

Giesecke, Matthias; Kind, Michael

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Bridge Unemployment in Germany: Response in Labour Supply to an Increased Early Retirement Age

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Matthias Giesecke
Michael Kind

Bridge Unemployment in Germany: Response in Labour Supply to an Increased Early Retirement Age

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Technische Universität Dortmund, Department of Economic and Social Sciences
Vogelpothsweg 87, 44227 Dortmund, Germany

Universität Duisburg-Essen, Department of Economics
Universitätsstr. 12, 45117 Essen, Germany

Rheinisch-Westfälisches Institut für Wirtschaftsforschung (RWI)
Hohenzollernstr. 1-3, 45128 Essen, Germany

Editors

Prof. Dr. Thomas K. Bauer
RUB, Department of Economics, Empirical Economics
Phone: +49 (0) 234/3 22 83 41, e-mail: thomas.bauer@rub.de

Prof. Dr. Wolfgang Leininger
Technische Universität Dortmund, Department of Economic and Social Sciences
Economics – Microeconomics
Phone: +49 (0) 231/7 55-3297, email: W.Leininger@wiso.uni-dortmund.de

Prof. Dr. Volker Clausen
University of Duisburg-Essen, Department of Economics
International Economics
Phone: +49 (0) 201/1 83-3655, e-mail: vclausen@vwl.uni-due.de

Prof. Dr. Christoph M. Schmidt
RWI, Phone: +49 (0) 201/81 49-227, e-mail: christoph.schmidt@rwi-essen.de

Editorial Office

Joachim Schmidt
RWI, Phone: +49 (0) 201/81 49-292, e-mail: joachim.schmidt@rwi-essen.de

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Matthias Giesecke and Michael Kind¹

Bridge Unemployment in Germany: Response in Labour Supply to an Increased Early Retirement Age

Abstract

This study examines an increase in the early retirement age from 60 to 63 for the group of older unemployed men in Germany. As consequence of this policy reform, the time to retirement is increased from the perspective of recently unemployed individuals and therefore serves as a source of exogenous variation. We estimate continuous time hazard models for individuals at risk of leaving the state unemployment into employment or into early retirement due to exceptional rules. We find a positive impact of an increase in the early retirement age on the reemployment probability whereas the probability to retire early due to exceptional rules is not affected.

JEL Classification: J14, J26, J64

Keywords: Labour supply; retirement behaviour; old age unemployment; duration analysis

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¹ Matthias Giesecke, University of Duisburg-Essen and RGS Econ; Michael Kind, RWI and RGS Econ. – We are grateful to John P. Haisken-DeNew, Reinhold Schnabel and many colleagues for detailed comments. Furthermore we thank participants of the annual meeting of the SOLE (2012, Chicago), the SOEP Conference (2012, Berlin) and various seminars for helpful discussions. – All correspondence to Michael Kind, RGS Econ, c/o RWI, Hohenzollernstr. 1-3, 45128 Essen, Germany, E-Mail: michael.kind@rgs-econ.de.

1 Introduction

Unemployment of older workers is often permanent and thus very costly. Increasing the early retirement age may increase welfare payments if it implies that unemployed individuals remain unemployed for a longer period. In this paper, an institutional increase of the early retirement age (ERA) for an old age pension due to unemployment is used to examine the corresponding response in labour supply.¹ The central research question is whether the increased ERA, that is an increased distance to retirement age, affects the decision of older unemployed workers to remain unemployed, to return to work or to retire early using exceptional rules.²

Regarding work-retirement decisions, dynamic models under uncertainty suggest that individuals evaluate their retirement decision in each period (see e.g. Stock and Wise, 1990). In models of this kind, the relative expected lifetime utility determines whether one is to retire immediately or at some later period. Once individuals enter unemployment the decision set is changed fundamentally. Then, the trade-off is between three alternatives, *(i)* returning to a job, *(ii)* retiring early or *(iii)* staying unemployed.

First, individuals may want to return to work in order to raise their income and to accumulate savings for retirement. The economic literature provides evidence that unemployment in late stages of working careers has enormous effects on subsequent employment. For example, Chan and Stevens (2001) show that older displaced workers have lower employment rates in subsequent years compared to non-displaced workers. In addition, Tatsiramos (2010) finds that older displaced are less likely to be reemployed compared to the non-displaced. As reemployment is a market outcome, difficulties to return to work may originate from both the labour supply as well as the labour demand side of the market.

Second, the recently unemployed may exit into early retirement due to exceptional rules. Early retirement in this context refers to exits from unemployment that are considered to

¹In the context of this paper the ERA refers to the earliest possible retirement age where an old age pension due to unemployment is available.

²With respect to the terminology of this paper it is very important to note, that by early retirement we refer to exceptional pathways into retirement. This does not refer to the early receipt of an old age pension. In contrast, it refers to pensions that are rather claimed as long as an old age pension is not available because certain requirements (age, contribution years etc.) are not met.

be labour market withdrawals through exceptional rules, for example disability rules. According to Borsch-Supan and Schnabel (1998), about 68 per cent of German male workers retired by making use of disability benefits in 1981. In 1995 the share was still about 41 per cent. As such, early retirement due to exceptional rules reflect a relevant pathway for exits from the labour market.

Third, unemployed individuals may avoid returning to a job and remain unemployed. In this case unemployment serves as a bridge until an old age pension is available. The attractiveness of this alternative crucially depends on the time horizon induced by the ERA. Using Austrian data, Staubli and Zweimüller (2011) detect an increase in the unemployment rate once the ERA is increased.

By increasing the ERA, the institutional setting of the German public pension system changes the reemployment-retirement trade-off in case of a late-career job loss. Until 2006, the minimum age for early retirement due to unemployment was 60 years. Then, the German social security legislation was modified, such that the ERA for the unemployed was increased in monthly steps to age 63. When the reform fully phased in between January 2006 and December 2011, older unemployed workers were faced with a stepwise three-year increase of the ERA.

Due to the prolonged time horizon where no old age pension is available, the increase of the ERA changes the decision problem of the worker *ceteris paribus*. Very little is known about the influence of an increase of the ERA on individual decision making; size and direction of such an impact are not clear a priori.

In favour of a reasonable policy reform there should exist some positive relationship between the time until an old age pension is available and the reemployment probability. More specifically, increasing the ERA for unemployed individuals from 60 to 63 constrains the availability of an old age pension to higher ages and should therefore incentivise reemployment. The reform may also affect the alternative of a pathway into early retirement due to exceptional rules. That is, potential entry costs of such pathways may be relatively smaller over a prolonged time horizon making the use of exceptional rules more attractive. As for both reemployment and early retirement, size and direction of the impact are not clear cut, we investigate these mechanisms empirically.

From an empirical point of view, the reform can be considered as a source of exogenous variation and as such it allows to identify a causal effect on employment and retirement behaviour following a late-career job loss. In our empirical analysis we condition on a sample of unemployed men of age 55 to 63 using data from the German Socio-Economic Panel (GSOEP) for the years 1991 to 2011³. For those individuals at risk, we estimate the hazard rates of leaving the state unemployment into employment or into early retirement given the change in the time until the ERA is reached and a set of socio-demographic indicators.

The results indicate a positive effect of the increased ERA on the reemployment probability. Raising the ERA by one month implies an increase in the hazard to leave unemployment into employment by roughly 1.3 per cent, holding everything else constant. The estimated coefficients are robust across various specifications. This result is largely in line with the finding of Hairault et al. (2010), that the distance to retirement age has a substantial positive effect on employment.⁴ In contrast, we do not find an impact of the increased ERA on early retirement. We conclude that there is evidence for a behavioural response to an increased ERA, as the probability to return to work increases for older unemployed workers rather than bridging the gap until an old age pension is available.

The remainder of this paper is structured as follows. In section 2 we describe the institutional setting in more detail and provide theoretical considerations. Section 3 explains data, identification, and empirical strategy. Section 4 presents empirical results. Section 5 provides a discussion of some results with respect to influential aspects and roughly quantifies the impact of our results on public expenditures. Section 6 concludes.

³The observation period ends in 2010 due to the retrospective nature of calendar data on employment status. For further details, see section 3.

⁴Note that Hairault et al. (2010) derive their results on employment status where they use a broader definition of employment, i.e. employment versus non-employment of older male individuals. In contrast, our study is restricted to older male individuals who enter unemployment. However, the principle idea of analysing the impact of distance (time) until a pension is available on employment patterns, is the same with similar results.

2 Institutional Setting and Theoretical Considerations

2.1 Recent Labour Market Development and Retirement Behaviour

Between 2005 and 2011 the number of persons in gainful employment over all age groups increased by 3.3 Mio. from 36.6 Mio. to 39.9 Mio. (Federal Statistical Office, 2012). About one third of this increase (0.9 Mio.) can be attributed to the group of older males at age 55 to 64. At the same time, unemployment of older individuals is still prevalent in the German labour market but has decreased remarkably in recent years. Precisely, the number of unemployed individuals at age 50 to 64 has decreased from about 1.2 Mio. in 2005 to 0.9 Mio. in 2011 (Federal Employment Agency, 2012). In relative terms, this corresponds to a drop from 12.0% to only 6.1%. Moreover, the average duration of completed unemployment spells decreased from about 36 weeks in 2005 to 34 weeks in 2011 (Federal Employment Agency, 2012). Correspondingly, less individuals exhibited a direct transition from unemployment into retirement. Specific interest lies on old age pensions due to unemployment where the total number of retirement entries has decreased remarkably from 127,937 in 2005 to 60,324 in 2010; in relative terms compared to all types of old age pensions the drop was from 33,4% in 2005 to 19,5% in 2010 (German Federal Pension Insurance, 2011).

This recent labour market development has some indications. First, the number of older male persons in gainful employment has increased by about one third in recent years. Second, unemployment of older males has become less frequent and the average unemployment duration has declined. Third, the take-up rate of old age pensions due to unemployment has decreased remarkably which implies that direct transitions from unemployment into retirement seem to be less frequent. These developments are very likely to have different reasons but are certainly influenced by a series of labour market reforms. As such, this study analyses the impact of the increase in the ERA on unemployment duration, reemployment probability and retirement behaviour of older males.

2.2 Institutional Setting

The German public pension system has been converted into a pure pay-as-you-go pension system after World War II. In the course of a major reform in 1972, the generosity of the public pension scheme was increased dramatically. Inevitably, this system ran into severe financing problems due to demographic change and major disincentives (see e.g. Borsch-Supan, 2000).

A series of reforms, beginning in the early 1990's, was motivated by the necessity to adjust to today's requirements and to be suitable for future generations. It seems natural in such a setting, that the burden of a changing old age dependency ratio must somehow be allocated among those groups who participate in the public pension system.⁵

Therefore a policy reform was introduced into the German social security legislation that reorganises the specific retirement rules for unemployed individuals.⁶ The reform was originally enacted in 1992 and eventually took effect starting in 2006.

The change in the relevant rule that has finally found its way to realisation can be described as follows. The former minimum age to receive an old age pension due to unemployment is increased from 60 years to 63 years in monthly steps. This increase is realised for the birth cohorts 1946 to 1948.⁷ Adding one additional month for each month of birth implies that the reform phases in between January 2006 and December 2011. For instance, a person born in April 1947, will face a postponement of 16 months until eligibility for old age pension due to unemployment is achieved. In other words, this person cannot receive old age pension benefits due to unemployment as formerly starting in April 2007 but instead in August 2008. Given this setting, we have the above mentioned six-year period of calendar time (2006 - 2011) for the increasing ERA which is therefore relevant to our analysis.⁸

As we analyse the impact of the aforementioned policy change, the preferred identification strategy would be a difference-in-difference estimator. In order to successfully implement such an estimator, we convincingly need to distinguish a control group from a treatment

⁵The old age dependency ratio is refers to the ratio of pension benefit recipients to contributors.

⁶The relevant clause in the German social security legislation (*Sozialgesetzbuch*) is § 237 Absatz 3 *SGB VI* in combination with *supplement 19 SGB VI*.

⁷For more details, see Table 5 and Table 6 in the appendix for the *supplement 19 in SGB VI*.

⁸Staubli and Zweimüller (2011) investigate labour market effects for a similar reform that took place in Austria between 2000 and 2006.

group. However, this is difficult in the specific setting for the following reason. While the increase in the ERA due to unemployment affects both sexes equally, women still have the option to retire by the age of 60 due to specific legislative rules (§ 237a SGB VI). This would classify them to be a sufficient control group. However, women can only make use of such alternatives, if they meet certain requirements (e.g. a minimum of contribution years). Unfortunately, the data do not provide sufficient information to determine whether a women meets the requirements to take up an old age pension by age 60 or is affected by the increase in the ERA otherwise.⁹ Due to this imprecision in the separation between control group and treatment group, a before and after comparison of male workers only, is the preferred strategy and implemented for identification.

2.3 Theoretical Considerations

It is important how unemployment of older workers may affect the subsequent decision process referring to labour supply. The basic mechanisms are essential to understand whether the policy reform may incentivise individuals to return to the labour market.

In this paper, we consider only those individuals with a job loss such that they face a situation of unemployment by definition. The decision process is then characterised by a trade-off between staying unemployed, returning to a job or to enter retirement due to exceptional rules.

Concerning reemployment we distinguish two relevant mechanisms. First, a job loss itself may alleviate the attractiveness of subsequent work. Jacobson et al. (1993) find that six years after a job loss, a typical U.S. worker still faces earnings reductions of roughly 25 per cent. In such a scenario the expected future payoff from work decreases and therefore staying unemployed or early retirement become relatively more attractive (Chan and Stevens, 1999). Second, to compensate a decrease of financial resources following a job loss, an individual may have strong incentives to return to a job and postpone retirement. Depending on which effect dominates, the theory boils down to a deterministic problem to be solved by returning to the labour market if the expected lifetime utility of work (and

⁹Table 7 in the appendix shows results for a difference-in-difference estimation where the failure event is reemployment, ignoring the shortcomings of the precise differentiation between control and treatment group. The sign at size of the hazard ratio imply robustness of the results derived below.

subsequent retirement) is larger compared to using unemployment as a bridge and then entering retirement.

Now the reform of increasing the ERA comes into play. By nature, this implies an extension of the time horizon until an old age pension is available for unemployed individuals by a maximum of three years. In this context we observe two important mechanisms. First, the increased time to retirement is equivalent to an extended duration of unemployment *ceteris paribus*. Therefore, opportunity costs of unemployment increase and as a consequence the reemployment probability may increase due to the corresponding incentives to return to the labour market. Second, empirical evidence shows that there is a negative relationship between age and reemployment probability (see e.g. Chan and Stevens, 2001). These two basic effects may offset each other and ultimately it is an empirical question to investigate, whether the reform induces a positive response in labour supply in terms of an increasing reemployment probability.

The reform may also affect the second alternative of a pathway into some kind of early retirement due to exceptional rules. According to Borsch-Supan et al. (2004), 45 per cent of all men state to be retired by the age of 59. In about 50 per cent of the cases they entered early retirement due to disability. The other 50 per cent chose official or unofficial pre-retirement schemes.¹⁰ Due to an increase of the ERA, changes in the payoff structure may occur with respect to alternative pathways into retirement. Exceptional rules potentially imply higher entry costs to such pathways, which may be partly alleviated as the ERA increases. Any benefits from exceptional early retirement rules may then be materialised over a longer period with relatively smaller entry costs. Thus, the state of unemployment may become less attractive in comparison to alternative pathways into early retirement.

¹¹ As for the reemployment probability, the net effect is unclear and has to be investigated empirically.

¹⁰For instance, the so-called “58er-Regel” enabled older workers to conclusively withdraw from the labour market and continue to receive unemployment benefits at age 58. In turn, they committed themselves to claim an old age pension as soon as such benefits were available without reductions.

¹¹However, it must be mentioned, that the German legislation increased the barriers to make use of such clauses. Although not directly attached to an increase of the ERA, this is a potential pitfall as it may be confounded as an impact caused by the change in the ERA.

3 Data and Empirical Strategy

3.1 Data

For this study we use data provided by the German Socio-Economic Panel (GSOEP). It includes about 11,000 German households with some 20,000 individuals to be interviewed in subsequent years. As such, the GSOEP is a representative sample of the German population. It allows access to a rich set of socio-demographic characteristics on the individual level as well as on the household level (see Haisken-DeNew and Frick, 2005).

The key information used in this paper is based on calendar records of employment status, unemployment status and retirement status. We use precise monthly information which is based on retrospective questions for the panel waves from 1991 to 2011. Individuals who participate in the survey are asked to answer these retrospective questions corresponding to the year before being interviewed. Due to the retrospectiveness of the calendar records, the employment status is only available until 2010 and hence the observation period is 1991 to 2010. After we restrict our sample to males of age 55 to 63 (2,110 individuals) we identify only those individuals that enter unemployment in the relevant observation period between 1991 and 2010 (797 individuals).¹² Furthermore, civil servants are excluded from the analysis due to different legislative rules. By only including individuals who enter unemployment during the sample period, we can rule out problems that result from left-censoring, as we precisely know when unemployment spells are to begin. Subsequently, we follow these unemployment spells over time. In a simple three state world we either observe spells to end in a transit to reemployment, in a transit to retirement or to be right-censored at the end of the observation period. In the case of right-censoring we do not know when a spell is to end. After conditioning on a set of control variables, the final sample consists of 633 male workers (11,776 person-month observations) where 202 exhibit a transition into reemployment, 118 retire early by the use of exceptional rules and the remaining 313 stay unemployed.

¹²The data used in this paper was extracted using the Add-On Package PanelWhiz for Stata. PanelWhiz (<http://www.PanelWhiz.eu>) was written by Dr. John P. Haisken-DeNew (john@PanelWhiz.eu). See Haisken-DeNew and Hahn (2010) for details. The PanelWhiz generated DO file to retrieve the data used here is available upon request. Any data or computational errors in this paper are the authors'.

Our intention is to explain how exits out of unemployment are affected by an increased ERA, such that the focus is on two different dependent variables, the reemployment probability and the early retirement probability. First, we define a binary variable to be zero as long as an individual remains unemployed. As soon as an individual enters full- or part time employment, this variable is assigned to be one. Second, we apply exactly the same principle for the transition behaviour out of unemployment into early retirement. Here, the binary indicator is zero as long as an individual remains unemployed and one as soon as an entry into early retirement has occurred. Similar to Borsch-Supan et al. (2004) we rely on the self-reported retirement status. Thus, we cannot control for the specific pathway into early retirement.¹³

To determine how reemployment and retirement probabilities are affected by an increase in the time to the ERA, the explanatory variable of central interest is the information to what extent an individual faces such an increase. This variable measures the exogenous change in the time to retirement and this change exclusively depends on the year and month of birth of an individual. That is, whether an individual is affected by the reform is a question of being born before January 1946 (not affected) or after (affected). For those individuals who are born in or after January 1946, the ERA for an old age pension increases by one additional month for each month they are born later. The variable is constructed in a way that it takes on zero values for those who are not affected and counts the number of additional months for those who are affected (about 40 per cent of the individuals in our sample are affected by the reform). Thus, the reform variable shows a minimum of zero and a maximum of 36 additional months.

Using the GSOEP data, we can draw upon a large number of socio-demographic variables. We make extensive use of this kind of information as the retirement behaviour is determined by various individual-specific and household-specific characteristics. The set of explanatory variables includes age, region (east/west), migrant status, subjective health status¹⁴, homeownership, dependent children, years of education, past unemployment ex-

¹³A check of the data shows which pathway individuals choose. While about 50 per cent of the individuals do not report a labour income after early retirement, about 60 per cent do not report their type of occupation. This finding is in line with Borsch-Supan et al. (2004), where about 50 per cent choose the pathway of official or unofficial pre-retirement schemes.

¹⁴The self-assessed health status is included due to the potential endogeneity between disability status and the retirement decision (see also Borsch-Supan et al., 2004).

Table 1: Descriptive Statistics

| | Income Not Included | | | | Income Included | | | |
|---------------------------|---------------------|----------|------|------|-----------------|----------|------|------|
| | Mean | Std.Dev. | Min. | Max. | Mean | Std.Dev. | Min. | Max. |
| Additional Month (Reform) | 11.25 | (15.50) | 0 | 36 | 10.79 | (15.40) | 0 | 36 |
| Current Year Age | 57.36 | (1.62) | 55 | 62 | 57.45 | (1.57) | 55 | 62 |
| West Germany | 0.48 | (0.50) | 0 | 1 | 0.49 | (0.50) | 0 | 1 |
| Migrant | 0.15 | (0.36) | 0 | 1 | 0.15 | (0.36) | 0 | 1 |
| Subjective Health | 0.75 | (0.43) | 0 | 1 | 0.74 | (0.44) | 0 | 1 |
| Married | 0.80 | (0.40) | 0 | 1 | 0.83 | (0.38) | 0 | 1 |
| Home Owner | 0.48 | (0.50) | 0 | 1 | 0.49 | (0.50) | 0 | 1 |
| Dep. Child in Household | 0.10 | (0.30) | 0 | 1 | 0.09 | (0.28) | 0 | 1 |
| Years of Education | 11.62 | (2.45) | 7 | 18 | 11.55 | (2.38) | 7 | 18 |
| Regional UE Rate | 12.95 | (4.79) | 4 | 22 | 12.93 | (4.76) | 4 | 22 |
| Pre-Retirement | 0.07 | (0.26) | 0 | 1 | 0.08 | (0.27) | 0 | 1 |
| Unemployed Partner | 0.12 | (0.33) | 0 | 1 | 0.13 | (0.33) | 0 | 1 |
| Retired Partner | 0.11 | (0.31) | 0 | 1 | 0.11 | (0.31) | 0 | 1 |
| Past UE Experience | 1.51 | (2.31) | 0 | 21 | 1.13 | (1.82) | 0 | 16 |
| Log. Gross Income (t-1) | - | - | - | - | 7.51 | (0.59) | 4 | 10 |
| N | 633 | | | | 539 | | | |

Note: Own calculations based on the GSOEP (1991-2011). Descriptive statistics in the left part are computed using all observations. Descriptive statistics in the right part are computed using only those observations that include income information. Unemployment is abbreviated by *UE* and (*t-1*) refers to the period before an individual enters unemployment. Note that age is measured in years and the observed maximum value is 62 since we exclude individuals after they turn to age 63.

perience, annual unemployment rate by state, participation in pre-retirement agreements, employment status of the spouse and log gross income in the period before entering unemployment.¹⁵

3.2 Empirical Strategy

We start by implementing a linear probability model (LPM), estimating the reemployment and retirement probability on a set of regressors including exogenous variation due to the reform steps. As we face a binary decision of being unemployed or leaving unemployment into employment or retirement respectively, we take this into account using a binary probit model. While allowing for the discreteness of the dependent variable, this proceeding still faces a few shortcomings. First, the probit framework very much relies on the normal distribution assumption of the error term. Second, we specifically analyse transitions out of unemployment and therefore need to take into account duration dependence. Third, due to the presence of right censoring we do not observe completed unemployment spells

¹⁵Note, that we do not include time fixed-effects in our model for the following reasons. First, we make use of annual regional unemployment rates, which should account for most of the variation regarding unemployment and calendar time. Second, we include age and the reform variable. This perfectly determines calendar time for a relevant share of the sample (after 2005).

for the whole sample. Although the simple probit framework may condition on the length of unemployment spells which could be included as a regressor, it does not provide appropriate mechanisms to account for right censoring. Therefore we apply an estimation technique which is able to handle these problems and hence make use of duration models, which are widely used in the relevant literature.¹⁶

The natural starting point in this framework is a formal statement on the probability distribution of unemployment spells, which is given by the cumulative distribution function

$$F(t) = \text{Prob}[T < t] \quad (1)$$

where T is a random variable for the duration of unemployment and t is an arbitrary failure time of the unemployment spell.¹⁷ Clearly, this is the probability that an unemployment spell is to end within the observation period. As an equivalent statement, the corresponding probability density function is

$$f(t) = dF(t)/dt \quad (2)$$

To describe the upper tail of the probability distribution, the survivor function is defined as

$$S(t) = \text{Prob}[T \geq t] = 1 - F(t) \quad (3)$$

which describes the probability of an unemployment spell to be equal or to exceed t . A useful concept within the duration framework is the hazard function, which is derived from the survivor function and can be written as

$$\lambda(t) = f(t)/[1 - F(t)] = f(t)/S(t) \quad (4)$$

¹⁶See, among many others, Lancaster (1979), Nickell (1979), Chan and Stevens (2001), Steiner (2001) or Tatsiramos (2010).

¹⁷See Kiefer (1988) for a comprehensive overview on economic duration data and hazard functions. The formal notation follows Kiefer (1988) or Cox and Oakes (1984), where $F(t) = \text{Prob}[T < t]$ instead of the usual convention, where $F(t) = \text{Prob}[T \leq t]$ which is useful for a more precise statement of the hazard function.

A more precise statement of the hazard function in terms of probabilities is

$$\lambda(t) = \lim_{h \rightarrow 0} \frac{\text{Prob}[t \leq T < t + h | T \geq t]}{h} \quad (5)$$

where h is a small instant of time. The hazard function has a straightforward interpretation as it is the rate at which durations T will be completed in time t (see Kiefer, 1988). We treat time to be continuous although we draw on discrete time units. Since we have precise monthly information on unemployment spells and do not observe many transitions out of unemployment at one particular point in time this appears to be reasonable. We start from a fully parametric specification, modelling a proportional hazard specification of the form

$$\lambda(t|\mathbf{x}) = \lambda_0(t, \alpha) \cdot \phi(x, \beta) \quad (6)$$

where $\lambda(t|\mathbf{x})$ is the hazard rate conditional on a set of socio-demographic characteristics \mathbf{x} , $\lambda_0(t, \alpha)$ is the baseline hazard and $\phi(x, \beta)$ is a scale factor. The basic principle of the proportional hazard framework is to factorise the hazard rate into a baseline, which is a function of time only, and a scale factor which is a function of observed covariates. Consequently, all individuals have the same baseline hazard which changes over time. Socio-demographic characteristics are used in the estimation framework to scale the baseline hazard. We assume duration time T to be described by a Weibull distribution. The Weibull distribution is the best fit of what we observe in the data with respect to the length of unemployment spells.¹⁸ To reduce the reliance on functional form assumptions of the baseline hazard, we additionally estimate a semi-parametric Cox model.

A remaining problem in the analysis is with respect to unobserved heterogeneity. An individual's attitude towards work may, for example, impact both reemployment behaviour and entering retirement due to exceptional rules. If unobserved characteristics are neglected in the analysis, the results might be biased. An econometric approach to deal with unobserved heterogeneity in the duration framework is a frailty model. The basic assumption is that unobserved heterogeneity is multiplicatively linked to the hazard func-

¹⁸The results are robust to alternative distributional assumptions such as the Gompertz or exponential distribution. According to the Akaike information criterion the Weibull distribution is superior in terms of fit.

tion $\lambda(t|\alpha) = \alpha\lambda(t)$.¹⁹ In this paper, we use a frailty model assuming an inverse Gaussian distribution, which implies that the relative variability in the sample due to the unobservables reduces over time and gradually leaves a more homogeneous sample.²⁰ This assumption is well suited for this application, as individuals with a higher affinity to work will have a higher reemployment probability. Thus, individuals with a lower affinity to work will remain longer in the sample creating a more homogeneous sample over time. To control for unobserved heterogeneity, we estimate the hazard function

$$\lambda_{\theta}(t|x) = \lambda(t|x)[1 - 2\theta \ln\{S(t)\}]^{-\frac{1}{2}} \quad (7)$$

As argued before, unemployed individuals face a decision problem among three alternatives. They either stay unemployed, enter retirement or find a new job. It therefore seems straightforward to implement a competing risk model between alternatives that are mutually exclusive. In this context, the different failure types reemployment or early retirement are not assumed to be independent from each other as in the previous models. In this paper the approach by Fine and Gray (1999) is used and in contrast to equation (5), the risk set is extended, which can then be written as

$$\lambda(t) = \lim_{h \rightarrow 0} \frac{\text{Prob}[t \leq T < t + h \text{ and event Type 1} | T > t \text{ or } (T \leq t \text{ and not event Type 1})]}{h} \quad (8)$$

Hence, the probability that an individual experiences event Type 1, conditional on not having failed before or at least not having experienced event Type 1 before, is estimated.

From a decision-theoretic point of view, we model individual behaviour in the point in time that corresponds to a job loss. This leads to a data structure, where socio-demographic characteristics of individuals and households only play a role once an individual enters unemployment and not thereafter. Consequently, in what follows - and particularly in the duration framework - we make use of time-invariant regressors only.

¹⁹Note that α represents unobserved heterogeneity, being a random positive quantity with mean 1 and variance θ .

²⁰See Gutierrez (2002) for more details.

4 Results

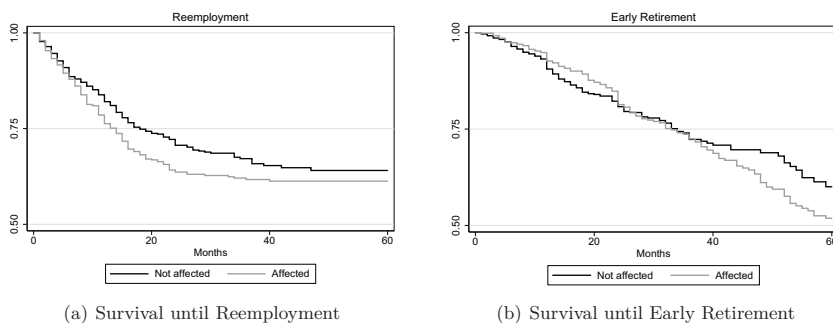
We distinguish between two fundamental transition mechanisms where one describes exits from unemployment into reemployment and the other is for exits from unemployment into early retirement due to exceptional rules. The point of departure is a non-parametric test on subgroup differences in observed transition rates for both transition types (log-rank test). For this exercise, two subgroups are defined as to whether they are affected by the reform or not. The only relevant information to compare survival distributions in these two subsamples is the total number of unemployed individuals, the number of transitions into reemployment and the number of transitions into early retirement. For transitions from unemployment into reemployment, the Null hypothesis of no subgroup difference in hazard rates is rejected. The probability that this result occurs by chance is 0.03. However, for transitions from unemployment into early retirement the Null hypothesis of no subgroup difference in hazard rates cannot be rejected. The probability that this result occurs by chance is large (0.34).

The proportional hazard assumption implies that hazard profiles with respect to some explanatory variable are more or less parallel lines. Differences in hazard rates concerning the variable of interest should therefore only induce a shift in the level and not in the slope. To assess graphically whether the proportional hazard assumption with respect to the reform variable is reasonable, we plot Kaplan-Meier survival estimates for the two distinct cases of individuals who are affected or not affected by the reform. For the sake of this graphical test, we drop some information and redefine the reform variable as a binary indicator. This variable takes the value one if the number of additional months until ERA is greater than zero (affected) and zero otherwise (not affected). The resulting empirical survival functions for transitions from unemployment into reemployment and from unemployment into early retirement are shown in Figure 1.

For the case of reemployment as shown in panel (a) of Figure 1, survival rates clearly indicate proportionality between individuals who are affected by the reform and those who are not. More precisely, survival rates in unemployment are systematically smaller for those who are affected by an increased ERA. The proportional hazard assumption seems justifiable since survival rates are more or less parallel lines as they proceed over time. For

the case of early retirement as shown in panel (b) of Figure 1, the graphical illustration is ambiguous since survival profiles intersect for individuals who are affected by the reform and those who are not. Here, the proportional hazards assumption seems not justifiable. This finding is very much in line with the nonparametric log-rank test, where we found significant differences for subgroups (affected/not affected) with respect to reemployment and no such differences with respect to early retirement due to exceptional rules. Thus we assume that there is no impact on early retirement behaviour due to exceptional rules and therefore we focus on the reemployment case when assessing whether the reform induces significant differences between hazard rates.

Figure 1: Kaplan-Meier Survivor Functions.



Source: Own calculations using the GSOEP (1991-2011).

In what follows, we present estimation results only for the reemployment probability while results regarding early retirement are moved to the appendix.²¹ Finally, both transition mechanisms are regarded simultaneously in a competing risk model.

4.1 The Impact of an Increased ERA on Reemployment

All models are estimated in two versions, one including log income in the period before entering unemployment and one without log income. This is due to the large number of missing values on the income variable. When using survey data as is done here, typical reasons for missing income information are refused answers or recall errors. However, another important reason that specifically applies to our framework can be described as

²¹See Table 8 in the appendix for a detailed representation of results for early retirement.

Table 2: Results on LPM and Probit Estimation.

| | LPM | LPM | Probit | Probit |
|-----------------------------|----------------------|----------------------|----------------------|----------------------|
| Additional Month (Reform) | 0.003** (0.001) | 0.005*** (0.001) | 0.010** (0.004) | 0.015*** (0.005) |
| Age(55) | -0.087*** (0.011) | -0.087*** (0.012) | -0.286*** (0.041) | -0.295*** (0.046) |
| West Germany | -0.193*** (0.068) | -0.125 (0.076) | -0.637*** (0.240) | -0.430 (0.274) |
| Migrant | -0.043 (0.052) | -0.033 (0.056) | -0.173 (0.199) | -0.138 (0.224) |
| Subjective Health | 0.125*** (0.037) | 0.119*** (0.040) | 0.495*** (0.140) | 0.507*** (0.150) |
| Married | 0.047 (0.047) | 0.050 (0.051) | 0.156 (0.157) | 0.137 (0.174) |
| Home Owner | 0.039 (0.037) | 0.038 (0.040) | 0.142 (0.121) | 0.153 (0.133) |
| Dep. Child in Household | -0.095 (0.060) | -0.159** (0.067) | -0.343* (0.199) | -0.598** (0.251) |
| Years of Education | 0.004 (0.008) | 0.001 (0.009) | 0.011 (0.024) | 0.002 (0.029) |
| Regional UE Rate | -0.005 (0.007) | 0.005 (0.008) | -0.017 (0.026) | 0.019 (0.030) |
| Pre-Retirement | -0.152*** (0.051) | -0.155*** (0.054) | -0.812*** (0.311) | -0.890** (0.358) |
| Unemployed Partner | -0.092* (0.051) | -0.092* (0.055) | -0.321* (0.181) | -0.322 (0.197) |
| Retired Partner | -0.043 (0.053) | -0.057 (0.058) | -0.148 (0.198) | -0.227 (0.225) |
| Past UE Experience | 0.001 (0.007) | 0.001 (0.011) | 0.013 (0.027) | 0.019 (0.042) |
| Log. Gross Income ($t-1$) | | -0.010 (0.034) | | -0.019 (0.121) |
| Constant | 0.488*** (0.176) | 0.423 (0.282) | -0.042 (0.609) | -0.374 (1.050) |
| N | 633 | 539 | 633 | 539 |
| R ² | 0.192 | 0.207 | | |
| PseudoR ² | | | 0.174 | 0.193 |

Note: Own calculations based on the GSOEP (1991-2011). *** p<0.01; ** p<0.5; * p<0.1. Robust standard errors in parentheses. Marginal effects at the sample mean are reported for the probit model. Each model is estimated once without income information (left column) and once including income information (right column). Age(55) is age centered at 55. Unemployment is abbreviated by *UE* and ($t-1$) refers to the period before an individual enters unemployment.

follows. We observe an individual because she has entered unemployment. It is possible though, that she was unemployed already in the period before we started observing her due to e.g. age restrictions. She eventually exhibited a reemployment meanwhile and became eligible for our sample as soon as she entered unemployment again, given that all other requirements were met. In this specific case, no valid log gross income is available in the period before the interview takes place (i.e. $t-1$).

Transitions are from unemployment into reemployment, where reemployment is used as the binary dependent variable (LPM and probit) or failure event (duration models) re-

spectively. The results for LPM and probit estimations in Table 2 provide a first insight on the basic mechanisms. Important regressors such as age and subjective health have expected signs. Increasing age reduces the probability to return to employment and a better self-rated health condition increases the reemployment probability. Living in West Germany is negatively correlated to the reemployment probability which may be explained by a more flexible labour market in East Germany.²² Entering unemployment due to a pre-retirement programme has the expected negative impact on reemployment since there is no necessity to return to work due to a contract between employer and employee. Most importantly, there is a positive coefficient on the reform variable (“Additional Month”). Thus, we find first evidence of a positive impact of the increased ERA on reemployment in the LPM and probit framework.

In the duration framework, hazard ratios for the transition from unemployment into reemployment are presented in Table 3.²³ Increasing age reduces the hazard of leaving the state of unemployment into employment. A rather strong and positive effect can be found for subjective health assessment. As in previous models, participation in a pre-retirement programme negatively affects the reemployment probability. The same holds true for dependent children in a household or an unemployed spouse, which may indicate specific time use preferences.

Similar to the LPM and probit framework and in line with Staubli and Zweimüller (2011) and Hairault et al. (2010), the estimated coefficients for an increase in the ERA are positive in all models. The point estimates of the hazard ratios vary from 1.010 to 1.029. However, the 95% confidence intervals overlap from 1.006 to 1.020. The frailty models (last two columns in Table 3), which take unobserved heterogeneity into account, report point estimates at the upper bound. However, the confidence intervals of the other estimates include the point estimates of the frailty models.²⁴ Thus, we conclude that the positive effect of an increase in the ERA is roughly about 1.3 per cent for an additional month.²⁵ Making use of the proportional hazards framework to extrapolate this result to

²²For more information see Bellmann and Hohendanner (2009).

²³The hazard ratio represents the percentage change of the baseline hazard with respect to a change in the corresponding regressor.

²⁴In the frailty model ignoring income information, the estimated coefficient is not significant in the common statistical sense. The probability that this result occurs by chance is 10.02 per cent.

²⁵ $(1.020 + 1.006)/2 = 1.013$.

Table 3: Results on Duration Model Estimation.

| | Cox | Cox | Weibull | Weibull | Frailty | Frailty |
|---------------------------------|---------------------|---------------------|---------------------|---------------------|----------------------|-----------------------|
| Additional Month (Reform) | 1.011** (0.005) | 1.018*** (0.006) | 1.010* (0.006) | 1.017*** (0.006) | 1.014 (0.009) | 1.029*** (0.011) |
| Age(55) | 0.758*** (0.040) | 0.740*** (0.045) | 0.797*** (0.045) | 0.773*** (0.051) | 0.682*** (0.063) | 0.655*** (0.077) |
| West Germany | 0.353*** (0.097) | 0.448*** (0.131) | 0.269*** (0.083) | 0.388*** (0.127) | 0.072*** (0.027) | 0.165*** (0.085) |
| Migrant | 0.811 (0.236) | 0.837 (0.271) | 0.774 (0.240) | 0.830 (0.287) | 0.670 (0.320) | 0.773 (0.421) |
| Subjective Health | 1.848*** (0.346) | 1.838*** (0.363) | 1.857*** (0.374) | 1.823*** (0.385) | 2.622*** (0.814) | 2.840*** (0.981) |
| Married | 1.327 (0.256) | 1.245 (0.270) | 1.428 (0.311) | 1.280 (0.305) | 1.408 (0.484) | 1.299 (0.510) |
| Home Owner | 1.146 (0.168) | 1.182 (0.195) | 1.195 (0.192) | 1.301 (0.234) | 1.320 (0.354) | 1.476 (0.469) |
| Dep. Child in Household | 0.674 (0.174) | 0.492* (0.179) | 0.632 (0.184) | 0.459** (0.179) | 0.455* (0.211) | 0.274** (0.173) |
| Years of Education | 1.002 (0.031) | 0.986 (0.036) | 0.996 (0.035) | 0.982 (0.040) | 0.957 (0.046) | 0.962 (0.064) |
| Regional UE Rate | 0.955 (0.028) | 1.003 (0.033) | 0.932** (0.031) | 0.992 (0.037) | 0.841*** (0.029) | 0.947 (0.051) |
| Pre-Retirement | 0.291** (0.156) | 0.227** (0.146) | 0.271** (0.148) | 0.210** (0.137) | 0.150** (0.123) | 0.116** (0.109) |
| Unemployed Partner | 0.647* (0.145) | 0.631* (0.159) | 0.631* (0.163) | 0.604* (0.179) | 0.444** (0.181) | 0.426* (0.202) |
| Retired Partner | 0.771 (0.188) | 0.665 (0.190) | 0.829 (0.213) | 0.711 (0.211) | 0.719 (0.311) | 0.513 (0.248) |
| Past UE Experience | 1.006 (0.034) | 1.027 (0.049) | 1.019 (0.037) | 1.039 (0.053) | 1.031 (0.060) | 1.029 (0.085) |
| Log. Gross Income (t-1) | | 1.046 (0.137) | | 1.001 (0.143) | | 0.767 (0.125) |
| Weibull Parameter ρ | | | 0.799*** (0.035) | 0.798*** (0.040) | 1.331*** (0.097) | 1.354*** (0.136) |
| Variance Inv. Gaussian θ | | | | | 15.561*** (7.630) | 18.657*** (13.894) |
| N | 633 | 539 | 633 | 539 | 633 | 539 |

Own calculations based on the GSOEP (1991-2011). *** p<0.01; ** p<0.5; * p<0.1. Robust standard errors in parentheses. Hazard ratios are reported (HR > 1 positive effect; HR < 1 negative effect). ρ is the additional parameter of the Weibull distribution that allows for duration dependence, where $\rho = 1$ implies the exponential distribution. θ is the heterogeneity parameter of the inverse Gaussian distribution, where $\theta = 0$ implies that no unobserved heterogeneity is present. Each model is estimated once without income information (left column) and once including income information (right column). Age(55) is age centered at 55. Unemployment is abbreviated by *UE* and (*t-1*) refers to the period before an individual enters unemployment.

an increased ERA of a full year implies an increase in the hazard to leave unemployment into employment by roughly 17 per cent ceteris paribus ($1.013^{12} = 1.168$). Due to the robustness of sign and size of the coefficients and the corresponding hazard ratios, we conclude that the reemployment probability of recently unemployed individuals increases as the ERA is raised. As all control variables are from the labour supply side, this suggests an increase in the incentives to return to work.

The decision between three alternatives that are mutually exclusive implies that choosing

Table 4: Results on Competing Risk Estimation.

| | Event: Reemployment | Event: Reemployment |
|---------------------------|---------------------|---------------------|
| Additional Month (Reform) | 1.012** (0.005) | 1.018*** (0.006) |
| Age(55) | 0.749*** (0.040) | 0.731*** (0.044) |
| West Germany | 0.363*** (0.100) | 0.464*** (0.136) |
| Migrant | 0.813 (0.235) | 0.839 (0.268) |
| Subjective Health | 1.923*** (0.364) | 1.926*** (0.384) |
| Married | 1.349 (0.258) | 1.283 (0.277) |
| Home Owner | 1.121 (0.164) | 1.153 (0.189) |
| Dep. Child in Household | 0.685 (0.176) | 0.504* (0.182) |
| Years of Education | 1.002 (0.031) | 0.988 (0.036) |
| Regional UE Rate | 0.961 (0.029) | 1.010 (0.033) |
| Pre-Retirement | 0.293** (0.157) | 0.229** (0.148) |
| Unemployed Partner | 0.635** (0.142) | 0.620* (0.155) |
| Retired Partner | 0.718 (0.182) | 0.614* (0.181) |
| Past UE Experience | 1.010 (0.034) | 1.024 (0.049) |
| Log. Gross Income (t-1) | | 1.028 (0.135) |
| N | 633 | 539 |

Note: Own calculations based on the GSOEP (1991-2011). *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$. Robust standard errors in parentheses. Hazard ratios are reported (HR > 1 positive effect; HR < 1 negative effect). The competing event is early retirement. Each model is estimated once without income information (left column) and once including income information (right column). Age(55) is age centered at 55. Unemployment is abbreviated by *UE* and (*t-1*) refers to the period before an individual enters unemployment.

one alternative is equivalent with not choosing the other two. With respect to this interdependence, the econometric approach in the framework of duration analysis should be a competing risk model. Table 4 shows the results for a model in which the event of interest is reemployment and the competing event is early retirement. The coefficient of interest (“Additional Month”) indicates robustness of the results obtained earlier. Even though, the independence assumption of reemployment and early retirement is dropped, the positive impact of increasing the ERA by one additional month on reemployment behaviour remains stable. Since the sign and the size of the coefficient are robust across various specifications with different assumptions, it is concluded that the reemployment probability increases as the time horizon to bridge unemployment is prolonged by an increased ERA.

5 Discussion

5.1 Selection versus Incentives

An important question is to what extent the positive effect of an increased ERA on reemployment is the result of a change in incentives (as is argued in this paper) or rather due to selection.

Before the ERA was increased, pre-retirement agreements were frequently used to downsize the workforce. Often, contracts with employees were cancelled by mutual agreements and employees received a compensation. On this pathway individuals entered unemployment using the compensation to maintain their standard of living until they reached the ERA. Due to the increase in the ERA this procedure has lost some of its attractiveness, *ceteris paribus*. Employees would now be unemployed for a longer period while waiting for an old age pension to be available. From the employers' perspective the costs of such agreements increase as the compensation has to be higher in order to enable employees to maintain their standard of living. If employers do not increase the compensation, the employees' willingness to enter pre-retirement on this pathway may decrease. Therefore, the number of individuals entering unemployment due to some mutual pre-retirement agreement is lower after the reform.

This change in the composition of the sample potentially has an impact on the results. Before the reform took place, a certain share of the sample entered unemployment through a pre-retirement agreement. This group had a reemployment probability of zero by definition, resulting in a downward bias of the average reemployment probability in the sample. After the reform, the share of individuals who enter unemployment through pre-retirement agreements is lower, which leads to an increase of the average reemployment probability in the sample.²⁶ As a result, the increase in the reemployment probability after the reform could either be driven by a change in incentives but could also be due to selection, i.e. the

²⁶The average reemployment probability in the sample was 0.25 before the reform and 0.29 after the reform.

changed composition of the sample.

In order to clarify whether the observed increase in reemployment probabilities is due to a change in the take-up rate of pre-retirement agreements or due to changed incentives, all regressions conducted in this paper control for the participation in pre-retirement agreements (see section 3). A dummy variable indicating participation in a pre-retirement agreement (equal to one if participation and zero otherwise) is included as a control variable in the estimations shown above. If the *ceteris paribus* assumption of the applied methods holds, the impact of the increased ERA is independent from the change in the sample composition. If pre-retirement agreements are not controlled for, the coefficient of the reform variable increases.²⁷ This is expected as the increase of the average reemployment probability due to the decrease in pre-retirement agreements induces an upward bias of the corresponding coefficient of the reform. Thus, we are confident to identify a response in labour supply due to a change in incentives and that selection is sufficiently controlled for.

5.2 Other Influential Reforms

Another important issue is with respect to changes in the unemployment insurance if they influence the decision to return to the labour market. If the relative attractiveness of unemployment benefits is changed through any corresponding rule, this may induce variation in the data, which is not attributable to an increased ERA. In recent years, a series of labour market reforms have been enacted.²⁸ Specifically, what matters for this study is the length of payment of regular unemployment insurance benefits before declining to social welfare benefits for older workers. The duration of unemployment benefit receipt has been subject to changes during the observation period between 1991 and 2010.²⁹ As such benefits are in interference with both the reforms of the public pension system and the relevant time frame, they may indeed play a role in the decision problem of an older unemployed worker. Effectively, it is difficult to take these reforms into consideration in

²⁷The results of this exercise are available from the authors upon request.

²⁸Recent labour market reform acts are commonly known as the so called “*Hartz reforms*” in Germany, worked out by a commission in the early 2000’s.

²⁹The relevant clause in the German social security legislation (*Sozialgesetzbuch*) is § 127 *Grundsatz SGB III*.

an empirical sense. We have examined this problem in a simple model, where individuals are discriminated against each other in whether they are affected by the reform of the unemployment insurance or not. We do not find any effect of the reform of the length of unemployment benefit receipt.³⁰

5.3 Political Relevance

The results indicate a positive impact on the individual reemployment probability. In terms of policy relevance the question is to what extent the social security system is relieved. To obtain some rough estimates we calculate ballpark figures to get an idea of the value of the reform in monetary terms.

Two distinct effects have to be examined. First, the unemployment insurance is monetarily relieved as individuals are more likely to become reemployed. From the duration framework we can thus infer that individuals are reemployed sooner on average. Second, reemployed individuals pay taxes to the government. Thus, additional benefits resolve from the increased reemployment probability.

To quantify the difference in the duration of unemployment, we compare predicted median survival times for reemployed individuals who are affected by the reform and those who are not.³¹ Predictions are drawn from the estimation results and for this exercise, we restrict the sample to reemployed individuals only. This yields differences in predicted survival times for the group of unemployed individuals that are relevant to the spending of the Federal Employment Agency. The predicted median survival time of individuals who are subject to the reform is about 3.8 months smaller than the one of those who are not affected by an increase in the ERA. This implies that the median individual who is affected by the reform leaves the state of unemployment 3.8 months earlier compared to the median individual who is not affected. Recently, monthly unemployment insurance benefit averaged to roughly 900 Euro per month.³² Thus the Federal Employment Agency saves about 3,420 Euro per person (3.8 months x 900 Euro). Recently, roughly 195,000 male

³⁰The results of this test are available from the authors upon request.

³¹We predict median survival times, as the mean survival time is subject to some outliers that have large predicted unemployment spells due to a combination of very specific socio-demographic characteristics.

³²Note that this includes all unemployed individuals, irrespective of the length of their unemployment spell (Statistics of the German Federal Employment Agency, 2011).

individuals of age 55 and older have entered unemployment during one year (see Statistics of the German Federal Employment Agency (2011) for a summary of monthly reports concerning unemployment entries on the German labour market among older workers). Within our sample about one third (202 out of 633) of the individuals are reemployed, which amounts to total savings of the Federal Employment Agency of about 212 million Euro per year (62,000 individuals³³ x 3,420 Euro). Taking into account the annual budget of the Federal Employment Agency of about 4 billion, savings are about 5.3% in relative terms.

In 3.8 months of earlier reemployment, individuals pay contributions to social security and taxes. The sample average of those monthly payments is about 600 Euro.³⁴ For each individual, the payments are thus in an order of magnitude of about 2280 Euro (3.8 months x 600 Euro). As this refers to about 62,000 individuals per year recently, additional payments are about 141 million Euro.

As we do not find evidence for changes with respect to early retirement, we cannot state whether or not the public pension system is financially relieved.

6 Conclusion

This paper analyses the effect of a reform in the German public pension system on the reemployment probability and early retirement behaviour for older unemployed male individuals. In the course of this reform, the ERA for an old age pension due to unemployment is increased by a maximum of three years from age 60 to 63 in monthly steps. The sample is restricted to a pool of male individuals who enter unemployment between 1991 and 2010. Using data from the German Socio-Economic Panel allows to control for a rich set of socio-demographic factors, which are part of a complex relationship between unemployment, reemployment and early retirement.

From the perspective of an older unemployed individual, an increase in the ERA may

³³We extrapolate from the relative share of reemployments in our sample (roughly one third). Evaluated at the average real unemployment entries of about 195,000 in the relevant age group per year, this amounts to roughly 62,000 reemployments.

³⁴We calculate this as the difference between gross labour earnings and net labour earnings.

change the expected lifetime utility of each alternative as the time horizon until an old age pension is available increases. In this context, two main questions are examined. First, we investigate whether prolonged unemployment becomes less attractive, incentivising elderly unemployed to return to work instead of using unemployment as a bridge until an old age pension is available. Second, we examine whether early retirement due to exceptional rules becomes more favourable, as potentially high entry costs are now spread over a longer period and are therefore relatively lower.

We find evidence that increasing the ERA for an old age pension due to unemployment raises the reemployment probability by roughly 1.3 per cent for each month by which the ERA is raised. An increased reemployment probability after increasing the ERA may be caused by the incentives of the unemployed to return to work due to an increase in the opportunity costs of unemployment. Returning to work seems relatively more favourable in the reform scenario. In addition, the probability of choosing early retirement as an exit option is not affected by an increased ERA. This may stem from two reverse mechanisms. First, entry costs are spread over a prolonged period leading to an increased attractiveness of early retirement. Second, changes in the German legislation increased the difficulty to make use of exceptional clauses and thus less individuals are able to take such a pathway into early retirement. In our empirical analysis, we do not find that any of these two mechanisms dominates the other.

From a policy perspective this result implies that the social security system is at least partially relieved. The burden of payments from the unemployment insurance is reduced as individuals become reemployed. Roughly calculated, this implies savings of 5.3% of the annual budget of the Federal Employment Agency. To conclude, our finding suggests that increasing the ERA positively stimulates reemployment of older unemployed individuals, which is beneficial for social security. However, the magnitude of this impact largely depends on the persistence and quality of employment contracts. These aspects have recently been subject to extensive transformations due to demographic change and are important issues for future research.

References

- Bellmann, L., F.-G. and C. Hohendanner (2009). Betriebliche dynamik und flexibilität auf dem deutschen arbeitsmarkt. *Handbuch Arbeitsmarkt*, 359–401.
- Borsch-Supan, A. (2000). A model under siege: A case study of the german retirement insurance system. *Economic Journal* 110(461), 24–45.
- Borsch-Supan, A. and R. Schnabel (1998). Social security and declining labor-force participation in germany. *American Economic Review, Papers and Proceedings* 88(2), 173–78.
- Borsch-Supan, A., R. Schnabel, S. Kohnz, and G. Mastrobuoni (2004). Micro-modeling of retirement decisions in germany. In *Social Security Programs and Retirement around the World: Micro-Estimation*, NBER Chapters, pp. 285–344. National Bureau of Economic Research, Inc.
- Chan, S. and A. H. Stevens (1999). Employment and retirement following a late-career job loss. *The American Economic Review, Papers and Proceedings* 89(2), 211–216.
- Chan, S. and A. H. Stevens (2001). Job loss and employment patterns of older workers. *Journal of Labor Economics* 19(2), 484–521.
- Cox, D. and D. Oakes (1984). Analysis of survival data. *London: Chapman & Hall*.
- Federal Employment Agency (2012). Arbeitsmarkt 2011. *Amtliche Nachrichten der Bundesagentur für Arbeit (ANBA), Jahrgang 59, Sondernummer 2*.
- Federal Statistical Office (2012). Bevölkerung und Erwerbstätigkeit. *Mikrozensus, Fachserie 1 Reihe 4.1.1*.
- Fine, J. P. and R. J. Gray (1999). A proportional hazards model for the subdistribution of a competing risk. *Journal of the American Statistical Association* 94(446), 496–509.
- German Federal Pension Insurance (2011). Rentenversicherung in zeitreihen. *DRV-Schriften, Band 22*.
- Gutierrez, R. G. (2002). Parametric frailty and shared frailty survival models. *Stata Journal* 2(1), 22–44.

- Hairault, J.-O., F. Langot, and T. Sopraseuth (2010). Distance to retirement and older workers' employment: The case for delaying the retirement age. *Journal of the European Economic Association* 8(5), 1034–1076.
- Haisken-DeNew, J. P. and J. Frick (2005). Desktop companion to the german socio-economic panel (soep). *Berlin: German Institute for Economic Research*.
- Haisken-DeNew, J. P. and M. H. Hahn (2010). Panelwhiz: Efficient data extraction of complex panel data sets - an example using the german soep. *Schmollers Jahrbuch : Journal of Applied Social Science Studies / Zeitschrift für Wirtschafts- und Sozialwissenschaften* 130(4), 643–654.
- Jacobson, L. S., R. J. LaLonde, and D. G. Sullivan (1993). The costs of worker dislocation. *Kalamazoo, MI: W.E. Upjohn Institute for Employment Research*.
- Kiefer, N. M. (1988). Economic duration data and hazard functions. *Journal of Economic Literature* 26(2), 646–679.
- Lancaster, T. (1979). Econometric methods for the duration of unemployment. *Econometrica* 47(4), 939–56.
- Nickell, S. J. (1979). Estimating the probability of leaving unemployment. *Econometrica* 47(5), 1249–66.
- Statistics of the German Federal Employment Agency (2011). *Arbeitsmarkt in Zahlen, Statistik über Leistungen nach dem SGB III*.
- Staubli, S. and J. Zweimüller (2011). Does raising the retirement age increase employment of older workers? *ECON - Working Papers econwp020*, Department of Economics - University of Zurich.
- Steiner, V. (2001). Unemployment persistence in the west german labour market: Negative duration dependence or sorting? *Oxford Bulletin of Economics and Statistics* 63(1), 91–113.
- Stock, J. H. and D. A. Wise (1990). Pensions, the option value of work, and retirement. *Econometrica* 58(5), 1151–80.

Tatsiramos, K. (2010). Job displacement and the transitions to re-employment and early retirement for non-employed older workers. *European Economic Review* 54(4), 517–535.

A Appendix

Table 5: Supplement 19, Social Security Code (*Anlage 19, SGB VI*): Part I.

| Increase of Retirement Age for Old Age Pension due to Unemployment | | | | | |
|--|-----------|----------------|-----------------|--------------|-------|
| Year of Birth | Increase | | | Early Claims | |
| | in Months | to Age (Years) | to Age (Months) | Year | Month |
| 1937 | | | | | |
| January | 1 | 60 | 1 | 60 | 0 |
| February | 2 | 60 | 2 | 60 | 0 |
| March | 3 | 60 | 3 | 60 | 0 |
| April | 4 | 60 | 4 | 60 | 0 |
| May | 5 | 60 | 5 | 60 | 0 |
| June | 6 | 60 | 6 | 60 | 0 |
| July | 7 | 60 | 7 | 60 | 0 |
| August | 8 | 60 | 8 | 60 | 0 |
| September | 9 | 60 | 9 | 60 | 0 |
| October | 10 | 60 | 10 | 60 | 0 |
| November | 11 | 60 | 11 | 60 | 0 |
| December | 12 | 61 | 0 | 60 | 0 |
| 1938 | | | | | |
| January | 13 | 61 | 1 | 60 | 0 |
| February | 14 | 61 | 2 | 60 | 0 |
| ⋮ | ⋮ | ⋮ | ⋮ | ⋮ | ⋮ |
| November | 23 | 61 | 11 | 60 | 0 |
| December | 24 | 62 | 0 | 60 | 0 |
| 1939 | | | | | |
| January | 25 | 62 | 1 | 60 | 0 |
| February | 26 | 62 | 2 | 60 | 0 |
| ⋮ | ⋮ | ⋮ | ⋮ | ⋮ | ⋮ |
| November | 35 | 62 | 11 | 60 | 0 |
| December | 36 | 63 | 0 | 60 | 0 |
| 1940 | | | | | |
| January | 37 | 63 | 1 | 60 | 0 |
| February | 38 | 63 | 2 | 60 | 0 |
| ⋮ | ⋮ | ⋮ | ⋮ | ⋮ | ⋮ |
| November | 47 | 63 | 11 | 60 | 0 |
| December | 48 | 64 | 0 | 60 | 0 |
| 1941 | | | | | |
| January | 49 | 64 | 1 | 60 | 0 |
| February | 50 | 64 | 2 | 60 | 0 |
| ⋮ | ⋮ | ⋮ | ⋮ | ⋮ | ⋮ |
| November | 59 | 64 | 11 | 60 | 0 |
| December | 60 | 65 | 0 | 60 | 0 |
| 1942 - 1945 | 60 | 65 | 0 | 60 | 0 |

Source: *Anlage 19, SGB VI*.

Note: The numbers displayed here reflect the reform steps for an increase in the regular age for eligibility of old age pension due to unemployment.

Table 6: Supplement 19, Social Security Code (*Anlage 19, SGB VI*): Part II.

| Increase of Retirement Age for Old Age Pension due to Unemployment | | | | | |
|--|-----------|----------------|-----------------|--------------|-------|
| Year of Birth | Increase | | | Early Claims | |
| | in Months | to Age (Years) | to Age (Months) | Year | Month |
| 1946 | | | | | |
| January | 0 | 65 | 0 | 60 | 1 |
| February | 0 | 65 | 0 | 60 | 2 |
| March | 0 | 65 | 0 | 60 | 3 |
| April | 0 | 65 | 0 | 60 | 4 |
| May | 0 | 65 | 0 | 60 | 5 |
| June | 0 | 65 | 0 | 60 | 6 |
| July | 0 | 65 | 0 | 60 | 7 |
| August | 0 | 65 | 0 | 60 | 8 |
| September | 0 | 65 | 0 | 60 | 9 |
| October | 0 | 65 | 0 | 60 | 10 |
| November | 0 | 65 | 0 | 60 | 11 |
| December | 0 | 65 | 0 | 61 | 0 |
| 1947 | | | | | |
| January | 0 | 65 | 0 | 61 | 1 |
| February | 0 | 65 | 0 | 61 | 2 |
| March | 0 | 65 | 0 | 61 | 3 |
| April | 0 | 65 | 0 | 61 | 4 |
| May | 0 | 65 | 0 | 61 | 5 |
| June | 0 | 65 | 0 | 61 | 6 |
| July | 0 | 65 | 0 | 61 | 7 |
| August | 0 | 65 | 0 | 61 | 8 |
| September | 0 | 65 | 0 | 61 | 9 |
| October | 0 | 65 | 0 | 61 | 10 |
| November | 0 | 65 | 0 | 61 | 11 |
| December | 0 | 65 | 0 | 62 | 0 |
| 1948 | | | | | |
| January | 0 | 65 | 0 | 62 | 1 |
| February | 0 | 65 | 0 | 62 | 2 |
| March | 0 | 65 | 0 | 62 | 3 |
| April | 0 | 65 | 0 | 62 | 4 |
| May | 0 | 65 | 0 | 62 | 5 |
| June | 0 | 65 | 0 | 62 | 6 |
| July | 0 | 65 | 0 | 62 | 7 |
| August | 0 | 65 | 0 | 62 | 8 |
| September | 0 | 65 | 0 | 62 | 9 |
| October | 0 | 65 | 0 | 62 | 10 |
| November | 0 | 65 | 0 | 62 | 11 |
| December | 0 | 65 | 0 | 63 | 0 |
| 1949 - 1951 | 0 | 65 | 0 | 63 | 0 |

Source: *Anlage 19, SGB VI*.

Note: The numbers displayed here reflect the reform steps for an increase in the regular age for eligibility of old age pension due to unemployment.

Table 7: Results on Differences-in-Differences Duration Analysis (Failure: Reemployment).

| | Cox | Cox | Weibull | Weibull | Frailty | Frailty |
|---------------------------------|---------------------|---------------------|---------------------|---------------------|-----------------------|----------------------|
| Additional Month (Reform) | 0.998 (0.007) | 1.007 (0.008) | 0.997 (0.008) | 1.004 (0.009) | 0.986 (0.011) | 1.002 (0.012) |
| Male | 1.703*** (0.281) | 1.680*** (0.316) | 1.813*** (0.323) | 1.753*** (0.352) | 2.287*** (0.664) | 2.481*** (0.749) |
| Male X Additional Month | 1.013* (0.008) | 1.010 (0.009) | 1.013 (0.009) | 1.012 (0.010) | 1.029** (0.014) | 1.024* (0.014) |
| Age(55) | 0.745*** (0.033) | 0.727*** (0.036) | 0.793*** (0.037) | 0.773*** (0.041) | 0.641*** (0.048) | 0.655*** (0.052) |
| West Germany | 0.474*** (0.111) | 0.531** (0.134) | 0.384*** (0.099) | 0.457*** (0.127) | 0.086*** (0.028) | 0.264*** (0.107) |
| Migrant | 0.740 (0.172) | 0.747 (0.189) | 0.730 (0.178) | 0.758 (0.200) | 0.598 (0.238) | 0.658 (0.267) |
| Subjective Health | 2.034*** (0.329) | 2.064*** (0.362) | 1.972*** (0.333) | 1.989*** (0.364) | 2.718*** (0.710) | 3.036*** (0.807) |
| Married | 1.044 (0.157) | 0.976 (0.161) | 1.061 (0.176) | 0.957 (0.171) | 0.895 (0.241) | 0.825 (0.223) |
| Home Owner | 1.134 (0.138) | 1.128 (0.152) | 1.174 (0.155) | 1.213 (0.178) | 1.210 (0.267) | 1.256 (0.286) |
| Dep. Child in Household | 0.758 (0.171) | 0.619 (0.191) | 0.751 (0.186) | 0.605 (0.198) | 0.534 (0.220) | 0.417* (0.204) |
| Years of Education | 1.022 (0.028) | 1.006 (0.032) | 1.020 (0.030) | 1.004 (0.034) | 0.961 (0.041) | 1.000 (0.052) |
| Regional UE Rate | 0.968 (0.024) | 0.994 (0.028) | 0.947** (0.026) | 0.977 (0.030) | 0.831*** (0.027) | 0.937 (0.039) |
| Pre-Retirement | 0.324*** (0.138) | 0.290*** (0.138) | 0.314*** (0.136) | 0.284*** (0.136) | 0.154*** (0.101) | 0.177*** (0.115) |
| Unemployed Partner | 0.995 (0.172) | 1.017 (0.195) | 0.992 (0.190) | 1.019 (0.220) | 0.962 (0.305) | 1.065 (0.333) |
| Retired Partner | 0.829 (0.145) | 0.699* (0.138) | 0.891 (0.164) | 0.758 (0.157) | 0.746 (0.231) | 0.542** (0.168) |
| Past UE Experience | 0.984 (0.024) | 1.015 (0.034) | 0.989 (0.026) | 1.025 (0.037) | 0.961 (0.042) | 0.989 (0.053) |
| Log. Gross Income (t-1) | | 0.967 (0.098) | | 0.944 (0.103) | | 0.664*** (0.084) |
| Weibull Parameter ρ | | | 0.768*** (0.028) | 0.769*** (0.032) | 1.280*** (0.097) | 1.191*** (0.067) |
| Variance Inv. Gaussian θ | | | | | 21.497*** (13.306) | 10.249*** (3.502) |
| N | 1147 | 949 | 1147 | 949 | 1147 | 949 |

Note: Own calculations based on the GSOEP (1991-2011). *** p<0.01; ** p<0.5; * p<0.1. Robust standard errors in parentheses. Hazard ratios are reported (HR > 1 positive effect; HR < 1 negative effect). ρ is the additional parameter of the Weibull distribution that allows for duration dependence, where $\rho = 1$ implies the exponential distribution. θ is the heterogeneity parameter of the inverse Gaussian distribution, where $\theta = 0$ implies that no unobserved heterogeneity is present. Each model is estimated once without income information (left column) and once including income information (right column). Age(55) is age centered at 55. Unemployment is abbreviated by *UE* and (*t-1*) refers to the period before an individual enters unemployment.

Table 8: Results for Transitions into Early Retirement.

| | LPM | LPM | Probit | Probit | Cox | Weibull | Weibull | Frailty | Frailty | Comp. Risk | Comp. Risk |
|---------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|--------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| Additional Month (Reform) | 0.998 (0.001) | 0.997 (0.001) | 0.994 (0.005) | 0.992 (0.005) | 0.991 (0.005) | 0.994 (0.005) | 0.989 (0.005) | 0.992 (0.005) | 0.991 (0.005) | 0.987 (0.005) | 0.987 (0.005) |
| Age(55) | 0.009 (0.009) | 0.009 (0.009) | 0.037 (0.037) | 0.037 (0.037) | 0.037 (0.037) | 0.037 (0.037) | 0.037 (0.037) | 0.037 (0.037) | 0.037 (0.037) | 0.037 (0.037) | 0.037 (0.037) |
| West Germany | 1.172*** (0.065) | 1.138*** (0.076) | 1.850*** (0.431) | 1.634*** (0.408) | 1.309 (0.108) | 1.149 (0.106) | 1.362 (0.117) | 1.854 (0.281) | 2.309** (0.982) | 1.975* (0.709) | 2.935*** (0.891) |
| Migrant | 0.976 (0.049) | 0.981 (0.056) | 0.942 (0.176) | 0.963 (0.190) | 0.897 (0.253) | 0.863 (0.244) | 0.918 (0.266) | 0.746 (0.421) | 0.738 (0.251) | 0.950 (0.260) | 0.980 (0.282) |
| Subjective Health | 0.888*** (0.035) | 0.914** (0.040) | 0.657*** (0.088) | 0.733** (0.103) | 0.563*** (0.111) | 0.641** (0.110) | 0.555*** (0.133) | 0.308*** (0.123) | 0.619** (0.146) | 0.480*** (0.091) | 0.554** (0.111) |
| Married | 0.966 (0.069) | 0.938 (0.076) | 0.850 (0.166) | 0.766 (0.187) | 0.747 (0.222) | 0.778 (0.246) | 0.619 (0.166) | 0.545 (0.187) | 0.588 (0.166) | 0.736 (0.166) | 0.639 (0.166) |
| Home Owner | 1.057* (0.068) | 1.066* (0.076) | 1.253* (0.187) | 1.281* (0.206) | 1.497* (0.344) | 1.545* (0.365) | 1.496* (0.344) | 2.236* (0.891) | 1.544 (0.344) | 1.387 (0.344) | 1.387 (0.344) |
| Dep. Child in Household | 0.034 (0.034) | 0.038 (0.038) | 0.164 (0.176) | 0.176 (0.187) | 0.317 (0.344) | 0.321 (0.344) | 0.359 (0.344) | 0.961 (0.961) | 0.342 (0.342) | 0.275 (0.275) | 0.297 (0.297) |
| Years of Education | 0.991 (0.052) | 1.039 (0.069) | 0.995 (0.226) | 1.176 (0.286) | 1.061 (0.349) | 1.120 (0.374) | 1.234 (0.420) | 1.255 (0.838) | 1.022 (0.377) | 1.022 (0.339) | 1.286 (0.435) |
| Regional UE Rate | 1.000 (0.006) | 0.999 (0.008) | 0.997 (0.027) | 0.989 (0.030) | 0.984 (0.045) | 0.982 (0.048) | 0.981 (0.048) | 0.963 (0.089) | 0.949 (0.060) | 0.995 (0.044) | 0.996 (0.044) |
| Pre-Retirement | 1.002 (0.006) | 1.001 (0.007) | 1.012 (0.024) | 1.007 (0.027) | 0.985 (0.038) | 0.985 (0.042) | 0.984 (0.039) | 0.975 (0.076) | 0.895** (0.047) | 1.009 (0.037) | 1.004 (0.039) |
| Unemployed Partner | 1.087 (0.087) | 1.095 (0.095) | 1.337 (0.365) | 1.371 (0.384) | 1.430 (0.402) | 1.430 (0.418) | 1.517 (0.440) | 2.306 (0.929) | 1.597* (0.459) | 1.602* (0.475) | 1.602* (0.475) |
| Retired Partner | 1.063 (0.049) | 1.069 (0.054) | 1.259 (0.227) | 1.271 (0.242) | 1.330 (0.377) | 1.330 (0.429) | 1.467 (0.459) | 1.660 (2.006) | 1.597* (1.200) | 1.602* (0.524) | 1.602* (0.419) |
| Past UE/Experience | 1.098* (0.061) | 1.110* (0.069) | 1.452* (0.305) | 1.457* (0.305) | 1.664* (0.456) | 1.622* (0.468) | 1.606* (0.468) | 2.758* (1.554) | 1.453 (0.460) | 1.777** (0.500) | 1.745** (0.494) |
| Log. Gross Income (t-1) | 0.978*** (0.005) | 0.981** (0.008) | 0.860*** (0.033) | 0.908** (0.043) | 0.824*** (0.053) | 0.871* (0.072) | 0.820*** (0.054) | 0.672*** (0.089) | 0.794*** (0.071) | 0.802*** (0.055) | 0.831** (0.071) |
| Constant | 1.019 (0.149) | 1.019 (0.149) | 0.431 (0.276) | 0.431 (0.276) | 1.113 (0.255) | 1.113 (0.255) | 1.113 (0.255) | 0.567** (0.206) | 1.104 (0.085) | 1.104 (0.085) | 1.104 (0.085) |
| Weibull Parameter ρ | 1.243 (0.170) | 1.243 (0.285) | 0.431 (0.255) | 0.431 (0.255) | 1.113 (0.255) | 1.113 (0.255) | 1.113 (0.255) | 0.567** (0.206) | 1.104 (0.085) | 1.104 (0.085) | 1.104 (0.085) |
| Variance Inv. Gaussian θ | 633 | 539 | 633 | 539 | 633 | 633 | 539 | 633 | 633 | 633 | 539 |
| N | 633 | 539 | 633 | 539 | 633 | 633 | 539 | 633 | 633 | 633 | 539 |

Note: Own calculations based on the GSOEP (1991-2011). *** p<0.01; ** p<0.05; * p<0.1. Robust standard errors in parentheses. Hazard ratios are reported (HR > 1 positive effect, HR < 1 negative effect). ρ is the additional parameter of the Weibull distribution that allows for duration dependence, where $\rho = 1$ implies the exponential distribution. θ is the heterogeneity parameter of the inverse Gaussian distribution, where $\theta = 0$ implies that no unobserved heterogeneity is present. Each model is estimated once without income information (left column) and once including income information (right column). Age(55) is age centered at 55. Unemployment is abbreviated by UE and (t-1) refers to the period before an individual enters unemployment.