

where WH_i are the number of hours worked per week and X_{2i} is a vector of exogenous variables. The estimation of the equation (8) by probit and the estimation of the equation (10) by OLS will yield to biased estimates of α_2 and γ_2 if D_i is not exogenous. Therefore, IV is used in order to handle this endogeneity problem. The main question when using this method is to define the right instruments. The instruments chosen for the present analysis are health measures that have been already used in the literature (Campolieti, 2002). Concretely, information is used about whether individuals have been diagnosed in the past one of the following health problems: high blood pressure, diabetes, cancer, lung disease, heart problems, stroke, psychical problems and arthritis and the individuals' body mass index. The main properties that these instruments must fulfil in order to be valid as instruments are the following: first, they must be highly correlated with disability and second, they must be uncorrelated with the error terms ε_i and η_i . These instruments present a strong correlation with disability, as the F-tests on excluded

1
2
3 variables show¹¹. Furthermore, it is not likely that these instruments are correlated with
4
5 the error term of the equations (8) and (10), as has been already discussed by Campolieti
6
7 (2002).
8
9

10 In table 1, the results of two different models of labour participation are presented. First,
11
12 the effect of disability on labour participation is estimated without instrumentalizing
13
14 disability.¹² Next, in the second model, an IV probit is estimated.
15
16

17 In the first model we observe that non-instrumentalized disability has a significant and
18
19 negative effect on labour participation. In the second model disability is intrumentalized
20
21 using the health measures specified above. Instrumented disability has a significant and
22
23 negative effect on labor participation. The higher the disability index, the lower the
24
25 probability of participating in the labor market. By comparing the marginal effects
26
27 obtained from the estimation of the two models, we observe that instrumentalized
28
29 disability has a higher effect on labour force participation than non instrumentalized
30
31 disability. This result indicates that in the second model, endogeneity leads to a
32
33 downsize bias in the effect of disability on labour participation. The magnitude of the
34
35 impact of disability on labor participation derived from our results is similar to the
36
37 magnitude obtained by Campolieti (2002).
38
39
40
41
42

43 Other controls have been introduced in the estimation of the models. In the second
44
45 model these controls present the following results: year of birth has a significant and
46
47 positive effect on labor participation. The younger an individual is, the higher the
48
49 probability of their working. We control for year of birth and not for age because in this
50
51
52
53
54

55
56 ¹¹ F-tests are listed on the regression tables.

57 ¹² Disability is an index which can take values between 0 (non disability) and 2 (when the ADL index
58 takes value 1 and the IADL index takes value 1).
59
60

1
2
3 way, we also control for the cohort effects. Being a woman and being partnered or
4
5 married have a significant and negative
6
7 effect on labor participation. Higher education and longer work experience have a
8
9 significant and positive effect on labor participation. At the same time, the higher the
10
11 number of individuals in the household, the higher the probability of working. Region
12
13 dummies have been introduced in order to control for labour market disparities across
14
15 the regions. However, these dummies are not significant.

16
17
18
19
20 Next, we estimate how disability affects the self-reported number of hours worked. In
21
22 order to correct for selection bias, we calculate the inverse Mills ratio (λ) using the
23
24 probit parameter estimates (Berndt, 1991). Then, λ is included in the estimation models
25
26 of the number of hours worked per week¹³. Again, two different models of number of
27
28 worked hours are estimated and the results are presented in table 2. In the first model,
29
30 the effect of disability on the number of hours worked is estimated. In the second model
31
32 disability is instrumentalized using different health measures (Z). Disability and
33
34 instrumentalized disability have a significant and negative effect on the number of hours
35
36 worked per week. Again, the effect of instrumentalized disability is greater, which
37
38 indicates that endogeneity leads to a downsize bias in the estimation of the effect of
39
40 disability on the number of hours worked.
41
42
43
44

45
46 From these results we can conclude that disability has a negative effect on labour
47
48 participation, and furthermore, has also a negative effect on the number of hours worked
49
50 per week for those who participate in the labour market, which confirms the results
51
52 obtained in the descriptive analysis.
53
54
55
56

57
58 ¹³ For persons working only.
59
60

1
2
3 However, there is another aspect that has to be taken into account in order to predict
4 which the effect of the delay in the onset of health problems on labor participation will
5 be. The effect of disability on labor participation may change with time. This is due to
6 different reasons: first, there are changes in leisure preferences between cohorts and
7 second, there are also changes in labor conditions so that individuals with certain
8 disability problems in the present may have a different likelihood to participate in the
9 labour market than in the past. In order to corroborate this idea, a model of labour
10 participation is estimated separately for different cohorts (the results are presented in
11 table 3). Not all the cohorts can be compared, given the age selection of the sample.
12 Only War Babies (born between 1942 and 1947) and HRS (born between 1931 and
13 1941) are compared.¹⁴ By comparing the marginal effect of disability on labor
14 participation from both cohorts, we observe that the negative effect of disability on labor
15 participation is greater for the younger cohort. This result confirms the idea that the
16 effect of disability on labor status changes with time.

17
18
19 In order to better illustrate how different levels of disability affect labour supply, we
20 calculate changes in predicted probabilities of labor participation for different disability
21 levels¹⁵. We first calculate how labor participation would change for the War Babies
22 cohort if disability were to increase to the same level as the HRS cohort. Next, we
23 calculate how labor participation would change for the HRS cohort if disability is
24 reduced to the War Babies disability level.

25
26 We find that labor participation for the War Babies cohort would decrease by 1.8% if the
27 level of disability had not decreased between cohorts (if there had been no compression
28
29

30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
¹⁴ There are not enough observations in order to also include CODA (born between 1924 and 1930).

¹⁵ Calculations have been carried out following Long and Freese (2001).

of morbidity)¹⁶. On the other hand, labor participation for the HRS cohort would have been 1.4% higher had they the same disability levels as the War Babies cohort.

5 Summary and Conclusions

The increase in longevity has led to important debates. One of these debates is about the health consequences of increases in life expectancy. If the proportion of individuals with problems in carrying out daily activities increases as result of increases in life expectancy, we should be prepared to meet need for their social and health care. However, it is not clear that the recent trends in longevity cause increases in morbidity. Fries argues that increases in life expectancy are not necessarily translated into increases in morbidity. Due, among other reasons, to improvements in medical care and in lifestyles, the onset of morbidity in older ages is delayed. If this delay is greater than the increase in life expectancy, there is no increase in morbidity.

In this paper we analyze, using the HRS, whether younger cohorts suffer less from functional problems at given ages. From this analysis we conclude that there is evidence of compression of morbidity, since younger cohorts suffer less from functional problems than older cohorts.

The delay in the onset of disability in older ages may have important consequences for the labor market. Currently, the increase in the retirement age is being discussed in most developed countries in order to overcome the financial problems of the public pension systems. At the same time, early retirement is discouraged so that the individuals must

¹⁶ The change in disability is the difference in disability level between two cohorts for ages between 51 and 60 (ages at which both cohorts are comparable).

1
2
3 work until the legal retirement age if they do not wish to be financially penalized. The
4
5 idea is that older workers are necessary in order to maintain the public pension systems
6
7 in economies where the old age dependency ratio is increasing dramatically.
8
9

10 In the second part of the paper, we analyze the effect of disability on labor force
11
12 participation and on the number of hours worked per week. We do observe after
13
14 controlling for endogeneity that disability has a negative effect on labor force
15
16 participation and on the number of worked hours per week for those who work.
17
18 Furthermore, we have observed that the negative effect of disability on labor participation
19
20 changes between cohorts, having a greater effect for younger cohorts.
21
22

23
24 According to the cohort analysis and the multivariate analysis carried out in this paper,
25
26 individuals will be able to work longer because of the delay in the onset of disability
27
28 problems which cause lower participation in the labor force. However, this effect will be
29
30 partly counteracted by changes in the effect disability will have on labor participation
31
32 through time.
33
34

35
36 To summarize, given the improvements in the health of older workers in recent decades,
37
38 there is an increasing number of potential labor force participants who would formerly
39
40 have left the labor market due to health reasons. The labor market should be able to
41
42 absorb this labor force in order to alleviate the financial problems of the public pension
43
44 systems.
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

For Peer Review

References

- 1
2
3
4
5
6 [1] **Almond, D., Chay, K.Y. and Lee, D.S. (2004)** The costs of low birth weight,
7
8 Working Paper 10552, National Bureau of Economic Research. Cambridge, MA:
9
10 NBER.
- 11
12
13 [2] **Bhattacharya, J., Cutler, D.M., Goldman, D.P., Hurd, M.D., Joyce, G.F.,**
14
15 **Lakdawalla, D.N., Panis, C.W. and Shang, B. (2004)** Disability forecasts and future
16
17 Medicare costs, *Frontiers in Health Policy Research*, 7, 75-94.
- 18
19
20 [3] **Bell, F.C. and Miller, M.L. (1999)** Life tables for the United States social security
21
22 area 1900-2100. Actuarial study n.116. [http://www.lifetable.de/data/MPIDR/USA_1901-](http://www.lifetable.de/data/MPIDR/USA_1901-1999.pdf)
23
24 [1999.pdf](http://www.lifetable.de/data/MPIDR/USA_1901-1999.pdf)
- 25
26
27 [4] **Benjamin, D., Brandt, L. and Fan, J-Z. (2003)** Ceaseless Toil? Health and labor
28
29 supply of the elderly in rural China, Working Paper of the Economics Department.
30
31 University of Toronto.
- 32
33
34 [5] **Berndt, E. (1991)** The practice of econometrics: Classic and contemporary.
35
36 Addison-Wesley.
- 37
38
39 [6] **Blau, D.M., Gilleskie, D.B. and Slusher, C. (2001)** The effect of health on
40
41 employment transitions of older men, *Research in labor economics*, 20.
- 42
43
44 [7] **Campolieti, M.(2002)** Disability and the labor force participation of older men in
45
46 Canada, *Labour Economics*, 9, 405-432.
- 47
48
49 [8] **Case, A., Lubotsky, D. and Paxson, C. (2002)** Economic Status and Health in
50
51 Childhood: The Origins of the Gradient. *American Economic Review*, American
52
53 Economic Association, 92(5), 308-1334.
- 54
55
56 [9] **Costa, D. (1996)** Health and labor force participation of older men 1900-1991,
57
58 *Journal of Economic History*, 56, 62-89.
- 59
60

1
2
3 [10] **Costa, D. (2002)** Changing chronic disease rates and long-term declines in
4 functional limitation among older men, *Demography*, 39(1), 119-137.

5
6
7
8 [11] **Crimmins, E.M., Saito, Y. and Ingegneri, D. (1997)** Trends in disability-free life
9 expectancy in the United States, 1970-90, *Population and Development Review*, 23(3),
10 555-572.

11
12
13
14 [12] **Crimmins, E. M, and Saito, Y. (2001)** Trends in Disability-Free Life Expectancy
15 in the United States, 1970-1990: Gender, Racial, and Educational Differences, *Social*
16 *Science and Medicine*, 52, 1629-1641.

17
18
19
20 [13] **Currie, J. and Madrian, B.C. (1999)** Health, health insurance and the labor
21 market, in *Handbook of Labor Economics* (Ed.) O. Ashenfelter and D. Card,
22 Amsterdam: North-Holland.

23
24
25
26 [14] **Fallace, R.B., Herzog, A.R. (1995)** Overview of the health measures in the health
27 and retirement study, *The Journal of Human Resources*, 30, supplement.

28
29
30
31 [15] **Freedman, V.A., Martin, L.G. and Schoeni, R.F. (2002)** Recent trends in
32 disability and functioning among older adults in the United States: A systematic review,
33 *The Journal of the American Medical Association (JAMA)*, 288(4).

34
35
36
37 [16] **Fries, J.F. (1980)** Aging, natural death and the compression of morbidity, *The New*
38 *England Journal of Medicine*, 303, 130-135.

39
40
41
42 [17] **Fries, J.F. (2003)** Measuring and monitoring success in compressing morbidity,
43 *Annals of Internal Medicine*, 139, 455-459.

44
45
46
47 [18] **Gruenberg, E.M. (1977)** The Failures of Success, *Midland Memorial Foundation*
48 *Quarterly/ Health and Society*, 55, 3-24.

1
2
3 [19] **Jacobzone, S., Cambois, E. and Robine, J-M. (2000)** Is the health of older
4 persons in OECD countries improving fast enough to compensate for population
5 ageing?, *OECD Economic Studies*, 30.
6
7

8
9
10 [20] **Kramer, M. (1980)** The rising pandemic of mental disorders and associated
11 chronic diseases and disabilities, *Acta Psychiatrica Scandinavica*, 62 (Suppl.285), 282-
12 297.
13
14

15
16
17 [21] **Lakdawalla, D. and Philipson, T. (2002)** The rise in old-age longevity and the
18 market for long-term care, *The American Economic Review*, 92(1), 295-306.
19

20
21 [22] **Long, J.S. and Freese, J.(2001)** *Regression Models for Categorical Dependent*
22 *Variables Using Stata*. College Station, TX: Stata Press.
23
24

25
26
27 [23] **Manton, K.G. (1982)** Changing concepts of morbidity and mortality in the elderly
28 population, *Milbank Memorial Fund Quarterly / Health and Society*, 60, 183-244.
29

30
31 [24] **Manton, K.G., Stallard, E. and Corder, L. (1997)** Changes in the age dependence
32 of mortality and disability: cohort and other determinants, *Demography*, 34(1),135-157.
33
34

35
36 [25] **Manton, K.G. and Gu, X. (2001)** Changes in the prevalence of chronic disability
37 in the United States black and nonblack population above age 65 from 1982 to 1999,
38 *Proceedings of the National Academy of Sciences USA*, 98 (11), 6354-6359.
39
40

41
42 [26] **Mathers, C.D. (1996)** Issues in the measurement of health status, Invited paper 9th
43 Meeting of the International Network on Health Expectancy (REVES) Rome.
44
45

46
47 [27] **Mete, C. and Schultz, T.P. (2002)** Health and labor force participation of the
48 elderly in Taiwan. Discussion Paper 846, Economic Growth Center. Yale University.
49
50

51
52 [28] **Miah, M.S. and Wilcox-Gök, V. (2007)** Do the sick retire early? Chronic illness,
53 asset accumulation and early retirement. *Applied Economics*, 39(15), 1921-1936.
54
55
56
57
58
59
60

1
2
3 [29] Munnell, A.H., Meme, K.B., Jivan, N.A. and Cahill, K.E. (2004) Should we raise
4 Social Security's earliest eligibility age? An issue in brief: Center for Retirement
5 Research at Boston College.
6
7

8
9
10 [30] Robine, J.M., Mathers, C.D., Brouard, N. (1996) Trends and differentials in
11 disability-free life expectancy: concepts, methods and findings, in Health and Mortality
12 Among Elderly Populations (Ed.) Caselli G., Lopez A., Clarendon Press, Oxford.
13
14

15 [31] Sickles, R.C. and Yazbeck, A.S. (1998) On the dynamics of demand for leisure
16 and the production of health. Journal of Business & Economic Statistics, 16(2), 187-
17 197.
18
19

20 [32] St. Clair, P. et al. (2003) RAND HRS Data Documentation, Version C.
21
22 <http://hrsonline.isr.umich.edu/meta/rand/randhrsc/randhrsc.pdf>
23
24

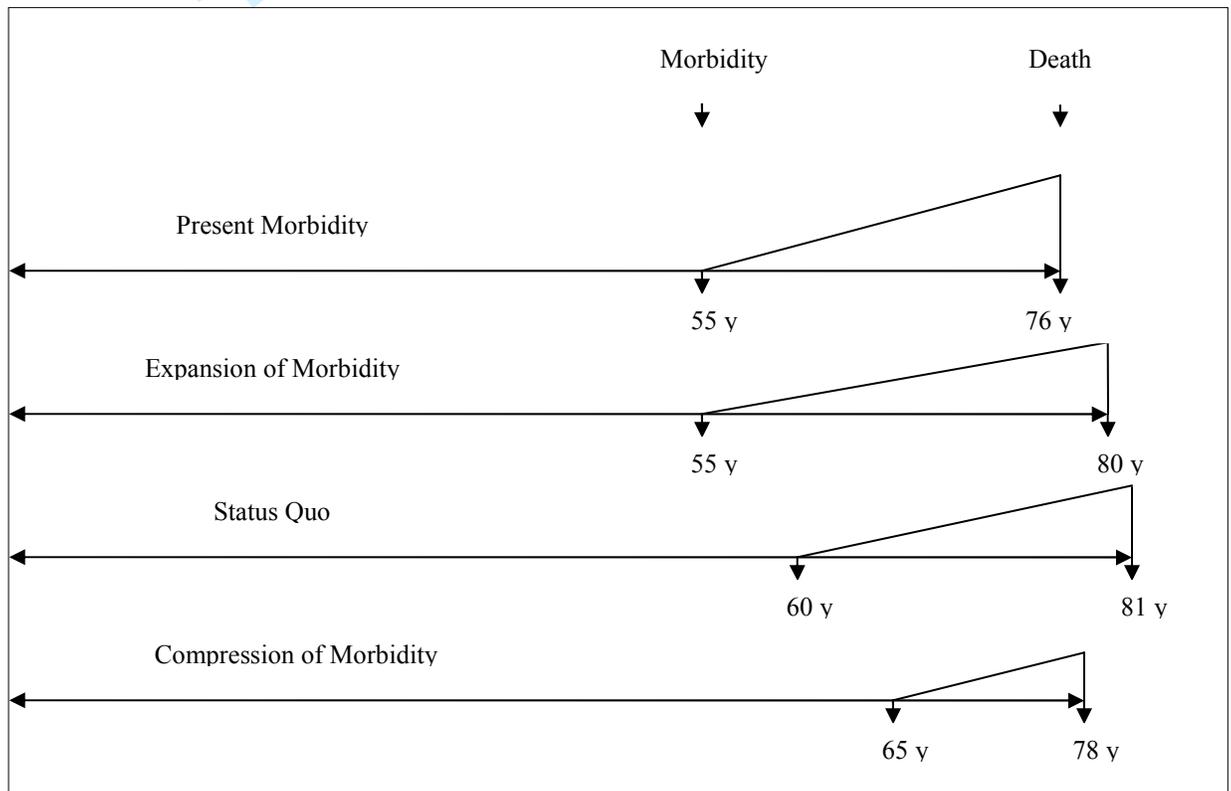
25 [33] Vita, A.J. and Campion, E.W. (1998) Aging, health risks, and cumulative
26 disability. The New England Journal of Medicine, 338(15), 1035-1041.
27
28

29 [34] Wilson, S.E. (2001) Work and the accommodation of chronic illness: A re-
30 examination of the health-labour supply relationship. Applied Economics, 33(9), 1139-
31 1156.
32
33

34 [35] Wilson, S., Burton, J. and Howell, B. (2005) Work and the disability transition in
35 20th century America, Working Paper 11036, National Bureau of Economic Research.
36 Cambridge, MA: NBER.
37
38

39 [36] Zweifel, P., Felder, S. and Meier, M. (1999) Aging of populations and health care
40 expenditure: a red herring?, Health Economics, 8(6), 485-496.
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Figure 1. Theories about the evolution of morbidity. Source: Fries (2003).



1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Figure 2. HRS cohorts and ages at which they are comparable. Source: own calculations.

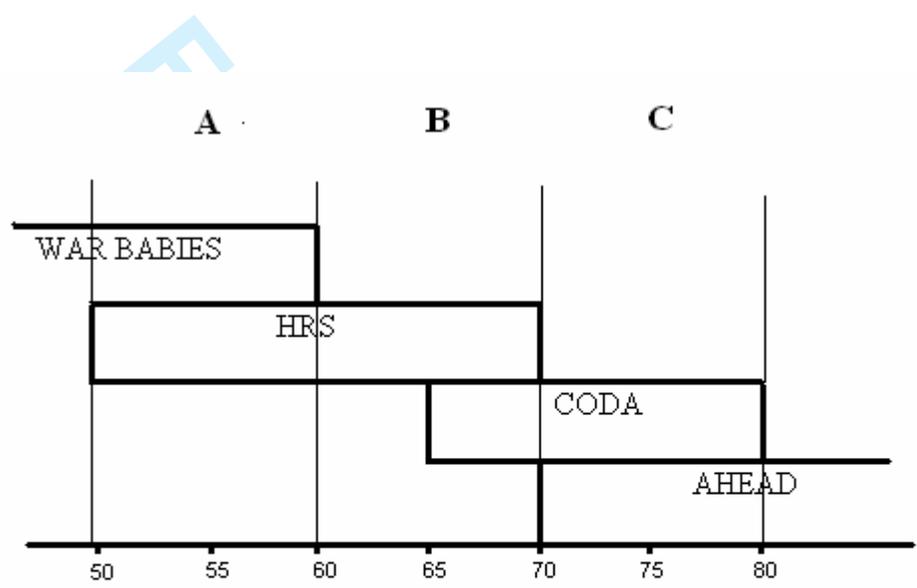
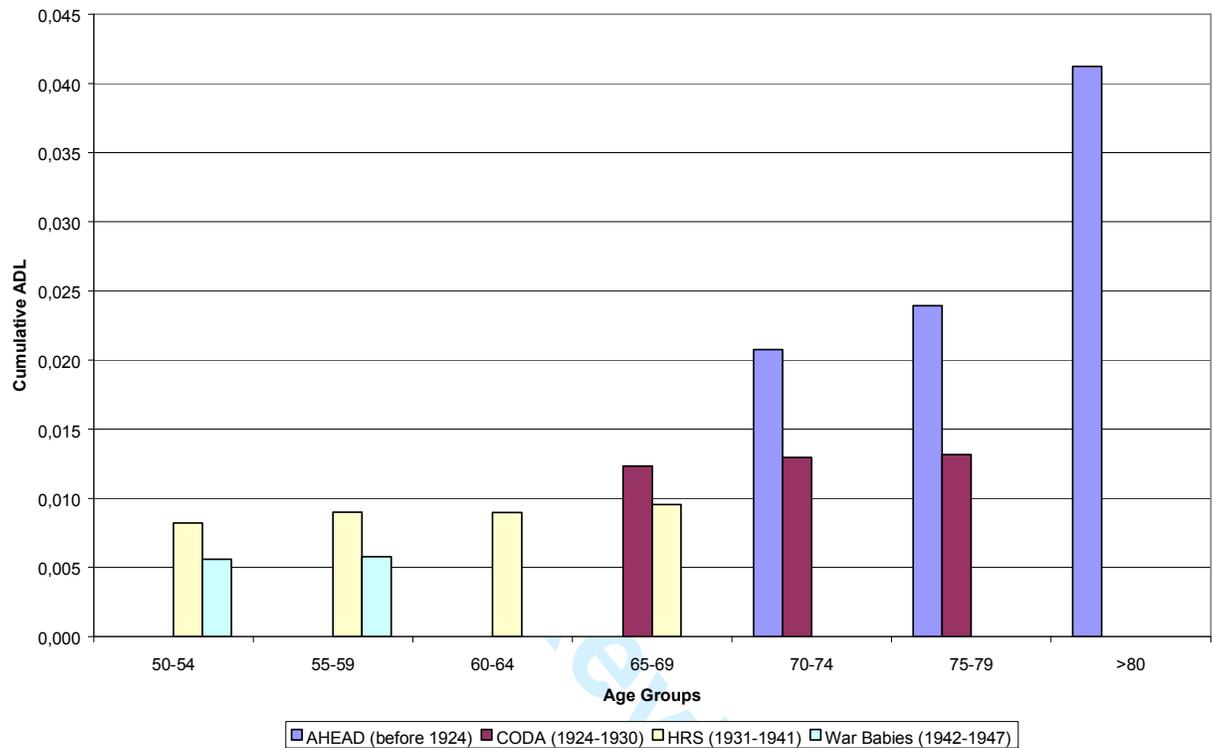


Figure 3. Cumulative ADL per age group and cohort. Source: own calculations.



1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Figure 4. Cumulative ADL per age group and cohort. Source: own calculations.

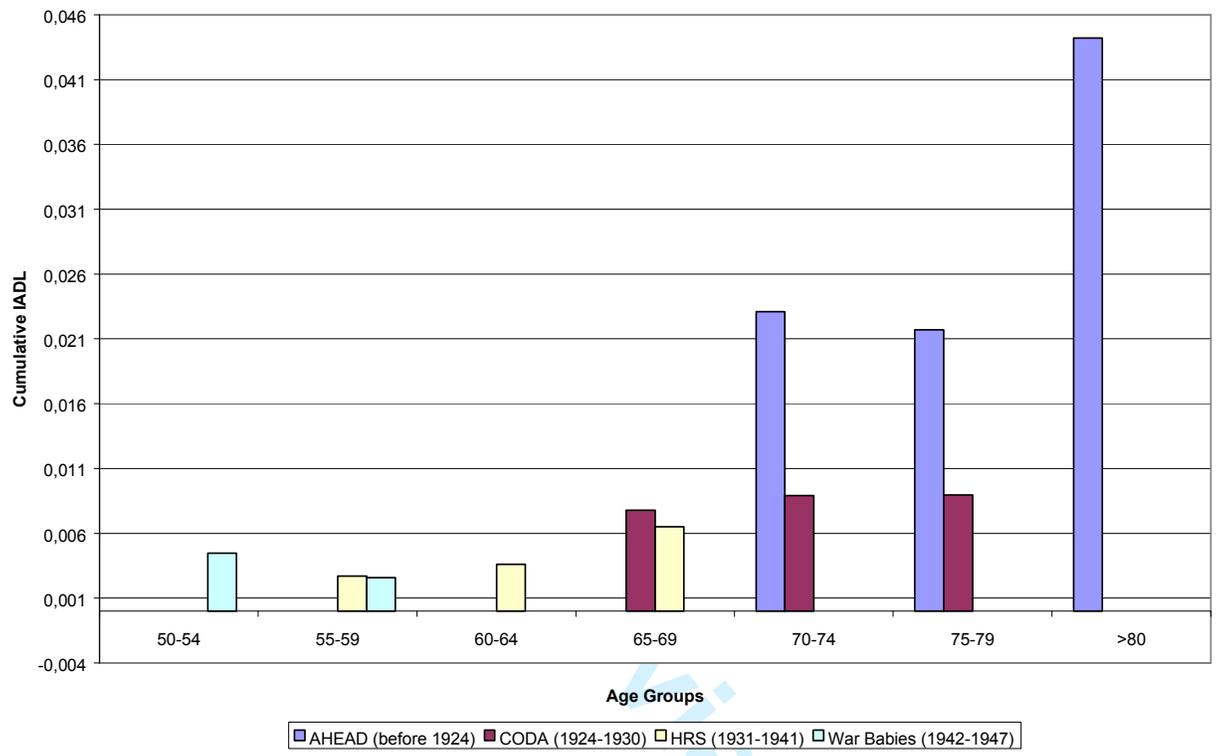


Table 1. Estimates of labor force participation. Dependent variable: labor participation (=1) if working for pay, (=0) otherwise.

	(1)	(2)
Disability	-1.9627*** (0.06519)	-4.3576*** (0.13611)
Year of Birth	0.1015*** (0.00253)	0.0999*** (0.00269)
Race (=1 non white)	-0.0495** (0.02512)	-0.0777** (0.02759)
Gender (=1 women)	0.0263 (0.02218)	-0.0445* (0.02398)
Marital Status (=1 married or partnered)	-0.1464*** (0.02451)	-0.2945*** (0.02723)
Number of Individuals in the HH	0.0448*** (0.00822)	0.0472*** (0.00879)
Number of Living Children	0.0169** (0.00494)	0.0170** (0.00528)
Religion (=1 no religion)	0.1559*** (0.04345)	0.1678*** (0.04653)
Years of education 2 (>=8.5 and <=12)	0.1256*** (0.03560)	-0.0730* (0.03940)
Years of education 3 (more than 12)	0.3222*** (0.03689)	-0.0707* (0.04139)
Years worked	0.0443*** (0.00090)	0.0379*** (0.00100)
Region dummy 1	0.4729 (0.72085)	0.7849 (0.77512)
Region dummy 2	0.4936 (0.72076)	0.8348 (0.77505)
Region dummy 3	0.4225 (0.72062)	0.7840 (0.77493)
Region dummy 4	0.4260 (0.72081)	0.7550 (0.77509)
Constant	-198.78*** (4.96553)	-195.324*** (5.29049)
	N=22370	N=22363
F-test on excluded variables	F(9, 22343) = 375.23***	

*p<0.1, **p<0.05, ***p<0.001. Standard Errors in parenthesis.

(1) Probit of labor force participation with disability as explanatory variable.

(2) IV Probit of labor force participation (instrumentalised disability).

Table 2. Estimates of the number of hours worked weekly.

	(1)	(2)
Disability	-6.6167*** (1.18713)	-36.7252*** (5.95842)
Mills Ratio	4.3455** (2.59807)	0.3363 (1.20336)
Year of Birth	1.0095*** (0.24348)	0.6254*** (0.11703)
Gender (=1 women)	-6.6094*** (0.25501)	-6.5948*** (0.26421)
Race (=1 white)	-0.9759** (0.32516)	-0.5257 (0.32389)
Marital Status (=1 married or partnered)	-2.1584*** (0.45278)	-1.8871*** (0.44570)
Number of Individuals in the HH	0.4210** (0.14389)	0.2804** (0.11117)
Self-employment (=1 self-employed)	-0.8556** (0.29673)	-0.7453** (0.30487)
Years worked	0.1379*** (0.01340)	0.1463** (0.04556)
Years of education 2 (>=8.5 and <=12)	0.4897 (0.59747)	-0.8106 (0.52927)
Years of education 3 (more than 12)	1.9830** (0.92950)	-0.2492 (0.54546)
Constant	-1934.38*** (481.05910)	-1174.636*** (232.85580)
	N=13907	N= 13991
F-test on excluded variables		F(8, 13971) = 71.13***

*p<0.1, **p<0.05, ***p<0.001. Standard Errors in parenthesis.

(1) Estimation of the number of hours worked with disability as explanatory variable.

(2) IV Estimation of the number of hours worked (instrumentalised disability).

Table 3. IV Probit of labor force participation separated by cohorts. Dependent variable: labor participation (=1) if working for pay, (=0) otherwise.

	(1)	(2)
Disability	-3.9905*** (0.15172)	-5.2946*** (0.30932)
Year of Birth	0.1147*** (0.00469)	0.0715*** (0.01269)
Race (=1 non white)	0.0821** (0.03174)	0.0465 (0.05909)
Gender (=1 women)	-0.0311 (0.02735)	-0.1034** (0.05367)
Marital Status (=1 married or partnered)	-0.2919*** (0.03028)	-0.2640*** (0.06602)
Number of Individuals in the HH	0.0601*** (0.01031)	0.0203 (0.01820)
Number of Living Children	0.0170** (0.00595)	0.0133 (0.01214)
Religion (=1 no religion)	0.2250*** (0.05655)	0.0201 (0.08830)
Years of education 2 (>=8.5 and <=12)	-0.0374 (0.04389)	-0.1742** (0.09432)
Years of education 3 (more than 12)	0.0862** (0.04653)	0.0207 (0.09701)
Years worked	0.0355*** (0.00113)	0.0468*** (0.00229)
Region dummy 1	3.7012 (8.70659)	0.0540 (0.99615)
Region dummy 2	3.7932 (8.70621)	-0.0788 (0.99558)
Region dummy 3	3.7395 (8.70634)	-0.0812 (0.99510)
Region dummy 4	3.7205 (8.70677)	-0.1690 (0.99577)
Constant	-226.9115*** (2.79618)	-139.08*** (24.68071)
	N=15789	N=5912
F-test on excluded variables	F(9, 15769) = 281.91***	F(9, 5892) = 86.38***

*p<0.1, **p<0.05, ***p<0.001. Standard Errors in parenthesis.

(1) IV Probit of labor force participation (instrumentalised disability) HRS

(2) IV Probit of labor force participation (instrumentalised disability) WAR BABIES

Acknowledgements

The author acknowledges the financial support provided through the European Community's Human Potential Programme under contract HPRN-CT-2002-00235, [AGE]. This paper was written during my stay at the University Ca'Foscari of Venice. I thank the Economics Department and specially Agar Brugiavini for her support and her contributions. I also thank David M. Blau, Mette Christensen, Christina Wübbecke and Johann Fuchs for their comments.

For Peer Review