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Disability Pensions and Labor Supply

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Disability Pensions and Labor Supply

Evidence from Germany

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I investigate the incentive effects of disability pensions on the labor supply decision of the elderly in Germany. In the year 2001, a reform decreased the level of benefits and tightened the criteria of eligibility. The purpose of this paper is twofold: First, I estimate transition rates into disability retirement, both prior to and after the reform in order to evaluate the effect of the reform on retirement behavior. Second, I use the exogenous variation in (a) expected benefit levels and (b) expected benefit accruals that is caused by the reform, in order to obtain reliable estimates of individuals' responses in retirement behavior to financial incentives. While health status and expected wages turn out to be important determinants of the decision to enter disability retirement, benefits have only a small effect.

Keywords: disability pensions, labor force exit, Germany

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1. Introduction

Compared to international standards, labor force participation of the elderly is low in Germany. In 2006, only 64.1% of males aged 55 and older participated in the labor market. Among females of that age, the labor force participation rate was even lower at 46.7% (OECD, 2007a). Disability pensions are an important pathway into early retirement. In 2006, 28.1% of retirement entries prior to the regular retirement age of 65 were entries to disability retirement (Deutsche Rentenversicherung Bund, 2008).

Disability retirement affects not only labor force participation of the elderly. It is also an important part of public retirement expenditures. Public spending for disability benefits increased sharply, especially after the German reunification. During the 1980s, benefit expenditures remained rather constant at about 10 billion € per annum. In 1992, when the retirement insurance of the former GDR and the West German insurance system were merged, benefit expenditures jumped up by more than 40%, mainly because the number of insured individuals was expanded drastically. However, within the subsequent eight years, those expenditures increased by another 20% to more than 17 billion € in 2000 (Deutsche Rentenversicherung Bund, 2008).

Unsurprisingly hence, the funding of disability retirement appeared on the political agenda. The overall retirement insurance system in Germany faces important financial challenges due to the aging of society. It was drastically changed in several reforms during the last two decades. In that context, also disability pensions were reorganized in 2001. Eligibility criteria are now stricter than before, and benefits for the partially disabled are substantially lower.

This study examines whether and to what extent the change in the regulations of disability pensions changed individuals' labor market behavior. The previous literature regarding the effect of disability pensions on labor force participation led to ambiguous conclusions. Most

contributions examine disability pensions in the United States. Early analyses, such as Parsons (1980a, 1980b), Leonard (1979), Slade (1984) and Lando et al. (1979), found large elasticities of labor force participation with respect to disability benefits and concluded that disability retirement accounts for a substantial part of the decrease in male labor force participation in the U.S. since the 1960s. Yet, these analyses were discussed controversially. Bound (1989) argues that the mentioned analyses suffered from endogeneity of benefits, wages, and replacement rates. Several later contributions used instrumental variable estimators (Haveman and Wolfe, 1984a; Haveman et al., 1991; and Riphahn, 1999), took advantage of natural experiments (Gruber, 2000; Campolieti, 2004), or used rejected applicants for disability benefits as a control group (Bound, 1989; Chen and van der Klaauw, 2008) to deal with the potential endogeneity of benefits. Typically, those analyses found much smaller responses to disability benefits than studies that did not account for endogeneity of benefits.

In this analysis, I account for endogeneity of benefits using a strategy proposed by Gruber (2000), who uses average benefit entitlements by population groups rather than individual benefits for the estimation of transition rates to disability retirement. My analysis contributes to the literature in four more ways: first, unlike most former analyses, I use both subjective and objective health measures and compare the results for different health measures. Second, forward-looking incentive measures are introduced, which is common in the general retirement literature, but missing in the analysis of disability retirement until now (cf. Haveman and Wolfe, 2000). By using forward-looking measures, I can distinguish between short-term effects of the reform that are mainly due to anticipation and the reform's long-term effects. Third, I take advantage of panel data and can account for unobserved heterogeneity, in contrast to most of the existing literature. And finally, there is only one previous investigation using

German data (Riphahn, 1999), which was also conducted prior to the above mentioned reform. To the best of my knowledge, this analysis is the first evaluating the effects of the recent reform.

I find almost no behavioral response to benefit levels in the long run. There is a sizable anticipation effect of the reform, increasing the probability of retirement prior to the decline of benefits. Yet, once the reform was fully implemented and the anticipation effect disappeared, the incidence of disability retirement no longer differs from the situation prior to the reform. Furthermore, I find strong responses of individual retirement decisions to expected wages and current health.

2. Literature Review

Most empirical analyses dealing with disability pensions examine the social security system in the United States. In the 1960s, disability benefits as well as the number of eligible persons had been increased strongly in the U.S., and afterwards, labor force participation of the elderly sharply decreased. Because of this timing of events, a causal relationship between both developments was presumed, and a large number of studies investigated the incentive effects of disability pensions since the 1980s.[1]

Parsons (1980a) estimates the probability of labor force participation as a function of the wage replacement rate and found very high elasticities. As expected from economic theory, an individual's probability to participate in the labor market is the lower the higher his disability benefits relative to expected wages. Parsons concludes that almost the entire decrease in labor force participation during the 1960s and 1970s can be explained by the increase in disability pensions. His findings were confirmed by several similar studies using different micro data sets, e.g. Leonard (1979), Parsons (1980b), and Slade (1984). The elasticity of labor force

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

participation found in these studies range from 0.49 to 0.93. Lando et al. (1979) corroborate Parsons' result using aggregate data.

However, these findings were discussed controversially in the following literature. The mentioned analyses suffered mainly from two problems: first, the selection into the sample of individuals, for whom a wage is observed and replacement rates are calculated is not random. Individuals in bad health, who are unable to work for a longer period of time and thus are unlikely to respond to benefit levels, are not represented in an analysis restricted to individuals for whom a wage can be observed. In addition, observed wages as well as benefits may be endogenous, and so may be the replacement rate. High wages may be correlated with unobserved heterogeneity, such as physical or mental abilities or motivation. At the same time, individuals with high wages typically face low replacement rates of disability benefits. As a consequence, the effect of replacement rates on labor force participation possibly cannot be interpreted as a causal effect, but may reflect the individual's motivation and ability.

The first issue was raised by Haveman and Wolfe (1984a, 1984b). They repeated Parsons' study using different data and found very similar elasticities. Yet, in a second step they estimated wages for individuals for whom no wage is observed and included those individuals in their analysis. The resulting elasticity was reduced by more than 80% to 0.06.[2]

The second issue was first discussed by Bound (1989). He repeated Parsons' model in a first step and found similar results. In a second step, he applied an identical model to a subsample of individuals who never tried to apply for disability benefits. There is no obvious reason why these individuals' labor market decision should depend on benefit levels. Nevertheless, Bound found almost identical elasticities for this subsample as for the entire

[2] However, the different findings may partly result from the use of different health measures (cf. Parsons, 1982). While Parsons applied mortality in the years after the period of analysis as an objective measure, Haveman and Wolfe used self-rated health status as a subjective measure. It is controversial which health measures are the more reliable ones. Compare Currie and Madrian (1999) for a survey of the empirical literature.

population, confirming that the initially estimated elasticities are caused by unobserved heterogeneity rather than a true causal effect.

In the subsequent literature, we can distinguish four strategies to deal with the endogeneity of benefit levels. A first attempt by Bound and Waidmann (1992) is to use aggregate time-series data rather than cross-sectional data and to analyze retirement behavior prior to and after changes in institutional regulations. Yet, this approach does not allow distinguishing between changes in institutions and any other changes in relevant retirement determinants over time.

A second approach is the use of instrumental variable estimators, as was done, for example, by Riphahn (1999), Kreider and Riphahn (2000), Haveman and Wolfe (1984a) and Haveman et al. (1991). To my knowledge, the study of Riphahn (1999) is the only one utilizing German data. Moreover, it takes unobserved heterogeneity into account by exploiting the panel structure of the used micro data. She finds an elasticity of non-labor force participation with respect to benefit levels of 0.4. At the same time, the influence of benefits appears much lower than the influence of health and wages.

A third approach exploits the rejection of applicants: Bound (1989) estimates the labor force participation of rejected applicants and states that their working probability can be interpreted as an upper bound for the working probability of disability retirees if there were no disability program. While Parsons (1980a) finds that disability benefits can explain almost the entire decrease in the labor force participation of the elderly, Bound concludes that those benefits account for only one fourth of the decline in labor force participation. Chen and van der Klaauw (2008) follow a similar approach: they use discontinuities in the disability determination rule to compare applicants for disability benefits who were rejected to those not rejected. They apply a

regression discontinuity approach. They find similar and only slightly smaller effects than Bound.

The fourth approach is to take advantage of natural experiments, causing truly exogenous variation in benefits. Gruber (2000) and Campolieti (2004) utilize administrative changes in the Canadian benefit system. In 1972, disability pensions were strongly increased in the province of Quebec and held constant in the other provinces. In 1987, the other Canadian provinces raised benefits to Quebec's level. Gruber analyzes the reform of 1987, while Campolieti investigates the change in 1972. Both studies apply a difference-in-differences approach to evaluate the reform's effect in general and use models that explicitly parameterize the effect of benefit levels. To account for endogeneity of disability benefits, they construct expected earnings histories. Average wages by age, gender, place of residence, and education are used as a hypothetical earnings history. Based on actual regulations, expected benefit levels are calculated and included in the regression. They find elasticities of labor force participation with respect to benefit levels of 0.28 (Gruber, 2000) and 0.21, respectively (Campolieti, 2004), which is substantially lower than former results gained when not accounting for endogeneity. Autor and Duggan (2003) also use differential variation in replacement rates over time across regions to identify the effect of disability benefits on labor force participation. They use state level data for the U.S. and exploit the fact that, first, the wage level differs across regions, second, the benefit formula does not account for those regional differences, and third, the benefit formula is progressive. This leads to exogenous variation in program generosity, with higher replacement rates in low-wage states. They find disability benefits to be an important reason for labor force exit of low-skilled workers.

In summary, the estimated effects of disability benefits on labor force participation are very heterogeneous and depend on whether the endogeneity of benefits is taken into account.

Finding an appropriate strategy to deal with endogeneity appears to be the most important challenge when analyzing the influence of disability pensions on retirement. Another critical issue is the measurement of health. Furthermore, Haveman and Wolfe (2000) point out that the inclusion of forward-looking measures, which are widely used in the analysis of retirement behavior in general, is missing in empirical studies of disability retirement so far. Besides, only few studies use panel data and can therefore account for unobserved heterogeneity. My strategy to handle each of these points is described in Section 4.

3. Institutional Background

In Germany, the public disability insurance is part of the general public retirement insurance system. The retirement insurance is financed by payroll taxes and is organized as a PAYG-system. Employees are mandatorily insured. They make up about 80% of the labor force. The main objective of the retirement insurance is the provision of old-age benefits. In addition, individuals are eligible for several services in case of disability. The public insurance provides training courses and rehabilitation programs and subsidizes employers' expenses for the adjustment of workplaces to meet the needs of the disabled. These schemes aim at the recovery of an individual's earnings capacity. Furthermore, disability benefits are paid in case of reduced earnings capacities for health reasons.

Individuals are eligible for disability benefits if they have contributed to the retirement insurance for at least five years, if they have worked at least three out of the last five years, and if their earnings capacity is reduced for health reasons. Until 2001 the program was generous. It distinguished between occupational disability and general disability. 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. Benefits for general disability amounted to full old-age pensions and were granted if an individual was unable to

perform any regular employment in any occupation on a continuous basis. Additionally, general disability benefits were provided if an occupationally disabled individual was "effectively excluded from the labor 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 was passed in 1998 and involved four major modifications: first, if individuals can perform part-time work, it is no longer taken into account whether they are able to do so in their own occupation. Instead, disability benefits are divided into benefits for the partially disabled and the fully disabled. Benefits for full disability can be received if an individual can work less than three hours per day in any occupation, benefits for the partially disabled are provided for those individuals who are able to work less than six hours per day in any occupation. Second, benefits for the partially disabled are significantly lower than the former benefits for occupationally disabled: they amount to half of the full old-age pension now, instead of previously two thirds. Third, whether an individual qualifies for benefits for the fully or the partially disabled is now independent of the labor market situation, i.e. the concept of "effective exclusion from the labor market" was abolished. And fourth, benefits for the fully and for the partially disabled are reduced by 10.8% if claiming takes place prior to age 60.[3] The legal changes were passed and thus became known to the public on December 19, 1998. They became effective January 1, 2001. The new regulations applied to all individuals who entered disability retirement after the reform. Retirees who entered disability retirement until December 31, 2000 were subject to a grandfather clause and their benefits remained unchanged.

[3] 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.

4. Hypotheses and 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. However, for the sake of simplicity, I follow a common approach in the literature and assume that the entry to disability retirement is an individual decision (compare e.g. Parsons (1980a), Haveman et. al (1991), Riphahn (1999), Gruber (2000), Chen and van der Klaauw (2008)). Consider an individual behaving according to the Option Value model as established by Stock and Wise (1990). Originally developed to model entry to regular retirement, it can be used to explain the entry to disability retirement as well. Based on the Option Value model, an individual's utility depends on income and leisure. Individuals evaluate expected income flows and expected leisure time at all possible ages of labor force exit. They will postpone labor force exit, if they can realize a higher discounted utility stream by waiting. Retirement will take place, if the expected net present value of the utility stream related to immediate retirement is higher than the expected net present value of all possible utility streams related to any later date of retirement. The model immediately leads to the following two hypotheses: ceteris paribus, the probability of an immediate entry to disability retirement should

(i) increase in the net present value of disability benefits that are available immediately and

(ii) decrease in the net present value of disability benefits that are available if retirement entry is delayed.

To test these hypotheses, I estimate transition rates to disability retirement. Exits from disability retirement back to the labor force occur rarely,[4] and disability is interpreted as an

[4] 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 refers to an average rate of recovery of less than 2%.

absorbing state. In each period t the individual can decide whether to enter disability retirement until t+1, or to remain in the labor force instead. Only those in the labor force can undertake a transition.

Reconsidering the timing of the reform, we can distinguish three periods:

- the pre-reform period until the end of 1998,
- the anticipation period during 1999, and
- the post-reform period from 2000 onwards.[5]

In the pre-reform period, benefits were calculated according to the rather generous old law and individuals expected the institutions not to change in the future. Thus, the net present value for both retirement entry at the next possible date and delayed retirement entry are expected to be high. During the anticipation period, individuals knew that monthly benefits will be calculated according to the old law if retirement entry takes place in the following year, but anticipated that relevant benefit rules will have changed if they delay retirement entry by another year. Hence, they expect the net present value of monthly benefits to be high if they enter retirement at the next possible date and to be low if they delay retirement until any later date. Finally, in the post-reform period individuals knew that benefits will be calculated according to the new regulations at all possible dates of retirement entry, i.e. for both retirement entry at the next possible date and delayed retirement entry, the net present value of benefits is expected to be low. **Table 1** illustrates the time schedule of current and expected future eligibility criteria and benefit amounts over time.

[5] The post-reform period is defined to begin in 2000, although the reform was in force from 2001 onwards. This is because of the annual structure of the used data set (compare Section 5): if an individual is at risk to enter retirement in the year 2000, retirement entry can be observed in 2001 at the earliest. At this time, the new institutional regulations are implemented.

Combining hypotheses (i) and (ii) and the timing of the reform, the following further hypotheses result: the probability of an entry to disability retirement within the following year should

(iii) increase in the anticipation period compared to the pre-reform period,

(iv) decrease in the post-reform compared to the anticipation period, and

(v) decrease in the post-reform period compared to the pre-reform period.

In a first step, I estimate transition rates in each of these periods, while controlling for personal characteristics, in order to evaluate the short-term and long-term effects of the reform. In a second step, I use the exogenous variations in benefits that are caused by the reform to evaluate the effect of financial incentives on retirement behavior: if an individual enters disability retirement until t+1 instead of staying in the labor force, he or she gains (i) leisure time and (ii) disability benefits that can be drawn from t+1 until age 59.[6] On the other hand, he or she loses (iii) expected benefit streams that were available if retirement would have been postponed for at least another year and (iv) labor market income during the period of delay. Hence, the transition rate is estimated as a function of: (i) taste shifter variables that can be used to approximate utility from leisure, such as education, age, wealth, or health status, (ii) the expected net present value of discounted disability benefits drawn from t+1 until age 59, (iii) the change in

[6] From age 60 onwards, regular old-age benefits can be drawn regardless of the individual's health. Those benefits are not taken into account in the analysis for two reasons: First, their amount is highly dependent on the decision, whether to draw them at age 60 immediately or to delay receipt of old-age benefits until some later age. This decision has to be taken within a regulatory framework that is beyond this analysis. Furthermore, old-age benefits depend only little on the previous decision, whether and when to draw disability benefits. For the calculation of old-age benefits for a former disability retiree it is assumed that the disability retiree had continued to pay contributions according to his average contributions prior to the occurrence of the disability. That means, the old-age pension of a former disability retiree 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.

the expected net present value of discounted benefits if retirement were postponed by another year,[7] and (iv) expected wages during the year of postponement.

As discussed in Section 2.2, a key issue in the estimation is the endogeneity of income variables. 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, hypothetical entitlements for disability benefits at every point in time can be derived for the population cells and are assigned to every individual belonging to one of these cells.

Furthermore, an appropriate health measure should be used. It is controversial, whether objective or subjective measures are more reliable. Regarding self-rated health status, 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 health may be jointly determined by unobservables. On the other hand, objective measures often suffer from a high measurement error and therefore maybe inappropriate to control for the actual health status. Both phenomena may bias the estimation of the health effect and as a consequence the estimation of financial effects.[8] I will use different health measures, subjective and objective ones, to test the robustness of the results. The transition rates are estimated using a binary logit estimator. To account for unobserved heterogeneity, a random effects specification with normally distributed unobserved heterogeneity is applied.

[7] According to the Option Value model, not only one year of postponement should be considered, but postponement until any later age is taken into account by the individuals. However, 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 one-year change in benefits without neglecting relevant incentives of the benefit formula.

[8] Compare e.g. Anderson and Burkhauser (1984), Bound (1991), and Kreider (1999). Currie and Madrian (1999) provide a detailed survey of empirical studies analyzing the relationship between health and employment status and the problems that may arise due to measurement of health.

5. Data and Descriptive Statistics

To perform the analysis described in the last section, I combine information from two data sets. The first one is the "German Socioeconomic Panel" (GSOEP), an annual household panel study conducted since 1984. I analyze data of one decade around the above described reform and use the waves 1995 to 2005. The first wave of the GSOEP contains information on approximately 6,000 households and 12,000 individuals. The survey sample was almost doubled in 2001, to broaden the available data set and to countervail the effects of panel attrition. In 2005 information on more than 11,000 households and 21,000 individuals was available. The GSOEP contains information on employment, job characteristics, income, and a broad range of socioeconomic variables, such as education. Furthermore, it provides detailed information on the household context and information about partners. Moreover, several objective and subjective health measures are available, which is of special importance for the analysis of disability. I exclude self-employed workers and civil servants from the analysis, as well as individuals who were living in East Germany prior to unification and immigrants who moved to Germany after the age of 15. [9] Their benefit claims follow different rules, and I cannot estimate their benefit entitlements.

Furthermore, I restrict the analysis to individuals aged 45 to 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 behavior regarding disability retirement and are excluded from the analysis. Individuals younger than 45 are rarely disabled

[9] However, the sample is not restricted to the actually 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. That definition matches the sample that is used for the estimation of benefit entitlements, which is explained in more detail later.

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.[10]

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. Overall, 258 entries to disability retirement are observed, out of 18,755 person-year-observations for 4,814 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: as expected, a sharp increase in disability transitions can be seen in the anticipation period, while the disability incidence decreases again in the post-reform period. 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 some general downward trend in the incidence of disability retirement. Yet, there is no clear drop. It stands to question, whether the reform had any long-term effect going beyond the anticipation effects.

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. 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. If the individual is not living alone, age, employment status, and health status of the partner are controlled for in the model. Regional dummies are used to control for general labor market characteristics of the individual's place of residence. **Table 2a** reports descriptive statistics for the full sample and for individuals who enter disability retirement during the observation period. Disability retirement is more common for men than among women, which is easily explained by

[10] While only 17% of all transitions into disability retirement prior to age 60 occur in the age group 15 to 44, 31% of all transitions out of disability apply to this age group (GSOEP, 1995-2005, own calculation).

women's weaker labor force attachment: disability retirees must have worked three out of the last five years and males are more likely to meet this criterion for entitlement. Moreover, in the subsample of retirees individuals are older, have lower levels of education, and are less likely to work in service jobs. The most striking differences arise in individual health status, regardless of whether we use objective or subjective measures. As a first objective indicator we can use mortality: the variable takes the value one in year t if the individual died until t+3.[11] This applies to 0.6% of the observations for the full sample, but to almost 1.3% of the observations in the subsample of disability retirees. The frequency of suffering from an officially acknowledged handicap and the probability of hospital utilization in the last year are more than twice as high among the disabled in comparison to the full sample. The subjective health measure differs across both subsamples as well. While only about 16% of the population report a poor or very poor health status, the same is true for almost half of the disabled population. Furthermore, disabled individuals differ substantially in their partners' characteristics: the disabled are less likely to be married and more likely to live alone. If they have a spouse or partner, those suffer more often from bad health as well and are less often employed.

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. There is insufficient information to obtain a reliable estimate of individual hypothetical benefit entitlements at a given point in time. However, it is possible to estimate potential benefit entitlements for employees, based on observed benefits for retirees. Yet, this approach may lead to biased results since both types of individuals necessarily differ in

[11] The last wave of the GSOEP that was available at the time of the analysis is 2007, so we can observe mortality for up to three years after the period of analysis.

their past labor market decisions and therefore may differ in their labor market history and thus in their benefit entitlements.

Instead, 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. 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. The employment and contribution history is provided on a monthly basis, from the individual age of 14 until the year 2005. The main advantages of these administrative data are that there is no panel attrition, no recall bias, and almost no missing value. Based on the contribution history and the benefit formula at a given time, it is possible to derive the exact potential benefit entitlement of an individual at any point in time. These profiles of entitlements over the lifetime are averaged out over all individuals by education, gender, and region of residence, as suggested by Gruber (2000).[12] The same population groups by education, gender, and region can be identified in the GSOEP. The profiles based on the administrative date are then assigned to the individual observations taken from the GSOEP by population group.

Based on these entitlement histories and the legal regulations that were in force at the given point in time, I calculate monthly benefits if the individual decides to draw benefits in t+1, and if he or she decides to postpone entry to disability retirement until t+2. 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. I use the share of beneficiaries who received full or partial pensions in a given year as the probabilities of getting full or partial benefits (Deutsche Rentenversicherung Bund, 2008). As a general rule, I

[12] The coefficient of correlation between actual entitlement and averaged entitlement is slightly increasing over the lifetime and amounts to 0.59 at age 45 and 0.63 at age 59.

assume that individuals base their expectation on the granting policy of the preceding year, with one exception: in 1999 and 2000, individuals were informed that the probability of getting full benefits will decrease after the reform, since the labor market situation will no longer be taken into account,[13] and working capacity is evaluated regardless of own occupation. Therefore, I assume that the probability of getting a partial instead of a full pension is perfectly anticipated for the year 2001.

After the derivation of expected monthly benefits, the expected net present value of disability benefits received until the end of age 59, is calculated for immediate retirement entry (labeled as ENPV) and for a retirement entry that is postponed by another year. 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)). The accrual, i.e. the difference between both benefit streams (labeled as ACC) is used as an incentive measure. **Table 2b** reports the mean of the financial incentive variables over the used GSOEP-sample over time. The accruals are negative in all cases because the period of receipt is shortened if retirement is postponed. They differ substantially in their magnitude during the reform process. In the pre-reform period, individuals expect a net present value of disability benefits of about €62,000 if they were to retire immediately in the next period. For one year of postponement, the expected reduction in the net present value of benefits amounts to approximately €9,000. During the anticipation period, individuals base their benefit expectations on the new institutional regulations. Their benefits would be calculated according to the old law if they retired immediately at the next possible point in time (i.e. in the year 2000). Thus, the ENPV is of comparable magnitude as in the years

[13] Kruse (1998) investigates by how much the probability of getting a partial pension instead of a full pension changes if the concept of "exclusion from the labor market" is abolished. He uses data about disability retirees who entered disability retirement in 1996, i.e. when the labor market situation still affected an individual's benefit entitlement. He finds that 9.2% of all individuals who were granted a full pension would have been granted a partial pension only, if the labor market situation had not been taken into account.

before. However, they anticipate that – unlike the years before – not only the period of receipt will be shortened by one year if they delay retirement entry, but also monthly benefits will be reduced substantially. Therefore, the absolute value of ACC is much higher in 1999. In the post-reform period, individuals expect a substantially lower benefit stream for both immediate and postponed retirement entry. Hence, the ENPV is lower than in the pre-reform period, but relative to the ENPV the ACC is of comparable magnitude.

6. Results

The estimation of transition rates is done in two steps: first, I estimate transition rates over time using a random effects logit estimator, while controlling for personal characteristics. The differences between transition rates during the pre-reform period, the anticipation period, and the post-reform period provide an estimate of the short-term and long-term effects of the reform. Personal and partners' characteristics that may have changed simultaneously to the institutional regulations are controlled in the model in order to identify the reform's effects. For the reliable identification of the reform effect an important assumption is needed: there is no shock other than the reform that (i) affects retirement behavior and (ii) follows the same time schedule as the reform. I assume that this condition holds.

In a second step, I include the variables describing financial incentives as discussed in Section 4. The variation of actual benefits between individuals may be endogenous. To solve this problem, estimated benefits are included in the estimation as proposed by Gruber (2000) and discussed in Section 5. Furthermore, the reform causes truly exogenous variation in ENPV and ACC over time. The effect of financial incentives on transition rates thus can be interpreted as a causal effect.

6.1 Short-term and Long-term Effects of the Reform on Retirement Behavior

First, I estimate transition rates during the pre-reform period, anticipation period and post-reform period using two specifications: both models control for personal and partners' characteristics. Specification (A) includes dummy variables indicating the three reform periods, while specification (B) includes the full set of year dummies. **Table 3a** shows the results. Because coefficients have no straight-forward interpretation in non-linear models, the table presents the change in average predicted transition probabilities for a change in a given covariate, holding all other covariates constant (average partial effect). Standard errors are calculated using the delta-method.

Behavioral changes over time, as seen in **Figure 1**, still show up after controlling for personal characteristics: in specification (A) the increase in transition probabilities during the anticipation period is clearly visible. It amounts to 0.3%-points. Yet, unlike **Figure 1** suggests and contrary to the hypotheses, in the post-reform period transition rates are even somewhat higher than in the pre-reform period, although the difference is insignificant at conventional levels. In the more flexible specification (B) we see the same pattern: while the transition rates during the pre-reform period are almost constant, they increase in the anticipation period, and decrease again in the post-reform period. Yet, transition rates after the reform and prior to the reform are of comparable magnitude. Additional Wald-tests are provided in **Table 3b**. For both specifications, transition rates are significantly higher in the anticipation period than before and significantly lower again in the post-reform period in comparison to the anticipation period, confirming the hypotheses. However, there is no support for the hypotheses that transition rates were expected to be lower after the reform than prior to the reform, since benefit levels are substantially lower at that time. These findings suggest that individuals indeed responded to the anticipated decrease in benefits if they postponed retirement entry by one year, i.e. they respond

to short-term changes in benefits. Yet, there seems to be no response to a permanently lower benefit level.

The effects of personal and partners' characteristics are slightly stronger in specification (A), in comparison to the model with more flexible time controls. However, the overall pattern is the same for both models. We can see strong and significant effects of occupation and education. Considering specification (B), individuals' risk of entering disability retirement increases by about 0.4%-points if they are working in manufacturing occupations, in comparison to an average transition rate to disability retirement of 1.38%. Low educated individuals have a higher incidence of disability as well: their hazard rates are approximately 0.25%-points higher than the hazard rates of individuals with middle and high education. Women have a lower probability of entry to disability retirement than men, which may be at least partly due to their employment histories. As mentioned in Section 3, individuals have to have worked at least three out of the last five years to be entitled for disability benefits, which should occur more frequently for men.

In a next step, I reestimate specification (B) adding additional variables accounting for health status to test whether the above findings still hold after controlling for individual's and the partners' health. **Table 4** reports the results for four different health measures. Three objective measures are used, i.e. mortality, hospitalization, and whether the individual suffers from an officially acknowledged handicap. Additionally, self-rated health status is included as a subjective measure.

While partners' health has a slightly negative, but clearly insignificant effect on an individual's probability to retire, the effect of own health is large.[14] A bad health condition substantially increases the risk of disability retirement, and this result holds regardless of the

[14] The models allowed the coefficients for health measures to differ by gender. However, the interactions were insignificant at the 10%-level except for hospitalization, where women showed a somewhat weaker response than men. Yet, the difference was significant at the 10%-level only, and small. In all other cases, the results for men and women did not differ, and the average effect is presented.

measure that is used. Using objective measures, the estimated increase in the transition rate due to a bad health status ranges from 0.8%-points (if measured by mortality) to 1.7%-points (if measured by an officially acknowledged handicap) in comparison to an average transition rate of 1.38%. The subjective measure, self-reported health, is within the same interval: if an individual reports a poor health condition, the transition rate increases by 1%-point. Reporting a very poor health status has even larger effects. The average effect of reporting "poor" or "very poor" health, instead of "very good" to "satisfactory", amounts to 1.3%-points. Approximately, a bad health status doubles the transition rates to retirement, while the effects vary with the measure that is used.

Yet, as discussed before, we would expect that the estimated health effect that is based on a subjective measure is larger than the effects that are based on objective measures. If bad health is reported to justify an early retirement decision, we would expect to find a stronger, upward biased effect of health when subjective measures are used, which cannot be found in the data. Instead, we find that the effect based on the subjective measure is within the range of the effects based on objective ones. Large differences do not occur when subjective and objective measures are compared, but within the group of objective measures. Using hospitalization or mortality we find much lower effects than using the existence of a handicap. There are two possible explanations: the individuals' decision to search for an official acknowledgment of a handicap may be positively correlated with their decision to apply for disability benefits, which means the estimated health effect is upward biased if handicaps are used as a health measure. Alternatively, the correlation between working capacity, on the one hand, mortality or hospitalization, on the other hand, is low. In that case, the health effect is downward biased because of large measurement errors. Both explanations are in line with the substantially lower explanatory power of the model using hospitalization and mortality, as reflected by the corresponding likelihoods

and AIC-criteria. Hence, we can interpret the estimated effects resulting from the different objective measures as lower and upper bounds for the true health effect, while the subjective measure ranges within this interval.

The effect of institutional regulations over time follows the same pattern, regardless of the health measure that is used: transition rates do not differ significantly from each other prior to the reform, sharply increase when individuals are able to anticipate the reform, and decrease again when the reform is enforced. Yet, the data clearly show that a response to the reform, as could be found if one compares transition rates immediately prior to and immediately after the reform, is almost completely due to a short-term anticipation effect. There is little to no long-term response to the permanently decreased benefit levels after implementation of the reform.

6.2 The Effect of Financial Incentives on Retirement Behavior

In the next step, I estimate the transition rates as a function of financial incentive variables, namely the net present value of expected benefits in case of retirement at the next possible date, the change in the net present value of benefits for postponement of retirement by one year, and expected labor market income during the year of postponement. The incentive measures vary between population groups and over time. The variation over time is dependent on the current institutional regulations as caused by the reform. A general time trend is included in a linear specification in the model.[15] Personal and partners' characteristics are controlled as in specifications (C1) to (C4). **Table 5** presents the results, for different health measures (specifications (D1) to (D4)).

A first finding is that the effect of health is large and significant, ranging from 0.6%-points to 1.4%-points. It is of comparable magnitude as in the estimations presented in Section 2.6.1. Second, we find a clear pattern regarding the financial incentives: there is a clear response

[15] Polynomials of higher order were tested as well but did not increase the explanatory power of the model.

of transition rates with respect to expected labor market income, a sizable response to losses in benefits if retirement is postponed by one year, yet almost no response to benefit levels.[16] The elasticity of labor force non-participation with respect to expected wages is large. It ranges from 2.7 to 4 and is significant at the 5%-level. The elasticity of the transition probability with respect to ACC is significant at the 5%-level to 10%-level and ranges from 0.7 to 1, depending on the health measure that is used. At the same time, the elasticity with respect to the ENPV is almost zero and clearly insignificant for each health measure. Additional models were tested, where the forward-looking incentive measure was excluded from the model. The estimated elasticities of labor force non-participation with respect to benefit levels ranged from 0.1 to 0.15 and were insignificant for every health measure.

Apparently, individuals respond to expected losses or gains in future benefits in case of a delayed retirement entry. Yet, there is almost no response to a permanently lower benefit level. That means if monthly benefits are dependent on the date of retirement entry according to the benefit formula, individuals may be encouraged to postpone retirement entry to some extent. Yet, a mere decrease of benefit levels independent of the date of retirement entry does not prevent individuals from entry to disability retirement.

The results found in this analysis are in line with former results found for Germany by Riphahn (1999). She finds strong responses to individuals' health and sizable responses to potential labor market income, but - unlike studies for the U.S. or UK - almost no response to disability benefits. The author argues this may be because of the more generous unemployment and welfare system in Germany. The replacement rate of benefits relative to the last net income from work was almost the same for the unemployed and for disability retirees during the 1990s

[16] Additional models were tested, where the effects of financial variables were allowed to differ for males and females. The explanatory power of the models did not improve and the difference in the effects for men and women were insignificant.

(Riphahn, 1997). Besides that, the unemployed naturally do not have to meet the medical criteria for disability benefits, and therefore unemployment benefits are easier to draw for eligible non-disabled individuals. For both reasons, receipt of disability benefits was a relatively unattractive pathway into early retirement in Germany for the non-disabled, even prior to the reform in 2001. Apparently, it was mainly used by the actually disabled population, which responds only little to a change in institutional regulations. This presumption is corroborated by Börsch-Supan (2007). He analyzes take-up rates for disability benefits in a cross country comparison and finds that enrolment and eligibility rules - which are relatively strict in Germany in an international comparison - are more important determinants of the incidence of disability benefit receipt rather than the level of benefits.

7. 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 behavioral responses to a decrease in benefits. I have estimated the probability of entering disability retirement using random effects logit estimators 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.

I find a significant response to the anticipated future decrease of benefits during the reform process. Yet, once the reform was fully implemented and the anticipation effect tapered off, the incidence of disability retirement did no longer differ in comparison to the situation prior to the reform, despite significantly lower benefits.

Expected labor market income and the current health situation turn out to be important determinants of the incidence of disability retirement. Several subjective and objective health

measures were tested, and the effect of health on the retirement decision was significant and of comparable magnitude for all measures. The estimated effect of health on the retirement probability somewhat decreases once the estimation controls for financial variables, but is still large and significant.

At the same time, disability benefits play a minor role, giving rise to an important policy implication: if the reform aimed merely at a reduction of expenses for disability benefits, the reform objective is generally met. While expenditures for disability benefits were increasing during the 1990s and amounted to 17.2 billion € in 1999, they are constantly decreasing since the reform in 2001 and amounted to 14.3 billion € in 2007 (Deutsche Rentenversicherung Bund, 2008). On the other hand, if the reform aimed at higher labor force participation, the reform's objective is clearly missed, since individual labor market behavior did not change. At the same time, individuals are not as well insured against the event of becoming disabled as before. Kruse (1998) calculated the share of disabled retirees in 1996 who are entitled to benefits lower than the social assistance level. Their benefits were computed according to the regulations prior to the reform. In West (East) Germany 18% (13%) of the male retirees and 62% (48%) of the female retirees received disability benefits that amounted to less than the social assistance amount. With implementation of the reform, these shares rise substantially to 22% (men) and 75% (women). While a large part of the insured population had to rely on additional income sources in case of disability already prior to the reform, this problem grew substantially after implementation of the reform. 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.

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

Period	Year	Expectations about disability regulations if entry takes place:	Next year	One or more years ahead
Regulations that are relevant for disabled individuals who are able to work part-time				
pre-reform	<= 1998	Ability to work will be tested for … occupation	own	own
anticipation	1999		own	any
post-reform	>= 2000		any	any
pre-reform	<= 1998	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 can be up-graded if no part-time job is found	yes	yes
anticipation	1999		yes	no
post-reform	>= 2000		no	no
Regulations that are relevant for all disabled individuals				
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

Table 2a: Explanatory Variables – Descriptive Statistics

	Full Sample	Disability Retirees
Variable	Mean (Std. Dev.)	
Dependent Variable: Transition Probability	1.38%	
Age	51.00 (4.06)	52.23 (3.80)
Year	2000.47 (2.72)	1998.91 (2.63)
Individual is female	53.00%	43.37%
Education:		
Lower education (ISCED 0-2)	14.30%	23.55%
Secondary education (ISCED 3)	57.65%	55.73%
Higher education (ISCED 4-6)	27.13%	19.82%
Missing	0.92%	0.90%
Occupation:		
Manufacturing	11.40%	12.10%
Technical	8.36%	5.15%
Service	52.24%	33.46%
Other	28.00%	49.29%
Region:		
North	18.49%	21.88%
West	36.25%	39.51%
South	40.95%	32.05%
East	4.31%	6.56%
Health:		
Mortality: Individual died within next three years	0.62%	1.29%
Individual has an officially acknowledged handicap	10.42%	38.10%
Overnight-stay in hospital last year	10.34%	25.87%
Self-rated health status:		
very good	6.78%	2.32%
good	39.23%	17.63%
satisfying	37.17%	29.99%
poor	13.95%	31.92%
very poor	2.68%	18.02%
Partner:		
Indivdual is married	80.10%	71.17%
Individual is living together with a partner	5.34%	8.88%
Individual has no partner/spouse	14.56%	19.95%
Age of partner/spouse	50.93 (6.91)	51.47 (6.41)
Partner/spouse is employed	77.04%	66.12%
Partners'/spouses' self-rated health status is poor/very poor	16.49%	20.66%
Person-Year Observations	18,755	605
Persons	4,556	258

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

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

Period	Year	ENPV	ACC
Pre-reform	1995	61585	-9395
	1996	61837	-9378
	1997	63407	-9423
	1998	63068	-9334
Anticipation	1999	65411	-18579
Post-reform	2000	57654	-8108
	2001	57540	-8091
	2002	58238	-8137
	2003	58706	-8187
	2004	57696	-8087

Note: The means were calculated over the individual observations drawn from the GSOEP (1995 – 2005).
Source: Own calculation using VSKT(2005) and GSOEP (1995 – 2005).

Table 3a Estimation Results (Random Effects Logit Estimator)

			(A)		(B)	
	Variable		Δ Predicted Transition Probability	Wald-Test Δ=0: χ^2 (1)	Δ Predicted Transition Probability	Wald-Test Δ=0: χ^2 (1)
Reference: Pre-reform	Anticipation		0.313%	4.77 *	no	
	Post-reform		0.037%	0.48		
Reference: 1995	Pre-reform	1996	no		0.051%	1.21
		1997			0.085%	1.95
		1998			0.059%	1.34
		1999			0.253%	4.95 *
	Post-reform	2000			0.076%	2.31
		2001			0.055%	1.69
		2002			0.076%	2.41
		2003			0.143%	4.76 *
		2004			0.088%	2.90 °
Reference: Manufacturing	Technical		-0.772%	9.22 **	-0.428%	5.91 *
	Service		-0.771%	9.21 **	-0.429%	5.93 *
	Other		-0.756%	9.46 **	-0.423%	6.01 *
Reference: Lower Education	Secondary Education		-0.373%	6.84 **	-0.252%	5.13 *
	Higher Education		-0.338%	5.35 *	-0.234%	4.45 *
Reference: North	West		-0.017%	0.04	-0.011%	0.05
	South		-0.065%	0.64	-0.042%	0.66
	East		0.167%	0.67	0.122%	0.07
	Female		-0.425%	9.64 **	-0.267%	6.48 *
Reference: Married	Living with partner		0.183%	1.34	0.117%	1.20
	Living alone		0.591%	1.96	0.392%	1.62
	Partner/spouse is employed		-0.084%	1.59	-0.051%	1.43
			Semielasticity of Transition Probability	z-value	Semielasticity of Transition Probability	z-value
	Own age		0.192	5.51 **	0.234	5.72 **
	Age of partner/spouse		0.015	1.52	0.017	1.55
Log-likelihood			-1,155.969		-1,152.933	
No. of observations			18,755		18,755	
Wald-test of model significance: χ^2(df)			95.19(16)		119.41(23)	
ρ (Std.Err.)			0.658(0.07)		0.756 (0.05)	
Likelihood-ratio test ρ =0: χ^2(df)			31.38(1)		33.86(1)	

*Notes: **, *, ° indicate significance at the 1%-level, 5%-level and 10%-level. Critical Values of χ^2(1)-distribution for significance at the 1%-level, 5%-level, and 10%-level: 6.64, 3.84 and 2.71.*
Source: Own calculations using GSOEP(1995-2005) and VSKT(2005).

Table 3b Wald-Tests

Hypothesis	Test statistic(dF)	Prob [χ^2(dF)≥Teststatistic]
$\Delta\hat{P}_{post} = \Delta\hat{P}_{anti}$	3.60(1)	0.059 °
$\Delta\hat{P}_{1996} = \Delta\hat{P}_{1997} = \Delta\hat{P}_{1998} = 0$	2.53(3)	0.470
$\Delta\hat{P}_{2000} = \Delta\hat{P}_{2001} = \Delta\hat{P}_{2002} = \Delta\hat{P}_{2003} = \Delta\hat{P}_{2004}$	2.24(4)	0.692
$\Delta\hat{P}_{1999} = 0$	4.95(1)	0.026
$\Delta\hat{P}_{1999} = \Delta\hat{P}_{2000}$	3.08(1)	0.072
$\Delta\hat{P}_{1996} = \Delta\hat{P}_{1997} = \Delta\hat{P}_{1998} = \Delta\hat{P}_{2000} = \Delta\hat{P}_{2001} = \Delta\hat{P}_{2002} = \Delta\hat{P}_{2003} = \Delta\hat{P}_{2004}$	5.60(8)	0.692

Notes: $\Delta\hat{P}_{anti}$ and $\Delta\hat{P}_{post}$ are the changes in transition rates for the anticipation period and post-reform period, compared to the pre-reform period. $\Delta\hat{P}_{,year,}$ is the change in the predicted transition at the corresponding year, compared to the baseline year 1995. All changes are predicted while holding all other covariates constant.
**, ° indicate significance at the 5%-level and 10%-level.*
Source: Own calculations using GSOEP(1995-2005) and VSKT(2005).

Table 4 Estimation Results: Health Effects (Random Effects Logit Estimator)

		(C1)		(C2)		(C3)		(C4)	
Variable		Δ Predicted Transition Probability	Wald-Test Δ=0: χ^2 (1)	Δ Predicted Transition Probability	Wald-Test Δ=0: χ^2 (1)	Δ Predicted Transition Probability	Wald-Test Δ=0: χ^2 (1)	Δ Predicted Transition Probability	Wald-Test Δ=0: χ^2 (1)
Time									
	1996	0.079%	1.02	0.128%	1.13	0.154%	1.31	0.185%	1.22
Pre-reform:	1997	0.125%	1.82	0.224%	2.14	0.182%	1.61	0.236%	1.68
	1998	0.085%	1.04	0.120%	0.97	0.114%	0.80	0.162%	0.91
Anticipation:	1999	0.365%	6.74 **	0.506%	4.55 *	0.487%	5.21 *	0.593%	6.42 *
	2000	0.111%	2.00	0.155%	1.79	0.171%	1.91	0.211%	1.86
	2001	0.065%	0.87	0.112%	1.14	0.073%	0.47	0.109%	0.57
Post-reform:	2002	0.097%	1.63	0.158%	1.99	0.128%	1.26	0.189%	1.51
	2003	0.184%	4.31 *	0.273%	4.44 *	0.237%	3.32 °	0.354%	4.31 *
	2004	0.099%	1.62	0.170%	2.03	0.114%	0.95	0.159%	1.03
Individual…									
…died until t+3		0.784%	4.31 *	no		no		no	
…has handicap		no		1.684%	4.56 *	no		no	
…was hospitalized last year		no		no		1.108%	6.49 *	no	
Self-rated health status									
good								-0.034%	0.13
satisfactory		no		no		no		-0.004%	0.00
poor								1.025%	10.75 **
very poor								3.516%	12.75 **
(Reference: very good)									
Partner…									
…died until t+3		-0.201%	1.70	no		no		no	
… has handicap		no		-0.028%	0.06	no		no	
…was hospitalized last year		no		no		-0.207%	3.68 °	no	
Self-rated health-status poor to very poor		no		no		no		-0.113%	1.03
(Reference: very good to satisfactory)									
Model controls for…									
Age, Age of Partner		Linearly		Linearly		Linearly		Linearly	
Occupation, Region		3 Dummies each		3 Dummies each		3 Dummies each		3 Dummies each	
Education, Marital Status/ Lives with Partner		2 Dummies each		2 Dummies each		2 Dummies each		2 Dummies each	
Gender, Employment Status of Partner		1 Dummy each		1 Dummy each		1 Dummy each		1 Dummy each	
Log-likelihood		-1,149.546		-1,065.917		-1,116.079		-1,062.933	
AIC-criterion		2,353.091		2,185.834		2,286.157		2,191.865	

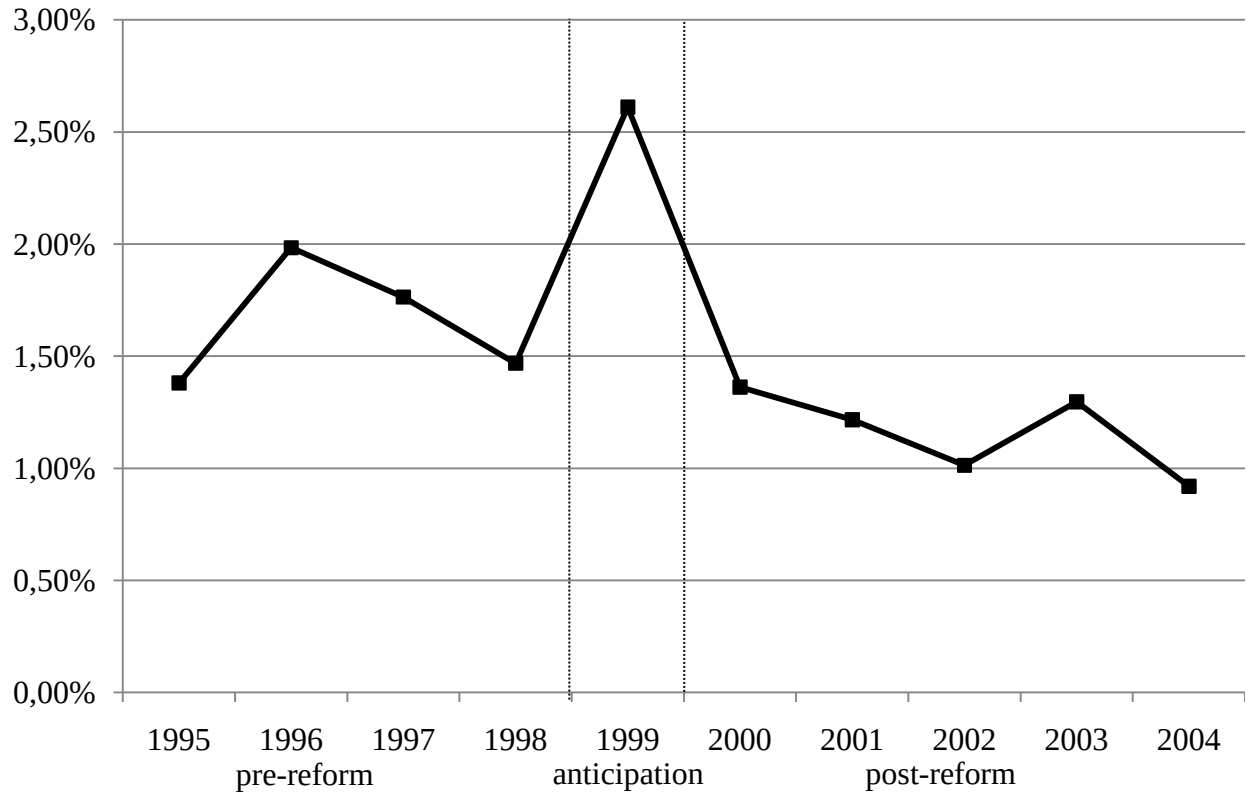
Notes: See Table 3a.
Source: Own calculation using GSOEP(1995-2005) and VSKT(2005).

Table 5 Estimation Results: Effects of Financial Variables

	(D1)		(D2)		(D3)		(D4)	
	Elasticity of Transition Proability	z-value	Elasticity of Transition Proability	z-value	Elasticity of Transition Proability	z-value	Elasticity of Transition Proability	z-value
…with respect to ENPV	0.319	0.48	0.279	0.43	0.201	0.37	-0.072	-0.13
…with respect to ACC	1.039	2.08 *	0.890	1.76 °	0.814	1.88 °	0.773	1.77 °
…with respect to expected real wage	-4.041	-2.23 *	-3.420	-1.96 *	-3.074	-2.31 *	-2.702	-2.03 *
	Δ Predicted Transition Probability	Wald-Test Δ=0: χ^2 (1)	Δ Predicted Transition Probability	Wald-Test Δ=0: χ^2 (1)	Δ Predicted Transition Probability	Wald-Test Δ=0: χ^2 (1)	Δ Predicted Transition Probability	Wald-Test Δ=0: χ^2 (1)
Individual…								
…died until t+3	0.536%	2.15	no		no		no	
…has handicap	no		1.347%	4.43 *	no		no	
…was hospitalized last year	no		no		0.967%	4.40 *	no	
Self-rated health status								
good							-0.062%	0.48
satisfactory	no		no		no		0.037%	0.08
poor							0.855%	8.43 **
very poor							1.990%	9.61 **
(Reference: very good)								
Model comtrols for…								
Year, Age, Age of Partner	Linearly		Linearly		Linearly		Linearly	
Occupation, Region	3 Dummies each		3 Dummies each		3 Dummies each		3 Dummies each	
Education, Marital Status/Lives with Partner	2 Dummies each		2 Dummies each		2 Dummies each		2 Dummies each	
Gender, Employment Status and Health of Partner	1 Dummy each		1 Dummy each		1 Dummy each		1 Dummy each	
Log-Likelihood	-988.833		-909.283		-958.470		-913.954	
AIC-Criterion	2017.666		1858.565		1956.939		1873.908	

*Notes: **, *, ° indicate significance at the 1%-level, 5%-level and 10%-level. Critical Values of $\chi^2(1)$-distribution for significance at the 1%-level, 5%-level, and 10%-level: 6.64, 3.84 and 2.71. Source: Own calculations using GSOEP(1995-2005) and VSKT(2005).*

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



Source: Own illustration, based on GSOEP(1995-2005), unweighted data.