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Staubli, Stefan; Zweimüller, Josef

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Does raising the retirement age increase employment of older workers?

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Does Raising the Retirement Age Increase Employment of Older Workers?

Stefan Staubli
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July 2011

Forschungsinstitut
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Institute for the Study
of Labor

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Stefan Staubli
University of St. Gallen,
University of Zurich and RAND

Josef Zweimüller
University of Zurich,
CEPR, CESifo and IZA

Discussion Paper No. 5863
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IZA

P.O. Box 7240
53072 Bonn
Germany

Phone: +49-228-3894-0
Fax: +49-228-3894-180
E-mail: iza@iza.org

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ABSTRACT

Does Raising the Retirement Age Increase Employment of Older Workers?*

This paper studies how an increase in the minimum retirement age affects the labor market behavior of older workers. Between 2000 and 2006 the Austrian government gradually increased the early retirement age from 60 to 62.2 for men and from 55 to 57.2 for women. Using administrative data on the universe of Austrian private-sector employees, the results from the empirical analysis suggest that this policy change reduced retirement by 19 percentage points among affected men and by 25 percentage points among affected women. The decline in retirement was accompanied by a sizeable increase in employment of 7 percentage points among men and 10 percentage points among women, but had also important spillover effects into the unemployment insurance program. Specifically, the unemployment rate increased by 10 percentage points among men and 11 percentage points among women. In contrast, the policy change had only a small impact on the share of individuals claiming disability or partial retirement benefits.

JEL Classification: J14, J26

Keywords: early retirement, retirement age, labor supply, policy reform

Corresponding author:

Stefan Staubli
SEW-HSG
Universität St. Gallen
CH–9000 St. Gallen
Switzerland
E-mail: stefan.staubli@unisg.ch

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1 Introduction

Between 1970 and 2010 the average life expectancy at age 65 in OECD countries increased by roughly 4 years for men and 5 years for women. Over the same period the average retirement age has declined by almost one year. Forecast suggest that there will be a further increase in life expectancy of around 3 years between 2010 and 2050 (OECD, 2011). These trends raise concerns about the financial stability of public pension systems because individuals tend to claim retirement benefits longer and the ratio of workers to pensioners is expected to rise. The OECD projects that these forces will increase pension expenditures from 9.2 percent of GDP in 2007 to 12.7 percent of GDP in 2060 (OECD, 2011). To reduce the financial pressure on public pension systems, many countries have cut retirement benefits or increased the retirement age.[1] To evaluate the cost and benefits of these policy measures, it is critical to estimate how labor supply at older ages responds to changes in the program rules.

There is an extensive literature on how changes in benefit generosity affect the timing of retirement (Burtless, 1986; Krueger and Pischke, 1992; Samwick, 1998; Coile and Gruber, 2007; Liebman et al., 2009; Manoli and Weber, 2010). Those studies typically find that changes in retirement benefits have a significant impact on the timing of retirement. In contrast, there is little work on how a rise in the retirement age affects labor force participation. Most countries distinguish between an early retirement age (ERA) and a normal retirement age (NRA). While individuals can claim retirement benefits at a reduced rate upon reaching the ERA, they will only qualify for full retirement benefits at the NRA. This paper investigates how an increase in the ERA affects the labor force participation of older workers by exploiting two policy changes in the Austrian pension system that increased the ERA for men and women by more than 2 years between 2000 and 2006.

[1] For a summary of the reforms implemented in the 1990s see Schwarz and Demirguc-Kunt (1999). More recent reforms in industrialized countries are discussed in Gruber and Wise (2007).

The first objective of this paper is to determine how a rise in the ERA affects employment and retirement behavior. A series of studies that investigate the relationship between social security provisions and retirement have documented a sharp increase in retirement rates at the age of first eligibility for retirement benefits (Gruber and Wise, 2007). Judging from this empirical regularity, an increase in the ERA is likely to be an effective measure to delay retirement. At the same time, the employment response may be weak if individuals respond to a rise in the ERA by seeking benefits from other social insurance programs. A second key question is therefore whether an increase in the ERA leads to more enrollment in other social insurance programs that may be used as a gateway to early retirement. Understanding how a rise in the ERA affects inflow into other programs is also important to assess the consequences for government expenditures.

The Austrian labor market is characterized by an extremely low labor force participation of older workers aged 55-64. In 2009 only 42 percent of individuals in this age group were employed or looking for a job compared to an average of 57 percent in the OECD countries. The low labor force participation rate of older individuals in Austria is due mainly to the low ERA compared to other countries and the availability of alternative pathways into early retirement. Prior to 2000, men could claim retirement benefits already at age 60 and women at age 55, conditional on having contributed a certain number of years to the public pension system. Approximately 30 percent of working men and women exit the labor market at these ages. However, because eligibility criteria for disability benefits are relaxed starting at age 57, a large fraction of men withdraws from the labor market already before the ERA through the disability insurance program. The unemployment insurance is another important pathway into early retirement in Austria, because older unemployed can claim unemployment benefits longer than younger unemployed.

In an effort to foster employment among older individuals, the Austrian

government implemented a series of changes in 2000 and 2004, which reduced the generosity of and accessibility to retirement benefits. The most important element of these policy changes was an increase in the ERA by 26 months between 2000 and 2006, which is the period covered by our data. Because the increase was phased in gradually, month-of-birth is the key determinant for the age of first eligibility for retirement benefits. We can therefore estimate the effects of these policy changes by comparing the labor market behavior of younger birth cohorts to older birth cohorts who were not affected by the rise in the ERA. The change in the ERA did not apply to men and women with a long work history who could still claim retirement benefits at age 60 and 55, respectively. We use this rule to evaluate the robustness of our main results by comparing the labor market behavior of people with low work experience to those with high work experience.

Using administrative data from all private sector workers in Austria, the empirical analysis suggests that these policy changes reduced the claiming of retirement benefits by 19 percentage points among affected men and by 25 percentage points among affected women. The drop in retirement benefit claiming was accompanied by a lasting increase in employment of 7 percentage points among men and 10 percentage points among women. The total effect on employment was even larger, since the rise in the ERA increased enrollment into the partial retirement scheme by 0.5 percentage points among men and 1.8 percentage points among women. However, the estimates also indicate that the increase in the ERA led to a substantial increase in registered unemployment of 10 percentage points among men and 11 percentage points among women. Similarly, there was a rise in the probability of receiving disability benefits and a rise in the probability of being out of the labor force, although the estimated effects are small in magnitude.

Earlier studies have relied on out-of-sample predictions to estimate the labor supply response to changes in the ERA and NRA and typically find that a raise

in the retirement age leads to a sizeable increase in labor force participation of older workers (Rust and Phelan, 1997; Panis et al., 2002; Gruber and Wise, 2004). More recently, Mastrobuoni (2009) exploits a policy change in the U.S. that increased the NRA from 65 to 67 and raised the penalty for claiming retirement benefits before the NRA. He concludes that an increase in the NRA by 2 months delays effective retirement by around 1 month. This estimates is much larger than the effect suggested by the previous simulation studies, possibly because the out-of-sample projections omit factors that are important for the timing of retirement such as social custom or liquidity constraints.

Our paper estimates the labor supply response of an increase in the ERA as opposed to the NRA. This distinction is important for two reasons. First, an increase in the ERA forces individuals to claim retirement benefits later (or seek benefits from other sources) while an increase in the NRA is equivalent to a reduction in benefits. Second, the documented peak in the age distribution at retirement is typically more pronounced at the ERA as opposed to the NRA (Gruber and Wise, 1999). Therefore, a rise in the ERA is likely to be a more effective measure to increase labor force participation among older workers as opposed to a rise in the NRA.

This paper also builds on a growing literature that explores how changes in the generosity of one social insurance program affects enrollment in other programs. Most of these studies focus on spillover effects of changes in the disability insurance (Autor and Duggan, 2003; Karlström et al., 2008; Borghans et al., 2010; Staubli, 2011) or unemployment insurance (Bloemen et al., 2011; Inderbitzin et al., 2011). The most closely related paper is Duggan et al. (2007) who study the same policy change as Mastrobuoni (2009) and find that the increased penalty for claiming retirement benefits before the NRA led to more disability insurance enrollment prior to the NRA. Our findings suggest that the increase in the ERA had a relatively small effect on disability recipiency. Instead we find that a significant fraction of affected individuals responded to the in-

crease in the ERA by claiming unemployment benefits or staying in employment longer.

This paper proceeds as follows. Section 2 describes Austria's social insurance programs and the policy changes in the public pension system. Section 3 summarizes the data and presents descriptive statistics. Section 4 outlines the empirical strategy. Section 5 presents the results. Section 6 draws conclusions.

2 Background

2.1 The Public Pension System in Austria

The Austrian pension system covers almost all workers in Austria and provides retirement and disability benefits. All benefits are subject to income taxation and mandatory health insurance contributions. Public retirement benefits are the main source of retirement income and replace on average 80 percent of the most recent gross wage up to maximum of approximately 2,900 euros per month. Conditional on having 35 contribution years or 37.5 insurance years, retirement benefits can be claimed at any age after the ERA of 60 for men and 55 for women, though at a reduced rate. Insurance years comprise both contributing years (periods of employment, including sickness, and maternity leave) and qualifying years (periods of unemployment, military service, or secondary education). Full retirement benefits can be claimed at the NRA of 65 for men and 60 for women as long as the individual has 15 insurance years in the last 30 years or 15 contribution years.

The level of retirement benefits depends on the assessment basis and the pension coefficient. The assessment basis corresponds to the average earnings over the best 15 years after applying a cap to earnings in each year. The pension coefficient is the percentage of the assessment basis that is received in the pension. The pension coefficient increases with the number of insurance years up to a maximum of 80 percent (roughly 45 insurance years). Since

1996 there is a penalty for claiming benefits before the NRA and a bonus for retirement after the statutory retirement age of approximately 2 percentage points per year.

To be eligible for disability benefits, applicants must suffer a health impairment that will last for at least 6 months and must have accumulated at least 5 insurance years. Because medical criteria for disability classification are relaxed starting at age 57, the disability insurance has played an important role in early retirement (Staubli, 2011). More specifically, below that age threshold, an individual is generally considered disabled if the capacity to work is reduced by more than 50 percent in any occupation in the economy. Above the age threshold of 57 the same individual qualifies for benefits if the work capacity is reduced by 50 percent in the same occupation. Because men first become eligible for retirement benefits at age 60 as opposed to 55 for women, disability enrollment is disproportionately high among older men. In 2008, for example, 61 percent of new male recipients and 31 percent of new female recipients were older than 55. The calculation of disability benefits is identical to that of retirement benefits, except for a special increment that is granted to applicants below age 57.

In January 2000 the Austrian government introduced a partial retirement scheme, allowing for a gradual transition from work to retirement. Conditional on having worked for 15 years in the past 25 years, male workers older than 55 and female workers older than 50 can reduce their working time to 40-60 percent of their previous work hours for a maximum period of five years while their earnings are only reduced to 70-80 percent. The scheme is popular as a pathway into early retirement because of the great deal of flexibility in scheduling work hours. In particular, workers are allowed to block their work hours within the agreed period. For example, a male worker who agreed to reduce his work hours by 50 percent can choose to work full time during the first 2.5 years of the program and effectively retire at age 57.5.

Unemployment benefits are not taxed and replace around 55 percent of the

last net wage. Depending on the previous work history, unemployment benefits can be claimed for up to one year. Individuals who exhaust their regular unemployment benefits may apply for unemployment assistance. These means-tested transfers last for successive periods of 39 weeks after which eligibility requirement are recurrently checked and can be at most 92 percent of regular unemployment benefits. Unemployment insurance is an important pathway into early retirement in Austria. Many older workers continue to stop working before the ERA and bridge the gap to the ERA via unemployment insurance benefits.

2.2 The 2000 and 2004 Pension Reforms

In Austria, like in other industrialized countries, the ERA has an important effect on the labor force participation decision of older workers. As Figure 1 illustrates, in 2000 the percentage of men and women working drops by around 30 percentage points at the ERA (60 for men and 55 for women) and then gradually declines up to the NRA (65 for men and 60 for women). Figure 1 also shows that in 2006 employment rates after the ERA are significantly higher compared to 2000. For example, employment among 60 year old men and 55 year old women increased by around 15 percentage points. These increases resulted from two reforms of the Austrian Pension System in 2000 and 2004 that delayed the labor market exit of elderly workers by increasing the ERA.

Figure 1

To improve the fiscal health of the public pension system, the Austrian government enacted the 2000 pension reform on October 1st 2000. The reform was debated in Parliament in June 2000 and approved at the beginning of July. The most important change was an increase in the ERA by 1.5 years for men and women. This increase was phased-in gradually over time. More specifically, each quarter of birth the ERA was raised by 2 months for men born after September 1940 and women born after September 1945 until reaching 61.5 for men born

after September 1942 and 56.5 for women born after September 1947. Men with at least 45 contribution years and women with at least 40 contribution years were unaffected by the increase in the ERA.

Along with this change, the Austrian government temporarily extended the maximum duration of unemployment benefits from 1 to 1.5 years. The extension of unemployment benefit was limited to a small group of people. Only men born between 1940 and 1942 and women born between 1945 and 1947 who had worked at least 15 years in the past 25 years and were unemployed in July 2000 or became unemployed after July 2000 were eligible. The benefit extension was in effect until December 2002.

The reform also increased the penalties for early retirement (before the NRA) and the bonus for retirement after the NRA. Specifically, before the reform each year of retirement prior to the NRA reduced the pension coefficient by 2 percentage points. After the reform this number was increased to 3 percentage points. The 2000 reform also extended the maximal duration of the partial retirement scheme from 5 to 6.5 years. This increase allowed for a smooth transition from partial retirement to regular retirement while leaving the minimum age to enter the partial retirement scheme unchanged at 55 for men and 50 for women. In June 2003 the Austrian government enacted the 2004 pension reform, which became effective on January 1, 2004. The reform continued the increase in the ERA from 61.5 to 65 for men and from 56.5 to 60 for women. This increase was phased in gradually and occurred in two main stages. Each quarter of birth the ERA increased by two months for men born between January and June 1943 and women born between January and June 1948, followed by one-month increments per quarter of birth for men born between July 1943 and December 1952 and women born between July 1948 and December 1957. As for the 2000 pension reform, men with at least 45 contribution years and women with at least 40 contribution years were unaffected by the increase in the ERA.

The reform also reduced the generosity of retirement benefits by lowering the pension coefficient and increasing the penalty for retirement prior to the NRA. Specifically, before the reform each insurance year replaced 2 percent of the assessment basis. After the reform this number was lowered to 1.88 percent. Moreover, the reform changed the assessment basis from the best 15 years to the best 40 years. This extension is being phased-in between 2004 and 2028 and will decrease pension benefits, because wages tend to increase in age. Unlike the 2000 pension reform, there was no temporary extension of unemployment benefits.

Figure 2 summarizes the changes in the ERA for men born in January 1940 to June 1944 (left Panel) and for women born in January 1945 to June 1949 (right Panel). For these birth cohorts the ERA was increased between 2000 and 2006, which is the time period covered by our data. Over this time period the ERA was raised by a total of 26 months (2.17 years). For older birth cohorts the ERA was increased in two-month increments, followed by one-month increments for younger birth cohorts, i.e. men born after June 1943 and women born after June 1948.

Figure 2

The consequences of the increase in the ERA are seen in Figure 3, which plots the share of men aged 60-62.17 and women aged 55-57.17 claiming retirement benefits. As Figure 3 illustrates, in the years before the 2000 reform became effective approximately 40 percent of men and 50 percent of women claimed retirement benefits. The fraction is higher among women because many men already withdraw from the labor market before age 60 by applying for disability benefits. After 2000 the fraction of retired men aged 60-62.17 decreases by almost 15 percentage points. Similarly, there is a 25 percentage points decline in the share of 55-57.17 year old women in retirement. The figure also illustrates that a large share of individuals were unaffected by the increase in the ERA

because they had accumulated enough contribution years. At the end of 2006, roughly 23 percent of men aged 60-62.17 still claimed retirement benefits, even though the ERA was 62.17. The share is smaller among women, because women tend to have less contribution years on average.

Figure 3

3 Data

To examine the impact of the increase in the ERA on labor market behavior, we use data from the Austrian Social Security Database (ASSD), which is described in Zweimüller et al. (2009). The data contain very detailed longitudinal information dating back to 1972 for all private sector workers in Austria. For all individuals who have retired by the end of 2006, information on insurance relevant states is available for the years prior to 1972. At the individual level the data include gender, nationality, month and year of birth, blue-collar or white-collar status, labor market history, earnings and individual identifiers. The data contain several firm-specific variables: geographical location, industry affiliation and firm identifiers (from 1972) that allow us to link both individuals and firms.

Our main sample consists of all men aged 60-62.25 and women aged 55-57.25 over the period 1997 to 2006 (men born in September 1937 to September 1946 and women born in September 1942 to September 1951). Given the introduction of the partial retirement scheme in January 2000 with the potential to affect labor market behavior, the analysis focuses primarily on the years 2000 to 2006. The sample restrictions are as follows. From the initial sample of 299,583 men and 278,829 women we exclude 24,127 men and 12,704 women who spent more than one year as civil servants, as they are covered by a separate pension system with different eligibility rules. For the same reason we exclude 52,199 men and 37,008 women who spent more than one year in self-employment. The final sample thus comprises 223,257 men and 229,117 women.

Individuals are observed on the 1st of January, 1st of April, 1st of July, and 1st of October in each year. Due to the phase-in of the 2000 and 2004 policy changes, the age at which someone can claim retirement benefits is a function of the month and year of birth. Since this information is contained in the data, we can determine exactly who is eligible for retirement benefits in a given quarter. The earliest start date for retirement benefits is the first of the month after reaching the ERA. For example, individuals who start claiming retirement benefits on October 1, 2000, have reached the ERA in September 2000 or earlier.

Tables 1 presents summary statistics by year for men aged 60-62.25 and women aged 55-57.25. As shown in Panel A, from 2000 to 2006 there have been dramatic changes in the fraction of men and women in different labor market states. Over this time period the share of individuals claiming retirement benefits decreased from 40.1 to 25.3 percent among men and from 48 to 15 percent among women. This decline was accompanied by a significant rise in employment from 7 to 17 percent among men and from 29 to 48 percent among women. There is also an increase in partial retirement of around 5 percentage points among men and 7 percentage points among women. However, there is also evidence that the rise in the ERA increased registered unemployment. From 2000 to 2006 the unemployment rate rose by roughly 7 percentage points for both men and women. Similarly, there is 2-2.5 percentage points increase in the share of individuals who are not in the labor force. Over the same period disability enrollment declined, perhaps reflecting the fact that the 2000 and 2004 policy reforms reduced the generosity of disability and retirement benefits.

Panel B shows the characteristics of our sample in different years. Both for men and women there are only minor differences in observable characteristics between different years. Women are less likely to work in blue-collar occupations and tend to have more sick leave days than men. They also tend to have less work experience and less insurance years than their male counterparts. These differences largely arise because women in our sample are on average five years

younger than men. Finally, the last two rows of Panel B show that annual and average earnings of women are roughly one third below annual and average earnings of men.

Table 1

4 Identification Strategy

The goal of the 2000 and 2004 reforms was to foster employment among older workers by increasing the ERA. While access to retirement benefits became stricter as a result of this increase, eligibility criteria for unemployment, partial retirement, and disability benefits remained the same. Therefore, it is plausible that some individuals who would have otherwise claimed retirement benefits responded to this change by seeking benefits from other social insurance programs. Such a change in behavior would diminish the positive effect of these reforms on employment.

Because the increase in retirement age was phased-in gradually, the age at which an individual could claim retirement benefits depended on the month of birth. For example, men born before October 1940 could claim benefits at age 60 while those born in October to December 1940 had to wait 2 months longer before they became eligible for benefits. As illustrated in Figure 2, there are similar discontinuities in the ERA for other birth cohorts and for women. On this basis, the primary approach to estimate the effect of the rise in the retirement age compares the labor market behavior of younger birth cohorts to older birth cohorts who were not affected by the increase in the ERA.

This comparison can be implemented by estimating regressions of the following type:

$$y_{it} = \alpha + \theta_i + \lambda_t + X'_{it}\beta + \gamma \; Below_{it} + \varepsilon_{it} \tag{1}$$

where i denotes individual, t quarter, and y_{it} is the outcome variable of interest; θ_i are age fixed effects (where age is measured in months) to control for age-

specific trends in labor market behavior; λ_t is a set of time fixed effects to capture common time shocks in labor market behavior; and X_{it} represents individual or region specific characteristics to control for any observable differences that might confound the analysis (blue-collar status, experience, insurance years, sick days, previous annual earnings, average earnings over the best 15 years, industry dummies, region dummies, and a fourth-order polynomial in birth-month to control for cohort-varying outcome characteristics).

The key explanatory variable is *Below*, which is equal to one if an individual's age in quarter t is below the ERA, and zero otherwise. For example, because the first increase in the ERA occurred in the forth quarter of 2000, *Below* is zero for all individuals on January 1, April 1, July 1, and October 1, 2000. On January 1, 2001, *Below* is one for men below age 60.17 born in October to December 1940 and women below age 55.17 born October to December 1945, because for these birth cohorts the ERA was increased by 2 months in the forth quarter of 2000.

The identifying assumption is that, absent the increase in the ERA, the change in y_{it} would have been comparable between age groups not yet eligible for retirement benefits (treatment group) and those eligible (comparison group) after controlling for background characteristics. Under this assumption, γ measures the average causal effect of an increase in the ERA on y_{it}, using variation over time. Equation (1) is estimated separately for men aged 60-62.25 and women aged 55-57.25 using data for the period 2000 to 2006. The advantage of focusing on a small age range is that individuals who are not affected by the increase in the retirement age are close substitutes to those affected. Thus, trends in labor market behavior across age groups are likely to be similar. As a placebo check, we estimate equation (1) for the subsample of men with more than 45 contribution years and women with more than 40 contribution years. Because these individuals were not affected by the increase in the ERA, γ should be zero.

Both the 2000 and 2004 pension reforms implemented other changes to the pension system, in addition to the increase in the ERA. A potential concern of our empirical strategy is that theses changes had a differential impact on the labor market behavior in the treatment and comparison groups. Both the 2000 and 2004 pension reforms raised the penalty for claiming retirement benefits before the NRA. The reduction in the pension coefficient was relatively modest and is unlikely to have affected retirement behavior in the treatment and comparison groups differently. For example, the 2000 pension reform reduced the retirement benefits of a 62 year old men by 3 percentage points. The penalty implemented with the 2004 reform was even smaller.

To investigate the impact of the reduction in benefit generosity, we perform two robustness tests. First, we re-estimate equation (1) with age-specific time trends, to allow treatment and comparison age groups to follow different trends. Second, we estimate a difference-in-difference regression using men with more than 45 contribution years and women with more than 40 contribution years as comparison groups. This approach allows us to isolate the effect of the increase in the ERA, because the penalty for claiming retirement benefits before the NRA depended only on age but not on work experience. Because individuals with little work experience may differ in observable and unobservable ways from those with ample work experience, we restrict the sample to individuals with at least 35 contribution years. Moreover, we focus only on men aged 60-61.5 and women aged 55-56.5 who were affected by an increase in the ERA between January 2001 and May 2004. This restriction allows us to observe affected individuals for at least 2.5 years after the increase in the ERA took effect.

This difference-in-difference comparison is implemented using the following specification:

$$y_{it} = \alpha + \theta \; Little_{it} + \lambda_t + X'_{it}\delta + \sum_{l=1997}^{2006} \gamma_l \; (d_l \times Little_{it}) + \varepsilon_{it} \qquad (2)$$

where *Little* is a dummy that is equal to 1 if an individual has too little contribution years to be exempted from the increase in the ERA and d_l is a dummy that is 1 in year l and 0 otherwise. Each coefficient γ_l measures the difference in the outcome variable of interest in year l between the treatment group and the comparison group relative to the baseline year (2000). The pre-reform interaction terms provide pretreatment specification tests, although they may capture possible anticipation effects. The post-reform interaction terms allow for an examination of the long running effects of this policy change.

The 2000 pension reform also temporarily extended the unemployment benefit duration from 1 to 1.5 years for certain birth cohorts. This extension is unlikely to exert an effect on retirement benefit claiming, but it may affect the employment response. In particular, eligible individuals could be more inclined to respond to the increase in the ERA by seeking unemployment benefits instead of remaining in employment. We will explore the impact of the unemployment benefit extension in three ways. First, since the benefit extension was only in effect until the end of 2002, we estimate equation (1) separately for the period when the extension was in effect and after it was abolished. Second, men with more than 45 contribution years and women with more than 40 contribution years were also eligible for the benefit extension, but they could still claim retirement benefits at the pre-reform ERA. Hence, the estimates of equation (2) capture the isolated impact of the increase in the ERA. Third, men born in 1942 were eligible for the benefit extension in 2002 while men born in 1943 were not. This rule allows us to examine how the unemployment benefit extension affected unemployment durations, by comparing unemployed men born in 1942 with unemployed men born in 1943. A similar strategy can be applied for women.

5 Results

5.1 Descriptive Statistics

To assess the impact of the increase in the ERA graphically, Figure 4 plots trends in retirement, employment, unemployment, disability, partial retirement, and not in labor force by age for men born in different months. The vertical lines represent the cohort-specific ERA as implemented by the 2000 and 2004 policy changes. As shown in Panel A, the fraction of retired individuals increases by around 15 percentage points at the ERA. Approximately 10 to 15 percent of the individuals still claim retirement benefits before the ERA (but after age 60) because they have accumulated enough contribution years in order to be exempted from the increase in the ERA.

The increase in retirement benefits claiming at the ERA is accompanied by a drop in employment and unemployment of almost 10 percentage points. However, for younger birth cohorts the declines in employment and unemployment occur later in life due to the increase in the ERA. Panel D suggests that the increase in the ERA had little effect on disability enrollment. Similarly, the fraction of individuals not in the labor force differs only slightly across birth cohorts, as shown in Panel F. There is evidence that some individuals responded to the increase in the ERA by enrolling in the partial retirement scheme (Panel E).

Figure 4

Figure 5 presents labor market trends for women born in different months. As shown in Panel A, the fraction of women claiming retirement benefits rises by around 30 percent at the ERA which is roughly twice as large as for men. Panel B suggests that a significant share of women responded to the policy change by staying in employment as for younger birth cohorts the drop in employment occurs at a later age. Panel C shows that a sizeable share of women

is unemployed before claiming retirement benefits. Because of the increase in the retirement age, younger birth cohorts tend to stay unemployed longer than older birth cohorts. As for men, the increase in the ERA had virtually no effect on the probability of receiving disability benefits (Panel D) or on the probability of being out of the labor force (Panel F). Panel E shows that there is an increase in enrollment in the partial retirement scheme for younger birth cohorts.

Figure 5

The difference-in-difference estimation strategy that uses individuals with a long work history as comparison group assumes that, absent the increase in the ERA, individuals with a short and long work history have comparable labor market trends. To shed light on this assumption, Figure 6 reports retirement trends for 60 to 61.5 year old men and 55 to 56.5 year old women by number of contribution years. As the Figure demonstrates, prior to 2001 trends in retirement benefits claiming are similar across groups, suggesting that individuals with many contribution years are a good counterfactual for those with less contribution years. After 2001 there is a substantial drop in retirement of around 25 percentage points among men with 35 to 45 contribution years and of almost 50 percentage points among women with 35 to 40 contribution years. There is no change in retirement for men with 45 contribution years or more and women with 40 contribution years or more because these groups were not affected by the increase in the ERA. Figure 6 also shows that a sizeable share of men and women in the treatment group still claim retirement benefits in 2005 and 2006, although in these years the ERA is already 61.5 for men and 56.5 for women. This pattern suggests that our approach to calculate the contribution years underestimates the true number of contribution years, most likely due to measurement error in the data.

Figure 6

5.2 Baseline Results

Using the model in equation (1), we first explore the impact of the increase in the ERA on retirement benefits claiming, employment and non-employment (defined as not being employed or retired). In each case the dependent variable y_{it} is a dummy, which is equal to 1 if an individual is in the state in question and 0 otherwise. Table 2 shows OLS estimates for our key explanatory variable *Below*. Columns 1 through 4 provide results for men and columns 5 through 8 display analogous results for women.

Column 1 of Panel A indicates that the increase in the ERA reduced retirement benefits claiming among affected men by 18.63 percentage points, or 46.5 percent of the baseline retirement rate of 60-62.25 year old men in 2000. Column 1 of Panel B shows that this decline was accompanied by an increase in employment of 7.33 percentage. At the same time, the share of affected men not employed increased by 11.3 percentage points, as illustrated in column 1 of Panel C. Column 2 of Table 2 indicates that adding control variables to equation (2) has only minor effect on the estimates. These estimates will be biased if the treatment and comparison groups have different labor supply tendencies. To shed light on this concern, we add age-specific time trends to the baseline specification. The implied estimates are largely insensitive to these additional controls, as illustrated in column 3 of Table 2. Column 4 shows estimates if we restrict attention to men with more than 45 contribution years. Although some coefficients are significant, the magnitude is small, suggesting that our estimation strategy is not simply picking up long-run trends in differences across age groups.

Turning to the results for women, column 5 of Panel A demonstrates that the increase in the ERA reduced retirement benefits claiming among affected women by 23.9 percentage points. This decline amounts to 50 percent of the baseline retirement rate among 55-57.25 year old women in 2000. As shown in column 5 of Panel C, one direct consequence of the decline in retirement

benefits claiming was an increase in employment of 10.47 percentage points. Similarly, there is a 13.43 percentage points increase in the share of women not employed (column 5 of Panel C). As for men, the results are very similar for the various specifications such as adding individual characteristics (column 6) and controlling for age-specific time trends (column 7). Column 8 presents estimates if we restrict the sample to women with 40 contribution years or more. Some coefficients are significant, but they are all small in size.

Table 2

The next set of results, summarized in Table 3, investigates how the increase in the ERA affected enrollment into other social insurance programs. Columns 1 through 4 report coefficient estimates of our key explanatory variable *Below* in equation (1) for men and the next four columns display the analogous estimates for women. Here the dependent variable y_{it} is a dummy, which is equal to 1 if an individual is in the state in question and 0 otherwise.

Consistent with the graphical analysis, column 1 of Panel A shows that registered unemployment increased by 9.49 percentage points among affected men. On the other hand, the increase in the ERA had little impact on disability enrollment, as shown in Panel B. One possible explanation for the low disability response is that the application process for disability benefits is time consuming. Therefore, disability enrollment varies little in the short-term. The long-term response on disability enrollment is likely to be larger. Column 1 of Panel C indicates that this policy change increased enrollment into the partial retirement scheme increased by 1.14 percentage points. Also there was an increase in the share of men not in the labor force by 0.98 percentage points, as illustrated in column 1 of Panel D. Columns 2 and 3 show that these results are very robust to different specifications. Column 4 illustrates that the coefficient estimates are largely insignificant if we restrict the sample to men with 45 contribution years or more.

Turning to the results for women, column 5 of Panel A illustrates that, as for men, the rise in the ERA led to a substantial increase in registered unemployment of 9.75 percentage points and had virtually no effect on disability enrollment (column 5 of Panel B). As column 5 of Panel C demonstrates, enrollment in the partial retirement scheme increased by 2.43 percentage points among affected women, which is roughly twice as large as the corresponding estimate for men. This difference could be attributed to the age difference between affected women and men. This policy change also led to a small increase the share of women who are not in the labor force, as shown in column 5 of Panel D. Adding control variables leads to a larger estimate of the increase in the ERA on registered unemployment (columns 6 and 7 of Panel A) and reduces the estimated impact on enrollment into the partial retirement scheme (columns 6 and 7 of Panel C). As for men, column 8 illustrates that the estimates are small in size and mostly insignificant if we restrict attention to women with more than 40 contribution years.

Table 3

The effects shown in Tables 2 and 3 can result either from 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, Table 4 reports estimates from equation (1) for transitions from and persistence in employment and unemployment. We focus on these two states because they were affected most by the increase in the ERA. Column 1 of Panel A suggests that among men the increase in the ERA reduced direct exits from employment into retirement by 26.69 percentage points. This decline was compensated by a one to one increase in employment persistence, as illustrated in column 2 of Panel A. On the other hand, columns 3 to 6 of Panel A indicate that this policy change had only minor effects on transitions from employment into unemployment, disability, partial retirement, or out of labor force. Panel B summarizes the results for transitions

from and persistence in unemployment among men. As column 1 of Panel B demonstrates, there is a sizeable decline in transitions from unemployment to retirement by 79 percentage points. As in the case of employment, the decline in retirement benefits claiming was absorbed by an increase in unemployment persistence (column 3 of Panel B), while leaving transitions to other exit states largely unaffected.

The analogous estimates for women are summarized in Panels C and D of Table 4. The estimated decline in transitions from employment to retirement of 12.61 percentage points summarized in column 1 of Panel C is half as large as the corresponding estimate for men. As for men, the rise in the ERA increased persistence in employment by 12.27 percentage points but had no effect on transitions to other states. The estimates in Panel D illustrate that the increase in the ERA reduced the probability of a transition form unemployment to retirement (column 1) and increased the persistence in unemployment (column 3).

Table 4

5.3 Subsample Analysis

Tables 5 to 7 present estimates of the effects from the increase in the ERA for different subgroups of individuals. Because disutility of work may increase over age, it is instructive to examine the impact of the increase in the ERA for different age groups separately. OLS estimates of equation 1 for three different age groups are provided in Table 5. In each case the sample is restricted to the time period over which the increase in the ERA was phased-in for the age group of interest.

Panel A shows that this policy change was much more effective in reducing retirement benefits claiming at younger ages compared to older ages. One possible explanation is that if the ERA is higher, individuals have more time to accumulate contribution time. Thus, individuals are more likely to have suffi-

cient contribution years to be exempted from the increase in the ERA. Panel B illustrates that the rise in the ERA increased employment in all age groups, but the magnitude is almost twice as large for the youngest age group compared to the oldest age group. The estimates in Panel C illustrate that approximately 50 percent of the decline in retirement was compensated by an increase in registered unemployment, although in absolute terms the effect is larger for younger ages compared to older ages. The increase in the ERA for the first and, to some extend, the second age group was accompanied by a temporary extension of unemployment benefits from 1 to 1.5 years. The constant relative increase in registered unemployment across age groups suggests that the temporary extension of unemployment benefits had only a small impact on behavior. Panels D to F of Table 5 consider the effect of the increase in the ERA on disability enrollment, partial retirement, and out of labor force. The estimated coefficients indicate a modest effect on the share of individuals in these states.

Table 5

Previous studies have documented that health (e.g., Dwyer and Mitchell, 1999; McGarry, 2004) and previous job characteristics (e.g. Hurd and McGarry, 1993) are important determinants of the retirement decision. To examine the importance of these factors, Table 6 reports OLS estimates of equation (1) by health and occupational status (blue- versus white-collar). An individual is defined as healthy if he or she has not spent any time in sick leave in the past 2 years. Individuals with positive sick leave days in the past 2 years are defined as unhealthy.

Columns 1 and 2 of Panel A in Table 6 indicate that the reduction in retirement after the increase in the ERA was disproportionately large among male white-collar workers. For this group the probability of claiming retirement benefits decreased by 23.6 percentage points, compared to 14.4 percentage points for male blue-collar workers. However, the pre-reform retirement rate among male

white-collar workers is almost double that of male blue-collar workers, because blue-collar workers are more likely to exit the labor market through the disability insurance program. As illustrated in columns 5 and 6 of Panel A, the effects are very similar for female blue-collar and female white-collar workers, although in relative terms the effect is larger for female blue-collar workers. Interestingly, while for men the decline in retirement is more pronounced for healthy relative to unhealthy individuals (columns 3 and 4 of Panel A), the opposite pattern emerges for women (columns 7 and 8 of Panel A). This difference is attributable to a relaxation in eligibility for disability benefits at age 55, which induces unhealthy men to leave the labor force through the disability insurance program prior to the ERA.

As Panel B demonstrates, for both men and women around one third of the decline in retirement is compensated by an increase in employment. The effect is even larger for healthy individuals. For this group roughly half of the decline in retirement is compensated by an increase in employment. Panel C shows that the rise in the ERA increased registered unemployment for all subgroups. Measured relative to the decrease in retirement, the increase in unemployment is larger for unhealthy individuals and blue-collar workers. As Panel D demonstrates, there is a relatively modest increase in disability enrollment after the increase in the ERA. Specifically, depending on the subgroup disability enrollment increases by 0.1 to 1.1 percentage points among men and by 0.5 to 1.8 percentage points among women. Panel E suggests that the rise in the ERA increased participation in the partial retirement scheme except for men that are unhealthy or have worked in blue-collar jobs. But the size of the increase is small compared to the impact of this policy change on employment and unemployment. As Panel F shows, the rise in the ERA is also associated with an increase in the fraction of individuals not in the labor force, particularly among white-collar workers and healthy individuals.

Table 6

To further explore the heterogeneity in the effects of the increase in the ERA, individuals are grouped into quartiles based on their average earnings of the best 15 years. Then we estimate equation (1) separately for each quartile of the earnings distribution. The results of this estimation are documented in Table 7. Panel A shows that after the increase in the ERA retirement decline in all quartiles of the earnings distribution. The magnitude of the estimates is larger for higher quartiles, particularly among men. For example, in the top quartile retirement declined by 26.04 percent for men and 24.90 percent for women, which are twice as large as the corresponding estimates for men and women in bottom quartile. However, measured relative to the pre-reform mean the decline in retirement is larger for individuals at the lower end of the earnings distribution.

As Panel B demonstrates, approximately one third of the decline in retirement is compensated by an increase in employment. The employment response is slightly larger for men and women in the top quartile of the earnings distribution. Panel C shows that the rise in the ERA is also associated with a substantial increase in registered unemployment. The estimates tend to be larger for individuals at the top of the earnings distribution, but the differences across quartiles are relatively small compared to the differences in the employment response. As illustrated in Panel D, we find that the increase in the ERA had little impact on disability enrollment, which is in line with the estimate for the full sample reported in Table 3. Panel E indicates that enrollment in the partial retirement scheme increased for women and men at the top of the earnings distribution and remained almost unchanged for those at the bottom. Panel F shows that among men in the higher earnings quartiles and among women there was a slight increase in the share of individuals not in the labor force.

Table 7

5.4 Further Robustness Tests

Both the 2000 and 2004 pension reforms increased the penalty for claiming retirement benefits before the NRA. The 2000 pension reform also temporarily extended the unemployment benefit duration from 1 to 1.5 years for certain birth cohorts. One possible concern with the first set of estimates is that these changes affected the labor supply behavior of younger and older individuals differently. To shed light on this issue, Figure 6 plots the estimated coefficients of the interaction terms from equation (2), which uses men with more than 45 contribution years and women with more than 40 contribution years as comparison groups. Each dot on the solid line captures the difference in the outcome variable in the treatment group relative to the comparison group in a given year relative to the baseline year (2000). This approach allows us to isolate the impact of the increase in the ERA, because individuals in the comparison group were also affected by the other elements of the 2000 and 2004 pension reforms with exception of the increase in the ERA. The analysis focuses on men aged 60-61.5 and women aged 55-56.5 who have at least 35 contribution years. The age restriction allows us to observe individuals for at least 2.5 years after the increase in the ERA took effect (June 2004 - October 2006).

Figure 7

The estimates are qualitatively similar to those presented in Tables 2 and 3, but they differ somewhat in size. As Figure 6 shows, the estimated coefficients fluctuate around 0 before 2001 when the first two-month increment of the ERA became effective. This pattern suggests that the identification strategy is not simply picking up pre-existing trends between the treatment and the comparison group. Panel A demonstrates that the fraction of 60 to 61.5 year old men claiming retirement benefits start to decline after the 2000 pension reform becomes effective. In 2005 and 2006 retirement is around 20 percentage points below the pre-reform level, which is slightly higher than the estimated effect

for the full sample. Among 55 to 56.5 year old women there is 40 percentage point decline in retirement after the 2001 policy change is implemented. This estimate is around 15 percentage points higher than for the full sample, because the full sample contains many women with insufficient contribution years to be eligible for retirement benefits who are not affected by the increase in the ERA.

As Panel B illustrates, around half of the decline in retirement is compensated by a rise in employment. Specifically, employment increased by around 10 percentage points among men and 20 percentage points among women. Similarly, there is an increase in registered unemployment after the increase in the ERA of approximately 6 percentage points, which is 3 to 5 percentage points below the estimated effect for the full sample. Panel D shows that the rise in the ERA led to more disability enrollment, particularly among men. However, this effect diminishes over time. As Panel E demonstrates, there is a substantial increase in enrollment into the partial retirement scheme after the 2000 policy reform becomes effective with the effect being approximately twice as large for women compared to men. This pattern is consistent with the estimates shown in Table 3, although the documented increase in partial retirement in Table 3 is smaller in magnitude. Panel F indicates that the rise in the ERA also led to an increase in the fraction of individuals who are not in the labor force.

The extension of unemployment benefits from 1 to 1.5 years was only in effect until 2002 and only certain birth cohorts were eligible. More specifically, in 2002 men born in 1942 with 15 employment years in the past 25 years could claim benefits for 1.5 years while those born in 1943 could only claim unemployment benefits for 1 year. To further explore the impact of the unemployment benefits extension, we can therefore compare job seekers in 2002 who are born in 1942 with those who are born in 1943 using a regression discontinuity design. We can use an analogous approach for women, because in 2002 women born in 1947 with 15 employment years in the past 25 years were eligible for the extended benefits while those born in 1948 were not.

Table 8 displays the coefficients (with robust standard errors in parentheses) form regressing the unemployment duration on a dummy for being eligible for the benefit extension. Columns (1) to (3) provide results for men and the next three columns display the analogous results for women. The estimates in columns (1) and (4) include a linear birth cohort trend and a linear birth cohort trend interacted with a dummy for being eligible for the benefit extension. Columns (2) and (5) add quadratic birth cohort trends and columns (3) and (6) add cubic birth cohort trends (always interacted with a dummy for being eligible for the benefit extension). The coefficients are insignificant in all specifications, suggesting that the extended benefits did not affect the unemployment duration.

Table 8

6 Conclusion

Relying on two policy changes in Austria, this paper analyzed the impact of an increase in the ERA on the labor supply of older workers. Austria is characterized by an extremely low labor force participation rate of older workers as compared to other industrialized countries. Only 42 percent of men and 29 percent of women aged 55-64 are employed or actively seeking for work. With the goal of fostering employment and improving the fiscal health of the public pension system, in 2000 and 2004 the Austrian government implemented a series of changes to the public pension system. The most significant change brought about by this legislation was a gradual increase in the retirement age from 55 to 57.2 for women and from 60 to 62.2 for men.

Using data on the universe of Austrian private-sector workers, the empirical analysis suggests that an increase in the ERA has a significant impact on employment. Specifically, employment increased by 7 percentage points among affected men and by 10 percentage points among affected women. The empirical analysis also suggests that an increase in the ERA may affect enrollment

in other government programs which provide income replacement in the event of separation from the labor market for economic or health reasons. In this case, the share of individuals receiving unemployment benefits increased by 10 percentage points among men and by 11 percentage points among women.

The public pension programs are large and growing in most industrialized countries. Understanding how changes in the program parameters affect labor supply is extremely important for policy makers. One way to control the size and growth of public pension programs is through an increase in the ERA. The estimates presented in this paper suggest that this measure is effective in increasing employment, despite large absorption effects by the unemployment insurance. The Austrian labor market is characterized by relatively high unemployment rate of older workers. Thus, the large increase in the unemployment rate may reflect unfavorable labor market conditions of older workers. In a more flexible labor market, such as in the U.S. for example, increasing the ERA is likely to have a smaller impact on unemployment.

References

Autor, David H. and Mark G. Duggan (2003): The Rise in the Disability Rolls and the Decline in Unemployment, *Quarterly Journal of Economics*, Vol. 118, pp. 157 – 206.

Bloemen, Hans, Stefan Hochguertel, and Marloes Lammers (2011): Job Search Requirements for Older Unemployed: Transitions to Employment, Early Retirement and Disability Benefits, *IZA DP*, Vol. 544, pp. 1–49.

Borghans, Lex, Anne C. Gielen, and Erzo F.P. Luttmer (2010): Social Support Shopping: Evidence from a Regression Discontinuity in Disability Insurance Reform, *IZA DP No. 5412*.

Burtless, Gary (1986): Social Security, Unanticipated Benefit Increases, and the Timing of Retirement, *The Review of Economic Studies*, Vol. 53, No. 5, pp. 781–805.

Coile, Courtney C. and Jonathan Gruber (2007): Future Social Security Entitlements and the Retirement Decision, *The Review of Economics and Statistics*, Vol. 89, No. 2, pp. 234–246.

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.

Dwyer, Debra S. and Olivia S. Mitchell (1999): Health problems as determinants of retirement: are self-rated measures endogenous?, *Journal of Health Economics*, Vol. 18, pp. 173–193.

Gruber, Jonathan and David A. Wise (Eds.) (1999): Social Security and Retirement around the World, University of Chicago Press.

Gruber, Jonathan and David A. Wise (Eds.) (2004): Social Security Programs and Retirement Around the World: Micro Estimation, University of Chicago Press.

Gruber, Jonathan and David A. Wise (Eds.) (2007): Social Security Programs and Retirement around the World: Fiscal Implications of Reform, University of Chicago Press.

Hurd, Michael and Kathleen McGarry (1993): The Relationship Between Job Characteristics and Retirement, *NBER Working Paper No. 4558*.

Inderbitzin, Lukas, Stefan Staubli, and Josef Zweimüller (2011): Unemployment Insurance, Disability Insurance and the Early-Retirement Decision, *mimeo, University of St. Gallen and University of Zurich.*

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, pp. 2071–82.

Krueger, Alan B. and Jorn-Steffen Pischke (1992): The Effect of Social Security on Labor Supply: A Cohort Analysis of the Notch Generation, *Journal of Labor Economics*, Vol. 10, pp. 412–437.

Liebman, Jeffrey B., Erzo F.P. Luttmer, and David G. Seif (2009): Labor supply responses to marginal Social Security benefits: Evidence from discontinuities, *Journal of Public Economics*, Vol. 93, pp. 1208–1223.

Manoli, Dayanand and Andrea Weber (2010): Intertemporal Substitution in Labor Force Participation: Evidence from Policy Discontinuities, *IZA DP No. 5248*.

Mastrobuoni, Giovanni (2009): Labor supply effects of the recent social security benefit cuts: Empirical estimates using cohort discontinuities, *Journal of Public Economics*, Vol. 93, pp. 1224–1233.

McGarry, Kathleen (2004): Health and retirement: do changes in health affect retirement expectations?, *Journal of Human Resources*, Vol. 39, No. 3, pp. 624–648.

OECD (2011): Pensions at a Glance 2011, Tech. report., Organisation for Economic Co-operation and Development.

Panis, Constatijn, Michael Hurd, David Loughran, Julie Zissimopoulos, Steven Haider, and Patricia StClair (2002): The Effects of Changing Social Security Administration's Early Entitlement Age and the Normal Retirement Age, *report for the SSA, RAND.*

Rust, John and Christopher Phelan (1997): How Social Security and Medicare Affect Retirement Behavior In a World of Incomplete Markets, *Econometrica*, Vol. 65, No. 4, pp. 781–831.

Samwick, Andrew A. (1998): New evidence on pensions, social security, and the timing of retirement, *Journal of Public Economics*, Vol. 70, pp. 207–236.

Schwarz, Anita M. and Asli Demirguc-Kunt (1999): Taking Stock of Pension Reforms Around the World, *World Bank, Social Protection Discussion Paper Series 9917.*

Staubli, Stefan (2011): The Impact of Stricter Criteria for Disability Insurance on Labor Force Participation, *forthcoming, Journal of Public Economics.*

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.*

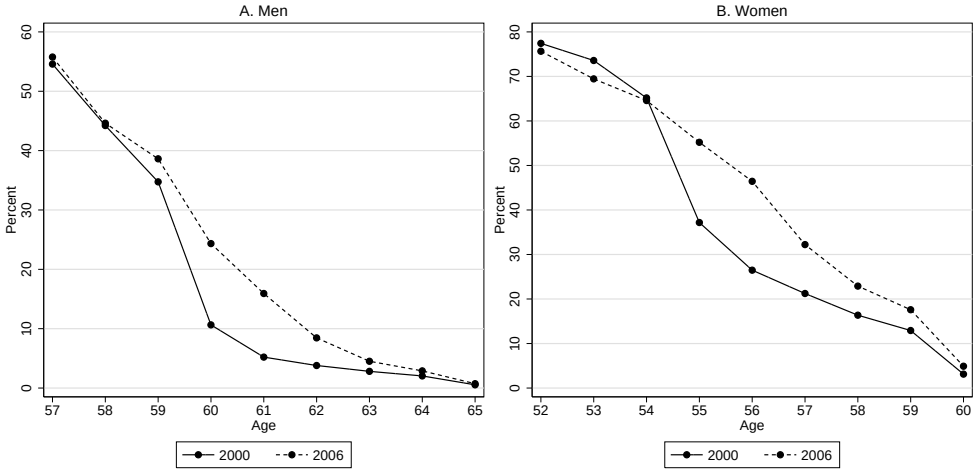

Figure 1: Percentage of men and women working by age in 2000 and 2006.
Source: Own calculations, based on Austrian Social Security Data.

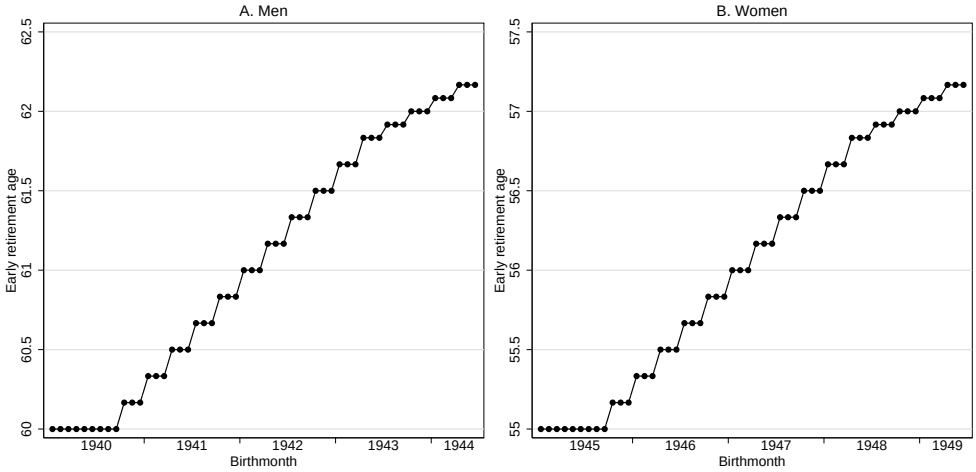

Figure 2: Increase in the minimum retirement age by gender.
Source: Austrian federal laws (Bundesgesetzblätter) no. 92/2000, 71/2003.

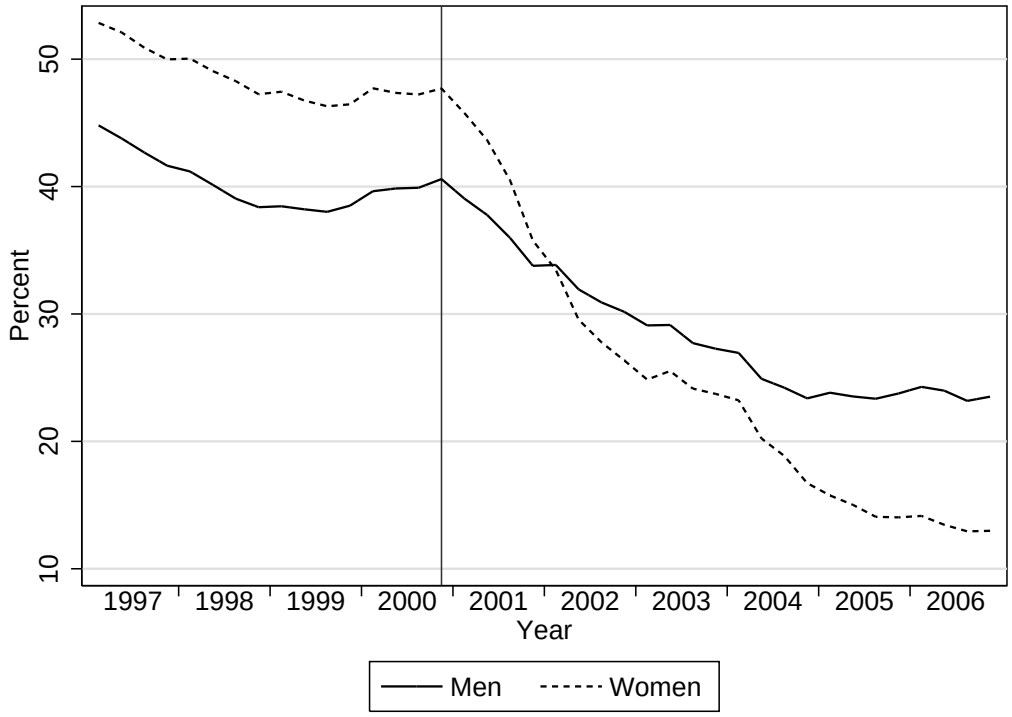

Figure 3: Percentage of men aged 60-62.17 and women aged 55-57.17 claiming retirement benefits by year.
Source: Own calculations, based on Austrian Social Security Data.

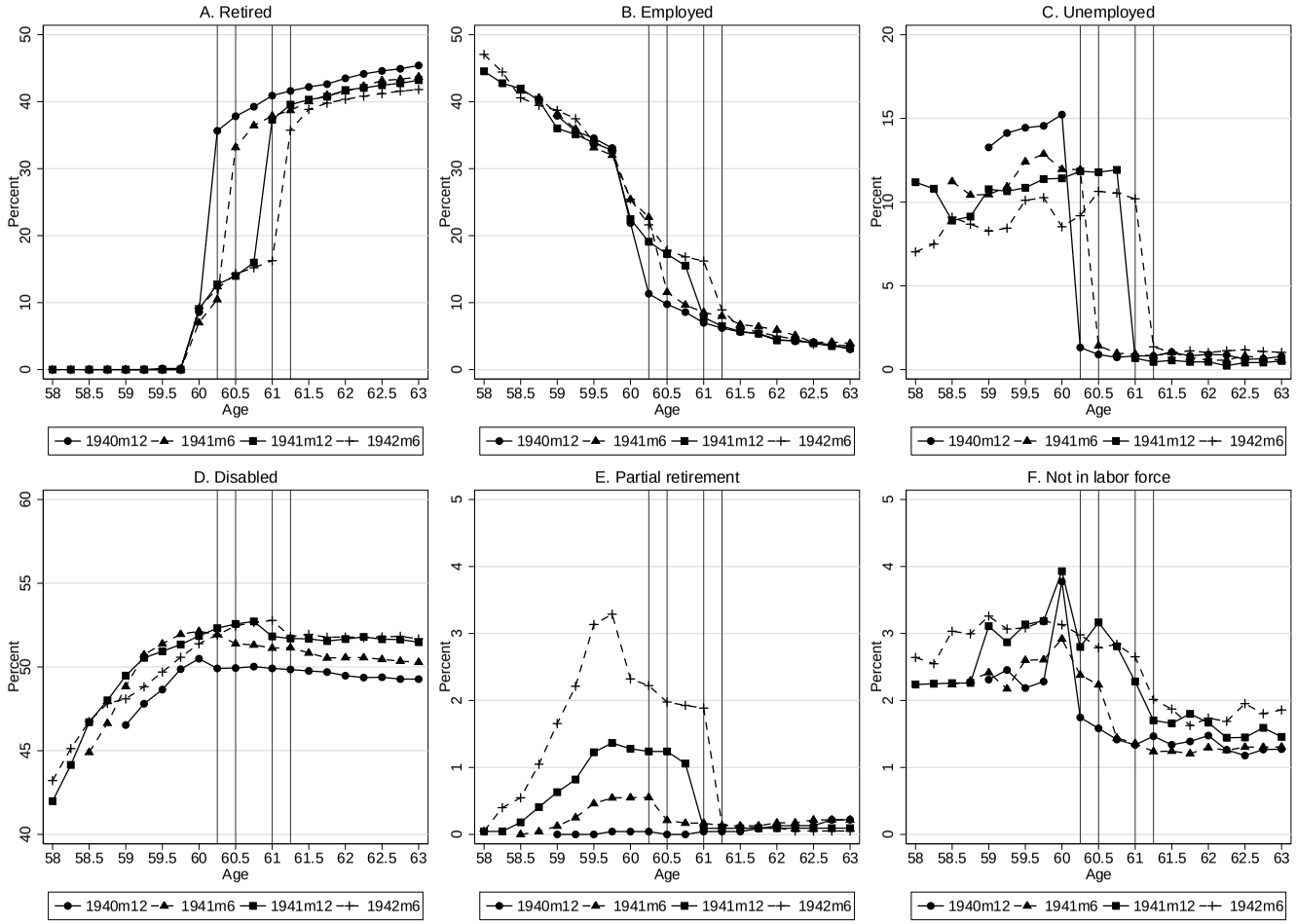

Figure 4: Trends in different states for men born in different months

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

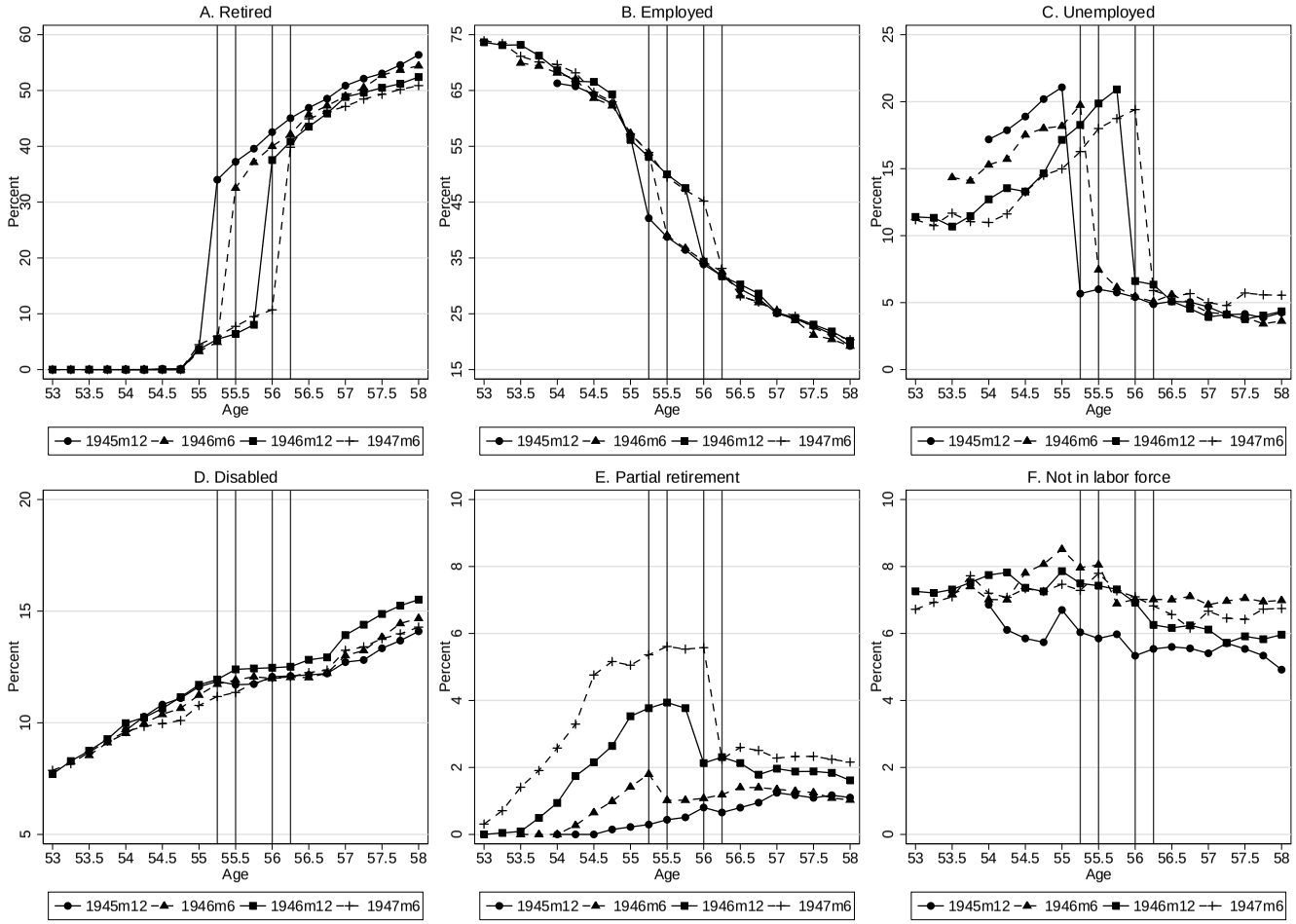

Figure 5: Trends in different states for women born in different months
Source: Own calculations, based on Austrian Social Security Data.

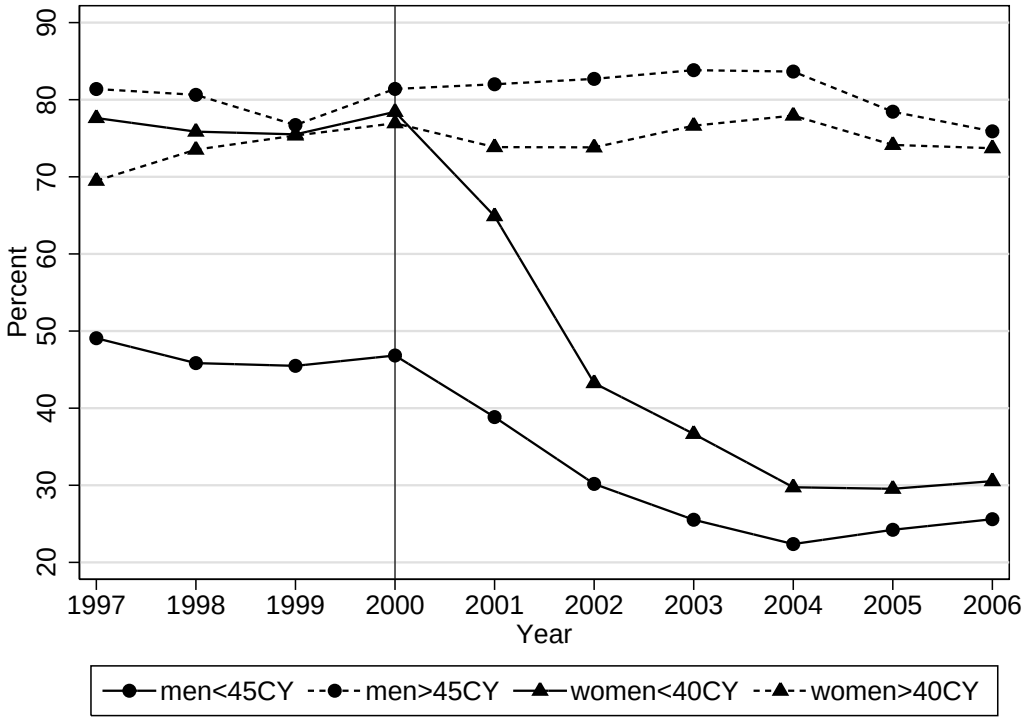

Figure 6: Percentage of men aged 60-61.5 and women aged 60-61.5 claiming retirement benefits by year and work experience.
Source: Own calculations, based on Austrian Social Security Data.

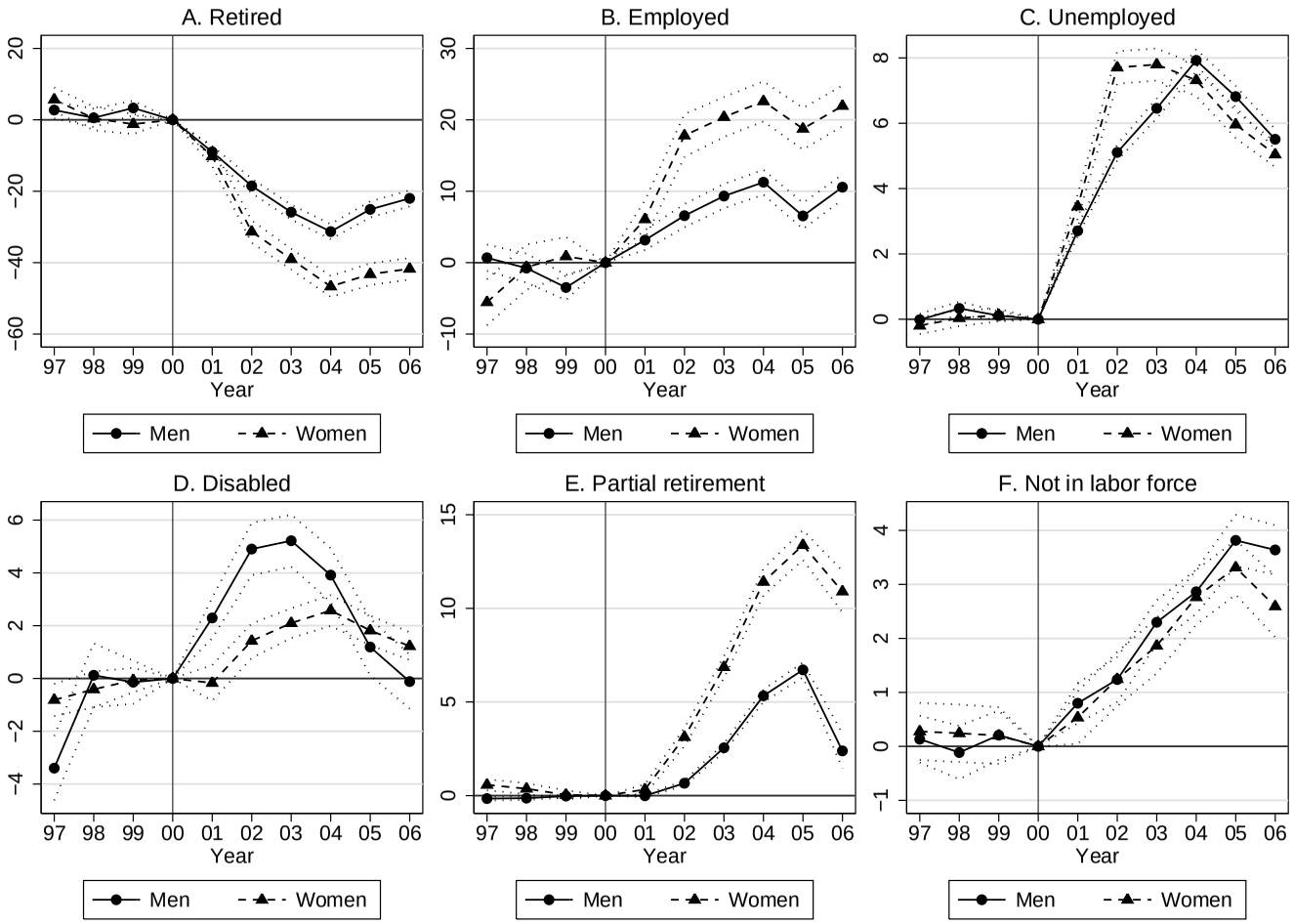

Figure 7: Coefficients of the interaction year × treatment in equation (2) for different states, with 95-percent confidence interval
Source: Own calculations, based on Austrian Social Security Data.

Table 1: Sample statistics for men aged 60-62.25 and women aged 55-57.25 by year

	Men				Women			
	2000	2002	2004	2006	2000	2002	2004	2006
A. Labor market states (%)								
Retirement	40.1	32.7	26.2	25.3	48.0	30.9	21.9	15.0
Employment	6.7	10.2	14.3	17.4	29.2	38.9	41.8	47.9
Unemployment	0.8	3.8	6.8	7.9	4.3	9.5	10.9	10.9
Disability	51.4	50.9	46.9	41.0	13.1	12.3	12.5	11.7
Partial retirement	0.0	0.5	3.0	4.8	0.0	1.8	6.0	7.1
Not in labor force	1.1	1.8	2.8	3.7	5.4	6.6	7.0	7.4
B. Background characteristics								
Blue collar	0.563	0.542	0.537	0.559	0.405	0.427	0.437	0.455
Sick days	6.1	6.3	7.5	7.4	13.4	15.5	14.3	12.8
Experience	19.3	19.1	19.1	19.1	17.8	17.6	17.8	17.8
Insurance years	38.5	38.8	38.8	38.7	29.7	29.5	29.8	29.7
Annual earnings	30,222	30,914	31,113	31,327	21,233	20,855	21,210	21,594
Average earnings	30,514	31,521	32,179	32,478	20,893	20,872	21,265	21,593
Number of observations	241,941	263,173	223,827	192,017	219,914	207,436	251,873	240,652

Notes: "Experience" denotes experience in the last 25 years, "sick days" is the sum of days spent in sick leave in the last 2 years, and "average earnings" is the average annual earnings over the best 15 years. Annual earnings and average earnings are adjusted for inflation.

Table 2: Effects on retirement, employment, and non-employment

	Men				Women			
	No controls	With controls	Age × time trends	At least 45 CY	No controls	With controls	Age × time trends	At least 40 CY
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
A. Retired								
Below	-18.63***	-18.40***	-18.45***	-1.68***	-23.90***	-22.40***	-22.57***	-1.95**
	(0.20)	(0.16)	(0.17)	(0.54)	(0.20)	(0.17)	(0.18)	(0.77)
R^2	0.061	0.319	0.319	0.305	0.165	0.372	0.372	0.329
Mean	40.08	40.08	40.08	82.67	48.04	48.04	48.04	78.48
B. Employed								
Below	7.33***	6.16***	6.33***	1.35***	10.47***	8.79***	8.60***	1.09
	(0.13)	(0.11)	(0.12)	(0.52)	(0.19)	(0.15)	(0.17)	(0.76)
R^2	0.046	0.194	0.194	0.342	0.054	0.223	0.223	0.316
Mean	6.73	6.73	6.73	14.96	29.16	29.16	29.16	20.48
C. Not employed								
Below	11.30***	12.24***	12.12***	0.33	13.43***	13.61***	13.97***	0.87***
	(0.19)	(0.14)	(0.16)	(0.21)	(0.19)	(0.16)	(0.18)	(0.24)
R^2	0.010	0.385	0.385	0.041	0.026	0.213	0.213	0.043
Mean	53.19	53.19	53.19	2.37	22.80	22.80	22.80	1.03
Obs.	1,646,691	1,646,691	1,646,691	91,851	1,604,993	1,604,993	1,604,993	53,281

Notes: This Table displays 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. Controls are experience and its square, blue-collar status, insurance years, annual earnings, average earnings over the best 15 years, number of sick leave days in the last 2 years, industry, region and month-of-birth. Annual earnings and average earnings are adjusted for inflation. The time period is 2000-2006. Reported means are for men aged 60-62.25 and women aged 55-57.25 in 2000. Significance levels: *** = 1%, ** = 5%, * = 10%.

Table 3: Effects on unemployment, disability, part-tim work, and not in the labor force

	Men				Women			
	No controls (1)	With controls (2)	Age × time trends (3)	At least 45 CY (4)	No controls (5)	With controls (6)	Age × time trends (7)	At least 40 CY (8)
A. Unemployed								
Below	9.48***	9.84***	9.92***	0.04	9.75***	10.83***	11.13***	0.12*
	(0.11)	(0.11)	(0.12)	(0.03)	(0.13)	(0.13)	(0.14)	(0.06)
R^2	0.044	0.105	0.105	0.002	0.022	0.120	0.120	0.005
Mean	0.77	0.77	0.77	0.01	4.27	4.27	4.27	0.03
B. Disabled								
Below	-0.30*	0.82***	0.64***	-0.08	0.39***	0.48***	0.66***	-0.05
	(0.16)	(0.09)	(0.11)	(0.11)	(0.11)	(0.08)	(0.09)	(0.08)
R^2	0.006	0.378	0.378	0.034	0.001	0.089	0.089	0.006
Mean	51.35	51.35	51.35	1.16	13.12	13.12	13.12	0.19
C. Partial retirement								
Below	1.14***	0.77***	0.83***	0.39***	2.43***	1.51***	1.48***	0.93***
	(0.05)	(0.05)	(0.05)	(0.09)	(0.07)	(0.07)	(0.07)	(0.17)
R^2	0.029	0.066	0.066	0.104	0.031	0.081	0.081	0.055
Mean	0.00	0.00	0.00	0.00	0.03	0.03	0.03	0.03
D. Not in labor force								
Below	0.98***	0.81***	0.72***	-0.03	0.87***	0.79***	0.70***	-0.13
	(0.06)	(0.05)	(0.06)	(0.15)	(0.09)	(0.07)	(0.07)	(0.15)
R^2	0.006	0.038	0.038	0.019	0.001	0.255	0.255	0.031
Mean	40.08	40.08	40.08	82.67	5.37	5.37	5.37	0.78
Obs.	1,646,691	1,646,691	1,646,691	91,851	1,604,993	1,604,993	1,604,993	53,281

Notes: This Table displays coefficients from a linear proability 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. Controls are experience and its square, blue-collar status, insurance years, annual earnings, average earnings over the best 15 years, number of sick leave days in the last 2 years, industry, region and month-of-birth. Annual earnings and average earnings are adjusted for inflation. The time period is 2000-2006. Reported means are for men aged 60-62.25 and women aged 55-57.25 in 2000. Significance levels: *** = 1%, ** = 5%, * = 10%.

Table 4: Effect on transitions from employment and unemployment by gender

Transition to:	Retired	Employed	Unemployed	Disabled	Partial retirement	Not in labor force
	(1)	(2)	(3)	(4)	(5)	(6)
Men						
A. Employed						
Below	-26.69***	26.05***	1.75***	0.21**	0.09**	-1.41***
	(0.40)	(0.43)	(0.14)	(0.08)	(0.04)	(0.13)
R^2	0.116	0.099	0.055	0.035	0.005	0.009
Obs.			176,441			
B. Unemployed						
Below	-79.90***	1.03***	78.68***	0.06	0.01	0.12
	(0.55)	(0.22)	(0.59)	(0.13)	(0.01)	(0.13)
R^2	0.619	0.080	0.433	0.019	0.001	0.015
Obs.			71,175			
Women						
C. Employed						
Below	-12.61***	12.27***	0.80***	0.02	-0.02	-0.45***
	(0.16)	(0.19)	(0.09)	(0.04)	(0.04)	(0.06)
R^2	0.084	0.071	0.046	0.023	0.005	0.013
Obs.			565,728			
D. Unemployed						
Below	-52.80***	0.34*	51.79***	0.32***	-0.01	0.36***
	(0.41)	(0.20)	(0.47)	(0.11)	(0.01)	(0.13)
R^2	0.348	0.094	0.186	0.024	0.001	0.016
Obs.			130,990			

Notes: This 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 control for experience and its square, blue-collar status, insurance years, annual earnings, average earnings over the best 15 years, number of sick leave days in the last 2 years, industry, region, month-of-birth and cohort-specific time trends. Annual earnings and average earnings are adjusted for inflation. The time period is 2000-2006. Significance levels: *** = 1%, ** = 5%, * = 10%.

Table 5: Estimates for different periods

	Men			Women		
Δ ERA:	60 to 60.67	60.75 to 61.5	61.58 to 62.17	55 to 55.67	55.75 to 56.5	56.58 to 57.17
Ages:	60-60.75	60.75-61.58	61.58-62.25	55-55.75	55.75-56.5	56.5-57.25
Quarters:	Jan 00-Jul 02	Jul 02-Jul 04	Apr 04-Oct 06	Jan 00-Jul 02	Jul 02-Jul 04	Jul 04-Oct 06
	(1)	(2)	(3)	(4)	(5)	(6)
A. Retired						
Below	-21.39***	-18.46***	-12.18***	-23.61***	-24.09***	-13.65***
	(0.35)	(0.36)	(0.34)	(0.39)	(0.35)	(0.31)
R^2	0.314	0.312	0.330	0.353	0.340	0.361
Mean	37.86	41.77	41.52	40.93	49.44	54.07
B. Employed						
Below	7.60***	7.44***	4.26***	9.28***	8.32***	5.55***
	(0.30)	(0.29)	(0.24)	(0.45)	(0.38)	(0.34)
R^2	0.213	0.216	0.192	0.224	0.206	0.212
Mean	9.03	5.62	4.34	35.95	27.87	23.35
C. Unemployed						
Below	12.20***	9.84***	7.12***	13.68***	12.69***	6.72***
	(0.26)	(0.25)	(0.21)	(0.38)	(0.31)	(0.25)
R^2	0.104	0.100	0.102	0.106	0.125	0.140
Mean	0.86	0.73	0.67	5.16	4.23	3.37
D. Disabled						
Below	0.99***	0.59*	0.33	0.20	-0.10	-0.09
	(0.30)	(0.32)	(0.30)	(0.27)	(0.24)	(0.24)
R^2	0.390	0.376	0.377	0.075	0.086	0.104
Mean	50.88	51.04	52.67	12.09	13.21	14.17
E. Partial retirement						
Below	0.08	1.66***	0.65***	0.10	2.75***	1.08***
	(0.06)	(0.12)	(0.07)	(0.11)	(0.17)	(0.13)
R^2	0.019	0.043	0.018	0.034	0.062	0.042
Mean	0.00	0.00	0.00	0.04	0.03	0.03
F. Not in labor force						
Below	0.61***	0.59***	0.46***	0.35	0.42**	0.38**
	(0.14)	(0.14)	(0.14)	(0.22)	(0.18)	(0.18)
R^2	0.035	0.034	0.033	0.252	0.268	0.268
Mean	1.37	0.85	0.80	5.84	5.22	5.02
Obs.	266,712	209,914	175,360	202,639	213,471	200,366

Notes: This Table displays 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 control for experience and its square, insurance years, annual earnings, average earnings over the best 15 years, industry, region, month-of-birth, and cohort-specific time trends. Reported means are for the year 2000. Significance levels: *** = 1%, ** = 5%, * = 10%.

Table 6: Estimates for subsamples: skill and health

	Men				Women			
	Blue-collar	White-collar	Unhealthy	Healthy	Blue-collar	White-collar	Unhealthy	Healthy
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
A. Retired								
Below	-14.39***	-23.24***	-15.13***	-24.67***	-21.05***	-23.72***	-24.94***	-19.70***
	(0.21)	(0.28)	(0.20)	(0.33)	(0.26)	(0.25)	(0.25)	(0.27)
R^2	0.300	0.291	0.314	0.269	0.346	0.379	0.367	0.386
Mean	28.63	54.86	29.36	59.79	40.21	53.40	47.46	48.64
B. Employed								
Below	4.86***	8.03***	4.47***	9.92***	7.62***	9.35***	8.66***	8.89***
	(0.15)	(0.21)	(0.13)	(0.26)	(0.25)	(0.23)	(0.22)	(0.26)
R^2	0.145	0.236	0.138	0.237	0.239	0.221	0.199	0.227
Mean	3.45	10.96	2.83	13.88	28.39	29.69	22.45	36.09
C. Unemployed								
Below	8.71***	11.33***	9.37***	10.86***	11.17***	11.09***	13.76***	7.55***
	(0.16)	(0.18)	(0.14)	(0.21)	(0.22)	(0.18)	(0.21)	(0.18)
R^2	0.111	0.105	0.101	0.097	0.127	0.108	0.097	0.055
Mean	0.95	0.54	0.74	0.83	5.57	3.38	4.71	3.81
D. Disabled								
Below	0.50***	0.86***	0.65***	0.57***	1.09***	0.33***	0.81***	0.42***
	(0.15)	(0.15)	(0.14)	(0.17)	(0.15)	(0.11)	(0.14)	(0.10)
R^2	0.294	0.355	0.336	0.210	0.088	0.087	0.116	0.028
Mean	66.14	32.27	66.38	23.74	18.06	9.75	20.33	5.69
E. Partial retirement								
Below	0.25***	1.52***	0.36***	1.72***	0.64***	2.11***	1.06***	2.03***
	(0.05)	(0.10)	(0.05)	(0.13)	(0.09)	(0.11)	(0.09)	(0.13)
R^2	0.045	0.085	0.053	0.087	0.064	0.091	0.076	0.088
Mean	0.00	0.01	0.00	0.01	0.01	0.05	0.03	0.04
F. Not in labor force								
Below	0.07	1.50***	0.28***	1.61***	0.53***	0.83***	0.65***	0.80***
	(0.06)	(0.10)	(0.06)	(0.12)	(0.12)	(0.09)	(0.10)	(0.11)
R^2	0.021	0.084	0.017	0.106	0.271	0.233	0.197	0.333
Mean	0.83	1.36	0.69	1.75	7.76	3.74	5.02	5.73
Obs.	900,070	746,621	1,082,522	564,169	696,030	908,963	877,277	727,716

Notes: This 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 control for experience and its square, insurance years, annual earnings, average earnings over the best 15 years, industry, region, month-of-birth, and cohort-specific time trends. Specifications (1), (2), (5), and (6) also control for the number of sick leave days in the last 2 years. Specification (3), (4), (7), and (8) also control for blue-collar status. Annual earnings and average earnings are adjusted for inflation. The time period is 2000-2006. Reported means are for the year 2000. Significance levels: *** = 1%, ** = 5%, * = 10%.

Table 7: Estimates by quartiles of life-time earnings

	Men				Women			
	1st quartile (1)	2nd quartile (2)	3rd quartile (3)	4th quartile (4)	1st quartile (5)	2nd quartile (6)	3rd quartile (7)	4th quartile (8)
A. Retired								
Below	-12.60***	-15.18***	-19.82***	-26.04***	-13.41***	-22.39***	-26.11***	-24.90***
	(0.28)	(0.32)	(0.35)	(0.39)	(0.27)	(0.34)	(0.36)	(0.37)
R^2	0.212	0.309	0.346	0.260	0.314	0.369	0.379	0.360
Mean	19.53	32.78	42.91	65.08	28.45	45.72	55.33	62.64
B. Employed								
Below	3.62***	5.59***	5.79***	10.16***	5.11***	7.61***	10.80***	10.21***
	(0.21)	(0.22)	(0.23)	(0.31)	(0.29)	(0.31)	(0.32)	(0.32)
R^2	0.150	0.161	0.174	0.294	0.235	0.239	0.242	0.236
Mean	5.27	3.37	3.60	14.66	31.84	28.28	28.33	28.20
C. Unemployed								
Below	8.04***	8.55***	12.25***	10.80***	6.81***	12.75***	12.36***	9.96***
	(0.24)	(0.22)	(0.25)	(0.23)	(0.26)	(0.29)	(0.26)	(0.23)
R^2	0.110	0.098	0.145	0.090	0.106	0.117	0.126	0.119
Mean	2.05	0.58	0.23	0.23	7.27	5.46	3.13	1.24
D. Disabled								
Below	0.69***	0.58***	0.67***	0.64***	0.49***	0.64***	0.32**	0.37***
	(0.24)	(0.22)	(0.22)	(0.18)	(0.19)	(0.18)	(0.16)	(0.12)
R^2	0.197	0.352	0.396	0.291	0.065	0.084	0.097	0.108
Mean	71.24	62.44	52.57	19.20	18.95	16.01	10.79	6.75
E. Partial retirement								
Treated	0.23***	0.44***	0.47***	2.18***	0.08**	0.61***	2.08***	3.55***
	(0.05)	(0.08)	(0.10)	(0.16)	(0.04)	(0.10)	(0.16)	(0.19)
R^2	0.024	0.048	0.068	0.104	0.014	0.045	0.084	0.113
Mean	0.00	0.00	0.00	0.01	0.00	0.03	0.05	0.04
F. Not in labor force								
Treated	0.02	0.03	0.63***	2.27***	0.91***	0.79***	0.56***	0.80***
	(0.10)	(0.09)	(0.10)	(0.15)	(0.18)	(0.13)	(0.10)	(0.11)
R^2	0.061	0.058	0.046	0.048	0.278	0.206	0.173	0.072
Mean	1.91	0.82	0.69	0.82	13.48	4.51	2.37	1.14
Obs.	411,604	411,741	411,662	411,684	401,199	401,281	401,249	401,264

Notes: This 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 control for experience and its square, blue-collar status, insurance years, annual earnings, average earnings over the best 15 years, number of sick leave days in the last 2 years, industry, region, month-of-birth and cohort-specific time trends. Annual earnings and average earnings are adjusted for inflation. The time period is 2000-2006. Reported means are for the year 2000. Significance levels: *** = 1%, ** = 5%, * = 10%.

Table 8: The effect of extended benefit duration on unemployment durations

	Men			Women		
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment effect	62.55	119.67	62.33	30.18	-27.37	-38.25
	(64.74)	(76.30)	(99.50)	(38.74)	(58.59)	(56.61)
Linear cohort trends	Yes	Yes	Yes	Yes	Yes	Yes
Quadratic cohort trends		Yes	Yes		Yes	Yes
Cubic cohort trends			Yes			Yes
Obs.	5,336	5,336	5,336	6,368	6,368	6,368
R^2	0.007	0.007	0.008	0.002	0.002	0.003

Notes: This Table displays the coefficients from regressing unemployment duration on a dummy for being born before 1/1/1943 (men) or 1/1/1948 (women). The male sample includes all men born in 1942 or 1943 who were unemployed on 1/1/2002 or started a new unemployment spell in 2002. The female sample includes all women born in 1947 or 1948 who were unemployed on 1/1/2002 or started a new unemployment spell in 2002. Significance levels: *** = 1%, ** = 5%, * = 10%.