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Barbara Hanel

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Barbara Hanel
Melbourne Institute of Applied Economic and Social Research,
The University of Melbourne

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Melbourne Institute of Applied Economic and Social Research
The University of Melbourne
Victoria 3010 Australia
***Telephone* (03) 8344 2100**
***Fax* (03) 8344 2111**
***Email* melb-inst@unimelb.edu.au**
***WWW Address* http://www.melbourneinstitute.com**

Abstract

I investigate the incentive effects of disability pensions on the labour supply decision. The implicit tax rate on further work is included as a forward looking incentive measure in order to investigate the effect of disability benefits on disability retirement entry as a special type of early retirement. A substantial change of the disability pension legislation caused exogenous variation in disability benefits in Germany in 2001 and is used to obtain estimates of individual's responses to financial incentives. Benefit levels appear to have no effect on the labour market behaviour. At the same time, there is a sizable and significant disincentive effect of implicit taxes on labour market income, indicating that alleviating such disincentives would likely increase labour force participation. Since the response to financial incentives occurs mainly among those in good health, such a policy might on the other hand imperil the aim of providing insurance against a health induced loss of ones working capacity.

JEL classification: I12, J26

Keywords: Disability pensions, labour force exit

1. Introduction

Losing the ability to work is one of the most personally disastrous and financially costly events in life. The social safety nets of all industrialized countries therefore provide insurance against the risk of becoming disabled and provide benefits for those with a limited working capacity. In the European Union in 2005, 7.9% of the total expenditures on social benefits were spent on disability. The expenditures on disability exceeded those on unemployment by about 30% on average (Eurostat, 2008). While being of high importance in the prevention of poverty among those who lose their ability to work, these benefits may on the other hand serve as an exit route to early retirement and encourage individuals to withdraw from the labour force early. In many countries in the European Union (e.g. Denmark, UK, Belgium and the Netherlands), permanent labour force withdrawal occurs on average about two years prior to the earliest age of entitlement for old-age benefits (OECD, 2009a). Entry into disability retirement may be misused to finance labour force exit before old-age benefits are legally availabe and thus regular retirement becomes feasible.

The previous literature regarding the effect of disability pensions on labour force participation led to ambiguous conclusions.[1] The earliest analyses such as Parsons (1980a, 1980b), Leonard (1979), and Slade (1984) estimated the probability of labour force participation as a function of the replacement rate and found large elasticities with respect to disability benefits. Parsons concluded from his analysis that almost the entire decrease in labour force participation during the 1960s and 1970s in the U.S. can be explained by the increase in disability pensions. In a second strand of the literature, later contributions used instrumental variable estimators to deal with the endogeneity of benefits and wages, such as Haveman and Wolfe (1984a), Haveman et al. (1991), Riphahn (1999), and Kreider and Riphahn (2000). They find much smaller to almost no response of labour force participation

[1] For a detailed discussion of the literature see Haveman and Wolfe (2000).

to disability benefits. For example, the elasticity found by Haveman and Wolfe (1984b) was about 80% smaller than the first result by Parsons (1980a). In a third approach, variation in benefit regulations over time and across regions is used to identify their effect on labour force participation (e.g. Gruber, 2000; Campolieti, 2004; Autor and Duggan, 2003). Some studies use rejected applicants for disability benefits as a control group (Bound, 1989; Chen and van der Klaauw, 2008). Those analyses found responses to disability benefits within the range of the first two approaches, yet the results vary greatly with the estimation method.

I contribute to the literature in two ways: first, the paper takes advantage of a reform of disability pensions in Germany in 2001. Eligibility criteria are now stricter than before for some population groups, and benefits are substantially lower. The reform led to substantial exogenous variation in benefits, and moreover, in benefit accruals from an additional year of work during an anticipation period. This exogenous variation can be used to identify to what extent financial incentives affect individuals' labour market behaviour. Second, forward-looking incentive measures are introduced, which is common in the general retirement literature, but rare in the analysis of disability retirement.

I find no behavioural response to benefit levels, but a substantial effect of the implicit tax on further employment. Responses to financial incentives occur mainly among those in relatively good health, while individuals in bad health do not adjust their labour market behaviour substantially. The results are robust to the inclusion of different subjective and objective health measures and to the application of different distributional assumptions and discount rates.

2. Institutional Background

An important advantage of the public retirement system in Germany for the analysis of retirement behaviour is that it is almost universal and the most important income source for most retirees, with private pensions or company pensions being relatively unimportant.

About 80% of the labour force is covered, and the average net replacement rate with respect to the last wage is high. It was 61.3% in 2008 (OECD, 2009b). Besides old-age pensions and survivor's pensions, disability benefits are provided that are proportional to the individual's old-age pension entitlements. Individuals are eligible for disability benefits if they meet some lenient criteria regarding their employment history and their earnings capacity is reduced for health reasons. A medical screening procedure is supposed to limit potential moral hazard among the insured population, who may overstate a limitation due to their working impairment in order to get access to benefits. The medical assessment is undertaken by insurance doctors, who assess the working capacity based on a physical examination or on medical files in case of recent in-patient treatment.

Until 2001 the program was generous. It distinguished between occupational disability and general disability. Benefits for general disability amounted to the individual's full old-age pension entitlements and were granted if an individual was unable to perform any regular employment in any occupation on a continuous basis. New retirees received €738 (~US-$ 1000) in 2000 on average (Deutsche Rentenversicherung Bund, 2008). Benefits for occupational disability amounted to two thirds of full old-age benefits and were granted if an individual's working capacity was less than four hours per day in his or her occupation. Additionally, general disability benefits were provided if an occupationally disabled individual was "effectively excluded from the labour market", i.e. the health situation would allow for employment in part-time jobs at suitable workplaces, but the individual could not find such employment after searching for one year. After one year, occupational disability benefits were then upgraded to general disability benefits.

The Retirement Insurance Reform involved three major modifications: first, it now distinguishes between full disability and partial disability instead of occupational and general disability. Benefits for the fully disabled can be received if an individual can work less than

three hours per day, benefits for the partially disabled are provided for those who are able to work less than six hours per day. If individuals can perform part-time work, their ability to do so *in their own occupation* is taken into account only for those who are born before 1960. For individuals born later, their work capacity is evaluated independent from their occupation. Second, benefits for the partially disabled are significantly lower than the former benefits for occupationally disabled: rather than two thirds of the full old-age pension, they amount to half the old-age pension now (regardless of whether the retiree was born prior to or after 1960). And third, benefits for the fully and for the partially disabled are reduced by 10.8% if claiming takes place prior to age 60.[2,3]

The legal changes were first passed shortly before the parliamentary elections in September 1998 at the initiative of the conservative government at the time. Before the new regulations took effect, the Socialdemocrats and Greens won the elections and suspended the enforcement of the reform until 2001. In December 1998, the new government announced to the public that the reform will apply to individuals who enter disability retirement after January 1, 2001, yet individuals entering prior to that date will be subject to a grandfathering clause and their benefits will remain unchanged. **Table 1** illustrates the announcement and enforcement of the reform. As discussed later, the timing is important as it resulted in a period when anticipated changes in benefit regulations subtsantially altered the implicit tax on an additional year of labour market income receipt.

3. Empirical Approach

The entry to disability retirement depends on the individual's decision to apply for benefits and on the granting agency's decision to accept the application. The reform in 2001

[2] Between age 60 and age 63, monthly benefits are gradually increased by 0.3% for every month the retirement entry is delayed. The full pension for the fully disabled and half of the pension for the partially disabled is paid, if disability entry takes place from age 63 onwards.

[3] When the reform was passed, the concept of "effective exclusion from the labor market" was also abandoned at first. However, that legal change was redeemed again before the new law was actually enforced.

thus changed two important determinants of disability retirement entry: first, the amount of pensions was changed, which will affect the relative attractiveness of disability retirement entry compared to continued labour force participation and therefore the probability of applying for benefits. And second, by abandoning the concept of occupational disability, the probability of approval given the individual's health status was lowered for individuals born after 1960.[4] Generally, the individual's decision to apply and the agency's decision to approve an application should be modelled jointly. However, as no data on rejected applications are available, this approach is not feasible. I therefore restrict the analysis to individuals born before 1960. For them, only the determinants of the application decision changed during the reform process while the agency's decision process remained unaffected. By restricting the analysis to potential applicants who - given his or her health status - face a constant granting probability, it can be justified to follow a common simplification in the literature and to model the entry into disability retirement as an individual decision (cf. Parsons 1980a, Haveman et al. 1991, Riphahn 1999, Gruber 2000, Chen and van der Klaauw, 2008).

The analysis focuses on workers in the age group 45-59. Individuals aged 60 and older face several options to retire and thus are subject to a different set of institutional regulations. They are likely to differ substantially in their behaviour regarding disability retirement, and are therefore excluded.[5] I assume that individuals are forward looking and take into account to what extent future benefits will change depending on the date of retirement entry. The measure I include to capture the incentive effects provided by the

4 Besides eligibility criteria, the approval of applications may be influenced by the *quality* of the screening process. The legal definition of disability is discrete, although the health status itself is a continuum. The result of the assessment may be influenced by doctors subjective perceptions of the legal definition, and misclassifications in both directions may occur particularly among individuals whose health status is close to where the line between the disabled and the non-disabled is drawn. However, since the medical screening process itself remained unchanged by the reform, the probability of a misclassification of applicants should not be affected and thus be constant over time.

5 For a study investigating the incentive effects resulting from the numerous competing pathways into retirement for those aged 60 and older compare Boersch-Supan (2001).

reform is the "implicit tax rate" on labour market earnings from a one-year delay in retirement, as it has been used before in several studies investigating the timing of entry to old-age retirement (e.g. Diamond and Gruber, 1999; Coile and Gruber, 2000; Boersch-Supan and Schnabel, 1999). It results from the expected net present value of the stream of expected disability benefits depending on the date of retirement:

$$ENPV_{t=s}(R) = \sum_{t=R}^{60} DB_t(R) \cdot p_t \cdot \delta^{t-s}$$

where $DB_t(R)$ is the amount of disability pension paid in *t* depending on the date of entry R, p_t is the survival probability until period t, and δ is the discount rate. Individuals who are working in *t*=s and decide to retire in *t*=s+1 receive disability benefits from *t*=s+1 until disability benefits are converted into regular old-age benefits, which usually happens at age 60.[6] If they decide to postpone retirement until *t*=s+2 instead, the period of receipt is shortened by one year, but there is no actuarial adjustment of monthly benefits.[7] As a result, the net present value of the expected benefit stream decreases, i.e. a delay of retirement entry results in a loss of benefits. Normalizing this loss of benefits by w_{t+1}, the expected labour income during the period of delay gives the "implicit tax rate" on labour market income caused by the disability benefit system:

$$TAX_s = -\frac{ENPV_s(s+2) - ENPV_s(s+1)}{w_{s+1}}$$

[6] Old-age benefits received from age 60 onwards are not taken into account in the analysis because they depend only little on the previous decision when to draw disability benefits. Old-age benefits for a former disability retiree are determined under the assumption that the disability retiree had continued to pay contributions according to his average contributions prior to the occurrence of the disability. The old-age pension of a former disability retiree therefore differs from the pension he or she would have been entitled to in case of non-disability only to the amount by which the individual's wage growth would have exceeded or undercut the average wage growth.

[7] In the context of retirement insurance systems, actuarial fairness usually refers to a situation when the expected net present value of benefits is proportional to the lifetime contributions for every individual of a given cohort of retirees and independent of the date of retirement entry. That means, if an individual claims benefits at a younger or later age and thus the expected period of receipt is extended or shortened, monthly benefits are adjusted in a way that the expected net present value of the entire benefit stream remains constant.

To test the behavioural response to the incentives set by the disability retirement insurance, I estimate transition rates to disability retirement. Exits from disability retirement back to the labour force occur rarely,[8] and disability is interpreted as an absorbing state. In each period t the individual can decide whether to enter disability retirement by t+1 or to remain in the labour force instead. Only those in the labour force, employed or unemployed, can undertake a transition. Observations are censored once the individual enters disability retirement. The probability of a transition to disability retirement for individual i in the time interval (t, t+1] given individual i did not enter disability retirement before, is estimated by a binary logit estimator. The transition rate is estimated as a function of the expected net present value of discounted disability benefits drawn from t+1 until the individual age 60, and the implicit tax rate on a one-year postponement of retirement entry. Furthermore, taste shifter variables have to be included to approximate utility from leisure, such as education, age, and health. Adding interaction terms between the financial incentive measures and health variables allows to test whether individuals in good health respond stronger to the reform than those in bad health.

In contrast to the widely used option value model established by Stock and Wise (1990), the incentive measure used in this analysis does not result from the comparison of all possible remaining retirement dates for an individual, but focuses on the change in benefits due to a one-year delay of retirement entry only. I do so for two reasons: first, the outcome of an application for disability benefits is uncertain, and the probability of approval depends on the health status at the time of the application. While it is plausible to assume that individuals have relatively good information about their health status in one year and can form an expectation about the disability benefits they will get, it is less convincing to assume that they

[8] In 2005, approximately 1.65 million individuals draw either full or partial benefits for the disabled (Deutsche Rentenversicherung Bund, 2006a). Within the same year, about 32,000 individuals dropped out of benefit receipt because their health impairment was cured (Deutsche Rentenversicherung Bund, 2006b). This translates into an average rate of recovery of less than 2%.

can do so for a long time in advance. Second, the most important incentive effects provided by the reform should be captured sufficiently by the one-year accrual in benefits, as the only "kink" in the tax rates occurs in one specific year for postponement from one year to the next, which is due to the specific timing of the reform. We can distinguish three relevant periods: Until the end of 1998 ("pre-reform period"), benefits were calculated according to the generous old law and individuals expected the institutions not to change in the future, as the reform was not yet announced. The net present value of the entire benefit stream will decrease with every day the retirement entry is delayed. However, delaying retirement entry by several years instead of only one year is expected to result in comparable losses per year and should thus result in very similar implicit tax rates on annual labour market income. Likewise, from 2000 onwards individuals knew that benefits would be calculated according to the new regulations at all possible dates of retirement entry. They were expected to be considerably lower than in the pre-reform period and to decrease further with a delay of the date of entry. But they again were expected to decrease steadily at a comparable rate. I refer to that period as "post-reform period". It is important to note that, although the reform was enforced in January 2001, the post-reform period begins in the year before. Individuals who are still in the labour force and thus at risk of entering disability retirement in 2000, cannot retire prior to 2001, when the new reagulations already took effect.[9]

It is only in 1999 that a non-monotonicity occurs: individuals knew that monthly benefits would be calculated according to the old law if retirement entry took place at the next possible point in time, i.e. in the year 2000. But they anticipated that relevant benefit rules would have changed if they delayed retirement entry to 2001 or later. Hence, they expected the net present value of monthly benefits to be high if they entered retirement at the next possible date and to drop sharply if they delayed retirement for one more year.

[9] The annual structure of the data does not allow to identify the exact day, but only the year of retirement entry.

Afterwards, the loss per year of delay does no longer change substantially. I refer to that year as "anticipation period". **Table 1** illustrates the time schedule of current and expected future eligibility criteria and benefit amounts over time. There are no non-monotonicities in the benefit formula during both the pre-reform and the post-reform period, and the non-monotonic change during the anticipation period is fully captured by the one-year change in benefits. The forward-looking incentive measure can therefore be restricted to the implicit tax rate on a one-year delay without neglecting relevant incentives of the benefit formula.

A key issue in the construction of financial incentives estimation is the endogeneity of income variables. The main source of variation in benefits and the implicit tax rate over time is caused by the reform and thus exogenous, yet the variation in benefits and wages across individuals is not. To account for that endogeneity, I follow the approach suggested by Gruber (2000). By creating "population cells" by gender, education, and region of residence, he calculates average earnings over the life cycle and thereby constructs a hypothetical earnings history for each of these population cells. Given these earnings histories, at every point in time hypothetical entitlements for disability benefits for retirement in $t+1$ and $t+2$ can be derived for the population cells and are assigned to every individual belonging to one of these cells.

In the absence of a control group, a major problem may arise from reforms of other labour market institutions that coincide with the disability pension reform. Of particular importance here are old-age benefits or unemployment benefits. While there were only very moderate institutional changes that may have affected the attractiveness and feasibility of unemployment benefits during the 1990s, substantial reforms were implemented during the period of 2004-2006 (so-called "Hartz-Reforms"). Two major changes were implemented: first, the period of entitlement for unemployment benefits was shortened especially for older workers in 2006, and second, unemployment compensation payments were substantially

reduced in 2005.[10] These important reforms are likely to change the relative attractiveness of different pathways out of the labour force and in turn also the probability of applying for disability benefits. Possible anticipation effects should be taken into account, as both changes were passed in 2004. I therefore restrict the analysis to individuals entering disability retirement at 2003 at the latest, i.e. to individuals who are "at risk" up to the year 2002.

Furthermore, one might argue that entry into disability insurance may be affected by the generosity and accessibility of old-age benefits. There were indeed two major reforms of the old-age insurance system, one in 1997 and a second one in 2001 ("Riester-reform"). The first one introduced permanent benefit reductions for early retirees. However, it affected individuals only from age 60 onwards, while this analysis focuses on workers up to age 59. The latter reform is more problematic. It is widely seen as "the end of pension generosity" (Boeri et. al., 2002) and thus may have disturbed transitions to pension receipt among the whole population. As it coincides with the reform under analysis here, I cannot identify a group that is affected by one of both reforms only. A response to a change in disability benefit levels may thus partly reflect the fact that the German population expected further declines in all social benefit levels after 2001. The estimated effect may thus be slightly upward biased and should be interpreted as an upper bound. However, the reform can influence the results only in the last two years of the analysis, and a time trend is included which further limits the potential bias.

4. Data and Descriptive Statistics

I combine information from two data sets. The first one is the "German Socioeconomic Panel" (GSOEP), an annual household survey conducted since 1984. It covers a broad range of variables, of special interest for this study is information on employment, health and the household context. I use the waves 1995 to 2003. In 2003

[10] For a more detailed description of the reforms and an analysis of the 2006 reform's effect on unemployment claims see Dlugosz et al. (2009).

information on more than 11,000 households and 21,000 individuals was available. As discussed in the last section, I exclude individuals from age 60 onwards and before age 45. Individuals younger than 45 are rarely disabled and have higher rates of recovery than older individuals. For them it is not plausible to interpret disability retirement as an absorbing state and a pathway into early retirement. These restrictions on age group and time span imply that individuals born after 1960 do not enter the sample of analysis as well. I exclude individuals who were living in East Germany prior to unification and immigrants who moved to Germany after the age of 15, as well as self-employed workers and civil servants, as their benefit claims follow different rules. However, the sample is not restricted to the currently employed population in order to avoid endogenous sample selection problems. Instead, the sample contains all individuals who ever held a job subject to compulsory social security contributions regardless of whether they are currently employed or unemployed.

The dichotomous dependent variable takes the value one in year *t*, if an individual receives disability benefits in *t*+1, and zero otherwise. Observations are censored after retirement entry. Overall, 195 entries to disability retirement are observed, out of 12,530 person-year-observations for 4,034 individuals. **Figure 1** shows the incidence of disability retirement over time. The effect of the *anticipation* of lower benefit levels after the reform is clearly visible in 1999: as expected, a sharp increase in disability transitions can be seen, suggesting that some individuals brought their retirement entry forward in order to get the higher benefits before the reform was going to be inforced. The disability incidence decreases again in 2000, when low benefits are expected for all remaining dates of retirement entry (2001 and later). However, comparing the frequency of entries to disability retirement for the pre-reform period, on the one hand, and the post-reform period, on the other hand, there seems to be a general downward trend in the incidence of disability retirement. Yet, there is no clear drop. It is questionable, whether the reform had any long-term effect.

Explanatory variables drawn from the GSOEP include variables that will be used to approximate utility from leisure. Gender, age, and health may influence disutility from work, since they may influence the individual's working ability. Subjective and objective health measures are available. As a first objective indicator, we can use mortality: the variable takes the value one in year *t* if the individual died until *t*+5. Furthermore, dummy variables are constructed indicating whether the individual was hospitalized for at least one night in the previous year, and whether the individual suffers from an officially acknowledged handicap. As a subjective measure, the self-rated health status (ranging from "very good" to "very poor") is used.

Education and occupation are likely to be correlated with job characteristics. The decision to retire is usually taken in a household context, and therefore, I include whether the individual is married or living with a partner, and whether children are living in the household. If the individual lives with a partner, age, employment status, and health status of the partner are controlled for in the model. Regional dummies are used to control for general labour market characteristics of the individual's place of residence, and the analysis controls for a general time trend.

Table 2a reports descriptive statistics for individuals who enter disability retirement during the observation period and for individuals who do not. Disability retirement is more common for men than women. Individuals in the subsample of retirees are older, have higher levels of education, and are less likely to work in service jobs. They are more likely to live alone, and if they have a partner, their partner is more often not employed or has a health impairment as well. Consistent with the expectations, the most striking differences arise in individual's health status, regardless of whether we look at objective or subjective measures. Mortality within the next five years is about three times as high for disability retirees than for the rest of the population, and they are more than twice as often hospitalized. While only 15

% of the sample without benefit receipt report a poor or very poor health status, the same is true for almost 50% of the sample of disability retirees.

One might argue that the increase in the incidence of disability retirement in 1999 compared to other years comes along with differences in the socioeconomic characteristics of both groups of retirement entrants. **Table 2b** therefore looks at differences between disability retirees who enter retirement from 1999 to 2000 and other retirees. Both sub-samples differ significantally in socio-economic characteristics with respect to marital status and occupation. Retirees entering in 1999 are less often married and work more often in manufacturing jobs. But, most noticable, they do not differ substantially in their health status. However, this may be partly due to the small number of entries each year.

The variables drawn from the GSOEP do not include financial variables. GSOEP provides information on earnings and income, but not on the individual earnings history prior to the first interview, and the provided information on the employment history suffers from numerous missing values. Therefore I use a second data set: the "Sample of Insurance Accounts 2005" (Versicherungskontenstichprobe 2005 (VSKT(2005)), a random sample of insurance accounts that were held by the public retirement insurance in 2005.[11] Apart from some basic information about gender, education, and region of residence, the insurance accounts contain the full employment and contribution history of every individual who ever held a job subject to compulsory social insurance contributions. For each individual, the labour market income, be it wages or unemployment benefits, and social insurance contributions are known on a monthly basis from the individual age of 14 until their age in 2005. The main advantages of these administrative data are that there is no panel attrition, no recall bias, and almost no missing values. The contribution histories are averaged out over all individuals by education, gender, and region of residence, as suggested by Gruber (2000) to

[11] The Sample of Insurance Accounts (*FDZ-RV – SUFVSKT2005*, referred to as VSKT(2005) in the remainder of the text) was kindly provided by the Research Data Center of the Retirement Insurance (Forschungsdatenzentrum der Rentenversicherung, FDZ-RV).

deal with the endogeneity of labour market histories. They are then assigned to the individual observations taken from the GSOEP, where the same population groups can be constructed. The coefficient of correlation between actual lifetime contributions and averaged lifetime contributions by population cells is slightly increasing over the lifetime and amounts to 0.59 at age 45 and 0.63 at age 59. Based on the contribution history and the benefit formula at a given time, the benefit entitlement of an individual conditional on the claiming date t+1 and t+2 and the resulting implicit tax rate is calculated.[12] **Table 2a** shows that disability retirees have below average benefit entitlements, but above average losses in case of delayed retirement entry. If we look specifically at disability retirees who enter disability retirement from 1999 to 2000, their entitlements are substantially, although insignificantly, lower than those of other disability retirees. Highly significant differences between disability retirees occur for the implicit tax rate on delayed entry. It is more than 1.6 times as high for individuals who enter disability retirement in 1999 than for other retirees or non-retirees. **Table 2c** sheds some further light on that finding. It reports the mean of the financial incentive variables over the GSOEP-sample over time. They differ substantially in their magnitude during the reform process: while $ENPV_{t+1}$ decreases substantially when the post-reform period begins, we can see a sharp increase in the tax rate during the anticipation period that immediately disappears once the reform is fully implemented.

5. Results

Table 3 shows the results of estimation of transition rates for two specifications with and without health controls.[13] Because coefficients have no straight-forward interpretation in

[12] Besides the contribution history and the regulation of the time, expected benefits depend on whether full or partial disability benefits are granted and are calculated as a weighted average of both. As I do not have information on the individual's probability to be classified as generally or partially disabled, I use administrative aggregate data about the share of beneficiaries who received full or partial pensions in a given year as weights (Deutsche Rentenversicherung Bund, 2008). Thereby it is assumed implicitly that the probability of getting a partial or a full pension is perfectly anticipated by the individuals. The discount rate is assumed to be 3% and survival probabilities by age, gender, and year are drawn from official life table data (Statistisches Bundesamt (2008a)).

[13] Robustness checks using other health measures are presented later in this section.

non-linear models, the table presents the average semi-elasticity of predicted transition probabilities for a change in financial covariates. For continuous control variables the average marginal effect on the predicted transition probability is calculated, for categorical variables the average partial effect. Standard errors clustered among individuals and calculated using the bootstrap method.

A first important finding is that there is almost no response to the net present value of expected benefit levels. The semi-elasticity of the probability of entering retirement is very close to zero and insignificant. That is the case although the estimated effect may be slightly upward biased due to the "Riester-reform". This finding matches the results by Riphahn (1999) for Germany and Bratberg (1999) for Norway, who both found only small behavioural effects of disability benefits. At the same time, responses to the implicit tax rate are reflected in the data: we find a significant and sizable semi-elasticity of 2.1 with respect to the implicit tax rate, i.e. a decrease in the implicit tax rate on labour market income by 1%-point decreases the propensity to enter disability retirement by 2.1%. While benefit levels do not seem to influence the retirement decision strongly, there is indeed a significant response to forward-looking incentives.

Specification b) introduces a subjective measure of health. The effect of the health status turns out to be highly significant and very large in comparison to the effect of financial incentives. Compared to a transition rate to disability retirement of 0.9% for those in very good health, the transition rate increases by 2.1%-points (5.9%-points) if the individual states to be in poor (very poor) health. The probability of retirement entry is more than two to four times as high for those in poor or very poor health than the overall transition rate of 1.6%. The important role of health hardly comes as a surprise, as a health-induced reduction of the working capacity is a legal requirement to receive disability benefits.

Other important socioeconomic characteristics include occupation, with individuals in manufacturing occupations facing a substantially increased risk of disability retirement, gender, and the household context: While individuals who live alone are more likely to become a disability retiree, those with a partner or spouse have an even lower risk of entering disability retirement if their partners/spouses are employed or suffer from a health condition themselves.

In a next step, a specification is estimated that includes financial incentives by health status separately, in order to test whether the response differs among population groups. Self-rated health status is reduced to a dummy indicator, taking the value one if a “very poor” or “poor” health status is reported, and zero otherwise. Semi-elasticities of labour force exit for individuals in good or bad health are presented in **Table 4**. Again, we find no response to the expected benefit level, neither for those in good health nor those in bad health. A behavioural effect of the benefit system is found with respect to the tax rate only, and here – most strikingly - for individuals in relatively good health only. This result has to be seen in the light of the uncertainty of the approval decision. The better the individual’s health status, the less likely an approval of an application for disability benefits should be. A perfectly healthy individual without any reduction of his or her working capacity should not respond to the implicit tax rate, because claiming disability benefits is not a feasible option for them. If a significant effect is found, this implies that the behavioural response of those who are close to the distinct border between legally disabled and legally non-disabled must be even higher. An important policy implication follows: while a mere cut of benefits appears to be a poor policy measure to encourage continued labour force participation, actuarial adjustments of benefits which in turn lead to a decrease of the implicit tax rate are much more promising to avoid misuse of the disability insurance as an exit route to early retirement.

On the other hand, this policy option will also affect the level of insurance against the risk of becoming disabled. As expected, the behavioural response of individuals in bad health is substantially smaller and also insignificant. This result is much less surprising and reflects the fact that labour market income is not feasible for those who have indeed lost their capacity to work, and consequently taxes on such income are not relevant for their behaviour.

To test the robustness of the results, the estimation was repeated for several objective and lagged subjective health measures. It is often argued that health impairments may be overstated by disability retirees in order to justify the receipt of benefits, i.e. retirement status and self-rated health may be jointly determined by unobservables ("justification bias").[14] **Table 5** presents the results for five specifications using mortality, hospitalization in the previous year, the existence of an officially acknowledged handicap in the current year as well as lagged by one year, and the subjective self-rated health status lagged by one year. Lagged variables are used to account for potential endogeneity. While the resulting elasticities change slightly in their magnitude, the overall pattern remains stable and confirms the previous result: the response to benefit levels is virtually zero and insignificant for all individuals. We see a sizable response to the implicit tax rate for relatively healthy individuals, but the response of individuals in bad health is insignificant and with the exception of the health measure "mortality" substantially smaller than for those in good health. **Table 6** presents further robustness checks using different discount rates for the calculation of the net present value of benefit streams. It was assumed to equal 3% in the previous estimations and the analysis is now repeated assuming a discount rate of 2%, 4% and 5%. The results are very stable and confirm the previous findings. The last robustness check repeats the estimation using different specifications for the distribution of the hazard rates. The baseline model used a simple logit estimator, assuming a logistic distribution. The

[14] Compare e.g. Anderson and Burkhauser (1984), Bound (1991), and Kreider (1999). Currie and Madrian (1999) provide a detailed survey of the empirical literature.

model is now repeated assuming a normal distribution of the hazard rates, which leads to the estimation of a probit model. In addition, logit estimators with a time-constant, individual-specific part of the error term are applied to account for unobserved heterogeneity that may lead to biased results in the estimation of hazard rates. I estimated specifications with normally distributed unobserved heterogeneity, and with discretely distributed unobserved heterogeneity where the distribution of the time-constant part of the error term is estimated jointly with the model coefficients.[15] Results are shown in **Table 7**. While changing slightly in magnitude, the overall pattern of the result is again very stable and matches previous findings.

6. Conclusions

A recent reform of the German public disability insurance substantially lowered the benefits for individuals who suffer from health impairments and whose earnings capacity is reduced. This analysis investigated the behavioural responses to a decrease in benefits. I have estimated the probability of entering disability retirement and have considered forward-looking financial incentive measures as determinants. Administrative data containing very detailed information on employment and earnings histories and survey data containing socio-demographic and health information were combined. The results are robust to different health measures, discount rates and distributional assumptions.

As expected the most important determinant of the claiming of disability appears to be the individual's health status. There is no behavioural response to expected benefit levels independent of the individual's health status. Consequently, a mere cut of benefit levels does not appear to be an effective policy measure in order to set incentives for a longer working life. On the other hand, the forward-looking incentive measure, the implicit tax rate on further work, is significant and of sizable magnitude. This result is in line with most studies

[15] See Heckman and Singer (1984) and for software implementation Rabe-Hesketh et al. (2004).

investigating old-age retirement, that usually find that it is the further gain in income from further work that drives retirement behaviour, rather than the income level itself. This finding immediately leads to the conclusion that actuarial adjustments should be incorporated in the benefit system.

However, this policy measure is much more problematic in the context of disability pensions than in the context of old-age pensions. While there might be a trade-off between labour market income and disability pensions for some individuals whose working capacity is reduced but not fully lost yet, others in a very bad health status do not respond to financial incentives because labour market income is not feasible. The response to the implicit tax rate is substantially smaller and also insignificant for those in bad health than for those in relatively good health. They are likely to fall in poverty if actuarial adjustments reduce their pensions substantially. If the public retirement insurance does not provide a reasonable maintenance for individuals with reduced earnings capacity for health reasons, one of the main tasks of the public system of social security is neglected.

A solution to that trade-off might be found in other relevant institutional regulations. Boersch-Supan (2007) shows in a cross-country comparison, that the ease of access to benefits is the most important determinant of the up-take rate, particularly the strictness of vocational assessments. If the medical screening procedure was further improved, the current health situation was reassessed more regularly, disability was strictly assessed without regard to an individual's occupation, and rehabilitation programs or subsidies for the adjustment of workplaces were given priority over a generous pension granting policy, access to disability pensions could be limited more strictly to those who are not able to respond to financial incentives.

References

Anderson, Kathryn H. and Richard V. Burkhauser (1984), The Retirement-Health Nexus: A New Measure for an Old Puzzle, *Journal of Human Resources* 20(3), 315-330.

Autor, David H. and Mark G. Duggan (2003), The Rise in the Disability Rolls and the Decline in Unemployment, *The Quarterly Journal of Economics* 118(1), 157-205.

Boeri, Tito, Axel Boersch-Supan and Guido Tabellini (2002), Pension Reforms and the Opinions of European Citizens, *American Economic Review* 92(2), 396-401.

Boersch-Supan, Axel (2001), Incentive Effects of Social Security Under an Uncertain Disability Option, in: D.Wise (ed.), *Themes in the Economics of Aging*, The University of Chicago Press, Chicago, 281-310.

Boersch-Supan, Axel (2007), Work Disability, Health and Incentive Effects, *MEA Working Paper Series* No. 135-2007, Mannheim.

Boersch-Supan and Reinhold Schnabel (1999), Social Security and Retirement in Germany, in Gruber, J. and D. Wise (eds.), *Social Security and Retirement Around the World*, The University of Chicago Press, Chicago, 135-180.

Bound, John (1989), The Health and Earnings of Rejected Disability Insurance Applicants, *American Economic Review* 79(3), 482-503.

Bound, John (1991), Self-reported Versus Objective Measures of Health in Retirement Models, *Journal of Human Resources* 26(1), 106-138.

Bratberg, Espen (1999), Disability Retirement in a Welfare State, *The Scandinavian Journal of Economics* 101(1), 97-114.

Campolieti, Michele (2004), Disability Insurance Benefits and Labor Supply: Some Additional Evidence, *Journal of Labor Economics* 22(4), 863-887.

Chen, Susan and Wilbert van der Klaauw (2008), The Work Disincentive Effects of the Disability Insurance Program in the 1990s, *Journal of Econometrics* 142(2), 757-784.

Coile, Courtney and Jonathan Gruber (2000), Social Security and Retirement, *NBER Working Paper Series No. 7830,* Cambridge.

Coile, Courtney and Jonathan Gruber (2001), Social Security Incentives for Retirement, in: D.Wise (ed.), *Themes in the Economics of Aging*, The University of Chicago Press, Chicago, 311-354.

Currie, Janet and Brigitte Madrian (1999), Health, Health Insurance and the Labor Market, in: Ashenfelter, O. and D. Card (eds.), *Handbook of Labor Economics*, Vol. 3C, Elsevier Amsterdam, 3309-3416.

Deutsche Rentenversicherung Bund (2008), *Rentenversicherung in Zeitreihen 2008*, *DRV-Schriften* Band 22, Sonderausgabe der DRV, Berlin.

Deutsche Rentenversicherung Bund (2006a), *Statistik der deutschen Rentenversicherung: Rentenbestand 2005*, Berlin.

Deutsche Rentenversicherung Bund (2006b), *Statistik der deutschen Rentenversicherung: Rentenzugang 2005*, Berlin.

Diamond, Peter and Jonathan Gruber (1999), Social Security and Retirement in the United States, in: Gruber, J. and D. Wise (eds.), *Social Security and Retirement Around the World*, The University of Chicago Press, Chicago, 437-473.

Dlugosz, Stephan, Gesine Stephan and Robert Wilke (2009), Fixing the Leak: Unemployment Incidence Before and After the 2006 Reform of Unemployment Benefits in Germany, *ZEW Discussion Paper* No. 09-079.

Eurostat (2008), Social Protection in the European Union, *Statistics in Focus* No. 46/2008.

Gruber, Jonathan (2000), Disability Insurance Benefits and Labor Supply, *Journal of Political Economy* 108(6), 1162-1183.

Haveman, Robert H., Philip De Jong and Barbara L. Wolfe (1991), Disability Transfers and the Work Decision of Older Men, *Quarterly Journal of Economics* 106(3), 939-949.

Haveman, Robert H. and Barbara L. Wolfe (1984a), Disability Transfers and Early Retirement: A Causal Relationship, *Journal of Public Economics* 24(1), 47-66.

Haveman, Robert H. and Barbara L. Wolfe (1984b), The Decline in Male Labor Force Participation: Comment, *Journal of Political Economy* 92(3), 532-541.

Haveman, Robert H. and Barbara L. Wolfe (2000), The Economics of Disability and Disability Policy, in: Culyer, A.J. and J.P Newhouse (eds.), *Handbook of Health Economics*, Vol. 1, Elsevier Amsterdam, 995-1050.

Heckman, James J. and Burton Singer (1984), A Method for Minimizing the Impact of Distributional Assumptions in Econometrics Models for Duration Data, *Econometrica* 52(2), 271-320.

Kreider, Brent (1999), Latent Work Disability and Reporting Bias, *Journal of Human Resources* 34(4), 734-769.

Kreider, Brent and Regina T. Riphahn (2000), Explaining Applications to the U.S. Disability System, *Journal of Human Resources* 35(1), 82-115.

Leonard, Jonathan S. (1979), The Social Security Disability Insurance Program and Labor Force Participation, *NBER Working Paper Series* No. 392.

OECD (2009a), *Society at a Glance- OECD Social Indicators*, Paris.

OECD (2009b), *Pension at a Glance 2009 - Retirement-Income Systems in OECD Countries*, Paris.

Parsons, Donald O. (1980a), The Decline of Male Labor Force Participation, *Journal of Political Economy* 88(1), 117-134.

Parsons, Donald O. (1980b), Racial Trends in Male Labor Force Participation, *American Economic Review* 70(5), 911-920.

Parsons, Donald O. (1982), The Male Labor Force Participation Decision: Health, Reported Health and Economic Incentives, *Economica* 49(193), 81-91.

Rabe-Hesketh, Sophia, Anders Skrondal, and Andrew Pickles (2004), *GLLAMM Manual*, U.C. Berkeley Division of Biostatistics Working Paper Series Paper 160, Berkeley.

Riphahn, Regina T. (1999), Disability Retirement Among German Men in the 1980s, *Industrial and Labor Relations Review* 52(4), 628-647.

Slade, Frederic B. (1984), Older Men: Disability Insurance and the Incentive to Work, *Industrial Relations* 23(2), 260-269.

Statistisches Bundesamt (2008), *Periodensterbetafeln fuer Deutschland*, Wiesbaden.

Stock, James H. and David A. Wise (1990), Pensions, the Option Value of Work, and Retirement, *Econometrica* 58(5), 1151 – 1180.

Table 1: Timing and Anticipation of the Reform of Disability Pensions and its Regulations

Period	Year t	Expectations about disability regulations if entry takes place:	In year t+1	One or more years ahead (>= t+2)
Regulations affecting the amount of benefits				
pre-reform	<= 1998	Partial benefits amount to … of full pension	2/3	2/3
anticipation	1999		2/3	1/2
post-reform	>= 2000		1/2	1/2
pre-reform	<= 1998	Benefits will be decreased if disability occurs prior to age 63	no	no
anticipation	1999		no	yes
post-reform	>= 2000		yes	yes
Regulations affecting the pool of potential beneficiaries				
pre-reform	<= 1998	Ability to work will be tested for … occupation	own	own
anticipation	1999		own	any (if born after 1960)
post-reform	>= 2000		any (if born after 1960)	any (if born after 1960)

Table 2a: Explanatory Variables – Descriptive Statistics

	Non-retirees	Disability Retirees	t-test on H_0: Difference of Means=0
Variable	Mean		p-value
Age	51.01	52.85	0.000
Year	1999.34	1997.90	0.000
Individual is female	53.61%	43.13%	0.000
Education:			
higher education (ISCED 4-6)	15.19%	27.29%	0.000
secondary education (ISCED 3)	59.75%	54.96%	0.028
lower education (ISCED 0-2)	25.06%	17.75%	0.000
Occupation:			
manufacturing	13.75%	21.37%	0.000
technical	8.79%	5.53%	0.009
service	59.07%	41.98%	0.000
missing/ other	18.38%	31.11%	0.000
Region:			
north	18.55%	22.71%	0.017
west	36.35%	39.12%	0.196
south	40.80%	30.34%	0.000
east	4.30%	7.82%	0.000
Partner:			
indivdual is married	80.76%	69.66%	0.000
individual is living together with a partner	5.09%	9.35%	0.000
individual has no partner/spouse	14.16%	20.99%	0.000
age of partner/spouse	48.77	50.04	0.038
partner/spouse is emplyoed	73.37%	58.94%	0.000
partners'/spouses' self-rated health status is (very) poor	16.15%	18.12%	0.286
Number of children <16 in household	0.30	0.11	0.000
Health:			
mortality: individual died within next five years (t, t+5]	1.29%	3.63%	0.000
individual has an officially acknowledged handicap	9.71%	35.69%	0.000
overnight-stay in hospital last year	9.96%	23.28%	0.000
self-rated health status			
very good	6.62%	2.29%	0.000
good	39.33%	18.89%	0.000
satisfying	38.29%	30.73%	0.000
poor	13.44%	31.49%	0.000
very poor	2.31%	16.60%	0.000
Financial Variable:			
$ENPV_{t+1}$ (in 1000 €)	60.79	52.13	0.000
Tax (in %-points)	0.35	0.40	0.000
# of Observations (Person-years)	12041	489	

Source: Own calculations using GSOEP (1995-2007) for the mortality index and GSOEP (1995-2003) for all other variables.

Table 2b: Explanatory Variables – Disability Retirees at the Time of Retirement Entry

	Disability Retirees Entering Retirement...		
	from 1999 to 2000	at any other time	t-test on H_0: Difference of Means=0
Variable	Mean		p-value
Age	54.76	53.64	0.132
Individual is female	45.45%	38.27%	0.444
Education:			
higher education (ISCED 4-6)	30.30%	30.86%	0.950
secondary education (ISCED 3)	51.52%	50.62%	0.926
lower education (ISCED 0-2)	18.18%	18.52%	0.964
Occupation:			
manufacturing	27.27%	13.58%	0.050
technical	3.03%	4.32%	0.735
service	42.42%	33.33%	0.320
missing/ other	27.27%	48.77%	0.024
Region:			
north	30.30%	17.90%	0.106
west	30.30%	40.12%	0.293
south	27.27%	36.42%	0.317
east	12.12%	5.56%	0.170
Partner:			
indivdual is married	54.55%	76.54%	0.009
individual is living together with a partner	15.15%	4.94%	0.032
individual has no partner/spouse	30.30%	18.52%	0.128
age of partner/spouse	54.43	50.93	0.154
partner/spouse is emplyoed	60.87%	56.06%	0.670
partners'/spouses' self-rated health status is (very) poor	17.39%	18.94%	0.862
Number of children <16 in household	0.18	0.09	0.204
Health:			
mortality: individual died within next five years	9.09%	8.02%	0.840
individual has an officially acknowledged handicap	51.52%	43.83%	0.421
overnight-stay in hospital last year	36.36%	30.25%	0.492
self-rated health status			
very good	3.03%	3.09%	0.987
good	15.15%	19.75%	0.541
satisfying	15.15%	20.37%	0.493
poor	39.39%	36.42%	0.748
very poor	27.27%	20.37%	0.382
Financial Variable:			
$ENPV_{t+1}$ (in 1000 €)	36.96	44.70	0.218
Tax (in %-points)	0.61	0.37	0.000
# of Observations (Individuals)	33	162	

Source: Own calculations using GSOEP (1995-2007) for the mortality index and GSOEP (1995-2003) for all other variables.

Table 2c Financial Incentive Variables, Mean over Time (in Euro)

$Year_t$	$ENPV_{t+1}$ (in 1000 €)	TAX= $(ENPV_{t+2}-ENPV_{t+1})/w_{t+1}$
1995	61.74	37.14%
1996	62.05	36.66%
1997	63.48	36.46%
1998	63.08	35.97%
1999	65.45	63.26%
2000	58.92	30.75%
2001	57.57	30.08%
2002	58.25	29.25%

Notes:

The mean is calculated over the individuals in the GSOEP sample, after the incentive variables from the VSKT(2005) were assigned to them.

Source: Own calculation using VSKT(2005) and GSOEP (1995 – 2003).

Table 3 Estimation Results: Logit-Model

Dependent Variable: Probability of Transition to Disability Retirement

Effect of Financial Incentives and Health

	(1a)			(1b)		
	No Health Controls			*Self-rated Health*		
Financial Incentives	Semi-Elasticity of Transition Probability	p-value		Semi-Elasticity of Transition Probability	p-value	
w.r.t. $ENPV_{t+1}$	-0.007	0.577		-0.006	0.602	
w.r.t. implicit tax	2.167	0.028	*	2.129	0.036	*
Self-rated Health Status (Ref.: very good)	Δ Pred. Transition Probability in %-points	p-value		Δ Pred. Transition Probability in %-points	p-value	
good	no			-0.28	0.45	
satisfactory				-0.26	0.47	
poor				2.13	0.00	**
very poor				5.99	0.00	**
Log-Likelihood	-750.71			-686.94		
Wald-Test: $\chi 2$(df)	200.83(19)			457.53(24)		
Number of Observations	12530					

Notes: see next page.

Table 3 - continued

Effect of Socioeconomic Characteristics

	(1a)			(1b)		
	No Health Controls			*Self-rated Health*		
Categorial Variables	Δ Pred. Transition Probability in %-points	p-value		Δ Pred. Transition Probability in %-points	p-value	
Sector (Ref.: Manufacturing)						
Technical	-2.141	0.000	**	-1.939	0.000	**
Service	-2.782	0.000	**	-2.421	0.000	**
Other	-2.296	0.000	**	-1.931	0.000	**
Education (Ref.: Lower Educ.)						
Secondary Education	-1.186	0.001	**	-0.854	0.007	**
Higher Education	-0.832	0.107		-0.309	0.532	
Region (Ref.: North)						
West	-0.029	0.923		-0.083	0.794	
South	-0.101	0.713		-0.151	0.608	
East	-0.063	0.896		-0.459	0.276	
Gender (Ref.: Male)						
Female	-1.730	0.000	**	-1.699	0.001	**
Partner Status (Ref.: Married)						
Living with partner	0.744	0.181		0.639	0.225	
Living alone	0.920	0.373		0.553	0.470	
Partner/spouse is ...						
... employed	-0.482	0.037	*	-0.478	0.046	*
... in bad health[b]	no			-0.545	0.017	*
Continuous Variables	Marginal Effect (multiplied by 100)	p-value		Marginal Effect (multiplied by 100)	p-value	
Year	0.030	0.578		0.000	0.427	
Number of Kids <16	-0.597	0.055	°	-0.006	0.053	°
Own Age	0.091	0.447		0.001	0.429	
Age of partner/ spouse	0.009	0.386		0.000	0.374	
Log-Likelihood	-750.71			-686.94		
Wald-Test $\chi 2$(df)	200.83(19)			457.53(24)		
Number of Observations	12530					

*Notes: **, *, ° indicate significance at the 1%-level, 5%-level and 10%-level.*
[a] age enters the estimation equation as a linear and a squared term.

Source: Own calculations using GSOEP(1995-2003) and VSKT(2005).

Table 4 Estimation Results: Logit-Model, Dependent Variable: Probability of Transition to Disability Retirement

Specification: Interaction of Health and Financial Variables

(1) *Indiviudal is in good health* [a]			(2) *Inidvidual is in bad health* [a]			(1)- (2) *Difference between samples*		
Probability of Transition	p-value		Probability of Transition	p-value		Difference in Probabilities	p-value	
0.681%	0.00	**	3.944%	0.00	**	-3.263%	0.00	**
Semi-Elasticity of Transition Proability	p-value		Semi-Elasticity of Transition Proability	p-value		Semi-Elasticity of Transition Proability	p-value	
-0.020	0.13		0.001	0.95		-0.021	0.00	**
3.389	0.01	**	1.486	0.22		1.902	0.16	
-686.01								
334.67(23)								
12530								

Notes: The model includes additional controls for year, age, age^2, gender, occupation, region, education, marital status/lives with partner, age of partner, employment status of partner, partner's health status (poor/very poor=bad health, 0 otherwise) presence of children <16 in household

***, *, ° indicate significance at the 1%-level, 5%-level and 10%-level.*

[a] *good health: individual's health status is very good to satisfactory; bad health: individual's health status is poor to very poor.*

Source: Own calculation using GSOEP(1995-2003) and VSKT(2005).

Table 5 – Robustness: Health Measures

		(1) *Indiviudal is in good health*			(2) *Inidvidual is in bad health*			(1)- (2) *Difference between samples*		
		Probability of Transition	p-value		Probability of Transition	p-value		Difference in Probabilities	p-value	
	(A) Mortality	1.192%	0.00	**	5.010%	0.00	**	-3.818%	0.02	*
	(B) Handicap	0.782%	0.00	**	4.605%	0.00	**	-3.823%	0.00	**
	(C) Handicap, t-1	0.713%	0.00	**	3.275%	0.00	**	-2.562%	0.00	**
	(D) Hospitalization, t-1	0.988%	0.00	**	3.672%	0.00	**	-2.684%	0.00	**
	(E) Self-rated, t-1	0.611%	0.00	**	2.810%	0.00	**	-2.199%	0.00	**
		Semi-Elasticity of Transition	p-value		Semi-Elasticity of Transition	p-value		Difference in Semi-Elasiticities	p-value	
w.r.t. $ENPV_{t+1}$	*(A) Mortality*	-0.009	0.44		0.009	0.56		-0.018	0.11	
	(B) Handicap	-0.008	0.52		0.000	0.98		-0.007	0.19	
	(C) Handicap, t-1	0.002	0.89		0.006	0.67		-0.004	0.62	
	(D) Hospitalization, t-1	-0.013	0.27		-0.002	0.87		-0.011	0.04	*
	(E) Self-rated, t-1	-0.001	0.97		0.002	0.89		-0.003	0.71	
w.r.t. implicit tax	*(A) Mortality*	2.063	0.03	*	3.308	0.21		-1.246	0.63	
	(B) Handicap	2.584	0.02	*	1.524	0.27		1.060	0.47	
	(C) Handicap, t-1	2.664	0.02	*	1.056	0.50		1.609	0.36	
	(D) Hospitalization, t-1	2.705	0.02	*	1.365	0.29		1.340	0.36	
	(E) Self-rated, t-1	3.197	0.02	*	0.691	0.62		2.51	0.17	
Log-Likelihood (# of Observations)	*(A) Mortality*	-738.93 (12530)								
	(B) Handicap	-697.43 (12530)								
	(C) Handicap, t-1	-508.81 (10290)								
	(D) Hospitalization, t-1	-722.81 (12530)								
	(E) Self-rated, t-1	-503.62 (10290)								

*Notes: The model includes additional controls like in Table 4. **, *, ° indicate significance at the 1%-level, 5%-level and 10%-level.*
Source: Own calculation using VSKT(2005), GSOEP(1995-2007) for spec. A), GSOEP(1995-2003) for spec. B) and GSOEP (1995-2003)for spec.C) and D).

Table 6 – Robustness: Discount Rates

		(1) *Indiviudal is in good health*			(2) *Inidvidual is in bad health*			(1)- (2) *Difference between samples*		
		Probability of Transition	p-value		Probability of Transition	p-value		Difference in Probabilities	p-value	
	δ=2%	0.681%	0.00	**	3.942%	0.00	**	-3.261%	0.00	**
	δ=4%	0.681%	0.00	**	3.946%	0.00	**	-3.265%	0.00	**
	δ=5%	0.682%	0.00	**	3.948%	0.00	**	-3.266%	0.00	**
		Semi-Elasticity of Transition	p-value		Semi-Elasticity of Transition	p-value		Difference in Semi-Elasiticities	p-value	
w.r.t. $ENPV_{t+1}$	δ=2%	-0.018	0.13		0.001	0.93		-0.019	0.00	**
	δ=4%	-0.021	0.12		0.001	0.96		-0.022	0.00	**
	δ=5%	-0.023	0.12		0.000	0.98		-0.024	0.00	**
w.r.t. implicit tax	δ=2%	3.182	0.01	*	1.379	0.23		1.804	0.17	
	δ=4%	3.603	0.01	**	1.599	0.21		2.004	0.16	
	δ=5%	3.826	0.01	**	1.718	0.20		2.108	0.15	
Log-Likelihood	δ=2%	-686.69								
	δ=4%	-685.85								
	δ=5%	-685.70								
Number of Observations		12530								

Notes: see Table 4.

Source: Own calculation using GSOEP(1995-2003) and VSKT(2005).

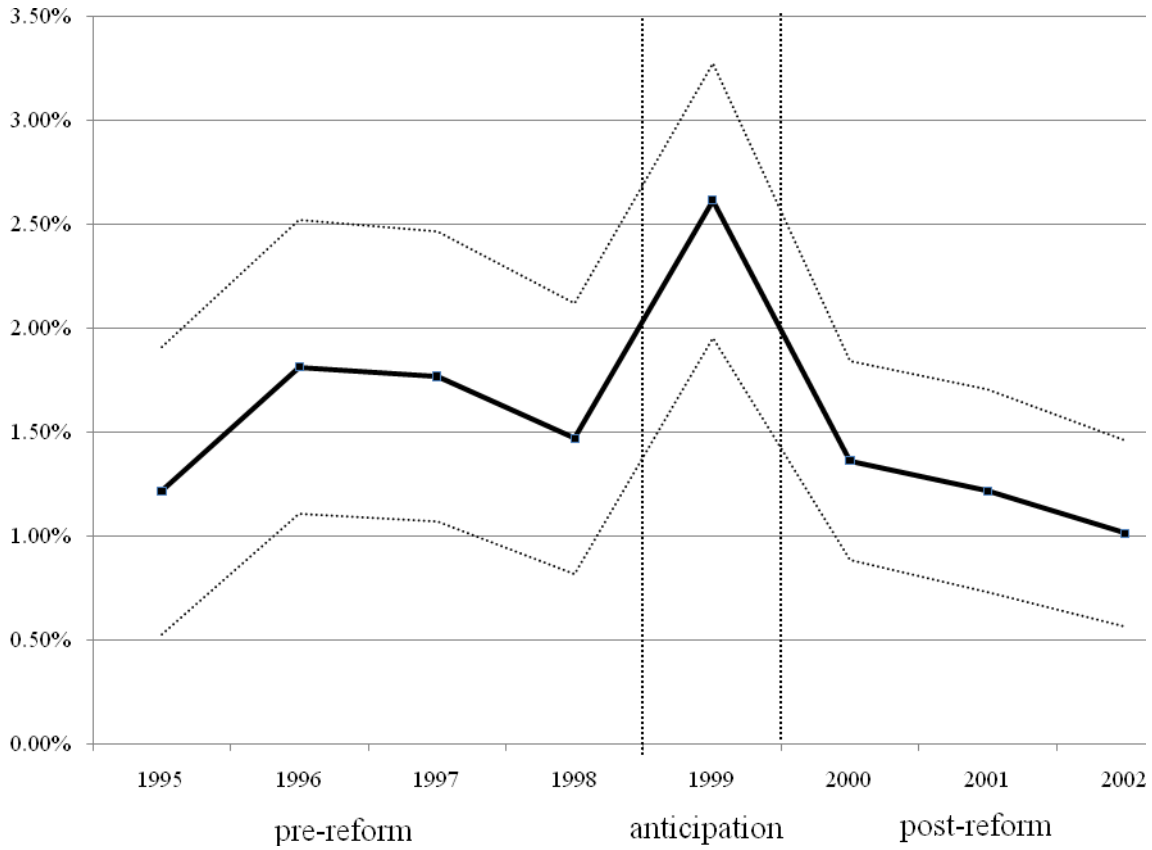
Table 7 – Robustness: Error Term Specification

		(1) *Indiviudal is in good health*			(2) *Inidvidual is in bad health*			(1)- (2) *Difference between samples*		
		Probability of Transition	p-value		Probability of Transition	p-value		Difference in Probabilities	p-value	
(A) Probit		0.658%	0.00	**	4.037%	0.00	**	-3.379%	0.00	**
(B) Logit with normally distributed Random Effects		0.902%	0.00	**	4.898%	0.00	**	-3.997%	0.00	**
(C) Logit with discretly distributed Random Effects		0.740%	0.00	**	2.880%	0.00	**	-2.141%	0.00	**
		Semi-Elasticity of Transition	p-value		Semi-Elasticity of Transition	p-value		Difference in Semi-Elasiticities	p-value	
w.r.t. $ENPV_{t+1}$	(A)	-0.021	0.20		0.001	0.97		-0.021	0.01	*
	(B)	-0.019	0.68		0.002	0.96		-0.021	0.50	
	(C)	-0.018	0.61		0.001	0.97		-0.019	0.21	
w.r.t. implicit tax	(A)	3.594	0.03	*	2.430	0.12		1.164	0.52	
	(B)	4.220	0.31		2.524	0.59		1.696	0.78	
	(C)	3.432	0.22		2.317	0.46		1.115	0.78	
Log-Likelihood	(A)	-683.52								
	(B)	-680.18								
	(C)	-680.72								
Number of Observations		12530								

Notes: see Table 4.

Source: Own calculation using GSOEP(1995-2003) and VSKT(2005).

Figure 1 Relative Frequency of Entry into Disability Benefit Receipt Over Time



Notes: Dotted lines represent the upper and lower bound of a 95% confidence interval.

Source: Own illustration & calculation, GSOEP(1995-2003), unweighted data