

# Later Retirement and the Labor Market Re-Integration of Elderly Unemployed Workers<sup>†</sup>

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## Abstract

This paper studies the impact of raising the eligibility age of early retirement on the re-integration into the labor market of elderly unemployed workers. I exploit two Austrian pension reforms increasing the early retirement age step-wise for different quarter-of-birth cohorts. Empirical results based on Austrian administrative data reveal a substantial gender difference in how unemployed workers are affected by the policy change. While unemployed women only benefit little with shorter unemployment duration, modest higher re-employment probability as well as labor income after unemployment, unemployed men benefit in several aspects: although unemployment duration remains unaffected, re-employment chances, labor income and participation in active labor market policies significantly increase. Elderly unemployed workers closer to their early retirement age are systematically assigned to programs increasing their job application and job search skills, while workers more than five years away from their early retirement age are more likely to participate in programs increasing their skills. The gender difference may be explained by the nature of the pension reforms. From a policy perspective, these results suggest that increasing the early retirement age is not only a feasible way to improve the financial sustainability of public pension systems but also improves the reintegration of elderly unemployed male workers.

*JEL Classification:* J14, J26, J68

*Keywords:* pension reform, early retirement, active labor market policies, unemployment

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# 1 Introduction

A lot of societies face a demographic transition to an increasing share of older people in the population. This particularly challenges the financial sustainability of public pension systems. As a response, governments react with policies and reforms to raise the participation in the labor market of elderly workers. Such policy changes focus on offering financial incentives for longer employment or raising the eligibility age of (early) retirement. These policies, however, primarily affect a rather vulnerable group of workers with less promising labor market perspectives; the labor market participation rate of workers above 55 among OECD countries is only 73% for men as compared to 90.1% of prime-age workers in 2018. This paper uses data from Austria, where the labor participation rate of elderly workers of 63.5% is substantially below OECD average and these workers are particularly affected by long-term unemployment.<sup>1</sup>

The reintegration of unemployed elderly workers is challenging. Ichino et al. (2017) report that elderly workers also face a higher probability of a transition to early retirement in particular when they are unemployed. In this context, it is important to study and understand how raises in the (early) retirement age affect these workers. Theoretically, there are two obvious channels through which such a policy reform could affect employment prospects of elderly unemployed workers. First, Hairault et al. (2010) argue that the probability of older workers' employment is affected by the distance to retirement. A raise in the eligibility age of early retirement extends the expected time to retirement and could therefore support the reintegration of unemployed workers. Second, retirement reforms may increase the returns to (on-the-job) training for elderly workers. Standard neo-classical human capital theory would predict that later early retirement should have positive effects on human capital formation because the period in which benefits from human capital investments may materialize, is longer (Becker, 1975). Less surprisingly, training of older workers is often promoted as a policy to keep older workers employed or bring them out of unemployment (Mayhew and Rijkers, 2004).

This paper directly connects to these two channels. I study how raising the eligibility age of early retirement affects unemployment duration, the reintegration on the labor market and the participation in active labor market policies (ALMP). I exploit a natural experiment in the Austrian pension system as an exogenous variation in early retirement age. In two pension reforms, the eligibility age of early retirement was increased stepwise for different quarter-of-birth cohorts from 60 to 65 for men and 55 to 60 for women. I use comprehensive social security data and detailed data on active labor market policy

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<sup>1</sup>Data from the Austrian Public Labor Agency (AMS) show that the average unemployment duration for male workers aged 30-34, for example, is 122 days in comparison to 197 days of workers aged 55-59.

participation of unemployed people in Austria between 2000 and 2013. Based on a sample of unemployed workers due to plant closures and mass layoffs I find a significant gender gap in how workers are affected by a raise in the early retirement age. While unemployment duration is unaffected for men and lower for women, men benefit from an enforced later retirement in terms of larger re-employment probabilities and better subsequent job quality (measured by days in employment and labor income after unemployment) as compared to women. In terms of participation in active labor market policies (ALMP), men are more likely to be assigned to training programs, which primarily focus on improving job search/application skills rather than job qualification trainings. The latter effect is, however, not homogenous for all workers. There are no such effects observable for women.

This paper contributes to several strands in the literature. First, it relates to the extensive economic literature on the labor market effects of pension reforms. These studies find – consistently across countries and nature of pension reforms – positive employment effects as a response to retirement policies which restrict access to (early) retirement or reduce financial incentives for earlier retirement.<sup>2</sup>

Second, the paper contributes to the literature on unemployment, job displacement and retirement decisions. Ichino et al. (2017), Hairault et al. (2010) or Marmora and Ritter (2015) document that unemployment of elderly workers affects retirement timing and re-employment probabilities. Using the Regional Extended Benefits Program in Austria, Inderbitzin et al. (2016) show that extending unemployment insurance for older workers generates a substantial increase in the incidence of early retirement. Tatsiramos (2010) shows that in countries with more generous unemployment insurance provisions for older unemployed workers including a pathway to early retirement, displaced older workers have lower re-employment and higher retirement rates.

Finally, the paper also contributes to the strand of literature about training and older workers' employment. To avoid skill obsolescence of older workers, investment in training is recognised as an important element to the benefit of workers and employers (Picchio, 2015). Particularly the ongoing fast technological progress prevalent in many sectors makes training of the older workforce a useful policy. Indeed several studies suggest that

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<sup>2</sup>For Germany, Engels et al. (2017) and Hanel (2010) exploit raises in the NRA and actuarial deductions and find significant postponement of retirement and no substitution into unemployment. For Austria, Staubli and Zweimüller (2013) and Manoli and Weber (2016) show substantial labor supply effects as a response to increases in the eligibility age of early retirement. Mastrobuoni (2009) for the US and Cribb et al. (2016) for the UK document an increase in the mean retirement age and employment rate following increases in the eligibility age for retirement, Hanel and Riphahn (2012) for Switzerland and Hernaes et al. (2016) for Norway find positive labor supply effects due to changes of financial incentives. Vestad (2013) shows that a reduction in the lower age limit leads to earlier retirement and generates substantial costs.

in particular on-the-job training helps keeping older workers in employment for a longer period (e.g. Belloni et al. (2015), Picchio and van Ours (2013), Berg et al. (2017)).<sup>3</sup> However, there is no evidence that specific training for old employees is associated with higher relative productivity of these employees (Göbel and Zwick, 2013) and mixed evidence regarding the training wage premium (Belloni and Villosio, 2015). Very recently Zhang et al. (2020) show that training has a significantly positive effects on job match quality. Despite positive employment effects of on-the-job training, (early) retirement institutions play an important role for the participation in training of elderly workers. Fouarge and Schils (2009) show that generous early retirement schemes discourage older workers from taking part in training, while more flexible schemes encourage. In this context, pension reforms introducing incentives for later retirement may also have positive spillover effects to the willingness to participate in training programs of older workers. Indeed, Brunello and Comi (2015) show that an increase in the minimum retirement age in Italy substantially increased training participation by private sector employees aged 40-54. Montizaan et al. (2010) exploit a Dutch pension reform reducing pension rights and find significant increases in training course participation among older employees in large organizations.

The contribution of this paper is combining and extending these strands of the literature in several aspects: this is the first paper to study the effect of a pension reform on unemployed elderly workers. Second, I extend findings in Brunello and Comi (2015) or Montizaan et al. (2010) by not only considering training participation, but due to availability of comprehensive data on participation in ALMPs, I am also able to shed light on the exact types of ALMPs and the duration spent in those programs. This is particularly interesting in the Austrian context, where assignment to ALMPs is organized by a public labor agency. Hence, this paper also provides first evidence on whether public labor market institutions react to pension reforms and adapt their policies in their attempt to improve skill set of workers and re-employ elderly workers.

The paper is organized as follows: Section 2 provides an overview of the institutional background in Austria and describes the pension reforms implemented in Austria. Section 3 presents the empirical model, data and descriptive statistics, Section 4 summarizes the empirical findings and results from a heterogeneity analysis, and Section 5 concludes.

## 2 Institutional background

*The Austrian pension system* The public pension system in Austria covers all private-sector workers and provides early retirement, old-age and disability pensions, and is by

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<sup>3</sup>In contrast to employer-provided specific employee training, Stenberg et al. (2012) look at more general adult schooling and find no effects on the timing of retirement.

far the most important pillar in old-age financial provision for retirees in Austria. The pension depends on the number of insurance months collected during one's working life and income histories. For most individuals in the sample the assessment base of the pension is based on the 15 best annual earnings years.<sup>4</sup>

Austria is associated with a low labor force participation of elderly workers: although the statutory retirement age is 65 for men and 60 for women, the factual retirement age including disability pensions for men (women) in 2018 is 61.3 (59.3) years. At the same time, the Austrian public pension systems offers a generous gross pension replacement rate of 76.5% in 2018 as compared to the OECD average of 49% (in 2018) (OECD, 2019), and has long been criticised as actuarially unfair (e.g. Hofer and Koman (2006) or Hanappi (2012)). To smooth the transition into retirement, the Austrian government introduced partial retirement schemes for older employees in the early 2000s, where the working time reductions of elderly workers are subsidized. Also employers influence their workers' behavior by offering special severance payments (i.e., golden handshakes) to workers for earlier job exits if wage costs of older workers are too high (Frimmel et al., 2018).

*Pension reforms* To ensure the fiscal sustainability of the public pension system, the Austrian government implemented several pension reforms during the sample period of 2000–2013. This paper focuses on the two pension reforms in 2000 and 2003. Later reforms affect older workers in the sample only marginally given the typically long transition periods of implementation of reforms.

The key element of the reforms in 2000 and 2003 is the gradual increase in the eligibility age for early retirement.<sup>5</sup> The first reform increased eligibility age from 60 to 61.5 for men, and from 55 to 56.5 for women. This raise was implemented stepwise for different birth-quarter cohorts. More precisely, men born before October 1940 were still eligible for early retirement at the age of 60, whereas for men born in the fourth quarter of 1940, the eligibility age was increased by two months. For every subsequent birth quarter, the eligibility age was raised until the total increase of 1.5 years was reached. The same stepwise increase applies to women, where women born after September 1945 had a two-month higher eligibility age than women born before. The second reform in 2003, further increased the eligibility age for early retirement, from 61.5 to 65 years for men and from 56.5 to 60 years for women, via a similar stepwise increase for each birth-quarter cohort. Figure 1 shows the development of the early retirement age over birth quarters, for men and women. Workers with at least 40 social insurance years were allowed to retire at age 62 via the so-called corridor pension. Thus, the gradual increase in early retirement age for men is practically capped at age 62 (see horizontal red line in figure 1). Also

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<sup>4</sup>In 2004, the system gradually changed to a pension account system, which considers lifetime income.

<sup>5</sup>Further relevant changes on account of the reforms included a stepwise extension of the assessment base, from the best 15 earning years to lifetime earnings and increased penalties for early retirement, from 2% to 4% of the pension per year (capped at 10%).

men (women) with more than 45 (40) insurance years, or workers with heavy labor were exempted from the reform and remained at age 60 (55) as the earliest possible retirement age.

The effect of the reform on employment, unemployment and retirement is illustrated in Figure 2 where I compare workers of three different birth cohorts, each associated with a one-year difference in the eligibility age of early retirement, ranging from 60 to 62 for men, and 55 to 57 for women. For both, men and women, I consistently find a shift with the eligibility age to a higher share in employment during the extended working age period (see sub-figures (a) and (b)), e.g. men with an eligibility age of 61 have a higher employment rate between 60 and 61 as compared to the cohort with the unchanged eligibility age of 60. A very similar pattern can be observed for the share of unemployed workers (sub-figures (c) and (d)) as well as the share of retired workers (sub-figures (e) and (f)). Sub-figures (c) and (d) also suggest that the reform might lead to increased unemployment during the extended working life period, but there is no – descriptive – evidence that later cohorts are associated with a different unemployment risk before the age of 60. Generally, all three cohorts show identical trends and shares in employment, unemployment and retirement before the original eligibility age of early retirement of 60 and 55, respectively.

This graphical evidence is more thoroughly discussed in Staubli and Zweimüller (2013) and Manoli and Weber (2016). Staubli and Zweimüller (2013) find that the increase in the early-retirement eligibility age increased employment by 9.75 percentage points for men and 11 percentage points for women. The reforms generated substantial spillovers on the unemployment insurance program. Using a regression-kink design and a slightly different sample of more labor market attached workers, Manoli and Weber (2016) find that a one-year increase in the early retirement age increased the average job exit age by 0.4 years.

*The Austrian unemployment insurance system* The Austrian public unemployment insurance offers a universal coverage for unemployment benefits for all private-sector employees and apprentices.<sup>6</sup> The system is financed by withholding 3 percent of income from employers and 0-3 percent from employees (depending on their income). In case of unemployment, workers receive unemployment benefits which amount to 55-60 percent of prior net income plus possible additional payments for family members. The duration for receiving unemployment benefits depends on age and collected social insurance years; generally, unemployment benefits are granted for 20 weeks, which increases to 30 weeks in case of 156 collected social insurance weeks. Unemployed workers older than 40 years with 312 weeks of social insurance within the last 10 years receive unemployment benefits

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<sup>6</sup>Marginally employed workers are excluded, while self-employed can voluntarily opt into unemployment insurance since 2009.

for 39 weeks. For unemployed workers above 50 and 468 weeks of social insurance during the last 15 years, unemployment benefits duration is extended to 52 weeks. The duration may also be extended for rehabilitation purposes.

The Austrian labor agency is responsible for the payments of unemployment benefits. Apart from these financial benefits, the Austrian Labor Agency offers various labor market activating programs and subsidies to support unemployed workers finding new jobs or to improve their skills. Table 5 summarizes the most important unemployment subsidies and active labor market policies offered by the Austrian Labor Agency. The spectrum reaches from training programs to increase skills or programs for job applications and job interviews up to programs specifically designed for firm founders

## 3 Research design

### 3.1 Data

The empirical analysis is based on two Austrian administrative data sources. All labor market and retirement-related information is drawn from the Austrian Social Security Database (ASSD), which is a matched employee–employer dataset collected to verify pension claims for all Austrian private-sector workers (Zweimüller et al., 2009). It contains detailed information on workers’ employment and earnings histories and basic socioeconomic characteristics (e.g. age, broad occupation, experience, and tenure). The ASSD also contains information on the start of the pension, as well as pathways into retirement (i.e. disability pension, early retirement, or regular old-age retirement). Information on the first jobs after unemployment is also drawn from the ASSD. I use days in employment, and daily labor income as proxies for job quality.

The ASSD is merged to data from the Austrian Labor Agency comprising detailed information on the receipt and duration of unemployment benefits, training and qualification programs, outplacement trusts or job integration subsidies between the years 2000 to 2014. Apart from unemployment duration, I use information on all labor market activating programs described in Table 5. Since the focus of this study is on older workers, the sample consists of all unemployment spells of male and female private-sector workers born between 1938 and 1955 - cohorts directly affected by the stepwise increase of eligibility age of early retirement - and who become unemployed in the period between 2000 until 2013. I also exclude unemployment spells of individuals who are already eligible for early retirement, i.e. all unemployment spells beyond age 60 for men and 55 for women are ignored. So workers cannot directly move from unemployment to (early) retirement except for disability reasons. This also rules out effects of the reform on direct retirement

and inflow to unemployment<sup>7</sup>.

As entry into unemployment is likely selective, I focus on a more exogenous inflow into unemployment, and restrict the sample to individuals subject to plant closures or mass layoffs.<sup>8</sup> There is no evidence that the increase in early retirement age is associated with plant closures or mass layoffs (Frimmel, 2020).<sup>9</sup> If individuals were affected by plant closures or mass layoffs in several years, they enter the data multiple times. Overall, the sample consists of 94,648 individual unemployment spells for men and 45,063 unemployment spells for women. This corresponds to 66,128 men and 35,602 women. The panel is unbalanced, given that only a relatively small number of individuals was subject to more than one plant closure or mass layoff.

### 3.2 Empirical strategy

To analyze the effect of raising the early retirement age, I examine a set of important outcome variables for unemployed workers, i.e. unemployment duration, re-employment, participation and duration in labor market activating measures as well as job quality. The empirical strategy follows Brunello and Comi (2015) and I estimate the following empirical model:

$$outcome_{it} = \beta_0 + \beta_1 era_{it} + \Gamma X_{it} + \gamma_i + \gamma_t + \epsilon_{it}$$

where the set of outcome variables of individual  $i$  who became unemployed in year  $t$  is regressed on the exogenous individual-specific policy-determined eligibility age of early retirement  $era_{it}$ . The variable  $era_{it}$  is 60 for men born before October 1940 (55 for women born before October 1945) and increases for every subsequent quarter of birth as summarized in Section 2 and in Figure 1. Note that the eligibility age is not constant for cohorts affected by the reform 2003 if they have unemployment spells before and after the implementation of the reform. Cohort of birth fixed effects  $\gamma_i$  and year fixed effects  $\gamma_t$  capture cohort, age and business cycle effects. Individual characteristics summarized by the vector  $X_{it}$  include industry indicators of the previous job, last gross income, job experience, binary indicator for blue-collar workers (vs. white-collar workers) and regional fixed effects. All binary outcomes are estimated with a probit model, duration outcomes with OLS.

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<sup>7</sup>Staubli and Zweimüller (2013) show that spillover effects of the reform to the unemployment insurance program mainly occur beyond the age of 60 for men.

<sup>8</sup>Mass layoff is defined as a reduction of the workforce of at least 25 percent.

<sup>9</sup> In a robustness check, I also present results for the sample of all unemployed individuals.

### 3.3 Descriptive statistics

The sample comprises 66,128 men and 35,602 women born between 1938 and 1955 who were subject to a plant closure or mass layoff during the years 2000 until 2013. Table 2 shows individual characteristics of these men (Column (I)) and women (Column (II)). Based on the cohorts in the sample, the average eligibility age of early retirement is 61.77 for men and 57.3 for women. In comparison, the average age at the beginning of the unemployment spell is 54.63 years for men and 53.25 for women. There is a significant educational gradient, more than 80 percent for both gender have compulsory schooling or apprenticeship as the highest educational attainment. Similarly, 79.2 (59.0) percent of men (women) are blue-collar workers. The average annual gross income before unemployment amounts to 22,840 euros for men and 14,924 euros for women.

Outcome variables are summarized in Table 3. The average duration of unemployment is 185.3 days for men and 203.2 days for women with substantial variation (standard deviation is between 258 and 272 days). For men, approximately 11 percent receive some training, and spend on average 6.4 days in training. A closer look at the types of training program reveals that 50 percent of these trainings (or 5 percent of the entire sample) are programs to increase qualifications, another 4.9 percent deal with active job search. Another 5.7 percent find jobs through the job integration support of the labor agency. Other labor market activating policies are only of minor importance. The pattern for women is very comparable: 12.3 percent receive some training measure, i.e. 6.5 percent for qualifications and 4.4 percent for active labor search. 5.3 percent receive the job integration support.

64.8 percent of men (58.2 percent of women) found a new job after unemployment by the end of 2014, 1.3 (0.8) percent of unemployed become self-employed. 8 percent of men (11.2 percent of women) re-enter the labor market through marginal employment. Job quality is proxied by days of employment within the first two years after unemployment and the daily labor income<sup>10</sup>. The average days of employment for men (women) is 155.5 (157.0) days with an average daily labor income of 32.21 (17.25) euros.

Tables A.1 and A.2 of the Web Appendix summarize individual characteristics and outcomes by eligibility age.<sup>11</sup> Apart from differences by construction in the average age at unemployment and corresponding job experience, there are no significant differences in individual characteristics. In terms of outcome variables, men and women with higher eligibility age (high-ERA) stay marginally longer in unemployment and are more likely to participate in trainings, in particular with respect to qualifications. Kaplan-Meier estimates in Panel A of Figure 3 reveal that the longer unemployment duration for high-ERA men is in the range between 100 and 250 days, while for women this difference is absent.

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<sup>10</sup>In case of unemployment, daily labor income and days of employment are set to zero.

<sup>11</sup>The threshold between high and low eligibility age is set at 61.5 years for men and 57.5 years for women.

Training duration is only longer for high-ERA males during the first 50 days of training (Panel B), but this pattern reverses with training duration. This might indicate that these unemployed workers tend to receive substantially shorter qualification measures. Re-employment probability for high-ERA males is on average reduced and subsequent days of employment is shorter (Panel C of Figure 3). This could be driven by a greater assignment to training programs. The pattern is less pronounced for unemployed women. Generally, there should not be given any causal interpretation to all these observed differences, e.g. they could simply reflect an age effect, because individuals with higher eligibility age are on average older at unemployment; also seasonal influences may influence the relationship. A regression analysis will control for these potentially distorting effects more thoroughly.

## 4 Estimation results

This section presents the empirical findings of the model described in section 3.2. I present the main results for unemployment durations, unemployment subsidies and active labor market policies as well as for subsequent employment and job quality in the main section 4.1. Section 4.2 summarizes results from a heterogeneity analysis and Section 4.3 provides a brief discussion on external validity of the results.

### 4.1 Main results

*Unemployment duration* Table 4 summarizes results of the effect of the raise in eligibility age (ERA) on unemployment duration of men (Column I) and women (Column II). In line with the descriptive Kaplan-Meier estimators, the point estimates are positive and larger for men, but rather imprecisely estimated. Although this result contradicts evidence on bridging the time between job exit and retirement entry, it has to be considered that the sample comprises individuals being unemployed before the age of 60, so bridging is not feasible.<sup>12</sup> In contrast, unemployment duration of women is lower by approximately 50 days.

*Active labor market policies* Although unemployment durations for men are unaffected by the increase of the eligibility age of early retirement, it does not imply that activities during unemployment remain unchanged. For example, unemployed male workers with different eligibility ages may systematically be assigned to more or less labor market activating policies (ALMP) and/or spend a different amount of time in such programs. Given

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<sup>12</sup>The reforms, however, had adverse effects on unemployment after the age of 60. Staubli and Zweimüller (2013) provide evidence of increased bridging due to the reforms. Based on a sample of employed workers, they find an increase in unemployment for workers with higher eligibility age for the extended working period induced by the reforms.

unemployment duration, spending more time in training during unemployment would be evidence for a more active labor market policy for elderly workers if these programs are designed to improve employment prospects and the reintegration of elderly workers on the labor market. Of course, spending less time in labor-market activating policies would allow for a more negative interpretation.

To shed light on this question, Table 5 presents results for the participation in five different labor-market activating policies: participation in training programs, outplacement trusts, firm founding program, job interview support and job integration support. Panel A shows the average marginal effects for men: first, a one-year higher ERA significantly increases the probability to participate in a training program by 15.9 percent (Column (1)). This result is also in line with findings from Brunello and Comi (2015) and Montizaan et al. (2010). Because the gradual increase of eligibility age is on a monthly basis, the effect size is equal to 1.3 percent increase in training participation per month increase in eligibility age. Panel A of Table 6 takes a closer look at the type of training program for men, i.e. for qualifications, job orientation or active job search. It turns out, that the positive training effect is entirely driven by increased training for active job search (Column (3) of Table 6), such as job application trainings (plus 18.9 percent). There are no significant effects for qualification and job orientation trainings. So it seems that the labor agency tries to bring those workers with longer future employment perspectives due to later expected retirement back to the labor market as fast as possible and equip them with the necessary tools to be successful in job applications. They are on average not more likely to receive relatively cost-intensive programs to acquire new qualifications for a new job, although these could pay off more in case of higher expected retirement ages. However, this effect is not homogenous among all male workers (see Section 4.2).

Second, the probability of being employed through the job integration support significantly increases by 21.8 percent (Column(5) of Table 5). The job integration support temporarily reduces labor costs for firms if they employ elderly workers. So this result suggests that the temporarily subsidized hiring of elderly workers becomes more attractive, the longer future employment prospects are.

There is a very pronounced diverging pattern between men and women observable, as results for female ALMP participation (Panel B of Table 5) show. A one-year higher ERA does not change the probability of receiving a training program, other programmes are only marginally affected. Only the job integration support increases with the early retirement age by 2.2 percent. Consistently, when looking at the types of training programs (Panel B of Table 6), there are no significant or relevant effects for training types.

These findings are confirmed when considering the duration spent in ALMPs. Panel A of Table 7 shows that men spent on average 10.8 days per year more in training programs. There is only a marginal statistical significant change in the duration in the job integration

support. Given the higher probability of the job integration support, this implies that the partial reduction of labor costs for firms is granted more often, but on average for a shorter period. For women, ALMP durations only marginally change: women spent 0.9 days per year more in training programs, 2.1 days more in outplacement trusts, 0.4 days in the firm founding program and 1.5 days more in the job integration support (Panel B of Table 7).

*Re-employment and job quality* Ultimately, the question whether raising the eligibility age of early retirement affects re-employment perspectives of unemployed workers is essential. As stated, the effect can be ambiguous: unemployed workers with a higher ERA are associated with a longer future employment perspective, which could make such workers more attractive for firms to hire. So re-employment should increase. However, if firms generally discriminate elderly workers and do not provide jobs once a certain age is reached, then a higher ERA would simply lead to longer unemployment durations at older ages or a higher drop-out rate of the labor force.

Table 8 summarizes estimation results for re-employment probabilities and job quality after unemployment. For men (Panel A), re-employment increases by 13.8 percent, but is only marginally significant.<sup>13</sup> This corresponds to a 1.2 percent increase in re-employment for a one-month increase in ERA. Days in employment within 2 years after unemployment<sup>14</sup> is on average 113 days longer. The average daily labor income increases by 16.6 euros, so workers tend to benefit financially. Whether this wage premium is due to a higher training incidence cannot be answered within the research strategy. Overall these findings corroborate evidence that firms prefer hiring workers with a longer future employment perspectives in the firm. Women tend to benefit to a lesser extent from raising the ERA in terms of re-employment and job quality: a one-year raise of the ERA increases employment probabilities by 7 percent, days in employment increase by 30 days and daily labor income by 3.8 euros (Panel B of Table 8).

*Gender difference* Although women show shorter unemployment durations with a higher eligibility age, men tend to benefit more, particularly in assignment to training programmes, re-employment and labor income. Explanations for this significant gender difference may be manifold. First, the response of women to the reform of the early retirement age was substantially smaller: as shown in Table A.1, the age at retirement for men with low and high early retirement age differs by approximately one year<sup>15</sup>, while this difference is on average less than four months for women. A reason for the weaker

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<sup>13</sup>When looking at the sample of all unemployed workers, estimates become more precisely estimated. There, re-employment increases by 17.7 percent or, equivalently a one-month increase in ERA results in a 1.5 percent increase in employment. Results are shown in Panel A of Table A.4 in the Appendix.

<sup>14</sup>In case of no re-employment, the variable is set to zero.

<sup>15</sup>The age at retirement for men relative to the statutory retirement age is in general lower due to a substantial fraction of – mostly blue-collar – workers in disability pensions

response of women is the fact that the average retirement age of women is generally much closer to the statutory retirement age. For instance, compared to men, where the factual average retirement age is around 5 years below the statutory age of 65, the average retirement age of women with a low ERA (between 55 and 57.5 years) is on average 58.13 years, hence only approximately 2 years below the statutory retirement age of 60 (see Table A.1). This is mostly due to a lack of social insurance years collected over lifetime, e.g. because of family obligations (parental care for children or informal care for sick relatives).

Second and closely related, firms may not differentiate between employment perspectives of women with high or low ERA, because retirement behavior changes to a substantially lesser degree, but the increased employment perspectives of men may provide sufficiently large incentives for firms to hire these unemployed workers. A similar argument may arise for the assignment to training programmes by the public labor agency.

Third, the pension reform affects men and women at different ages. A raise of the ERA between 55 and 60 as for women or between 60 and 65 for men could simply trigger differential responses by the labor agency or firms employing elderly workers.

## 4.2 Heterogeneous effects

Table 9 for men and Table 10 for women summarize results from a heterogeneity analysis along several dimensions, i.e. age before ERA (less/more than 5 years before ERA), occupation (blue-collar/white-collar), level of educational attainment (high/low) and local labor market conditions at unemployment (above/below average local industry-specific unemployment rate). There are several interesting patterns observable. It turns out that the age of getting unemployed due to mass layoffs and plant closures has a substantial influence which type of ALMP workers receive. Male workers who are more than 5 years away from the early retirement age are 9.3 percent more likely to receive a training in new qualifications while this effect is totally absent for unemployed workers closer to the ERA. These workers are, however, 14.5 percent more likely to receive trainings to support job search but the labor agency refrains from re-training these workers. This is also reflected in re-employment; since training in qualifications is time-consuming, workers further away from the ERA are less likely to be employed after one year of unemployment.

In terms of socio-economic differences, white-collar and more educated workers have a higher propensity to receive a training in job search, while blue-collar workers and workers with a lower educational attainment are more likely to be employed through the job integration support. This is consistent with the observation that particularly firms requiring skilled manual labor make use of the job integration support. Less surprisingly, if the local labor market (measured by the local industry-specific unemployment rate) is tighter, workers participate significantly more in ALMPs.

For women, differences across subgroups are less pronounced. However, women further away from their ERA are much less likely to be assigned to a training program or to receive the job integration support, while women closer to the ERA receive more job integration support and also have higher re-employment chances. There are no remarkable differences in other analyzed dimensions for women.

### 4.3 External validity

The baseline sample consists of unemployed workers who were subject to a plant closure or a mass layoff because of selective entry into unemployment and spillover effects from the pension reform. To determine whether and to what extent selective entry changes the results and findings are comparable to the universe of unemployed workers, I extend the sample to all unemployment spells between the years 2000 and 2013. All remaining sample restrictions and the empirical model remain unchanged. Given endogenous selection into unemployment, estimates on this sample cannot necessarily be interpreted causally, but may still be insightful to evaluate the main results of the paper in a potentially wider context. Table A.3 in the Web-Appendix replicates the results for the participation in training and type of training and Table A.4 in the Web-Appendix summarizes estimations results for re-employment probability and job quality.

For both, men and women, I do not find any systematic qualitative differences of results in comparison to the restricted baseline sample, but estimates appear to be somewhat smaller in size and are more precisely estimated due to sample size. The probability of receiving a job search training for men is with a 7 percent increase significantly smaller than in the main sample. This may be explained by the cause of unemployment - mass layoff and plant closures - in the the main sample. These cases typically receive much higher attention by the public than other entries into unemployment. My main results suggest that the stronger response of the labor agency might be related to the original cause of unemployment. Apart from that - particularly in terms of re-employment and job quality - the two samples yield remarkably similar results. So, potentially selective entry into unemployment does not seem to significantly alter the main findings and results do not appear to be specifically driven by the exogenous group of unemployed workers.

## 5 Concluding remarks

The demographic transition towards an older society led to ongoing reforms of public pension systems to ensure future financial sustainability. The need of a higher labor force participation of elderly workers also requires a higher (early) retirement age. In this study, I analyze how an increase in the eligibility age of early retirement affects unemployed el-

derly workers in Austria, a group particularly vulnerable in the labor market. I exploit two Austrian pension reforms increasing the early retirement age step-wise for different quarter-of-birth cohorts to identify the causal effect of a raise in early retirement age on unemployment duration, re-employment probability and participation in active labor market policies (ALMP) and training programs. Empirical results based on Austrian administrative data reveal a substantial gender difference in how the raise in early retirement age affects unemployed workers. While unemployed women only benefit little with a shorter unemployment duration, modest higher re-employment probability as well as labor income after unemployment, unemployed men below the age of 60 benefit in several aspects: although unemployment duration remains unaffected, re-employment chances and participation in active labor market policies significantly increase. Men also receive larger labor income increases after unemployment. Elderly unemployed workers closer to their early retirement age are systematically assigned to programs increasing their job application and job search skills, workers more than five years away from their early retirement age are more likely to participate in training programs increasing their skills. The result for women not benefiting to a similar degree than males does not necessarily imply that the extended working life for women is not helpful for reintegration at all, but could rather reflect that (i) the Austrian pension reform affects women at a younger age and (ii) women's response to these particular reforms was substantially weaker.

The results are in line with theoretical predictions that an expected longer employment of workers increases the reintegration of elderly workers (Hairault et al., 2010) and supports human capital formation by incentivizing investments to train elderly workers and upgrade their qualifications (Becker, 1975). Public labor agencies adapt their assignments to ALMPs to the extended expected working life by supporting elderly workers for a faster reintegration – either through job application trainings or financial support for firms employing elderly workers – and by upgrading workers' skills in comprehensive training programs. Whether and to what extent these ALMPs contribute to the reintegration of these unemployed workers – the *causal* effect of ALMPs – is beyond the scope of this paper.

From a policy perspective, these results suggest that increasing the early retirement age is not only a promising way to improve the financial sustainability of public pension systems but also sufficiently incentivizes the reintegration of elderly unemployed workers (below the age of 60). The latter is an important contribution to increase the labor force participation of older workers and to keep the public pension systems financially viable in the future.

## References

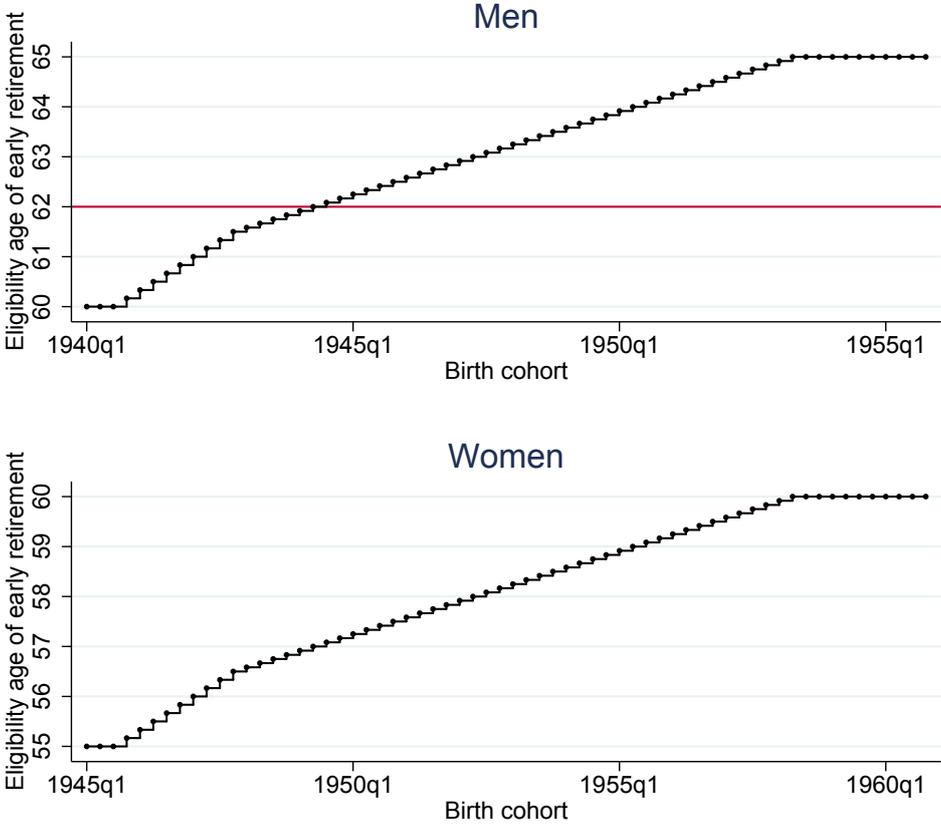
- Becker, Gary S (1975), Investment in human capital: effects on earnings, in ‘Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education, Second Edition’, NBER, pp. 13–44.
- Belloni, Michele, Agar Brugiavini, Elena Meschi and Giacomo Pasini (2015), *Does Training Help Retaining Older Workers Into Employment? Evidence from the SHARE Survey*, De Gruyter, chapter 23, pp. 257–265.
- Belloni, Michele and Claudia Villosio (2015), ‘Training and Wages of Older Workers in Europe’, *European Journal of Ageing* **12**, 7–16.
- Berg, Peter B., Mary K. Hamman, Matthew M. Piszczek and Christopher J. Ruhm (2017), ‘The Relationship between Employer-provided Training and the Retention of Older Workers: Evidence from Germany’, *International Labour Review* **156**(3-4), 495–523.
- Brunello, Giorgio and Simona Comi (2015), ‘The Side Effect of Pension Reforms on the Training of Older Workers. Evidence from Italy’, *The Journal of the Economics of Ageing* **6**, 113–122.
- Cribb, Jonathan, Carl Emmerson and Gemma Tetlow (2016), ‘Signals Matter? Large Retirement Responses to Limited Financial Incentives’, *Labour Economics* **42**, 203–212.
- Engels, Barbara, Johannes Geyer and Peter Haan (2017), ‘Pension Incentives and Early Retirement’, *Labour Economics* **47**, 216–231.
- Fouarge, Didier and Trudie Schils (2009), ‘The Effect of Early Retirement Incentives on the Training Participation of Older Workers’, *Labour* **23**, 85–109.
- Frimmel, Wolfgang (2020), Payroll shocks and firm behavior, Technical report, Department of Economics.
- Frimmel, Wolfgang, Thomas Horvath, Mario Schnalzenberger and Rudolf Winter-Ebmer (2018), ‘Seniority Wages and the Role of Firms In Retirement Decisions’, *Journal of Public Economics* **168**, 19–32.
- Göbel, Christian and Thomas Zwick (2013), ‘Are Personnel Measures Effective in Increasing Productivity of Old Workers?’, *Labour Economics* **22**, 80–93.
- Hairault, Jean-Olivier, Francois Langot and Thepthida Sopraseuth (2010), ‘Distance to Retirement and Older Workers’ Employment: The Case for Delaying the Retirement Age’, *Journal of the European Economic Association* **8**(5), 1034–1076.
- Hanappi, Tibor Paul (2012), Retirement Behaviour in Austria: Incentive Effects on Old-Age Labor Supply, Technical report, The Austrian Center for Labor Economics and the Analysis of the Welfare State, Johannes Kepler University Linz, Austria.
- Hanel, Barbara (2010), ‘Financial Incentives to Postpone Retirement and Further Effects on Employment - Evidence from a Natural Experiment’, *Labour Economics* **17**, 474–486.

- Hanel, Barbara and Regina T. Riphahn (2012), ‘The Timing of Retirement - New Evidence from Swiss Female Workers’, *Labour Economics* **19**, 718–728.
- Hernaes, Erik, Simen Markussen, John Piggott and Knut Roed (2016), ‘Pension Reform and Labor Supply’, *Journal of Public Economics* **142**, 39–55.
- Hofer, Helmut and Reinhard Koman (2006), ‘Social Security and Retirement Incentives in Austria’, *Empirica* **33**(5), 285–313.
- Ichino, Andrea, Guido Schwerdt, Rudolf Winter-Ebmer and Josef Zweimüller (2017), ‘Too old to work, too young to retire?’, *The Journal of the Economics of Ageing* **9**, 14–29.
- Inderbitzin, Lukas, Stefan Staubli and Josef Zweimüller (2016), ‘Extended Unemployment Benefits and Early Retirement: Program Complementarity and Program Substitution’, *American Economic Journal: Economic Policy* **8**(1), 253–288.
- Manoli, Dayanand S. and Andrea Weber (2016), ‘The Effects of the Early Retirement Age on Retirement Decisions’, *NBER Working Paper 22561*.
- Marmora, Paul and Moritz Ritter (2015), ‘Unemployment and the Retirement Decisions of Older Workers’, *Journal of Labor Research* **36**, 274–290.
- Mastrobuoni, Giovanni (2009), ‘Labor Supply Effects of the Recent Social Security Benefit Cuts: Empirical Estimates Using Cohort Discontinuities’, *Journal of Public Economics* **93**, 1224–1233.
- Mayhew, Ken and Bob Rijkers (2004), ‘How to improve the human capital of older workers or the sad tale of the magic bullet’, *OECD*.
- Montizaan, Raymond, Frank Cörvers and Andries De Griep (2010), ‘The Effects of Pension Rights and Retirement Age on Training Participation: Evidence from a Natural Experiment’, *Labour Economics* **17**, 240–247.
- OECD (2019), *Pensions at a Glance 2019*.  
**URL:** <https://www.oecd-ilibrary.org/content/publication/b6d3dcfc-en>
- Picchio, Matteo (2015), ‘Is Training Effective for Older Workers?’, *IZA World of Labor* **121**, 1–10.
- Picchio, Matteo and Jan van Ours (2013), ‘Retaining through Training even for Older Workers’, *Economics of Education Review* **32**, 29–48.
- Staubli, Stefan and Josef Zweimüller (2013), ‘Does Raising the Early Retirement Age Increase Employment of Older Workers?’, *Journal of Public Economics* **108**, 17–32.
- Stenberg, Anders, Xavier de Luna and Olle Westerlund (2012), ‘Can Adult Education Delay Retirement from the Labour Market?’, *Journal of Population Economics* **25**, 677–696.
- Tatsiramos, Konstantinos (2010), ‘Job Displacement and the Transitions to Re-employment and Early Retirement for Non-employed Older Workers’, *European Economic Review* **54**, 517–535.

- Vestad, Ola L. (2013), ‘Labour Supply Effects of Early Retirement Provision’, *Labour Economics* **25**, 98–109.
- Zhang, Yi, Martin Salm and Arthur van Soest (2020), ‘The Effect of Training on Workers’ Perceived Job Match Quality’, *Empirical Economics* pp. 1–22.
- Zweimüller, J., R. Winter-Ebmer, R. Lalive, A. Kuhn, O. Ruf, S. Büchi and J.-P. Wuellrich (2009), ‘The Austrian Social Security Database (ASSD)’. NRN Working Paper, University of Linz.

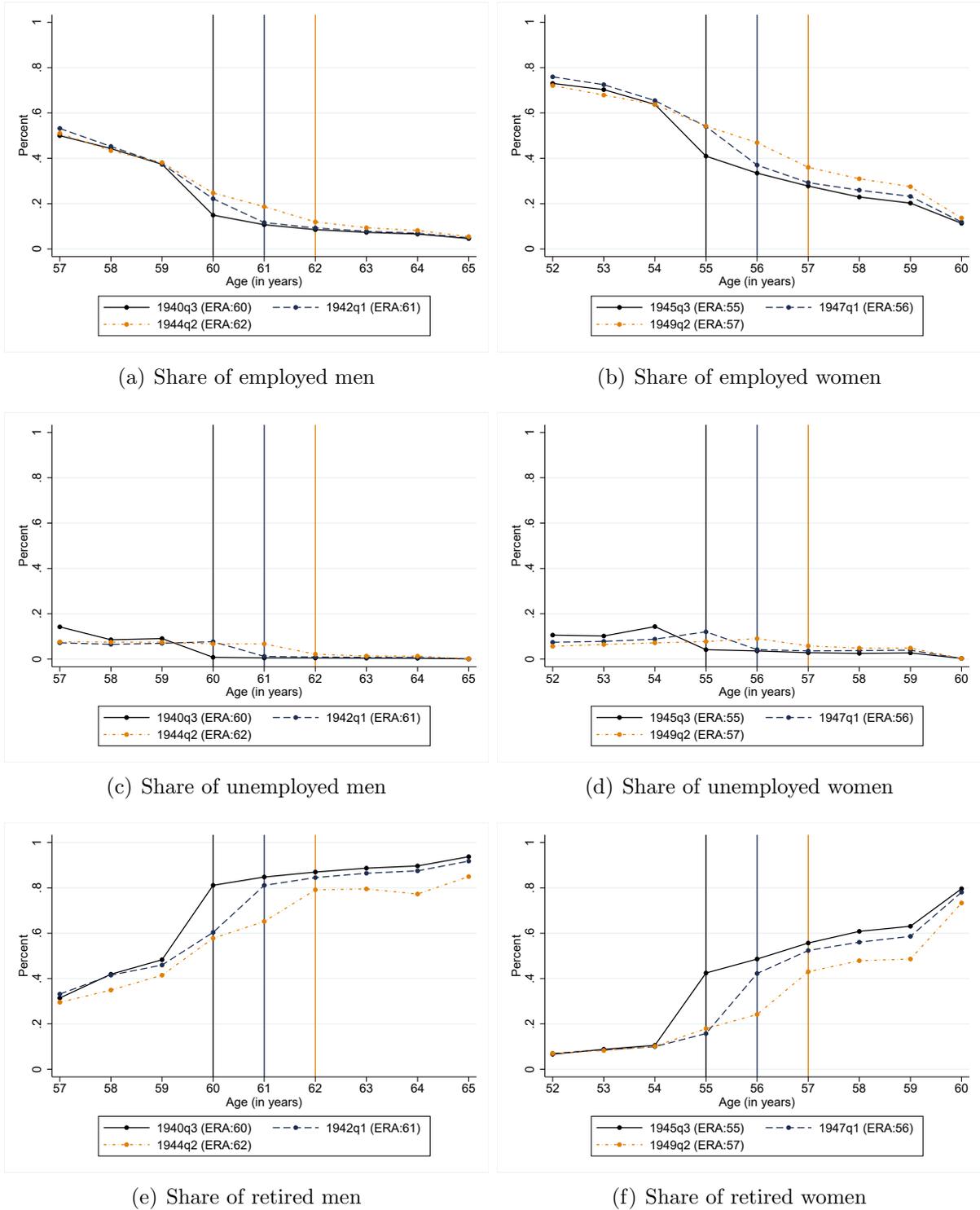
# 6 Tables and figures (to be placed in the paper)

Figure 1: Eligibility age of early retirement in Austria



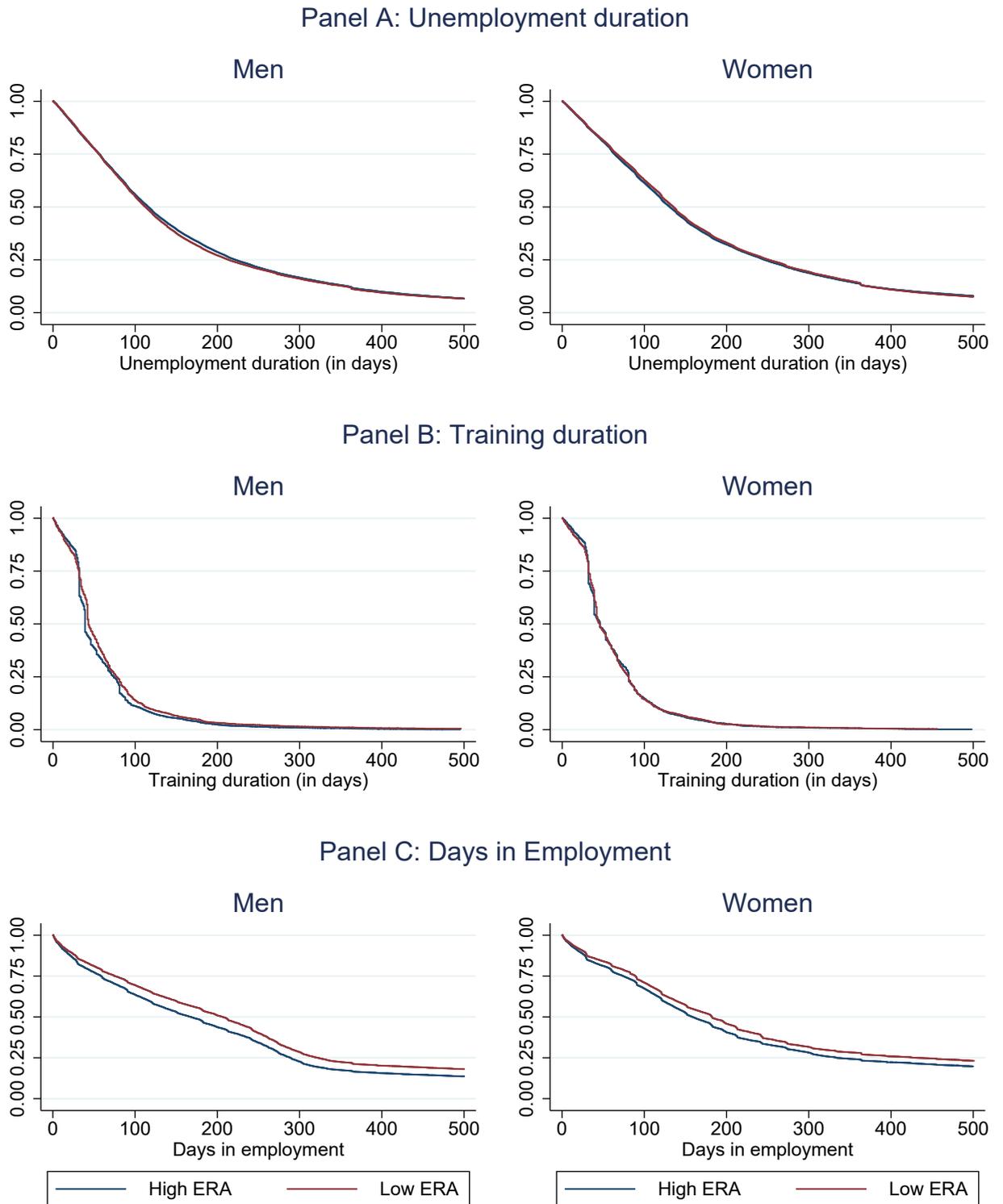
Notes: The figure illustrates the stepwise increase of the eligibility age of early retirement over birth-quarter cohorts for men and women, consistent with the 2000 and 2003 pension reforms. The red horizontal line indicates the corridor pension at age 62 for men.

**Figure 2:** Employment, unemployment and retirement by cohorts



*Notes:* Figures compare the share of employed (*figures (a) and (b)*), unemployed (*figures (c) and (d)*) and retired (*figures (e) and (f)*) men (left) and women (right) for different birth cohorts. These cohorts differ in the eligibility age of early retirement (ERA), e.g. men of cohort 1940q3 (born in third quarter of 1940) have an ERA of 60 years, while cohorts 1942q1 and 1944q2 have an increased ERA of 61 years and 62 years respectively. Equivalently for women, ERA for birth cohorts 1945q3, 1947q1 and 1949q2 is 55, 56 and 57 years respectively. All figures are based on data from the ASSD.

**Figure 3:** Kaplan-Meier estimates



*Notes:* Kaplan-Meier estimates are based on sample described in Section 3.1 Panel A shows unemployment duration for men (left) and women (right) with high and low eligibility age of early retirement (ERA). The threshold for high ERA is defined at 61.5 years for men and 56.5 years for women. Correspondingly, Panel B compares training duration and Panel C the duration in the subsequent job after re-employment (conditional on being employed).

**Table 1:** Overview of Active Labor Market Policies(ALMP)

<b>Subsidy</b>	<b>Description</b>
Training	Educational programs to gain new qualifications, to support job orientation or to help in active job search
<i>Qualifications</i>	Certificated training programs and courses specifically offered to increase the qualifications necessary for (new) jobs of unemployed workers.
<i>Job Orientation</i>	Assistance for job orientation or occupational choices, e.g. tests to find out possible appropriate occupational areas, counseling or provision of information to support new job orientation...
<i>Active job search</i>	Training offered to support the active job search, e.g. job application training.
Outplacement trusts	Labor market policy specifically for a larger group of workers who are (expected to be) unemployed due to mass layoffs or plant closures; the focus lies on specific qualification measures, e.g. training programs, job orientation measures, support for active job search or firm founding programs.
Firm founding program	Support for unemployed who become self-employed. Also counseling is offered and there is a possibility to acquire necessary qualifications. Support may be granted up to 9 months.
Job interview support	Partial refund of cost which occur at supra-regional job applications
Job integration support	Job integration support is a program to incentivise firms to employ workers of age 50 or older, often with health restrictions and long unemployment durations or re-entry into labor market. The Labor Agency offers a subsidy to firms who employ older workers. Possible up to 6-12 months.

*Notes:* This table summarizes the most important unemployment subsidies and active labor market policies of the Austrian Labor Agency.

**Table 2:** Descriptive statistics of sample

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	(I) Men	(II) Women
Early retirement age	61.77 (0.257)	57.32 (1.002)
Age at unemployment	54.63 (4.128)	53.25 (3.660)
<i>Educational attainment</i>		
Compulsory schooling	0.397	0.518
Apprenticeship	0.494	0.298
Matura	0.074	0.146
Academic	0.035	0.038
<i>Occupation</i>		
Blue-collar	0.792	0.590
White-collar	0.208	0.410
Experience (in years)	22.34 (8.705)	18.32 (8.133)
Annual gross income	22,840.7 (25,197.3)	14,924.3 (14,392.5)
<hr/>		
Observations	94,648	45,063
# of individuals	66,128	35,602

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*Notes:* Descriptive statistics for men (column (I)) and women (column (II)) are based on the sample described in Section 3.1. Standard deviations for non-binary variables in parentheses.

**Table 3:** Descriptive statistics of outcome variables

	(I) Men	(II) Women
Unemployment duration (in days)	185.3 (272.1)	203.2 (258.7)
<i>ALMPs</i>		
Training	0.108	0.123
Outplacement trusts	0.010	0.010
Firm founding program	0.005	0.003
Job interview support	0.009	0.005
Job integration support	0.057	0.053
<i>Type of training program</i>		
Qualifications	0.049	0.065
Job orientation	0.010	0.013
Active job search	0.049	0.044
<i>Duration in ALMP</i>		
Days in training	6.402 (28.16)	7.830 (30.31)
Days in outplacement trusts	3.595 (52.13)	3.102 (41.31)
Days in firm founding program	0.838 (14.16)	0.543 (11.39)
Days with job integration support	2.081 (26.72) (29.30)	2.440 (28.39) (24.34)
<i>Subsequent employment</i>		
Employed	0.648	0.582
Self-Employed	0.013	0.008
Marginal employment	0.080	0.112
Not employed	0.259	0.298
<i>Job quality (2 yrs after unemployment)</i>		
Days in employment	155.5 (214.40)	157.00 (233.17)
Daily labor income	32.21 (37.10)	17.25 (25.32)
Observations	94,648	45,063

*Notes:* Descriptive statistics for men (column (I)) and women (column (II)) are based on the sample described in Section 3.1. Duration in ALMP and job quality variables are set to zero if they do not apply. Standard deviations for non-binary variables in parentheses.

**Table 4:** Unemployment duration (in days)

	(1) Men	(2) Women
Early retirement age	32.827 (56.024)	-49.491*** (4.229)
Educational attainment (baseline: compulsory schooling):		
<i>Apprenticeship</i>	12.575*** (1.719)	4.970* (2.825)
<i>Matura</i>	54.040*** (4.241)	17.464*** (3.950)
<i>Academic degree</i>	59.354*** (6.353)	44.439*** (8.788)
White-collar worker	25.963*** (2.540)	7.308*** (2.736)
Experience	-0.001*** (0.000)	-0.001*** (0.001)
Gross income	-0.000*** (0.000)	-0.000** (0.000)
Previous industry affiliation FE	Yes	Yes
Regional FE	Yes	Yes
Unemployment year FE	Yes	Yes
Cohort of birth FE	Yes	Yes
Number of observations	94,648	45,063
Mean of dep. var.	175.83	200.48

*Notes:* The sample consists of all unemployed workers due to plant closures or mass layoffs between 2000 and 2013. Estimates are based on OLS estimation. Standard errors are clustered on individuals; \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

**Table 5:** Active labor market policies

	(1)	(2)	(3)	(4)	(5)
	Training	Outplacement trusts	Firm founding program	Job interview support	Job integration support
<b>Panel A: Men</b>					
Early retirement age	0.159** (0.073)	0.044* (0.026)	0.036 (0.029)	0.035 (0.035)	0.218*** (0.073)
Covariates	Yes	Yes	Yes	Yes	Yes
Previous industry affiliation FE	Yes	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes	Yes
Unemployment year FE	Yes	Yes	Yes	Yes	Yes
Cohort of birth FE	Yes	Yes	Yes	Yes	Yes
Number of observations	94,648	94,648	94,648	94,648	94,648
Mean of dep.var.	0.11	0.01	0.00	0.01	0.06
<b>Panel B: Women</b>					
Early retirement age	0.003 (0.005)	0.008*** (0.002)	0.003*** (0.001)	0.003*** (0.001)	0.022*** (0.003)
Covariates	Yes	Yes	Yes	Yes	Yes
Previous industry affiliation FE	Yes	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes	Yes
Unemployment year FE	Yes	Yes	Yes	Yes	Yes
Cohort of birth FE	Yes	Yes	Yes	Yes	Yes
Number of observations	45,063	45,063	45,063	45,063	45,063
Mean of dep.var.	0.14	0.01	0.00	0.01	0.06

*Notes:* The sample consists of all unemployed workers due to plant closures or mass layoffs between 2000 and 2013. Estimates are average marginal effects based on a probit estimation. Educational attainment, occupation, gross income and work experience before unemployment are included as covariates. Standard errors in parentheses are clustered on individuals; \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

**Table 6:** Training program types

	(1) Qualifications	(2) Job orientation	(3) Job search
<b>Panel A: Men</b>			
Early retirement age	-0.029 (0.046)	0.037 (0.038)	0.186*** (0.059)
Covariates	Yes	Yes	Yes
Previous industry affiliation FE	Yes	Yes	Yes
Province FE	Yes	Yes	Yes
Unemployment year FE	Yes	Yes	Yes
Cohort of birth FE	Yes	Yes	Yes
Number of observations	94,648	94,648	94,648
Mean of dep.var.	0.05	0.01	0.05
<b>Panel B: Women</b>			
Early retirement age	0.003 (0.004)	0.002 (0.002)	-0.006** (0.003)
Covariates	Yes	Yes	Yes
Previous industry affiliation FE	Yes	Yes	Yes
Province FE	Yes	Yes	Yes
Unemployment year FE	Yes	Yes	Yes
Cohort of birth FE	Yes	Yes	Yes
Number of observations	45,063	45,063	45,063
Mean of dep.var.	0.07	0.02	0.05

*Notes:* The sample consists of all unemployed workers due to plant closures or mass layoffs between 2000 and 2013. Estimates are average marginal effects based on a probit estimation. Educational attainment, occupation, gross income and work experience before unemployment are included as covariates. Standard errors in parentheses are clustered on individuals; \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

**Table 7: ALMP duration**

	(1)	(2)	(3)	(4)
	Training	Outplacement trusts	Firm founding program	Job integration support
<b>Panel A: Men</b>				
Early retirement age	10.845*** (3.213)	4.610 (3.897)	0.476 (1.136)	7.256* (3.801)
Covariates	Yes	Yes	Yes	Yes
Previous industry affiliation FE	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes
Unemployment year FE	Yes	Yes	Yes	Yes
Cohort of birth FE	Yes	Yes	Yes	Yes
Number of observations	94,648	94,648	94,648	94,648
Mean of dep.var.	6.42	3.59	0.86	2.36
<b>Panel B: Women</b>				
Early retirement age	0.967** (0.468)	2.136*** (0.535)	0.436** (0.202)	1.578*** (0.408)
Covariates	Yes	Yes	Yes	Yes
Previous industry affiliation FE	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes
Unemployment year FE	Yes	Yes	Yes	Yes
Cohort of birth FE	Yes	Yes	Yes	Yes
Number of observations	45,063	45,063	45,063	45,063
Mean of dep.var.	8.60	3.58	0.64	2.95

*Notes:* The sample consists of all unemployed workers due to plant closures or mass layoffs between 2000 and 2013. Estimates are based on an OLS estimation. Outcome variables are set to zero if not assigned to a programme. Educational attainment, occupation, gross income and work experience before unemployment are included as covariates. Standard errors in parentheses are clustered on individuals; \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

**Table 8:** Employment and job quality

	(1)	Employment (2)	(3)	Job quality (4)	(5)
	Employment	Self-employment	Marginal Employment	Days in employment	Daily labor income
<b>Panel A: Men</b>					
Early retirement age	0.138*	-0.003	0.027	84.926***	14.252***
	(0.082)	(0.027)	(0.052)	(32.363)	(5.482)
Covariates	Yes	Yes	Yes	Yes	Yes
Previous industry affiliation FE	Yes	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes	Yes
Unemployment year FE	Yes	Yes	Yes	Yes	Yes
Cohort of birth FE	Yes	Yes	Yes	Yes	Yes
Number of observations	94,648	94,648	94,648	94,648	94,648
Mean of dep.var.	0.70	0.01	0.07	173.36	35.55
<b>Panel B: Women</b>					
Early retirement age	0.075***	0.002	0.035***	34.716***	3.957***
	(0.007)	(0.001)	(0.005)	(3.626)	(0.368)
Covariates	Yes	Yes	Yes	Yes	Yes
Previous industry affiliation FE	Yes	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes	Yes
Unemployment year FE	Yes	Yes	Yes	Yes	Yes
Cohort of birth FE	Yes	Yes	Yes	Yes	Yes
Number of observations	45,063	45,063	45,063	45,063	45,063
Mean of dep.var.	0.66	0.01	0.12	186.05	20.35

*Notes:* The sample consists of all unemployed workers due to plant closures or mass layoffs between 2000 and 2013. Estimates for binary employment outcomes are average marginal effects based on a probit estimation. Estimates for job quality are based on an OLS estimation. Outcome variables are set to zero if not assigned to a programme. Educational attainment, occupation, gross income and work experience before unemployment are included as covariates. Standard errors in parentheses are clustered on individuals; \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

**Table 9:** Heterogeneous effects for male unemployed workers

	Age		Occupation		Education		Local labor market	
	> 5 years before ERA	< 5 years	Blue-collar	White-collar worker	High	Low	Low unemployment rate	High
Training	0.059** (0.030)	0.108 (0.070)	0.029 (0.079)	0.568*** (0.165)	0.346 (0.214)	0.117 (0.078)	-0.012 (0.143)	0.201** (0.085)
<i>in qualifications</i>	0.093*** (0.018)	-0.055 (0.051)	-0.079 (0.054)	0.065 (0.097)	0.07 (0.153)	-0.074 (0.052)	-0.167 (0.104)	0.024 (0.056)
<i>in job search</i>	-0.040 (0.026)	0.145*** (0.051)	0.088 (0.060)	0.538*** (0.164)	0.352** (0.148)	0.154** (0.064)	0.139 (0.140)	0.196*** (0.066)
Job integration support	0.089*** (0.023)	0.160** (0.071)	0.203** (0.100)	0.293*** (0.119)	0.155 (0.132)	0.306*** (0.102)	0.166 (0.158)	0.245*** (0.076)
Employment	-0.463*** (0.034)	0.133 (0.106)	0.009 (0.095)	0.487*** (0.177)	0.320 (0.222)	0.106 (0.089)	0.351 (0.224)	0.087 (0.088)
Number of observations	53,771	40,877	74,060	20,588	10,937	83,711	21,499	73,149

*Notes:* The sample consists of all male unemployed workers between 2000 and 2013. Estimates are average marginal effects based on a probit estimation. Educational attainment, occupation, gross income and work experience before unemployment as well as industry, province, unemployment year and cohort of birth fixed-effects are included in all estimations. Standard errors in parentheses are clustered on individuals; \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

**Table 10:** Heterogeneous effects for female unemployed workers

	Age		Occupation		Education		Local labor market	
	> 5 years before ERA	< 5 years	Blue-collar worker	White-collar worker	High	Low	Low unemployment rate	High unemployment rate
Training	-0.264*** (0.066)	0.021* (0.012)	-0.005 (0.006)	0.015* (0.008)	0.011 (0.013)	0.002 (0.005)	-0.000 (0.009)	0.004 (0.006)
<i>in qualifications</i>	-0.072* (0.041)	0.014 (0.009)	0.001 (0.004)	0.007 (0.006)	0.021* (0.011)	0.001 (0.004)	0.002 (0.008)	0.004 (0.004)
<i>in job search</i>	-0.211*** (0.055)	0.002 (0.006)	-0.011*** (0.004)	0.001 (0.005)	-0.011 (0.008)	-0.004 (0.003)	0.000 (0.006)	-0.009** (0.003)
Job integration support	-0.134*** (0.051)	0.031*** (0.009)	0.017*** (0.004)	0.030*** (0.006)	0.028*** (0.010)	0.022*** (0.004)	0.021*** (0.007)	0.023*** (0.004)
Employment	0.018 (0.063)	0.047*** (0.017)	0.069*** (0.009)	0.082*** (0.011)	0.099*** (0.016)	0.068*** (0.008)	0.079*** (0.014)	0.074*** (0.008)
Number of observations	11,160	33,903	26,458	18,605	8,289	36,774	12,330	32,733

*Notes:* The sample consists of all male unemployed workers between 2000 and 2013. Estimates are average marginal effects based on a probit estimation. Educational attainment, occupation, gross income and work experience before unemployment as well as industry, province, unemployment year and cohort of birth fixed-effects are included in all estimations. Standard errors in parentheses are clustered on individuals; \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

# Web Appendix

This Web Appendix provides additional material discussed in the manuscript 'Later Retirement and the Labor Market Re-Integration of Elderly Unemployed Workers' by Wolfgang Frimmel.

**Table A.1:** Descriptive statistics of sample by early retirement age

	Men		Women	
	High ERA	Low ERA	High ERA	Low ERA
Age at unemployment	56.33 (3.325)	52.55 (4.064)	54.23 (2.736)	52.62 (4.021)
Age at retirement	60.39 (3.409)	59.48 (3.940)	58.62 (2.449)	58.18 (2.854)
<i>Educational attainment</i>				
Compulsory schooling	0.402	0.391	0.529	0.518
Apprenticeship	0.489	0.501	0.295	0.298
Matura	0.074	0.073	0.137	0.146
Academic	0.035	0.035	0.039	0.038
<i>Occupation</i>				
Blue-collar	0.793	0.789	0.608	0.578
White-collar	0.204	0.209	0.391	0.421
Public servant	0.003	0.002	0.001	0.001
Experience	23.80 (9.130)	20.54 (7.792)	20.10 (8.400)	17.18 (7.744)
Gross income	23,073.9 (24,366.9)	22,556.1 (26,172.7)	15,448.5 (14,653.9)	14,589.1 (14,212.9)
Observations	52,515	42,133	18,391	26,672

**Table A.2:** Descriptive statistics of outcome variables by early retirement age

	Men		Women	
	High ERA	Low ERA	High ERA	Low ERA
Unemployment duration (in days)	187.5 (278.5)	181.8 (262.0)	204.1 (270.0)	202.5 (250.4)
<i>ALMPs</i>				
Training	0.120	0.089	0.141	0.110
Labor trusts	0.009	0.011	0.011	0.010
Firm founding program	0.004	0.006	0.003	0.003
Job interview support	0.009	0.009	0.006	0.005
Job integration support	0.061	0.052	0.056	0.050
<i>Type of training program</i>				
Qualifications	0.064	0.025	0.089	0.048
Job orientation	0.012	0.006	0.017	0.011
Active job search	0.046	0.055	0.036	0.050
<i>Duration of unemployment subsidies</i>				
Days in training	6.896 (26.80)	5.644 (30.10)	8.951 (30.39)	7.041 (30.23)
Days in labor trusts	3.774 (57.00)	3.320 (43.60)	3.485 (43.21)	2.832 (39.92)
Days in firm founding program	0.729 (13.45)	1.006 (15.18)	0.617 (12.13)	0.490 (10.85)
<i>Subsequent employment</i>				
Employed	0.586	0.743	0.552	0.603
Self-Employed	0.009	0.018	0.007	0.010
Marginal employment	0.092	0.061	0.119	0.107
Not employed	0.405	0.239	0.441	0.386
<i>Job quality</i>				
Days in employment	129.96 (198.6)	194.86 (231.3)	139.30 (220.9)	169.45 (240.6)
Daily labor income	27.39 (37.67)	39.63 (34.93)	15.81 (25.41)	18.27 (25.20)
Observations	52,515	42,133	18,391	26,672

**Table A.3:** Effects on training: All unemployed workers

	(1)	(2)	(3)	(4)
	Training	Qualifications	Type of training Job orientation	Job search
<b>Panel A: Men</b>				
Early retirement age	0.135*** (0.031)	0.037* (0.022)	0.036* (0.018)	0.070*** (0.021)
Covariates	Yes	Yes	Yes	Yes
Previous industry affiliation FE	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes
Unemployment year FE	Yes	Yes	Yes	Yes
Cohort of birth FE	Yes	Yes	Yes	Yes
Number of observations	566,216	566,216	566,216	566,216
Mean of dep.var.	0.11	0.05	0.01	0.05
<b>Panel B: Women</b>				
Early retirement age	0.008*** (0.002)	0.003** (0.001)	0.002*** (0.001)	-0.001 (0.001)
Covariates	Yes	Yes	Yes	Yes
Previous industry affiliation FE	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes
Unemployment year FE	Yes	Yes	Yes	Yes
Quarter of unemployment FE	Yes	Yes	Yes	Yes
Number of observations	291,016	291,016	291,016	291,016
Mean of dep.var.	0.14	0.07	0.02	0.05

*Notes:* The sample consists of all unemployed workers between 2000 and 2013. Estimates are average marginal effects based on a probit estimation. Educational attainment, occupation, gross income and work experience before unemployment are included as covariates. Standard errors in parentheses are clustered on individuals; \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

**Table A.4:** Employment and job quality: All unemployed workers

	(1)	(2)	(3)
	Employment	Days in employment	Daily labor income
<b>Panel A: Men</b>			
Early retirement age	0.177*** (0.036)	113.183*** (14.204)	16.568*** (2.398)
Covariates	Yes	Yes	Yes
Previous industry affiliation FE	Yes	Yes	Yes
Province FE	Yes	Yes	Yes
Unemployment year FE	Yes	Yes	Yes
Cohort of birth FE	Yes	Yes	Yes
Number of observations	566,216	566,216	566,216
Mean of dep.var.	0.70	174.28	33.74
<b>Panel B: Women</b>			
Early retirement age	0.070*** (0.003)	30.106*** (1.492)	3.829*** (0.161)
Covariates	Yes	Yes	Yes
Previous industry affiliation FE	Yes	Yes	Yes
Province FE	Yes	Yes	Yes
Unemployment year FE	Yes	Yes	Yes
Cohort of birth FE	Yes	Yes	Yes
Number of observations	45,063	45,063	45,063
Mean of dep.var.	0.67	169.74	19.98

*Notes:* The sample consists of all unemployed workers due to plant closures or mass layoffs between 2000 and 2013. Estimates for the binary employment outcome is an average marginal effect based on a probit estimation. Estimates for job quality outcomes are based on an OLS estimation. Outcome variables are set to zero if not assigned to a programme. Educational attainment, occupation, gross income and work experience before unemployment are included as covariates. Standard errors in parentheses are clustered on individuals; \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$