Unemployment Durations in West-Germany Before and After the Reform of the Unemployment Compensation System during the 1980s

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Abstract

This paper analyzes empirically the distribution of unemployment durations in West-Germany before and after the changes during the mid 1980s in the maximum entitlement periods for unemployment benefits for elderly unemployed. The analysis is based on the comprehensive IAB employment subsample containing register panel data for about 500.000 individuals in West Germany. We analyze two proxies for unemployment since the data do not precisely measure unemployment in an economic sense. We provide a theoretical analysis of the link between the durations of nonemployment and of unemployment between jobs. Our empirical analysis finds significant changes in the distributions of nonemployment durations for older unemployed individuals. At the same time, the distribution of unemployment durations between jobs did not change in response to the reforms. Our findings are consistent with an interpretation that many firms and workers used the more beneficial laws as a part of early retirement packages but those workers who were still looking for a job did not reduce their search effort in response to the extension of the maximum entitlement periods. This interpretation is consistent with our theoretical model under plausible assumptions.

Keywords: definition of unemployment, duration analysis, unemployment insurance
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1 Introduction

Standard job search theory implies that longer entitlement periods for unemployment benefits increase the expected duration of unemployment spells until individuals accept a new job (see Katz and Meyer, 1990, for a survey). A number of institutional changes in the West German unemployment compensation system were enacted between 1985 and 1987.[1] The probably most important change was the extension of the maximum entitlement period for unemployment benefits in the case of elderly unemployed (table 1). The transition was stepwise over the years 1985-1987 for the different age groups. Since the maximum entitlement periods for unemployment spells starting in 1984 or later was also ex-post extended, it is expected to find smoother transitions in the data and not a single jump. The unemployment durations started in 1983 were the last to which only the old law applied. The analysis here is about the effects on unemployment durations due to these reforms. The paper is highly policy relevant since a reduction in benefit entitlement periods is currently implemented by policy makers in Germany to effectively undo most of the institutional changes in the 1980s in an effort to reduce the level of unemployment in Germany.

Starting with the seminal paper by Hunt (1995), a number of studies have already analyzed empirically unemployment durations in West Germany before and after the reform under consideration (see Hujer and Schneider, 1995, Steiner, 1997, Weber, 1999, and Plaßmann, 2002). Most of these studies are based on the German Socio–Economic Panel (GSOEP).[2] The authors typically apply parametric (mixed-)proportional hazard models for a single spell of unemployment, in some cases using a competing risks model allowing for exits to employment and to out–of–labor force. In his influential recent survey, van den Berg (2001) stresses that single spell (mixed–) proportional hazard models often yield unstable estimates and the results obtained should be interpreted with extreme caution. In the literature, the reported estimates for the effects of the reform differ substantially. Weber (1999) does not observe an "unemployment generating" effect of the unemployment compensation system. Contrary, other studies suggest that longer entitlement periods for unemployment benefits result in lower re-employment rates and therefore in longer unemployment duration. Hunt (1995) finds that for workers aged 44-48 unemployment duration increased strongly in comparison to younger workers. She also finds that the effect for the 49-57 year-old workers was smaller. Hujer and Schneider (1996) find that the age group 44-48 exhibits significantly smaller re-employment hazards compared to younger workers. Steiner (2001) and Plaßmann (2002) have similar findings for elderly unemployed. Steiner (2001) concludes that the

[1] For a detailed description of the German unemployment compensation system and of the conducted reforms, see Hunt (1995) and Plaßmann (2002).

[2] Only Weber (1999) and Plaßmann (2002) use antecedent issues of the IAB employment subsample.

results are in accordance with one of the main implications of job-search theory, i.e. unemployment durations increase when entitlement periods are extended. There are also several contributions with related topics using survey data from other countries. Empirical studies for the United States suggest a positive effect of the potential duration and the benefits level on the expected duration of unemployment (Katz and Meyer, 1990, and Solon, 1985). Narendranathan, Nickell and Stern (1995) find for Britain a positive elasticity of expected unemployment duration for men with respect to the level of unemployment benefits. The effect depends on the age and is smaller for the > 45 years old. They do not find an impact for the long term unemployed. Van den Berg (1990) obtains positive elasticities using data from the Netherlands in a non-stationary job search model. The elasticities are greater after two years of duration time.

This paper involves a descriptive empirical analysis based on comprehensive German register data, the IAB employment subsample, which contains panel data for about 500.000 individuals for West-Germany during the period 1975-1997. We make use of the richness of the data and, in contrast to the literature so far, we focus on descriptive, non–parametric estimates of the duration of unemployment thus reducing the risk of misspecifying the empirical model. Due to the lack of precise information on the length of unemployment in an economic sense, our analysis distinguishes between the duration of nonemployment versus the duration of unemployment between jobs as two benchmarks. Our findings suggest that the strong increases in maximum benefit entitlement periods for older workers in West-Germany during the 1980s did not extend the duration until unemployed workers found a new job among those who were still looking for a new job. The effect was rather to extend the duration of nonemployment effectively leading the way to early retirement and withdrawal from the labor market. Furthermore, we develop a stylized theoretical model to rationalize the differences between the two benchmarks for unemployment in the data and to support our interpretation of the descriptive evidence. Finally, while our analysis focusses on the duration of unemployment, we add some complementary evidence on employment before and after unemployment. These extensions allow us to investigate whether our results on the duration of unemployment are likely to be affected by selection or composition effects. Also, we address some implications from search theory on the relationship between the duration of unemployment and the quality of the job after unemployment.

Concretely, our findings are as follows: The median nonemployment duration for elderly unemployed ($>$53 years) almost doubled between 1981 and 1995, whereby the median nonemployment duration of younger unemployed ($<$42 years) remained constant. At the same time, the median duration of unemployment between jobs remained almost constant over the period for all age groups. In particular for exits from the manufacturing sector, the probability for staying in nonemployment has increased for the elderly to the striking level of about 90%. This is probably

due to a sharp increase in the use of early retirement packages. The extension of the maximum entitlement of unemployment insurance has only a limited influence on the distribution of the length of temporary unemployment durations, i.e. we do not observe that elderly individuals spend more time in unemployment before they accept a new job. Moreover, if elderly unemployed accept a new job, they do this more quickly than the younger unemployed. We also observe that the length of employment spells after a period of unemployment between jobs did not increase for the age groups with longer entitlements in comparison. Moreover, the post-unemployment earnings for the aged $42-65$ unemployed did not increase after the reform relative to the earnings of the aged <42. This indicates that the matching quality between employee and job has not improved after the reforms. We conclude that the additional expenses by the German federal labor office yield an advantage for two groups: companies, who disband their elderly unemployed using subsidized early retirement packages and the elderly employees who lost the incentive to look for a new job using the extensive early retirement packages.

The remainder of this paper is structured as follows: Section 2 describes the data and the institutions. Nonemployment and unemployment–between–jobs are defined in section 3 as two proxies for unemployment available in the data. Section 4 presents our main descriptive findings on the durations for the two proxies and the changes induced by the reforms. A theoretical model to analyze differences between the two proxies is developped in section 5. Section 6 provides complementary evidence on employment before and after unemployment. Section 7 concludes and the appendix contains further institutional information and the detailed empirical findings.

2 Data and Institutions

The empirical analysis uses the IAB Employment Subsample (IAB-Beschäftigtenstichprobe 1975-1997 [Regionalfile], IABS). A basic description of this data set can be found in Bender et al. (2000).[3] The data contain daily register data of about 500.000 individuals in West-Germany on their employment spells and the spells during which they receive transfer payments from the labor offices. It is a representative sample of employment subject to social security taxation and, therefore, it is not representative with respect to periods of nonemployment. Employment periods are based on the register records of the public pension funds which obtain from the companies the relevant information about employment spells subject to social security taxation. Periods of self employment and employment as life-time civil servants (Beamte) are not included in the data.

[3]These data are also used by Plaßmann (2002) to analyze unemployment duration. To sharpen our understanding of the data generating process, one of the authors (R. Wilke) visited some unemployment offices in different parts of West Germany.

Periods of registered unemployment – or economically more meaningful concepts of unemployment (e.g. according to the ILO standard) – can not be identified from the data. The German federal labor office has added instead the periods in which the individuals obtain some kind of income transfer payment. The data records spells involving the following three types of transfer payments:

1. Unemployment benefits UB ("Arbeitslosengeld"),
2. Unemployment assistance UA ("Arbeitslosenhilfe"), and
3. Income Maintenance during training IMT ("Unterhaltsgeld"). This is paid during participation in public sponsored training as a part of active labor market policy.

Our discussion of institutions refers to the setup between 1981 and 1997 which differs from the situation today.[4] The analysis in this paper is restricted to the years 1981 to 1997 because the information about spells with transfer payments is likely to be incomplete before that time, see Bender et al. (2000) and the references given there.

The three types of transfer payments differ with respect to the income replacement ratio and as to whether they are means tested. UB as well as IMT are paid as certain percentage (between 60 and 67%) of past earnings and they are generally not means tested. UA involves a somewhat lower replacement ratio (between 53 and 58% in the period of consideration) and it is means tested. Provided that individuals had sufficiently long employment spells before they become unemployed they are eligible for UB for the maximum entitlement periods depicted in table 1. After the end of the maximum entitlement periods, they would become eligible for the lower UA only if their family had no other source of income and no wealth (means tested). Until 1997 also participation in training did not only provide a source of income through receipt of IMT but it itself did also renew the entitlement for UB – just as if the unemployed individual had been working.

Unfortunately, the data only involve spell information on the fact whether transfer payments were received but do not provide the information on the level of these payments. Evidence reported in Franz (2003, table 7.9) suggests that the actual replacement ratios are typically lower than the nominal ratios mentioned above. This is mostly due to temporary (6–12 weeks) or permanent sanctions ("Sperrzeiten") which are mainly applied for two reasons. First, when an

[4]Also during the time period under consideration a number of changes were enacted in addition to the extension of the benefit entitlement periods. For instance, the income replacement ratios for UB and UA were reduced in the case of unemployed individuals without children and increased in the case of unemployed individuals with children, see Hunt (1995). The income replacement ratio for IMT was above the ratio for UB at the beginning. It was reduced a number of times so that for most of the time period under consideration it was equal to the ratio for UB.

unemployed worker quits voluntarily, he becomes eligible for UB only after a while. Second, when an unemployed worker rejects an acceptable job offer, he is punished by losing UB for a while. The IABS reports these periods of no UB receipt as a late start or as interruption in the spells of transfer payments. Wilke (2004a) provides a descriptive analysis of sanctions in the IAB-Employment subsample.

In order to reduce the labor supply and "free jobs for young workers", government policy allowed receipt of UB as an intermediate step between employment and early retirement. While being on UB, social security taxes were still paid for unemployed individuals and they were still accumulating claims on social security payments after retirement. In addition, the discount on social security payments after early retirement, i.e. before the official retirement age at 65 years, was actuarially biased in favor of early retirement (see table 1 in Berkel and Börsch–Supan, 2003). Thus, during the mid 1980s receipt of UB was becoming the stepping stone towards early retirement for workers at an age above 55 years (see Koller et al., 2003, for a recent account of this). Hunt (1995) finds some evidence for this using survey data (GSOEP) but she does not analyze this issue in detail.

The data provide no information on spells when an individual is registered as unemployed and is not entitled to transfer payments from the labor offices as well as whether she receives welfare payments ("Sozialhilfe"). This is particularly relevant for an analysis of long–term unemployment which in cases without transfer payments in the data can not be reasonably distinguished from having left the labor force.

3 Proxies for Unemployment

Since the data does not allow for an economically meaningful, exact assessment as to whether an individual is unemployed or out of labor force, we use the two extreme benchmarks nonemployment and unemployment–between–jobs to analyze the changes in the duration of unemployment. The common definition "registered unemployment" cannot be used because there is not sufficient information in the data. The two benchmarks are operationalized as follows:

1. **Nonemployment** (NE): all periods of nonemployment after an employment period which contain at least one period with income transfers by the German federal labor office. The nonemployment period is considered as censored if the last record involves a UB, UA, or IMT payment that is not followed by an employment spell.[5] In this case we do not know whether the individual is still unemployed, out of labor force or maybe self-employed. With

[5] A nonemployment spell is treated as right censored if it is not fully observed.

this definition of unemployment we include the periods of nonemployment (out of the labor force, social benefits) which are not explicitly recorded in the data. From 1980 to 1997, a total number of 371.317 nonemployment periods are observed in the IABS.

2. **Unemployment between jobs** (UBJ): all episodes between two employment spells during which an individual continuously receives UB, UA, or IMT payments. Interruptions of these payments can be up to four weeks – in the case of cut–off times: six weeks. With this definition it is ensured that the individuals are continuously registered as unemployed. Note that this sample does not include many registered unemployed, in particular long term unemployed. From 1980 to 1997, a total number of 204.954 UBJ spells are observed in the IABS.

These two definitions provide benchmarks on the length of unemployment taking account of the fact that not all unemployed are successful in finding a new job during the period of observation (therefore the UBJ definition can not be used alone) and of the fact that unemployed individuals may leave the labor force. In order to proxy for the unemployment period when people eventually leave the labor force, the NE definition assumes that unemployment ends after the exhaustion of transfer payment and the only usable information is then that unemployment is right censored at this point. However, this definition also entails the possibility that individuals might have left the labor force earlier, i.e. they are not interested in a new job any more, and they just keep receiving the transfer payments because the labor offices can not sanction this behavior.[6] In contrast, the UBJ definition excludes cases where a job is found some time after the end of the entitlement to transfer payments. This allows us to focus on the link between benefit entitlement periods and finding a job. The definition also excludes cases where people leave the labor force after the end of the entitlement period and later find a job. Section 5 analyzes the link between the length of unemployment, NE, and UBJ based on a theoretical model.

4 Evidence on Unemployment Durations

This section presents the main descriptive empirical findings of the paper. We investigate the durations of nonemployment and unemployment between jobs for different age groups and different years. First, we present some raw evidence based on histograms and median lengths for the observed, possibly censored durations as well as trends over time in the number of started

[6]See Wilke (2004a) for an analysis of sanctions when unemployed individuals do not take an acceptable job offer. This study shows that sanctions to a large extent seem ineffective due to a high withdrawal rate.

unemployment spells. Then, we provide Kaplan–Meier estimates of the survival functions taking account of censoring in the observed durations.

4.1 Raw Evidence

For the unemployment spells starting in 1981 and 1994, the histograms in figure 1 present the empirical distributions over the first three years (≈ 1.095 calender days). The upper panel shows the nonemployment (NE) spells and the lower panel the unemployment between jobs (UBJ) spells. The censored observations are included in the distribution of NE durations. It is important to note that there are small mass points at 12 months (1981 and 1994) and 32 months (1994) in the distribution of NE spells. These mass points are directly related to the maximum UB entitlements periods: a considerable number of NE spells are censored at the end of the UB entitlement period. Interestingly, mass points at these durations are not observed for UBJ spells. This suggests that job searchers usually do not wait until the exhaustion of their UB entitlement period before they accept a new job. Figure 2 presents the median unemployment duration for the age groups of table 1 from 1981 to 1995. It is evident that median NE duration for > 53 years old unemployed almost doubled over this period whereas it remained constant for the < 42 years old. For the other age groups, the median NE duration remained constant during the 1980s and increased after the German reunification in the 1990s. This is most likely due to macroeconomic changes. Considering the median UBJ durations, one observes the same variation due to the business cycle but, at the same time, the older unemployed (> 53 years) leave unemployment faster than all other age groups. This property does not change over time and is therefore not affected by the reforms under consideration. Note that figures for the years after 1995 are not reported due to the censoring of the data at the end of 1997.

Table 2 reports the observed number of unemployment spells for the different age groups. Most noticeable is the sharp increase of the NE spells for the age group > 53 years, i.e. the inflows into NE spells but not into UBJ spells have increased strongly over time. This finding corresponds to our evidence on transitions from employment to unemployment in section 6.1.

4.2 Kaplan–Meier Estimates

This section presents estimates of survival functions, which report the probability of remaining in NE and in UBJ, respectively, after a given duration. The Kaplan-Meier-estimator takes account of the inherent censoring for NE durations. An upward movement (increase) of the survival functions

means that the probability of leaving unemployment has decreased.[7]

The following figures present selected representative survival function estimates for the 1980s and 1990s (until 1995) for the age groups considered.[8] Figure 3 (left, upper panel) shows that the NE survival function did not change much for the < 42 years old. The estimated survival curves are higher for bad years (1981,1995: bad in the sense of the labor market conditions) and lower for good (see above) years (1985, 1990). For the age groups 42-43 and 44-48 we observe similar changes apart from that survival functions increase in the labor market slowdown of the mid 1990s (figure 3, left, middle and bottom). For the age group 49-53 the increase in the mid 1990s is sharper (figure 4, left, up). Considering the age group > 53, it is apparent that the NE survival functions continuously increased over the 15 years under consideration and they did so even in the boom year after the reunification (figure 4, left, bottom). Interestingly, at the same time, the UBJ survival curves of the elderly (> 53 years) remained almost constant(!) (figure 4, right, bottom). We observe similar patterns for the other age groups and the survival curves in the mid 1990s increased a bit for all groups including even the younger unemployed. It is not evident from these results that the increase is due to the reform between 1985-1987. It seems to be caused by a structural change due to the unfavorable macroeconomic environment. Since the increase of the UBJ survival functions is a bit greater for those aged 42-53 than for the young unemployed it might be the case that the reform shows an effect in a weak macroeconomic situation only. Surprisingly, we do not observe this for the > 53 aged which is in line with the theoretical model to be discussed in section 5 under plausible assumptions. Our discussion of the differential shifts in the estimated survival function is confirmed by the difference–in–differences (DiD) estimates $\hat{\Delta}_{t,t_0} = \hat{S}_t - \hat{S}_{t_0} - (\hat{S}^0_t - \hat{S}^0_{t_0})$, where S^0 is the survival function of the control age group and $t > t_0$. DiD estimates for the UBJ survival functions are presented in figure 5. Controlling for common time effects, they contrast the before–after–reform changes in the estimated survival functions for the elderly with the corresponding changes for the control group of younger workers <42 not affected by the reforms. While the DiD estimates would show a strong upward movement of the NE survival functions for the elderly, we do not observe such evidence for UBJ for the elderly .

Figure 6 shows that the survival curves vary sharply over the sector of last employment before entering unemployment. For the manufacturing sectors[9], the survival curves for the age group > 53 increased up to more than 0.9 after three years (figure 6, up, left), while this probability is

[7] A detailed Kaplan-Meier unemployment survival analysis of the West-German 26-41 aged workforce can be found in Wilke (2004b).

[8] Due to the large sample sizes the corresponding confidence bands are narrow. We did not add them because this would affect the readability of the graphs while the gain of information would be rather limited for our following reasonings.

[9] Production of durables, consumption goods and base materials.

only about 0.6 for the other sectors [10] (figure 6, bottom, left). The sharp increase of the survival functions, in particular in the manufacturing sector, is probably directly related to the massive early retirement programs which were conducted at this time. Considering the survival functions of those in UBJ (figure 6, right), the survival curves remained almost constant over time with some increase in the manufacturing sector in the mid 1990s.

Considering the empirical survival functions for the age group > 53 years in figure 7, the effect of the reform on the observed length of NE becomes immediately apparent. The jumps at the maximum length of UB entitlements are shifted to the right after the reform. This shift is particularly obvious for the manufacturing sectors,[11] where the empirical survival function is shifted about 20 months to the right. The jumps for NE (being absent for UBJ) reflect that many observed spells end at the maximum entitlement periods and are thus due to the administrative rules. It follows that many elderly nonemployed then drop out of the labor force or they are not eligible for further unemployment benefits. From figure 4 (right, bottom) it was already apparent that most of them did not re-enter into regular employment.

5 Theoretical Considerations on the Length of Nonemployment and Unemployment between Jobs

Ideally, our empirical analysis should investigate the determinants of unemployment within a competing risk model. However, we cannot observe unemployment in the available data and, instead, we analyze both nonemployment (NE) and unemployment–between–jobs (UBJ) as benchmarks. This section treats both durations as the outcome of a competing–risks–model in order to discuss the link between the duration of unemployment and to rationalize our findings on the differences between NE and UBJ.

5.1 Basic model

The issue of linking the two proxies for unemployment is analyzed by means of the following competing–risks–model

$$t = min(t_E, t_O) \tag{1}$$

[10] Agriculture, energy, mining, nutrition, construction, traffic, communication, services, public sector, with trade excluded.

[11] During the period 1985 to 1987 the maximum length of entitlements was increased step by step from 12 to 32 months. This pattern is clearly visible in figure 7 (left).

where t is the possibly unobserved unemployment duration,
t_E is the time until a new job is taken, and
t_O is the time until individual leaves the labor force.

Both definitions NE and UBJ provide possibly censored observations on the duration of unemployment t. NE entails an information loss due to many individuals being right censored and due to the possibility that individuals who are receiving transfer payments might not be searching for a job any more. Otherwise NE involves no further restriction on the observability of t thus we treat in the following t as the length of NE. In contrast, UBJ involves no right censored durations but this definition conditions the observability of t on the outcome $t_E < t_O$.[12]

How is the economically meaningful concept of unemployment captured in this model and what are the effects we are looking for in our analysis of unemployment? Incentive effects of unemployment benefits derived from search theory operate mainly through the job finding duration t_E, which represents the economic concept of unemployment. However, it is conceivable that the exit rate out of labor force is indirectly affected by changes in unemployment benefits, e.g. when benefits are extended it is rational to postpone an exit out of labor force. The effects of stronger incentives for early retirement by elderly workers are just opposite. Such incentives reduce the duration until the exit out of labor force and, at the same time, they reduce the incentives to search for a new job, thus increasing t_E. What we are looking for in our empirical analysis is evidence for such differential effects on t_E and t_O. This evidence can only be indirect since t_E and t_O are not directly observed. Instead of estimating a structural competing risks model requiring a number of modeling assumptions, which are difficult to justify based on first principles, we investigate the implication of this model on the observable NE and UBJ durations.

For simplicity of the argument, let us assume that both t_E and t_O are exponentially distributed, independent random variables with hazard rates λ_E and λ_O, respectively. Then, it follows immediately that t is exponentially distributed with hazard rate $\lambda = \lambda_E + \lambda_O$.[13] This links the exit rates to employment λ_E and to out–of–labor–force λ_O with λ as the exit rate of the duration of the NE spells .

UBJ spells are observed conditional upon $t_E < t_O$, thus the following argument links λ_E and λ_O to the duration of the UBJ spells. The probability that an observed UBJ spell is longer than

[12]In our empirical analysis, UBJ excludes cases where individuals find a job some time after the end of their benefit entitlement. Therefore, it is to be expected that the distribution function of UBJ according to the definition in the empirical analysis lies strictly to the left of the one for the definition used in the theoretical model. The main insights gained from the theoretical model – as to be seen later – will therefore apply a forteriori to the relationship between the empirical NE and UBJ distributions.

[13]To see this, note $P(t > T) = P(t_E > T) \cdot P(t_O > T) = exp(-\lambda_E T) \cdot exp(-\lambda_O T) = exp[-(\lambda_E + \lambda_O)T]$.

T is given by[14]

$$P(t_E > T, t_E < t_O | t_E < t_O) = exp[-(\lambda_E + \lambda_O)T] \quad .$$

Therefore, we obtain the possibly surprising result that UBJ and NE spell durations exhibit, in fact, the same exponential distribution with exit rate $\lambda = \lambda_E + \lambda_O$. Both durations are therefore affected in the same way by changes in the determinants of the job finding rate λ_E and the exit rate from the labor force λ_O. Let $S_{NE}(T)$ and $S_{UBJ}(T)$ be the survival functions of the NE and the UBJ durations, respectively, and let z be a variable affecting λ_E and λ_O, then one obtains

$$\frac{\partial S_{NE}(T)}{\partial z} = \frac{\partial S_{UBJ}(T)}{\partial z} = -T \cdot exp[-(\lambda_E + \lambda_O)T] \left(\frac{\partial \lambda_E}{\partial z} + \frac{\partial \lambda_O}{\partial z} \right) \quad . \tag{2}$$

Based on this result, the effects of an increase in unemployment benefits or in incentives for early retirement is ambiguous both for NE and UBJ durations. It is highly plausible that with unemployment benefits the effect through t_E dominates, i.e. NE and UBJ durations increase in response to an extension of unemployment benefits, and vice versa with incentives for early retirement the effect through t_O dominates, thus, the introduction of early retirement benefits reduces both NE and UBJ durations.

The main result in this subsection, namely, that NE and UBJ durations exhibit the same distribution is neither helpful to assess differential effects on NE and UBJ duration nor to infer something about the effects on t_E and t_O durations. The equality of the NE and UBJ distribution hinges critically on the absence of unobserved heterogeneity, as we will show in the next subsection. Also a deviation from the assumption of a constant hazard rate for both risks results in differences between NE and UBJ. The direction of the difference is ambiguous and this is something we do not base our empirical analysis upon.[15] For the clarity of the theoretical argument and because of the economic plausibility of the importance of unobserved heterogeneity, we stick in the following to the case of constant hazard rates. Finally, it has to be noted as well that the definition of NE durations, when individuals do not find a job (see previous section), also entails the possibility that individuals might have left the labor force earlier than the end of transfer payments. This effect would result in an upward bias in the observed NE distribution.

[14] To see this, note $P(t_E < t_O) = \frac{\lambda_E}{\lambda_E + \lambda_O}$ and

$$P(t_E > T, t_E < t_O) = \int_T^\infty \int_{t_E}^\infty \lambda_E exp(-\lambda_E t_E) \lambda_O exp(-\lambda_O t_O)\, dt_O\, dt_E = \frac{\lambda_E}{\lambda_E + \lambda_O} \cdot exp[-(\lambda_E + \lambda_O)T] \,.$$

[15] Generally speaking, one obtains the intuitive result that the UBJ distribution lies strictly to the left (to the right) of the NE distribution, if the distribution of t_e durations lies to the left (to the right) of t_o durations and the variance of both distributions is small. The part about the variance is crucial because the result is just reversed when variances are large. Simulation results of both types for lognormal distributions are available upon request.

5.2 Unobserved heterogeneity

Our subsequent empirical results show that the survival function of NE durations is larger than that for UBJ durations for all subgroups considered. As indicated at the end of the last subsection, this could be the outcome of a particular deviation from the assumption of a constant hazard rate for both risks. Our focus lies, however, on the fact that unobserved heterogeneity, introduced in a particular way, is consistent with our empirical findings.

The introduction of unobserved heterogeneity changes the comparison between the NE and UBJ duration for the case of constant hazard rates, see Van den Berg (2001) for a recent survey on duration models illustrating the importance of unobserved heterogeneity. We allow here for the simplest distribution of unobserved heterogeneity just involving two types of workers, i.e. a mass point distribution with two types.[16] Assume for the hazard rates into employment and out of labor force

$$\lambda_E(\alpha) = \bar{\lambda}_E + \alpha \quad \text{and} \quad \lambda_O(\alpha) = \bar{\lambda}_O - l \cdot \alpha \quad ,$$

where α represents the unobserved heterogeneity part, $\bar{\lambda}_E$ and $\bar{\lambda}_O$ are the systematic parts of the hazard rates, and $0 < l < 1$. This specification involves a negative correlation between the two hazard rates. It is plausible that unobserved characteristics which positively affect the job finding rate are negatively correlated with the propensity to leave the labor force. Since $l < 1$, it is also assumed that the effect on the job finding rate is stronger than on the exit rate from the labor force. The setup here corresponds to the discussion of differential effects on t_E and t_O in the previous subsection. We assume a distribution with two mass points $P(\alpha = \alpha_j) = p_j$ with $j = 1, 2$, $p_1 + p_2 = 1$, and $\alpha_1 > \alpha_2$, i.e. the α_1–type individuals are more likely to find a job and less likely to leave the labor force compared to the α_2–types.

Based on the results above, the survival functions of the NE and the UBJ durations for the different α–types is given by

$$S_{NE}(T|\alpha) = S_{UBJ}(T|\alpha) = exp\{-[\bar{\lambda}_E + \bar{\lambda}_O + (1-l)\alpha]T\} \quad .$$

However, this does not imply that the distributions of the observed durations for which α is integrated out are also the same. In fact, it is now shown that the survival function of NE duration lies strictly to the right of the survival function of UBJ durations, i.e. $S_{NE}(T) > S_{UBJ}(T)$ for all T. Therefore, UBJ spells end more quickly than NE spells in the presence of unobserved heterogeneity.

[16] Differences in observed characteristics can be dealt with in standard ways by stratifying the data according to the observed characteristics (or using regression type methods). The equality of the two distributions then holds within each stratum.

To show this, note that for NE durations by the law of iterated expectations

$$S_{NE}(T) = \sum_{j=1}^{2} p_j exp\{-[\bar{\lambda}_E + \bar{\lambda}_O + (1-l)\alpha_j]T\} \quad .$$

To analyze the survival function for UBJ durations, note that

$$S_{UBJ}(T) = P(t_E > T | t_E < t_O) = \frac{P(t_E > T, t_E < t_O)}{P(t_E < t_O)} \quad .$$

For the two probabilities in the last expression, one obtains (see footnote 14)

$$P(t_E < t_O) = \sum_{j=1}^{2} p_j \frac{\bar{\lambda}_E + \alpha_j}{\bar{\lambda}_E + \bar{\lambda}_O + (1-l)\alpha_j}$$

and

$$P(t_E > T, t_E < t_O) = \sum_{j=1}^{2} p_j \frac{\bar{\lambda}_E + \alpha_j}{\bar{\lambda}_E + \bar{\lambda}_O + (1-l)\alpha_j} exp\{-[\bar{\lambda}_E + \bar{\lambda}_O + (1-l)\alpha_j]T\} \quad .$$

Hence,

$$S_{UBJ}(T) = \sum_{j=1}^{2} \tilde{p}_j exp\{-[\bar{\lambda}_E + \bar{\lambda}_O + (1-l)\alpha_j]T\} \quad ,$$

with "adjusted weights"

$$\tilde{p}_j = \frac{p_j \frac{\bar{\lambda}_E + \alpha_j}{\bar{\lambda}_E + \bar{\lambda}_O + (1-l)\alpha_j}}{\sum_{k=1}^{2} p_k \frac{\bar{\lambda}_E + \alpha_k}{\bar{\lambda}_E + \bar{\lambda}_O + (1-l)\alpha_k}} \quad \text{for} \quad j = 1, 2.$$

Since $\alpha_1 > \alpha_2$, it follows that $\tilde{p}_1 > p_1$ and $\tilde{p}_2 < p_2$ [17] and, therefore, $S_{UBJ}(T) < S_{NE}(T)$. From this result we can easily infer that an increase in the dispersion of α_1 and α_2 for given weights p_j with $j = 1, 2$ results in a larger difference between $S_{UBJ}(T)$ and $S_{NE}(T)$.

This result can be motivated as follows. Since we assume some form of unobserved heterogeneity which affects UBJ durations more strongly than NE duration, the quicker exits of the α_1–types to employment results in the UBJ population having a larger share of α_1–types than the population of all individuals corresponding to the NE population. Therefore, on average the individuals in the UBJ population exhibit shorter durations which is captured by the adjusted weights $\tilde{p}_j$.

[17] This result follows from the simple fact that

$$\frac{\frac{1-x}{a-x(1-l)}}{\frac{1+y}{a+y(1-l)}} < 1$$

for $a > 1$, $x, y > 0$, $l > 0$, provided that the expressions $1 - x$, $a - x(1-l)$, and $a + y(1-l)$ are strictly positive.

To finish this subsection, how does the introduction of unobserved heterogeneity change the comparative statics for the observed NE and UBJ survival functions? It is clear, that for NE durations $\frac{\partial S_{NE}(T)}{\partial z}$ is just a weighted average of expressions as in equation (2) where the weights are the probabilities p_j. For UBJ duration, $\frac{\partial S_{UBJ}(T)}{\partial z}$ also involves the effect of a change in z on the adjusted weights $\tilde{p}_j$. It is therefore not possible to sign unambiguously the difference between the changes in the two durations. For instance, a reduction in job finding rates $\bar{\lambda}_E$ can possibly result in a stronger increase of NE durations compared to UBJ durations.

5.3 Simulation results

Anticipating our major empirical finding, for older individuals NE durations but not UBJ durations have became relatively longer compared to younger individuals between the 1980s and 1990s. How can this finding be rationalized within our model setup in light of the policy changes discussed in the introduction? This subsection illustrates a plausible mechanism by means of a simulation of our model.

For the simulation, we assume that there exist two subgroups of workers, the treatment group (the older workers) and the control group (the younger workers).[18] These two groups can be identified in the data. We make the economically plausible assumption that for the treatment group, the job finding rates are lower and the exit rates out of the labor force are larger compared to the control group, i.e. the specific hazard rates used for the simulation are given by

$$\lambda_E = 0.3 + \alpha(TREAT) \quad \text{and} \quad \lambda_O = 0.2 - 0.4 \cdot \alpha(TREAT)$$

and $TREAT = 1$ for the treatment group and $TREAT = 0$ for the control group. Further, an individual belongs with probability 0.5 to either the treatment or the control group. Concretely, we assume

$$\alpha(TREAT) = \begin{cases} \alpha_1 = 0 & \text{with probability } p_1 = 0.5 \text{ irrespective of treatment status} \\ \alpha_2(TREAT) & \text{with probability } p_2 = 0.5 \end{cases}$$

where $\alpha_2(0) = -0.1$ and $\alpha_2(1) = -0.14$. For the α_2–types in the treatment group, the policy change increases the propensity to leave the labor force and it decreases the job finding rate. There is no change for the control group as well as for the α_1–types in the treatment group. Also, the share of α_2–types does not change in either group.

[18] These labels are motivated by the fact that older workers were affected by various policy changes. Both incentives for early retirement and unemployment benefit entitlement periods did increase strongly over time for this group.

This setup is motivated by the following interpretation of the actual policy changes in Germany. For older individuals, the combination of an extension of unemployment benefits and an increase of incentives for early retirement did strongly increase the propensity to leave the labor force and reduce the job finding rate for the subgroup of individuals characterized by low labor force attachment ("α_2–types"). In contrast, older individuals with a high labor force attachment ("α_1–types") were barely affected by these changes.

We simulate the above model for a random sample of 400,000 observations to obtain a good estimate of the survival functions implied by the model. The results are depicted in figure 8. The first two graphs provide the survival functions of NE and UBJ durations both for the treatment and the control group before and after the simulated policy change, respectively. Before the policy change, the NE survival curve is strictly to the right of the UBJ survival curve for both groups but for the control group this difference is not visible. After the change, the difference between NE and UBJ is larger for the treatment group. This is to be expected since the dispersion of the unobserved heterogeneity distribution increases. The third graph shows that the NE survival function for the treatment group moves strictly to the right. In contrast, and possibly surprising at first glance, the UBJ survival function moves strictly to the left for the most part of the distribution and the change is strongest in the upper part of the distribution. Thus, our modelling setup implies an increase in NE durations and no increase (in fact a decline) in UBJ durations even though the job finding rates decline for a subgroup of workers.

The substance of our result, namely that NE durations increase more strongly than UBJ durations, does not change when we allow the share of α_2–types to increase (this is likely to occur since older individuals might increasingly become unemployed due to stronger early retirement incentives) and when the job finding rate also declines for the α_1–types due to the longer benefit entitlement periods (the latter effect is likely to be small since the vast majority of UBJ durations are considerably shorter than the longer benefit entitlement periods). We investigated the sensitivity of the results by further simulations which are available upon request.

6 Evidence on Employment before and after Unemployment

Our descriptive findings in section 4 might be affected by selection or composition effects. For instance, the group of elderly unemployed who end up finding a job might have become more selective in response to the reforms. The latter should show up in a higher quality of employment before and after unemployment, i.e. in higher employment stability or in higher wages. Also

search theory would suggest that the quality of employment after unemployment increases when longer entitlement periods reduce search costs. To gauge the validity of our interpretation of the descriptive findings in section 4, this section provides complementary descriptive evidence on the changes in employment before and after unemployment. In light of this limited goal, this section does not attempt a comprehensive analysis of employment before and after unemployment.

6.1 Transitions from Employment to Unemployment

Elderly workers in West-Germany enjoy substantial employment protection in the period under investigation which is codified in the German law for dismissal protection. In practice, it is very difficult to lay off older employees with a certain tenure level. The risk of unemployment for this group of individuals should therefore be quite low. It is also important to mention that since 1986 there is a pool of elderly unemployed (currently aged 59 or above) who receive unemployment benefits – irrespective of their entitlement based on their employment history – if they commit not to search for a new job. Elderly unemployed therefore have the option to receive unemployment benefits until they are entitled for transfers from the pensions system and during this period they are not counted as unemployed in the official statistics.

Figure 9 presents the exit rates from employment to unemployment by age for 40 to 62 year old employees based on the two definitions of unemployment in selected years with rather different macroeconomic conditions.[19] It becomes apparent that the risk of UBJ is almost independent of the age of the unemployed and of the year, whereas the risk of NE varies sharply. First, the risk of NE shows a peak between age 55 and 59. In 1981, the peak is only evident for age 59. In 1985 and 1990 the size of the peak declines but the dispersion increases and it shifts to the left. The shift to the left and the increased dispersion are due to the extension of the unemployment insurance payment. This is because even workers who loose their job at age 55 after the reform are able to reach the critical age limit 59 without interruption of unemployment benefits transfers. In 1995, the size of the peak sharply increases. This is due to the recession in the mid 1990s. Moreover, the 55-60 aged employees exhibit uniformly higher risks of NE. The risk of NE is particularly high in the manufacturing sector and even in the public sector the risk of nonemployment increased in the 1990s (see figure 10). In table 3, we calculate the length of previous employment for employees who enter NE or UBJ. It is evident that, in particular, elderly employees with exits to NE exhibit very long previous employment spells. Over time, the length of previous employment increases and again the increase is strongest for the elderly. In manufacturing this occurs for all groups in

[19]See Wilke (2004) for a more detailed analysis of the impact of changing macro conditions on the risk of unemployment for the 26-41 aged workforce.

the age range 44 and above while in the public sector we see this only for the group >53. At the same time we do not observe this for employees entering UBJ.

The different results for the two definitions of unemployment suggest that in particular, in bad economic circumstances unemployment benefits are used as an integral part in early retirement packages. Due to the reform of the maximum entitlement period, the peak of the NE risk shifted to the left, i.e. the early retirement is offered to the employees several years earlier. Moreover, since the reform the ratio of the UBJ risk relative to the NE risk decreased in particular for the elderly (see figure 11). For the age group > 53, this ratio decreased by 50% from 1985 until 1995, whereas the decrease for the other age groups (apart from the group 49-53) is in the range of 15%. This shows that even in the years with quite favorable macroeconomic conditions (1985, 1990) the overall ratio of employees aged >53 entering UBJ given that they enter NE has decreased after the reform.

6.2 Employment Stability and Wages after Unemployment

Employment after unemployment could be affected by the policy change and by changes in the composition of UBJ transitions over time. This can be assessed by analyzing the length of the following employment spells (employment stability) and the changes in earnings after unemployment compared to before unemployment. Also, search theory would suggest that the match quality of employment after unemployment increases, resulting for instance in higher employment stability or in a higher wage, when longer entitlement periods for unemployment benefits reduce search costs. Figure 12 reports the median[20] of the length of employment spells after UBJ. The evidence does not show improvement for the elderly over time compared to the younger unemployed, see also the corresponding evidence in figure 13 for the estimated survival functions. It is also apparent that the median is highest for 1988 because employment stability was highest during the reunification boom with low unemployment rates during the time period 1990 to 1992.

Now, we turn to the wage as another indicator for the quality of the subsequent match. Denote w_p as the wage of the unemployed in the previous employment and denote w_f as the wage in the future employment. In the following, let us consider the transition from the position of w_p in the wage distribution (F) in the year when the unemployment spell begins (t_1) to the position of w_f in F in the year when the unemployment spell ends (t_2). Denote $\Delta F_{t_1} = F_{t_2}(w_f) - F_{t_1}(w_p)$ as the change in the position in the wage distribution. ΔF_t has an intuitive meaning: it is negative (positive) if the future wage is in a lower (higher) position in the population wage distribution

[20]The median is chosen because many long employment spells are censored at the data end of 1997. This affects in particular the average values in the 1990ties.

than the previous wage. An extension of the maximum entitlements period should allow the unemployed to spend more time in waiting for the same job offer compared to an individual without extended entitlements. This should increase the expected ΔF_t for the treated individuals and therefore result in a shift of the distribution of ΔF_t to the right.

Table 4 presents the summary statistics for ΔF_t for the full time employees in the different age groups. It is evident that the distributions for the age groups are almost time invariant.[21] The increase of the maximum entitlement period is not associated with a shift of the distributions for the treated individuals to the right. The changes in the distributions are mainly due to the business cycle. Surprisingly, between $50 - 60\%$ of the considered group of unemployed reach after the unemployment period a higher position in the wage distribution compared to before unemployment.

Another way to assess the impact of the reform on future earnings is to use a difference–in–differences method by including age dummies in a regression model. The following Tobit regression model is estimated:

$$log(w_f^*) = \alpha + \beta' x_1 + \gamma' \mathbb{1}_{\text{age group, year}} + \delta' x_2 + \epsilon,$$

where $w_f^* = \min\{w_f, c\}$, x_1 is a vector of exogenous observable variables, and x_2 is a vector of variables which control for the unobserved heterogeneity (such as the wage w_p in the previous job, the duration of unemployment, and unemployment experience). $\mathbb{1}_{\text{age group, year}}$ is a 14×1 dummy vector for the age groups, the calender years and the cross terms, i.e. the treatment effects (see table 4 for details). We choose the untreated individuals (aged <42) and the year before the reform (1981) as reference category. ϵ is the error term. The censoring of the wage distribution from above (c is the topcoding value) is due to the upper threshold for social security taxation above which wages are not reported. Two models are estimated: one basic model, where the error term is in fact the convolution of ϵ and the unobserved heterogeneity, and one model that controls for x_2 as proxying unobserved heterogeneity. From the results in table 5 it is not apparent that the reform of the maximum entitlements periods had an effect on the earnings of the elderly, since none of the estimated coefficients for the treatment effects are significantly positive and just one of the significant coefficients indicate a positive treatment effect (age 44-48 in 1985). These results are in contrast to Gangl (2002) who finds based on the GSOEP that more generous payments of unemployment benefits weakens the negative effect of unemployment on the quality of employment after unemployment.

Summarizing, at a descriptive level, there is no evidence, among the elderly, for a higher quality of the job after unemployment regarding employment stability or higher wages. Therefore, it is

[21] Nonparametric density estimates of the distributions are also time invariant over 1980, 1985, 1990, and 1994.

not likely that search has become more efficient in response to the extension of benefit entitlement periods and, at the same time, it is not likely that the group of elderly workers with UBJ transitions has become a more positive selection after the reform. We take this as complementary evidence supporting our interpretation of the descriptive findings in section 4.

7 Conclusions

This paper provides a descriptive analysis of the duration of nonemployment and unemployment between jobs in West Germany. We investigate the effects of the extensions in the maximum entitlement period for unemployment benefits for older workers during the mid 1980s. The analysis develops a theoretical framework in order to interpret differences between nonemployment and unemployment between jobs. Our analysis of the duration of unemployment is complemented by descriptive evidence on employment before and after unemployment.

Our main empirical result is that the duration of nonemployment for elderly unemployed increased sharply after the reform under consideration whereas the duration of unemployment between jobs does not seem to be affected. This is probably because unemployment benefits were used as an integral part of early retirement packages. With the reform, private firms - and even the public sector - obtained a convenient instrument in order to disband elderly employees with the help of social compensation plans. Since the elderly employees did approve of such generous retirement packages, they didn't insist on their dismissal protection. This is a typical win–win situation at the expense of the general public. An increase in the usage of early retirement is also strongly suggested both by the increase in the inflows of elderly workers into nonemployment, especially in the economic recession after the reform, compared to the fact that inflows of the elderly into unemployment between jobs did not rise after the reform. As already emphasized by the seminal study of Hunt (1995), our results imply that it is indispensable to distinguish between the flows out of labor force and the flows back into employment among the elderly (>53 years) unemployed.

One striking aspect of our descriptive results is that the duration of unemployment between jobs among the elderly did not increase for this group, which is in contrast to the findings of Hunt (1995) and others in the literature. In fact, the behavior of the unemployed who are willing to accept a new job before and after the reform does not seem to be affected by the reform considered here. Our results also suggest that the varying macroeconomic environment may affect the job search behavior for the considered age groups in a different manner. Because of the descriptive nature of our analysis, it is not possible to estimate how many unemployed were induced not to accept a new job at all due to the reform. Finally, our results suggest that extended benefit

entitlements for unemployed did not result in a better job match regarding higher employment stability or higher earnings. Put differently, this suggests that, among the elderly, the selection of those unemployed who found a new job did not change in response to the reform. Further research using more structural methods at the cost of strong identifying assumptions will be useful to assess whether our descriptive results are robust with respect to selection problems.

Appendix: Tables and Figures

Table 1: Maximum entitlements for unemployment benefits (UB) before and after the reform (in months).

Age group	until December 1984	January 1985 - December 1985	January 1986- December 1987	from July 1987
<42	12	12	12	12
42-43	12	12	12	18
44-48	12	12	16	22
49-53	12	18	20	26
>53	12	18	24	32

Source: Bundesgesetzblatt 1983–1988, Hunt (1995)

Table 2: Number of observed unemployment durations starting in the respective year

Age group	1981	1983	1985	1987	1989	1991	1993	1995
Nonemployment (NE)								
<42	16.281	16.401	16.262	15.738	13.115	12.848	16.144	14.810
42-43	839	792	640	503	500	547	776	746
44-48	1.551	1.915	1.875	1.623	1.235	1.141	1.578	1.613
49-53	1.112	1.256	1.382	1.526	1.292	1.400	1.755	1.332
>53	1.826	1.906	1.846	1.900	1.709	2.117	3.168	3.033
Unemployment between Jobs (UBJ)								
<42	9.493	9.677	10.544	9.989	8.134	7.185	9.241	8.093
42-43	538	498	435	333	330	326	420	392
44-48	993	1.195	1.299	1.098	780	640	867	875
49-53	619	723	938	934	841	785	822	595
>53	672	715	816	710	579	582	684	672

Table 3: Median of length of previous employment spell (in months)

	NE									UBJ		
	all sectors			manufacturing			public sector			all sectors		
	1985	1990	1994	1985	1990	1994	1985	1990	1994	1985	1990	1994
<42	20	18	24	24	22	39	12	16	19	12	11	13
42-43	16	13	26	26	26	58	12	12	12	10	10	14
44-48	12	12	30	19	42	105	10	12	24	10	10	12
49-53	11	12	48	37	37	164	9	9	14	9	9	12
>53	53	72	169*	64*	123*	172*	10	10	139	9	10	10

*: censoring limit

Table 4: Descriptive Statistics for the computed $\Delta F_t(w)$: average values, sample variances in brackets and the percentage of observations with positive value.

Age group		1981	1985	1990	1994
<42		0.0295 (0.0362)	0.0369 (0.0348)	0.0415 (0.0362)	0.0198 (0.0345)
	> 0	59%	61%	61%	57%
42-43		−0.0019 (0.0285)	−0.0137 (0.0344)	−0.0017 (0.0347)	−0.0153 (0.0393)
	> 0	54%	51%	54%	50%
44-48		−0.0083 (0.0293)	−0.0088 (0.0340)	−0.0006 (0.0350)	−0.0238 (0.0384)
	> 0	54%	53%	53%	47%
49-53		−0.0032 (0.0270)	−0.0244 (0.0301)	0.0080 (0.0275)	−0.0364 (0.0397)
	> 0	55%	50%	57%	48%
>53		−0.0025 (0.0286)	−0.0184 (0.0268)	0.0125 (0.0230)	−0.0067 (0.0347)
	> 0	57%	48%	59%	55%

Table 5: Results of Tobit regression of wage in new job after unemployment.

	basic model		unobserved heterogeneity	
variable		t-value		t-value
const	4.1650*	667.8544	2.7641*	123.5678
female	−0.2701*	-51.2730	−0.1507*	-29.3110
married	0.1477*	29.9222	0.0630*	14.0086
female * married	−0.1768*	-20.8681	−0.1493*	-19.5119
citizenship	−0.0342*	-5.0147	−0.0436*	-7.0584
skilled	0.1556*	37.5522	0.0400*	10.3488
university degree	0.4897*	36.0653	0.2518*	19.9314
$\log(w_p)$	-		0.3594*	69.1368
w_p left-censored	-		1.1017*	41.9865
w_p right-censored	-		1.9586*	64.7698
length of unemployment spell	-		−0.0000*	-4.3668
recently unemployed before	-		−0.0490*	-12.5614
previously recalled	-		0.0674*	13.9588
age group 42-43	0.0966*	5.4078	0.0316*	1.9601
age group 44-48	0.0566*	4.1460	0.0071	0.5746
age group 49-53	0.0374*	2.2172	−0.0076	-0.5048
age group >53	0.0614*	3.8126	0.0013	0.0904
age group 42-43 × 1985	-0.0215	-0.8038	−0.0281	-1.1647
age group 44-48 × 1985	0.0354*	1.9736	0.0115	0.7095
age group 49-53 × 1985	0.0357	1.6648	0.0036	0.1882
age group 42-43 × 1990-1994	−0.0810*	-3.2872	−0.0639*	-2.8703
age group 44-48 × 1990-1994	0.0156	0.8739	0.0061	0.3799
age group 49-53 × 1990-1994	0.0328	1.6122	0.0183	1.0050
age group >53 × 1985-1994	0.0035	0.1861	−0.0043	-0.2536
1985	0.1083*	18.5624	0.0791*	15.2591
1990	0.2880*	45.4523	0.1909*	33.7011
1994	0.4030*	65.4637	0.2517*	44.5560
σ^2	0.1302		0.1066	
Log-likelihood	−15218.172		−11582.154	
Nobs, Nvars	37438, 21		37438, 27	
# of censored	171		171	

*: significant at the 5% level

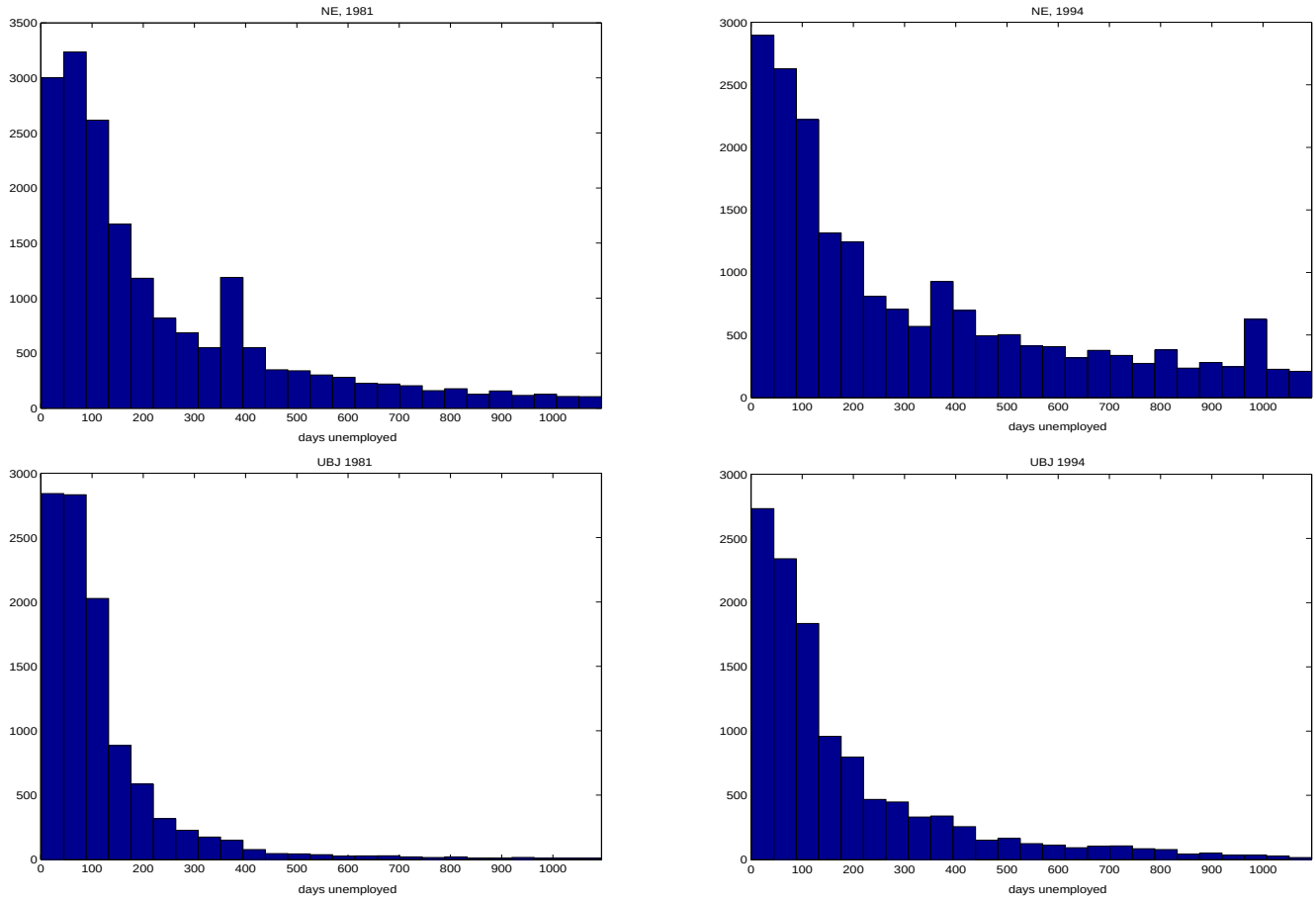


Figure 1: Histogramm of the length of observed unemployment durations in 1981 and 1994.

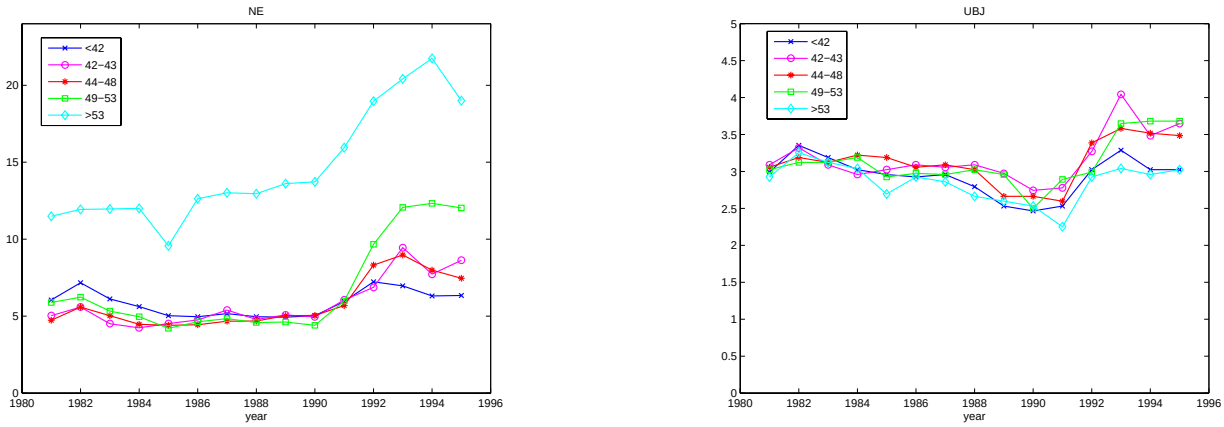


Figure 2: Evolution of median unemployment duration (in months)

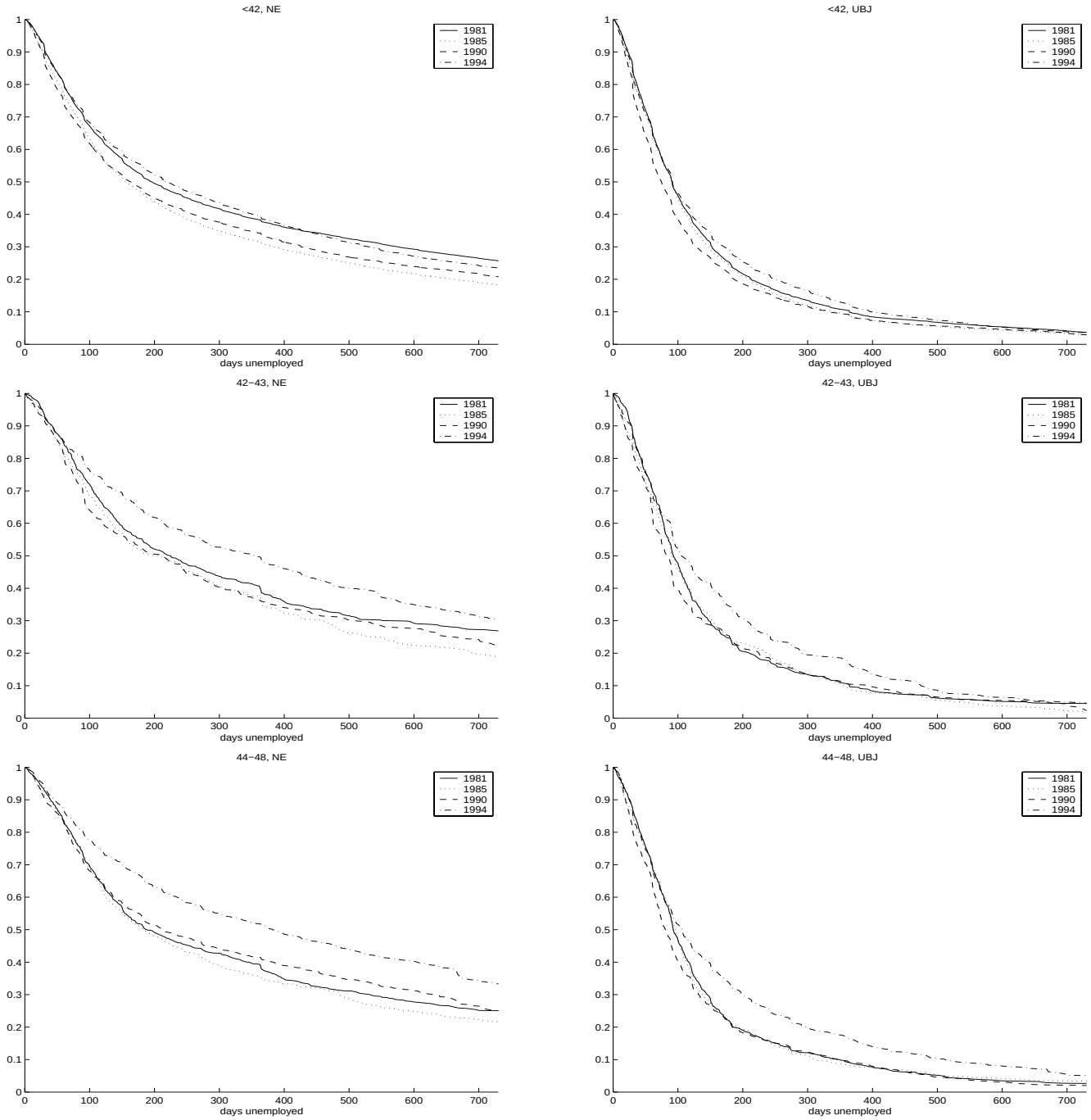


Figure 3: Kaplan-Meier-survival function estimates

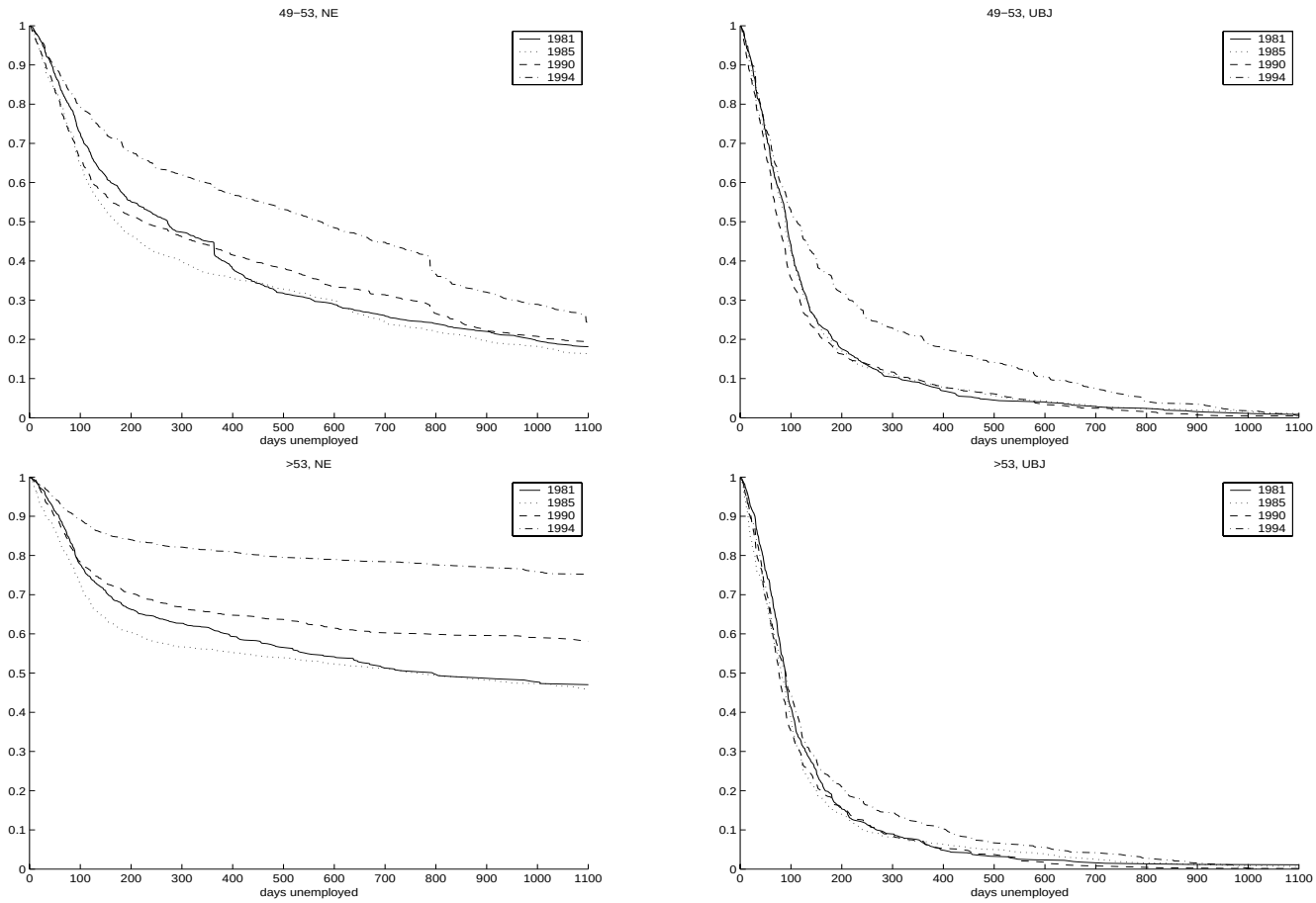


Figure 4: Kaplan-Meier-survival function estimates

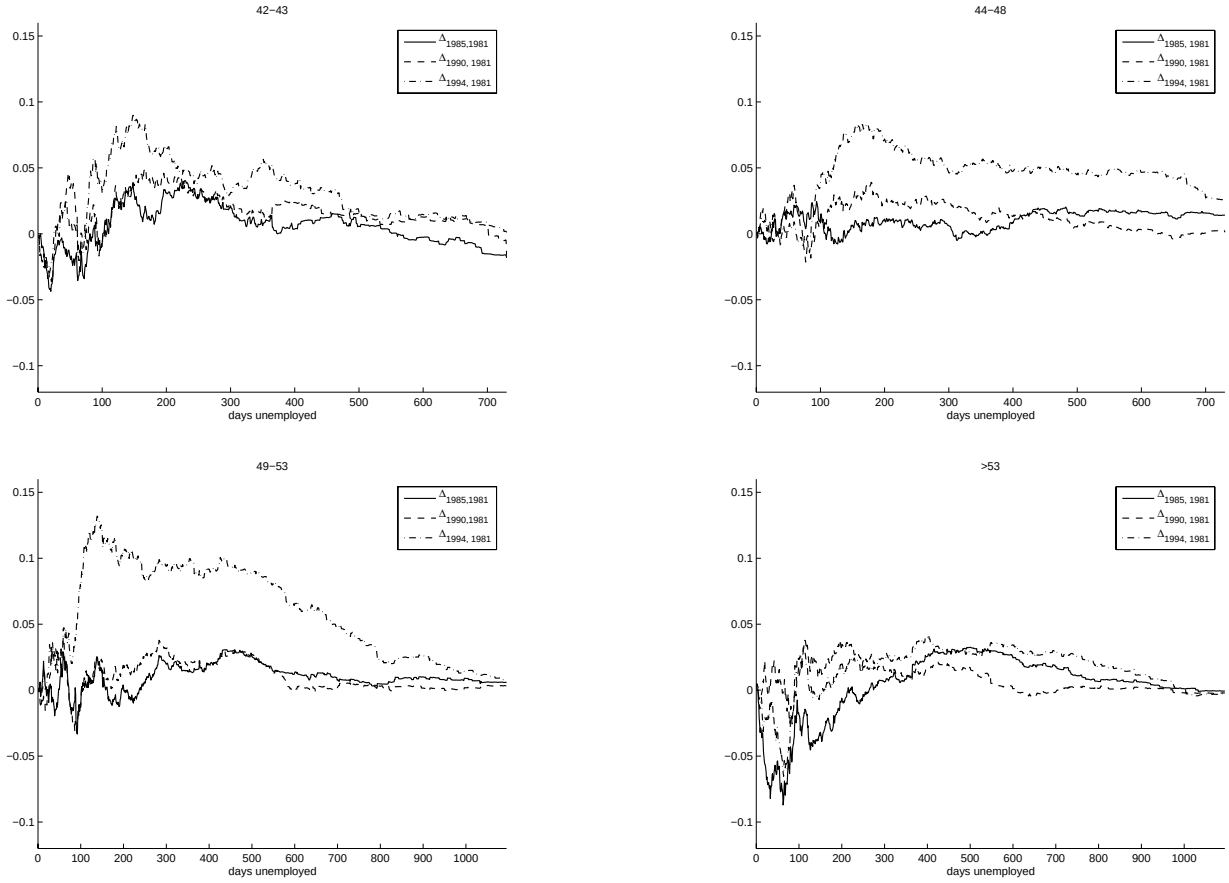


Figure 5: Difference-in-difference estimates for UBJ survival functions

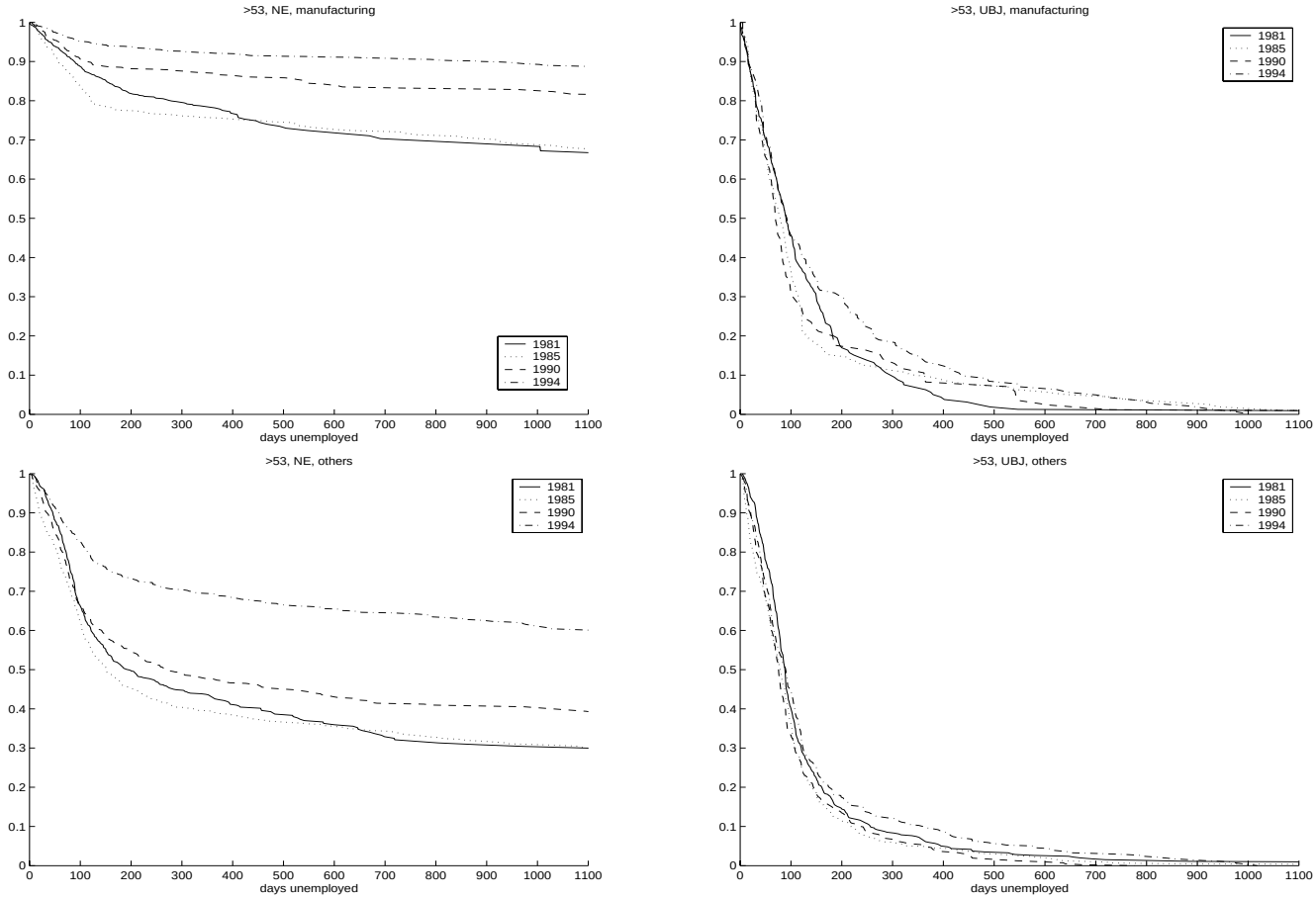


Figure 6: Kaplan-Meier-survival function estimates stratified by business sectors

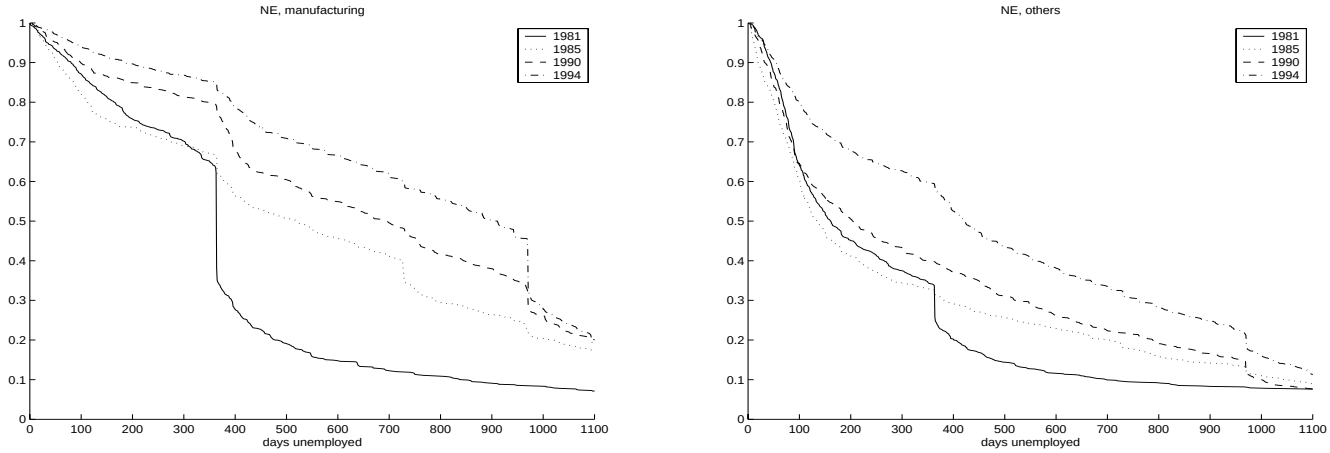
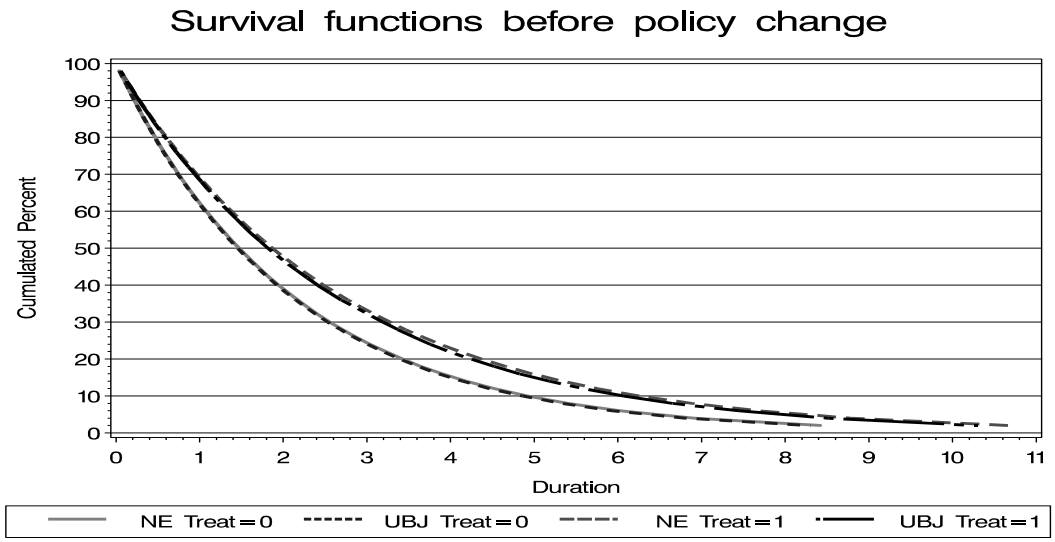
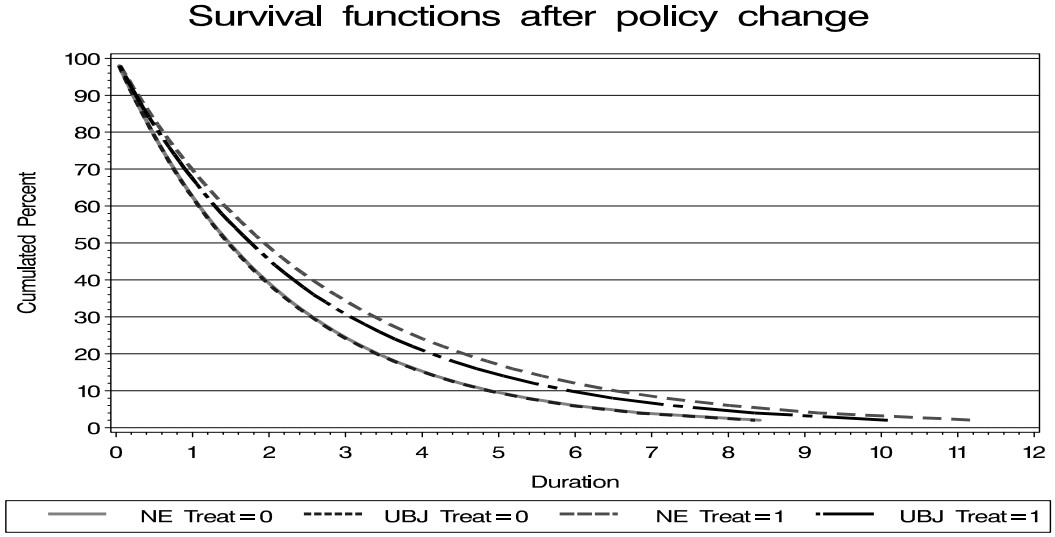


Figure 7: Empirical survival function estimates for age group > 53 years stratified by business sector





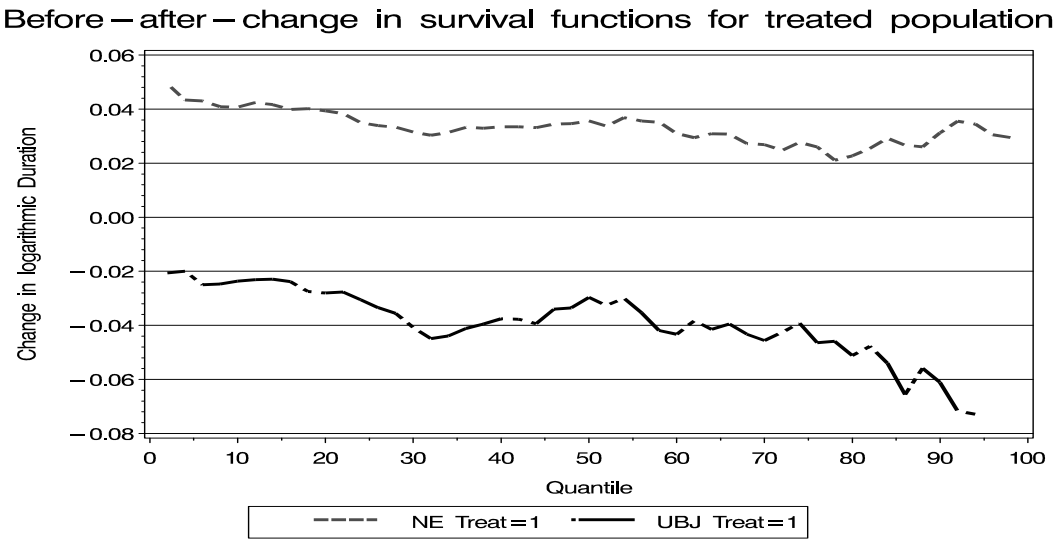


Figure 8: Simulation Results regarding survival functions of NE and UBJ durations

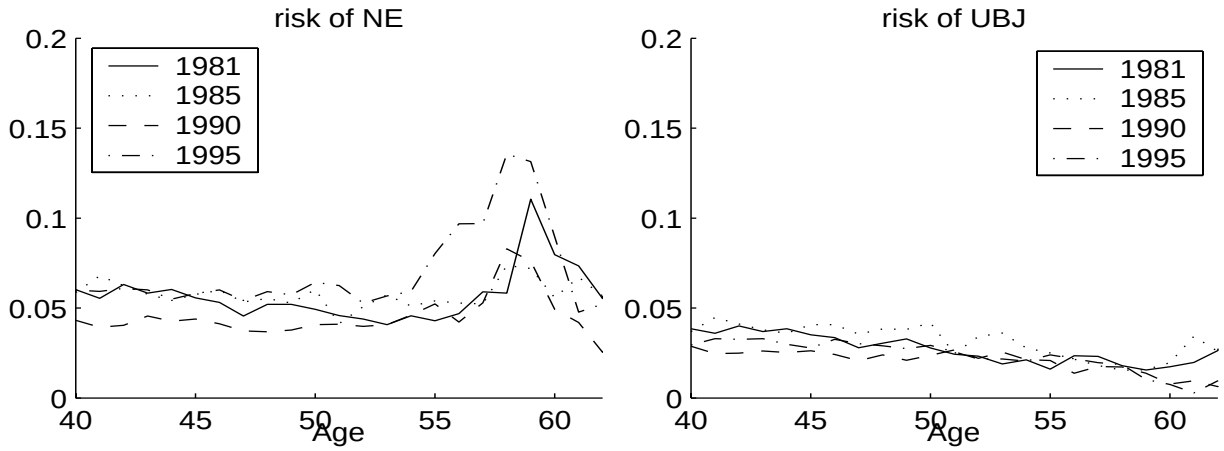


Figure 9: Average risk of unemployment as a function of the age

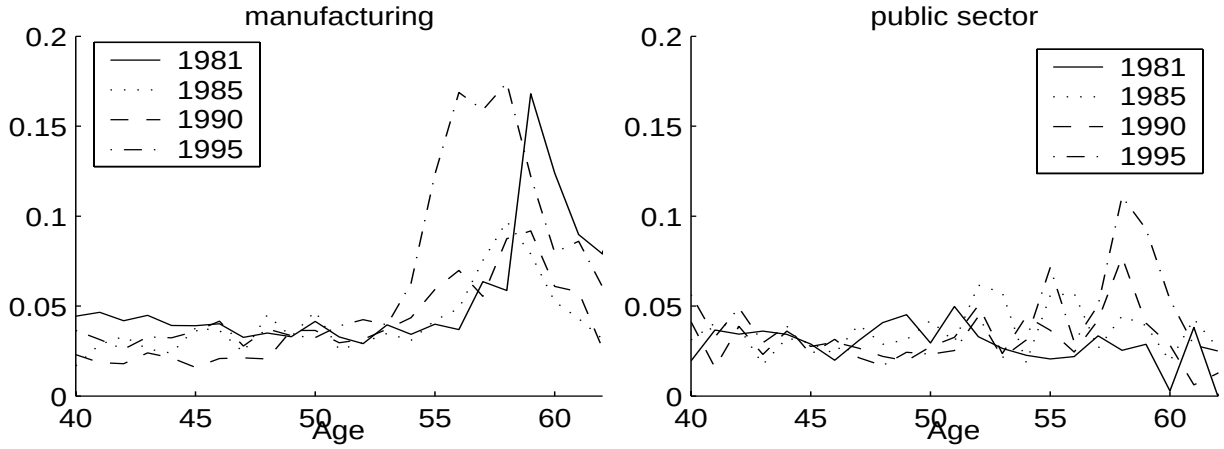


Figure 10: Average risk of nonemployment in selected business sectors

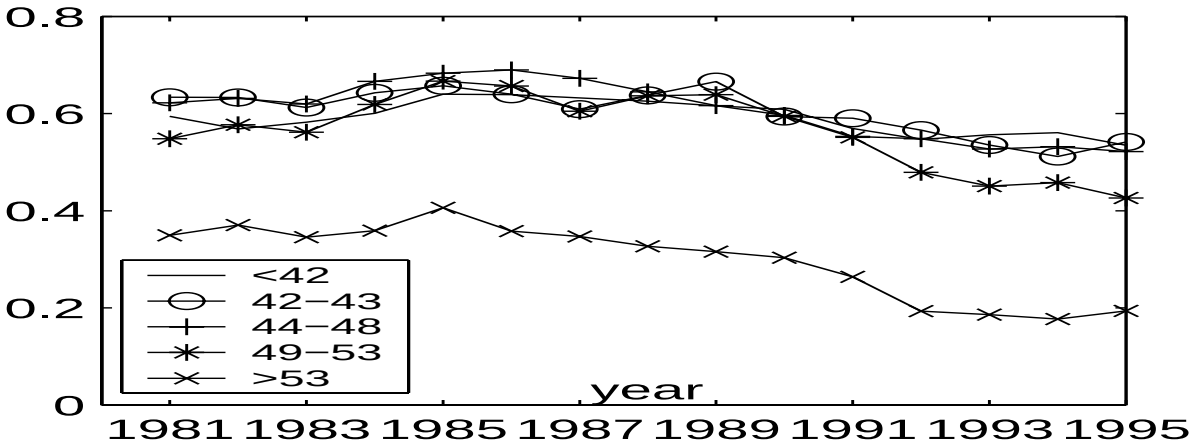


Figure 11: Average risk of unemployment between jobs given nonemployment

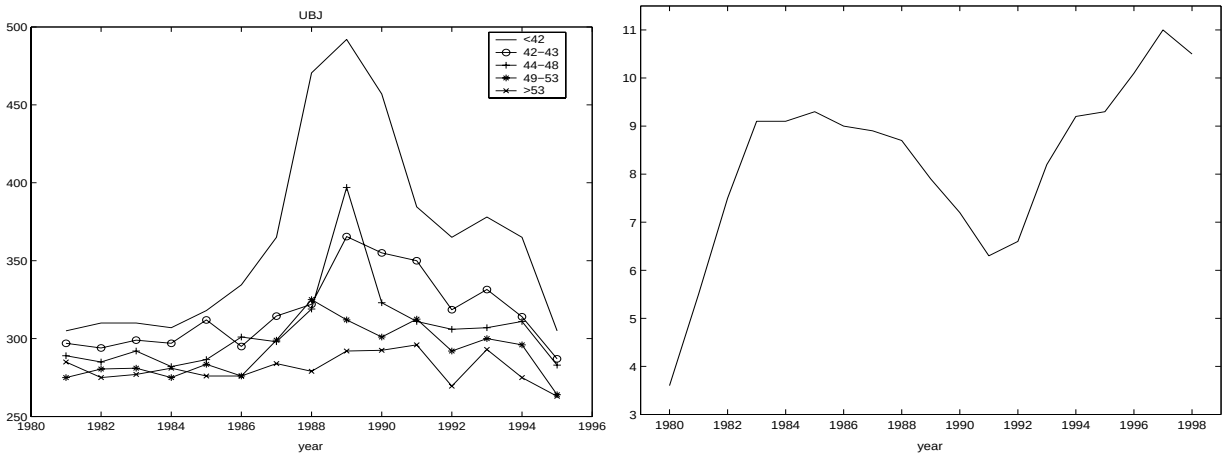


Figure 12: Median of employment spells after UBJ in days for respective years (left), unemployment rates for West-Germany (right)

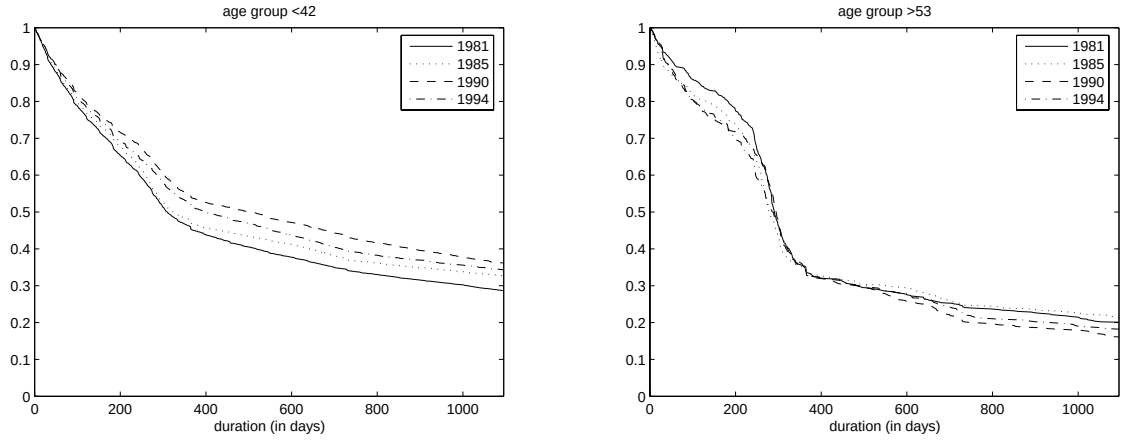


Figure 13: Kaplan-Meier survival function estimates for employment spells after UBJ in days for respective years

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