Discussion Paper

Discussion Paper No. 94–20

Labour Market Transitions and the Persistence of Unemployment – West Germany 1983 - 1992

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ZEW
Zentrum für Europäische Wirtschaftsforschung GmbH
Labour Economics, Human Resources and Social Policy Series

Labour Market Transitions and the Persistence of Unemployment – West Germany 1983 – 1992

by

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December 1994

Abstract: Although explanations of the persistence of high unemployment in Germany, in particular long-term unemployment, have increasingly focused on structural factors, there is only very limited evidence on their empirical importance so far. In this paper, these factors are analyzed based on a microeconometric model of individual transitions from unemployment into employment and non-participation for the West German labour market. The empirical analysis is based on waves 1 – 9 of the Socio-Economic Panel for West Germany covering the period 1983 to 1992. The focus of the study is on the importance of 'negative duration dependence' arising from causal factors and 'sorting' effects due to unobserved heterogeneity in the unemployment pool. I also sort out the relative contribution of various factors, such as individual characteristics, the state of the labour market, and the effects of unemployment benefits on long-term unemployment.

*) I thank Florian Kraus and Andreas Spörl for implementing the statistical model in GAUSS and for their helpful comments. Financial support from the Anglo-German Foundation under the grant "*Labour markets in transition: A comparative analysis of labour force and income dynamics in Britain and Germany*" is gratefully acknowledged.

1 Introduction

The persistence of high unemployment has been one of the most important economic problems in West Germany for many years. Following the severe recession in 1981-82 unemployment almost tripled compared to 1980 and remained at that high level throughout the second half of the eighties despite relatively high economic growth rates in this period. The exceptionally strong economic upswing at the beginning of the 1990s associated with the German unification boom did reduce the overall unemployment rate somewhat, but it remained well above its pre-recessionary level. With the onset of the recession in 1993 the number of unemployed people again increased sharply and reached an all-time high in West German post-war history in 1994 (see Figure 1). Breaking up the unemployment rate into its duration and incidence components - the inflow into unemployment within a year relative to the stock of employed people at the beginning of the period - reveals that the persistence of unemployment in the eighties is characterized by a substantial increase in the average completed duration of an unemployment spell, while the incidence of unemployment declined towards its level before the 1981-82 recession. Figure 1 also shows an upward jump in the incidence of unemployment and an increasing spell duration with the onset of the recession in 1993.

Even more pronounced than the increase in the overall unemployment rate and the average duration of the unemployment flow has been the rise in long-term unemployment, as defined by an interrupted duration of more than 12 months in the unemployment pool (Figure 1). The increasing share of long-term unemployed people after the recession in the early eighties and its persistently high level throughout the decade has lent some credence to the view that even at the peak of the business cycle a considerable percentage of the labour force - in particular older, disabled and unqualified workers as well as females with small children - is simply not employable. Research on unemployment has therefore increasingly focused on 'structural' factors (Franz, 1987) and potential disincentive effects arising from taxes and benefits (Zimmermann, 1993).

A central topic in the empirical analysis of the persistence of unemployment relates to the relative importance of 'state dependence' versus 'sorting' effects in the unemployment process. As to the former, one can distinguish between 'duration dependence' in the current spell and 'lagged duration' as well as 'occurrence dependence' which relate to an individual's previous unemployment history (Heckman/Boras, 1980). Duration dependence in the unemployment process would imply that an individual's employment prospects deteriorate with the duration of the unemployment spell, because of factual depreciation of an individual's human capital or, alternatively, because prospective employers facing a rigid wage structure set a minimum productivity level and use the experience of long-term unemployment as an indicator for an individual's expected productivity. Assuming that firms rank appli-

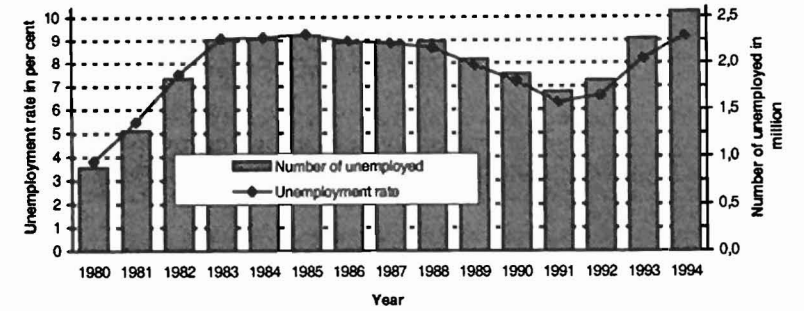
cants for vacancies by their unemployment duration, simple models of the matching process in the labour market imply a decreasing exit rate from unemployment (Blanchard / Diamond, 1990). Similar effects may also prevail with respect to lagged duration and occurrence dependence as far as an individual's actual or by the prospective employer perceived human capital is impaired by previous unemployment experience.

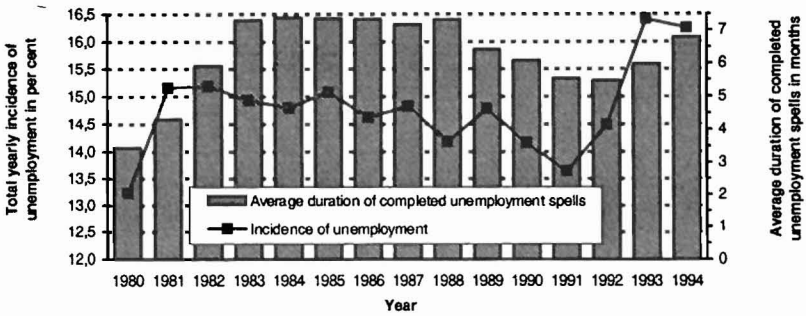
The practical implication of these state dependence effects for the persistence of unemployment is that the longer it has already lasted the less likely will long-term unemployment be reduced in the subsequent economic upswing. Alternatively, the increase of long-term unemployment could also be explained by a well-known sorting mechanism (Salant, 1977); during and after the recession the proportion of people becoming unemployed with low re-employment probabilities may have increased, which would manifest itself in a rising share of long-term unemployment even if individual re-employment probabilities remain constant over the unemployment spell. The differentiation between these alternative hypotheses is not only a prerequisite for testing competing theories of unemployment persistence but also has important practical implications for the targeting of labour market and social policies.

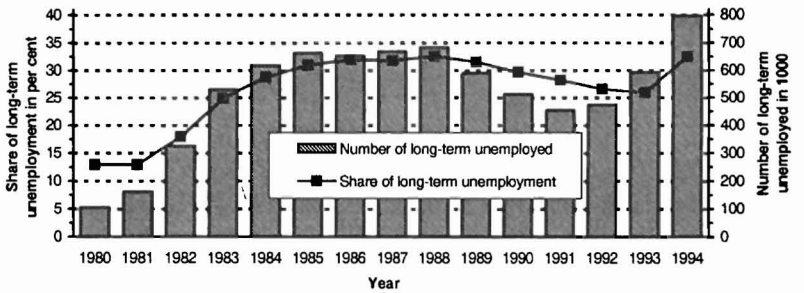
Previous microeconometric studies of unemployment duration (Hujer/Löwenbein/Schneider, 1990, Schneider, 1991, Licht/Steiner, 1991, Wurzel, 1993, Hunt, 1995) based on the Socio-Economic Panel for West Germany have isolated various important determinants of long-term unemployment, but overall there seems to be no general consensus on the main factors contributing to it. This can partially be explained by differences in model specification; in particular, these studies differ in the way transitions from unemployment into other labour force states, an individual's previous unemployment history, state dependence effects as well as both observed and unobserved population heterogeneity are taken into account.

In this paper, I try to account for these factors within an microeconometric model of unemployment transitions for the West German labour market. The focus of the study is on the determinants of individual transitions from unemployment into employment and non-participation, where special attention is paid to various state dependence effects in the unemployment process. I will also sort out the relative contribution of various factors, such as individual characteristics, the state of the labour market, and the effects of the unemployment insurance system, on individual labour force behaviour and the persistence of long-term unemployment. The empirical analysis is based on waves 1 – 9 of the Socio-Economic Panel for West Germany.

Figure 1. Unemployment in West Germany 1980-1994







Note: The unemployment rate is based on all dependently employed people in the civil sector and refers to the September in each year.

Source: Amtliche Nachrichten der Bundesanstalt für Arbeit (Official Publication of the federal Labour office); consecutive yearly issues.

2 A Discrete Hazard Rate Model of Labour Market Transitions with Unobserved Population Heterogeneity

The standard approach to modelling individual unemployment behaviour in empirical labour economics centers on the hazard function, i.e. the conditional probabilty of leaving unemployment (for summaries see Kiefer, 1988, Lancaster, 1990). Within this rather flexible framework, an individual's re–employment probability is explained as a function of the duration he or she has been unemployed in the current spell, individual characteristics, labour market variables that account for the costs and expected returns to search and, possibly, an individual's previous unemployment history (see Devine/Kiefer, 1991, for a literature review).

In this paper I will use event history data available on a monthly basis in the Socio-Economic Panel for West Germany (for a description see below) to analyze individual labour market transitions and the determinants of the duration of unemployment for the period 1983 to 1992. In contrast to previous empirical research on labour force dynamics in West Germany (see, e.g., Flaig/Licht/Steiner, 1993; Mühleisen, 1994, Mühleisen/Zimmermann, 1994) this sampling scheme avoids some of the problems of models based on traditional panel studies, where an individual's labour force status is only observed at, say, yearly intervals, in which case short unemployment spells usually are not counted.

Given the focus of this paper and the data base used for the analysis, the standard two–state single–spell hazard function approach has to be extended in several ways;

(i) the discrete measurement of unemployment durations derived from the monthly calendar data and the associated heavy ties of observations make it more appropriate to specify a discrete rather than a conventional continuous-time hazard rate model;

(ii) transitions into non-participation must be taken into account, which is of considerable importance for the explanation of female labour force behaviour;

(iii) the 'baseline' transition rate, the evolution of which describes 'duration dependence' in the unemployment process, has to be specified in a flexible way:

(iv) an individual random effect has to be included in the hazard function to account for unobserved population heterogeneity in individual unemployment behaviour;

(v) multiple spells of unemployment have be taken into account, which introduces certain interdependencies between subsequent spells in an individual's unemployment history, and

(vi) the explanatory variables in the model must be allowed to vary both with process and with calendar time.

A flexible specification of the baseline rate is very important if one wants to test for duration dependence, which rules out a continuously decreasing or increasing rate, as, e.g., in the popular Weibull model (see Kiefer, 1988). In this context, it is also particularly important to account for unobserverd population heterogeneity because ignoring it will lead to spurious duration dependence in the unemployment process, as the results reported below show.

The structure of the empirical model used to analyze individual labour market transitions is the following. The duration of an individual's k-th unemployment spell is described by a non-negative random variable, T, which takes on integer values only. If an unemployment spell ends in the interval $[I_{t-1}, I_t)$ this variable takes on a value of $T = t$, where the spell can either end in employment or in non-participation; since monthly event data will be used in the empirical analysis, this interval will be set to the length of one. The central variable for modelling the transition process from unemployment into any one of these two states is the discrete transition rate. For the i-th person (i = 1, ..., n) the transition rate in spell k (k = 1,2, K_i) into state j (j=1,2) in interval t, $\lambda_{ij}^{k}(t)$, is the conditional probability of a transition into state j in this interval, given individual i has been unemployed until t. Somewhat more formally,

$$(1) \qquad \lambda_{ij}^{k}\left(t \mid x_i(t), \varepsilon_i^m\right) = \Pr\left[T_{ik} = t, \Omega = j \mid T_{ik} \geq t, x_i(t), \varepsilon_i^m\right]$$

with i = 1,2,...n; j = 1,2; k =1,2,...K_j;

$x_i(t)$ = vector of covariates of individual i in intervall t

Ω = 1, if transition into employment

= 2, if transition into non-participation

ε_i^m = time-invariant individual effect, with

$$E(\varepsilon_i) = \sum_{m=1}^{M} p(\varepsilon_i^m)\varepsilon_i^m = 0; \quad \sum_{m=1}^{M} p(\varepsilon_i^m) = 1; \quad E(\varepsilon_i^m x_i(t)) = 0, \ \forall\, m \ (m = 1,2,\ldots M)$$

The time-invariant individual effect, ε_i, accounts for unobserved population heterogeneity in the transition rates and is assumed to come from an arbitrary discrete probability distribution with a small number of mass points, ε_i^m (m=1,2,..M); these mass points and their probabilities, $p(\varepsilon_i^m)$ are simultanously estimated with the parameters of the model, where estimation is by the maximum likelihood method. The individual effect is assumed to be uncorrelated with the set of explanatory variables in the model, $x_i(t)$. Note that some of these variables, e.g. the regional

unemployment rate, not only depend on process time, i.e. the month of the unemployment spell, but also on historical time.

Conditional on the vector of covariates and the individual effect, transitions into the two states are independent and can thus be modelled as competing risks.[1] The hazard rate from unemployment is therefore given by

$$(2) \qquad \lambda^k(t|\cdot) = \sum_{j=1}^{2} \lambda_j^k(t|\cdot)$$

In terms of the hazard rate, the probability of remaining unemployed in period t conditional on having been in that state up to period $t-1$ is simply given by

$$(3) \qquad \Pr[T_k > t | T_k \geq t, \cdot] = 1 - \lambda^k(t|\cdot)$$

The survivor function does not condition on spell duration and gives the probabilty of remaining unemployed up to period t; in terms of the hazard rate it can be written as

$$(4) \qquad \Pr(T_k > t|\cdot) = S^k(t|\cdot) = \prod_{\tau=1}^{t-1} \left(1 - \lambda^k(\tau|\cdot)\right)$$

The probability of a transition into state j in period t in terms of the respective transition rate and the hazard function as

$$(5) \qquad \Pr(T_k = t, \Omega = j|\cdot) = \lambda_j^k(t|\cdot) \prod_{\tau=1}^{t-1} \left(1 - \lambda^k(\tau|\cdot)\right)$$

The transition rates are modelled by means of random-effects logit models with three distinct choices (states), namely unemployment, employment and non-participation, the first one being the base category. While the set of covariates is the same for all alternatives, the coefficient vectors are allowed to vary between alternatives with the one for the employment state set to the null vector. For this model the transition rate in the k-th unemployment spell into state j in period t is given by

$$(6) \qquad \lambda_{ij}^k(t|x(t), \varepsilon_i^m) = \frac{\exp(\alpha_j(t) + \beta_j' x_i(t) + \varepsilon_i^m)}{1 + \sum_{l=1}^{2} \exp(\alpha_l(t) + \beta_l' x_i(t) + \varepsilon_i^m)};$$

the corresponding survivor function is

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[1] However, not conditioning on the individual effect, transitions into the two states will of course be correlated.

$$(7) \qquad S^k(t_i|\cdot) = \prod_{\tau=1}^{t-1} \frac{1}{1+\sum_{l=1}^{2} \exp(\alpha_l(\tau)+\beta_l' x_i(\tau)+\varepsilon_i^m)}$$

The so-called 'baseline' rate, $\alpha_j(t)$, describes the dependence of the transition rate on process time ('duration dependence'). The hypothesis of 'negative duration dependence' would imply that the transition rate into employment declines with the duration of unemployment. To avoid the danger of seriously misspecifying the model due to an unwarranted a priori restriction on the functional form of the baseline hazard, I model it in a flexible way by a set of dummy variables. Also note, that the specification of the transition rates in equ. (6) does not imply the rather restrictive proportional hazard assumption usually encountered in unemployment duration studies (see, e.g., Kiefer, 1988; Lancaster, 1990).

To derive the sample likelihood function for this model, I define the indicator variable

$$c_{ik} = \begin{cases} 1, & \text{if the k - th unemployment spell of individual i is right - censored} \\ 0, & \text{otherwise.} \end{cases}$$

Right-censored observations include interrupted spells either at the end of the observation period or because of sample attrition. Following usual practice, I will assume that the censoring mechanism is non-informative (i.e., random). Since there is no operational way to include information on left-censored spells in the likelihood function in a consistent way, they are excluded from the sample.

Defining another indicator variable

$$\delta_{ijk} = \begin{cases} 1, & \text{if the k - th unemployment spell of individual i ends in state j} \\ 0, & \text{otherwise} \end{cases}$$

and assuming that, conditional on the explanatory variables in the model and the individual effect, all observations are independent[2], the sample likelihood function is given by

$$(8) \qquad L = \prod_{i=1}^{n} \sum_{m=1}^{M} p(\varepsilon_i^m) \prod_{k=1}^{K_i} \prod_{j=1}^{2} \left[\lambda_{ij}^k(t_i|x_i(t_i),\varepsilon_i^m)\right]^{\delta_{ijk}} \prod_{\tau=1}^{t_i-1} \left(1-\lambda_i^k(\tau|x_i(\tau),\varepsilon_i^m)\right)^{c_{ik}}.$$

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[2] The assumption that observations are independent between individuals is standard in microeconometric models of individual unemployment behaviour.

For a completed unemployment spell the contribution to the likelihood function is given by the corresponding transition probabiltiy, for a censored spell it is given by the survivor function. Note that due to the individual effect all observations for a given individual - both within and between spells - are, conditionally on the previous state and the set of explanatroy variables, correlated. As discussed in the literature on individual unemployment dynamics (see, e.g., Heckman, 1981), it is important to take this correlation into account if one wants to test for the presence of 'true' state dependence effects. Furthermore, there may also be dynamic effects from an individual's previous unemployment experience, referred to in the literature as 'lagged duration' and 'occurrence' dependence. These effects are modelled here by including various indicators of an individual's unemployment history as explanatory variables in x(t) as discussed below.

3 Data and Variables

Estimation of the model described in the previous section is based on waves 1 - 9 of the Socio-Economic Panel for West Germany (GSOEP-West), which is a representative sample of the resident population on a household basis (for general descriptions of the GSOEP in English see Burkhauser, 1991; Wagner/Burkhauser/Behringer, 1993). These nine waves cover the period 1984 to 1992; in the first wave some 12,000 individuals older than sixteen years of age living in about 6,000 households were interviewed. Sample attrition in the GSOEP is substantial and is not balanced by those entering the panel who consist of youth living in 'old' households crossing the age limit of 16 years for inclusion in the sample and 'new' households, of which at least one member was part of the households initially included. Provided sufficient information on these persons is available for all the variables in the model, they are also included in the sample used for the empirical analysis.

The answers to the questionnaires provide information on an individual's employment status, personal characteristics, educational and occupational indicators, industry and region of residence, various types of income etc.. In addition, at the date of interview of each wave, retrospective monthly 'calendar' information on an individual's detailed labour force status in each month of the previous calendar year is recorded. Depending on the wave, there are between eight and ten different categories for an individual's labour force status, which I have aggregated into the following three states

(i) *unemployment*

(ii) *employment*

(iii) *non-participation*.

Since the questionnaire refers to *registered* unemployment its definition used here is, in principle, the same as in official statistics, and has the same well-known problems of both over- and underreporting. The employment state includes full-time, part-time and temporary employment as well as vocational training in firms. The non-participation state comprises those in retirement, in full-time education, on military service, working at home, and 'others'.

Completed durations of unemployment spells are derived from information on the date of entry into unemployment and the date of the transition from this state into states (ii) or (iii); interrupted durations of right-censored spells are calculated from the entry data and the date an unemployed is observed for the last time in the SOEP, which also includes sample attrition. The number of unemployment spells for which complete information on all variables in the model is available is 1442, of which 853 are males and 589 are females; of these 117 and 99 are right-censored, respectively. The number of spells refers to 620 different males and 495 different females, the average duration of unemployment, including both completed and right-censored observations, is 6.2 months for males and 8.3 months for females.

Aside from this duration information, the following groups of explanatory variables are included in the model:

- *personal characteristics* and *household structure*
- *entitlement to unemployment benefits* and *income replacement ratio*
- *previous (un)employment history*
- *labour market indicators.*

Since labour force behaviour is known to differ substantially by gender, the sample is split by sex and the respective sets of explanatory variables are specified differently with respect to household structure. Description and summary statistics of variables are given in Table 1 below.

Personal characteristics and household structure should primarily account for individual differences in the costs and expected returns of job search and the decision to participate in market work. The other control variables for personal characteristics included in the model are a dummy for foreign nationality and for disability to work for reasons of bad health, and two dummies for, respectively, no and higher occupational training, with completed apprenticeship training as the base category.

For females, household structure is generally considered an important factor for labour force behaviour; it is described here by marital status and the number of small children (up to 6 years) living in the household as well as an interaction term of the number of children with marital status. For both males and females the log of other

household income (deducting unemployment benefits) is included as explanatory variable which, implicitely, also takes into account the employment status of the spouse.

Information on an individual's entitlement to unemployment benefits – unemployment insurance ('Arbeitslosengeld') and unemployment assistance ('Arbeitslosenhilfe') – is available on a monthly basis from the income calendar data in the GSOEP. The entitlement period to unemployment insurance payments depends on the duration of previous employment and age; it expires, on average, after about 7 months (for a brief description of the system see, e.g., Hunt, 1995). Unemployment assistance, for which only those with previous entitlement to insurance payments qualify, is means–tested, i.e. depends on family circumstances, wealth etc., and is granted for a maximum of a year in the first instance, but is renewable under certain circumstances; in principle, there is no upper limit on the eligibility period for unemployment assistance if the means-test is passed. In the estimation, unemployment benefits and assistance had to be aggregated due to the small number of unemployed eligible for the latter. In addition to this dummy variable, the log of the so-called income replacement ratio, i.e., the ratio of the level of unemployment benefits as derived from the monthly income calendar data to the net wage in the previous job is included as explanatory variable in the model. Although not without problems, this seems to be the preferred way the potential effect of the level of unemployment benefits on the hazard is modelled in the empirical literature (see, e.g., Atkinson and Micklewright, 1991).

The set of variables describing an individual's previous employment history include actual labour market experience, tenure in the last job (both linear and squared terms of these variables are used to account for non-linear effects), and sector of last employment. Labour market experience and tenure are derived from retrospective survey information[3] and the calendar data in the GSOEP. An individual's previous previous unemployment history is described by two dummy variables for the occurence of, respectively, one and more unemployment spells before the current spell, and the duration and its square of the last spell. These latter variables are included to test – in addition to 'duration' dependence in the current unemployment spell as described above – for the presence of 'occurrence' and 'lagged duration

[3] In the the so-called 'bioscope' records in the GSOEP-West each individual marks her labour force status in each year since she has turned 15 years; in case more than one activity was coded (i.e., schooling and employment) in one year, time was split equally between these activities. Starting with the first wave for which valid monthly calendar information on labour market experience and job tenure is available, this more accurate information was substituted for the respective information derived from the bioscope records.

dependence' in the unemployment process, as discussed in the literature (see, e.g., Heckman / Borjas, 1980).

The labour market indicators should account for general demand conditions in regional labour markets. In addition to the level and the relative change of the monthly state unemployment rate, where several adjacent states have been aggregated[4], also two dummies for the 'northern' (West Berlin, Niedersachsen, Schleswig-Holstein, Hamburg and Bremen) and 'southern region' (Bayern, Baden-Württemberg, and Hessen) with Nordrhein-Westfalen, Rheinland-Pfalz and Saarland making up the reference region are included in the model. Whereas these dummies should account for structural differences between these broad regions, the effects of short-term fluctuations in regional labour market conditions on individual unemployment behaviour are accounted for by the inclusion of the level and monthly change of the (aggregated) regional unemployment rates.

Except for the income and benefit variables, labour market experience and job tenure and the regional unemployment rate, which is obtained from monthly data published by the Federal Labour Office, information on the explanatory variables in the model is only collected at the date of the interview in each wave of the survey. This information had therefore to be merged with the monthly calendar data on an individual's labour force status where the following conventions have been used. Information from the dates of interview of waves t (t = 1, 2, ... 9) is related to the calendar data from wave $t + 1$ covering the period January to December in year t. If information on certain explanatory variables is missing in a particular wave, it was substituted from the subsequent or, if also lacking, from the previous wave. If information is not available for any of two neighbouring years, the spell is excluded from the sample.

4 Estimation Results

Estimation results obtained by maximizing the (log) likelihood function in equ. (8) are summarized for males in Table 2 and for females in Table 3. As it turned out, for males estimation results for the transition rate into non-participation could not be obtained because of the relatively small number of transitions into that state observed in most months, and only a two-state model could therefore be estimated.[5]. Before estimation results with respect to the effects of particular variables are interpreted, I first comment on the results for the heterogeneity terms and the baseline hazard function.

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[4] The states of Niedersachsen and Schleswig-Holstein, Hamburg and Bremen, and Rheinland-Pfalz and Saarland have been aggregated into three regions.

[5] Following usual practice, observations with a transition into non-participation were treated as right-censored at the date of leaving unemployment.

Table 1 Description and Means of Variables

Variable	Males	Females
Foreigner	0.38	0.32
Disabled	0.06	0.04
Married	--	0.49
# Children under 6 years	--	0.25
25 < Age ≤ 30	0.13	0.16
30 < Age ≤ 55	0.43	0.36
Age > 55 years	0.06	0.06
No occupational qualification	0.37	0.43
Higher occupational qualification	0.08	0.08
Tenure in previous job (months)	60.96	51.56
Labor market experience (years)	13.83	9.16
Northern region	0.24	0.26
Southern region	0.47	0.43
Regional unemployment rate (%)	8.16	9.43
Δ Regional unemployment rate	0.05	-0.01
ln other household income	0.55	0.75
Receives unemployment benefits	0.84	0.75
ln Unemployment benefits	4.77	4.27
ln Previous wage	6.79	5.93
One previous unemployment spell	0.21	0.18
More than one unemployment spells	0.20	0.11
Duration of previous spell	2.43	2.50
Duration squared/100	0.41	0.43
# Unemployment sSpells	853	589
of which right-censoredl	117	99
# Persons	620	495
Average spell duration (months)	6.2	8.3

Source: GSOEP-West, waves 1 – 9; own calculations.

Note: Time varying variables are evaluated at the beginning of an unemployment spell.

Table 2 Hazard rate from unemployment, males
Two-state semi-parametric logit model with non-parametric unobserved population heterogeneity; ML estimates

Variable	Coeff	|t|
Constant	-2.8693	7.19
Foreigner	-0.2873	2.11
Disabled	-0.4685	1.65
25 < Age ≤ 30	-0.1671	0.82
30 < Age ≤ 55	-0.4144	1.47
Age > 55 years	-2.4060	4.59
No occupational qualification	-0.1525	1.19
Higher occupational qualification	0.4873	2.25
Tenure in previous job	-0.0036	1.71
Tenure squared/100	0.0010	1.60
Labor market experience	0.0155	0.47
Labor market experience squared	-0.0009	1.17
Never employed before	-0.9750	2.29
Primary sector	0.7818	2.65
Construction	0.4630	2.57
Services	-0.2202	1.48
Sector missing	-0.3715	1.88
Northern region	-0.4990	3.03
Southern region	0.3713	2.25
Regional unemployment rate	0.1184	3.61
Δ Regional unemployment rate	-3.8378	7.26
ln other household income	-0.0504	0.71
Receives unemployment benefits	0.3953	2.13
ln Replacement ratio	-0.1171	5.80
One previous unemployment spell	0.2710	1.55
More than one unemployment spells	0.1406	0.73
Duration of previous spell	-0.0462	1.94
Duration squared/100	0.0384	0.89
Months 2	0.2367	1.45
Months 3	0.4807	2.53
Months 4	0.2626	1.18
Months 5	0.2018	0.83
Months 6	0.5376	2.14
Months 7	0.4607	1.65
Months 8	0.0749	0.23
Months 9	-0.0744	0.21
Months 10 - 12	1.2554	4.03
Months 13 - 18	1.9795	5.64
Months 19 - 24	1.6360	3.33
Months > 24	3.5524	5.97

... cont.

Table 2 continued

Variable	Coeff	|t|
ε_1	-0.1419	1.31
ε_2	1.8375	4.99
ε_3	-3.0595	0.86
$P(\varepsilon_1)$	0.8370	14.80
$P(\varepsilon_2)$	0.1261	2.66
$P(\varepsilon_3)$	0.0369	1.31
# Spells = 853	*ln* L = -1608.64	

Table 3 **Transition rates from unemployment, females**
Three-state semi parametric logit model with non-parametric unobserved population heterogeneity; ML estimates

	Transition into			
	Employment		Non-Participation	
Variable	**Coeff**	**|t|**	**Coeff**	**|t|**
Constant	-2.4698	2.38	-4.4721	3.40
Foreigner	-0.5310	2.19	-0.6070	2.05
Disabled	-0.6494	1.29	0.2952	0.56
Married	-0.2734	1.11	0.3201	0.98
# Children under 6 years	-0.8830	2.58	-0.7157	1.82
Married with children	0.5240	1.32	0.6971	1.58
25 < Age ≤ 30	-0.2137	0.70	-0.3979	0.97
30 < Age ≤ 55	-0.6019	1.98	-0.7896	2.14
No occupational qualification	-0.1737	0.72	0.0038	0.01
Higher occupational qualification	-0.1797	0.54	-1.0682	1.81
Tenure in previous job	-0.0179	4.56	-0.0033	0.61
Tenure squared/100	0.0034	2.80	-0.0001	0.04
Labor market experience	0.0141	0.29	-0.0014	0.02
Labor market experience squared/100	-0.0015	1.07	-0.0013	0.82
Never employed before	-1.0383	2.30	0.0052	0.01
Primary sector	0.4520	0.59	0.4559	0.37
Services	0.2846	1.15	0.4756	1.54
Sector missing	0.0759	0.21	0.4701	1.17
Northern region	0.6582	2.29	0.0949	0.27
Southern region	1.4235	3.31	1.2384	2.29
Regional unemployment rate	0.1448	1.98	0.0923	0.98
Δ Regional unemployment rate	0.8086	0.19	4.8345	0.82
ln other household income	0.2138	1.61	0.0828	0.46
Receives unemployment benefits	0.2823	1.24	0.3058	0.99
ln Replacement ratio	-0.1421	3.68	-0.1181	2.37
One previous unemployment spell	-0.4172	1.08	-1.0248	1.79
More than one unemployment spells	-0.8705	1.87	-1.8847	2.64
Duration of previous spell	0.0109	0.20	0.0792	1.01
Duration squared/100	-0.0711	0.47	-0.2218	1.08
Months 4 - 6	0.3266	1.29	1.1359	3.10
Months 7 - 9	0.5848	1.72	1.5384	3.47
Months 10 - 12	1.1200	2.48	3.4948	7.29
Months > 12	3.6081	5.50	5.8778	8.63

... cont.

Table 3 continued

	Transition into			
	Employment		Non-Participation	
Variable	**Coeff**	**|t|**	**Coeff**	**|t|**
ε_1	-2.3888		3.07	
ε_2	3.0332		4.63	
ε_3	-0.0784		0.50	
$P(\varepsilon_1)$	0.1225		1.89	
$P(\varepsilon_2)$	0.1162		1.93	
$P(\varepsilon_3)$	0.7613		9.76	
# Spells = 589		*ln* L = -1022.76		

Note: Due to the small number of observations, for females no estimates could be obtained for the age dummy referring to the oldest group and for the dummy referring to those previously employed in the construction sector.

To start with, it was assumed that, both for males and females, population heterogeneity can be described by four heterogeneity groups, i.e. mass points of the discrete probability distribution of the random individual effect. Estimation results were then sequentially compared to models with three and two mass points based on likelihood-ratio test statistics which showed that both three heterogeneity groups are necessary and sufficient to account for unobserved population heterogeneity in both the male and female population. The three estimated mass points and their probabilities are reported at the bottom of Table 2 and Table 3, respectively. These probabilities can also be interpreted as proportions of unemployed people with given observed characteristics belonging to one of these three heterogeneity groups.

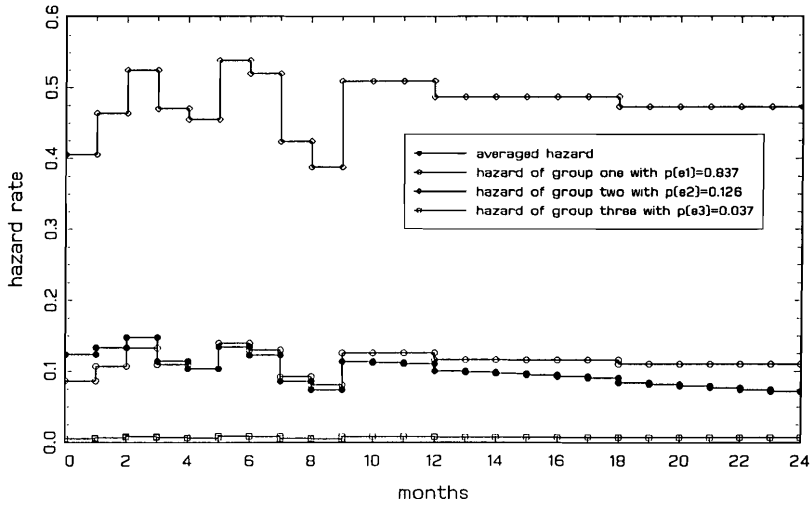
Turning to the estimates for the baseline hazard functions, some comments on their specification seem in order. Single months with only a few completed durations (less than 25, on average) had to be aggregated with adjacent months. For females months had to be aggregated in broader classes from the beginning of the spell because there are very few transitions into non-participation in the first couple of months. The estimated coefficients for the corresponding baseline term refer to the whole interval; for the graphs below estimates for monthly hazards are obtained by simply dividing the estimate for the interval by its length[6]; for the last (open) class such a calculation is unfortunately not possible without some arbitrary endpoint restriction. Estimated

[6] Under the assumption that durations are exponentially distributed within a given interval this simplification yields a good approximation to the exact value of the monthly hazard.

coefficients for the monthly dummies are to be interpreted relative to the base category (the first months for males and month 1 - 3 for females) and show the change in the hazard relative to the constant term.

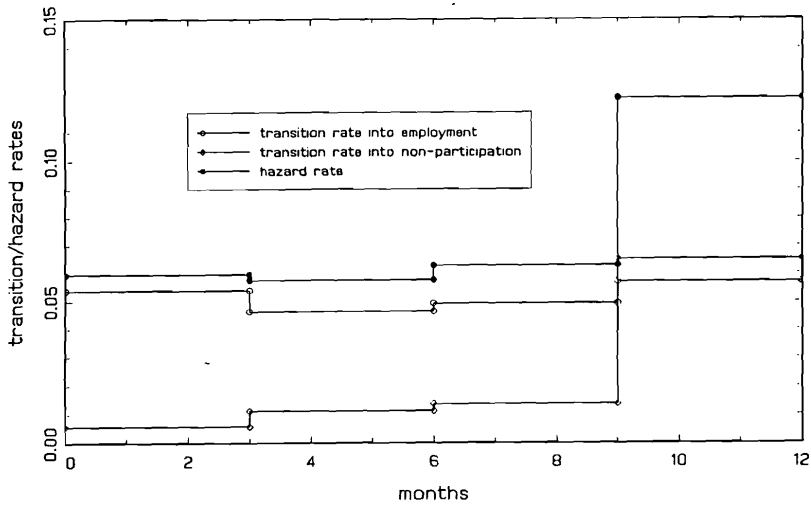
The shape of the baseline hazard function for males is plotted in Figure 2 for the three heterogeneity groups and the 'averaged' hazard which is the weighted sum of the three groups' hazard functions, where the weights are the estimated probabilities, $p(e^m)$, m = 1,2,3. The levels of the hazard functions depend on the estimated mass points as well as the linear combination of the estimated β coefficents and the corresponding covariates, whereas the shape of the hazards mainly depends on the estimated dummies describing the baseline rate. The values of the observed explanatory variables are defined according to the reference group described in the note to Figure 2.

Figure 2 Hazard rate from unemployment, males
Two state semi-parametric logit model with non-parametric unobserved population heterogeneity – three groups and average



Note: The reference group is defined as follows: German, not disabled, 30 < age ≤ 55 years, skilled worker, lives in Nordrhein-Westfalen, previously employment in manufacturing, receives unemployment benefits, no previous unemployment spell; the metric variables tenure in last job, total labour market experience, the level and change of the regional unemployment rate, other net household income are evaluated at sample means shown in Table 1, the income replacement ratio has been set at 65 %.

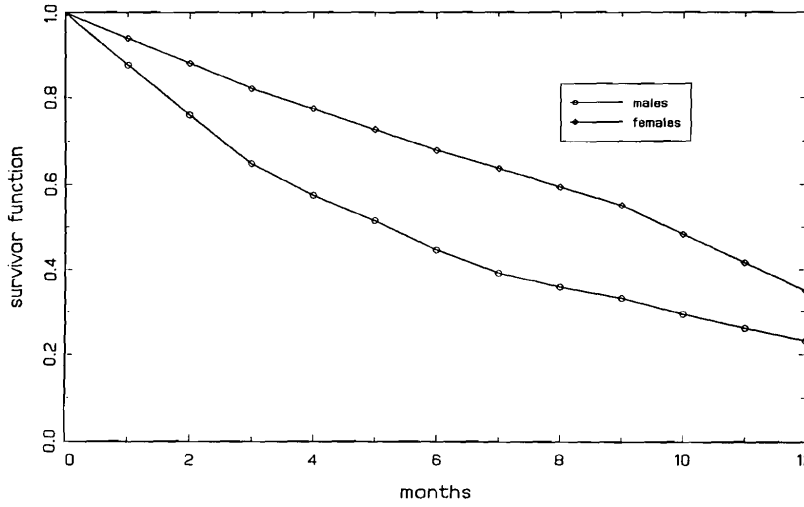
Figure 4 **Transition and hazard rates from unemployment, females**
Three state semi–parametric logit model with non–parametric unobserved population heterogeneity – averaged over three groups



Note: See Figure 3.

Gender differences in transition rates are reflected in different survivor functions for males and females, where the 'averaged' survivor functions are plotted in Figure 5. While its theoretical relationship to the hazard function is given by equ. (4) above, empirically, the survival rate in month t can also be interpreted as the proportion of a particular labour market group – defined by a particular normalization of the vector of explanatory variables in the model – with an unemployment duration of more than t months.

Figure 5 **Survivor function in unemployment, males and females**
Two state semi–parametric logit model with non–parametric unobserved population heterogeneity – averaged over three groups



Note: The survivor functions refer to the respective male and female reference groups defined in Figures 2 and 3 'averaged' over the three heterogeneity groups.

Females' survival rates in unemployment are substantially higher than those of males in every month; gender differences in survival rates increase up to the eight month and start converging only after the strong increase in the female transition rate into non-participation is compensating for their relatively low 'average' transition rate into employment. The relatively low level of the latter is associated with a much higher duration of unemployment than for males; for the respective reference groups the median of the (completed) duration of unemployment is about 5 months for males and almost 10 months for females.

Turning to the estimated coefficients of the explanatory variables in the model, the quantitative effects of certain important variables on the survivor function are presented in Table 4 (only statistically significant effects are reported). Since the focus of the present study is on long-term unemployment, it seems natural to calculate the effects of particular variables on the 12 months' survival rate, which is also the duration used in the official statistics to define long-term unemployment.[9] It

[9] Note, however, that in the official statistics long-term unemployment is usually defined with respect to the duration of the unemployment stock.

should be noted, though, that for females the survivor function compounds the effects of explanatory variables on the transition rates into employment and non-participation and, thus, only gives the net effect of a particular variable on the probability of remaining unemployed. Since for females the 12 months' survival rate is strongly influenced by the high transition rate into non-participation, I also report the six months' survival rate. In the upper part of Table 4, these two rates are shown for the three heterogeneity groups and for the 'averaged' survivor function where the observed explanatory variables are evaluated as for the male and female reference groups defined before.

Table 4 shows extremely large differences in survival rates between the three heterogeneity groups. Whereas virtually every male unemployed in group 2 has left the register after six months, the 12-month survival rate for group 3 is more than 90 percent! For females these differences are somewhat less dramatic, but still remarkable; the 12-month survival rate in group 2 is less than two percent, compared with a value of almost 90 percent in group 1. As the comparision of survival curves in Figure 5 has already shown, substantial gender differences remain after 'averaging'.

Estimated effects on the survival rates differ substantially by gender and can briefly be summarized as follows, where interpretation is always relative to the respective reference group.

- Single mothers with small children have relatively high survival rates in unemployment. Disability has a considerably stronger impact on remaining unemployed for males than for females, which can partially be explained by its effect on the transition rate into non-participation. The effect of foreign nationality on long-term unemployment is somewhat stronger for females than for males. Survival rates in unemployment for older males are extremely high.

- For males (females) a higher occupational qualification reduces (increases) the survival rate in unemployment relative to the reference group, which is defined by having completed apprenticeship training. Survival rates for unemployed males with no occupational training differ little from the reference group, for females the effect is statistically insignificant.

- Long tenure in the previous job increases females' survival rates in unemployment substantially, but has only a relatively modest effect on males' unemployment behaviour. In contrast, survival rates of unemployed males who have never been employed are much higher than for the reference group, whereas for females this effect is insubstantial. As the detailed estimation results in Tables 2 and 3 show, these gender differences are related to the indirect effects from labour market experience and tenure in the previous job.

Table 4. Effects of selected explanatory variables on 6- and 12-months survival rates (in percent)

	Males		Females	
Months	**6**	**12**	**6**	**12**
Heterogeneity group 1	48.7	23.7	96.7	87.4
Heterogeneity group 2	2.0	0.0	16.1	1.9
Heterogeneity group 3	96.0	92.1	74.3	36.7
Reference group ('averaged')	*44.6*	*23.2*	*68.0*	*34.9*
Foreigner	52.5	31.5	76.2	48.8
# Children under 6 years	--	--	80.0	55.0
Disabled	57.3	36.9	74.7	40.3
Age < 26 years	32.3	13.1	54.4	19.4
Age > 55 years	82.9	71.1	--	--
No occupational qualification	48.9	27.5	--	--
Higher occupational qualification	30.6	12.0	72.4	45.3
Tenure in previous job = 25 years	50.4	29.1	90.0	74.6
Never employed before	66.0	47.7	69.8	35.0
Primary sector	22.6	7.5	59.3	24.6
Construction	31.3	12.4	--	--
Services	50.7	29.5	62.1	26.7
Northern region	58.0	37.8	56.3	23.6
Southern region	33.9	14.2	37.6	10.6
Regional unemployment rate +10%	47.5	26.1	62.7	26.6
Reduction of regional unemployment rate = 10%	31.1	12.3	72.2	43.0
One previous unemplemployment spell (duration = 6 months)	44.4	23.0	74.4	46.4
More than one unemployment spell (duration = 6 months)	48.0	26.7	80.5	59.6
Reduction of Replacement ratio = 10%	44.2	22.9	67.7	34.6
Receives no unemployment benefits	32.5	13.3	55.9	22.0

Note: The respective male and female reference groups are defined in Figures 2 and 3. When varying tenure in the previous job labour market experience was adjusted accordingly; for those who have never been employed before job tenure and previous labour market experience were set to zero. For females the regional unemployment rate and the dummy for no occupational qualification are not statistically significant.

- The effects of sector of previous employment and place of residence on survival rates differ between males and females. Relative to the respective reference groups, survival rates are lower if the unemployed lives in the southern region and has previously been employed in the primary sector. A reduction of the regional unemployment rate decreases survival rates for males substantially.

- Survival rates of females with previous unemployment spells are considerably higher than for the reference group with no previous unemployment experience; for males these effects are insubstantial.

- Eligibility to unemployment benefits considerably increases survival rates in unemployment both for males and females. However, marginal reductions in the income replacement ratio have only small effects on survival rates.

Qualitatively similar results for most of these variables have also been found in other microeconometric studies of unemployment duration for West Germany (Hujer/Löwenbein/Schneider, 1990, Schneider, 1991, Licht/Steiner, 1991, Wurzel, 1993, Hunt, 1995). One particularly interesting exception is the effect of unemployment benefits on the duration of unemployment, where specifications of the benefit variable differ substantially, however.[10] Estimated effects found in the literature vary a lot depending on model specification, type of data used and level of aggregation, and the way the benefit variable is specified (see Atkinson and Micklewright 1991). This seems also to be the case for this and the mentioned German studies, although they all use the same data base and are all based on hazard rate models. Whereas Wurzel (1993), Hujer/Löwenbein/Schneider (1990) and Schneider (1991) find a statistically insignificant or even a positive effect of eligibility to or the level of unemployment benefits on the hazard rate from unemployment, Hunt (1995) models the effects of an extended period of entitlement to unemployment benefits for certain groups in the eighties and comes up with relatively strong negative effects on the hazard..[11] Compared to the latter study, my estimation results seem to imply a smaller eligibility effect, which could be due to differences in model specification, and a modest positive effect of the level of unemployment benefits on the duration of unemployment

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[10] In some of the mentioned studies the levels of unemployment benefits and of a wage variable are included as separate regressors. Based on standard likelihood ratio tests the restriction of numerical equality of the coefficients on the log-levels of unemployment benefits and the net wage in the previous job implied by the specification of the log replacement ratio in the present study could not be rejected (at the 5 % significance level) neither for males nor for females.

[11] Zimmermann (1993: 232) summarizing previous work concludes: 'In sum, there is not much evidence that would confirm the hypothesis that the German system of unemployment compensation causes unemployment by creating disincentives to work".

5 Conclusions

The empirical results of this paper do not suggest a simple economic explanation for the persistence of long-term unemployment in West Germany after the severe economic recession in the early 1980s. In particular, the preceding analysis has shown that individual re-employment probabilities for males and the great majority of females do not decline with the duration of unemployment, as some popular hypotheses on human capital decay and screening effects associated with long-term unemplomyent suggest. Empirically, both for males and females unobserved population heterogeneity can be characterized by three heterogeneity group. Even after taking a large number of explanatory variables into account, differences in unobserved factors substantially affect individual hazard rates from unemployment. For West German males the estimation results suggest that negative duration dependence in the hazard rate from unemployment is the result of a sorting process due to unobserved individual effects and can therefore not be interpreted in a causal sense. For a small minority of females, I have found evidence for negative duraton dependence in the transition rate into employment, whereas for the majority of unemployed females this rate increases with duration. Overall the hazard rate from unemployment for females is much lower than for males, resulting in a considerably higher share of long-term unemployed women. Long-term unemployment among females would be much higher still, did they not (temporarily) withdraw from the labour force after having been unemployed for a relatively long period of time.

Some of the analyzed explanatory variables could partially explain the increase in long-term unemployment. Females with higher occupational qualifications and previous prolonged work experience, whose share in the labour force has increased during the eighties, are less inclined to (temporarily) withdraw from the labour market in case of being affected by unemployment. The increase in the number of unemployed entering the labour market for the first time who are less likely to find employment has probably contributed to long-term unemployment among males. Long-term unemployment among single mothers with small children and elderly males can partly be explained by changes in social policies in the eighties. On the other hand, in a recession firms can discharge workers who are in normal times protected by special employment regulations, especially older and disabled employees, who, for this very reason, will be the last ones to be rehired in the ensueing economic upswing.

Even more difficult than to come up with a simple explanation for the persistence of long-term unemployment is to answer the question what labour market policy can do to reduce it. A conclusion one could draw from the preceding results is that policy instruments should be targeted more closely on particular groups characterized by low re-employment probabilities from the very beginning of their unemployment spell; especially older male employees, foreigners, the disabled, and those with no previous work experience. With respect to the effect of unemployment benefits on

long-term unemployment, which has recently been on centre stage of heated policy debates in Germany, my estimation results show that eligibility to unemployment benefits does indeed increase long-term unemployment substantially for males and females. However, marginal reductions of the income replacement ratio, as recently enacted in Germany, will not have much of an effect on long-term unemployment.

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