Compression of morbidity and the labor supply of older people

Romeu Gordo, Laura

IAB Discussion Paper
Beiträge zum wissenschaftlichen Dialog aus dem Institut für Arbeitsmarkt- und Berufsforschung

No. 9/2006

Compression of Morbidity and the Labor Supply of Older People

Laura Romeu Gordo

Bundesagentur für Arbeit

Compression of Morbidity and the Labor Supply of Older People

Laura Romeu Gordo

Contents

Abstract

This paper tests whether there is evidence of compression of morbidity using data from the American Health and Retirement Study 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, labor supply.

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 Wübbeke and Johann Fuchs for their comments.

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 rate[1] 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 demand[2]. Second, if the onset of severe health problems is delayed, this may have an impact on the labor supply of older people. Recently, the necessity of increasing the retirement age in order to compensate for the increase of the ratio between individuals receiving public pensions and contributors has been under discussion. Improvement

---

1 For women aged 15-49 (OECD 2005).

2 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.

in the health status of older people may also help to increase the labor supply of older people before and after the legal retirement age.

The impact of increases in life expectancy on health has traditionally been analysed in medical literature (Crimmins/Saito 2001; Freedman et al. 2002; Fries 1980; Fries 2003; Manton et al. 1997; Manton/Gu 2001). However, there is an increasing interest on this topic in the economic literature since it has very important economic implications (Lakdawalla/ Philipson 2002; Bhattacharya et al. 2004).While recent studies analyse the consequences of increasing longevity on health care costs, until now there has not been evidence of how compression of morbidity affects the labor supply of older people.

2 Health consequences of increases in life expectancy

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

There are three major hypothesis dealing with this question. The first one is the expansion of morbidity hypothesis (Gruenberg 1977; Kramer 1980), which argues that the decline in mortality is translated into an increase in morbidity. It has been argued that health policy has focused on preventing death without preventing morbidity. Most efforts have been focused on reducing fatal diseases like cardiovascular diseases, smoking-related respiratory illnesses and cancers. The consequences of these achievements is that the death rates of the younger olds (younger than 80) are decreasing. However, since the proportion of individuals older than 80 is increasing there is a higher proportion of the population affected by diseases which usually appear in older ages and which are usually related to disability problems[3].

The compression of morbidity hypothesis argues that the decline in mortality is not necessarily associated with an increase in morbidity. Fries (1980) argued that if the onset of chronic illness (typical for later life) is postponed and if this postponement is greater than increases in life expec-

---

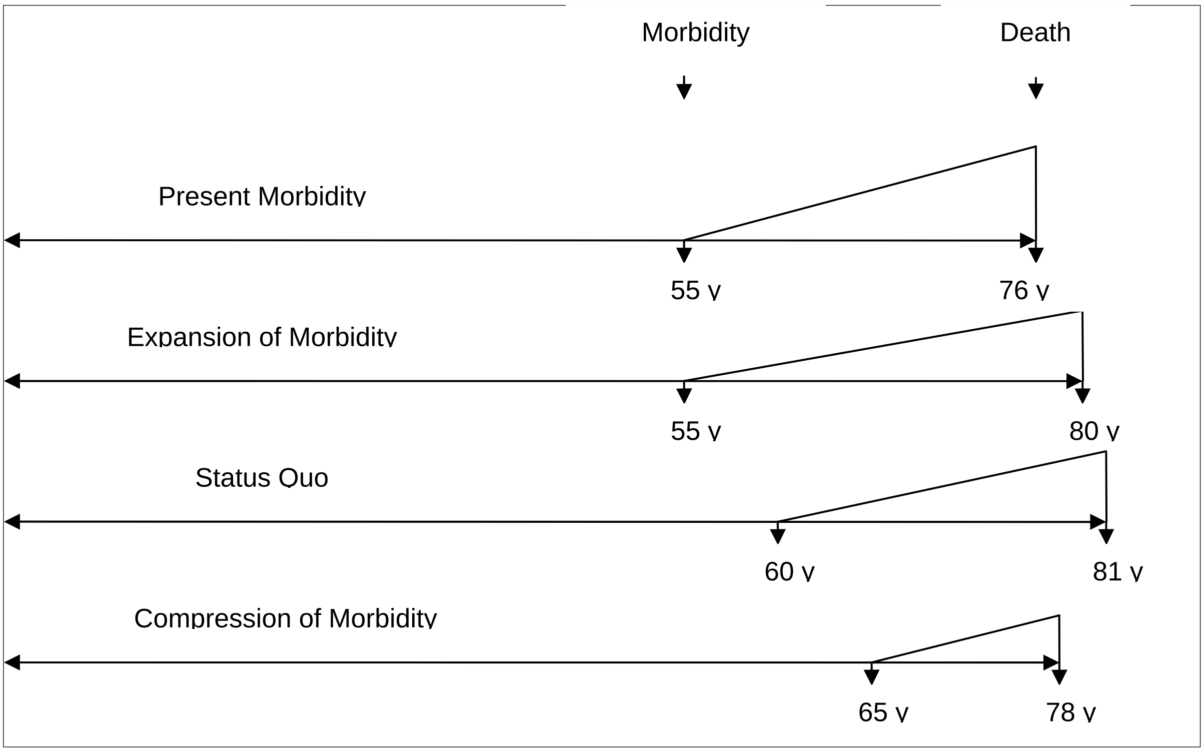
[3] Like osteoarthritis, depression, isolation, Alzheimer.

tancy, then the lifetime burden of illness could be reduced. The consequence of this trend would be a reduction in the cumulative lifetime morbidity.

The third hypothesis (Manton 1982) suggests a sort of status quo. There is a decline in mortality in younger ages, and at the same time, there is a decrease in the incidence and progression of chronic diseases.

These three hypotheses are represented in figure 1. The reference point in this figure is the hypothetical present situation of a representative individual in which the onset of morbidity occurs at age 55 and death occurs at age 76. In a context of expansion of morbidity, the period of morbidity is longer, given that the onset of morbidity does not change (55 years) but the death is delayed (80 years). In a situation of status quo, the onset of both morbidity and death are delayed (60 and 81 years respectively). In this case the total period of morbidity remains unchanged with respect to the reference situation. Finally, in a context of compression of morbidity, the onset of both morbidity and death are delayed (65 and 78 years). However, the delay in the onset of morbidity is larger than the delay of death, causing a reduction of the total period of morbidity.

Figure 1: Theories about the evolution of morbidity



Source: Fries (2003).

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

The concept of disability (or limited functional capacities) is very important when considering older ages. Disability increases with age (especially after 80) and implies that these individuals are dependent on others in order to carry out ordinary activities. Furthermore, when comparing different cohorts, disability is a more reliable indicator than chronic diseases, since the debilitating effects of chronic conditions may change from cohort to cohort (Costa 2002). At the same time, according to the epidemiological literature, disability summarizes the differential cohort accumulation of health effects of lifetime exposures (Manton et al. 1997).

In the disability literature, a distinction is made between severe and moderate disability (Jacobzone et al. 2000). 'Severe disability' includes individuals with problems carrying out Activities of Daily Living (ADL) such as eating, dressing and getting in and out of bed. Severe disability is usually associated with the need for personal help, either at home or in institutions. 'Moderate disability' includes individuals experiencing problems in carrying out Instrumental Activities of Daily Living (IADL) such as shopping, daily financial accounting or preparing meals. The trends in the prevalence of disability have been the instruments most used in order to test whether or not there has been compression of morbidity in recent decades (e.g. Jacobzone et al. 2000; Freedman et al. 2002; Crimmins et al. 1997; Vita/Campion 1998 and Manton/Gu 2001).

In the following section, we test the hypothesis of compression if morbidity using differences between cohorts. We want to analyze whether younger cohorts suffer less from functional problems than older cohorts at given ages.

3 Is compression of morbidity occurring? Health differences between cohorts

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

In this section, we intend to analyze, using data from the HRS[4] (Health and Retirement Study), whether there are differences between cohorts, and more concretely, whether younger cohorts suffer less from functional problems than older cohorts at a given age. We argue that this would be prima facie evidence of compression of morbidity.[5]

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

The RAND Center for the Studying of Ageing has developed what is called the RAND HRS Data files, which is a processed collection of variables derived from the Health and Retirement Study (HRS) (St. Clair et al. 2003). In the RAND version of the HRS, all information is summarized in 5 waves, after merging the second wave of the HRS cohort (started in 1994) and the first wave of the AHEAD cohort, which was started in 1993.

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

---

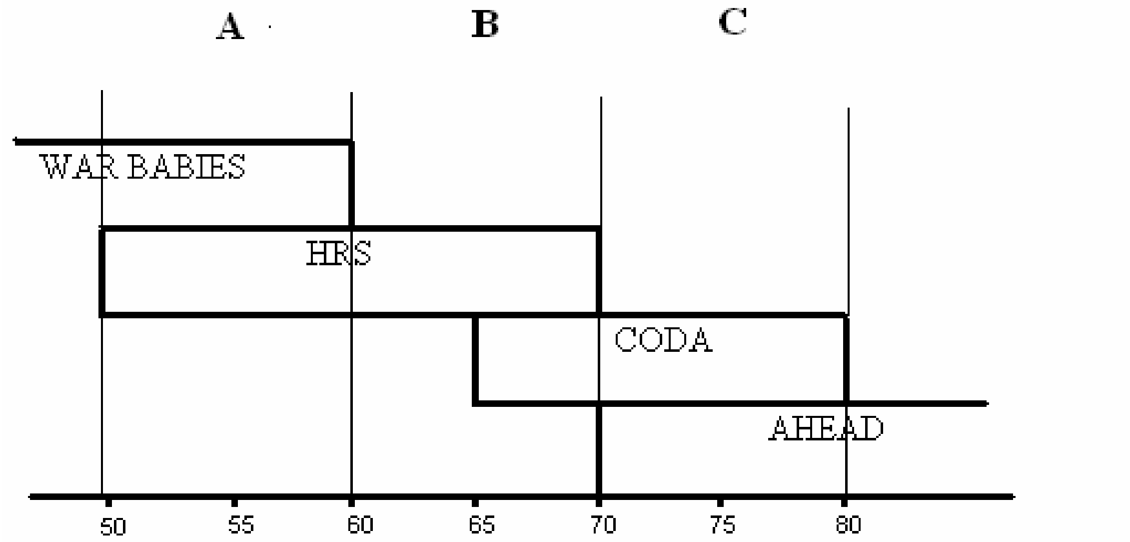
4 Concretely, the first 5 waves of the RAND version of the HRS.

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

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

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

Figure 2: HRS cohorts and ages at which they are comparable



Source: own calculations.

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

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

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

Figure 3 shows the mean of the cumulative ADL index by age for the different cohorts. The AHEAD cohort and the CODA cohort can be compared in two of the age groups considered (70-74 and 75-79). For both age groups, the disability mean for the CODA cohort was significantly lower. By comparing the CODA cohort with the HRS cohort for the age group 65-69, we can see that in this case again the younger cohort (HRS) has a lower disability mean than the older cohort. Finally, by comparing the HRS cohort with the War Babies cohort for the age groups 50-54 and 55-59, we observe that the HRS has a higher disability mean.

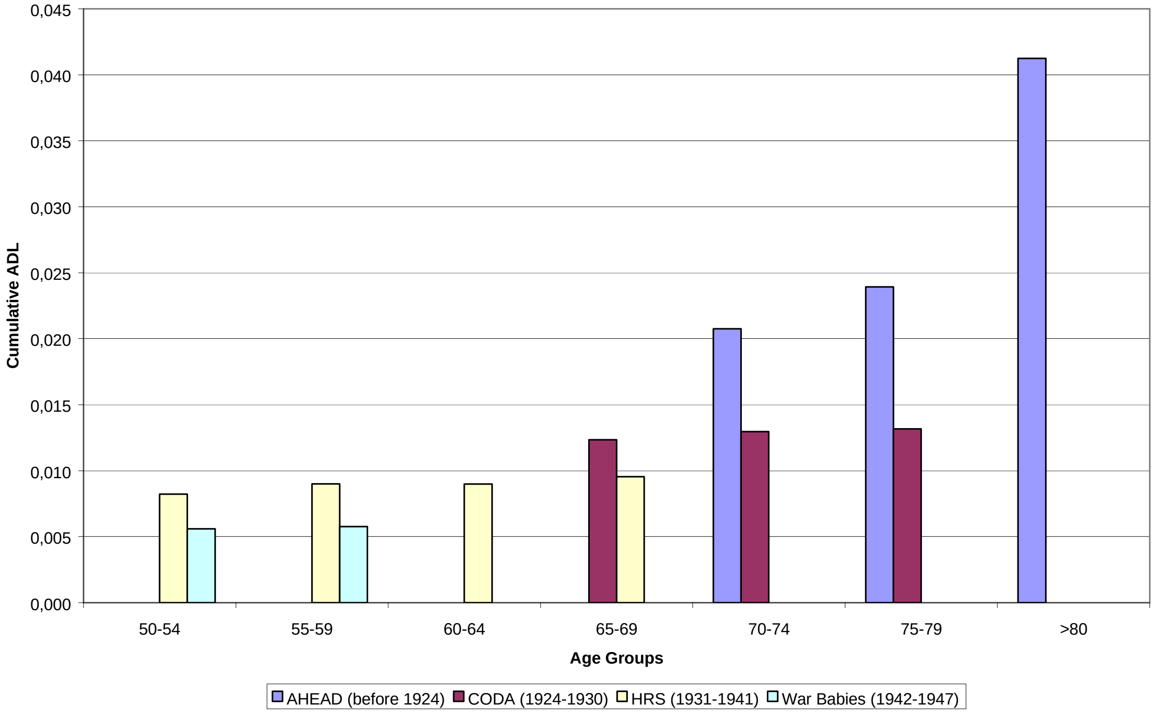
Summarizing, by comparing the different cohorts, we observe that the younger cohorts suffer less from functional problems than the older cohorts.

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

---

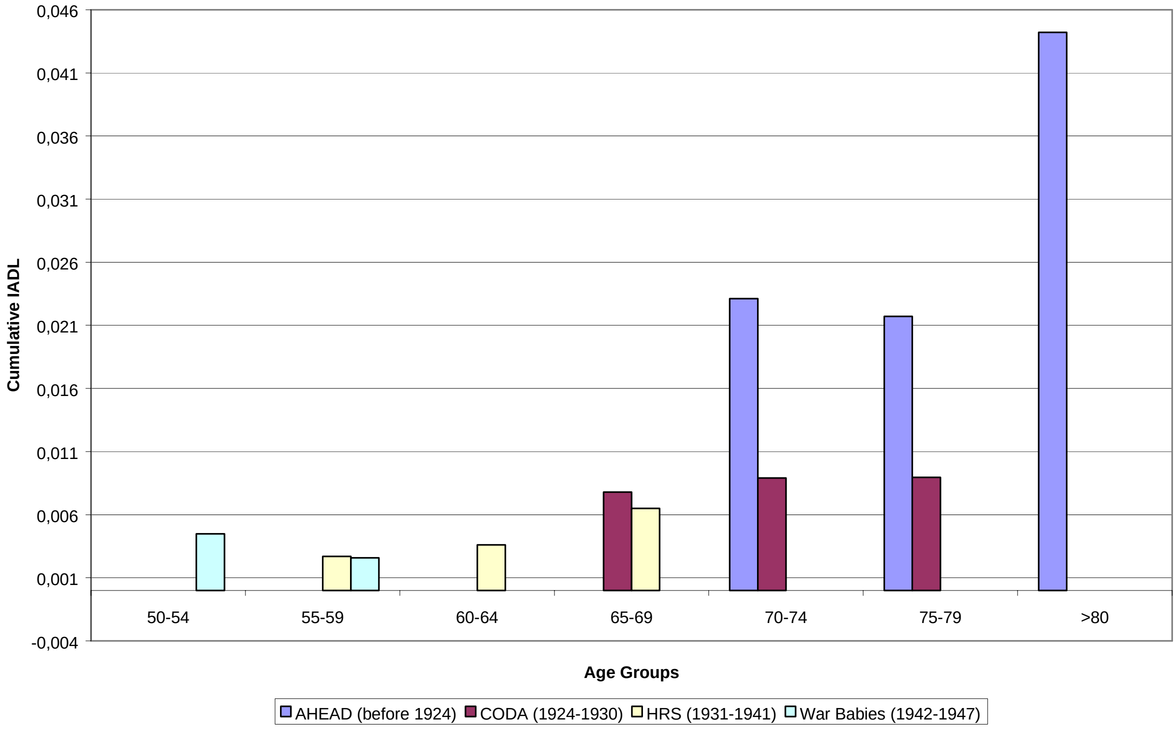
[6] We repeat this calculation for every wave, so that this cumulative measure changes for every age at which the individual is observable.

Figure 3: Cumulative ADL per age group and cohort



Source: own calculations.

Figure 4: Cumulative IADL per age group and cohort



Source: own calculations.

Based on the analysis of both disability indicators, we can conclude that older cohorts seem to be worse off. Therefore, there is prima facie evidence of compression of morbidity. However, we also observe that War Babies are not always better off than the preceding cohort. This shows that although there is a general trend of reduction of morbidity, this reduction is not equal for every cohort due to the different health technologies with which individuals are faced over the course of their life. One plausible explanation for the results obtained for the War Babies is the argument offered by Case et al. (2002)[7]. According to the authors, health in childhood is determined by household income. Furthermore, this relationship becomes more pronounced as children grow older.

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

Finally, we complete the analysis of compression of morbidity with a further exercise. Up to now we have used the mean of the cumulative ADL and IADL indexes to test whether there are differences between cohorts. Now, we analyze whether the proportion of individuals with no functional problems and the percentage of individuals with high functional problems at given ages change between cohorts. Analizing the percentage of individuals with no functional problems (ADL) we find no evidence of compression of morbidity since there are no significant differences between cohorts in the percentage of individuals with no functional problems. However, analyzing the percentage of individuals with high functional problems (cumulative ADL index higher than 0.2), we do find evidence of compression of morbidity, since younger cohorts have lower percentages of individuals with high functional problems.

These results, together with the conclusions obtained from the analysis of the mean differences between cohorts, lead us to the following overall conclusion: there is evidence of compression of morbidity in the sense

[7] See also Almond et al. (2004).

that younger cohorts have on average fewer functional problems than the older ones at given ages[8].

Furthermore, the percentage of individuals with high functional problems in carrying out ADLs is lower for younger cohorts. However, after this descriptive analysis we do not find evidence of a reduction of the percentage of individuals with no functional problems. Although we will not analyze this specific result in detail we note its importance in terms of policy recommendations.

4 Compression of morbidity and labor supply

4.1 Theoretical framework

In the last section, we concluded that there is evidence of compression of morbidity in the sense that younger cohorts have on average fewer functional problems than the older ones at given ages. This result has important policy implications since the social and health care needs of the elderly change with time, and adequate responses must be given to these changing needs.

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

As known from the literature (e.g. Costa 1996; Blau et al. 2001; Sickles/Yazbeck 1998 and Mete/Schultz 2002), there is an important link between labor force participation and health, especially in the elderly. This relationship has been shown to be endogenous and this aspect has conditioned the empirical works dealing with this topic.

The endogeneous relationship between the two variables derives from two sources. First, there is a double causal relationship between health and

---

[8] These results coincide with the results obtained in the medicine literature (Crimmins/Saito 2001; Freedman et al. 2002; Fries 2003; Manton/Gu 2001).

labor force participation. Individuals' decision to work at older ages may be affected by health but at the same time, work may have an effect on health. Second, individual unobserved factors may be associated with both the likelihood of working and with having a particular health status.

Although most of the empirical works conclude that good health has a positive effect on labor force participation at older ages, from a theoretical point of view, the relationship between health and labor supply is not trivial. In order to better understand the relationship between the two variables, we describe next the model developed by Currie/Madrian (1999). In this model, individuals derive utility from health, leisure and other commodities. By investing time and other health inputs in order to produce health, individuals reduce the total time being sick, which increases the total available time for leisure and market activities. At the same time, hours of work are necessary in order to increase the available income which allows the acquisition of material health inputs and other commodities from which individuals also derive utility.

The intertemporal utility function of the consumers is:

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

where, λ is the discount rate. U_t is defined by:

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

where H is the stock of health, C is consumption of other goods and L is leisure. X is a vector of exogenous factors affecting preferences, u_1 is a vector of permanent factors affecting individual preferences, and ε_1 denotes shocks to preferences. Each individual maximizes his or her utility subject to the following constraints:

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

This restriction is the health production function where M are material health inputs and TH are time health inputs. V is a vector of exogenous factors affecting productivity, u_2 is a vector of permanent individual factors affecting productivity and ε_{2t} denotes a productivity shock.

The budget constraint is:

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

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*):

$$Y_t = I_t + W_t TW_t + rA_t \quad (5)$$

The time constraint is:

$$L_t + TH_t + TW_t + S_t = 1 \quad (6)$$

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.

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

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

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

4.2 Empirical analysis

In this section, we analyse how disability affects labor participation, and where individuals are participating in the labour force, what the effect on the number of hours worked is. When including disability as a explanatory variable it must be taken into account that there is a possible endogenous relationship between disability and labor participation and between disability and number of worked hours. The most commonly 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 endogenity 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 variables show[9]. Furthermore, it is not likely that these instruments are correlated with the error term of the equations (8) and (10), as has been already discussed by Campolieti (2002).

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

In the first model we observe that non-instrumentalized disability has a significant and negative effect on labour participation. In the second model disability is intrumentalized using the health measures specified above. Instrumented disability has a significant and negative effect on labor participation. The higher the disability index, the lower the probability of participating in the labor market. By comparing the coefficients obtained from the estimation of the two models, we observe that instrumentalized disability has a higher effect on labour force participation than non instrumentalized disability. This result indicates that in the second model, endogeneity leads to a downsize bias in the effect of disability on labour participation. The magnitude of the impact of disability on labor participa-

---

9 F-tests are listed on the regression tables.

10 We are using the sample of individuals between 50 and 65 years old.

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

tion derived from our results is similar to the magnitude obtained by Campolieti (2002).

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

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

Other controls have been introduced in the estimation of the models. In the second model these controls present the following results: year of birth has a significant and positive effect on labor participation. The younger an individual is, the higher the probability of their working. We control for year of birth and not for age because in this way, we also control for the cohort effects. Being a woman and being partnered or married have a significant and negative effect on labor participation. Higher education and longer work experience have a significant and positive effect on labor participation. At the same time, the higher the number of individuals in the household, the higher the probability of working. Region dummies have been introduced in order to control for labour market disparities across the regions. However, these dummies are not significant.

Next, we estimate how disability affects the self-reported number of hours worked. In order to correct for selection bias, we calculate the inverse Mills ratio (λ) using the probit parameter estimates (Berndt 1991). Then, λ is included in the estimation models of the number of hours worked per week[12]. Again, two different models of number of worked hours are estimated and the results are presented in table 2. In the first model, the effect of disability on the number of hours worked is estimated. In the second model disability is instrumentalized using different health measures (Z). Disability and instrumentalized disability have a significant and negative effect on the number of hours worked per week. Again, the effect of instrumentalized disability is greater, which indicates that endogeneity leads to a downsize bias in the estimation of the effect of disability on the number of hours worked.

From these results we can conclude that disability has a negative effect on labour participation, and furthermore, has also a negative effect on the number of hours worked per week for those who participate in the labour market, which confirms the results obtained in the descriptive analysis.

However, there is another aspect that has to be taken into account in order to predict which the effect of the delay in the onset of health problems on labor participation will be. The effect of disability on labor participation may change with time. This is due to different reasons: first, there are changes in leisure preferences between cohorts and second, there are also changes in labor conditions so that individuals with certain disability problems in the present may be have a different likelihood to participate in the

---

[12] For persons working only.

labour market than in the past. In order to corroborate this idea, a model of labour participation is estimated separately for different cohorts (the results are presented in table 3). Not all the cohorts can be compared, given the age selection of the sample. Only War Babies and HRS are compared[13], War Babies being younger than HRS. By comparing the effect of disability on labor participation from both cohorts, we observe that the negative effect of disability on labor participation is greater for the younger cohort. This result confirms the idea that the effect of disability on labor status changes with time.

Table 2: Estimates of the number of hours worked weekly

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

[13] There are not enough observations in order to also include CODA. Age selection: individuals with ages between 51 and 60 (ages at which both cohorts are comparable).

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

In order to better illustrate how different levels of disability affect labour supply, we calculate changes in predicted probabilities of labor participation for different disability levels[14]. We first calculate how labor participa-

[14] Calculations have been carried out following Long and Freese (2001).

tion would change for the War Babies cohort if disability were to increase to the same level as the HRS cohort. Next, we calculate how labor participation would change for the HRS cohort if disability is reduced to the War Babies disability level.

We find that labor participation for the War Babies cohort would decrease by 1.8 % if the level of disability had not decreased between cohorts (if there had been no compression of morbidity). 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 work until the legal retirement age if they do not wish to be financially penalized. The idea is that older workers are necessary in order to maintain the public pension systems in economies where the replacement rates are decreasing dramatically.

In the second part of the paper, we analyze the effect of disability on labor force participation and on the number of hours worked per week. We do observe after controlling for endogeneity that disability has a negative effect on labor force participation and on the number of worked hours per week for those who work. Furthermore, we have observed that the negative effect of disability on labor participation changes between cohorts, having a greater effect for younger cohorts.

According to the cohort analysis and the multivariate analysis carried out in this paper, individuals will be able to work longer because of the delay in the onset of disability problems which cause lower participation in the labor force. However, this effect will be partly counteracted by changes in the effect disability will have on labor participation through time.

To summarize, given the improvements in the health of older workers in recent decades, there is an increasing number of potential labor force participants who would formerly have left the labor market due to health reasons. The labor market should be able to absorb this labor force in order to alleviate the financial problems of the public pension systems.

References

Almond, D./Chay, K.Y./Lee, D.S. (2004): The costs of low birth weight, Working Paper 10552, National Bureau of Economic Research. Cambridge, MA: NBER.

Bhattacharya, J./Cutler, D.M./Goldman, D.P./Hurd, M.D./Joyce, G.F./ Lakdawalla, D.N./Panis, C.W./Shang, B. (2004): Disability forecasts and future Medicare costs, Frontiers in Health Policy Research, 7, 75-94.

Bell, F.C./Miller, M.L. (1999): Life tables for the United States social security area 1900-2100. Actuarial study n. 116. http://www.lifetable.de/data/MPIDR/USA 1901-1999.pdf

Benjamin, D./Brandt, L./Fan, J.-Z. (2003): Ceaseless Toil? Health and labor supply of the elderly in rural China, Working Paper of the Economics Department. University of Toronto.

Berndt, E. (1991): The practice of econometrics: Classic and contemporany. Adisson-Wesley.

Blau, D.M./Gilleskie, D.B./Slusher, C. (2001): The effect of health on employment transitions of older men, Research in labor economics, 20.

Campolieti, M.(2002): Disability and the labor force participation of older men in Canada, Labour Economics, 9, 405-432.

Case, A./Lubotsky, D./Paxson, C. (2002): Economic Status and Health in Childhood: The Origins of the Gradient. American Economic Review, American Economic Association, 92 (5), 308-1334.

Costa, D. (1996): Health and labor force participation of older men 1900-1991, Journal of Economic History, 56, 62-89.

Costa, D. (2002): Changing chronic disease rates and long-term declines in functional limitation among older men, Demography, 39(1), 119-137.

Crimmins, E.M./Saito, Y./Ingegneri, D. (1997): Trends in disability-free life expectancy in the United States, 1970-90, Population and Development Review, 23 (3), 555-572.

Crimmins, E.M./Saito, Y. (2001): Trends in Disability-Free Life Expectancy in the United States, 1970-1990: Gender, Racial, and Educational Differences, Social Science and Medicine, 52, 1629-1641.

Currie, J./Madrian, B.C. (1999): Health, health insurance and the labor market, in Handbook of Labor Economics (Ed.): Ashenfelter, O./Card, D., Amsterdam: North-Holland.

Fallace, R.B./Herzog, A.R. (1995): Overview of the health measures in the health and retirement study, The Journal of Human Resources, 30, supplement.

Freedman, V.A./Martin, L.G./Schoeni, R.F. (2002): Recent trends in disability and functioning among older adults in the United States: A systematic review, The Journal of the American Medical Association (JAMA), 288 (4).

Fries, J.F. (1980): Aging, natural death and the compression of morbidity, The New England Journal of Medicine, 303, 130-135.

Fries, J.F. (2003): Measuring and monitoring success in compressing morbidity, Annals of Internal Medicine, 139, 455-459.

Gruenberg, E.M. (1977): The Failures of Success, Midland Memorial Foundation Quarterly/Health and Society, 55, 3-24.

Jacobzone, S./Cambois, E./Robine, J.-M. (2000): Is the health of older persons in OECD countries improving fast enough to compensate for population ageing?, OECD Economic Studies, 30.

Kramer, M. (1980): The rising pandemic of mental disorders and associated chronic diseases and disabilities, Acta Psychiatrica Scandinavica, 62 (Suppl.285), 282-297.

Lakdawalla, D./Philipson, T. (2002): The rise in old-age longevity and the market for long-term care, The American Economic Review, 92 (1), 295-306.

Long, J.S./Freese, J.(2001): Regression Models for Categorical Dependent Variables Using Stata. College Station, TX: Stata Press.

Manton, K.G. (1982): Changing concepts of morbidity and mortality in the elderly population, Milbank Memorial Fundation Quarterly/Health and Society, 60, 183-244.

Manton, K.G./Stallard, E./Corder, L. (1997): Changes in the age dependence of mortality and disability: cohort and other determinants, Demography, 34 (1),135-157.

Manton, K.G./Gu, X. (2001): Changes in the prevalence of chronic disability in the United States black and nonblack population above age 65 from 1982 to 1999, Proceedings of the National Academy of Sciences USA, 98 (11), 6354-6359.

Mathers, C.D. (1996): Issues in the measurement of health status, Invited paper 9th Meeting of the International Network on Health Expectancy (REVES) Rome.

Mete, C./Schultz, T.P. (2002): Health and labor force participation of the elderly in Taiwan. Discussion Paper 846, Economic Growth Center. Yale University.

Munnell, A.H./Meme, K.B./Jivan, N.A./Cahill, K.E. (2004): Should we raise Social Security's earliest eligibility age? An issue in brief: Center for Retirement Research at Boston College.

OECD (2005): OECD Health Data 2005, OECD, Paris.

Robine, J.M./Mathers, C.D./Brouard, N. (1996): Trends and differentials in disability-free life expectancy: concepts, methods and findings, in Health and Mortality Among Elderly Populations (Ed.): Caselli, G./Lopez, A., Clarendon Press, Oxford.

Sickles, R.C./Yazbeck, A.S. (1998): On the dynamics of demand for leisure and the production of health. Journal of Bussiness & Economic Statistics, 16 (2), 187-197.

St. Clair, P. et al. (2003): RAND HRS Data Documentation, Version C. http://hrsonline.isr.umich.edu/meta/rand/randhrsc/randhrsc.pdf

Vita, A.J./Campion, E.W. (1998): Aging, health risks, and cumulative disability. The New England Journal of Medicine, 338 (15), 1035-1041.

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

Zweifel, P./Felder, S./Meier, M. (1999): Ageing of populations and health care expenditure: a red herring?, Health Economics, 8 (6), 485-496.

Recently published

No.	Author(s)	Title	Date
1/2004	Bauer, T. K. Bender, S. Bonin, H.	Dismissal protection and worker flows in small establishments	7/04
2/2004	Achatz, J. Gartner, H. Glück, T.	Bonus oder Bias? : Mechanismen geschlechtsspezifischer Entlohnung published (revised) in: Kölner Zeitschrift für Soziologie und Sozialpsychologie 57 (2005), S. 466-493	7/04
3/2004	Andrews, M. Schank, T. Upward, R.	Practical estimation methods for linked employer-employee data	8/04
4/2004	Brixy, U. Kohaut, S. Schnabel, C.	Do newly founded firms pay lower wages? First evidence from Germany	9/04
5/2004	Kölling, A. Rässler, S.	Editing and multiply imputing German establishment panel data to estimate stochastic production frontier models published in: Zeitschrift für ArbeitsmarktForschung 37 (2004), S. 306-318	10/04
6/2004	Stephan, G. Gerlach, K.	Collective contracts, wages and wage dispersion in a multi-level model	10/04
7/2004	Gartner, H. Stephan, G.	How collective contracts and works councils reduce the gender wage gap	12/04
1/2005	Blien, U. Suedekum, J.	Local economic structure and industry development in Germany, 1993-2001	1/05
2/2005	Brixy, U. Kohaut, S. Schnabel, C.	How fast do newly founded firms mature? : empirical analyses on job quality in start-ups published in: Michael Fritsch, Jürgen Schmude (Ed.): Entrepreneurship in the region, New York et al., 2006, S. 95-112	1/05
3/2005	Lechner, M. Miquel, R. Wunsch, C.	Long-run effects of public sector sponsored training in West Germany	1/05
4/2005	Hinz, T. Gartner, H.	Lohnunterschiede zwischen Frauen und Männern in Branchen, Berufen und Betrieben published as: Geschlechtsspezifische Lohnunterschiede in Branchen, Berufen und Betrieben. In: Zeitschrift für Soziologie 34 (2005), S. 22-39	2/05
5/2005	Gartner, H. Rässler, S.	Analyzing the changing gender wage gap based on multiply imputed right censored wages	2/05
6/2005	Alda, H. Bender, S. Gartner, H.	The linked employer-employee dataset of the IAB (LIAB) published (shortened) as: The linked employer-employee dataset created from the IAB establishment panel and the process-produced data of the IAB (LIAB). In: Schmollers Jahrbuch. Zeitschrift für Wirtschafts- und Sozialwissenschaften 125 (2005), S. 327-336	3/05
7/2005	Haas, A. Rothe, T.	Labour market dynamics from a regional perspective : the multi-account system	4/05
8/2005	Caliendo, M. Hujer, R. Thomsen, S. L.	Identifying effect heterogeneity to improve the efficiency of job creation schemes in Germany	4/05
9/2005	Gerlach, K. Stephan, G.	Wage distributions by wage-setting regime	4/05

10/2005	Gerlach, K. Stephan, G.	Individual tenure and collective contracts	4/05
11/2005	Blien, U. Hirschenauer, F.	Formula allocation : the regional allocation of budgetary funds for measures of active labour market policy in Germany	4/05
12/2005	Alda, H. Allaart, P. Bellmann, L.	Churning and institutions : Dutch and German establishments compared with micro-level data	5/05
13/2005	Caliendo, M. Hujer, R. Thomsen, S. L.	Individual employment effects of job creation schemes in Germany with respect to sectoral heterogeneity	5/05
14/2005	Lechner, M. Miquel, R. Wunsch, C.	The curse and blessing of training the unemployed in a changing economy : the case of East Germany after unification	6/05
15/2005	Jensen, U. Rässler, S.	Where have all the data gone? : stochastic production frontiers with multiply imputed German establishment data	7/05
16/2005	Schnabel, C. Zagelmeyer, S. Kohaut, S.	Collective bargaining structure and its determinants : an empirical analysis with British and German establishment data	8/05
17/2005	Koch, S. Stephan, G. Walwei, U.	Workfare: Möglichkeiten und Grenzen published in: Zeitschrift für ArbeitsmarktForschung 38 (2005), S. 419-440	8/05
18/2005	Alda, H. Bellmann, L. Gartner, H.	Wage structure and labour mobility in the West German private sector 1993-2000	8/05
19/2005	Eichhorst, W. Konle-Seidl, R.	The interaction of labor market regulation and labor market policies in welfare state reform	9/05
20/2005	Gerlach, K. Stephan, G.	Tarifverträge und betriebliche Entlohnungsstrukturen	11/05
21/2005	Fitzenberger, B. Speckesser, S.	Employment effects of the provision of specific professional skills and techniques in Germany	11/05
22/2005	Ludsteck, J. Jacobebbinghaus, P.	Strike activity and centralisation in wage setting	12/05
1/2006	Gerlach, K. Levine, D. Stephan, G. Struck, O.	The acceptability of layoffs and pay cuts : comparing North America with Germany	1/06
2/2006	Ludsteck, J.	Employment effects of centralization in wage setting in a median voter model	2/06
3/2006	Gaggermeier, C.	Pension and children : Pareto improvement with heterogeneous preferences	2/06
4/2006	Binder, J. Schwengler, B.	Korrekturverfahren zur Berechnung der Einkommen über der Beitragsbemessungsgrenze	3/06
5/2006	Brixy, U. Grotz, R.	Regional patterns and determinants of new firm formation and survival in western Germany	4/06
6/2006	Blien, U. Sanner, H.	Structural change and regional employment dynamics	4/06
7/2006	Stephan, G. Rässler, S. Schewe, T.	Wirkungsanalyse in der Bundesagentur für Arbeit : Konzeption, Datenbasis und ausgewählte Befunde	4/06
8/2006	Gash, V. Mertens, A. Romeu Gordo, L.	Are fixed-term jobs bad for your health? : a comparison of West-Germany and Spain	5/06

Letzte Aktualisierung: 17.5.2006, 37 Einträge

Impressum

IABDiscussionPaper
No. 9 / 2006

Herausgeber
Institut für Arbeitsmarkt- und Berufsforschung
der Bundesagentur für Arbeit
Weddigenstr. 20-22
D-90478 Nürnberg

Redaktion
Regina Stoll, Jutta Palm-Nowak

Technische Herstellung
Jutta Sebald

Bezugsmöglichkeit
Volltext-Download dieses DiscussionPaper unter:
http://doku.iab.de/discussionpapers/2006/dp0906.pdf

IAB im Internet
http://www.iab.de

Rückfragen zum Inhalt an
Dr. Laura Romeu Gordo, Tel. 0911/179-5850,
oder E-Mail: laura.romeu-gordo@iab.de