Institutional reforms and an incredible rise in old age employment

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Very preliminary.

We investigate whether the reform of unemployment benefit payout periods for older workers affected labor market transitions. We apply rich administrative data and exploit a difference-in-differences approach. Compared to the reference group of 40-44 year olds for whom benefit payout did not change, we find that after the reform job exit rates declined, job finding rates increased, the propensity to remain employed increased, and the propensity to remain unemployed declined. These patterns suggest that the reform of unemployment benefits contributed to the vast increase in the employment rates of older workers and may be one reason for the recent incredible rise in old age employment in Germany.

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1.   Introduction

Between 2000 and 2014 the German population share of employed older workers (age 55-64) increased by 53 percent for men and by 110 percent for women.[1] This development dwarfs the increase in labor force attachment observed among older workers in the United States (Banerjee and Blau 2016) and other countries (Hoffmann and Lemieux 2015). For countries in the grip of demographic ageing, it is important to learn what can generate such a jump in older workers' labor force participation and employment.

This paper addresses the relevance of labor market institutions and their incentive effects for older workers' labor market outcomes. In particular, we use detailed administrative data to investigate the effects of an unemployment insurance reform on employment transitions, i.e., job entry and exit of older workers. Understanding the impact of institutions on employment choices of older workers is of general interest especially in societies characterized by demographic aging and with retirement systems under fiscal pressure.

This study connects to two prior contributions: Hoffmann and Lemieux (2015) analyze unemployment in the United States after the Great Recession and compare it to trends in other countries. They investigate the drop in nonemployment among older workers in Germany and argue that labor market reforms are unlikely to "explain a sizable part of the trends in nonemployment" (p. 132). Dlugosz et al. (2014) study the impact of German labor market reforms on older workers' subsequent entries to unemployment. In contrast to Hoffmann and Lemieux (2015) they find substantial reform effects of, e.g., up to 30 percent reductions in unemployment entries. Thus, the relevance of institutional reforms for employment trends of older workers is disputed and we contribute to that debate.

In this paper, we offer a broad and encompassing analysis. We differ from Hoffmann and Lemieux (2015) by focusing on the effect of the Hartz reforms specifically for older

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[1]   Shares computed from Mikrozensus data published by the German Federal Statistical Office; for a discussion see, e.g., Hoffmann and Lemieux (2015).

workers' labor market flows. We go beyond Dlugosz et al. (2014) by considering a broader set of labor market transitions, by separating male and female workers, and by accounting for seasonality and seam effects in monthly transition patterns.

This contributes to several lines of literature: it adds to the study of older workers' labor force participation, it contributes to the analysis of institutional reform effects, and it offers a new perspective on recent labor market developments in Germany. We briefly review the literature in each of these fields:

Older workers' labor force participation (LFP) receives substantial attention due to its immediate fiscal implications (Coile et al. 2014). The trends and determinants of older workers' LFP shifted over recent decades. Peracchi and Welch (1994) refer to developments such as wage dispersion, skill allocation in the economy, or changes in the industry and occupation mix to explain the falling LFP of older workers in the United States since the 1960s. Schirle (2010) looks at more recent data across countries and finds that, generally, increases in older men's LFP can be explained by increases in the labor market participation of their wives. In contrast, Blau and Goodstein (2010) conclude that changes in retirement incentives explain between one quarter and one half of the increase in U.S. older male workers' LFP by 2005. Most recently, Banerjee and Blau (2016) inspect employment trends in the U.S. through 2010. They find only limited explanatory power in demographics, education, and institutional incentives. We add to this literature by offering evidence on the relevance of institutional reforms in attaining a substantial increase in old-age LFP.

A large literature studies workers' responses to institutional incentives based on reforms of unemployment and retirement regulations. In an influential early contribution, Hunt (1995) applies survey data to study reforms of the German unemployment insurance in the 1980s. She concludes that "The large increase in potential duration of ALG [unemployment benefits] provoked a large response, (…)." (p. 118). Fitzenberger and Wilke (2009) much later studied the same reforms with administrative data. They confirm strong responses among older

unemployed workers. Similarly, Van Ours and Vodopivec (2006) find large effects of shortened unemployment transfers for workers in Slovenia. Also, Lalive et al. (2006) find that an extension of the potential benefit duration resulted in longer unemployment spells particularly among older workers; they exploited a 1989 reform of the Austrian unemployment insurance system. In another study of the Austrian unemployment system, Inderbitzin et al. (2016) look at the relationship between unemployment insurance and retirement incentives. Using an extension of unemployment benefits for older workers, they find strong effects on the incidence of early retirement. The authors suggest that policies aiming at postponing retirement need to consider the full mix of available transfer programs. Hairault et al. (2010) take on a different perspective and address the distance to retirement as a key determinant of older workers' labor market behavior. They argue that the returns to job finding vary with a job's potential duration. Based on a 1993 reform of the French retirement system they confirm that employment rates of older workers increase after postponing retirement. We add to this literature by evaluating the effects of a reform on labor market transitions while accounting for other relevant institutional features. This allows us to evaluate the sensitivity of job loss and job finding to search incentives.

Third, the good performance of the German labor market after the Great Recession with little change to employment and unemployment caused international attention (e.g., Hoffmann and Lemieux 2015, Burda and Hunt 2011). Interestingly, the dominant explanations of this development do not assign a central role to the preceding and much disputed labor market reforms. Instead, Burda and Hunt (2011) stress three different explanations: the pessimistic hiring behavior of employers prior to the recession, wage moderation, and working time accounts, which allowed for adjustments at the intensive vs. extensive margin of labor demand. Dustmann et al. (2014) emphasize the governance structure of German labor market institutions with decentralized wage setting institutions as the main reason for the strong performance of the German labor market. While both teams of authors argue that the labor market reforms

implemented between 2003 and 2006 are not of central importance, Hoffmann and Lemieux (2015, p. 138) point out that "large scale-reforms of the labor market and the pension system can have major impacts on labor market performance." However, they do not consider these reforms to be decisive for older workers. We offer an analysis of the relevance of the institutional framework for the labor force behavior of older workers. To the extent that transitions between labor market states such as employment, unemployment, or out-of-the labor force respond to rule changes implied by the Hartz reforms prior studies may have underestimated the contribution of these institutions to the overall development.

We think that understanding the impact of institutional changes on labor force participation choices of older workers is of general interest. The interplay between unemployment benefit provision and employment incentives is an internationally observed phenomenon. Numerous countries attempt to deal with the challenge of aging societies by making adjustments to the regulatory environment of work, unemployment, and retirement. Therefore, the study of causal reform effects is important to inform policy.

We find, based on a difference-in-differences analysis with large samples taken from precise administrative data that the reduction of unemployment benefit payments affected the transition rates of older workers in the expected ways. Compared to a reference group of 40-44 year olds for whom benefit payout did not change, job exit rates declined, job finding rates increased, the propensity to remain employed increased and the propensity to remain unemployed declined after the reform. We observe the largest behavioral adjustments among those affected most strongly by the reform. These patterns suggest that labor market effects of labor market reforms contributed to the vast increase in the employment rates of older workers and may be one reason for the incredible rise in old age employment in Germany.

In the next section, we explain recent labor market reforms and introduce the institutional framework. Based on this institutional background we derive specific hypotheses on adjustments in labor force transitions of older workers. In section three, we introduce our

administrative data. We explain our empirical method and identification strategy. Results and robustness tests follow in section four. We conclude in section five.

2.   Institutions and Hypotheses

This paper evaluates the role of institutional reforms for the recent increase in older workers' employment, specifically for changes in employment entry and exit. In explaining individual labor market transitions, it is important "to carefully consider the entire set of welfare programs" (Inderbitzin et al. 2016, p. 286). Thus, we discuss the reform of unemployment benefits and other relevant institutions.

Unemployment insurance 2006 reform: Our attention centers on the reform of unemployment benefits by a law, which passed parliament on Dec. 24, 2003 (Hartz IV law). It shortened the duration of unemployment benefit payout for workers aged 45 and above by up to 14 months. **Table 1** summarizes the changes in transfer durations. They vary by workers' age when entering unemployment: column 2 describes the maximum pre-reform payout duration and column 3 the post-reform situation.

The reform affected workers who became unemployed on or after February 1, 2006. It intended to strengthen older workers' labor market orientation. Job search theory (Mortensen 1970) and the empirical literature (e.g., Card et al. 2007) suggest that unemployment durations fall with benefit entitlement periods. Therefore, we expect that individuals age 45 and above who became unemployed (U) on or after February 1, 2006 ceteris paribus return to employment (E) faster than their peers who had lost their job earlier (H1: UE). The effect on exits from unemployment to employment should be strongest among those with the largest reductions in payout periods, i.e., age groups 52-54 and 57 and over (see **Table 1** column 4). As the reform renders the unemployment status less attractive, this may reduce workers' propensity to enter unemployment from employment after the reform (H2: EU), incentivize continued employment (H3: EE), and reduce the propensity to remain unemployed (H4: UU).

In addition to these expected responses to the reduction in benefit durations, Dlugosz et al. (2014) show substantial evidence of anticipation behavior prior to the reform date. Those older workers who were to lose their jobs on or after February 1, 2006 had an incentive to start an unemployment spell earlier: they may benefit from up to 14 additional months of transfer receipt if unemployment starts prior to the reform cutoff date of February 1, 2006. Thus, it is important to account for an anticipatory increase in entries to unemployment among older workers prior to the end of January 2006.

Unemployment insurance 2008 reform: In response to strong public opposition to the 2006 reform, the original reductions in payout durations were softened in a second reform.[2] This 2008 reform law passed parliament in January 2008 and retroactively affected all those unemployed on January 1, 2008 and after. Payout durations increased from 12 to 15 and from 18 to 24 months for selected age groups (see columns 5 and 6 in **Table 1**). While this reform may weaken some of the prior adjustments in transition behaviors for the concerned age groups, the net effect continued to be a substantial shortening of payout periods (see column 7 in **Table 1**). It is unlikely that the 2008 reform generated anticipation effects. The planned regulations were publicly known by Dec. 11, 2007 and benefited all those who continued to be unemployed beyond the end of 2007.[3] Given the fast change of the 2006 unemployment insurance reform, it is not possible to evaluate its long run effects.

58 regulation: As an additional change, the '58 regulation' expired at the end of 2007: if individuals age 58 and over entered unemployment prior to 2008, the '58 regulation' exempted them from the requirement to search for work which generally is a condition for receiving unemployment benefits. Workers who used the exemption had to retire as soon as they reached full retirement age. The exemption expired for those entering unemployment on January 1, 2008

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[2]   For an analysis of the 2008 reform on unemployed workers' search effort, see Lichter (2016).
[3]   In principle, individuals who received job offers after December 11 may have turned them down in expectation of an extension of their unemployment benefits. This might generate a very brief anticipatory dip in unemployment exits.

and after. This may have rendered unemployment less attractive for those affected. As the reform of the '58 regulation' becomes effective at the same time as the 2008 benefit extensions and for the same age group (see column 5 of **Table 1**), we cannot identify the general effects of the two reforms separately.[4] Workers may have anticipated the termination of the 58 regulation as it was announced already in 2006: those aged 58 and above had an incentive to bring an expected entry to unemployment forward and to enter unemployment prior to January 1, 2008.[5]

Retirement insurance: The German retirement system offers various pathways to retirement, which differ in their requirements (e.g., the number of contribution years, retirement age, gender, health, or prior unemployment). **Table 2** describes five pathways with respect to the minimum age of retirement entry. Due to various reforms, the rules differ by birth cohort. Generally, each pathway allows entry at a full (i.e., normal) and an early retirement age, the latter involving benefit reductions (for a recent description see Engels et al. 2016).

As a first pathway, **Table 2** shows 'retirement after long term unemployment' which allows individuals to retire if they were unemployed in at least 52 of the last 78 weeks prior to retirement (see columns A).[6] The minimum age for full retirement after long term unemployment increased from 60 to 65 for the birth cohorts until 1936 to 1941 and after. Since 2006, this pathway to retirement can be used prior to age 65 only via early retirement. Also, the minimum age for early retirement increased from 60 to 63. Thus, in addition to cutbacks in unemployment benefits after 2006 also retirement entry for the unemployed became more restrictive. This may delay exits from unemployment into retirement (and indirectly from employment to unemployment) after 2005 for the cohorts 1946 and after.

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[4]　The effect of the 2008 benefit duration extension could be identified for the age group 50-54 for whom benefit payout periods were extended by 3 months and the 58 regulation did not apply.

[5]　However, to the extent that workers or employers had expected another prolongation (the regulation had been prolonged without interruption since 1985) the anticipation behavior may have been limited.

[6]　Also, additional requirements must be met. In 2005, 18 percent of all old age retirements occurred via this pathway (DRV 2015).

The columns B in **Table 2** describe a pathway to retirement that existed only for females: historically, women could enter full retirement at age 60. This entry age was raised and starting with the birth cohorts 1945 this pathway to normal full retirement was abolished altogether. Until the birth cohort of 1951 women could still retire at age 60 via early retirement. Generally, the rising full retirement age for females in the early 2000s should contribute to prolonged employment. In comparison to men the abolition of early retirement at age 60 and the enforcement of age 65 as minimum age for full retirement came much later for women. Therefore, females may respond less strongly to changes in unemployment benefits than men.

The next columns in **Table 2** (columns C) show 'retirement after long term employment', which requires an insurance period of at least 35 years, and regular old age retirement (columns D). These pathways remained unchanged during our period of interest (2004-2008). They allow full retirement at age 65 and early retirement for the long term employed at age 63.[7]

Partial retirement subsidies: The German unemployment insurance subsidized partial retirement schemes where workers work part time over the last (up to) six years of their employment contract. This subsidy was abolished for those starting partial retirement after Dec. 31, 2009. However, this should not affect behavior in the period we are focusing on.

If we consider three mutually exclusive labor force states (employment, unemployment, out-of-the labor force) our discussion yields four main hypotheses on the response of labor market transitions to the 2006 unemployment insurance reform. We expect an increase in entry to employment from unemployment (H1), a decline in employment exits to unemployment (H2), an increased propensity to stay employed (H3), and a reduced propensity to remain in unemployment (H4). In testing these hypotheses, we account for anticipation of the 2006 reform

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[7]   For completeness, columns E describe 'retirement for the severely handicapped'. This pathway, for those with severe handicaps became more restrictive, as well. Since 2012 there is also a new pathway for the 'very long term employed' with insurance periods of at least 45 years (not shown in **Table 2**); we do not discuss it as it is outside our investigation period.

and of the abolition of the 58 regulation, for changes in retirement entry regulations, and investigate gender-specific effect heterogeneity.

3. Data and Method

3.1 Data, Sample, and Outcomes

We use administrative data collected by the unemployment insurance. The Sample of Integrated Labour Market Biographies (SIAB) 7510 provides a two percent random sample of records on all individuals who were in touch with the unemployment insurance at least once between 1975 and 2010.[8] It covers about 80 percent of the adult population excluding civil servants and the self-employed. The SIAB data provide employment biographies on a day-to-day basis for more than one million individuals with at least one period of employment subject to social security, unemployment benefit receipt, or job search. The data offer various advantages: survey problems such as non-response do not exist, labor force transitions are observed based on daily reporting, and the sample describes the entire work force subject to the regulations described above.

To test our hypotheses with respect to the effects of the 2006 unemployment insurance reform with pre- and post-reform observation periods of similar duration, our data cover March 2004 through December 2007, i.e. the same period before and after the reform. As we are interested in the behavior of older workers, we restrict our sample to East and West Germans aged between 40 and 64 years (i.e., birth cohorts 1939-1967). We exclude workers in the construction and mining sectors because they face special unemployment and retirement regulations.

In order to be eligible for the maximum duration of unemployment benefits as described in **Table 1** the unemployed must have contributed to the unemployment insurance for a

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[8]   The data are provided by Research Data Centre (FDZ) of the German Federal Employment Agency at the Institute for Employment Research (IAB). For details, see vom Berge et al. (2013).

minimum number of months ("insurance months").[9] We follow Dlugosz et al. (2014) and concentrate on workers who are eligible to for the maximum duration of unemployment benefits as they are fully affected by the reform. Alternatively, we could use (i) the full sample without regard to actual benefit claims. However, in this sample not all individuals are affected by the reform. (ii) Also, one could use a sample of those workers who suffered at least some reduction in their claims as a consequence of the reform, even if they were not eligible to the full transfer duration. Below we offer robustness tests based on this latter sample.[10]

We consider individuals' labor force status at the beginning of a month. An individual in an employment relationship paying mandatory social security contributions is coded as employed (state: E).[11] We code an individual as unemployed (state: U) if the person receives unemployment benefits (*Arbeitslosengeld I*), which is our outcome of interest.[12] Individuals who left the labor market are coded to be out of the labor force (state: O).[13] Our analysis sample

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[9]   For details, see **Table A.1**. Under the pre-reform regime, unemployment benefit eligibility required that the individual was employed for at least 12 months within the last 3 years or since the last receipt of unemployment benefits within the last 3 years. To be eligible for the maximum transfer duration, the individual needed up to 64 months of employment within the last 7 years or since the last receipt of unemployment benefits within the last 7 years.

[10]   Clearly, the three samples differ in size. For transitions out of unemployment (employment) we observe about .604 (10.065) million person-months in the full sample, .526 (8.615) in the sample with some benefit reductions, and .430 (8.021) in the sample with maximum claims.

[11]   Individuals in training, in early retirement, interns, protected disabled individuals in special employment situations, marginal employments, and those in civil and military service are considered to be out of the labor force.

[12]   Jung and Kuhn (2014) discuss that this definition differs from the one applied in analyses for the United States, where unemployment is associated with search rather than benefit receipt. Also, in those few instances, when the data suggest simultaneous employment and unemployment spells, we follow the data producers' recommendations and code employment as this is the more reliable information (see Jaenichen et al. 2005).

[13]   We code gaps of up to 12 weeks between E and U as well as between two U spells as direct transitions because individuals who voluntarily quit a job or fail to report to the unemployment insurance in time can be sanctioned by a delay of up to 12 weeks in the start of their benefit payouts (see Fitzenberger and Wilke 2009). In that case, they would be unemployed (without benefits) already up to 12 weeks prior to the start of the payout spell. We coded gaps of up to 12 weeks between U and E spells and two E spells as direct transitions. Gaps of more than 12 weeks suggest that the individual left the labor force: otherwise the individual has an incentive to claim unemployment benefits. For gaps of more than 12 weeks and for the last spell of an individual's employment biography that does not end by death we add out of the labor force spells to the data (coded O). This definition has some limitations as we might be miscoding periods such as self-employment - which we cannot recognize in the data - or marginal employment as O. However, this is the only possibility to add labor force exits - besides death - to our analysis.

describes 8.02 and 0.43 million person-month observations in employment and unemployment during the 45 months period between March 2004 and December 2007.

We focus on four types of labor market transitions, continued employment E-E, job separations E-U, job findings U-E, and continued unemployment U-U. We code a transition A-B in month t if an individual was in state A on day one of month t and in state B on day one of month t+1. In total, 99.3 and 92.0 percent of all monthly transitions stay in the original states of employment and unemployment, respectively. Starting in employment, 0.26 percent of all monthly transitions are to unemployment (20,855 observations), and 0.41 percent (32,886 observations) to out of the labor force or censored states. 2.89 percent of all monthly transitions from unemployment are into employment (12,436 observations) while 5.11 percent (21,988 observations) transit to out of the labor force or censoring.

Figures 1.1 and **1.2** depict the development of the four transition rates pooled over all age groups over time and adjusted for seasonality. In both cases, employment and unemployment, a high share of workers remains in the initial state (see **Figure 1.1**): the propensity to remain unemployed has been declining from about 92 to 89 percent since the end of 2005 whereas the propensity to remain employed was constant and close to 100 percent. **Figure 1.2** shows that the job finding rate (UE) increased since the end of 2005. We also see very little change in job exit rates (EU): with the exception of an increase at the end of 2005 and a brief decline in January 2006 this transition rate remains at a constant low level.[14]

3.2   Method

We are interested in identifying the causal effect of institutional reforms on labor market transitions of older workers. Our empirical strategy applies a difference-in-differences estimator where we compare the pre- (T=0) and post-reform (T=1) monthly labor force

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[14]   **Table A.2** in the appendix shows the age group and gender specific transition rates and sample sizes.

transitions for age groups affected (treatment group, G=1) and not affected (control group, G=0) by the reform. This identifies a causal treatment effect if the transitions of treatment and control groups would have continued to move in tandem without the reform. We address the validity of this parallel path assumption in detail below. Our control group consists of individuals aged 40-44, as older workers (age groups 45-46, 47-51, 52-54, 55-56, 57-59, 60-62, 62-64) are treated by the 2006 reform (see **Table 1**). Our main estimation equation is:

$$E[\ Y \mid T, G, X] = \Lambda(\alpha\ T + \beta\ G + \gamma\ TG + X\ \theta)\,, \tag{1}$$

where T and G are time and group indicators, X contains different sets of control variables, Λ is the cumulative distribution function of the binary outcome (Y), and α, β, γ, and θ are parameters to be estimated.

As our dependent variables indicate rare events - with average transition probabilities of below one percent - estimation results are sensitive to the estimation approach. In such a situation, the predicted outcomes of linear probability models, which impose linearity in marginal effects, can differ substantially from those based on discrete choice models (Greene 2012, p. 729). We apply logit estimations in order to be able to calculate reliable marginal effects.[15]

In order to facilitate the quantitative and qualitative interpretation of the estimation results we present coefficient estimates with standard errors clustered at the individual level and calculate marginal causal effects. We follow Puhani (2012, see equation 10) and determine the treatment effect of interest (τ) as the difference between two cross-differences, where Y^0 and Y^1 are potential outcomes without and with treatment:

$$\tau\ (T=1, G=1, X) \qquad = E[Y^1 \mid T=1, G=1, X] - E[Y^0 \mid T=1, G=1, X]$$

$$= \Lambda(\alpha + \beta + \gamma + X\theta) - \Lambda(\alpha + \beta + X\theta). \tag{2}$$

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[15] Dlugosz et al. (2014) follow the same strategy. Please note, that our data show rare events but not small samples (typically, we have at least 1,000 observations of the rare outcomes). We are therefore not at risk of small sample bias. Nevertheless, we applied estimators appropriate for rare events *and* small sample sizes to test the robustness of our estimates.

More specifically, our dependent variable describes whether a given transition between two labor market states (e.g., A and B) is observed for person i between month m and m+1; we consider indicators of *age* to represent treatment and control groups (G), and a post-reform indicator (*post*) as a period indicator (T).

The vector of control variables X contains two sets of measures (see **Table 3**). One set (X1) contains general and socio-demographic characteristics: gender, education[16], federal state of residence, and state-level linear and quadratic time trends, controls for calendar month capture seasonality, and for calendar year capture time trends and the business cycle. A second set of controls (X2) accounts for relevant institutions, intervening mechanisms and regulatory changes which we code based on the individuals' year of birth, the period of observation, and the specific regulation. Some controls considered in vector X2 depend on the considered transition. When estimating transitions from employment we account for potential anticipation of the 2006 reform, its interaction with age group indicators and anticipation of the end of the 58 regulation. When estimating transitions from unemployment we account for whether there are remaining unemployment benefit entitlements, and for the duration of past unemployment benefit receipt in the ongoing unemployment spell. With both outcomes we consider a vector of retirement indicators which describe current eligibility for early and full retirement and the number of years until eligible for early and full retirement (see **Table 3** for definitions and **Table A.3** for descriptive statistics). We estimate the following model:

$$E[AB_{i,m}] = \Lambda(\alpha_0 + \alpha_1 \, post_{i,m} + \beta_1 \, age_{i,m} + \gamma' \, (post_{i,m} * age_{i,m}) + \theta_1' \, X1_{i,m} + \theta_2' \, X2_{i,m}) \quad (3)$$

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[16]   The education information provided in SIAB is at times inconsistent and missing. In order to correct for the inconsistencies and to "fill" missing values we chose an imputation method similar to method IP I suggested by Fitzenberger et al. (2006). We fill missing education values in the future with observations from the past assuming that educational degrees cannot be lost. In order to maintain observations without education information in the data we code and control for a missing information indicator.

In a linear model, the coefficient estimate of the interaction of the post-reform indicator with the vector of age measures (γ) would yield the causal treatment effect. As we estimate a nonlinear model, we calculate the treatment effect based on equation (2). This allows us to test hypotheses H1-H4 regarding the effects of the 2006 reform for transitions between employment and unemployment with out of the labor force as a third state and accounting for additional institutional features. In order to quantify the relevance of the marginal effects we additionally present relative marginal effects (RME) which relate the marginal effect to the age-group specific pre-reform mean transition rate for the considered outcome.

3.3 Parallel Path Assumption

Our estimations identify causal treatment effects only if the identifying assumption of the difference-in-differences estimator, parallel trends in pre-reform transition rates holds. Without the reform the development in labor market transitions for treatment and control groups should have followed parallel trends. We offer two approaches to evaluate the validity of this assumption.

First, we inspect graphic representations of pre-reform trends in outcomes for treatment and control groups. As we consider four different outcome transitions and seven treatment age groups we cannot show all graphs. **Figures 2.1-2.4** present the developments over time for the control group (age 40-44) and, exemplarily, for the treatment groups age groups 45-51, 52-56, and 57-64 combined.[17] The depicted rates are adjusted for calendar month effects. Each figure is devoted to a different outcome. **Figure 2.1** shows the propensity to remain employed (E-E transitions) over time. Here, the trend for the oldest age group (57-64) is steeper than that observed for the control group. In contrast, in **Figures 2.2-2.4** we do not observe obvious

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[17]   We combine age groups first, to avoid clutter, and second, because data restrictions require a minimum group size of 30 observations for each data point. We do not reach that minimum for all transitions, age groups, and months.

deviations from the parallel path assumption for the three transitions (E-U, U-U, U-E) and age groups considered there.

Second, we offer tests for the significance of time trend differences. Based on data for the pre-reform, pre-anticipation period we estimate the following specification using a logit estimator:

$$AB_{i,m} = \gamma_0 + \gamma_1 \text{ age }_{i,m} + \gamma_2 \text{ t}_{i,m} + \gamma_3' (\text{t}_{i,m} * \text{age}_{i,m}) + \gamma_4' X1_{i,m} + \gamma_5' X2_{i,m} + \varepsilon_{i,m} . \qquad (4)$$

We interact age indicators for the treated groups with measures of the time trend (*t*) controlling for the *X1* and *X2* vectors of covariates. The coefficient vector γ_2 estimates the time trend for the control group; γ_3 indicates whether the time trend differs significantly for the treated age groups. We consider the four relevant transitions and apply linear, quadratic, and cubic specifications of the monthly time trend. If the estimates of γ_3 are jointly statistically significant, the identifying assumption does not hold and we cannot claim to observe causal effects.

Table 4 presents the results of the hypothesis tests for the full sample. We show the p-values of joint significance tests of γ_3 for the different functional forms for four different outcomes. If the test yields statistical significance at the five or one percent level, the p-value is underlined or marked in bold. Across the four outcome panels we find different patterns. While for the U-U transitions most age-group trends appear to differ significantly from the control group only a few age-groups appear to follow significantly different time trends compared to the control group of 40-44 year olds for the other three outcomes. For E-E transitions, we find different paths in the 57-59 age group, which confirms our conclusions based on **Figure 2.1**. For E-U transitions, there is weak evidence for age group 63-64 with cubic terms, and in the U-E transition only one cubic interaction term yields significant coefficient estimates. These results suggest that our difference in differences estimates of U-U transitions

may be the result of different pre-reform trends and therefore do not present causal effects.[18] In the other cases there is no general indication of heterogeneous pre-reform outcome trends.

Overall, we cannot generally interpret our findings as causal effects. This is particularly the case for U-U transitions and for certain older age groups regarding the E-E transitions. We consider this in our interpretation of findings and offer robustness tests controlling for group-wise time trends.

4.   Results and Robustness

4.1   Pooled sample

To determine the causal reform effects on older workers' labor force transitions we estimate difference-in-differences models on two samples of employed and unemployed workers and consider four transition outcomes (E-E, E-U, U-U, or U-E), each coded as a binary transition indicator. With shortened benefit payout periods we expect increased propensities to stay employed and to enter employment, and reduced propensities to stay unemployed or to enter unemployment for those affected by the reform compared to the reference group of 40-44 year olds who are not affected by the reform.

Table 5 presents coefficient estimates of the relevant parameters when controlling for the treatment indicators, general and socio-demographic control variables and institutional features: the individual coefficients mostly yield the expected sign and small standard errors (clustered at the individual level).[19] To interpret the estimated effects we calculated marginal effects and their standard errors based on the delta method (see **Table 6**). The results generally confirm the patterns observed based on the coefficient estimates in **Table 5**: column 1 shows positive marginal reform effects on the propensity to stay employed with the largest effects in

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[18]   A potential explanation for this deviation in pre-reform trends may related to heterogeneities in active labor market instruments, which may be applied differently across age groups.

[19]   Each reported group of covariates are jointly significant at the 1 percent level for all four outcomes.

the oldest groups, i.e., those who suffered the largest decline in benefit duration (see **Table 1**). We calculated relative marginal effects (RME) as the marginal effect relative to the mean pre-reform transition rate in the relevant age group. The RME for the 63-64 year olds (see column 2) suggests that the reform increased the propensity to stay employed in that age group by 0.34 percent per month, which is based on a highly statistically significant estimate of the marginal effect. This roughly accumulates to 4.16 percent per year ($1,0034^{12} = 1,0416$), which given the large employment rates even in this age group (see **Table A.2.1**) is a substantial effect.

The relative marginal effects are even larger for the other transitions where the baseline mean transition rates are smaller. For example, columns 3 and 4 of **Table 6** suggest that for all age groups the reform reduced the propensity to enter unemployment with significant effects of up to minus 22 percent per month for those aged 57-59. The response patterns match the expected treatment intensity: while the 55-56 year olds lost 8 months in unemployment benefit duration those in the neighboring younger and older age groups lost 14 months and show the expected stronger responses. Dlugosz et al. (2014) estimate similar models for transitions from employment to unemployment, only; their age groups and control variables are somewhat different but the results are of comparable magnitude. Surprisingly, we do not obtain statistically significant estimates in the oldest age group and thus cannot reject that the reform did not affect those aged 63 and 64. Columns 5-8 describe reform effects on transitions from unemployment. The reform reduced the propensity to stay unemployed for all age groups (columns 5-6). The job finding rate (see columns 7-8) increased for all age groups after the reform and in part substantially.

Overall, we cannot reject our four hypotheses regarding the effect of the unemployment benefit reform on labor market transitions of older workers. Thus, these institutional reforms may be at least partially responsible for the substantial increase in the observed employment rates of older workers observed in recent years.

4.2 Heterogeneity by Gender and Education

We discussed above that due to the retirement insurance regulations women in contrast to men may still have access to early retirement at age 60 even without prior unemployment spells. Also, women may enter normal retirement prior to age 65, see **Table 2**.[20] We concluded that females might thus respond less to the unemployment benefit reform of 2006. In order to investigate gender-based heterogeneities we re-estimated our models of **Table 5** separately for male and female subsamples. **Tables A.4** and **A.5** in the Appendix show the coefficient estimates and **Tables 7** and **8** present the marginal effects by gender. Once we split the samples, a few effects change signs: for example, column 1 of **Table 7** shows a significant negative marginal effect for age group 60-62 which is contrary to expectations, the same holds for the oldest age group of females in column 1 of **Table 8**. Overall, we expected larger reform effects for males than for females. However, we do not find consistent evidence of such a pattern. While in most age groups males show a stronger post-reform decline in unemployment entries than females these patterns are not confirmed for the other transitions; for example, the job finding rate out of unemployment increases by more for females than for males both in absolute and in relative terms. Possibly the share of females who can actually use the female retirement option is too small to affect the overall response to the unemployment reform.[21]

In addition, the effect of reduced unemployment benefit duration may differ depending on workers' human capital. Workers with little formal education may be under stronger pressure to hold a job and they may have more difficulty to find employment than better educated individuals. Our data allow us to split samples based on educational groups (see **Table 3** and **Table A.3**): about 8 percent of the sample holds neither a tertiary nor a vocational degree, about 75 percent hold a vocational degree, and about 15 percent hold a tertiary degree. We estimated

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[20]   It is important to point out that females must meet several specific requirements regarding their past retirement contributions to be able to enter early and normal retirement prior to males.
[21]   Based on aggregate statistics about 30 percent of all female retirement entries used the "female retirement pathway" (DRV 2015).

our models separately for the three subsamples and present the results in **Tables 9-11** (and **A.7-A.9**). Generally, we obtain fewer statistically significant marginal age group effects once we consider only subsamples. When we compare the relative marginal effects across education groups, we find the significant responses in terms of continued employment across all education groups for those aged 57-59 surprisingly with the largest relative marginal effects for those with low education. Similarly, the decline in job losses (E-U transitions) is similarly significant and of comparable magnitudes across education groups. Among those aged at least 57 the RME reach 20-30 percent. Across all groups, we observe significant changes in U-U transitions, which however we cannot interpret as causal effects due to the lack of parallel pre-reform trends for this specific transition. We observe clear differences in reform effects with respect to job finding rates: the effects are most significant for the largest group of middle educated individuals but the effects tend to be largest among those with the highest human capital, in particular at age 60 and above (see columns 8 in **Tables 9-11**). This heterogeneity can be due to better job finding opportunities for the highly educated.[22]

4.3   Robustness Tests

So far our results matched expectations and we found that the 2006 unemployment benefit reform indeed went along with and potentially caused increased persistence in employment, reduced persistence in unemployment, reduced unemployment entries and increased unemployment exits. We obtained these results under certain assumptions regarding sample selection, standard error calculations, and the choice of an estimator. In this section, we investigate whether the results are robust when we modify our procedure on each of these dimensions.

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[22]   In separate estimations, we tested whether the reform response among unemployed individuals with dependent children differs from that of those without dependent children. We did not observe significant differences by family status, neither for men nor for women.

First, we extend our sample of observations. We use not only those workers who based on their past labor market career can claim the maximum duration of unemployment benefits but instead we now consider all those who were affected at least somewhat by the reform. As an example, all those 45 year olds, who had not yet accumulated 36 insurance months prior to an unemployment spell could not claim 18 months of unemployment benefit pre-reform. Therefore, they did not experience the full reform-induced decline from 18 to 12 months benefit payout. While we omitted these observations so far, we now add them to our sample. **Table A.10** shows the coefficient estimates and **Table 12** the marginal effects and the relative marginal effects for the now larger, extended sample. A comparison of the results in **Table 6** with those in **Table 12** confirms a remarkable robustness of our main findings: the patterns of signs, significance, and magnitude of marginal effects are very similar when the extended sample is considered. Regarding transitions from employment effect sizes increased and with respect to transitions from unemployment effect sizes slightly decreased. The most substantial difference appears to be the relative marginal effect in the transition from unemployment to employment for the oldest age group (see column 8). Here the extended sample yields a large increase in the job finding rate for the added workers with weaker ties to the labor market. Generally, the results in **Table 12** strongly confirm the positive effect of the reform on labor market attachment, increased job finding and reduced job exit rates.

We performed a second test regarding to evaluate a selectivity dimension in our data. While we explicitly controlled for anticipation behavior prior to the reform we never accounted for the potential mechanical effect such anticipated transitions might yield on post-reform transition. As an example, the propensity to leave unemployment for employment may be subdued early after February 2006 if numerous workers just moved the unemployment entry forward to get it accomplished prior to February 1. In March and April they may be less motivated to find a job compared to the random person before the reform. Similarly, if many unemployment entries have been brought forward to early 2006, in the aggregate there may be

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a reduced risk of job loss afterwards. In order to test, whether such mechanisms affect our findings we apply a "donut-estimator" and simply re-estimated the model after omitting observations right after the reform. In **Table 16** we show the estimated marginal effects after omitting the months February - July 2006 (for coefficient estimates see **Table A.14**).[23] Overall, our estimates are highly robust to this change in sample. Among E-E transitions the effect for 60-62 year olds loses statistical significance, similarly for the E-U transitions the effect for the 55-56 year olds. The results for the other transitions are confirmed in terms of both, magnitude and significance.[24]

In our third robustness test we change the way standard errors are computed. While we allowed for clusters at the individual level so far, we now cluster at the cohort and calendar year level because that is the level at which the reform will affect workers. We show the estimated marginal effects in in **Table 13** and the coefficient estimates in Table A.11. Clustering the standard errors at a more conservative level merely affects the statistical significance of the E-E transitions. All marginal effects and the other significance levels did not change. Therefore, we conclude that the results are not due to unaccounted correlation patterns of the unobservable error terms.

Finally, we evaluate to what extent the results are robust to the choice of an estimator. We first replaced the logit by a probit and then by a complementary log-log model, which is a common choice in estimations of dichotomous dependent variables with very large and small shares of outcomes. We present the coefficient estimates in appendix **Tables A.12** and **A.13** and the marginal effects in **Tables 14** and **15**. Comparing the results in **Tables 6** on the one

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[23]   We also estimated the model when omitting only February - May 20ß6. There we observe even smaller changes in effects compared to **Table 6**.

[24]   Given the lack of parallel pre-reform time trends for the U-U transitions (see **Table 4**) we estimated a model accounting for age-groups specific trends (results not yet presented). The results of **Table 6** were robust to this modification. Therefore, the difference between the correlation and a causal effect may not be very large.

hand and in **Tables 14** and **15** confirms that the marginal effects are highly robust to the choice of an estimator.

5.   Conclusions

When we observe vast changes in labor force participation it is important to understand the underlying processes. This is of particular and international interest if the observed change is one that is relevant and desired for many labor markets. We study a potential determinant of an incredible rise in older workers' labor force participation in Germany: since 2000 the population share of employed older workers (age 55-64) increased by 53 percent for men and by 110 percent for women.

As the literature disagrees on the relevance of institutional framework, we investigate whether reforms affect older workers' transition rates. We focus on a reform of unemployment benefit duration, which was implemented in February 2006 and which was reversed slightly at the end of 2007. The reform shortened unemployment benefit payout by between 6 and 14 months for workers above age 45, a reduction that this is still in place. We apply a difference-in-differences estimator and compare the change in labor force transitions of workers affected and not affected by the reform.

Based on a search theory rationale we expect that reduced unemployment payout reduces the propensity to enter unemployment (EU) and to leave employment (EE); also it should increase the propensity to take up employment (UE) and to leave unemployment (UU). We test these hypotheses while accounting for a number of institutional developments; we account for potential anticipation behavior which has been established in prior studies (Dlugosz et al. 2014). We also carefully control for changes in retirement regulations that might affect labor market choices. We apply precise administrative data which offer large sample sizes.

We find that the reduction of unemployment benefit payments affected the transition rates of older workers in the expected ways. Compared to a reference group of 40-44 year olds

for whom benefit payout did not change, we find that after the reform job exit rates declined, job finding rates increased, the propensity to stay in employment increased and the propensity to stay in unemployment declined. We observed the largest behavioral adjustments among those affected most strongly by the reform. These patterns suggest that the reform of unemployment benefit durations contributed to the increase in the employment rates of older workers and may be one reason for the incredible rise in old age employment in Germany.

We compare the effects for subsamples separated by gender and education. We test the robustness of our results to different specifications of the estimation model, the sample selection mechanisms, and the estimators. In all cases, our results are confirmed. Therefore, we agree with Dlugosz et al. (2014) in the debate in the literature (cf. Hoffmann and Lemieux and Dlugosz et al. 2014) regarding the relevance of institutional reforms for the labor force participation choices of older workers. There is strong evidence that institutions matter and can have substantial effects on the employment behavior of older workers. This is important news for many countries with ailing retirement systems.

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Table 1   Maximum duration of unemployment benefit receipt (in months) by age and period

1	2	3	4	5	6	7
	Pre-Reform	Post-Reform 2006	Change in months	Post-Reform 2008	Change in months	Total change in months
Age	until 1/06	2/06-12/07	3 - 2	since 1/08	5 - 3	5 - 2
< 45	12	12	0	12	0	0
45-46	18	12	-6	12	0	-6
47-49	22	12	-10	12	0	-10
50-51	22	12	-10	15	3	-7
52-54	26	12	-14	15	3	-11
55-56	26	18	-8	18	0	-8
57	32	18	-14	18	0	-14
> 57	32	18	-14	24	6	-8

Note: The cut in durations as of February 2006 affected those unemployed since February 1, 2006. The prolongation of unemployment benefit durations as of January 2008 affected those entering unemployment on or after January 1, 2008 and aged 50 or 58 at that time, or those still receiving unemployment benefits from a prior entry to unemployment on January 1, 2008 and aged at least 50 or 58 at that time.

Source: BGBL.I, 1997, p. 627; BGBL.I, 2003, p. 3004; BGBL.I, 2008, p. 681

Table 2   Age at Retirement by Birth Cohort and Pathway

Birth Cohort	A Ret. after long term unemployment Full Age (Yr.)	Early Age (Yr.)	B Retirement for women Full Age (Yr.)	Early Age (Yr.)	C Ret. after long term employment Full Age (Yr.)	Early Age (Yr.)	D Regular old age retirement Full Age (Yr.)	Early Age (Yr.)	E Severely handicapped retirement Full Age (Yr.)	Early Age (Yr.)
1934	60 (1994)	n.a.	60 (1994)	n.a.	63 (1997)	n.a.	65 (1999)	n.a.	60 (1994)	n.a.
1935	60 (1995)	n.a.	60 (1995)	n.a.	rising to 64 (1999)	63 (1998)	65 (2000)	n.a.	60 (1995)	n.a.
1936	60 (1996)	n.a.	60 (1996)	n.a.	rising to 65 (2001)	63 (1999)	65 (2001)	n.a.	60 (1996)	n.a.
1937	rising to 61 (1998)	60 (1997)	60 (1997)	n.a.	65 (2002)	63 (2000)	65 (2002)	n.a.	60 (1997)	n.a.
1938	rising to 62 (2000)	60 (1998)	60 (1998)	n.a.	65 (2003)	63 (2001)	65 (2003)	n.a.	60 (1998)	n.a.
1939	rising to 63 (2002)	60 (1999)	60 (1999)	n.a.	65 (2004)	63 (2002)	65 (2004)	n.a.	60 (1999)	n.a.
1940	rising to 64 (2004)	60 (2000)	rising to 61 (2001)	60 (2000)	65 (2005)	63 (2003)	65 (2005)	n.a.	* rising to 61 (2001)	60 (2000)
1941	rising to 65 (2006)	60 (2001)	rising to 62 (2003)	60 (2001)	65 (2006)	63 (2004)	65 (2006)	n.a.	* rising to 62 (2003)	60 (2001)
1942	65 (2007)	60 (2002)	rising to 63 (2005)	60 (2002)	65 (2007)	63 (2005)	65 (2007)	n.a.	* rising to 63 (2005)	60 (2002)
1943	65 (2008)	60 (2003)	rising to 64 (2007)	60 (2003)	65 (2008)	63 (2006)	65 (2008)	n.a.	* 63 (2006)	60 (2003)
1944	65 (2009)	60 (2004)	rising to 65 (2009)	60 (2004)	65 (2009)	63 (2007)	65 (2009)	n.a.	* 63 (2007)	60 (2004)
1945	65 (2010)	60 (2005)	65 (2010)	60 (2005)	65 (2010)	63 (2008)	65 (2010)	n.a.	* 63 (2008)	60 (2005)
1946	65 (2011)	rising to 61 (2007)	65 (2011)	60 (2006)	65 (2011)	63 (2009)	65 (2011)	n.a.	* 63 (2009)	60 (2006)
1947	65 (2012)	rising to 62 (2009)	65 (2012)	60 (2007)	65 (2012)	63 (2010)	rising to 65 1 m.	n.a.	* 63 (2010)	60 (2007)
1948	65 (2013)	rising to 63 (2011)	65 (2013)	60 (2008)	65 (2013)	63 (2011)	rising to 65 2 m.	n.a.	* 63 (2011)	60 (2008)
1949	65 (2014)	63 (2012)	65 (2014)	60 (2009)	rising to 65 3 m.	63 (2012)	rising to 65 3 m.	n.a.	* 63 (2012)	60 (2009)
1950	65 (2015)	63 (2013)	65 (2015)	60 (2010)	rising to 65 4 m.	63 (2013)	rising to 65 4 m.	n.a.	* 63 (2013)	60 (2010)
1951	65 (2016)	63 (2014)	65 (2016)	60 (2011)	rising to 65 5 m.	63 (2014)	rising to 65 5 m.	n.a.	63 (2014)	60 (2011)
1952	retirement pathway terminated		retirement pathway terminated		rising to 65 6 m.	63 (2015)	rising to 65 6 m.	n.a.	rising to 63 1 m.	rising to 60 1 m.
1953					rising to 65 7 m.	63 (2016)	rising to 65 7 m.	n.a.	rising to 63 2 m.	rising to 60 2 m.
1954					rising to 65 8 m.	63 (2017)	rising to 65 8 m.	n.a.	rising to 63 3 m.	rising to 60 3 m.
1955					rising to 65 9 m.	63 (2018)	rising to 65 9 m.	n.a.	rising to 63 4 m.	rising to 60 4 m.
1956					rising to 65 10 m.	63 (2019)	rising to 65 10 m.	n.a.	rising to 63 5 m.	rising to 60 5 m.
1957					rising to 65 11 m.	63 (2020)	rising to 65 11 m.	n.a.	rising to 63 6 m.	rising to 60 6 m.
1958					rising to 66 (2024)	63 (2021)	rising to 66	n.a.	rising to 63 7 m.	rising to 60 7 m.
1959					rising to 66 2 m.	63 (2022)	rising to 66 2 m.	n.a.	rising to 63 8 m.	rising to 60 8 m.
1960					rising to 66 4 m.	63 (2023)	rising to 66 4 m.	n.a.	rising to 63 9 m.	rising to 60 9 m.
1961					rising to 66 6 m.	63 (2024)	rising to 66 6 m.	n.a.	rising to 63 10 m.	rising to 60 10 m.
1962					rising to 66 8 m.	63 (2025)	rising to 66 8 m.	n.a.	rising to 63 11 m.	rising to 60 11 m.
1963					rising to 66 10 m.	63 (2026)	rising to 66 10 m.	n.a.	rising to 64	rising to 61
1964					rising to 67 (2031)	63 (2027)	rising to 67	n.a.	rising to 64 1 m.	rising to 61 1 m.

Note: * Individuals born before Nov. 17 1950 and who were severely handicapped on Nov. 16 2000 can retire at age 60 without deductions. n.a. = not available.

Table 3   List of explanatory variables

Variable	Description
Treatment indicators	
Post-reform	Indicator for transition after the 2006 reform
Post-reform x 40-44 years old, ..., Post-reform x 63-64 years old	Interaction: post-reform and age group indicators (ref. = 40-44 years old)
General and socio-demographic characteristics (X1)	
Age, gender, education, state of residence	
40-44 years old	
45-46 years old	
47-51 years old	
52-54 years old	Indicator for the age group (ref. = 40-44 years old)
55-56 years old	
57-59 years old	
60-62 years old	
63-64 years old	
Female	Indicator variable for the gender
No univ. degree & no voc. training	
Vocational training	Indicator variables for the education groups (ref. = no university
Univ. degree/techn. college	degree & no voc. training)
Education missing	
Schleswig-Holstein, ..., Sachsen-Anhalt	Indicator for residential state (ref. = NRW)
Linear and quadratic trends x state , month and year effects	
Year x Schleswig-Holstein, ..., Year x Sachsen-Anhalt	Interaction: calendar year (coded 1, 2, …) and residential state (ref. = NRW)
Year^2 x Schleswig-Holstein, ..., Year^2 x Sachsen-Anhalt	Interaction: calendar year squared and residential state (ref. = NRW)
January, ..., December	Indicator for month of transition (ref. =January)
2004, …, 2007	Indicator for calendar year of transition (ref. =2004)
Institutional indicators (X2)	
Retirement controls	
Early retirement	Indicator that transition to early retirement is possible (=1 if individual can enter early retirement with benefit reductions at time of transition)
Full retirement	Indicator that transition to full retirement is possible (=1 if individual can enter full retirement without benefit reductions at time of transition)
Distance to early retirement	Variable for the years until eligibility for early retirement
Distance to full retirement	Variable for the years until eligibility for full retirement
Anticipation controls	
Antic	Indicator for anticipation period of 2006 reform: 09/2005 - 01/2006
Antic x 40-44 years old, ..., Antic x 63-64 years old	Interaction: anticipation period and age group (ref. = 40-44 years old)
reg58	Indicator that transition possibly affected by end of 58 regulation (=1 for cohorts 1944-49, transitions from E in period 10/2007-
Unemployment benefits controls	
Remaining entitlement of UB	Indicator for transitions from U: individual has unemployment benefit entitlements
Days of past UB receipt in current spell	Indicator for transitions from U: number of days individual received unemployment benefits in current spell

Table 4   Tests for parallel trends: pooled sample

	E-E transitions			E-U transitions			U-U transitions			U-E transitions		
	linear	quadratic	cubic	linear	quadratic	cubic	linear	quadratic	cubic	linear	quadratic	cubic
45-46 years old	0.0819	0.2126	0.3551	0.1821	0.2769	0.3386	0.6764	0.0933	0.1106	0.5577	0.0484	0.0720
47-51 years old	0.3141	0.5271	0.7359	0.5647	0.7895	0.8961	<u>0.0141</u>	<u>0.0386</u>	0.0856	0.1007	0.2340	0.3655
52-54 years old	0.0934	0.1143	0.0773	0.1397	0.3103	0.3976	**0.0005**	**0.0005**	**0.0002**	0.2325	0.3441	<u>0.0297</u>
55-56 years old	0.1462	0.0574	0.0517	0.0540	0.0900	0.1803	**0.0000**	**0.0000**	**0.0000**	0.2935	0.5623	0.3591
57-59 years old	**0.0050**	**0.0004**	**0.0000**	0.8615	0.8288	0.5203	**0.0000**	**0.0000**	**0.0000**	0.4566	0.2045	0.0946
60-62 years old	0.6480	0.9074	0.0770	0.0564	0.1227	0.1406	**0.0000**	**0.0000**	**0.0000**	0.7032	0.8986	0.9538
63-64 years old	0.9892	**0.0002**	**0.0001**	0.2352	0.4747	**0.0071**	**0.0013**	**0.0058**	**0.0042**	0.8204	0.9731	0.8346
Controls:												
Age, gender, education, state of residence	yes			yes			yes			yes		
Month effects	yes			yes			yes			yes		
Retirement controls	yes			yes			yes			yes		
Unemployment benefit controls	no			no			yes			yes		

Note: Standard errors are clustered at the individual level. Estimation period: Transitions from E=03/2004 –08/2005; Transitions from U=03/2004 –01/2006. Table shows p-values for the tests of joint significance of the coefficient for age specific time trends (β_3 in equation 2). For a list and definition of control variables, see **Table 3**.
Source: SIAB 7510 and own calculations.

Table 5   Logit coefficients of the reform effects on labour market transitions controlling for retirement, anticipation, and employment benefits: pooled sample

	E-E transitions (1)	E-U transitions (2)	U-U transitions (3)	U-E transitions (4)
Post-reform	-0.3508 ***	0.6853 ***	-0.0484	-0.1133 ***
	(0.0528)	(0.0841)	(0.0364)	(0.0434)
Post-reform x 45-46 years old	-0.0216	-0.0204	-0.2958 ***	0.1558 **
	(0.0404)	(0.0555)	(0.0616)	(0.0655)
Post-reform x 47-51 years old	0.0183	-0.1229 ***	-0.6186 ***	0.1008 *
	(0.0305)	(0.0425)	(0.0515)	(0.0538)
Post-reform x 52-54 years old	0.0590	-0.1229 **	-0.9303 ***	0.2950 ***
	(0.0367)	(0.0530)	(0.0625)	(0.0686)
Post-reform x 55-56 years old	0.0038	-0.0671	-0.7713 ***	0.2209 **
	(0.0410)	(0.0597)	(0.0703)	(0.0864)
Post-reform x 57-59 years old	0.2038 ***	-0.3613 ***	-0.6814 ***	0.5397 ***
	(0.0358)	(0.0558)	(0.0683)	(0.1038)
Post-reform x 60-62 years old	0.0397	-0.2808 ***	-0.6280 ***	0.6047 ***
	(0.0313)	(0.0626)	(0.0817)	(0.1773)
Post-reform x 63-64 years old	0.0710 *	-0.0766	-0.4915 ***	0.0127
	(0.0391)	(0.1286)	(0.1052)	(0.4538)
Controls:				
Age, gender, education, state of residence	yes	yes	yes	yes
Linear and quadratic trends x state, month and year effects	yes	yes	yes	yes
Retirement controls	yes	yes	yes	yes
Anticipation controls	yes	yes	no	no
Unemployment benefit controls	no	no	yes	yes
N	8,020,998		430,301	
Mean	0.9933	0.0026	0.9200	0.0289

Note: Standard errors are clustered at the individual level. ***: $p < 1\%$; **: $p < 5\%$; *: $p < 10\%$. Pre-reform period: Transitions from E=03/2004 –08/2005; Transitions from U=03/2004 – 01/2006. Anticipation period: Transitions from E=09/2005 – 01-2006. Post-reform period: 02/2006 – 12/2007. For a list and definition of control variables, see **Table 3.**

Source: SIAB 7510 and own calculations.

Table 6   Logit estimates of marginal effects (ME) and relative marginal effects (RME) of the reform on labor market transitions controlling for retirement, anticipation and unemployment benefits: pooled sample

	E-E transitions		E-U transitions		U-U transitions		U-E transitions	
	ME	RME	ME	RME	ME	RME	ME	RME
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
45-46 years old	-0.00009	-0.01%	-0.00004	-1.65%	-0.02899 ***	-3.29%	0.01059 ***	19.79%
	(0.00010)		(0.00007)		(0.00449)		(0.00329)	
47-51 years old	0.00008	0.01%	-0.00025 ***	-9.96%	-0.04723 ***	-5.20%	0.00548 ***	13.64%
	(0.00007)		(0.00005)		(0.00282)		(0.00208)	
52-54 years old	0.00028 ***	0.03%	-0.00026 ***	-9.29%	-0.05905 ***	-6.37%	0.01264 ***	46.88%
	(0.00010)		(0.00006)		(0.00339)		(0.00250)	
55-56 years old	0.00002	0.00%	-0.00016 *	-4.98%	-0.03614 ***	-3.85%	0.00641 ***	36.05%
	(0.00014)		(0.00009)		(0.00317)		(0.00220)	
57-59 years old	0.00161 ***	0.16%	-0.00103 ***	-22.29%	-0.02232 ***	-2.33%	0.00650 ***	105.52%
	(0.00015)		(0.00008)		(0.00214)		(0.00131)	
60-62 years old	0.00080 **	0.08%	-0.00103 ***	-18.39%	-0.01581 ***	-1.66%	0.00271 ***	130.92%
	(0.00034)		(0.00013)		(0.00208)		(0.00091)	
63-64 years old	0.00318 ***	0.34%	-0.00023	-6.15%	-0.01637 ***	-1.77%	0.00003	2.14%
	(0.00088)		(0.00022)		(0.00369)		(0.00096)	
Controls:								
Age, gender, education, state of residence	yes		yes		yes		yes	
Linear and quadratic trends x state , month and year effects	yes		yes		yes		yes	
Retirement controls	yes		yes		yes		yes	
Anticipation controls	yes		yes		no		no	
Unemployment benefit controls	no		no		yes		yes	
N		8,020,998				430,301		

Note: Standard errors are clustered at the individual level. ***: $p < 1\%$; **: $p < 5\%$; *: $p < 10\%$. RME are calculated as the relation of the age-specific marginal effect and the mean probability of the transition in the pre-reform period for the specific age group. Pre-reform period: Transitions from E=03/2004 –08/2005; Transitions from U=03/2004 –01/2006. Post-reform period: 02/2006 – 12/2007. Estimations include main reform effect "post-reform". For a list and definition of control variables, see **Table 3.**

Source: SIAB 7510 and own calculations.

Table 7   Logit estimates of marginal effects (ME) and relative marginal effects (RME) of the reform on labor market transitions controlling for retirement, anticipation and unemployment benefits: men

	E-E transitions		E-U transitions		U-U transitions		U-E transitions	
	ME	RME	ME	RME	ME	RME	ME	RME
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
45-46 years old	-0.00013	-0.01%	-0.00001	-0.47%	-0.02639 ***	-3.03%	0.00551	9.20%
	(0.00014)		(0.00009)		(0.00755)		(0.00544)	
47-51 years old	0.00000	0.00%	-0.00032 ***	-14.48%	-0.05019 ***	-5.56%	0.00545	11.95%
	(0.00009)		(0.00006)		(0.00483)		(0.00343)	
52-54 years old	0.00047 ***	0.05%	-0.00055 ***	-22.27%	-0.06387 ***	-6.93%	0.01306 ***	40.20%
	(0.00013)		(0.00008)		(0.00605)		(0.00438)	
55-56 years old	-0.00032 *	-0.03%	-0.00004	-1.59%	-0.03073 ***	-3.28%	0.00582 *	30.23%
	(0.00018)		(0.00012)		(0.00481)		(0.00335)	
57-59 years old	0.00043 **	0.04%	-0.00061 ***	-19.74%	-0.01648 ***	-1.73%	0.00545 ***	78.08%
	(0.00022)		(0.00011)		(0.00342)		(0.00208)	
60-62 years old	-0.00156 ***	-0.16%	-0.00130 ***	-28.45%	-0.01214 ***	-1.27%	0.00206	83.40%
	(0.00041)		(0.00017)		(0.00307)		(0.00134)	
63-64 years old	0.00601 ***	0.64%	-0.00084 ***	-22.89%	-0.01181 ***	-1.27%	0.00118	91.47%
	(0.00103)		(0.00026)		(0.00441)		(0.00146)	

Controls:				
Age, education, state of residence	yes	yes	yes	yes
Linear and quadratic trends x state, month and year effects	yes	yes	yes	yes
Retirement controls	yes°	yes°	yes	yes+
Anticipation controls	yes	yes	no	no
Unemployment benefit controls	no	no	yes	yes
N		4,134,258		198,595

Note: Standard errors are clustered at the individual level. ***: $p < 1$ %; **: $p < 5$ %; *: $p < 10$ %. RME show the ratio of the age-specific marginal effect over the mean probability of the transition in the pre-reform period for the specific age group. Pre-reform period: Transitions from E=03/2004 –08/2005; Transitions from U=03/2004 –01/2006. Post-reform period: 02/2006 – 12/2007. Estimations include main reform effect "post-reform". For a list and definition of control variables, see **Table 3**. °No controls for retirement due to few observations with eligibility for retirement. +One control for early and full retirement eligibility due to few observations with eligibility.

Source: SIAB 7510 and own calculations.

Table 8 Logit estimates of marginal effects (ME) and relative marginal effects (RME) of the reform on labor market transitions controlling for retirement, anticipation and unemployment benefits: women

	E-E transitions		E-U transitions		U-U transitions		U-E transitions	
	ME	RME	ME	RME	ME	RME	ME	RME
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
45-46 years old	-0.00005 (0.00015)	-0.01%	-0.00009 (0.00010)	-3.33%	-0.03088 *** (0.00552)	-3.48%	0.01420 *** (0.00409)	28.86%
47-51 years old	0.00027 ** (0.00010)	0.03%	-0.00028 *** (0.00007)	-10.37%	-0.04729 *** (0.00339)	-5.18%	0.00734 *** (0.00259)	20.24%
52-54 years old	-0.00039 ** (0.00015)	-0.04%	0.00025 ** (0.00010)	9.40%	-0.05691 *** (0.00399)	-6.11%	0.01327 *** (0.00298)	58.23%
55-56 years old	0.00014 (0.00021)	0.01%	-0.00020 (0.00013)	-6.33%	-0.03998 *** (0.00418)	-4.25%	0.00650 ** (0.00289)	39.13%
57-59 years old	0.00250 *** (0.00022)	0.25%	-0.00132 *** (0.00013)	-30.48%	-0.02284 *** (0.00277)	-2.39%	0.00599 *** (0.00166)	109.51%
60-62 years old	0.00290 *** (0.00057)	0.30%	-0.00039 * (0.00022)	-8.69%	-0.01833 *** (0.00281)	-1.93%	0.00321 *** (0.00121)	199.38%
63-64 years old	-0.01001 *** (0.00170)	-1.05%	0.00126 *** (0.00042)	62.69%	-0.01917 *** (0.00668)	-2.11%	-° -°	-° -°
Controls:								
Age, education, state of residence	yes		yes		yes		yes	
Linear and quadratic trends x state , month and year effects	yes		yes		yes		yes	
Retirement controls	yes		yes		yes		yes	
Anticipation controls	yes		yes		no		no	
Unemployment benefit controls	no		no		yes		yes	
N	3,886,740				231,706			

Note: Standard errors are clustered at the individual level. ***: $p < 1\%$; **: $p < 5\%$; *: $p < 10\%$. RME show the ratio of the age-specific marginal effect over the mean probability of the transition in the pre-reform period for the specific age group. Pre-reform period: Transitions from E=03/2004 –08/2005; Transitions from U=03/2004 –01/2006. Post-reform period: 02/2006 – 12/2007. Estimations include main reform effect "post-reform". For a list and definition of control variables, see Table 3. °Estimations for 63-64-year-olds not possible due to no observations with transitions from U to E in post-reform period in the age group.

Source: SIAB 7510 and own calculations.

Table 9 Logit estimates of marginal effects (ME) and relative marginal effects (RME) of the reform on labor market transitions controlling for retirement, anticipation and unemployment benefits: low educated individuals

	E-E transitions		E-U transitions		U-U transitions		U-E transitions	
	ME	RME	ME	RME	ME	RME	ME	RME
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
45-46 years old	-0.00046	-0.05%	-0.00025	-9.29%	-0.02555 **	-2.87%	0.00817	22.63%
	(0.00046)		(0.00027)		(0.01251)		(0.00954)	
47-51 years old	0.00069 **	0.07%	-0.00058 ***	-19.33%	-0.06542 ***	-7.10%	0.00700	28.36%
	(0.00029)		(0.00018)		(0.00786)		(0.00553)	
52-54 years old	0.00081 **	0.08%	-0.00042 **	-17.36%	-0.06417 ***	-6.89%	0.00595	33.04%
	(0.00036)		(0.00021)		(0.00848)		(0.00641)	
55-56 years old	0.00029	0.03%	-0.00023	-8.24%	-0.04699 ***	-4.99%	0.00686	58.04%
	(0.00049)		(0.00028)		(0.00959)		(0.00619)	
57-59 years old	0.00273 ***	0.28%	-0.00078 ***	-19.16%	-0.01872 ***	-1.96%	0.00320	110.73%
	(0.00052)		(0.00029)		(0.00508)		(0.00249)	
60-62 years old	0.00359 ***	0.37%	-0.00110 ***	-23.81%	-0.01603 ***	-1.68%	0.00052	54.17%
	(0.00113)		(0.00041)		(0.00553)		(0.00170)	
63-64 years old	-0.00144	-0.15%	0.00036	13.04%	-0.03384 **	-3.67%	-°	-°
	(0.00330)		(0.00075)		(0.01323)		-°	

Controls:				
Age, gender, state of residence	yes	yes	yes	yes
Linear and quadratic trends x state, month and year effects	yes	yes	yes	yes
Retirement controls	yes	yes	yes	yes+
Anticipation controls	yes	yes	no	no
Unemployment benefit controls	no	no	yes	yes
N		669,371		49,693

Note: Standard errors are clustered at the individual level. ***: p < 1 %; **: p < 5 %; *: p < 10 %. RME show the ratio of the age-specific marginal effect over the mean probability of the transition in the pre-reform period for the specific age group. Pre-reform period: Transitions from E=03/2004 –08/2005; Transitions from U=03/2004 –01/2006. Post-reform period: 02/2006 – 12/2007. Estimations include main reform effect "post-reform". For a list and definition of control variables, see Table 3. °Estimations for 63-64-year-olds not possible due to no observations with transitions from U to E in post-reform period in the age group. +One control for early and full retirement eligibility due to few observations with eligibility.

Source: SIAB 7510 and own calculations.

Table 10   Logit estimates of marginal effects (ME) and relative marginal effects (RME) of the reform on labor market transitions controlling for retirement, anticipation and unemployment benefits: middle educated individuals:

	E-E transitions		E-U transitions		U-U transitions		U-E transitions	
	ME	RME	ME	RME	ME	RME	ME	RME
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
45-46 years old	-0.00006	-0.01%	0.00000	0.00%	-0.02645 ***	-3.00%	0.00913 **	16.57%
	(0.00012)		(0.00008)		(0.00526)		(0.00380)	
47-51 years old	-0.00015 *	-0.02%	-0.00010 *	-4.20%	-0.04802 ***	-5.29%	0.00652 ***	15.62%
	(0.00008)		(0.00005)		(0.00325)		(0.00247)	
52-54 years old	0.00037 ***	0.04%	-0.00025 ***	-9.33%	-0.05758 ***	-6.21%	0.01066 ***	37.60%
	(0.00012)		(0.00007)		(0.00394)		(0.00291)	
55-56 years old	0.00006	0.01%	-0.00020 **	-6.69%	-0.03674 ***	-3.91%	0.00698 ***	38.39%
	(0.00016)		(0.00010)		(0.00366)		(0.00253)	
57-59 years old	0.00159 ***	0.16%	-0.00111 ***	-29.60%	-0.02327 ***	-2.43%	0.00693 ***	111.24%
	(0.00017)		(0.00010)		(0.00248)		(0.00153)	
60-62 years old	0.00030	0.03%	-0.00113 ***	-23.74%	-0.01668 ***	-1.75%	0.00248 **	118.66%
	(0.00040)		(0.00016)		(0.00243)		(0.00106)	
63-64 years old	0.00488 ***	0.52%	-0.00043	-11.78%	-0.01088 ***	-1.18%	-0.00020	-15.15%
	(0.00107)		(0.00027)		(0.00421)		(0.00105)	
Controls:								
Age, gender, state of residence	yes		yes		yes		yes	
Linear and quadratic trends x state , month and year effects	yes		yes		yes		yes	
Retirement controls	yes		yes		yes		yes	
Anticipation controls	yes		yes		no		no	
Unemployment benefit controls	no		no		yes		yes	
N		6,012,295				324,075		

Note: Standard errors are clustered at the individual level. ***: $p < 1$ %; **: $p < 5$ %; *: $p < 10$ %. RME are calculated as the relation of the age-specific marginal effect and the mean probability of the transition in the pre-reform period for the specific age group. Pre-reform period: Transitions from E=03/2004 –08/2005; Transitions from U=03/2004 –01/2006. Post-reform period: 02/2006 – 12/2007. Estimations include main reform effect "post-reform". For a list and definition of control variables, see Table 3.

Source: SIAB 7510 and own calculations.

Table 11 Logit estimates of marginal effects (ME) and relative marginal effects (RME) of the reform on labor market transitions controlling for retirement, anticipation and unemployment benefits: highly educated individuals

	E-E transitions		E-U transitions		U-U transitions		U-E transitions	
	ME	RME	ME	RME	ME	RME	ME	RME
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
45-46 years old	-0.00026	-0.03%	-0.00007	-3.54%	-0.04004 ***	-4.64%	0.01506	24.08%
	(0.00023)		(0.00016)		(0.01333)		(0.01048)	
47-51 years old	0.00062 ***	0.06%	-0.00073 ***	-31.47%	-0.02469 **	-2.76%	-0.00321	-6.57%
	(0.00015)		(0.00010)		(0.00961)		(0.00626)	
52-54 years old	-0.00043 *	-0.04%	-0.00012	-7.32%	-0.07197 ***	-7.82%	0.02828 ***	89.83%
	(0.00023)		(0.00014)		(0.01355)		(0.00958)	
55-56 years old	-0.00035	-0.04%	0.00018	9.73%	-0.01678 *	-1.80%	0.00396	17.93%
	(0.00031)		(0.00020)		(0.00894)		(0.00712)	
57-59 years old	0.00152 ***	0.15%	-0.00093 ***	-37.05%	-0.02555 ***	-2.69%	0.00927	81.89%
	(0.00031)		(0.00018)		(0.00949)		(0.00609)	
60-62 years old	0.00058	0.06%	-0.00056 *	-16.72%	-0.00973	-1.02%	0.00698 *	204.09%
	(0.00073)		(0.00031)		(0.00773)		(0.00402)	
63-64 years old	0.00076	0.08%	-0.00042	-19.00%	-0.02592 **	-2.79%	0.00349	168.60%
	(0.00183)		(0.00037)		(0.01090)		(0.00420)	
Controls:								
Age, gender, state of residence	yes		yes		yes		yes	
Linear and quadratic trends x state , month and year effects	yes		yes		yes		yes	
Retirement controls	yes		yes		yes		yes	
Anticipation controls	yes		yes		no		no	
Unemployment benefit controls	no		no		yes		yes	
N		1,201,836				43,401		

Note: Standard errors are clustered at the individual level. ***: p < 1 %; **: p < 5 %; *: p < 10 %. RME are calculated as the relation of the age-specific marginal effect and the mean probability of the transition in the pre-reform period for the specific age group. Pre-reform period: Transitions from E=03/2004 –08/2005; Transitions from U=03/2004 –01/2006. Post-reform period: 02/2006 – 12/2007. Estimations include main reform effect "post-reform". For a list and definition of control variables, see Table 3.

Source: SIAB 7510 and own calculations.

Table 12 Logit estimates of marginal effects (ME) and relative marginal effects (RME) of the reform on labor market transitions controlling for retirement, anticipation and unemployment benefits: extended pooled sample

	E-E transitions		E-U transitions		U-U transitions		U-E transitions	
	ME	RME	ME	RME	ME	RME	ME	RME
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
45-46 years old	0.00007	0.01%	-0.00012	-4.36%	-0.02616 ***	-2.99%	0.00764 *	13.15%
	(0.00010)		(0.00007)		(0.00417)		(0.00309)	
47-51 years old	0.00024 ***	0.02%	-0.00032 ***	-10.26%	-0.04080 ***	-4.53%	0.00362	7.91%
	(0.00007)		(0.00005)		(0.00260)		(0.00193)	
52-54 years old	0.00064 ***	0.06%	-0.00051 ***	-14.01%	-0.05194 ***	-5.65%	0.00997 ***	30.03%
	(0.00010)		(0.00007)		(0.00299)		(0.00229)	
55-56 years old	0.00023	0.02%	-0.00035 ***	-10.14%	-0.03415 ***	-3.66%	0.00459 *	20.69%
	(0.00014)		(0.00009)		(0.00308)		(0.00221)	
57-59 years old	0.00199 ***	0.20%	-0.00118 ***	-25.54%	-0.02297 ***	-2.41%	0.00849 ***	100.59%
	(0.00015)		(0.00009)		(0.00200)		(0.00140)	
60-62 years old	0.00089 **	0.09%	-0.00091 ***	-17.30%	-0.01516 ***	-1.59%	0.00427 ***	141.39%
	(0.00033)		(0.00014)		(0.00197)		(0.00106)	
63-64 years old	0.00393 ***	0.41%	-0.00038	-10.11%	-0.01374 ***	-1.49%	0.00280	155.56%
	(0.00085)		(0.00023)		(0.00373)		(0.00163)	

Controls:				
Age, gender, education, state of residence	yes	yes	yes	yes
Linear and quadratic trends x state , month and year effects	yes	yes	yes	yes
Retirement controls	yes	yes	yes	yes
Anticipation controls	yes	yes	no	no
Unemployment benefit controls	no	no	yes	yes
N	8,615,029		525,562	

Note: Standard errors are clustered at the individual level. ***: $p < 1\%$; **: $p < 5\%$; *: $p < 10\%$. RME are calculated as the relation of the age-specific marginal effect and the mean probability of the transition in the pre-reform period for the specific age group. Pre-reform period: Transitions from E=03/2004 –08/2005; Transitions from U=03/2004 –01/2006. Post-reform period: 02/2006 – 12/2007. Estimations include main reform effect "post-reform". For a list and definition of control variables, see Table 3. For a definition of the sample, see 3.1.

Source: SIAB 7510 and own calculations.

Table 13 Logit estimates of marginal effects (ME) and relative marginal effects (RME) of the reform on labor market transitions controlling for retirement, anticipation and unemployment benefits: pooled sample with different clustered standard errors

	E-E transitions		E-U transitions		U-U transitions		U-E transitions	
	ME	RME	ME	RME	ME	RME	ME	RME
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
45-46 years old	-0.00008 (0.00009)	-0.01%	-0.00005 (0.00007)	-2.07%	-0.02907 *** (0.00869)	-3.30%	0.01067 *** (0.00325)	19.94%
47-51 years old	0.00013 (0.00008)	0.01%	-0.00029 *** (0.00008)	-11.55%	-0.04769 *** (0.00438)	-5.25%	0.00612 *** (0.00191)	15.24%
52-54 years old	0.00005 (0.00008)	0.01%	-0.00016 ** (0.00007)	-5.71%	-0.05791 *** (0.00693)	-6.25%	0.01096 *** (0.00286)	40.65%
55-56 years old	-0.00009 (0.00013)	-0.01%	-0.00012 (0.00008)	-3.74%	-0.03579 *** (0.00487)	-3.81%	0.00596 *** (0.00169)	33.52%
57-59 years old	0.00125 (0.00138)	0.13%	-0.00089 *** (0.00015)	-19.26%	-0.02181 *** (0.00380)	-2.28%	0.00620 *** (0.00137)	100.65%
60-62 years old	0.00079 (0.00295)	0.08%	-0.00102 *** (0.00011)	-18.21%	-0.01572 *** (0.00205)	-1.65%	0.00267 *** (0.00089)	128.99%
63-64 years old	0.00485 (0.00750)	0.51%	-0.00034 (0.00023)	-9.09%	-0.01596 *** (0.00496)	-1.73%	-0.00001 (0.00041)	-0.71%

Controls:				
Age, gender, education, state of residence	yes	yes	yes	yes
Linear and quadratic trends x state , month and year effects	yes	yes	yes	yes
Retirement controls	yes	yes	yes	yes
Anticipation controls	yes	yes	no	no
Unemployment benefit controls	no	no	yes	yes
N		8,020,998		430,301

Note: Standard errors are clustered at the birth cohort-by-year-level. ***: p < 1 %; **: p < 5 %; *: p < 10 %. RME are calculated as the relation of the age-specific marginal effect and the mean probability of the transition in the pre-reform period for the specific age group. Pre-reform period: Transitions from E=03/2004 –08/2005; Transitions from U=03/2004 –01/2006. Post-reform period: 02/2006 – 12/2007. Estimations include main reform effect "post-reform". For a list and definition of control variables, see Table 3.

Source: SIAB 7510 and own calculations.

Table 14   Probit estimates of marginal effects (ME) and relative marginal effects (RME) of the reform on labor market transitions controlling for retirement, anticipation and unemployment benefits: pooled sample

	E-E transitions		E-U transitions		U-U transitions		U-E transitions	
	ME	RME	ME	RME	ME	RME	ME	RME
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
45-46 years old	-0.00009	-0.01%	-0.00004	-1.65%	-0.02688 ***	-3.05%	0.00971 ***	18.14%
	(0.00010)		(0.00007)		(0.00432)		(0.00331)	
47-51 years old	0.00007	0.01%	-0.00025 ***	-9.96%	-0.04273 ***	-4.70%	0.00489 **	12.17%
	(0.00007)		(0.00005)		(0.00280)		(0.00208)	
52-54 years old	0.00029 ***	0.03%	-0.00026 ***	-9.29%	-0.05527 ***	-5.96%	0.01135 ***	42.10%
	(0.00010)		(0.00006)		(0.00336)		(0.00251)	
55-56 years old	0.00003	0.00%	-0.00017 *	-5.30%	-0.03430 ***	-3.65%	0.00508 **	28.57%
	(0.00014)		(0.00009)		(0.00318)		(0.00219)	
57-59 years old	0.00167 ***	0.17%	-0.00103 ***	-22.29%	-0.02261 ***	-2.36%	0.00538 ***	87.34%
	(0.00015)		(0.00008)		(0.00222)		(0.00131)	
60-62 years old	0.00107 ***	0.11%	-0.00104 ***	-18.57%	-0.01530 ***	-1.60%	0.00216 **	104.35%
	(0.00034)		(0.00013)		(0.00210)		(0.00092)	
63-64 years old	0.00438 ***	0.46%	-0.00024	-6.42%	-0.01171 ***	-1.27%	-0.00049	-35.00%
	(0.00087)		(0.00022)		(0.00373)		(0.00094)	

Controls:								
Age, gender, education, state of residence	yes		yes		yes		yes	
Linear and quadratic trends x state, month and year effects	yes		yes		yes		yes	
Retirement controls	yes		yes		yes		yes	
Anticipation controls	yes		yes		no		no	
Unemployment benefit controls	no		no		yes		yes	
N			8,020,998				430,301	

Note: Standard errors are clustered at the individual level. ***: p < 1 %; **: p < 5 %; *: p < 10 %. RME are calculated as the relation of the age-specific marginal effect and the mean probability of the transition in the pre-reform period for the specific age group. Pre-reform period: Transitions from E=03/2004 –08/2005; Transitions from U=03/2004 –01/2006. Post-reform period: 02/2006 – 12/2007. Estimations include main reform effect "post-reform". For a list and definition of control variables, see Table 3.

Source: SIAB 7510 and own calculations.

Table 15 Cloglog estimates of marginal effects (ME) and relative marginal effects (RME) of the reform on labor market transitions controlling for retirement, anticipation and unemployment benefits: pooled sample

	E-E transitions		E-U transitions		U-U transitions		U-E transitions	
	ME	RME	ME	RME	ME	RME	ME	RME
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
45-46 years old	-0.00009	-0.01%	-0.00004	-1.65%	-0.02429 ***	-2.76%	0.01013 ***	18.93%
	(0.00010)		(0.00007)		(0.00414)		(0.00329)	
47-51 years old	0.00007	0.01%	-0.00025 ***	-9.96%	-0.03703 ***	-4.08%	0.00575 ***	14.31%
	(0.00007)		(0.00005)		(0.00275)		(0.00208)	
52-54 years old	0.00029 ***	0.03%	-0.00026 ***	-9.29%	-0.04995 ***	-5.39%	0.01225 ***	45.44%
	(0.00010)		(0.00006)		(0.00331)		(0.00250)	
55-56 years old	0.00004	0.00%	-0.00016 *	-4.98%	-0.03084 ***	-3.28%	0.00656 ***	36.90%
	(0.00014)		(0.00009)		(0.00315)		(0.00220)	
57-59 years old	0.00170 ***	0.17%	-0.00103 ***	-22.29%	-0.02164 ***	-2.26%	0.00647 ***	105.03%
	(0.00015)		(0.00008)		(0.00224)		(0.00131)	
60-62 years old	0.00123 ***	0.13%	-0.00103 ***	-18.39%	-0.01362 ***	-1.43%	0.00271 ***	130.92%
	(0.00033)		(0.00013)		(0.00211)		(0.00091)	
63-64 years old	0.00519 ***	0.55%	-0.00023	-6.15%	-0.00596	-0.64%	0.00003	2.14%
	(0.00087)		(0.00022)		(0.00372)		(0.00096)	
Controls:								
Age, gender, education, state of residence	yes		yes		yes		yes	
Linear and quadratic trends x state , month and year effects	yes		yes		yes		yes	
Retirement controls	yes		yes		yes		yes	
Anticipation controls	yes		yes		no		no	
Unemployment benefit controls	no		no		yes		yes	
N		8,020,998				430,301		

Note: Standard errors are clustered at the individual level. ***: p < 1 %; **: p < 5 %; *: p < 10 %. RME are calculated as the relation of the age-specific marginal effect and the mean probability of the transition in the pre-reform period for the specific age group. Pre-reform period: Transitions from E=03/2004 –08/2005; Transitions from U=03/2004 –01/2006. Post-reform period: 02/2006 – 12/2007. Estimations include main reform effect "post-reform". For a list and definition of control variables, see Table 3.

Source: SIAB 7510 and own calculations.

Table 16 Logit estimates of marginal effects (ME) and relative marginal effects (RME) of the reform on labor market transitions controlling for retirement, anticipation and unemployment benefits: pooled sample without February-July 2006

	E-E transitions		E-U transitions		U-U transitions		U-E transitions	
	ME	RME	ME	RME	ME	RME	ME	RME
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
45-46 years old	0.00003	0.00%	-0.00007	-2.90%	-0.02911 ***	-3.30%	0.00983 ***	18.49%
	(0.00012)		(0.00008)		(0.00480)		(0.0035)	
47-51 years old	0.00010	0.01%	-0.00023 ***	-9.39%	-0.04748 ***	-5.22%	0.00505 **	12.77%
	(0.00008)		(0.00005)		(0.00297)		(0.00221)	
52-54 years old	0.00030 ***	0.03%	-0.00026 ***	-10.16%	-0.06090 ***	-6.57%	0.01201 ***	44.33%
	(0.00011)		(0.00007)		(0.00362)		(0.00266)	
55-56 years old	-0.00003	0.00%	-0.00010	-3.53%	-0.03631 ***	-3.87%	0.00525 ***	29.68%
	(0.00016)		(0.00010)		(0.00329)		(0.00227)	
57-59 years old	0.00187 ***	0.19%	-0.00085 ***	-23.22%	-0.02261 ***	-2.37%	0.00666 ***	114.43%
	(0.00016)		(0.00010)		(0.00224)		(0.00135)	
60-62 years old	0.00052	0.05%	-0.00080 ***	-17.62%	-0.01687 ***	-1.77%	0.00257 ***	117.35%
	(0.00040)		(0.00016)		(0.00219)		(0.00096)	
63-64 years old	0.00371 ***	0.39%	0.00004	1.23%	-0.01532 ***	-1.66%	0.000047	3.92%
	(0.00100)		(0.00025)		(0.00384)		(0.00102)	

Controls:				
Age, gender, education, state of residence	yes	yes	yes	yes
Linear and quadratic trends x state , month and year effects	yes	yes	yes	yes
Retirement controls	yes	yes	yes	yes
Anticipation controls	yes	yes	no	no
Unemployment benefit controls	no	no	yes	yes
N		6,980,023		368,752

Note: Standard errors are clustered at the individual level. ***: $p < 1\%$; **: $p < 5\%$; *: $p < 10\%$. RME are calculated as the relation of the age-specific marginal effect and the mean probability of the transition in the pre-reform period for the specific age group. Pre-reform period: Transitions from E=03/2004 –08/2005; Transitions from U=03/2004 –01/2006. Post-reform period: 08/2006 – 12/2007. Estimations include main reform effect "post-reform". For a list and definition of control variables, see Table 3.

Source: SIAB 7510 and own calculations.

Figure 1   Transition rates over time

1.1   Monthly employment (E-E) and unemployment stays (U-U) as a share of observations observed in employment and unemployment at the beginning of the ongoing month (seasonally adjusted, age 40-64, male and female)
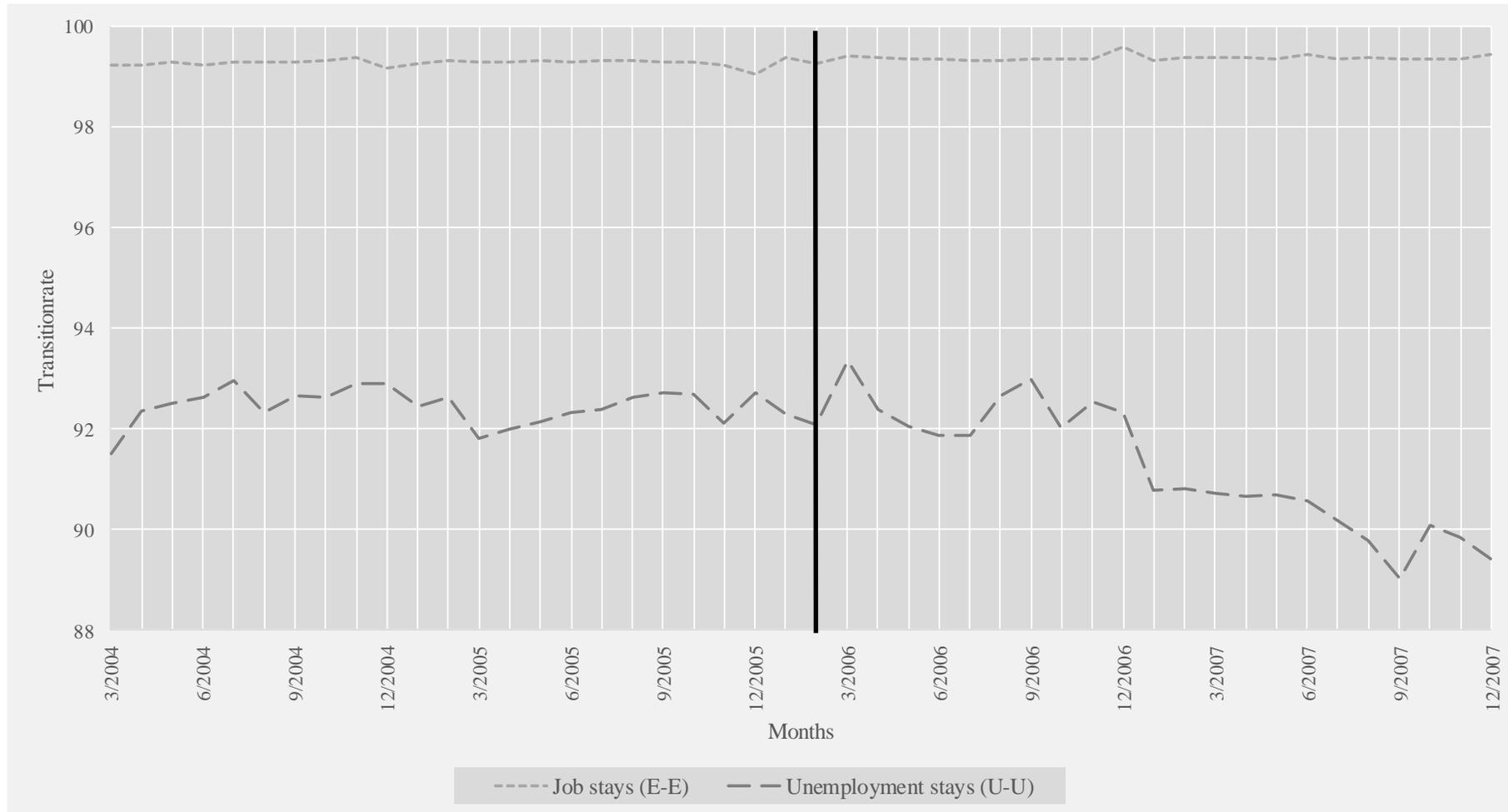
Note: Seasonally adjusted by deducting calendar month-specific average deviations from the overall mean transition rate from the observed values.
Source: SIAB 7510 and own calculations.

1.2   Monthly job separations (E-U) and findings (U-E) as a share of observations observed in employment and unemployment at the beginning of the ongoing month (seasonally adjusted, age 40-64, male and female)

Figure 2   Transition rates by control and treatment group from 01/2002 to 08/2005

2.1   Monthly employment stays (E-E) as a share of observations observed in employment and unemployment at the beginning of the ongoing month (seasonally adjusted)
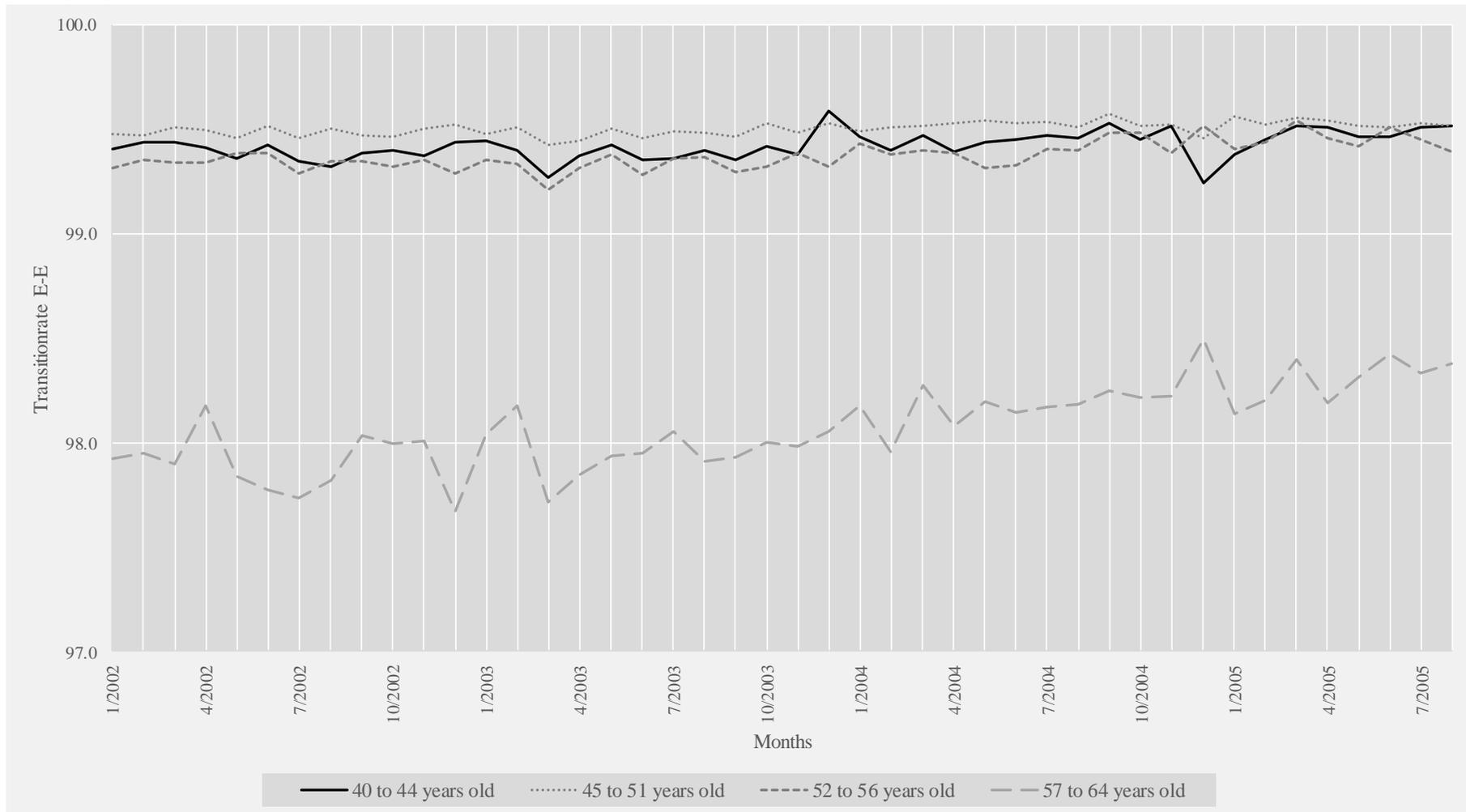
Note: Seasonally adjusted by deducting calendar month-specific average deviations from the overall mean transition rate from the observed values.
Source: SIAB 7510 and own calculations.

2.2   Monthly job separations (E-U) as a share of observations observed in employment and unemployment at the beginning of the ongoing month (seasonally adjusted)
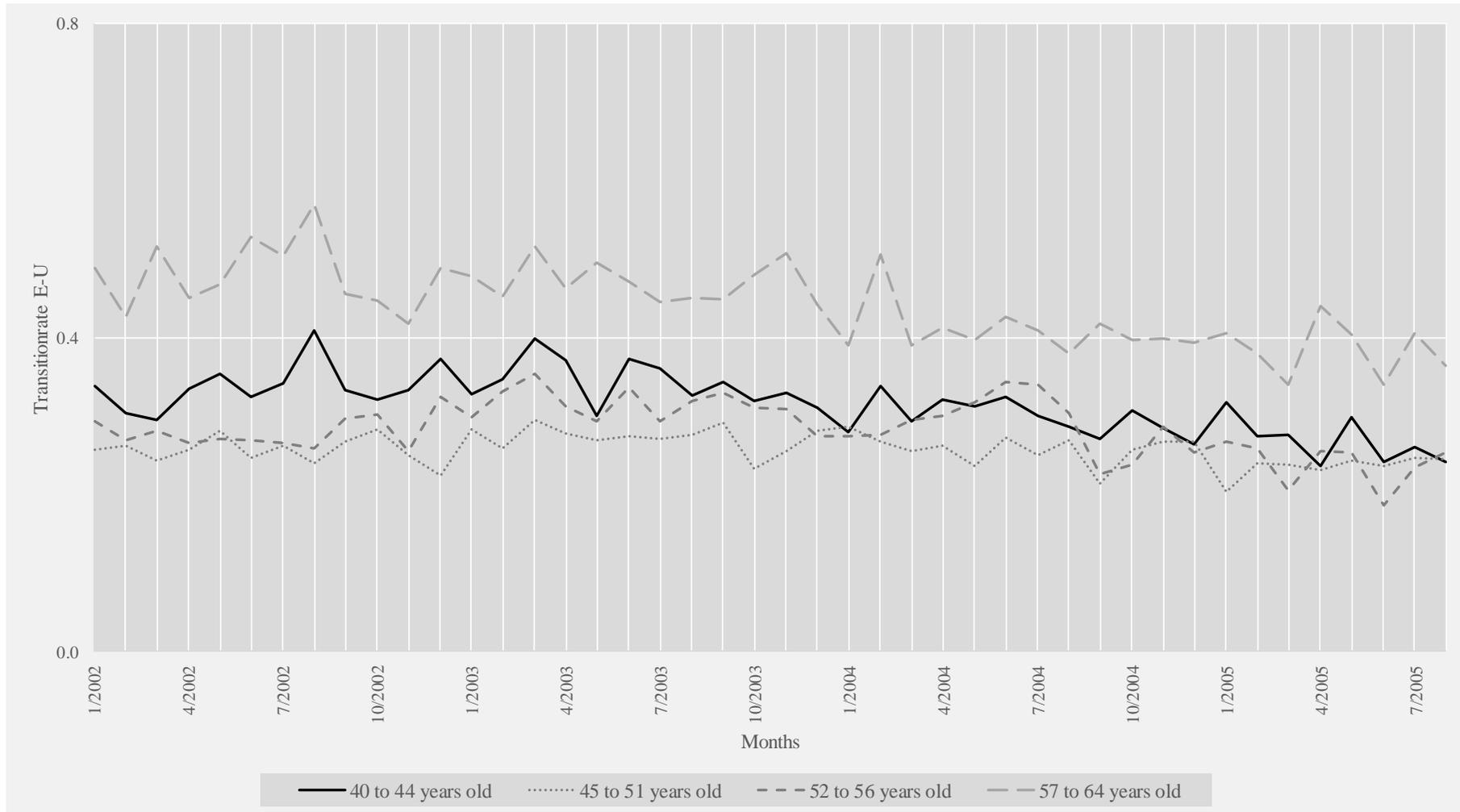
Note: Seasonally adjusted by deducting calendar month-specific average deviations from the overall mean transition rate from the observed values. Missing values for 60 to 62 year olds due to too few observations with transition in the respective month.

Source: SIAB 7510 and own calculations.

2.3   Monthly unemployment stays (U-U) as a share of observations observed in employment and unemployment at the beginning of the ongoing month (seasonally adjusted)
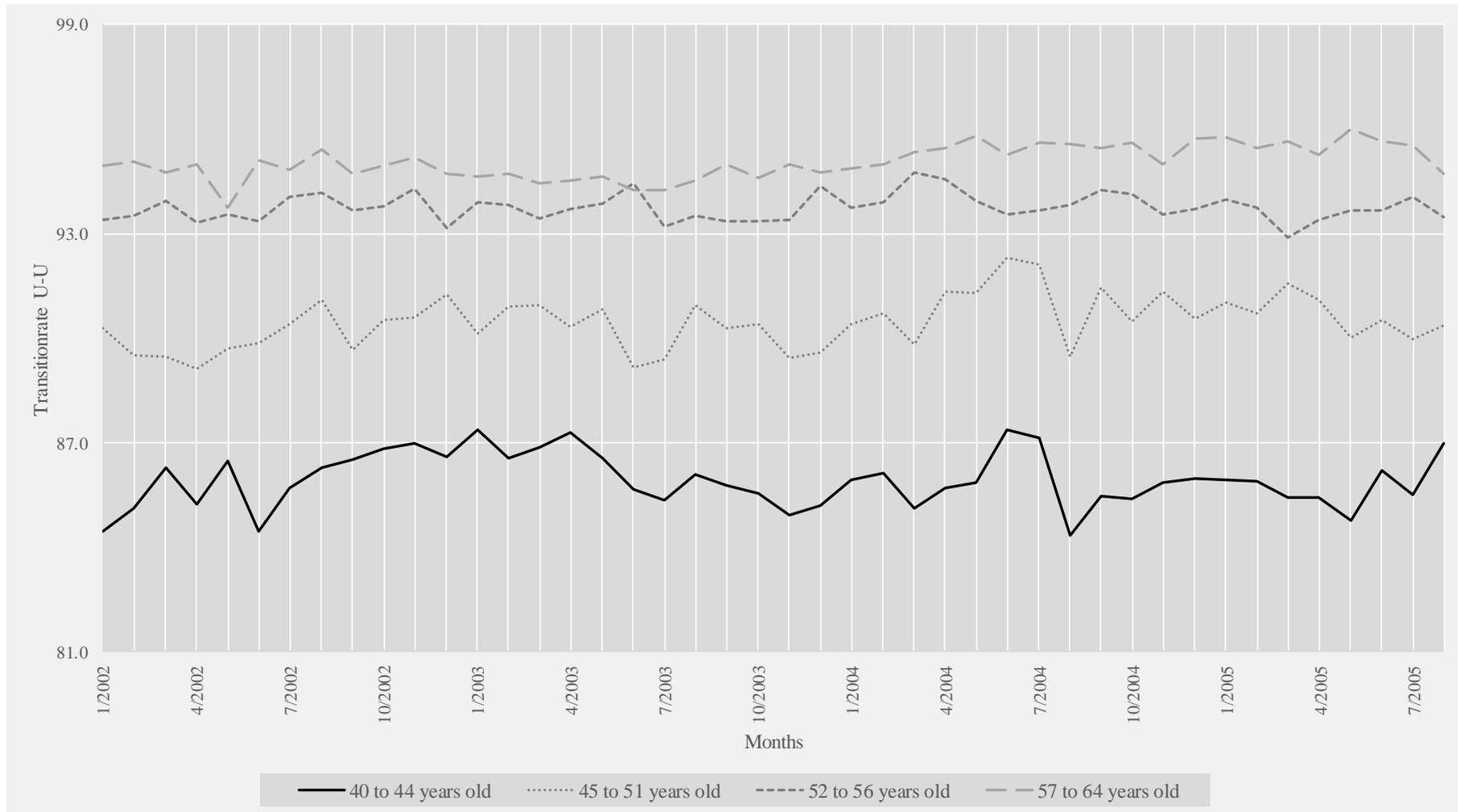
Note: Seasonally adjusted by deducting calendar month-specific average deviations from the overall mean transition rate from the observed values.
Source: SIAB 7510 and own calculations.

2.4   Monthly job findings (U-E) as a share of observations observed in employment and unemployment at the beginning of the ongoing month (seasonally adjusted
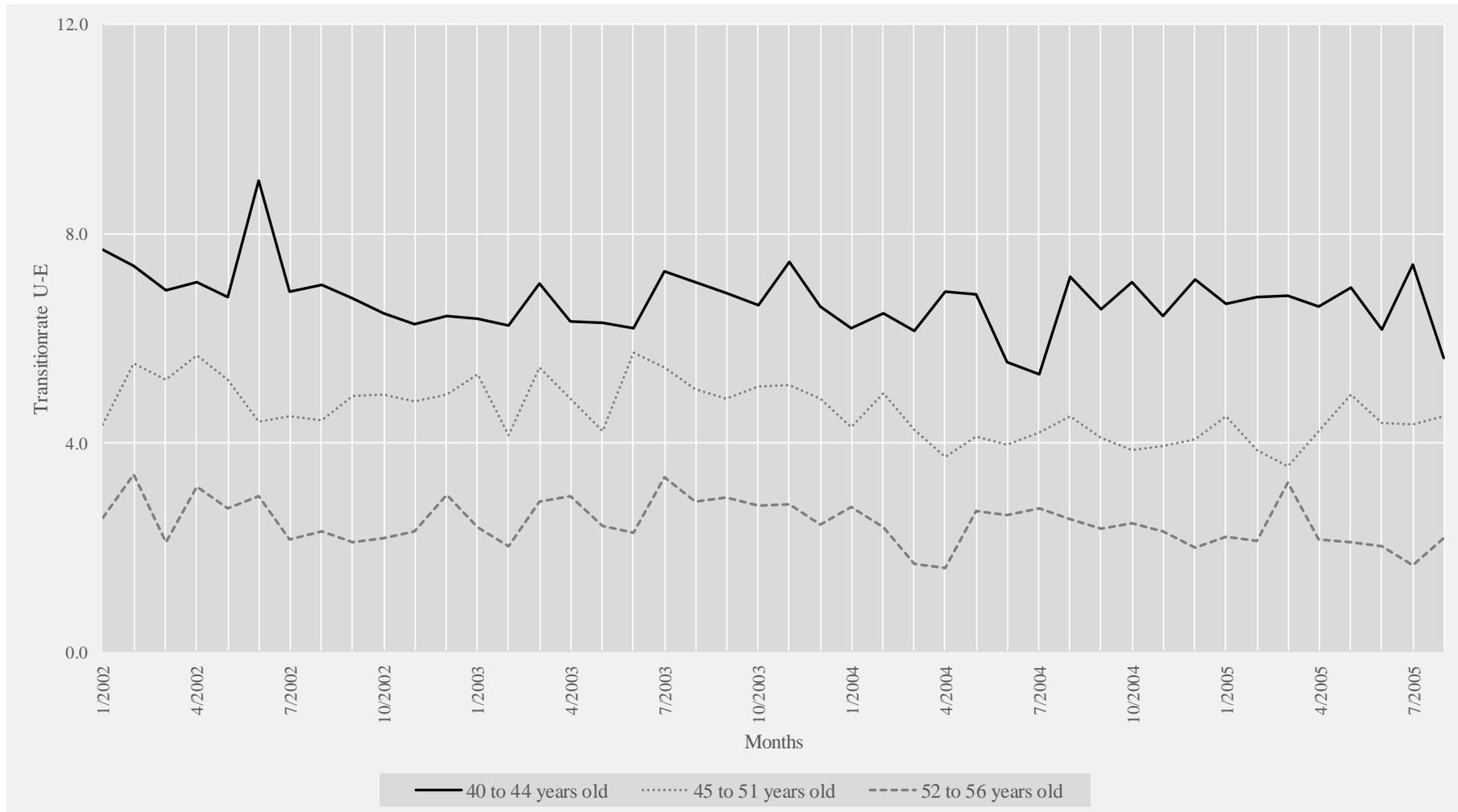
Note: Seasonally adjusted by deducting calendar month-specific average deviations from the overall mean transition rate from the observed values. Transition rate for 57 to 62 year-olds not available because of too few transitions.
Source: SIAB 7510 and own calculations.

Appendix A

Table A.1   Duration of unemployment benefit receipt (in months) by age and insurance months (pre-reform regulation)

Age	Minimum number of insurance months	Duration of unemployment benefit receipt (months)
all ages	12	6
all ages	16	8
all ages	20	10
all ages	24	12
> 44	28	14
> 44	32	16
> 44	36	18
> 46	40	20
> 46	44	22
> 51	48	24
> 51	52	26
> 56	56	28
> 56	60	30
> 56	64	32

Note: Remaining claims from a previous unemployment benefit receipt can be added to new unemployment benefit entitlements up to the age-specific maximum entitlement lengths if the remaining claims are not older than 4 years. This means that individuals can also get the age-specific maximum entitlement lengths without having the required number of months in employment (e.g. a 60-years-old has 56 insurance months but remaining claims of 4 months).

Source: BGBL.I, 1997, p. 627; BGBL.I, 2003, p. 3004; BGBL.I, 2008, p. 681

Table A.2   Descriptive statistics of transitions by age groups and by gender

A.2.1   Pooled sample

	40-44 years old	45-46 years old	47-51 years old	52-54 years old	55-56 years old	57-59 years old	60-62 years old	63-64 years old	40-64 years old
Transitions from Employment									
N	2,420,238	856,198	1,900,432	1,025,320	625,432	691,033	400,727	101,618	8,020,998
Share E-E=yes	0.9948	0.9955	0.9954	0.9948	0.9938	0.9915	0.9782	0.9509	0.9933
Share E-U=yes	0.0027	0.0023	0.0022	0.0024	0.0028	0.0034	0.0044	0.0032	0.0026
Transitions from Unemployment									
N	66,292	23,482	67,123	49,890	44,521	76,936	80,958	21,099	430,301
Share U-U=yes	0.8519	0.8758	0.9037	0.9214	0.9373	0.9558	0.9551	0.9286	0.9200
Share U-E=yes	0.0726	0.0606	0.0443	0.0308	0.0203	0.0073	0.0024	0.0015	0.0289

A.2.1   Men

	40-44 years old	45-46 years old	47-51 years old	52-54 years old	55-56 years old	57-59 years old	60-62 years old	63-64 years old	40-64 years old
Transitions from Employment									
N	1,234,247	422,706	949,721	527,074	323,435	369,349	235,665	72,061	4,134,258
Share E-E=yes	0.9957	0.9959	0.9958	0.9952	0.9943	0.9924	0.9811	0.9531	0.9933
Share E-U=yes	0.0023	0.0020	0.0020	0.0022	0.0025	0.0029	0.0044	0.0033	0.0026
Transitions from Unemployment									
N	26,218	9,405	27,925	21,162	19,806	35,081	43,377	15,621	198,595
Share U-U=yes	0.8375	0.8657	0.8965	0.915	0.9349	0.9545	0.9569	0.9339	0.9200
Share U-E=yes	0.0815	0.0659	0.0498	0.0366	0.0222	0.0083	0.0028	0.0015	0.0289

A.2.1   Women

	40-44 years old	45-46 years old	47-51 years old	52-54 years old	55-56 years old	57-59 years old	60-62 years old	63-64 years old	40-64 years old
Transitions from Employment									
N	1,185,991	433,492	950,711	498,246	301,997	321,684	165,062	29,557	3,886,740
Share E-E=yes	0.9938	0.9951	0.9950	0.9944	0.9934	0.9904	0.9742	0.9455	0.9933
Share E-U=yes	0.0031	0.0025	0.0025	0.0026	0.0031	0.0040	0.0044	0.0030	0.0026
Transitions from Unemployment									
N	40,074	14,077	39,198	28,728	24,715	41,855	37,581	5,478	231,706
Share U-U=yes	0.8614	0.8825	0.9089	0.9262	0.9392	0.9570	0.9531	0.9137	0.9200
Share U-E=yes	0.0668	0.0571	0.0403	0.0266	0.0187	0.0065	0.0020	0.0015	0.0289

Note: Share is calculated as the mean sum of the respective monthly transitions in percent of all monthly transitions from E resp. U.

Source: SIAB 7510 and own calculations.

Table A.3   Descriptive statistics of explanatory variable

	Transitions from Employment		Transitions from Unemployment	
	Mean	Std. Dev.	Mean	Std. Dev.
Post-reform	0.5081	0.4999	0.1726	0.3779
Post-reform x 40-44 years old	0.1518	0.3588	0.0477	0.2132
Post-reform x 45-46 years old	0.0544	0.2269	0.0151	0.1219
Post-reform x 47-51 years old	0.1199	0.3248	0.0309	0.1731
Post-reform x 52-54 years old	0.0636	0.2440	0.0182	0.1337
Post-reform x 55-56 years old	0.0403	0.1966	0.0165	0.1275
Post-reform x 57-59 years old	0.0465	0.2106	0.0215	0.1452
Post-reform x 60-62 years old	0.0243	0.1540	0.0167	0.1280
Post-reform x 63-64 years old	0.0074	0.0855	0.0059	0.0767
Age groups				
40-44 years old	0.3017	0.4590	0.1541	0.3610
45-46 years old	0.1067	0.3088	0.0546	0.2271
47-51 years old	0.2369	0.4252	0.1560	0.3628
52-54 years old	0.1278	0.3339	0.1159	0.3202
55-56 years old	0.0780	0.2681	0.1035	0.3046
57-59 years old	0.0862	0.2806	0.1788	0.3832
60-62 years old	0.0500	0.2179	0.1881	0.3908
63-64 years old	0.0127	0.1118	0.0490	0.2159
Female	0.4846	0.4998	0.5385	0.4985
Education groups				
No university degree & no vocational training	0.0835	0.2766	0.1155	0.3196
Vocational training	0.7496	0.4333	0.7531	0.4312
Univ. degree/techn. college	0.1498	0.3569	0.1009	0.3011
Education missing	0.0171	0.1298	0.0305	0.1720
Early retirement	0.0179	0.1328	0.1337	0.3404
Full retirement	0.0022	0.0464	0.0078	0.0880
Distance to early retirement	13.4969	6.9026	8.5010	7.6680
Distance to full retirement	16.4037	6.6962	11.7578	7.2432
Antic	0.1085	0.3110	-	-
Antic x 40-44 years old	0.0327	0.1780	-	-
Antic x 45-46 years old	0.0116	0.1073	-	-
Antic x 47-51 years old	0.0257	0.1581	-	-
Antic x 52-54 years old	0.0139	0.1171	-	-
Antic x 55-56 years old	0.0086	0.0922	-	-
Antic x 57-59 years old	0.0092	0.0956	-	-
Antic x 60-62 years old	0.0055	0.0738	-	-
Antic x 63-64 years old	0.0013	0.0359	-	-
reg58	0.0082	0.0901	-	-
Remaining entitlement of UB	-	-	0.8624	0.3445
Days of past UB receipt in current spell	-	-	343.60	244.42
N	8,020,998		430,301	

Source: SIAB 7510 and own calculations.

Table A.4 Logit coefficients of the reform effects on labor market transitions controlling for retirement, anticipation, and employment benefits: men

	E-E transitions (1)	E-U transitions (2)	U-U transitions (3)	U-E transitions (4)
Post-reform	-0.4127 ***	0.7996 ***	-0.1200 **	-0.1574 **
	(0.0763)	(0.1217)	(0.0549)	(0.0644)
Post-reform x 45-46 years old	-0.0339	-0.0048	-0.2465 ***	0.0763
	(0.0607)	(0.0841)	(0.0939)	(0.1020)
Post-reform x 47-51 years old	0.0011	-0.1719 ***	-0.5937 ***	0.0908
	(0.0460)	(0.0645)	(0.0774)	(0.0812)
Post-reform x 52-54 years old	0.1093 **	-0.2925 ***	-0.8724 ***	0.2563 **
	(0.0530)	(0.0770)	(0.0931)	(0.1005)
Post-reform x 55-56 years old	-0.0634	-0.0198	-0.5994 ***	0.1790
	(0.0597)	(0.0878)	(0.1006)	(0.1218)
Post-reform x 57-59 years old	0.0648	-0.2666 ***	-0.4190 ***	0.3601 **
	(0.0574)	(0.0917)	(0.1002)	(0.1528)
Post-reform x 60-62 years old	-0.0936 **	-0.3698 ***	-0.4425 ***	0.3785
	(0.0456)	(0.0863)	(0.1160)	(0.2362)
Post-reform x 63-64 years old	0.1431 ***	-0.2754 *	-0.3594 ***	0.4029
	(0.0502)	(0.1508)	(0.1347)	(0.4797)
Controls:				
Age, education, state of residence	yes	yes	yes	yes
Linear and quadratic trends x state , month and year effects	yes	yes	yes	yes
Retirement controls	yes°	yes°	yes	yes+
Anticipation controls	yes	yes	no	no
Unemployment benefit controls	no	no	yes	yes
N	4,134,258		198,595	
Mean	0.9937	0.0024	0.9194	0.0292

Note: Standard errors are clustered at the individual level. ***: $p < 1\%$; **: $p < 5\%$; *: $p < 10\%$. Pre-reform period: Transitions from E=03/2004 –08/2005; Transitions from U=03/2004 – 01/2006. Anticipation period: Transitions from E=09/2005 – 01-2006. Post-reform period: 02/2006 – 12/2007. For a list and definition of control variables, see Table 3. °No controls for early and full retirement due to few observations with eligibility for retirement. +One control for early and full retirement eligibility due to few observations with eligibility.

Source: SIAB 7510 and own calculations.

Table A.5   Logit coefficients of the reform effects on labor market transitions controlling for retirement, anticipation, and employment benefits: women

	E-E transitions (1)	E-U transitions (2)	U-U transitions (3)	U-E transitions (4)
Post-reform	-0.2649 ***	0.5693 ***	-0.0368	-0.0644
	(0.0734)	(0.1168)	(0.0486)	(0.0592)
Post-reform x 45-46 years old	-0.0104	-0.0387	-0.3372 ***	0.2190 **
	(0.0541)	(0.0739)	(0.0818)	(0.0856)
Post-reform x 47-51 years old	0.0549	-0.1181 **	-0.6791 ***	0.1479 **
	(0.0410)	(0.0572)	(0.0696)	(0.0726)
Post-reform x 52-54 years old	-0.0780	0.1116	-1.0086 ***	0.3582 ***
	(0.0533)	(0.0789)	(0.0873)	(0.0970)
Post-reform x 55-56 years old	0.0233	-0.0749	-0.9239 ***	0.2482 **
	(0.0568)	(0.0818)	(0.0988)	(0.1230)
Post-reform x 57-59 years old	0.2773 ***	-0.3883 ***	-0.7747 ***	0.5819 ***
	(0.0485)	(0.0747)	(0.0947)	(0.1494)
Post-reform x 60-62 years old	0.1201 ***	-0.1055	-0.7814 ***	0.9089 ***
	(0.0439)	(0.0947)	(0.1131)	(0.2668)
Post-reform x 63-64 years old	-0.2128 ***	0.4898 *	-0.5166 ***	-°
	(0.0720)	(0.2878)	(0.1693)	-°
Controls:				
Age, education, state of residence	yes	yes	yes	yes
Linear and quadratic trends x state , month and year effects	yes	yes	yes	yes
Retirement controls	yes	yes	yes	yes
Anticipation controls	yes	yes	no	no
Unemployment benefit controls	no	no	yes	yes
N	3,886,740		231,706	
Mean	0.9928	0.0029	0.9204	0.0287

Note: Standard errors are clustered at the individual level. ***: p < 1 %; **: p < 5 %; *: p < 10 %. Pre-reform period: Transitions from E=03/2004 –08/2005; Transitions from U=03/2004 –01/2006. Anticipation period: Transitions from E=09/2005 – 01-2006. Post-reform period: 02/2006 – 12/2007. For a list and definition of control variables, see Table 3. °Estimations for 63-64-year-olds not possible due to no observations with transitions from U to E in post-reform period in the age group.

Source: SIAB 7510 and own calculations.

Table A.7   Logit coefficients of the reform effects on labor market transitions controlling for retirement, anticipation, and employment benefits: low educated individuals

	E-E transitions	E-U transitions	U-U transitions	U-E transitions
	(1)	(2)	(3)	(4)
Post-reform	-0.3194 **	0.6929 ***	0.2099 *	-0.1015
	(0.1625)	(0.2600)	(0.1250)	(0.1562)
Post-reform x 45-46 years old	-0.0793	-0.1016	-0.2960	0.1617
	(0.1323)	(0.1902)	(0.2024)	(0.2480)
Post-reform x 47-51 years old	0.1194	-0.2265	-1.0979 ***	0.1850
	(0.0996)	(0.1389)	(0.1730)	(0.2004)
Post-reform x 52-54 years old	0.1439	-0.1912	-1.3060 ***	0.1853
	(0.1191)	(0.1769)	(0.1973)	(0.2502)
Post-reform x 55-56 years old	0.0412	-0.0886	-1.2198 ***	0.3059
	(0.1259)	(0.1870)	(0.2447)	(0.3108)
Post-reform x 57-59 years old	0.2585 **	-0.2129	-0.7756 ***	0.4847
	(0.1054)	(0.1585)	(0.2210)	(0.3873)
Post-reform x 60-62 years old	0.1479	-0.2866	-0.8182 ***	0.2585
	(0.0986)	(0.1948)	(0.2621)	(0.8444)
Post-reform x 63-64 years old	-0.0272	0.1307	-0.9539 ***	-°
	(0.1247)	(0.4225)	(0.3197)	-°
Controls:				
Age, gender, state of residence	yes	yes	yes	yes
Linear and quadratic trends x state, month and year effects	yes	yes	yes	yes
Retirement controls	yes	yes	yes	yes+
Anticipation controls	yes	yes	no	no
Unemployment benefit controls	no	no	yes	yes
N	669,371		49,693	
Mean	0.9914	0.0031	0.9280	0.0183

Note: Standard errors are clustered at the individual level. ***: $p < 1\%$; **: $p < 5\%$; *: $p < 10\%$. Pre-reform period: Transitions from E=03/2004 –08/2005; Transitions from U=03/2004 –01/2006. Anticipation period: Transitions from E=09/2005 – 01-2006. Post-reform period: 02/2006 – 12/2007. For a list and definition of control variables, see Table 3. °Estimations for 63-64-year-olds not possible due to no observations with transitions from U to E in post-reform period in the age group. +One control for early and full retirement eligibility due to few observations with eligibility.

Source: SIAB 7510 and own calculations.

Table A.8   Logit coefficients of the reform effects on labor market transitions controlling for retirement, anticipation, and employment benefits: middle educated individuals

	E-E transitions	E-U transitions	U-U transitions	U-E transitions
	(1)	(2)	(3)	(4)
Post-reform	-0.3680 ***	0.6522 ***	-0.0827 *	-0.0773
	(0.0615)	(0.0965)	(0.0424)	(0.0497)
Post-reform x 45-46 years old	-0.0133	0.0005	-0.2713 ***	0.1299 *
	(0.0468)	(0.0635)	(0.0721)	(0.0742)
Post-reform x 47-51 years old	-0.0358	-0.0507	-0.6179 ***	0.1131 *
	(0.0354)	(0.0491)	(0.0593)	(0.0608)
Post-reform x 52-54 years old	0.0750 *	-0.1161 *	-0.9028 ***	0.2398 ***
	(0.0423)	(0.0605)	(0.0726)	(0.0784)
Post-reform x 55-56 years old	0.0105	-0.0792	-0.7698 ***	0.2343 **
	(0.0470)	(0.0681)	(0.0808)	(0.0967)
Post-reform x 57-59 years old	0.1992 ***	-0.3876 ***	-0.7008 ***	0.5600 ***
	(0.0414)	(0.0647)	(0.0781)	(0.1173)
Post-reform x 60-62 years old	0.0147	-0.2993 ***	-0.6355 ***	0.5515 ***
	(0.0364)	(0.0725)	(0.0917)	(0.2073)
Post-reform x 63-64 years old	0.1047 **	-0.1336	-0.3357 ***	-0.0905
	(0.0467)	(0.1528)	(0.1292)	(0.5546)
Controls:				
Age, gender, state of residence	yes	yes	yes	yes
Linear and quadratic trends x state , month and year effects	yes	yes	yes	yes
Retirement controls	yes	yes	yes	yes
Anticipation controls	yes	yes	no	no
Unemployment benefit controls	no	no	yes	yes
N	6,012,295		324,075	
Mean	0.9933	0.0027	0.9202	0.0299

Note: Standard errors are clustered at the individual level. ***: $p < 1\%$; **: $p < 5\%$; *: $p < 10\%$. Pre-reform period: Transitions from E=03/2004 –08/2005; Transitions from U=03/2004 – 01/2006. Anticipation period: Transitions from E=09/2005 – 01-2006. Post-reform period: 02/2006 – 12/2007. For a list and definition of control variables, see Table 3.

Source: SIAB 7510 and own calculations.

Table A.9   Logit coefficients of the reform effects on labor market transitions controlling for retirement, anticipation, and employment benefits: highly educated individuals

	E-E transitions	E-U transitions	U-U transitions	U-E transitions
	(1)	(2)	(3)	(4)
Post-reform	-0.2774 *	0.8719 ***	-0.1141	-0.1862
	(0.1478)	(0.2530)	(0.0947)	(0.1181)
Post-reform x 45-46 years old	-0.0762	-0.0396	-0.3439 **	0.2015
	(0.1126)	(0.1582)	(0.1560)	(0.1864)
Post-reform x 47-51 years old	0.1902 **	-0.4233 ***	-0.2767 *	-0.0568
	(0.0841)	(0.1194)	(0.1433)	(0.1570)
Post-reform x 52-54 years old	-0.1266	-0.0813	-0.8580 ***	0.5236 ***
	(0.1089)	(0.1634)	(0.1869)	(0.1974)
Post-reform x 55-56 years old	-0.0907	0.1010	-0.3399 *	0.1286
	(0.1306)	(0.1883)	(0.1963)	(0.2670)
Post-reform x 57-59 years old	0.3060 ***	-0.5017 ***	-0.5329 ***	0.4536
	(0.1165)	(0.1833)	(0.2055)	(0.2974)
Post-reform x 60-62 years old	0.0400	-0.2039	-0.3321	0.8619 **
	(0.0877)	(0.1824)	(0.2741)	(0.4024)
Post-reform x 63-64 years old	0.0210	-0.2274	-0.6278 ***	0.9066
	(0.0936)	(0.3419)	(0.2423)	(0.8939)
Controls:				
Age, gender, state of residence	yes	yes	yes	yes
Linear and quadratic trends x state, month and year effects	yes	yes	yes	yes
Retirement controls	yes	yes	yes	yes
Anticipation controls	yes	yes	no	no
Unemployment benefit controls	no	no	yes	yes
N	1,201,836		43,401	
Mean	0.9945	0.0021	0.9075	0.0366

Note: Standard errors are clustered at the individual level. ***: $p < 1\%$; **: $p < 5\%$; *: $p < 10\%$. Pre-reform period: Transitions from E=03/2004 –08/2005; Transitions from U=03/2004 – 01/2006. Anticipation period: Transitions from E=09/2005 – 01-2006. Post-reform period: 02/2006 – 12/2007. For a list and definition of control variables, see Table 3.

Source: SIAB 7510 and own calculations.

Table A.10 Logit coefficients of the reform effects on labor market transitions controlling for retirement, anticipation, and employment benefits: extended pooled sample

	E-E transitions	E-U transitions	U-U transitions	U-E transitions
	(1)	(2)	(3)	(4)
Post-reform	-0.3998 ***	0.6957 ***	-0.0420	-0.1266 ***
	(0.0473)	(0.0703)	(0.0304)	(0.0360)
Post-reform x 45-46 years old	0.0148	-0.0502	-0.2541 ***	0.1063 *
	(0.0376)	(0.0511)	(0.0537)	(0.0581)
Post-reform x 47-51 years old	0.0485 *	-0.1247 ***	-0.4893 ***	0.0581
	(0.0270)	(0.0364)	(0.0430)	(0.0440)
Post-reform x 52-54 years old	0.1115 ***	-0.1808 ***	-0.7354 ***	0.1920 ***
	(0.0321)	(0.0442)	(0.0507)	(0.0543)
Post-reform x 55-56 years old	0.0366	-0.1223 **	-0.6305 ***	0.1265 *
	(0.0379)	(0.0539)	(0.0605)	(0.0721)
Post-reform x 57-59 years old	0.2264 ***	-0.3324 ***	-0.6322 ***	0.4952 ***
	(0.0319)	(0.0474)	(0.0572)	(0.0786)
Post-reform x 60-62 years old	0.0428	-0.2170 ***	-0.5229 ***	0.5909 ***
	(0.0288)	(0.0552)	(0.0683)	(0.1278)
Post-reform x 63-64 years old	0.0876 **	-0.1148	-0.3629 ***	0.5933 **
	(0.0368)	(0.1165)	(0.0963)	(0.2955)
Controls:				
Age, gender, education, state of residence	yes	yes	yes	yes
Linear and quadratic trends x state, month and year effects	yes	yes	yes	yes
Retirement controls	yes	yes	yes	yes
Anticipation controls	yes	yes	no	no
Unemployment benefit controls	no	no	yes	yes
N	8,615,029		525,562	
Mean	0.9923	0.0034	0.9124	0.0347

Note: Standard errors are clustered at the individual level. ***: $p < 1\%$; **: $p < 5\%$; *: $p < 10\%$. Pre-reform period: Transitions from E=03/2004 –08/2005; Transitions from U=03/2004 – 01/2006. Anticipation period: Transitions from E=09/2005 – 01-2006. Post-reform period: 02/2006 – 12/2007. For a list and definition of control variables, see Table 3.

Source: SIAB 7510 and own calculations.

Table A.11   Logit coefficients of the reform effects on labor market transitions controlling for retirement, anticipation, and employment benefits: pooled sample with different clustered standard errors

	E-E transitions	E-U transitions	U-U transitions	U-E transitions
	(1)	(2)	(3)	(4)
Post-reform	-0.3446 ***	0.6785 ***	-0.0558	-0.1075 **
	(0.0892)	(0.1048)	(0.0592)	(0.0547)
Post-reform x 45-46 years old	-0.0188	-0.0235	-0.2966 ***	0.1570 **
	(0.0629)	(0.0482)	(0.1045)	(0.0654)
Post-reform x 47-51 years old	0.0297	-0.1372 ***	-0.6259 ***	0.1130 *
	(0.0600)	(0.0503)	(0.0717)	(0.0584)
Post-reform x 52-54 years old	0.0117	-0.0761	-0.9036 ***	0.2509 ***
	(0.0721)	(0.0559)	(0.0835)	(0.0829)
Post-reform x 55-56 years old	-0.0160	-0.0484	-0.7611 ***	0.2039 ***
	(0.0690)	(0.0558)	(0.0939)	(0.0726)
Post-reform x 57-59 years old	0.1627	-0.3212 ***	-0.6600 ***	0.5074 ***
	(0.2601)	(0.0698)	(0.1075)	(0.1081)
Post-reform x 60-62 years old	0.0391	-0.2801 ***	-0.6230 ***	0.5939 ***
	(0.1970)	(0.0544)	(0.0957)	(0.1643)
Post-reform x 63-64 years old	0.1066	-0.1126	-0.4766 ***	-0.0053
	(0.2109)	(0.1621)	(0.1094)	(0.2530)
Controls:				
Age, gender, education, state of residence	yes	yes	yes	yes
Linear and quadratic trends x state, month and year effects	yes	yes	yes	yes
Retirement controls	yes	yes	yes	yes
Anticipation controls	yes	yes	no	no
Unemployment benefit controls	no	no	yes	yes
N	8,020,998		430,301	
Mean	0.9933	0.0026	0.9200	0.0289

Note: Standard errors are clustered at the birth cohort-by-year-level. ***: $p < 1$ %; **: $p < 5$ %; *: $p < 10$ %. Pre-reform period: Transitions from E=03/2004 –08/2005; Transitions from U=03/2004 –01/2006. Anticipation period: Transitions from E=09/2005 – 01-2006. Post-reform period: 02/2006 – 12/2007. For a list and definition of control variables, see Table 3.

Source: SIAB 7510 and own calculations.

Table A.12   Probit coefficients of the reform effects on labor market transitions controlling for retirement, anticipation, and employment benefits: pooled sample

	E-E transitions	E-U transitions	U-U transitions	U-E transitions
	(1)	(2)	(3)	(4)
Post-reform	-0.1314 ***	0.2271 ***	-0.0315 *	0.0232
	(0.0187)	(0.0268)	(0.0167)	(0.0181)
Post-reform x 45-46 years old	-0.0073	-0.0058	-0.1404 ***	0.0695 **
	(0.0139)	(0.0179)	(0.0302)	(0.0319)
Post-reform x 47-51 years old	0.0060	-0.0382 ***	-0.2720 ***	0.0423 *
	(0.0105)	(0.0137)	(0.0247)	(0.0256)
Post-reform x 52-54 years old	0.0210 *	-0.0396 **	-0.4116 ***	0.1188 ***
	(0.0128)	(0.0171)	(0.0295)	(0.0317)
Post-reform x 55-56 years old	0.0020	-0.0223	-0.3333 ***	0.0738 **
	(0.0144)	(0.0194)	(0.0332)	(0.0377)
Post-reform x 57-59 years old	0.0770 ***	-0.1187 ***	-0.3076 ***	0.1635 ***
	(0.0129)	(0.0183)	(0.0322)	(0.0412)
Post-reform x 60-62 years old	0.0217 *	-0.0956 ***	-0.2668 ***	0.1535 **
	(0.0121)	(0.0209)	(0.0374)	(0.0626)
Post-reform x 63-64 years old	0.0444 ***	-0.0269	-0.1552 ***	-0.0626
	(0.0169)	(0.0425)	(0.0503)	(0.1454)
Controls:				
Age, gender, education, state of residence	yes	yes	yes	yes
Linear and quadratic trends x state, month and year effects	yes	yes	yes	yes
Retirement controls	yes	yes	yes	yes
Anticipation controls	yes	yes	no	no
Unemployment benefit controls	no	no	yes	yes
N	8,020,998		430,301	
Mean	0.9933	0.0026	0.9200	0.0289

Note: Standard errors are clustered at the individual level. ***: $p < 1\%$; **: $p < 5\%$; *: $p < 10\%$. Pre-reform period: Transitions from E=03/2004 –08/2005; Transitions from U=03/2004 – 01/2006. Anticipation period: Transitions from E=09/2005 – 01-2006. Post-reform period: 02/2006 – 12/2007. For a list and definition of control variables, see Table 3.

Source: SIAB 7510 and own calculations.

Table A.13   Cloglog coefficients of the reform effects on labor market transitions controlling for retirement, anticipation, and employment benefits: pooled sample

	E-E transitions (1)	E-U transitions (2)	U-U transitions (3)	U-E transitions (4)
Post-reform	-0.0749 ***	0.6839 ***	-0.0344 ***	0.0104
	(0.0104)	(0.0840)	(0.0122)	(0.0367)
Post-reform x 45-46 years old	-0.0039	-0.0204	-0.0991 ***	0.1427 **
	(0.0076)	(0.0554)	(0.0226)	(0.0629)
Post-reform x 47-51 years old	0.0032	-0.1228 ***	-0.1744 ***	0.1025 **
	(0.0058)	(0.0424)	(0.0180)	(0.0519)
Post-reform x 52-54 years old	0.0115	-0.1226 **	-0.2667 ***	0.2774 ***
	(0.0070)	(0.0529)	(0.0211)	(0.0666)
Post-reform x 55-56 years old	0.0013	-0.0670	-0.2050 ***	0.2230 ***
	(0.0080)	(0.0596)	(0.0234)	(0.0844)
Post-reform x 57-59 years old	0.0446 ***	-0.3606 ***	-0.1959 ***	0.5325 ***
	(0.0073)	(0.0557)	(0.0224)	(0.1027)
Post-reform x 60-62 years old	0.0155 **	-0.2801 ***	-0.1543 ***	0.6031 ***
	(0.0073)	(0.0624)	(0.0257)	(0.1766)
Post-reform x 63-64 years old	0.0360 ***	-0.0764	-0.0520	0.0109
	(0.0112)	(0.1284)	(0.0352)	(0.4531)
Controls:				
Age, gender, education, state of residence	yes	yes	yes	yes
Linear and quadratic trends x state, month and year effects	yes	yes	yes	yes
Retirement controls	yes	yes	yes	yes
Anticipation controls	yes	yes	no	no
Unemployment benefit controls	no	no	yes	yes
N	8,020,998		430,301	
Mean	0.9933	0.0026	0.9200	0.0289

Note: Standard errors are clustered at the individual level. ***: $p < 1\%$; **: $p < 5\%$; *: $p < 10\%$. Pre-reform period: Transitions from E=03/2004 –08/2005; Transitions from U=03/2004 – 01/2006. Anticipation period: Transitions from E=09/2005 – 01-2006. Post-reform period: 02/2006 – 12/2007. For a list and definition of control variables, see Table 3.

Source: SIAB 7510 and own calculations.

Table A.14   Logit coefficients of the reform effects on labor market transitions controlling for retirement, anticipation, and employment benefits: pooled sample without February-July 2006

	E-E transitions	E-U transitions	U-U transitions	U-E transitions
	(1)	(2)	(3)	(4)
Post-reform	-0.3074 ***	0.5622 ***	-0.0237	-0.1707 ***
	(0.0568)	(0.0902)	(0.0393)	(0.0520)
Post-reform x 45-46 years old	0.0067	-0.0316	-0.2893 ***	0.1427 **
	(0.0436)	(0.0604)	(0.0642)	(0.0703)
Post-reform x 47-51 years old	0.0223	-0.1120 **	-0.6088 ***	0.0918
	(0.0328)	(0.0462)	(0.0533)	(0.0576)
Post-reform x 52-54 years old	0.0621	-0.1271 **	-0.9321 ***	0.2721 ***
	(0.0397)	(0.0581)	(0.0651)	(0.0733)
Post-reform x 55-56 years old	-0.0043	-0.0420	-0.7676 ***	0.1805 **
	(0.0439)	(0.0646)	(0.0727)	(0.0917)
Post-reform x 57-59 years old	0.2395 ***	-0.2957 ***	-0.6738 ***	0.5634 ***
	(0.0387)	(0.0603)	(0.0702)	(0.1110)
Post-reform x 60-62 years old	0.0256	-0.2203 ***	-0.6498 ***	0.5442 ***
	(0.0340)	(0.0687)	(0.0826)	(0.1831)
Post-reform x 63-64 years old	0.0821 **	0.0137	-0.4460 ***	0.2097
	(0.0410)	(0.1340)	(0.1078)	(0.4699)
Controls:				
Age, gender, education, state of residence	yes	yes	yes	yes
Linear and quadratic trends x state , month and year effects	yes	yes	yes	yes
Retirement controls	yes	yes	yes	yes
Anticipation controls	yes	yes	no	no
Unemployment benefit controls	no	no	yes	yes
N	6,980,023		368,752	
Mean	0.9932	0.0027	0.9194	0.0288

Note: Standard errors are clustered at the individual level. ***: $p < 1\%$; **: $p < 5\%$; *: $p < 10\%$. Pre-reform period: Transitions from E=03/2004 –08/2005; Transitions from U=03/2004 – 01/2006. Anticipation period: Transitions from E=09/2005 – 01-2006. Post-reform period: 08/2006 – 12/2007. For a list and definition of control variables, see Table 3.

Source: SIAB 7510 and own calculations.