

The Impact of Stricter Criteria for Disability Insurance on Labor Force Participation

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Abstract

This paper studies the effect of a large-scale policy change in the Austrian disability insurance program, which tightened eligibility criteria for men above a certain age. Using administrative data on the universe of Austrian private-sector employees, the results of difference-in-difference type regressions suggest a substantial and statistically significant decline in disability enrollment of 6 to 7.4 percentage points and an increase in employment of 1.6 to 3.4 percentage points. On the other hand, the policy change had important spillover effects into the unemployment and sickness insurance program. Specifically, the share of individuals receiving unemployment benefits increased by 3.5 to 3.9 percentage points and the share receiving sickness insurance benefits by roughly 0.7 percentage points.

Jel-Classification: H53, H55, J21, J64, J68

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1 Introduction

The Disability Insurance (DI) program is the largest social insurance program in most industrialized countries. In OECD countries, total expenditures on disability benefits account for approximately 2.5 percent of GDP on average (OECD (2009)). While the DI program is designed to provide income replacement in the case of a permanent loss of earnings capacity due to poor or deteriorating health, there are concerns that the DI program distorts work incentives and is used as a gateway for early retirement. Understanding the incentive effects of the DI program is important to assess the value of the insurance provided and to evaluate the cost and benefits of policy measures that try to reduce the disincentives to work.

There is a substantial U.S. based literature on the work disincentives of the DI program.¹ However, the behavioral response of changes in the disability insurance has been difficult to estimate because all workers face identical program rules, making it difficult to find a suitable counterfactual. This paper adds to this literature by exploiting a policy change in the Austrian DI program that tightened eligibility criteria for DI benefits of older workers close to retirement age. Since the change in law affected only a subset of workers while leaving nearly identical individuals completely unaffected, the impact of stricter eligibility criteria for DI benefits can be estimated using a difference-in-difference estimation strategy.

More specifically, the first objective of this paper is to determine how stricter eligibility criteria for DI benefits affect employment and enrollment into the DI program. A second key question is whether a tightening in eligibility rules leads to increases in enrollment in other programs.² Accounting for such spillover

¹For an excellent overview of the literature see Bound and Burkhauser (1999) and Autor and Duggan (2006).

²Spillover effects between government programs haven been examined in other contexts by Garrett and Glied (2000), Schmidt and Sevak (2004), Bound et al. (2004), and Duggan et al. (2007).

effects is potentially important for designing effective policies. In the present context, for example, the positive employment effect of more rigorous eligibility criteria may be small, to the extent that individuals can claim benefits from the unemployment insurance (UI) or sickness insurance (SI) instead.

Since the early 1980s the fraction of the working-age population receiving DI benefits in Austria has remained relatively constant at 8 percent, which is approximately twice as high as in the U.S. The high rate of disability receipt in Austria is mainly due to a relaxation in DI eligibility criteria starting at age 55. Specifically, below the age threshold an individual is generally considered disabled if a medically determinable impairment reduces the ability to work by more than 50 percent relative to a healthy person with comparable education in any type of work in the economy. Above the age-threshold of 55 the same individual qualifies for disability benefits if the ability to work is reduced by more than 50 percent relative to a healthy person with comparable education in a similar occupation. Thus, as older workers are only compared to the set of workers in their occupation, disability enrollment accelerates dramatically beginning at age 55.

With the aim of improving the fiscal health of the public pension system, the Austrian government implemented the Structural Adjustment Act on September 1, 1996, which restricted eligibility for early retirement benefits and introduced a bonus/malus system to penalize early retirement and encourage continued labor force participation. The most important change of all, however, was an increase in the age at which conditions for DI benefits are relaxed, from 55 to 57. Because DI enrollment has been particularly high among older men, this increase took effect only for men, while eligibility conditions for women were left unaffected.

Using administrative data from all private sector workers in Austria, the results from the empirical analysis suggest that enrollment in the disability insurance program responded significantly to the tightening of the eligibility criteria. Following the change in law, the share of disability recipients among 55-56 year old men decreased permanently by 6 to 7.4 percentage points. The drop in dis-

ability enrollment is countered by a substantial increase in employment of 1.6 to 3.4 percentage points, after the change in law became operative. On the other hand, the estimates suggest that the policy change led to an increase in unemployment of 3.5 to 3.9 percentage points and to an increase in sickness of 0.7 percentage points.

The magnitude of work disincentives of the disability insurance depends on the accessibility and generosity of DI benefits. Earlier studies in the literature relied on cross-sectional variation in potential DI benefits relative to previous earnings to estimate the elasticity of labor force participation with respect to benefit generosity (see, e.g., Parsons (1980)). Since the potential DI replacement rate is decreasing in past earnings, the finding that workers with higher potential DI replacement rates are more likely to seek benefits may simply reflect differences in the underlying tastes for work. More recent studies have therefore tried to estimate the behavioral impact of DI benefits using other methodologies. Bound (1989) uses the labor supply behavior of rejected applicants as an upper bound estimate of the work capacity of DI beneficiaries. His main result suggests that at most one third of DI recipients would have worked had they not received DI benefits. Chen and van der Klaauw (2008) confirm this estimate using more recent data. Exploiting regional variation in DI benefits across Canadian provinces, Gruber (2000) estimates an elasticity of labor force non-participation with respect to DI benefits of 0.28 to 0.36. In this study the level of benefits remains largely constant over the sample period and what changes is the access to disability benefits.

Since disability status is only imperfectly observable, determining whether program claimants are truly disabled is difficult. Under stricter screening of applicants and tighter eligibility rules seeking DI benefits is less attractive. The effect of screening stringency on labor force participation has been estimated for the U.S. by Gruber and Kubik (1997) and Autor and Duggan (2003). Using variation in denial rates across states as a proxy for screening stringency, Gruber

and Kubik (1997) find that stricter screening leads to a significant reduction in labor force non-participation among older men. Autor and Duggan (2003) use the liberalization of the disability determination process in 1984 and an unforeseen increase in the earnings replacement rate to explore the impact of the supply of disability benefits on the labor force participation of low-skilled workers. They estimate that the sum of these forces doubled the labor force exit propensity of high school dropouts. More recently, De Jong et al. (2010) use a controlled experiment in which some regional DI offices in the Netherlands were instructed to screen applicants more intensively. They find a significant reduction in DI applications in the regions with more intensified screening. Contrary to this paper, they find that long-term sickness absenteeism decreases with intensified screening. This results is driven by long-term sickness absenteeism being a precondition for DI benefits. Therefore, unlike in Austria, the SI program acts as a complement to the DI program rather than as a substitute.

There have been two recent papers estimating the labor supply response of changes in eligibility criteria for DI benefits. Chen and van der Klaauw (2008) focus on a subset of DI applicants in the U.S. whose disability determination is based on the applicant's age and conclude that the DI program has only a modest impact on labor force participation. This paper estimates a much larger labor supply response, which may reflect difference in characteristics of the marginal enrollee in the U.S. versus Austria, and extends on their work by providing evidence that stricter access to DI benefits increases enrollment in other social insurance programs. Moreover, since the policy change studied in this paper tightens eligibility criteria for all applicants in a certain age group, the empirical analysis is not restricted to applicants only.

Karlström et al. (2008) exploit a policy change in Sweden that tightened eligibility rules for older workers. As the new eligibility rules were announced 2 years prior to their implementation, there was a large anticipation effect, which causes an upward bias in the estimates. To address this issue, they exclude all

observations from the year the policy was announced to the year the policy was implemented. Since the policy change studied here was announced only a few months before its implementation, the anticipation effect was small. Unlike in this paper, they find that the stricter eligibility criteria led to only small decline in DI enrollment and had no effect on employment. Again this difference could be attributed to the difference in characteristics of the marginal DI applicant in Sweden versus Austria. In particular, since the reform studied by Karlström et al. (2008) applied only to those 60 and over, affected individuals are older and potentially less healthy on average.

The paper proceeds as follows. Section 2 describes Austria's social insurance programs and the 1996 reform in the DI program. Section 3 summarizes the data and presents descriptive statistics. Section 4 outlines the identification strategy. Section 5 presents the results. Finally, section 6 draws conclusions.

2 Background

2.1 Social Insurance Programs in Austria

There are three important social insurance programs in Austria that provide income replacement in the case of a separation from the labor market for economic or health reasons: disability insurance (DI), sickness insurance (SI), and unemployment insurance (UI). Austria's DI program covers all active labor market participants, although different rules apply for the self-employed and civil servants. Once benefits are awarded, DI beneficiaries receive monthly payments until return to work, medical recovery or death. DI claimants can continue work provided that the earnings are below a certain threshold (360 Euros per month in 2010). About 15 percent of DI recipients continue work. Because criteria for disability classification are relaxed for the elderly, the DI program has played an important role in early retirement. Since men are first eligible for old-age pensions

at age 60 compared to 55 for women, disability enrollment is disproportionately high among older men. In 2008 61 percent of new male DI recipients and 31 percent of new female DI recipients were older than 55.

DI benefits are subject to income and payroll taxation. The calculation of DI benefits is identical to that of retirement benefits and depends on the assessment basis and the pension coefficient. The assessment basis is determined by the average earnings of the best 15 years, after applying an earnings cap to earnings in each year. The pension coefficient corresponds to the percentage of the assessment basis that is received in the disability pension. The pension coefficient increases with the number of insurance years, which comprise both contributing years (periods of employment, including sickness, and maternity leave) and qualifying years (periods of unemployment, military service, or secondary education). Because older applicants had more time to accumulate insurance years, DI replacement rates tend to increase with age. As shown in the first column of Table 1, the average net replacement rate for males in the age group 49-50 is 54.5 percent compared to 62.9 percent in the age group 55-56. Younger workers therefore have less of an incentive to seek DI benefits, although applicants under age 50 (age 57 since 1993) qualify for a special increment if their pension coefficient is below 60 percent.

In case of a temporary illness, the employer continues to pay 100 percent of earnings up to 12 weeks, depending on the length of service. Once the right to full benefits by the employer has expired, individuals can claim benefits from the Austrian sickness insurance, which covers all private-sector employees and individuals currently receiving unemployment benefits. Continued wage payments and sickness benefits are both subject to taxation. As shown in the second column of Table 1, sickness benefits replace 64 percent of the last net wage up to the same maximum that applies to disability benefits. On top, family allowances are paid. The benefit duration is 52 weeks. However, depending on the funds regulation, sickness benefits can be extended up to 78 weeks.

The Austrian unemployment insurance system covers all employees except for the self-employed who can participate on a voluntary basis. Regular unemployment benefits depend on previous earnings and can be claimed for a limited period based on the previous work history. Specifically, individuals with at least 1 year of employment in the past 2 years receive 20 weeks of benefits, while those who have paid unemployment insurance contributions for 3 years or more in the last 5 years receive 30 weeks. Individuals in the age group 50 and older receive 52 weeks of benefits conditional on having worked for 9 years or more in the last 15 years. Unemployment benefits are not taxed and replace around 55 percent of the prior net wage (column 3 of Table 1). Individuals who exhaust their regular unemployment benefits can apply for unemployment assistance. These means-tested transfers last for an indefinite time period and can be at most 92% of regular unemployment benefits.

Table 1

2.2 The 1996 Reform to DI Eligibility Criteria

To be eligible for DI benefits, applicants must suffer a health impairment that will last for at least 6 months and must have, depending on age, accumulated between 5 and 15 insurance years. Since applicants currently in the labor force are eligible for DI benefits, the opportunity cost to seek DI benefits is lower in Austria than in the U.S. system where non-employment is a pre-condition for disability application. Therefore, DI applications may be more responsive to the business cycle in Austria compared to the U.S., although labor market conditions play no direct role in the award decision.³ The fraction of applicants rejected benefits is approximately 50 percent and among those who reapply around 15 percent are awarded benefits (OECD (2003)).

³See Autor and Duggan (2003) for the responsiveness of DI applications over the business cycle in the U.S.

As illustrated in Table 2, health eligibility criteria for DI benefits depend on age and whether the applicant is classified as a blue or white collar worker. In general, blue collar workers below age 55 are eligible for benefits if a medically determinable impairment causes more than 50 percent of a reduction in the ability to work relative to that of a healthy person with comparable education in any reasonable occupation that the individual can carry out. According to the law, an occupation is reasonable if there exist at least 100 jobs in the field (vacant or occupied) in Austria (Wörister (1999)), i.e. individuals are expected to be completely flexible as to changes in residence. Eligibility criteria for benefits are relaxed for white collar workers below age 55 because requirements to change occupation are lower. Specifically, conditional upon having worked in a similar occupation for 7.5 years or more in the most recent 15 years, white collar workers are classified as disabled if their ability to work has been reduced to less than 50 percent relative to that of a healthy person with comparable education in any occupation that belongs to the same occupational group.

To eliminate legal differences with respect to the self-employed, the Austrian government relaxed DI eligibility criteria for elderly private sector workers above 55 in 1981. Specifically, elderly applicants are classified as disabled if their ability to work has been reduced to less than 50 percent that of a healthy person with comparable education in a similar occupation. An occupation is considered similar if the core requirements are identical: manual and mental demands, amount of responsibility, posture, concentration, endurance, required care, and stress level must be comparable (Wörister (1999)). Thus, as older workers are only compared to the set of workers in their occupation, it is substantially easier for them to qualify for benefits. As an example, consider a server who is unable to carry dishes due to arthritis. Below the age threshold her disability application will be rejected, given that she could still work as a cashier, for example. Above the age threshold, however, she will be awarded a disability pension. As a direct consequence, disability enrollment rises significantly at and above the age

threshold.

Table 2

With the aim of improving fiscal health and fostering employment among older workers, the Austrian Pension System underwent significant changes in 1993, 1996, and 2000. While the 1993 and 2000 reforms had little impact on DI eligibility, the reform in 1996 reduced disability enrollment among the elderly substantially by increasing the age threshold for easy access to DI benefits from 55 to 57.

The 1993 pension reform, which became effective on July 1, introduced a bonus for retirement after the early retirement age and changed the assessment basis from the last 15 years of earnings to the highest 15 years of earnings. Given that wages generally rise with age, the later change had no effect on disability or retirement pension benefits for most individuals.

In May 1996 the Austrian government enacted the Structural Adjustment Act (Strukturanpassungsgesetz), which became effective on September 1, 1996. The primary objective was to cut down on expenditures in the public pension system, in order to satisfy the criteria for accession to the European Economic and Monetary Union (see Mairhuber (2003)). Specifically, the reform increased the number of contribution years required for the early retirement pension from 15 to 20, introduced a penalty for claiming benefits before the early retirement age and raised the bonus for retirement after the early retirement age. Although the new penalty for early retirement depended on age, the pension coefficient did not vary substantially with retirement age and did not represent a significant change to the pension coefficient before the 1996 reform.

Figure 1

The most important change of all, however, was the two-year increase in the age, at which conditions for DI benefits are relaxed. Since disability enrollment

is particularly high among older men, this increase only applied to men, while leaving eligibility conditions for women unaffected. The consequences of this policy change are seen in Figure 1, which plots the share of newcomers to the disability rolls by age for men (left panel) and women (right panel) before and after the policy change. As the Figure shows, in the period January 1994 to August 1996 disability inflow peaked at age 55 for men and women. Following the 1996 reform, the inflow rate for men at age 55 fell by 6 percentage points and increased by 3 percentage points at age 57. For the other ages as well as for women there is no significant change in the age distribution of newcomers to the disability rolls, providing informal evidence that the other elements of the reform had no effect on disability enrollment.

On May 23, 2000, the European Court of Justice ruled that different DI eligibility criteria for men and women would violate EU law. Therefore, on July 1, 2000, the Austrian government set the age at which conditions for disability benefits are relaxed to 57 for both men and women. The 2000 pension reform also gradually increased the minimum retirement age from 55 to 56.5 for women and from 60 to 61.5 for men and raised the penalty for early retirement and the bonus for retirement after the statutory retirement age.

2.3 Hypothesis

By tightening eligibility criteria, the 1996 Structural Adjustment Act decreased the supply of disability benefits for older male workers aged 55 and 56. The basic theory of how disability eligibility criteria affect labor supply is presented in Diamond and Sheshinski (1995) and Autor and Duggan (2003). Stricter eligibility criteria affect the labor supply behavior of individuals by reducing the fraction of the population who are eligible for disability benefits. Hence, the total share of individuals who seek benefits should decrease because (1) fewer people are awarded benefits and (2) the number of applicants declines due to self-screening

(see Parsons (1991)).

In addition to the DI program the UI and SI program provide income replacement in the case of a separation from the labor market for economic or health reasons. These programs may influence the individuals' response to changes in the DI program. In particular, employed workers that would have qualified for DI benefits under the relaxed eligibility criteria but do not under the strict criteria may seek UI or SI benefits instead. Moreover, affected individuals need to wait only two years (one year for men aged 56) before they reach the new eligibility age at which conditions to be classified as disabled are relaxed. Hence, UI or SI benefits may be used to bridge the time until the new eligibility age is reached.

Taken together, we expect to observe an increase in the UI and SI rate after the policy reform because (1) there are less transitions from these programs into DI and (2) more transitions from employment into these programs. We also expect to observe an increase in employment because employed workers are less likely to seek DI benefits. However, the positive effect on employment may be small if most employed workers that are no longer eligible for DI benefits claim UI or SI benefits instead.

3 Data

The data comes from the Austrian Social Security Database (ASSD), which is described in detail by Zweimüller et al. (2009). The data contains information on all private sector workers in Austria and has two attractive features. First, the data records all employment, unemployment, sickness, disability and retirement spells back to 1972, which permits to trace individuals over time and reconstruct an individual's entire labor market history. Second, even when very specific subgroups are considered, sample sizes are large and effects can be estimated with a high degree of precision. At the individual level the data provides information on gender, age, experience, tenure, blue collar or white collar status, and the number

of contribution and insurance years. The data also contains some firm-specific information such as region and industry affiliation. Information on applications for DI benefits is unfortunately not recorded in the data. Therefore, it is not possible to examine how much of the reform's impact on DI enrollment is due to more people being denied benefits under the stricter rules versus self-screening, i.e. less people seeking DI benefits. Similarly, the data does not permit an analysis of the reform's impact on the composition of the beneficiary population since the qualifying impairment of DI awardees is not known.

The main sample consists of all men aged 49-56 over the period 1991 to 2002 working in Austria. Individuals are observed on a quarterly basis for approximately 5 1/2 years before the implementation of the Structural Adjustment Act (January 1991 to August 1996) and a period of about 6 1/2 years (September 1996 to December 2002) when the reform was in effect. However, the main focus of the analysis lies on the years 1994 to 1999, given that both in 1993 and 2000 significant policy reforms became effective, which potentially had an impact on labor supply.

The sample restrictions are as follows. From the initial sample with 307,572 individuals I exclude 2,201 individuals who spent more than one year as public servants as they are covered by a separate pension system. In particular, public employees have relaxed eligibility conditions for disability benefits at all ages, which results in a high level of disability enrollment even at lower ages. For the same reason I exclude 60,404 individuals who spent more than one year in self-employment. Second, in order to isolate the effects of stricter eligibility criteria, I also exclude 8,749 individuals with less than five contribution years since these individuals are unlikely to satisfy the non-medical eligibility criteria for disability benefits. The final sample has 236,218 individuals.

Table 3 reports summary statistics by age group before (January 1994 to August 1996) and after the reform (September 1996 to December 1999). Except for the number of insurance years (and therefore disability benefits), there are

minor differences between the different age groups with respect to observable characteristics. A comparison of the fraction of individuals in different labor market states before and after the 1996 reform provides the first evidence on the impact of the policy change. Specifically, in the treatment group, relative to the comparison groups, the rate of disability declines considerably after the Structural Adjustment Act became effective. This decline has been accompanied by a substantial rise in registered unemployment. Similarly, the sickness and employment rate has increased after the reform, while the residual category has remained virtually unchanged.⁴

Table 3

4 Identification Strategy

The empirical strategy to evaluate the 1996 policy reform relies on a difference-in-difference approach. The first difference is over time, as access to disability benefits became stricter after 1996. The second difference is across groups; only men aged 55 and 56 were directly affected by the new disability eligibility rules. These individuals define the treated group. The definition of the comparison group is crucial, as it should capture counterfactual labor market trends in the absence of the policy change.

One potential comparison group would be all women aged 55 and 56. This group is an inadequate comparison group because over the period under consideration the labor force participation of older women generally increased. Thus, even in the absence of the policy change, trends in employment differ by gender. Moreover, since the early retirement age for women is 55, the labor supply behavior

⁴Unemployment is defined as being registered at an unemployment office but these individuals are not necessarily receiving regular unemployment benefits or unemployment assistance. The residual category contains individuals that are not employed, registered as unemployed, disabled, nor receive sickness benefits.

of older women is affected by changes in the early retirement rules. Specifically, the 1996 pension reform raised the number contribution years needed to qualify for early retirement from 15 to 20, thereby restricting access to early retirement benefits.

A better comparison group are men aged 53-54. Individuals in this age group are a close substitute to the individuals directly affected by the 1996 reform. On the other hand, forward-looking men in the age group 53-54 potentially adjust their labor supply behavior as a consequence of the policy change. For example, 53-54 year old job losers may increase their search effort given that after the reform they need to wait at least three years before they reach the new eligibility age at which eligibility criteria for DI benefits are relaxed. The empirical analysis will therefore also use men aged 49-50 and men aged 51-52 as comparison groups because they are less likely to change their labor supply behavior.

Alternatively, the stricter eligibility conditions for DI benefits for the age group 55-56 could feed back to the labor demand for the the age group 49-54 via general equilibrium effects. Specifically, the demand for workers below age 55 may decline if workers in the age group 55-56 remain in employment longer after this policy change is in effect. Such spillover effects are likely to be small because the age group 55-56 is much smaller in size compared to the age group 49-54. To shed light on this concern, it will be instructive to compare labor supply trends of the comparison groups before and after this policy change.

The difference-in-difference comparison is implemented by estimating regressions of the following type:

$$y_{it} = \alpha + \beta Treat_{it} + \gamma (Post_t \times Treat_{it}) + \lambda_t + X'_{it}\delta + \varepsilon_{it} \quad (1)$$

where i denotes individual, t time, and y_{it} is the outcome variable of interest. The variable $Treat$ is a dummy for treatment group (1 if treatment, 0 if comparison) to control for group-specific trends; $Post$ is a dummy which is 0 before September 1996 and 1 after September 1996; λ_t is a time fixed effect to control for changes

in macroeconomic conditions. The vector X_{it} is a set of individual or region specific characteristics to control for any observable differences that might confound the analysis (blue collar status, experience, number of insurance years, previous annual earnings, average earnings over the best 15 years, industry and region dummies, and regional GDP growth rate). The coefficient of interest is γ , which measures the effect of stricter DI eligibility criteria on the treated group relative to the comparison group, using variation over time. To explore the impact of the policy reform over time, equation (1) is generalized by replacing $(Post_t \times Treat_{it})$ with a full set of treatment times year interaction terms:

$$y_{it} = \alpha + \beta Treat_{it} + \sum_{l=1991}^{2002} \gamma_l (d_l \times Treat_{it}) + \lambda_t + X'_{it}\delta + \varepsilon_{it} \quad (2)$$

where d_l is a dummy that is 1 in year l and 0 otherwise. The pre-1996 interaction terms provide pretreatment specification test, although they may capture possible anticipation effects. Equation (1) and (2) are estimated for men aged 49-50, 51-52, and 53-54 as comparison groups. The identifying assumption is that there are no unobserved age-group-specific changes that (1) are correlated with the policy change and (2) are correlated with age-group-specific changes in the outcome variable. All observations are clustered at the individual level to account for correlation within observations across time, which may result in an underestimation of standard errors.

5 Results

5.1 Descriptive Evidence

To assess the impact of the change in disability eligibility criteria graphically, Figure 2 plots labor supply trends in men for the age groups 49-50, 51-52, 53-54, and 55-56 over time. As shown in the top left subfigure, after the change in law the fraction of disabled individuals in the age group 55-56 starts to decline

by almost 10 percentage points and stays fairly constant at the new level of 15 percent. As shown in the top right subfigure, in the years following the policy change the unemployment rate of the treatment group starts rising by roughly 5 percentage points reaching a maximum of 15 percent. A similar pattern can be observed for the SI rate (bottom left panel). For the age group 55-56 enrollment into the SI program starts growing by around 1 percentage point after the reform. Finally, the bottom right panel suggest that despite the large absorption effects by the UI and SI programs, employment in the treatment group clearly increases after the policy change took effect.

Figure 2

There is evidence of an anticipation effect because in the year of the reform the disability rate increases for the age group 55-56 while employment and enrollment into the SI program decreases. However, since the reform was made public only in May 1996, individuals had little time to adjust their behavior and therefore the magnitude of the anticipation effect is relatively small. For the comparison groups trends in different labor market states are relatively stable over the whole time period. This pattern suggests that the stricter eligibility criteria for the treatment group had no indirect effect on the comparison groups.

Figure 3 reports DI enrollment by age for the years 1994 and 1999. Clearly, after the reform fewer people receive disability benefits at ages 55 and 56. At age 57 disability enrollment starts to catch up and returns roughly to the pre-reform level at ages 58 and 59. Hence, although the Structural Adjustment Act permanently reduces disability enrollment at ages 55 and 56, it seems that most people merely postpone their application for disability benefits until they reach the new eligibility age at which conditions to be classified as disabled are relaxed.

Figure 3

5.2 Baseline Results

The first main set of results is summarized in Table 4, which shows the OLS estimates of equation (1). The dependent variable is a dummy, which is equal to 1 if an individual is in the state of interest and 0 otherwise. The pre period in the base specification is January 1994 to August 1996 and the post period is September 1996 to December 1999. These estimates are likely to be biased due to the anticipation effect shown in Figure 2 and because most of the 56 year olds in 1997 still could access disability benefits under the relaxed rules at age 55 in 1996. The last three columns of Table 4 therefore contain the results for an alternative specification that excludes the years 1996 and 1997. All estimates include controls for blue collar status, experience, insurance years, annual earnings, average earnings over the best 15 years, number of days spent in sick leave through age 49, industry and region dummies, and regional GDP growth rate. Annual earnings and average earnings over the best 15 years are measured at age 49 and adjusted for inflation.

The first row shows that in the base specification the share of disability recipients declined by 4.3 to 5.3 percentage points after this policy change, depending on the comparison group. The decline is more pronounced and varies between 5.98 and 7.44 percentage points if the years 1996 and 1997 are excluded. As shown in Table 4, the direct consequence of the decline in disability enrollment was an increase in unemployment rate of 2.44 to 2.93 percentage points in the base specification and 3.45 to 3.92 percentage points in the specification without the years 1996 and 1997. Similarly, there is a significant increase in the SI rate of around 0.47 to 0.70 percentage points, after the Structural Adjustment Act is implemented. In spite of the spillover effects to the UI and SI program, employment increased by 1.04 to 2.34 percentage points in the base specification and 1.61 to 3.37 percentage points in the specification without the years 1996 and

1997.⁵

Classifying individuals receiving SI or UI benefits as part of the labor force, the results in the last three columns of Table 4 suggest that this policy change increased labor force participation of 55-56 year old men by 6.1 to 7.5 percentage points. This estimate is considerably larger compared to existing studies. Chen and van der Klaauw (2008) estimate that a relaxation in eligibility criteria at age 55 in the U.S. decreases labor force participation by 6 to 12 percentage points for a group of “marginal” applicants whose disability determination is based on vocational factors and age. However, since this group is relatively small, the overall labor force participation of 55 year olds decreases much less. Karlström et al. (2008) study a similar policy change in Sweden and find no effect on DI inflow nor employment. These differences could be attributed to the difference in characteristics of the marginal DI enrollee across countries.

Table 4

The estimates presented in Table 4 will be biased if the treatment group and the comparison group have different labor supply tendencies. To shed light on this concern, Figure 4 plots the estimated coefficients on the interaction terms (equation (2)) for each of the three comparison groups over the full sample period 1991–2002. Each dot on the solid line is the coefficient of the interaction between an indicator variable for year and treatment (a 95-percent confidence interval is plotted by dotted lines). As shown in the top left panel, coefficients for disability turn significantly negative after the reform is in effect. The estimated decrease is persistent over time and comparable across different comparison groups. There is some evidence for an anticipation effect in 1996. The top right and bottom left panels indicate that the decline in disability enrollment led to a large increase in

⁵Equation (1) has also been estimated for the residual category (containing those that are not employed, unemployed, disabled, nor receiving SI). The results are not presented because the estimated effects are not significant independent of the comparison group.

the UI and, to a lesser extent, in the SI rate. This finding suggests that these programs act partly as substitutes for the DI program. In spite of these absorption effects, there is a substantial increase in employment, as shown in the bottom right panel of figure 4. In all four panels the estimated coefficients fluctuate around 0 before 1996 thereby providing evidence that the empirical strategy is not simply picking up long-run trends in differences between comparison and treatment group.

Figure 4

The overall effects shown in Table 4 can either be the results of changes in the inflow into a certain state; or changes in the persistence in a certain state; or both. To shed light on the importance of these two effects, transitions from and persistence in employment, unemployment, and sickness are examined separately. Disability is considered an absorbing state, given that only a small number of disability beneficiaries return to the labor force.

Figure 5 plots the estimated coefficients on the year \times treatment interaction terms of equation (2) for transitions from and persistence in employment for all three comparison groups. A 95-percent confidence interval is plotted with dotted lines. The top left subfigure suggests that the 1996 reform led to a decrease in direct exits from the labor market. There is evidence for an anticipation effect, given that the estimated probability of a transition from employment to disability is positive and significant just prior to the reform. As shown in the top right subfigure, there is an increase in transitions from employment to unemployment. Similarly, employed workers are more likely to seek SI benefits after the reform in in effect (bottom left panel). Finally, the bottom right panel suggests that the persistence in employment increased after this policy change.

Figure 5

The estimated interaction term coefficients for transitions from and persistence in unemployment are summarized in Figure 6. The top left subfigure suggests a substantial and significant decline in the probability of a transition from unemployment to disability after the policy reform is in effect, with little evidence of a preexisting trend. However, as in the case of employment, there is an increase in the number of transitions from unemployment to disability just prior to the reform, suggesting some anticipation behavior. The drop in the number of transitions from unemployment to disability is persistent over time and larger in magnitude than the estimated decline for employment. This finding is consistent with Autor and Duggan (2003) who show that the response to changes in DI eligibility criteria is more elastic for the unemployed because they face low opportunity costs of exiting the labor force to seek benefits than the employed.

Figure 6

The top right subfigure shows that after the change in the law the persistence in unemployment increased in the treatment group relative to the comparison groups. On the other hand, as shown in the bottom panels, the stricter eligibility rules for disability benefits had no effect on transitions from the UI to the SI program or into employment. The drop in the number of transitions from unemployment to disability and the increased persistence in unemployment highlight the role of the DI program in reducing measured unemployment.

The last set of results, summarized in Figure 7 explores transitions from sickness into other states. The probability of a transition from sickness to disability drops after the Structural Adjustment Act becomes effective (top left panel). On the other hand, as displayed in the top right subfigure, there is a sizeable increase in transitions to unemployment. Similarly, the bottom left panel indicates that the change in law increased the persistence in sickness. However, this effect is not significantly different from 0 in most cases. Lastly, the bottom right panel suggests that the change in law had no effect on transitions to employment.

Figure 7

5.3 Sensitivity Analysis

Tables 5-7 present estimates of the effects from the policy change for different subsamples of individuals. Because health eligibility criteria for disability benefits below the age threshold are more relaxed for white collar workers relative to blue collar workers, it is instructive to examine the impact of the Structural Adjustment Act for these two groups separately. OLS estimates of equation (1) for blue and white collar workers are reported in Table 5. The first row indicates that the reduction in disability was disproportionately large among blue collar workers. For this group disability enrollment decreased in the order of 8.01 to 11.20 percentage points, compared to a decline of 1.26 to 1.62 percentage points for white collar workers.

Interestingly, the pre-reform rate of DI receipt among 55-56 year old blue collar workers averaged 4.5 times that of white collar workers of the same age. The ratio is similar below age 55, despite of eligibility criteria being less strict for white collar workers. For white collar workers the decline in disability is completely absorbed by an increase in the inflow into the UI and SI program, but had no effect on employment. Although for blue collar workers there is also a sizeable substitution effect from disability into unemployment and the sickness insurance program, employment increases by 2.68 to 5.95 percentage points after the reform is in effect.

Table 5

As health plays an important role in the determination process for DI benefits, Table 6 presents estimates of the effects from the policy change broken down by health status. Health is measured by the time spent in sick leave in the 15 years prior to age 49. An individual is defined as healthy if he or she has not spent

any time in sick leave through age 49 (roughly 60 percent of the sample). An individual is defined as unhealthy if the time spent on sick leave in the 15 years prior to age 49 is above the median time for individuals with positive sick leave days.

As shown in the first row of Table 6, the reduction in DI enrollment is about three times as large in absolute terms for unhealthy individuals than for healthy individuals. The estimates in the remaining rows suggest that for unhealthy individuals the policy change led to a substantial increase in employment despite large spillover effects into the UI and SI program. For healthy individuals the decline in DI enrollment is completely absorbed by an increase in unemployment and sick leave.

Table 6

To further explore the heterogeneity in the effects from the policy change, individuals are grouped into quintiles based on their lifetime earnings at age 49 (as measured by average earnings of the best 15 years) and then equation (1) is estimated separately for each of the five quintiles of the lifetime earnings distribution. The first row of Table 7 shows that for the lowest quintile of the lifetime earnings distribution disability enrollment decreased by 11.97 percentage points after this policy change. This is a sizeable decline which amounts to one quarter of the baseline DI rate. The magnitude of the estimate decreases in absolute terms for higher quintiles, but is constant in relative terms.

This finding is consistent with the evidence that the incentives to seek DI benefits are higher with more generous income replacement rates (see, e.g., Autor and Duggan (2003)). In particular, because the DI benefit formula is concave in past earnings and given that maximum DI benefits are truncated at a cap of roughly 2,500 euros per month, high wage workers replace a lower share of income.

The remaining rows of Table 7 consider the effect of the reform on unemployment, sickness, and employment for different quintiles of lifetime earnings. The estimated coefficients indicate a significant increase in the unemployment and sickness rate that is substantially larger among the lower quintiles of the earnings distribution. The decline in disability is associated with a significant increase in employment at the bottom of the lifetime earnings distribution.

Table 7

5.4 Financial Implications

The primary objective of the Structural Adjustment Act was to reduce expenditures in the public pension system, by encouraging the labor force participation of older male workers. The reform tightened the eligibility criteria for disability benefits for older male workers aged 55 and 56; the main channel for early retirement among elderly men. The results from the empirical analysis presented in the previous sections suggest that the reform succeeded only partially in achieving this goal, given that the positive effect on employment was eroded by large spillover effects into the unemployment and sickness insurance programs.

Based on the estimation results, one can estimate the net budgetary savings of the Structural Adjustment Act, as shown in Table 8. Because of the differential impact of the reform for blue and white collar workers, these two groups are separately treated. The change in individuals in Table 8 is based on the estimates from Table 5 for the comparison group men aged 51-52. According to the first row in Table 5 the share of blue collar disability recipients in the age group 55-56 decreased by 9.88 percentage points relative to the age group 51-52 after the reform became effective. Combining this estimate with the average cohort size of 55-56 year old blue collar individuals in the period 1998-1999 implies a drop of 2,008 blue collar disability recipients each year (first column of Table 8). Given that in the period after the reform the average blue collar DI beneficiary

received 160 euros per week in benefits for a period of 47.7 weeks per year, the reduction in government expenditure was 15.4 million euros per year. A similar calculation for white collar individuals yields an additional 2.7 million euros in averted pension payments. Moreover, as a result of the increase in employment, the reform generated additional tax revenues of 4.6 million euros per year from blue collar workers (column two). Since white collar employment decreases slightly after the policy change, tax revenues from this group decline by 0.9 million euros.

However, the savings in government expenditures are reduced by additional expenditures in the UI and SI program due to spillover effects. In particular, the number of blue collar UI recipients increased by 1,008 and the number of white collar UI recipients by 362, as shown in column 3 of Table 8. Multiplying these numbers with the average level of UI benefits and the average unemployment duration implies that the policy change created additional expenditures in the UI program of 6 million euros per year for blue collar men and 3.2 million euros per year for white collar men. In addition, as shown in column 4, total SI expenditures increased by 0.5 million euros per year after the reform was put in place. Overall the stricter criteria for disability insurance reduced the government budget deficit by 12.1 million euros per year.

Table 8

6 Conclusion

Relying on a large policy change in Austria, this paper analyzed the impact of a tightening in DI eligibility rules on the labor supply of older workers. Similar to other industrialized countries, the disability insurance program in Austria is an important channel for early retirement, especially because conditions to be classified as disabled are substantially relaxed for older workers aged 55 and above.

With the aim of improving the fiscal health of the public pension system, the Austrian government enacted in 1996 the Structural Adjustment Act. The most significant change of this legislation was a two-year increase in the age, at which eligibility rules for disability benefits are relaxed. Since disability enrollment is particularly high among older men, this increase applied only to men.

Relying on a difference-in-difference approach and using data on the universe of Austrian private sector workers, the empirical analysis suggests that stricter eligibility rules have a significant impact on disability enrollment. Specifically, the share of disability recipients in the affected age group decreased by 6 to 7.2 percentage points after the reform was implemented. The empirical analysis also suggests that any change in the disability insurance program may affect enrollment in other government programs that provide income replacement in the case of a separation from the labor market for economic or health reasons. Specifically, the share of individuals receiving unemployment benefits increased by 3.2 to 3.9 percentage points and the share receiving sickness insurance benefits by roughly 0.7 percentage points. On the other hand, the estimates indicate that employment increased by 1.7 to 3.4 percentage points after this policy change. The estimates also suggest that the impact of the reform varies with individual characteristics, with blue collar, unhealthy and low earning workers showing larger responses than white collar, healthy and high earning workers.

The DI program is a large and growing social insurance program in most industrialized countries. Thus, understanding how changes in DI program parameters affect labor supply is extremely important for policy makers. One way to control the size and growth of the DI program is through stricter access to benefits. The estimates presented in this paper suggest that tightening eligibility criteria has a large effect on DI enrollment and are effective in increasing employment, despite large absorption effects by the UI and SI programs.

There is evidence that the demand for DI benefits depends crucially on labor-market conditions (Autor and Duggan (2003)). An examination of workers'

records prior to the inflow into the disability insurance highlights that a large fraction is unemployed before claiming disability benefits. Thus, the large increases in the unemployment and sickness rate after the change in eligibility rules may also be the consequence of poor labor market prospects for older workers that are still capable of working. More work on the employability of older workers is an important topic for future research.

References

- Autor, David H. and Mark G. Duggan (2003): The Rise in Disability Recipients and the Decline in Unemployment, *Quarterly Journal of Economics*, Vol. 118, pp. 157–205.
- Autor, David H. and Mark G. Duggan (2006): The Growth in the Social Security Disability Rolls: A Fiscal Crisis Unfolding, *Journal of Economic Perspectives*, Vol. 20, No. 3, pp. 71–96.
- Bound, John (1989): The Health and Disability of Rejected Disability Insurance Applicants, *The American Economic Review*, Vol. 79, No. 3, pp. 482–503.
- Bound, John and Richard V. Burkhauser (1999): Economic analysis of transfer programs targeted on people with disabilities, in: *Handbook of Labor Economics*, Vol. 3, pp. 3417–3528, Elsevier B.V.
- Bound, John, Todd Stinebrickner, and Timothy Waidman (2004): Using a Structural Retirement Model to Simulate the Effect of Changes to the OASDI and Medicare Programs, *University of Michigan Retirement Research Center Working Paper*.
- Chen, Susan and Wilbert van der Klaauw (2008): The work disincentive effects of the disability insurance program in the 1990s, *Journal of Econometrics*, Vol. 142, pp. 757–784.

- De Jong, Philip, Maarten Lindeboom, and Bas Van der Klaauw (2010): Screening Disability Insurance Applications, *Journal of the European Economic Association*, forthcoming.
- Diamond, Peter and Eytan Sheshinski (1995): Economic Aspects of Optimal Disability Benefits, *Journal of Public Economics*, Vol. 57, pp. 1–23.
- Duggan, Mark, Perry Singleton, and Jae Song (2007): Aching to Retire? The Rise in the Full Retirement Age and its Impact on the Social Security Disability Rolls, *Journal of Public Economics*, Vol. 91, No. 7-8, pp. 1327–1350.
- Garrett, Bowen and Sherry Glied (2000): Does State AFDC Generosity Affect Child SSI Participation, *Journal of Policy Analysis and Management*, pp. 275–295.
- Gruber, Jonathan (2000): Disability Insurance Benefits and Labor Supply, *Journal of Political Economy*, Vol. 108, No. 6, pp. 1162–1183.
- Gruber, Jonathan and Jeffrey D. Kubik (1997): Disability Insurance Rejection Rates and the Labor Supply of Older Workers, *Journal of Public Economics*, Vol. 64, pp. 1–23.
- Karlström, Anders, Marten Palme, and Ingemar Svensson (2008): The Employment Effect of Stricter Rules for Eligibility for DI: Evidence from a Natural Experiment in Sweden, *Journal of Public Economics*, Vol. 92, No. 10-11, pp. 2071–2082.
- Mairhuber, Ingrid (2003): The Austrian Pension Systems, *FORBA Research Report 2/2003*.
- OECD (2003): Transforming Disability into Ability: Policies to Promote Work and Income Security for Disabled People, Paris: OECD Publishing.
- OECD (2009): Sickness, Disability and Work, *OECD Background Paper*.

- Parsons, Donald O. (1980): The Decline in Male Labor Force Participation, *Journal of Political Economy*, Vol. 88, No. 1, pp. 117–134.
- Parsons, Donald O. (1991): Self-Screening in Targeted Public Transfer Programs, *Journal of Political Economy*, Vol. 99, No. 4, pp. 859–876.
- Schmidt, Lucie and Purvi Sevak (2004): AFDC, SSI, and Welfare Reform Aggressiveness: Caseload Reductions vs. Caseload Shifting, *Journal of Human Resources*, Vol. 39, No. 3, pp. 792–812.
- Wörister, Karl (1999): Länderbericht: Österreich, in: Invalidenrenten: Europäische Trends und Politik, Bundesamt für Statistik, Schweiz.
- Zweimüller, Josef, Rudolf Winter-Ebmer, Rafael Lalive, Andreas Kuhn, Jean-Philippe Wuellrich, Oliver Ruf, and Simon Büchi (2009): Austrian Social Security Database, *IEW – Working Papers Series No. 410*.

Table 1: Net replacement rates in different social insurance programs among males by age groups

Age group	Disability Insurance	Sickness Insurance	Unemployment Insurance
49-50	54.5	64.1	54.6
51-52	57.3	64.1	55.1
53-54	59.8	64.1	55.6
55-56	62.9	64.0	55.3

Source: Own calculations, based on Austrian Social Security Data

Table 2: Health-related eligibility criteria for DI benefits for different groups

Age	Blue collar	White collar
Age < 55	50% reduction in work ability in any reasonable occupation	50% reduction in work ability in any occupation belonging to the same occupational group
Age ≥ 55	50 % reduction in work ability in a similar occupation	50% reduction in work ability in a similar occupation

Table 3: Sample statistics by age groups before and after the 1996 reform

	Ages 49-50		Ages 51-52		Ages 53-54		Ages 55-56	
	Before	After	Before	After	Before	After	Before	After
<i>Labor market states (%)</i>								
Disability	5.20	5.71	7.22	7.68	10.51	10.37	23.24	18.19
Unemployment	8.20	9.48	9.95	10.98	11.93	12.97	10.03	14.04
Sickness	1.20	1.22	1.27	1.34	1.42	1.53	1.04	1.59
Employment	84.04	82.52	79.68	78.34	74.04	73.21	63.32	64.03
Residual	1.36	1.07	1.88	1.66	2.10	1.92	2.37	2.15
<i>Background characteristics</i>								
Blue collar	0.549	0.573	0.534	0.562	0.547	0.545	0.579	0.547
Sick days	46.02	50.49	41.10	47.42	37.88	42.77	39.66	38.33
Experience	13.39	13.31	13.32	13.15	13.22	12.96	12.97	12.71
Contribution years	13.40	13.55	15.03	15.08	16.79	16.55	18.19	18.05
Annual earnings	31,064	31,582	30,769	31,299	30,233	31,008	29,194	30,631
Average earnings	22,340	21,777	22,593	22,144	22,428	22,536	21,752	22,592
Number of observations	261,611	300,613	311,487	305,028	355,443	330,207	335,010	386,340

Notes: Before refers to the period January 1994 to August 1996. After denotes the period September 1996 to December 1999. Experience denotes experience in the last 15 years, sick days is the sum of days spent in sick leave prior to age 49, and average earnings is the average annual earnings over the best 15 years. Annual earnings and average earnings are measured at age 49 and adjusted for inflation.

Table 4: Impact of reform on disability, unemployment, sickness, and employment

	Base specification			Without transition years		
	49-50	51-52	53-54	49-50	51-52	53-54
<u>Disability</u>						
Post \times Treat	-5.30*** (0.22)	-5.00*** (0.24)	-4.30*** (0.22)	-7.44*** (0.27)	-6.58*** (0.30)	-5.98*** (0.26)
Treat	14.38*** (0.18)	12.53*** (0.18)	10.25*** (0.16)	13.96*** (0.20)	12.06*** (0.20)	9.82*** (0.18)
R ²	0.293	0.293	0.293	0.289	0.289	0.290
Mean		23.29			22.63	
<u>Unemployment</u>						
Post \times Treat	2.44*** (0.20)	2.91*** (0.22)	2.93*** (0.20)	3.45*** (0.25)	3.79*** (0.27)	3.92*** (0.24)
Treat	0.15 (0.16)	-1.56*** (0.15)	-3.10*** (0.13)	0.27 (0.18)	-1.47*** (0.17)	-2.97*** (0.15)
R ²	0.143	0.143	0.149	0.150	0.151	0.155
Mean		10.04			9.93	
<u>Sickness</u>						
Post \times Treat	0.60*** (0.06)	0.57*** (0.06)	0.47*** (0.06)	0.70*** (0.07)	0.68*** (0.07)	0.57*** (0.07)
Treat	-0.33*** (0.05)	-0.41*** (0.04)	-0.48*** (0.04)	-0.34*** (0.05)	-0.41*** (0.05)	-0.46*** (0.05)
R ²	0.015	0.013	0.013	0.017	0.014	0.015
Mean		1.04			1.10	
<u>Employment</u>						
Post \times Treat	2.34*** (0.22)	1.60*** (0.24)	1.04*** (0.21)	3.37*** (0.28)	2.21*** (0.30)	1.61*** (0.26)
Treat	-14.64*** (0.20)	-10.55*** (0.19)	-6.70*** (0.15)	-14.39*** (0.23)	-10.27*** (0.21)	-6.48*** (0.18)
R ²	0.483	0.484	0.494	0.484	0.483	0.494
Mean		63.29			63.94	
Observations	1,283,574	1,337,865	1,407,000	824,286	881,394	914,166

Notes: The Table reports coefficients from a linear probability model. Standard errors in parentheses are clustered at the individual level. Coefficient estimates and standard errors are multiplied by 100 and should be interpreted as percentage points. Details on the specifications are provided in the main text. The time period is 1994-1999 for the base specification. Without transition years excludes observations from 1996 and 1997. Reported means are for the age group 55-56 over the pre-reform period. Significance levels: *** = 1%, ** = 5%, * = 10%.

Table 5: Impact of reform for blue collar and white collar workers

	Blue collar			White collar		
	49-50	51-52	53-54	49-50	51-52	53-54
<u>Disability</u>						
Post \times Treat	-11.20*** (0.42)	-9.88*** (0.46)	-8.91*** (0.40)	-1.62*** (0.27)	-1.55*** (0.30)	-1.26*** (0.27)
Treat	19.57*** (0.32)	17.21*** (0.30)	14.10*** (0.27)	4.85*** (0.20)	4.13*** (0.20)	3.17*** (0.18)
R ²	0.308	0.304	0.298	0.151	0.153	0.157
Mean		33.31			7.45	
<u>Unemployment</u>						
Post \times Treat	4.11*** (0.37)	4.96*** (0.40)	5.46*** (0.36)	2.29*** (0.31)	2.00*** (0.33)	1.60*** (0.30)
Treat	-0.63** (0.27)	-3.00*** (0.26)	-5.07*** (0.23)	2.60*** (0.23)	1.35*** (0.22)	0.29 (0.19)
R ²	0.134	0.131	0.134	0.186	0.192	0.200
Mean		11.46			7.75	
<u>Sickness</u>						
Post \times Treat	1.17*** (0.12)	1.08*** (0.12)	0.93*** (0.12)	0.13** (0.06)	0.21*** (0.06)	0.14** (0.05)
Treat	-0.66*** (0.09)	-0.72*** (0.08)	-0.78*** (0.07)	-0.02 (0.04)	-0.10*** (0.04)	-0.08** (0.03)
R ²	0.015	0.013	0.014	0.009	0.007	0.006
Mean		1.63			0.35	
<u>Employment</u>						
Post \times Treat	5.95*** (0.41)	3.82*** (0.44)	2.68*** (0.37)	-0.77** (0.37)	-0.48 (0.38)	-0.42 (0.34)
Treat	-18.84*** (0.33)	-13.48*** (0.31)	-8.29*** (0.25)	-8.08*** (0.29)	-5.74*** (0.27)	-3.69*** (0.23)
R ²	0.474	0.463	0.469	0.407	0.417	0.432
Mean		51.40			81.74	
Observations	463,373	491,165	509,886	360,913	390,229	404,280

Notes: The Table reports coefficients from a linear probability model. Standard errors in parentheses are clustered at the individual level. Coefficient estimates and standard errors are multiplied by 100 and should be interpreted as percentage points. All estimates include controls for experience, insurance years, annual earnings, average earnings over the best 15 years, number of days spent in sick leave through age 49, industry and region dummies, and regional GDP growth rate. Annual earnings and average earnings are measured at age 49 and adjusted for inflation. The pre-period is 1994-1995 and the post period is 1998-1999. Reported means are for age group 55-56 over the pre-reform period. Significance levels: *** = 1%, ** = 5%, * = 10%.

Table 6: Impact of reform for unhealthy and healthy individuals

	Unhealthy			Healthy		
	49-50	51-52	53-54	49-50	51-52	53-54
<u>Disability</u>						
Post×Treat	-12.39*** (0.87)	-10.87*** (0.94)	-9.70*** (0.77)	-3.94*** (0.27)	-3.49*** (0.29)	-3.28*** (0.27)
Treat	22.65*** (0.62)	18.83*** (0.57)	15.49*** (0.49)	7.99*** (0.21)	7.20*** (0.21)	6.02*** (0.19)
R ²	0.297	0.304	0.309	0.190	0.180	0.180
Mean		43.54			12.00	
<u>Unemployment</u>						
Post×Treat	4.13*** (0.76)	4.65*** (0.82)	5.31*** (0.69)	2.65*** (0.26)	2.74*** (0.29)	2.67*** (0.27)
Treat	-4.80*** (0.51)	-5.21*** (0.48)	-6.05*** (0.41)	1.97*** (0.20)	0.19 (0.20)	-1.36*** (0.18)
R ²	0.125	0.124	0.119	0.157	0.162	0.179
Mean		12.85			8.02	
<u>Sickness</u>						
Post×Treat	1.14*** (0.27)	1.25*** (0.24)	1.17*** (0.23)	0.46*** (0.07)	0.45*** (0.07)	0.30*** (0.07)
Treat	-2.42*** (0.19)	-1.69*** (0.16)	-1.38*** (0.14)	0.13*** (0.05)	-0.05 (0.05)	-0.10** (0.04)
R ²	0.012	0.012	0.013	0.013	0.012	0.013
Mean		1.76			0.70	
<u>Employment</u>						
Post×Treat	7.05*** (0.73)	5.11*** (0.73)	3.29*** (0.61)	0.77** (0.33)	0.34 (0.36)	0.38 (0.32)
Treat	-15.81*** (0.57)	-12.07*** (0.51)	-8.16*** (0.41)	-10.57*** (0.27)	-7.41*** (0.26)	-4.62*** (0.22)
R ²	0.466	0.485	0.502	0.398	0.394	0.414
Mean		40.31			76.49	
Observations	163,940	172,853	178,202	492,909	532,948	553,882

Notes: The Table reports coefficients from a linear probability model. Standard errors in parentheses are clustered at the individual level. Coefficient estimates and standard errors are multiplied by 100 and should be interpreted as percentage points. All estimates include controls for blue collar status, experience, insurance years, annual earnings, average earnings over the best 15 years, industry and region dummies, and regional GDP growth rate. Annual earnings and average earnings are measured at age 49 and adjusted for inflation. The pre-period is 1994-1995 and the post period is 1998-1999. Reported means are for age group 55-56 over the pre-reform period. Significance levels: *** = 1%, ** = 5%, * = 10%.

Table 7: Impact of reform by quintiles of earnings over the best 15 years

	1 st Quintile	2 nd Quintile	3 rd Quintile	4 th Quintile	5 th Quintile
<u>Disability</u>					
Post × Treat	-11.97*** (0.91)	-8.12*** (0.72)	-5.70*** (0.63)	-4.07*** (0.52)	-0.59*** (0.20)
Treat	20.66*** (0.57)	15.48*** (0.49)	10.86*** (0.43)	7.80*** (0.36)	1.47*** (0.14)
R ²	0.267	0.283	0.274	0.222	0.073
Mean	43.40	30.43	22.35	14.86	2.10
<u>Unemployment</u>					
Post × Treat	6.51*** (0.82)	4.91*** (0.62)	3.45*** (0.59)	1.91*** (0.52)	-0.08 (0.29)
Treat	-6.35*** (0.48)	-2.25*** (0.40)	-0.12 (0.40)	1.76*** (0.36)	1.53*** (0.19)
R ²	0.120	0.130	0.155	0.171	0.089
Mean	14.22	10.39	11.53	10.53	2.98
<u>Sickness</u>					
Post × Treat	1.17*** (0.22)	0.80*** (0.19)	0.72*** (0.16)	0.61*** (0.14)	0.10* (0.06)
Treat	-1.39*** (0.16)	-0.63*** (0.12)	-0.16 (0.10)	-0.15* (0.09)	0.06** (0.03)
R ²	0.011	0.013	0.013	0.013	0.009
Mean	1.70	1.55	1.24	0.86	0.14
<u>Employment</u>					
Post × Treat	4.45*** (0.80)	2.62*** (0.72)	1.61** (0.66)	1.98*** (0.59)	0.83** (0.39)
Treat	-12.65*** (0.54)	-12.70*** (0.52)	-10.60*** (0.49)	-9.87*** (0.44)	-3.89*** (0.26)
R ²	0.402	0.424	0.463	0.459	0.286
Mean	39.92	55.93	62.09	70.22	92.52
Observations	176,264	176,289	176,273	176,239	176,329

Notes: The Table reports coefficients from a linear probability model. Standard errors in parentheses are clustered at the individual level. Coefficient estimates and standard errors are multiplied by 100 and should be interpreted as percentage points. All estimates include controls for blue collar status, experience, insurance years, annual earnings, number of days spent in sick leave through age 49, industry and region dummies, and regional GDP growth rate. Annual earnings is measured at age 49 and adjusted for inflation. The pre-period is 1994-1995 and the post period is 1998-1999. Reported means are for the age group 55-56 over the pre-reform period. Significance levels: *** = 1%, ** = 5%, * = 10%.

Table 8: Cost-benefit analysis

	Δ DI	Δ tax	Δ UI	Δ SI
	expenditures	revenues	expenditures	expenditures
<u>Blue collar</u>				
Δ individuals	-2,008	776	1,008	219
Avg. duration (weeks)	47.7	42.0	36.0	11.1
Weekly avg. transfer (2002 euros)	160	142	165	165
Annual Δ total (million euros)	-15.4	4.6	6.0	0.4
<u>White collar</u>				
Δ individuals	-280	-87	362	38
Avg. duration (weeks)	46.9	48.6	41.7	9.4
Weekly avg. transfer (2002 euros)	202	204	213	230
Annual Δ total (million euros)	-2.7	-0.9	3.2	0.1

Notes: Δ individuals is calculated based on the estimates in Table 5 for the comparison group men 51-52 and the average cohort size of 55-56 year olds in the period 1998-1999 with blue collar and white collar status, respectively. DI benefits, UI benefits, SI benefits are net of taxes.

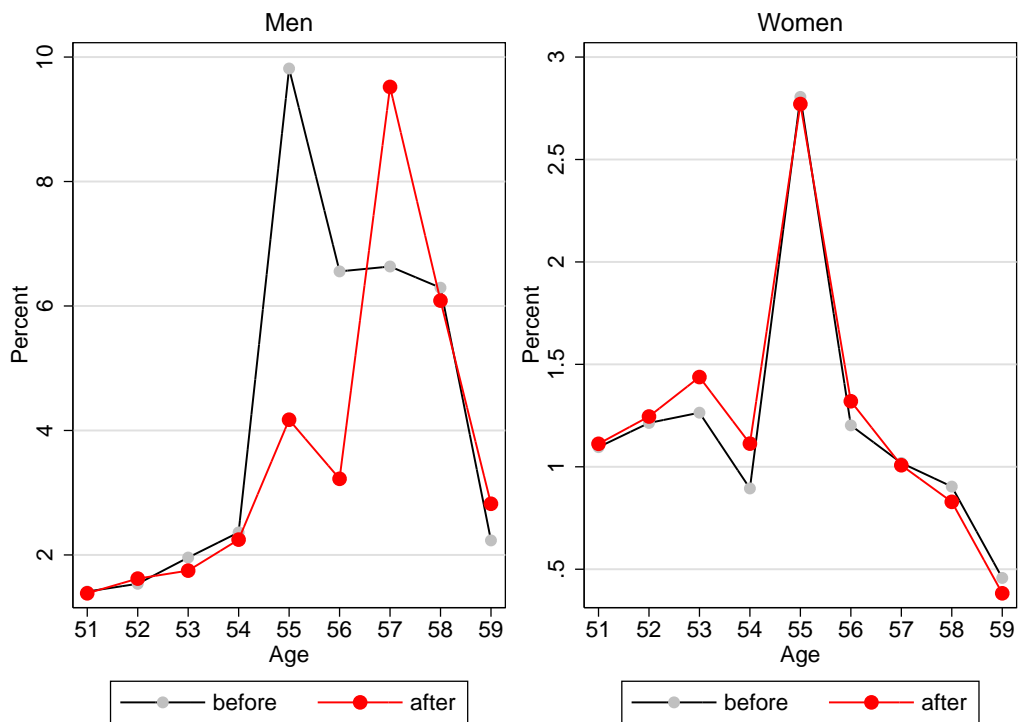


Figure 1: New enrollees to the DI program by age and gender before (Jan 1994–Aug 1996) and after (Sep 1996–Dec 1999) the reform is in effect

Source: Own calculations, based on Austrian Social Security Data.

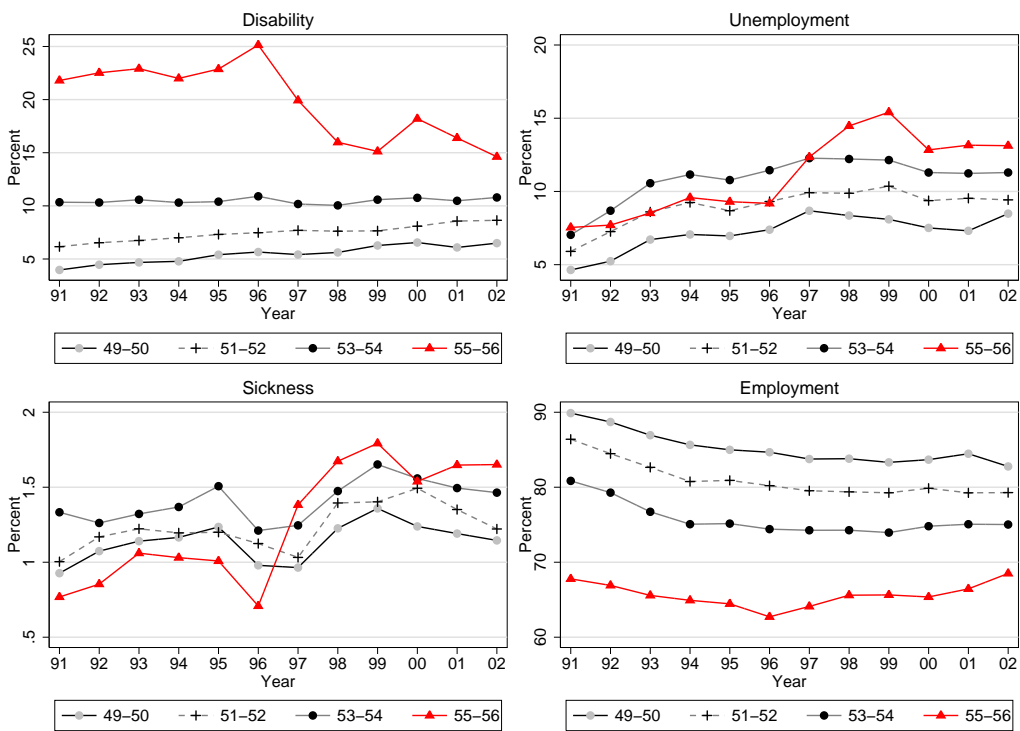


Figure 2: Trends in disability, unemployment, sickness, and employment over the period 1991-2002 among males in different age groups

Source: Own calculations, based on Austrian Social Security Data.

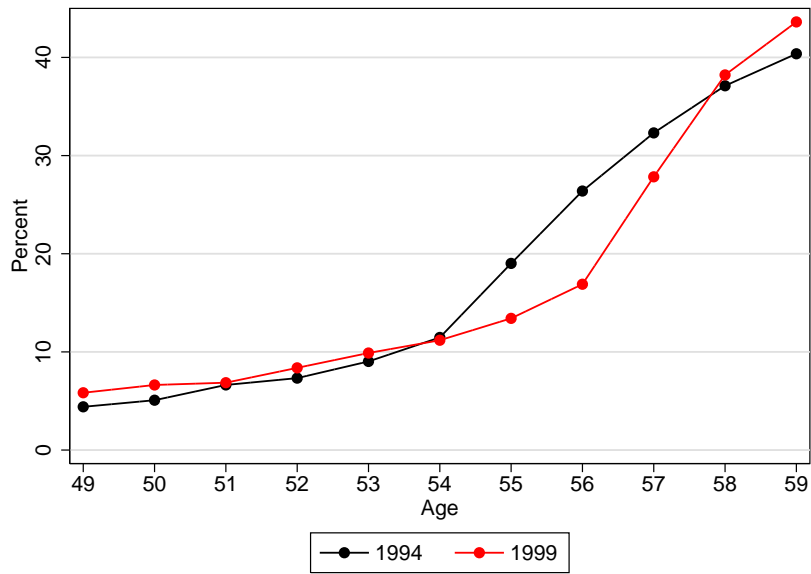


Figure 3: Percent of men receiving DI benefits by age, 1994 and 1999
 Source: Own calculations, based on Austrian Social Security Data.

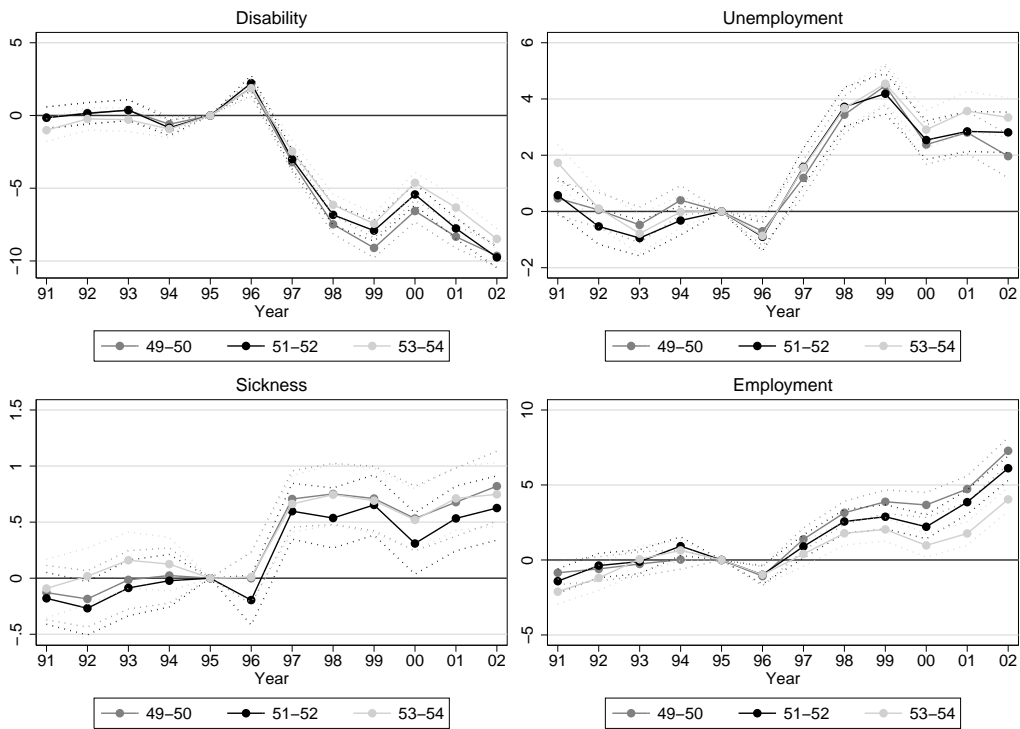


Figure 4: Coefficients of the interaction year × treatment in equation (2) for different states with 95-percent confidence interval

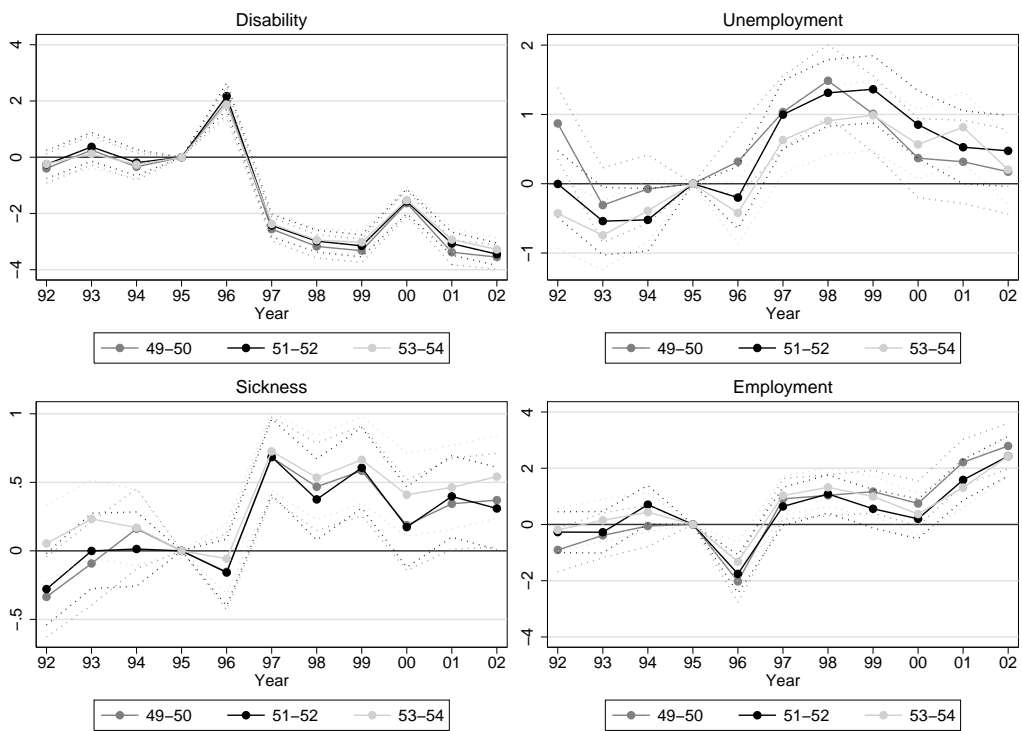


Figure 5: Coefficients of the interaction $\text{year} \times \text{treatment}$ in equation (2) for transitions from employment with 95-percent confidence interval

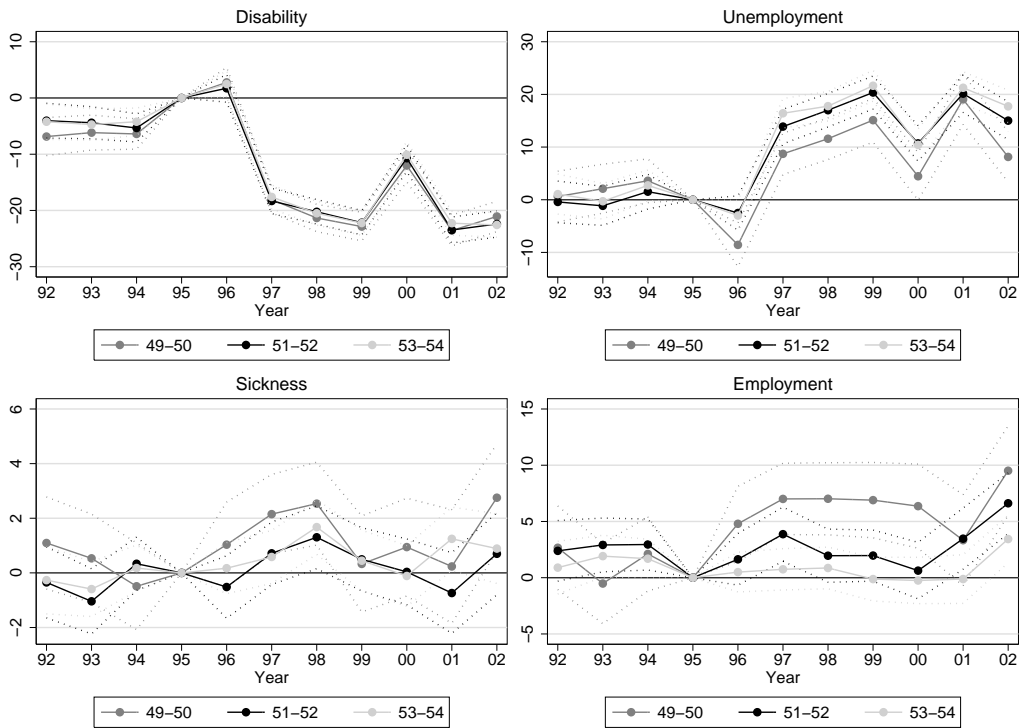


Figure 6: Coefficients of the interaction $\text{year} \times \text{treatment}$ in equation (2) for transitions from unemployment with 95-percent confidence interval

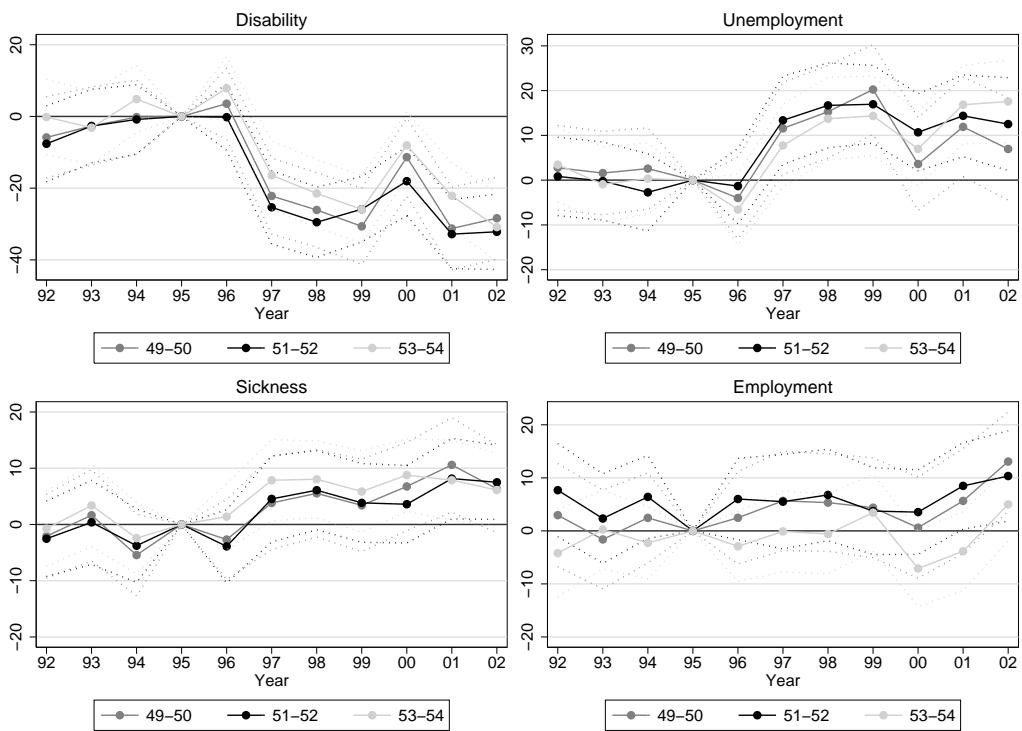


Figure 7: Coefficients of the interaction $\text{year} \times \text{treatment}$ in equation (2) for transitions from sickness with 95-percent confidence interval