The geographical mobility of unemployed workers. Evidence from West Germany

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Abstract

Using a competing-risk framework of exiting unemployment to jobs in a local or a distant labor market area, this paper investigates whether unemployed individuals in West Germany choose search strategies that favor migrating out of declining regions. Moreover, the paper investigates how such search strategies are affected by the local accommodation of labor market programs. Such programs have been suggested to lead to a regional locking-in effect. Empirical results are obtained from a stratified Cox partial likelihood proportional hazards model that allows for location-specific fixed effects. Estimation results are compared to estimates from a parametric log-logistic hazard model that takes account of unobserved individual heterogeneity. The findings indicate that unemployed in West Germany are responsive to local labor conditions and are more likely to leave regions with a tight labor market situation. No locking-in effect from labor market programs is found. The probability of migration is found to increase with search time.

Keywords: interregional mobility, unemployment duration, competing-risk, active labor market policy, unobserved location-specific heterogeneity

JEL classification: J62, J64, R23

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1 Introduction

It has often been argued that interregional mobility[1] plays a crucial role in equilibrating regional disparities in regional unemployment and wage levels. The underlying notion is that unemployed workers leave depressed regions in order to find employment in regions that offer better employment prospects. For the US, Blanchard and Katz (1992) find this adjustment mechanism to be quite effective. In European countries, including Germany, however, interregional labor mobility lacks behind the mobility levels in the US, Canada, Japan and Australia (Eichengreen 1991, Braunerhjelm 2000). More importantly, even though unemployment and wage differences are important factors in determining migration in Europe (Parikh and Leuvensteijn, 2002), recent findings suggest that the elasticities of aggregate migration flows with respect to unemployment and wage differentials are lower than in the US (Puhani, 1999). Möller (1995) examines regional adjustment dynamics in Germany and finds interregional migration to play a major role in the adjustment processes after an adverse regional employment shock. However, compared to the findings by Blanchard and Katz, he finds adjustment processes to take much longer so that regional disparities tend to be fairly persistent (see also Decressin und Fatas, 1995 and Martin, 1998).

The effectiveness of migration as an equilibrating mechanism ultimately depends on migratory decisions at the individual level. In particular, given the high level of unemployment in Germany, the willingness and ability of unemployed workers to seek employment in more prosperous and to migrate out of depressed regions is of central concern if migration is supposed to be an effective means of equilibrating regional disparities. Recent empirical evidence on internal migration in West Germany is rather mixed. Decressin (1994) looks at migration flows between West German states and finds that these flows tend to go from high to low unemployment regions. In contrast, a recent study by Windzio (2004) examines the determinants of individual mobility between south and north Germany within a hazard model framework and suggests that higher local unemployment levels in fact reduce migration probabilities. However, these studies do not focus explicitly on the group of unemployed, but look at labor mobility in general. Yet, the migratory behavior of unemployed jobseekers, is likely to differ from employed individuals.

Therefore, this study explicitly focusses on the migratory behavior of unemployed jobseekers. In particular, the main purpose of this paper is to investigate whether unemployed workers in Germany choose search strategies that favor migrating out of depressed regions with unfavorable re-employment opportunities. In addition, the paper investigates whether the extensive local use of active labor market policies (ALMP)[2] reduces interregional mobility among unemployed

[1] Throughout this paper, migration and interregional mobility are used synonymously.

[2] In Germany, ALMP have been an increasingly important policy instrument since the 1970s. During the late 1990s, the federal labor office spent around 30 % of total expenditures on ALMP (Caliendo et al. 2003).

individuals. This has been suggested by some recent Scandinavian studies (Westerlund 1997 and 1998, Fredriksson 1999). The underlying notion of such a locking-in effect is that unemployed individuals may postpone or avoid moving by entering labor market programs such as work creation schemes or training programs. In Germany, there has been an increasing interest in the evaluation of the job-finding chances of participants in such programs (e.g. Bergemann and Schultz 2000, Bergemann et al. 2000, Caliendo et al. 2003) as well as in the macroeconometric evaluation of the effect of ALMP on the matching efficiency (e.g. Hagen and Steiner 2000, Hujer et al. 2002). This paper is the first study in the German context that looks at the effect of ALMP on interregional mobility.

This paper analyzes migratory behavior of unemployed jobseekers within a search-theoretic framework[3]. The unemployed jobseeker chooses an optimal search strategy by allocating search effort across different regional labor markets and by choosing region-specific reservation wages such that the present value of accepting a job at this wage level just equals the present value of continuing the job search. This optimal search strategy may change over the duration of unemployment. According to Bailey (1991, 1994), migration can be viewed as a strategy of last resort since jobseekers often consider migration only after local job opportunities have been exhausted. Thus, migration may become relatively more likely with increasing search time. Due to this dynamic character of job search, Goss and Schoening (1984) argue that a binary choice model of migration that does not control for unemployment duration may be biased due to this unobserved heterogeneity. Since regional unemployment rates and regional average unemployment durations tend to be related, this may explain why studies that do not take account of unemployment durations show mixed results with regard to the effect of regional unemployment rates on migration probabilities[4].

Therefore, recent research explicitly models migratory behavior of unemployed individuals within a hazard model specification of unemployment durations. By distinguishing between the competing-risks of exiting unemployment to different regional labor markets, this approach provides information on the actual search strategy of unemployed workers[5]. So far, there have been only few studies that apply a competing-risk hazard model to the analysis of interregional mobility.

One example is the Finish study by Kettunen (2002). Using a Gompertz proportional hazard model with gamma distributed unobserved individual heterogeneity, the findings do not

[3]For an overview of studies using spatial job search approaches see Herzog et al. 1993.

[4]Herzog and Schlottmann (1984) for the US and Tervo (2000) for Finland do find evidence that high regional unemployment encourages individuals to migrate out of the region. By contrast, UK studies by Pissarides and Wadsworth (1989) and Hughes and McCormick (1994) suggest that regional unemployment even discourages mobility during the 1970s and 1980s.

[5]A similar line of argumentation for choosing a competing-risk framework to analyze inter-sectoral mobility can be found in Fallick 1993.

indicate any significant effect of local labor demand on the migration hazard, i.e. the hazard of finding employment via residential mobility. Using a Cox proportional hazards model, the US study by Yankow (2002) finds higher employment and wage levels to significantly reduce the migration hazard, while the unemployment rate and regional employment growth do not exert any significant influence.

In the German context, the only paper that uses a hazard model framework for the analysis of interregional mobility between north and south Germany is the paper by Windzio (2004). Using a single- risk specification, he examines which factors affect the duration until moving to the other part of the country. His findings suggest that higher local unemployment levels lower the migration hazard. However, as previously mentioned, his study sample is not restricted to unemployed individuals, but also includes employed individuals as well as individuals who are out of labor force.

In order to explicitly examine the determinants of interregional mobility of unemployed individuals in a framework that takes account of the possible duration dependence of the mobility decision, this study follows the recent research direction and applies a competing risk hazard model to the analysis of interregional mobility of unemployed individuals in West Germany. The analysis is based on the IAB employment subsample regional file. This register data set is well-suited for the proposed analysis because due to its sample size even relatively rare events of interregional mobility are observed in sufficient numbers to analyze migratory behavior of unemployed individuals. In particular, using more than 80.000 unemployment spells, this data set allows for separate estimations for different sub-groups in order to test whether search strategies differ significantly between men and women as well as between high-skilled and low-skilled individuals. I estimate a competing-risk proportional hazard model of unemployment durations using the Cox partial likelihood estimator (Cox, 1972). In order to take into account unobserved location-specific heterogeneity, the study uses a stratified partial likelihood estimator (Ridder and Tunali, 1999). For comparison, the paper also estimates a log-logistic accelerated failure time model that takes into account both location-specific fixed-effects and unobserved heterogeneity at the individual level.

The findings indicate that individuals choose search strategies that favor leaving local labor markets with a relatively tight labor market situation compared to other regional labor markets. Moreover, this responsiveness to local labor market conditions is more pronounced for men as compared to women and for high-skilled as compared to low-skilled individuals. In contrast to the Scandinavian literature, however, the local accommodation of labor market programs does not exert any significant locking-in effect.

The outline of the paper is as follows. The next section introduces a model of job search across space. Data and some institutional background will be discussed in section 3. Section 4 presents the econometric approach employed in this study. Estimation results are discussed in

section 5. Section 6 concludes.

2 A search model with search across space

The theoretical framework closely follows Damm and Rosholm (2003) who develop a search-theoretic approach in which unemployed workers seek employment across two regional labor markets $k = l, d$ (local and distant). The following framework is a simplified version of their approach because I do not consider the effect of place utilities of different residential locations in the decision process.

In this framework, individuals are allowed to search simultaneously across these two labor markets [6]. Jobseekers are risk-neutral and maximize the expected present value of job search $V^u(t)$, discounted to the present over an infinite horizon at rate ρ. An individual is assumed to keep a new job forever. Wage offers from each labor market are drawn from known distributions $f_l(w,t)$ and $f_d(w,t)$. The likelihood that an individual receives a wage offer from one of the two labor markets is given by $\alpha_k(e_k,t)$. This probability is an increasing and concave function of the search effort allocated to each regional labor market e_l and e_d with $\sum_k e_k = 1$. For a given search effort, the likelihood to receive a wage offer may differ across regions due to differences in the exogenous conditions on these labor markets (e.g. regional labor demand).

Searching the two labor markets comes with search cost $c(\sum_k e_k)$ with c satisfying $c' > 0$ and $c'' < 0$. The reservation wage and the allocation of search effort across k constitute the search strategy of the unemployed jobseeker. He chooses the search strategy that maximizes the expected present value of search $V^u(t)$:

$$\begin{aligned}\rho V^u(t) &= b(t) - c(\sum_k e_k, t) \\ &\quad + \alpha_l(e_l,t) \int_{w_l^r(t)}^{w_{max}} (w - w_l^r) f_l(w,t) dw \\ &\quad + \alpha_d(e_d,t) \int_{w_d^r(t)}^{w_{max}} (w - w_d^r) f_d(w,t) dw\end{aligned}$$

This flow value of being unemployed is equal to the sum of four components: the value of unemployment $b(t)$ (e.g. transfer payments), the cost of searching the two labor markets, the expected surplus of a local job times the probability of receiving a job offer locally and the expected surplus of a distant job that involves interregional residential mobility times the probability of receiving a job offer in this market.

[6] This is a generalization of the systematic search literature that considers the job searcher to sequentially sample regions, firms or sectors according to the expected returns from searching on these sub-markets (see Salop, 1973, McCall and McCall, 1987)

At the reservation wage w_k^r, the value of being employed at this wage, $V^e(w_k^r, t)$, just equals the value of continuing search $V^u(t)$. The present value of accepting a local job offer at the reservation wage is:

$$\rho V^e(w_l^r, t) = w_l^r(t)$$

Since accepting a job offer from a distant labor market necessitates residential mobility and thus causes permanent mobility costs m[7], the value of accepting a job offer from a distant labor market at the reservation wage is:

$$\rho V^e(w_d^r, t) = w_l^r(t) + m = w_d^r(t)$$

It follows that

$$\begin{aligned} w_l^r(t) &= \rho V^u(t) \\ w_d^r(t) &= \rho V^u(t) + m \end{aligned}$$

Comparative statics suggest that reservation wages for both local and distant jobs increase with improving job offer arrival rates or improved wage offer distribution anywhere in the economy (see Damm and Rosholm 2003 for a formal exposition). Also, reservation wages for both markets increase with unemployment benefits and decrease with increasing search costs. Note, that the reservation wage for a job that requires a residential move exceeds the local reservation wage by the costs of moving m. Since moving costs differ across individuals according to the distribution $f(m)$, individuals with high moving costs are less likely to accept a job offer from a labor market that involves mobility than others.

Besides determining the reservation wages for both markets, the job searcher endogenously and dynamically allocates search effort across the two labor markets. A similar theoretical framework for the allocation of search effort across industrial sectors has been developed by Thomas (1998). Intuitively, the allocation of search effort across k is chosen to equalize the marginal benefits of search in the two markets R_k with its marginal cost. Put differently, if at a given search strategy, the marginal benefit of searching locally exceeds the marginal benefit of searching the distant market, it pays off to shift search effort towards the local labor market. Formally, we can write:

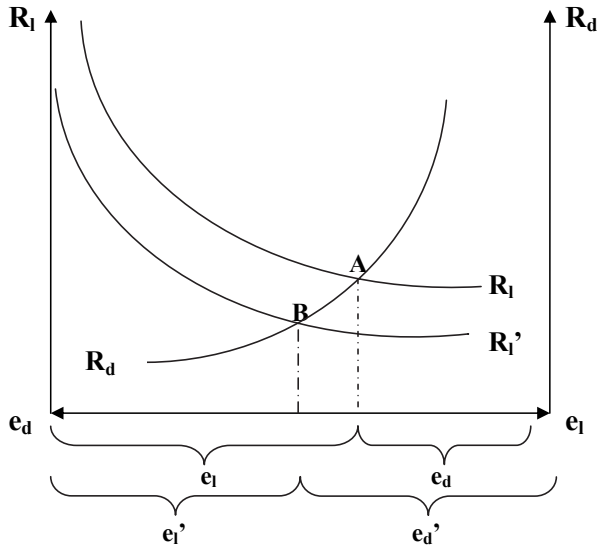
$$\begin{aligned} c'(\sum_k e_k^*, t) = R_l(e_l^*, t) &= R_d(e_d^*, t) \\ \text{with } R_k(e_k^*, t) &= \alpha_k'(e_k^*, t) \int_{w_k^r(t)}^{w_{max}} (w - w_k^r) f_k(w, t) dw \end{aligned}$$

[7]This is a reasonable assumption if moving to a new residential location also involves psychological costs that are unlikely to be of the lump-sum type

with e_k^* denoting the optimal search effort and R_k denoting the marginal return of searching in region k.

Figure 1 thus demonstrates how the allocation of search effort across two markets reacts to changing exogenous conditions. It shows the marginal return of searching the local and the distant labor market which both decline with search effort. In $t = 1$, search effort is slanted towards the local labor market. Even if both labor markets have equivalent offer arrival rates and wage distributions, this may be a typical situation due to the moving costs involved. In $t = 2$, conditions in the local labor market deteriorate so that job offer arrival rates in the local labor market decline. As a consequence, R_l shifts towards the left. At the given search strategy, the marginal return for searching the distant labor market now exceeds the marginal return of searching the local market. As a result, search effort shifts towards the distant labor market until marginal returns in both markets equate again in B.

Figure 1: The allocation of search effort across two labor markets



The probability that an individual i with characteristics x who is unemployed at the beginning of period t makes a transition to employment in k during this period is now given by the probability of finding a vacancy in k, the probability of being offered the job and the probability of accepting it:

$$h_k(t, x_i) \quad = \quad \alpha_k(e_k^*, t) * [1 - F_h(w_k^r(t, x_i); x_i)]$$

It follows that the local job-finding hazard $h_l(t, x_i)$ and the migration hazard $h_d(t, x_i)$ indirectly depend on the job offer arrival rate and the wage distribution in all labor markets by affecting the worker's search strategy. Based on this framework, we may now derive the following main

hypotheses to be tested regarding the effect of local labor market conditions and local active labor market policies on the migration and the local job-finding hazard:

1. Local labor market conditions influence the migration probability by affecting the search strategy. Unfavorable local job-finding opportunities in the local labor market compared to other labor markets shift search effort towards other regional labor markets and increase the migration hazard.

2. Entering a labor market programme may serve as a substitute for regular employment[8]. In regions with a high level of accommodation through labor market programs, unemployed jobseekers anticipate a future program participation. This tends to increase the expected value of unemployment and thus increases the reservation wage in both the local and the distant labor market. As a consequence, both the local job-finding hazard and the migration hazard decline. Moreover, since participating in such programs is a possibility to avoid or postpone moving, individuals may also shift search effort to the local area in order to find such a program. This further reduces the migration hazard.

3 Data

3.1 The IAB employment subsample 1981-1997 - regional file

The analysis is based on the IAB employment subsample 1981-1997 - regional file (IABESR) which is described in detail in Bender et al. (2000). This register data set is well-suited for the proposed analysis of interregional mobility because due to its sample size, even relatively rare events of interregional mobility are observed in sufficient numbers to analyze migratory behavior of unemployed individuals. In particular, the IABESR contains spell information on a 1 % sample of the population working in jobs that are subject to social insurance payments. As a consequence, the sample does not represent individuals who are not subject to social insurance contributions such as self-employed individuals and life-time civil servants. For West Germany, the sample includes spell information on about 500,000 individuals for whom employment histories can be reconstructed on a daily basis including the micro-census region of the workplace. In addition, the data contains spell information on periods for which the individual received unemployment compensation from the federal employment office (*Bundesagentur für Arbeit*) such as unemployment benefits UB (*Arbeitslosengeld*), unemployment assistance UA (*Arbeitslosenhilfe*) and maintenance payments during further training MP (*Unterhaltsgeld*).

[8]This is a reasonable assumption since during the period under study participating in such programs was paid similar to a regular job and also renewed the entitlement period for unemployment transfer payments just as a non-subsidized job did (see German labor promotion act (Arbeitsförderungsgesetz)).

Unfortunately, these information do not allow for identifying periods of registered unemployment. This is because UA is means-tested and thus only applies to a selective group of individuals who lack other financial resources such as, for example, spouse income. As a consequence, it is not possible to distinguish between those who have left the labor force and those still unemployed but not receiving any unemployment compensation since both of these states are unobserved in the IABESR. Therefore, it is necessary to define proxies for unemployment. Fitzenberger and Wilke (2004) introduce two extreme benchmarks, unemployment between jobs (UBJ) and non-emploment (NE) which cover a lower and an upper bound of unemployment. Since these definitions may be too extreme for the purpose of this analysis, I choose a definition of unemployment that lies in between these two benchmarks and which has been introduced previously by Lee and Wilke (2005). They define unemployment as unemployment between permanent income transfers (UPIT). Accordingly, unemployment encompasses all periods of continuous transfer receipt after an employment spell. Gaps between periods of transfer receipt may not exceed 4 weeks (in the case of suspension[9] up to 6 weeks). The unemployment spell is considered right-censored if the last spell observed involves unemployment compensation or if the gap between the end of transfer receipt and the beginning of employment exceeds 4 weeks. This last restriction tends to treat spells of long-term unemployed as censored, but at the same time censors spells of individuals who are no longer actively seeking employment.

Another drawback of the data that has to be mentioned is that it is not possible to distinguish between exits to employment and exits to a labor market program. As a consequence, job-finding hazards also include program participation hazards. Therefore, the effect of local labor market programs on the local job-finding and the migration hazard need to be interpreted with some care. Unlike other studies that examine the effect of participating in such programs on the migration hazard, the data structure of the IABESR only allows for examining the effect of the level of local accommodation with such programs on the search strategy of the unemployed jobseeker prior to entering such programs.

I restrict the analysis to West German[10] unemployment spells starting between 1982 to 1995. In addition, I only include individuals aged 26 to 41 years at the time of job loss. These restrictions ensure that the sample is rather homogenous with respect to the institutional framework in which these individuals act (see Lüdemann at al. 2004). Applying the above unemployment definition, these restrictions yield a sample of 88.699 unemployment spells. Due to missing data in major variables such as the workplace location, educational background, marital status and the sector of activity in the previous job, the final sample is further reduced

[9]Unemployment compensation may be temporarily suspended if an unemployed worker rejects an acceptable job offer (*Sperrzeiten*).

[10]I exclude unemployment spells from West Berlin because the geographical location of Berlin suggests that interregional mobility patterns may not be analyzed without the East German surrounding.

to 80.360 unemployment spells. 27.7 % of these unemployment spells are right-censored.

The IABESR includes information on the micro-census region of the workplace so that comparing the workplace location of the old and the new employer allows for identifying interregional mobility. However, the location of the last workplace is simply carried over to the subsequent unemployment spell so that the regional identifier of an unemployment spell does not contain any information on the actual whereabouts of the unemployed individual during this unemployment period. As a consequence, it is not possible to distinguish between migration that is induced by a successful job match (contracted migration) and mobility prior to finding a job in order to seek employment in a different local labor market (speculative migration). Analyzing interregional mobility based on the IABESR thus always refers to both speculative and contracted mobility[11]. I define interregional mobility as movements between extended labor market regions (LMR), i.e. movements between LMRs that are not located adjacently[12]. LMRs comprise typical daily commuting ranges such that for the majority of individuals the workplace is located within the LMR. Therefore, finding employment outside the extended LMR should usually necessitate residential mobility. In West Germany, there are 180 labor market regions (LMR) that lump together 270 micro-census regions. Among the 80.360 unemployment spells, 63.6 % exit to a local job within the extended local labor market region and 8.7 % exit to a job in a distant labor market region.

3.2 Covariates

Individual-level covariates used in the subsequent analysis include age, marital status, formal education, previous job status and previous sector of activity. These indicators are included in the IABESR. Unfortunately, the data set does not include several important determinants of mobility. In particular, home ownership and other household-related variables are either missing or unreliable. Clearly, the lack of household-related variables is a major drawback of the data set. On the other hand, the data structure of the IABESR allows for constructing covariates regarding the employment history of the unemployed jobseeker. Such indicators may help to capture some heterogeneity across individuals regarding their productivity, but also regarding their mobility cost.

In particular, I include previous wage income because having the necessary resources to migrate may be an important determinant of mobility. Additional covariates such as tenure in the previous job held and an indicator of whether someone has been recalled from his previous employer may capture individual heterogeneity in the attachment to the local area. An extended job tenure may be expected to have a negative effect on the migration hazard because a long

[11] According to Molho (1986) contracted migration is much more common in Europe than speculative migration

[12] Extended LMRs comprise areas with a 50 to 80 km radius.

job tenure stands for a long duration of residential immobility. Similarly, having been recalled from the previous employer may increase someone's local attachment due to waiting for another future recall.

In addition, I use an indicator of whether an individual has previously been unemployed and the total previous unemployment duration. Previous unemployment may actually help in finding re-employment in the local area due to previous experiences with job placement agencies etc. that increase the efficiency of local job search. Total previous unemployment duration, however, is likely to reduce both the job-finding and the migration hazard due to a depreciation of human capital and possible stigma effects that both tend to reduce general job-finding chances.

Several regional indicators have been added to the micro data set in order to test the main hypotheses that have been developed in the previous section[13]. Data sources include the federal labor office[14] and the New Cronos database that is released by Eurostat. In addition, several indicators have been calculated based on the IABESR itself. Table 1 gives the exact definition and data sources of all regional and aggregate variables. All regional indicators have been aggregated to the level of labor market regions. These regional entities are likely to be the most relevant for the job search behavior of unemployed jobseekers.

In particular, the analysis uses several **regional indicators** that capture local re-employment opportunities. According to the theoretical framework, a local labor market with unfavorable job finding chances should be associated with a high migration hazard. Since local job finding chances hinge on the local labor demand situation, I include the **unemployment-vacancy ratio** (uv-ratio) as an indicator of local imbalances between labor supply and labor demand. A high number of jobseekers per vacancy should lower the local job-offer arrival rate and reduce the reservation wage in all labor markets. If the direct negative effect outweighs the indirect positive effect due to a reduction of the reservation wages, the local job finding hazard is expected to be lower in regions with a high uv-ratio. Such a tight local labor market situation should shift search effort towards other regions if the labor demand situation in other regions is even worse. Therefore, I also use the **relative uv-ratio**, i.e. the local uv-ratio divided by the uv-ratio in all other regions, as an important covariate to be tested in the estimation. Individuals in a relatively tight labor market compared to other regional labor markets should

[13]Many thanks to Ralf Wilke and Tobias Hagen who were very helpful in collecting these data.

[14]Data from the federal labor office (FLO) is coded at the level of FLO districts (*Arbeitsamtsbezirke*. Since there is no exact merging rule available to merge data between FLO districts and the micro-census regions that are used in the IABESR, Arntz and Wilke (2005) develop various merging rules for these two regional entities based on a digital map intersection. They test the sensitivity of estimation results with regard to the merging rule applied and find estimation results to be very robust. For this analysis, a simple area weight has been used to merge regional data with the IABESR. According to Arntz and Wilke (2005) the choice of merging rule should not significantly affect the estimation results.

choose search strategies that favor migrating out of the region.

In order to test whether an extensive local use of labor market programs leads to a locking-in effect of unemployed jobseekers, I use the **WCS accommodation ratio**, i.e. the ratio between the number of individuals in work creation schemes (WCS) and the number of individuals who are either unemployed or participating in such programs, as an indicator of the local accommodation of labor market programs. Unfortunately, a time series encompassing the years between 1982 and 1995 is only available for work creation programs but not for training programs (TP) which are much more prevalent in West Germany than WCS[15]. On the other hand, regions with a high WCS accommodation ratio tend to have a high TP accommodation ratio so that using the WCS accommodation ratio may proxy for the local accommodation of labor market programs[16]

In addition, I use several regional indicators to control for further differences between local labor markets. In particular, I control for the sectoral composition, the share of all unemployed who are male, the population-job density as well as for regional employment growth and regional labor turnover.

From a theoretical perspective, higher **employment growth** and higher **labor turnover** in the local area are expected to shorten unemployment durations in the local labor market area and to reduce the migration hazard. In particular, higher labor turnover at a given imbalance between labor supply and labor demand should lead to higher job offer arrival rates and thus increase the local job finding hazard if the direct positive effect outweighs the negative indirect effect of higher reservation wages. Regarding employment growth, increasing employment opportunities may improve local job finding chances and may thus relieve pressures on the local labor market. Such favorable local labor market conditions should shift search effort towards the local area and should thus discourage migration.

The **population-job-density** measures the number of residents per job. This indicator reflects some structural differences between local labor markets. In particular, a low population-job density is likely to prevail in urban job centers where the net flow of commuters to and from the region is positive. In such employment centers, local job search is likely to generate more job offers so that a lower population job-density should be associated with a lower migration hazard.

A high **share of male unemployed** typically prevails in regions with structural problems in male-dominated industries such as, for example, old-industrialized regions in North-Rhine Westphalia and Saarland. On the one hand, this should decrease the local job-finding chances,

[15]In 1997, almost 270.000 persons entered training programs, while around 75.000 persons entered work creation schemes in West Germany (Caliendo et al. 2003)

[16]For the years for which both WCS and TP are available on a disaggregated level, the correlation coefficient is around +0.5.

especially among men, and thus increase the migration hazard. On the other hand, unfavorable employment chances for the male breadwinner may also result in the lack of financial resources that are necessary for residential mobility.

At the aggregate level, the total **aggregate hiring rate** is used to control for the macroeconomic situation. According to Jackman and Savouri (1989), interregional job matching is more likely during macroeconomic booms with high aggregate hiring rates. Therefore, during economic recessions, lower migration hazards may be expected.

Summary statistics of all covariates used in the analysis are shown in table 2 and 3 in the appendix.

4 Econometric specification

4.1 A stratified Cox proportional hazards model

The econometric analysis focuses on two competing hazard rates, the hazard of finding a job within the extended LMR (h_l) and the hazard of finding a job in a distant LMR (h_d), i.e. the migration hazard, as a function of time spent in unemployment. Since the focus of the analysis is on the effects of regional covariates on the migration hazard and not on the shape of the hazard function, a competing-risk form of the semi-parametric Cox proportional hazard model (Cox, 1972) seems to be an appropriate choice for the proposed analysis. A clear advantage of the semi-parametric Cox estimator compared to parametric specifications is that the baseline hazard is specified fully flexible. This avoids any biases that result from misspecifying the shape of the baseline hazard in parametric specifications.

Assuming that the two competing risks are independent conditional on all covariates included in the model[17], the exit-specific hazard rate of the Cox proportional hazard model for individual i may be written as

$$h_k(t_i|x_i) \quad = \quad h_k(t_i)exp(x_i(t)\beta_k)$$

where t_i is the elapsed duration of unemployment for individual i, $h_k(t)$ is the exit-specific baseline hazard with $k = d, l$ and $x_i(t)$ is a vector of both time invariant and time-varying covariates. β_k is the vector of parameters of interest. An important assumption underlying any proportional hazards model is that covariates shift the baseline hazard in a proportional manner. Using the above specification, estimation results may be biased due to unobserved

[17]This is a critical assumption since estimation results will only be consistent estimates of the true parameters if all relevant decision variables of whether to stay in the region or not are included in the model (see Gangl, 2004). Since a number of important variables for the migration decision is missing in the specification such as home ownership or number of children, future research needs to take a closer look at the robustness of results when this assumption is relaxed.

individual and unobserved regional heterogeneity. Therefore, I modify the above specification by estimating a fully flexible baseline hazard for each local labor market (LMR) j. This stratified Cox partial likelihood estimator (SPLE) removes any biases that result from unobserved, time-invariant characteristics of the local labor market region (LMR). A competing-risk form of the SPLE may be written as:

$$h_{kj}(t_{ij}|x_{ij}, \nu_j) \quad = \quad h_{kj}(t_{ij}, \nu_j) exp(x_{ij}(t_{ij})\beta_k)$$

with t_{ij} as the duration of unemployment of the ith individual in the jth LMR. $h_{kj}(t_{ij}, \nu_j)$ is the baseline hazard in LMR j and is allowed to depend on an unobserved location-specific fixed effect ν_j. This nuisance parameter along with the baseline hazard cancels out of the likelihood function. The possibility to remove stratum-specific fixed effects has already been discussed by Kalbfleisch and Prentice (1980) and Chamberlain (1985). Ridder and Tunali (1999) discuss the conditions under which such an approach is appropriate when using time-varying covariates. In particular, covariates have to be weakly exogenous, i.e. an explanatory variable x_t may not depend on observed exits from unemployment in the same labor market region in period $\tau \geq t$. This exogeneity condition may be problematic for some regional indicators if the exit of an unemployed individuals is likely to affect, for example, the uv-ratio. Therefore, I use lagged variables for those regional indicators for which such an endogeneity issue is likely to arise (see table 1).

Throughout the subsequent sections, model specification A refers to a Cox partial likelihood estimator that is stratified by labor market region. The corresponding inference is based on robust standard errors that take into account the clustering of individuals within labor market regions (see Lin and Wei, 1989). Otherwise, standard errors of covariates at the regional level may be biased downward (Moulton, 1990).

4.2 Log-logistic accelerated failure time model

One major caveat of the proposed estimation strategy is that it does not take into account unobserved heterogeneity at the individual level. Thus, a pure sorting effect may result in negative duration dependence and parameter estimates may be biased (Lancaster, 1990). Therefore, as a robustness check, I also estimate a parametric accelerated failure time (AFT) model that models the unemployment duration of an individual i as

$$log(t_i) \quad = \quad \beta x_{ij} + u_i$$

with u_i having density $f(.)$. Since descriptive evidence regarding the shape of the hazard function suggests a non-monotonic shape that initially rises and declines afterwards, I use the log-logistic density with shape parameter γ because it allows for a non-monotonic shape

of the hazard function. Moreover, it allows for incorporating unobserved heterogeneity as a multiplicative factor in the hazard rate, i.e. $h(t|\alpha) = \alpha h(t)$. The frailty term α is assumed to follow a gamma distribution with expectation one and variance θ. In my analysis, the individual frailty α takes into account that individuals may have multiple unemployment spells. Moreover, I include labor market dummies in order to take account of location-specific fixed effects[18]. Throughout the subsequent sections, model specification B refers to the AFT log-logistic model that takes into account unobserved heterogeneity at the level of individuals as well as location-specific fixed-effects. Unlike model specification A, this specification does not take into account that individuals are clustered in labor market regions. Thus, standard errors of covariates at the regional level may be biased downward (Moulton, 1990).

4.3 Marginal effects on interregional mobility

When estimating an independent competing-risk hazard model with separate parameter vectors β_k, the parameter vector for the migration hazard β_d may not be interpreted as the qualitative effect of covariates on the migration probability. In particular, if the estimated effect of covariate x_i is negative for both h_d and h_l, the qualitative effect on the migration probability might even be positive. This is because the likelihood of exit via a specific type of exit depends on covariate estimates for all exit-specific risks (Lancaster, 1990; Thomas, 1996). In particular, the probability that an unemployed with characteristics x leaves unemployment for a job in a distant labor market, i.e. the migration probability is given by

$$\Pi_d(x) = \int_0^t h_d(t,x)S(t,x)dt$$

with $h_d(t,x)$ as the migration hazard and $S(t,x)$ as the overall survival function. Thus, the migration probability is also a function of the covariate parameter for the local job-finding hazard. As a consequence, one possibility to interpret the effect of a covariate on the migration probability is to look at the marginal effect of a covariate on $\Pi_d(x)$:

$$\kappa_d = \frac{\partial \Pi_d(x)}{\partial x_i}$$

I simulate these marginal effects for both model specifications by calculating the difference between the probability $\Pi_d(\bar{x})$ for a reference worker[19] and the respective probability after varying the x_i of interest. Due to the stratification technique in model specification A, I obtain separate simulated marginal effects for each local labor market region. In this case, I calculate

[18]The difference to the stratification technique is that the inclusion of labor market dummies only allows for estimating separate intercepts for each labor market, while the stratified model estimates separate baseline hazards for each stratum in a fully flexible way.

[19]The reference worker always refers to an individuals with all dummy variables set to the reference category and all continuous varibales set to the average value (see table 2).

the average marginal effect across all strata $\bar{\kappa}_d$ by averaging across all j labor market specific marginal effects κ_{d_j}[20]..

One confusion in the competing-risk literature on interregional mobility is that the shape of the migration hazard is often interpreted as the probability of migration across search time. However, the probability of exiting to a specific exit type in a competing-risk framework always depends on all exit-specific hazards. Thus, in order to interpret the relationship between mobility and search duration it is more informative to look at the probability of migration conditional on exiting at time t. This conditional probability $P_d(t)$ is a function of time t and may be written:

$$P_d(t,x) = \frac{h_d(t,x)}{h_d(t,x) + h_l(t,x)}.$$

For a given individual with characteristics x_i, the shape of this function gives us an idea about the relative importance of exiting to a distant compared to a local job. For the proportional hazards model the conditional migration probability for a reference worker is given by:

$$P_d(t) = \frac{h_{0d}(t)}{h_{0d}(t) + h_{0d}(t)}.$$

with $h_{0k}(t)$ being the baseline hazard for exit type k. Thus, the conditional migration probability only depends on the shape of both exit-specific baseline hazards.

5 Estimation Results

Table 4 and 5 contain estimation results for the local job finding and the migration hazard for males and females, respectively. Each table contains coefficient estimates from both models A and B. According to the clustering test statistic proposed by Ridder and Tunali (1999), the inclusion of labor-market specific strata in model A is highly significant. Thus, parameter estimates of an unstratified Cox regression may have an additional bias and are therefore not displayed. Also, since for the AFT log-logistic model unobserved heterogeneity across individuals is highly significant for both men and women, I only display results from the model with individual heterogeneity[21]. Note that the interpretation of the coefficients is reversed when

[20] Alternatively, I estimated an unstratified Cox proportional hazards model in order to get a single marginal effect. I included dummies for labor market regions in order to capture location-specific fixed effects. However, the clustering test statistic proposed by Ridder and Tunali (1999) suggested that the stratified specification with fully flexible baseline hazards for each stratum is significantly better than the unstratified estimation including only proportional shift-factors for each labor market region. Therefore, I decided to average marginal effects across strata instead of reporting the marginal effects of the unstratified model.

[21] Estimation results for the AFT log-logistic model without individuals heterogeneity and the unstratified Cox proportional hazards model may be obtained from the author upon request.

comparing the results to model A, i.e. a positive (negative) coefficient decreases (increases) the hazard rate and thus lengthens (shortens) the unemployment duration. The third and sixth column shows the marginal effect on the likelihood of interregional mobility within three years of job search[22] corresponding to model A and B. Since the findings are quite robust across both specifications, I discuss findings based on model A if not stated otherwise.

5.1 Mobility effects of individual-level covariates

Even though the focus of this analysis clearly lies on the effects of labor market related characteristics on the migration hazard, there are some effects of individual-level characteristics that seem to have a strong influence on mobility.

Formal education, for example, has a strong influence on both the local job finding and the migration hazard for both males and females. Having only a high-school degree compared to a vocational training significantly reduces both hazards and thus leads to longer unemployment durations. This is in line with findings from a single-risk specification of unemployment durations by Lüdemann et al. (2004). The competing-risk approach in this paper now allows for identifying the marginal effect of being low-skilled on the probability of finding employment in a distant labor market. As expected, we find that a low level of formal education decreases the likelihood of mobility for men (women) by 2 (3) percentage points while a higher education increases the likelihood of being mobile by 4.1 (2.9). Compared to the reference worker with a probability of being interregionally mobile of 13.5% (13.0%), higher education thus leads to a 30.4% (22.9%) increase in the probability of being mobile for men (women). Thus, as expected, education is an important mobility-enhancing factor.

According to single-risk specifications of unemployment durations with the same data set (see Lüdemann et al. , 2004; Biewen and Wilke, 2004), higher previous wage income leads to shorter unemployment durations. The estimation results for the competing-risk model suggest that this effect is due to a higher migration hazard rather than due to a higher local job-finding hazard of individuals in higher wage quintile. The likelihood of leaving the local labor market region for a distant job even increases by more than 6 percentage points for both men and women. These effects even exceed the marginal effect of formal education. This finding is in line with a previous study by Windzio (2004) who finds a significant effect of previous wage income on the hazard of being mobile between north and south Germany. He suggests that previous wage income proxies for financial resources that are necessary to bear mobility cost. Apparently, having the necessary financial resources for mobility makes it possible to seek and accept employment elsewhere while this exit out of unemployment is not a feasible option for

[22]This time restriction is necessary to make results between both models comparable because for the Cox model there is no possibility to predict the probabilities beyond the last exit time of an individual in the sample.

less well-earning individuals who instead face prolonged unemployment durations.

The previous job status has a strong effect on search outcomes. White-collar worker and former apprentices, for example, are significantly more mobile than skilled blue-collar workers (the reference category). Female apprentices, for example, are almost 70% more likely to find employment in a distant labor market than someone who was previously working in a skilled blue-collar job. This suggests that previous educational investments such as an apprenticeship, increase the willingness to move to another region in order to realize the returns to this investment.

Interestingly, previous unemployment periods come with a lower probability of moving with a marginal effect of -2.9 for men and -1.5 for women. On the one hand, previous unemployment may have depleted financial resources that are necessary for interregional mobility. Secondly, having experienced repeated unemployed spells suggests an increased likelihood of future unemployment. These expectations may deter someone from a large mobility investment. Total unemployment duration, however, does not have a strong effect on the likelihood of interregional mobility, but leads to significantly longer unemployment durations. This is in line with findings by Biewen and Wilke (2004) for a single-risk specification of unemployment durations using the same data set and suggests that the length of previous unemployment aggravates general job-finding chances due to, for example, the depreciation of human capital.

Comparing the magnitudes of all marginal effects referring to individual-level covariates, having ever been recalled from the previous employer has the strongest marginal effect on the probability of interregional mobility. As expected, individuals who have experienced a recall lately, wait for another recall so that their search strategies tend to be concentrated on the local area. As a consequence, men (women) who have been recalled from their previous employer face a probability of being mobile that is less than half of that for their counterparts without such a recall.

Apparently, there are a number of individual characteristics that have a major influence on the likelihood of interregional mobility. Moreover, the findings are quite robust across both model specifications. Well earning, highly educated males and females who have never been unemployed nor recalled face the highest probability of being mobile. But how do local labor market conditions affect the search strategy of individuals with given characteristics?

5.2 Mobility effects of local labor market conditions

One major hypothesis to be tested is that individuals in local labor markets with unfavorable re-employment opportunities choose search strategies that favor migrating out of the region if the labor demand situation is more favorable in other regions. Indeed, the estimation results indicate that an the relative uv-ratio in other regions by one leads to a significantly higher

migration hazard among men, while the effect on the local job-finding hazard is negative and insignificant. Thus, better labor demand conditions elsewhere compared to the local area shift search effort towards other regions and consequently increases the probability of interregional mobility among men by a marginal effect of 2.5. For women, an unfavorable labor demand situation compared to other regions also comes with higher mobility levels. However, regional labor market conditions appear to be less important for women than they for men with a marginal effect of 1.4% only. Moreover, this mobility effect is due to a significant negative effect on the local job-finding hazard and not due to a significant positive effect on the migration hazard. Thus, for women the evidence is less clear-cut than for men. Still, we can conclude that contrary to the findings by Windzio (2004) regarding mobility between north and south Germany and in line with findings by Decressin (1994) on interregional migration flows in West Germany, men and to a lesser extent women in West Germany react to local labor market conditions and adjust search strategies accordingly. These findings are robust across both specifications with the marginal effects for model B being +1.6 for men and +1.3 for women.

When controlling for relative labor demand conditions, the ratio between unemployed jobseekers and vacancies in the local area has a negligible impact on mobility. In fact, both the local job-finding and the migration hazard are significantly lower in regions with a high uv-ratio. Thus, an overall increase in the imbalance between jobseekers and vacancies at given relative conditions between local labor markets significantly prolongs unemployment durations and does not affect interregional mobility levels. One explanation for this result might be that deteriorating overall labor demand conditions exert discouragement effects on unemployed individuals and thus lead to reduced overall search intensities.

From a theoretical perspective, it has been argued that higher employment growth and higher regional labor turnover increase the local job-finding hazard and result in search strategies that favor staying in the local labor market. Indeed, higher employment growth significantly increases the local job-finding hazard for both men and women. Yet, there is no significant effect on the migration hazard. Consequently, the negative effect of higher local employment growth on the probability of interregional mobility (marginal effect of -0.3 for both sexes) is mainly due to faster local job exits which may be a result of both a higher local job offer arrival rate and a shift in search effort towards the local area. However, since the negative effect on the migration hazard is insignificant, the evidence in favor of a change in the allocation of search effort across regions is inconclusive. Similarly, higher local labor turnover does not have a clear effect on an individual's search strategy. While for men, labor turnover does not exert any significant influence, for women, a higher local labor turnover significantly increases the local job finding hazard but does not affect the migration hazard. Again, there is no clear evidence that individuals in regions with higher local labor turnover shift search effort towards the local labor market region.

The above findings partially resemble and partially contradict the findings by other studies that use a competing-risk approach to the analysis of interregional mobility of unemployed jobseekers. The US study by Yankow (2002), for example, also finds no evidence that local employment growth affects the allocation of search effort across regions. Higher employment levels, on the other hand, significantly reduces the migration hazard. Yankow concludes that individuals in the US adapt search strategies to local labor market conditions. The findings in this paper confirm that West German jobseekers are also responsive to local labor market conditions. In particular, unfavorable local labor demand conditions relative to other regional labor markets have a significant and large impact on the probability of interregional mobility. In contrast, Kettunen (2002) does not find evidence that unemployed Finish jobseekers react to local labor demand conditions. However, he uses the local uv-ratio as an indicator only and does not test the influence of relative labor demand conditions in the economy.

Another major hypothesis to be tested in this paper concerns the effect of the local accommodation of labor market programs on the migration hazard and the probability of being mobile across regions. The theoretical framework in section 2 suggests that the anticipation of a possible participation in such programs may lead to search strategies that favor entering such a program in order to avoid or postpone migration. However, at least for men, an increase in the WCS accomodation ratio by one does neither affect the local job finding nor the migration hazard significantly. Thus, there is no evidence in favor of a locking-in effect of active labor market policies for men. In contrast, a higher level of local accommodation with work creation schemes significantly reduces the local job-finding hazard for women. One explanation for the differences between the female and male local-job finding hazards might be that a program participation is more attractive for women than for the male breadwinner. In this case, a high local accommodation with such programs should have a stronger positive effect on reservation wages for unemployed women than for unemployed men. Moreover, a program participation in order to avoid moving may also be more attractive for women if relocation decisions of the household are mainly based on the job status of the male breadwinner. Indeed, we find a negative effect of the local accommodation of work creation schemes on the female migration hazard such that the marginal effect on the probability of interregional migration is negative (-0.3%). However, since the effect on the migration hazard is significant at a 10% level for model B only, this should be considered a very weak evidence in favor of a locking-in effect of active labor market policies for women. Of course, this does not contradict findings by Lindgren and Westerlund (2003) regarding a locking-in effect of actually participating in labor market programs. As I discussed in the data section, the structure of the IABESR only allows for testing whether local active labor market programs exert a significant influence on the search strategies of unemployed jobseekers prior to entering such programs. No convincing evidence in favor of such locking-in effects is found. This is in line with a study by Widerstedt (1998)

on interregional mobility in Sweden. She finds that an extensive local use of labor market programs does not exert any significant influence on individual migration decisions.

Among the other regional control variables some deserve a short discussion. As expected, a high population-job density, for example, enhances mobility among both females and males. As discussed in section 3.2, a high number of residents per local job seems to necessitate a geographically broader job search strategy in order to generate job offers. Also, as expected, the share of unemployed who are male does not have any influence on search strategies of women. For men, however, regions with a high share of male unemployment seem to reflect regions with unfavorable local re-employment opportunities so that the local job finding hazard is significantly reduced. Interestingly, there is also a significant negative effect on the male migration hazard. This might be explained by a discouragement effect on the overall search effort of male workers.

Concerning the effect of the macroeconomic situation on the local job finding and the migration hazard, the results suggest that interregional migration is positively related to the business cycle, especially for men. This is consistent with previous evidence by Jackman and Savouri (1992) for the UK and Büttner (1999) for Germany.

From the above discussion, we can conclude that interregional mobility is mainly driven by individual level characteristics but that individuals are also sensitive to local labor market conditions. In particular, individuals choose search strategies that favor migrating out of regions with a relatively unfavorable labor demand situation compared to other regions. Given the high level of unemployment among low-skilled individuals in Germany, the responsiveness of this group of jobseekers to local labor market conditions may be particularly important for the equilibrating role of migration. Therefore, table 6 compares the marginal effects of labor market related covariates between a sub-sample of individuals with only a high-school degree and a sub-sample of individuals with a higher education. First of all, note that for the reference low-skilled worker the probability of leaving the local labor market within three years is only 11% compared to 28.4% for the high-skilled reference worker. More importantly, low-skilled individuals seem to be slightly less responsive to relatively unfavorable local labor demand conditions. An increase in the relative uv-ratio comes with a marginal effect of +1.1 (10%) for low-skilled jobseekers compared to +3.6 (12.7%) for high-skilled individuals. Given the high unemployment levels among low-skilled individuals, this result may be of some concern.

5.3 Mobility and unemployment duration

As discussed in the introduction to this paper, the likelihood of interregional mobility is unlikely to be constant across search time. Bailey (1991), for example, suggests that migration is a last resort after local job opportunities have been exhausted. Thus, mobility levels should increase

with search time. As discussed in the section on marginal effects, the probability of leaving the local labor market area for a job in a distant region conditional on finding employment at time t is given by the conditional migration probability $P_d(t)$. Figure 2 shows the estimated hazard functions for the local job-finding and the migration hazard as well as the smoothed conditional migration probability for a men with average characteristics for both model specifications[23]

First of all, note that the estimated local job finding hazard for the Cox model initially increases and declines afterwards, but that the migration hazard shows a second peak before declining again. Thus, the conditional migration probability is increasing with search time during the first two years of job search but declines afterwards. The falling shape of both hazard functions as well as of the conditional migration probability at high unemployment durations may of course be due to unobserved individual heterogeneity which is not taken into account in the Cox model. As a consequence a pure sorting effect may result in a falling migration probability at higher unemployment durations since the sample may increasingly contain immobile individuals. Indeed, the figures for the log-logistic model with unobserved heterogeneity suggest that this sorting effect may be relevant. While both hazards initially rise and decline afterwards, the slope for the local job finding hazard is flatter than in the Cox model. More importantly, the migration hazard only slightly decreases after an initial rise and remains on a high level. As a consequence, the migration probability monotonously increases with search time. Put differently, a male jobseeker who finds employment only after a long unemployment duration is increasingly likely to do so in other regions. I consider this as strong evidence that migration is indeed some kind of last resort that becomes a more relevant option after a long duration of unsuccessful job search. Figure 3 confirm these findings for women. Again, the conditional migration probabilities for both models are increasing with search time.

[23]In this case, the baseline hazard estimates for the Cox model refer to an unstratified model with additional labor market dummies in order to obtain one single estimated baseline hazard instead of 180 separate baseline hazards for the stratified model.

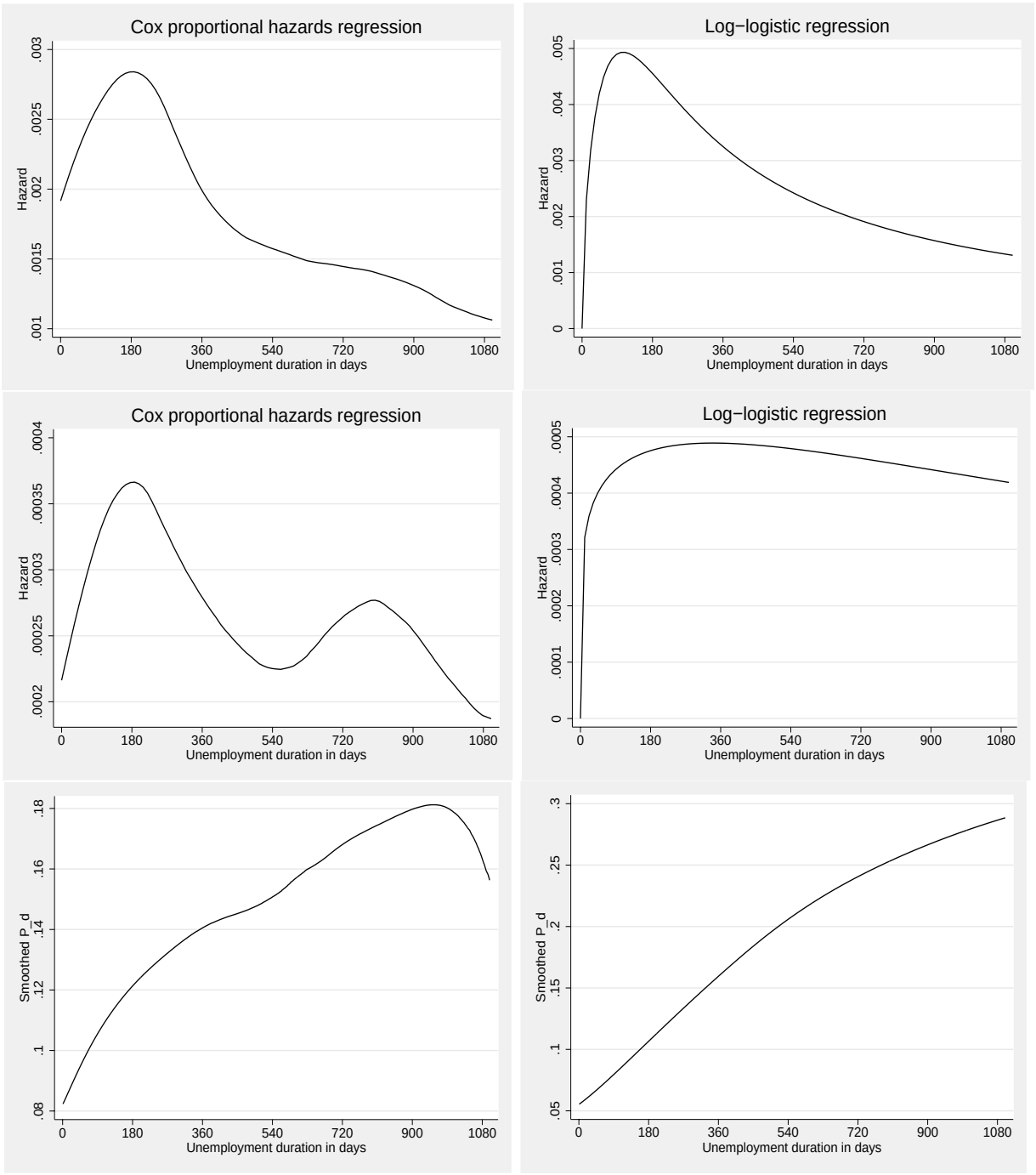


Figure 2: Hazard functions and conditional migration probabilities for men with average characteristics, Cox model (first column) and log-logistic model (second column), IABS 1982-1995

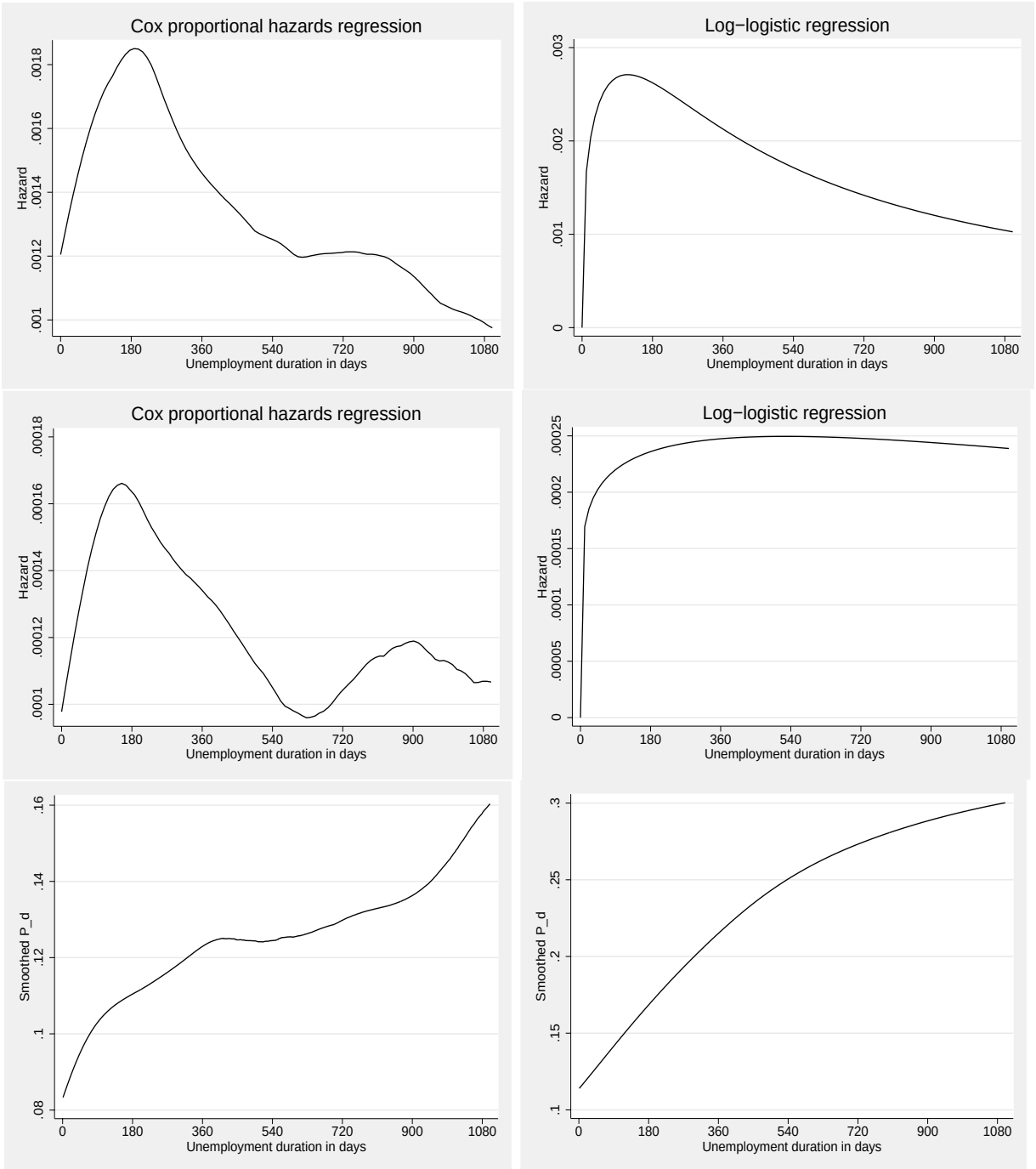


Figure 3: Hazard functions and conditional migration probabilities for a women with average characteristics, Cox model (first column) and log-logistic model (second column), IABS 1982-1995

6 Conclusion

This paper has looked at a competing-risk model of exiting unemployment to either a job in a local or a distant labor market area in order to test whether unemployed individuals in West Germany adjust their search strategy to favor migrating out of depressed regions. The equilibrating role of interregional migration critically hinges on such search strategies. In addition, this paper has also examined whether the extensive local use of labor market programs discourages migration by shifting search effort towards the local labor market area. Using both a stratified Cox model that takes into account location-specific fixed effects as well as a log-logistic accelerated failure time model that takes into account unobserved heterogeneity across individuals, the paper derives at the following conclusions:

- Unemployed individuals are found to be responsive to local labor market conditions. While local employment growth and labor turnover do not significantly affect the search strategy of unemployed jobseekers in West Germany, an unfavorable labor demand situation compared to other regions clearly shifts search effort towards other regions and increases the likelihood of mobility among the unemployed. This responsiveness is more pronounced for men and high-skilled individuals than for women and low-skilled individuals. Given the high level of unemployment among low-skilled individuals in Germany, the weaker responsiveness of low-skilled as compared to high-skilled individuals may be of some concern. In particular, due to low mobility levels among low-skilled individuals, this group is highly dependent on local labor market conditions. Deteriorating local conditions may then result in prolonged unemployment durations for low-skilled as compared to high-skilled individuals who are much more likely to leave the region. Recent labor market reforms demand unemployed individuals in Germany to accept job offers in distant labor market regions. Otherwise, transfer payments may be interrupted or even cut permanently. These measures might be justified in order to counteract an increase in long-term unemployment of low-skilled individuals who are stuck in a local labor market region with unfavorable employment prospects.

- There is no evidence in favor of a locking in effect of active labor market programs on the interregional mobility among male unemployed in West Germany. For female jobseekers, there is weak evidence in favor of a minor locking-in effect. Still, it seems safe to conclude that the extensive local use of ALMP does not significantly affect search strategies of unemployed individuals to concentrate on the local area. Due to the structure of the data set used for the analysis this result only applies to individuals who are not participating in labor market programs but may anticipate a future program participation. Thus, there may well be locking-in effects on individuals who are actually participating in such programs.

- The marginal effects of individual-level characteristics on the migration probability clearly dominate any labor market related effects. In particular, higher formal education as well as higher previous wage income strongly enhance interregional mobility among unemployed workers. This is consistent with a study by Windzio (2004) who concludes that the necessary financial resources to bear the cost of residential mobility are in fact the most important determinant of mobility. To some extent this is a surprising result since unemployed individuals who accept a job that necessitates residential mobility are entitled to a mobility grant that covers a large share of total mobility cost.

- The likelihood that an unemployed individual is mobile across regions is found to increase with search time. This confirms the notion that migration is considered a last chance of finding employment after local job search turned out to be unsuccessful. This is also consistent with the finding by Möller (1995) that interregional migration in Germany is an important but slow adjustment mechanism after regional shocks.

Despite the robustness of estimation results across model specifications, there are a number of methodological and data caveat that point at some future research directions. First of all, instead of using a proportional hazards model that assumes covariates to shift the baseline hazard in a proportional manner, censored quantile regression may be an interesting alternative because it allows for detecting whether the effect of certain covariates on interregional mobility vary with search time. Secondly, future research should check whether relaxing the critical assumption of independent competing risks significantly alters estimation results. Clearly, not controlling for some relevant household-related characteristics suggests that this independence assumption may be questionable in this analysis. Thirdly, not having periods of registered unemployment but only using a proxy for unemployment periods may be problematic. Therefore, estimation results based on the IABESR should be compared to results based on registered unemployment data.

This paper also points at some future research directions regarding the migratory behavior of unemployed individuals. First of all, the focus of the analysis was on the effect of local employment opportunities on interregional mobility. This analysis should be extended to examine whether unemployed individuals in West Germany adjust their search strategy to regional wage differentials rather than to regional differentials in labor demand conditions. Moreover, this paper only looked at the effect of push factors, i.e. conditions in the local labor market that encourage or discourage individuals to leave the area. Future research should also examine the effect of pull factors by explicitly looking at the destination choice of unemployed individuals who leave their local labor market for a distant job.

7 Appendix

Table 1: Description and data source of regional and aggregate variables[a]

Variables	Description	Data Source
Share of agriculture	Percentage share of employment in agriculture	IABS[b]
Share of inv. goods ind.	Percentage share of employment in the investment goods industry	IABS[b]
Share of cons. goods ind.	Percentage share of employment in the consumption goods industry	IABS[b]
Share of construction	Percentage share of employment in the construction sector	IABS[b]
Share of retail	Percentage share of employment in retail	IABS[b]
Share of other services	Percentage share of employment in other services	IABS[b]
Share of high-skilled employment	Percentage share of high-skilled individuals among all employees	IABS[b]
Population-job-density	Population[d]divided by total employmentO[c]	New Cronos,[d] FLO[c]
Share of male unemp.	Number of male unemployed divided by total unemployed ∗100	FLO[c]
U_l/V_l[e]	Ratio between unemployment jobseekers and vacancies in the local area	FLO[c]
$\frac{U_l/V_l}{U_d/V_d}$[e]	Local unemployment-vacancy ratio divided by unemployment-vacancy ratio in all other regions	FLO[c]
Employment growth	Yearly percentage change in the stock of employees	IABS[b]
Labor turnover	Hirings + separations during the year divided by the stock of employees in the same year ∗100	IABS[b]
WCS accommodation ratio[e]	Number of participants in work creation schemes divided by number of unemployed plus participants in WCS ∗100	FLO[c]
Aggregate hiring rate	Aggregate hirings during the year divided by the number of employed on Jan 1st of the year ∗100	IABS[b]

[a] All regional indicators have been aggregated to the level of labor market regions.

[b] Variables have been calculated on the basis of the IABESR.

[c] Data are coded at the level of federal labor office districts and are released by the federal labor office (FLO). Data have been merged using the merging schemes proposed by Arntz and Wilke (2005).

[d] New Cronos database is released by Eurostat.

[e] Variables with a 1 year lag.

Table 2: Descriptive statistics of variables included in the estimation, IABS 1982-1995, Males

			Spells ending ...			
	All Spells		in migration		locally	
Variables	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
Married[1]	0.506	0.500	0.495	0.500	0.523	0.500
Age 26-29 [1]	0.355	0.478	0.324	0.468	0.366	0.482
Age 30-33[1,2]	0.208	0.406	0.221	0.415	0.207	0.405
Age 34-37[1]	0.222	0.415	0.232	0.422	0.218	0.413
Age 38-41[1]	0.216	0.411	0.223	0.416	0.209	0.407
Formal education						
High school degree[1]	0.291	0.454	0.207	0.405	0.293	0.455
Vocational training[1,2]	0.649	0.477	0.641	0.480	0.668	0.471
Higher education[1]	0.060	0.237	0.153	0.360	0.039	0.193
Wage quintile						
1st[1]	0.201	0.401	0.181	0.385	0.182	0.386
2nd[1]	0.342	0.474	0.293	0.455	0.351	0.477
3rd[1,2]	0.196	0.397	0.171	0.377	0.210	0.407
4th[1]	0.133	0.340	0.147	0.354	0.138	0.345
5th[1]	0.128	0.334	0.208	0.406	0.118	0.323
Previous job status						
Apprentice[1]	0.016	0.126	0.018	0.133	0.016	0.124
Unskilled blue-collar job[1]	0.367	0.482	0.273	0.446	0.373	0.484
Skilled blue-collar job[1,2]	0.431	0.495	0.335	0.472	0.474	0.499
White-collar job[1]	0.165	0.371	0.343	0.475	0.121	0.326
Part-time job[1]	0.021	0.144	0.031	0.172	0.017	0.129
Previous sector of activity						
Agriculture[1]	0.042	0.201	0.024	0.154	0.048	0.215
Investment goods ind.[1]	0.207	0.405	0.188	0.391	0.207	0.405
Consumption goods ind.[1]	0.088	0.284	0.083	0.275	0.085	0.280
Construction[1]	0.262	0.440	0.185	0.388	0.299	0.458
Retail[1,2]	0.175	0.380	0.201	0.401	0.166	0.372
Other services[1]	0.225	0.417	0.319	0.466	0.194	0.395
Tenure in previous job (mths)	19.11	28.44	16.73	23.57	18.62	28.03
Prev. unemployment spell[1]	0.716	0.451	0.607	0.488	0.751	0.432

Continued on next page...

... table 2 continued

Tot. prev. unemp. dur. (mths)	11.69	15.74	8.973	14.24	12.23	15.49
Recall from prev. employer[1]	0.239	0.427	0.081	0.273	0.293	0.455
1983[1,2]	0.074	0.262	0.070	0.256	0.076	0.265
1984-1987[1]	0.306	0.461	0.286	0.452	0.325	0.468
1988-1991[1]	0.262	0.440	0.243	0.429	0.269	0.443
1992-1995[1]	0.358	0.479	0.401	0.490	0.330	0.470
Fourth quarter[1]	0.171	0.376	0.197	0.398	0.137	0.344
Sectoral composition						
Share of agriculture[4]	3.230	2.941	3.137	2.913	3.256	2.945
Share of inv. goods ind.[4]	24.98	8.439	25.01	8.483	24.97	8.451
Share of cons. goods ind.[4]	11.28	6.576	10.28	5.823	11.77	6.846
Share of construction[4]	7.975	2.239	7.663	1.947	8.132	2.326
Share of retail[4]	18.61	4.455	19.20	4.525	18.35	4.442
Share of other services[4]	33.92	7.175	34.71	7.024	33.52	7.169
Other regional characteristics						
Share of high-skilled emp.[4]	6.355	3.013	6.923	3.053	6.070	2.944
Population-job density[4]	3.015	0.993	3.011	0.998	3.027	0.994
Share of male unemployment[4]	55.01	5.522	54.48	5.145	55.11	5.687
Employment growth[4]	0.337	2.439	0.136	2.419	0.470	2.447
Labor turnover[4]	59.20	9.865	58.14	9.217	59.80	10.13
U_l/V_l[3,4]	16.58	13.14	15.44	12.41	17.02	13.43
$\frac{U_l/V_l}{U_d/V_d}$[3,4]	1.242	0.641	1.229	0.657	1.244	0.637
WCS accommodation ratio[3,4]	3.313	2.404	3.269	2.449	3.387	2.460
Aggregate indicators						
Aggregate hiring rate[4]	30.99	2.425	30.91	2.425	31.01	2.452
Number of spells	49617		4757		34907	

[1]Dummy Variable

[2]Reference category in the following estimation.

[3]Lagged variable (lag: 1 year)

[4]Time-varying variables: U_l/V_l, $\frac{U_l/V_l}{U_d/V_d}$ and WCS accommodation ratio on a quarterly basis, all others on a yearly basis.

Table 3: Descriptive statistics of variables, IABS 1982-1995, Females

			Spells ending ...			
	All Spells		in migration		locally	
Variables	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
Married[1]	0.601	0.490	0.432	0.496	0.524	0.499
Age 26-29[1]	0.371	0.483	0.432	0.496	0.341	0.474
Age 30-33[1,2]	0.212	0.409	0.214	0.411	0.202	0.402
Age 34-37[1]	0.205	0.404	0.179	0.383	0.217	0.412
Age 38-41[1]	0.212	0.409	0.175	0.380	0.240	0.427
Formal education						
High school degree[1]	0.276	0.447	0.173	0.378	0.280	0.449
Vocational training[1,2]	0.644	0.644	0.672	0.470	0.647	0.478
Higher education[1]	0.080	0.271	0.155	0.362	0.074	0.262
Wage quintile						
1st[1]	0.594	0.491	0.412	0.492	0.569	0.495
2nd[1]	0.238	0.426	0.279	0.449	0.267	0.443
3rd[1,2]	0.078	0.268	0.118	0.323	0.082	0.275
4th[1]	0.047	0.213	0.099	0.298	0.046	0.210
5th[1]	0.043	0.203	0.092	0.290	0.036	0.185
Previous job status						
Apprentice[1]	0.026	0.160	0.039	0.193	0.031	0.173
Unskilled blue-collar job[1]	0.236	0.425	0.141	0.348	0.244	0.430
Skilled blue-collar job[1,2]	0.088	0.283	0.061	0.240	0.099	0.299
White-collar job[1]	0.458	0.498	0.613	0.487	0.430	0.495
Part-time job[1]	0.192	0.394	0.145	0.353	0.195	0.396
Previous sector of activity						
Agriculture[1]	0.013	0.113	0.009	0.097	0.016	0.124
Investment goods ind.[1]	0.134	0.340	0.100	0.301	0.117	0.321
Consumption goods ind.[1]	0.128	0.334	0.086	0.280	0.127	0.333
Construction[1]	0.019	0.135	0.014	0.119	0.022	0.146
Retail[1,2]	0.220	0.414	0.228	0.420	0.221	0.415
Other services[1]	0.486	0.500	0.562	0.496	0.497	0.500
Tenure in previous job (mths)	27.43	36.72	24.59	31.65	22.30	32.98
Prev. unemployment spell[1]	0.571	0.495	0.539	0.499	0.639	0.480

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... table 3 continued

Tot. prev. unemp. dur. (mths)	7.242	11.51	6.304	10.68	8.534	12.18
Recall from prev. employer[1]	0.193	0.395	0.087	0.281	0.215	0.411
1983[1,2]	0.067	0.250	0.059	0.236	0.056	0.231
1984-1987[1]	0.277	0.448	0.264	0.441	0.254	0.435
1988-1991[1]	0.292	0.455	0.297	0.457	0.303	0.459
1992-1995[1]	0.363	0.481	0.380	0.485	0.387	0.487
Fourth quarter[1]	0.231	0.421	0.225	0.418	0.210	0.407
Sectoral composition						
Share of agriculture[4]	3.061	2.760	2.821	2.436	2.961	2.578
Share of inv. goods ind.[4]	25.21	8.580	24.73	8.052	24.93	8.403
Share of cons. goods ind.[4]	10.67	6.066	9.996	5.665	10.82	6.145
Share of construction[4]	7.674	1.972	7.462	1.802	7.737	2.006
Share of retail[4]	18.89	4.421	19.33	4.446	18.89	4.412
Share of other services[4]	34.49	7.120	35.67	7.132	34.66	7.095
Other regional characteristics						
Share of high-skilled emp.[4]	6.682	2.954	7.279	3.118	6.653	2.934
Population-job density[4]	2.981	0.979	2.933	0.986	2.966	0.970
Share of male unemployment[4]	54.17	5.281	54.26	4.885	54.19	5.367
Employment growth[4]	0.351	2.409	0.261	2.386	0.383	2.415
Labor turnover[4]	58.71	9.437	58.63	8.818	59.46	9.664
U_l/V_l[3,4]	15.44	12.50	14.27	11.52	14.49	11.78
$\frac{U_l/V_l}{U_d/V_d}$[3,4]	1.222	0.660	1.182	0.657	1.196	0.660
WCS accommodation ratio[3,4]	3.310	2.328	3.137	2.225	3.317	2.331
Aggregate indicators						
Aggregate hiring rate[4]	31.17	2.548	31.13	2.590	31.20	2.596
Number of spells	30743		2229		16172	

[1]Dummy Variable

[2]Reference category in the following estimation.

[3]Lagged variable (lag: 1 year)

[4]Time-varying variables: U_l/V_l, $\frac{U_l/V_l}{U_d/V_d}$ and WCS accommodation ratio on a quarterly basis, all others on a yearly basis.

Table 4: Estimation results for the local job finding hazard (h_l) and the migration hazard (h_d) including marginal effects on the migration probability (κ_d), IABS 1982-1995, Males

	Model A			Model B		
Variables	$\hat{\beta}_l$	$\hat{\beta}_d$	$\hat{\kappa}_d$	$\hat{\beta}_l$	$\hat{\beta}_d$	$\hat{\kappa}_d$
$\bar{\Pi}_d$ for reference worker			13.5%			9.0%
Married	0.180**	0.138**	-0.5	-0.185**	-0.180**	0.3
Age 26-29 years	0.046**	0.002	-0.5	-0.067**	-0.006	-0.3
Age 34-37 years	-0.031†	-0.058	-0.3	0.032†	0.055	-0.2
Age 38-41 years	-0.083**	-0.107*	-0.3	0.082**	0.079	-0.1
High school degree	-0.113**	-0.280**	-2.0	0.129**	0.308**	-1.5
Higher education	-0.272**	0.150†	4.1	0.289**	-0.237**	3.0
1st wage quintile	-0.295**	-0.265**	0.1	0.289**	0.233**	-0.1
2nd wage quintile	-0.106**	-0.174**	-0.8	0.079**	0.177**	-0.8
4th wage quintile	0.007	0.185**	2.3	0.029	-0.171**	1.5
5th wage quintile	-0.003	0.460**	6.6	0.060**	-0.418**	3.7
Apprentice	-0.087†	0.098	2.5	0.142*	-0.236†	2.5
Unskilled job	-0.097**	-0.147**	-0.6	0.082**	0.129**	-0.5
White collar job	-0.429**	0.243**	9.2	0.411**	-0.240**	4.4
Part-time job	-0.238**	0.158*	5.7	0.268**	-0.042	2.1
Prev. job in agriculture	0.205**	-0.106	-3.4	-0.166**	0.158	-1.9
Prev. job in inv. goods ind.	-0.072**	-0.209**	-1.6	0.052*	0.194**	-1.1
Prev. job in cons. goods ind.	-0.150**	-0.184**	-0.5	0.108**	0.176*	-0.7
Prev. job in construction	0.093**	-0.015	-1.2	-0.051*	0.028	-0.4
Prev. job in services	-0.088**	-0.010	0.9	0.062**	0.010	0.3
Tenure in previous job	-0.002**	-0.011**	-0.1	0.002**	0.012**	-0.1
Total unemp. duration	-0.007**	-0.011**	-0.1	0.008**	0.011**	0.0
Recall from prev. employer	0.384**	-0.739**	-8.8	-0.180**	0.664**	-4.5
Prev. unemployment spell	0.211**	-0.075†	-2.9	-0.119**	0.181**	-1.8

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... table 4continued

	Model A			Model B		
Fourth quarter	-0.608**	-0.318**	2.5	0.592**	0.314**	0.8
Share of Agriculture	0.031	0.012	-0.2	-0.021†	-0.018	0.0
Share of Inv. goods ind.	0.002	-0.019	-0.3	0.005	0.019	-0.1
Share of Cons. goods ind.	0.008	-0.054**	-0.7	0.007	0.069**	-0.5
Share of Construction	0.031*	0.000	-0.4	-0.017†	-0.007	0.0
Share of Services	0.012	-0.029	-0.5	0.001	0.037†	-0.3
Share of high-skilled emp.	-0.006	0.002	0.1	0.004	0.020	-0.1
Population-job-density	0.033	0.079*	0.6	-0.017	-0.085	0.5
Share of male unemployment	-0.024**	-0.053**	-0.4	0.034**	0.053**	-0.2
Employment growth	0.019**	-0.010	-0.3	-0.019**	0.013	-0.2
Labor turnover	0.001	-0.004	-0.1	-0.001	0.001	0.0
U_l/V_l	-0.005**	-0.005*	0.0	0.004**	0.005†	0.0
$\frac{U_l/V_l}{U_d/V_d}$	-0.039	0.152**	2.5	0.072**	-0.151**	1.6
WCS accommodation ratio	0.001	-0.003	0.0	-0.007	-0.006	0.0
Aggregate hiring rate	0.008	0.027*	0.2	-0.003	-0.034*	0.2
Time period dummies	X	X		X	X	
180 LMR dummies				X	X	
Constant				4.671**	7.273**	
γ				0.659	0.858	
θ				0.392	1.800	
P-value of H_0: No unobs. het.				0.000	0.000	
Number of strata (LMR)	180	180				
$\chi^2(df)$ clustering test	315.86(41)	79.71(41)				
Number of spells	49617	49617		49617	49617	
Number of exits	34907	4757		34907	4757	
Log-likelihood	-174247.05	-23127.01		-66899.04	-17180.55	
$\chi^2(df)$	4358.82(41)	2289.65(41)		5185.49(216)	1749.07 (216)	

Significance levels : † : 10% * : 5% ** : 1%

Table 5: Estimation results for the local job finding hazard (h_l) and the migration hazard (h_d) including marginal effects on the migration probability (κ_d), IABS 1982-1995, Females

	Model A			Model B		
Variables	$\hat{\beta}_l$	$\hat{\beta}_d$	$\hat{\kappa}_d$	$\hat{\beta}_l$	$\hat{\beta}_d$	$\hat{\kappa}_d$
$\bar{\Pi}_d$ for reference worker			13.0%			14.9%
Married	-0.240**	-0.363**	-1.8	0.385**	0.405**	-1.4
Age 26-29 years	0.011	0.241**	3.0	-0.039	-0.292**	2.7
Age 34-37 years	0.119**	-0.133	-2.5	-0.164**	0.153*	-2.4
Age 38-41 years	0.229**	-0.127†	-3.4	-0.310**	0.069	-2.6
High school degree	-0.146**	-0.398**	-3.0	0.188**	0.427**	-2.8
Higher education	-0.207**	0.079	2.9	0.227**	-0.154†	3.0
1st wage quintile	-0.252**	-0.659**	-4.4	0.300**	0.691**	-4.2
2nd wage quintile	0.016	-0.147†	-1.7	-0.025	0.074	-0.8
4th wage quintile	-0.046	0.256**	3.6	0.065	-0.222*	2.5
5th wage quintile	-0.126*	0.376**	6.2	0.151*	-0.336**	4.2
Apprentice	0.131*	0.697**	9.1	-0.199**	-0.876**	7.5
Unskilled job	-0.115*	-0.026	0.9	0.092*	0.000	.7
White collar job	-0.245**	0.245*	6.5	0.244**	-0.300	5.1
Part-time job	-0.074†	0.210†	3.7	0.022	-0.260*	2.8
Prev. job in agriculture	0.295**	0.113	-1.8	-0.236**	-0.228	0.5
Prev. job in inv. goods ind.	-0.306**	-0.353**	-1.2	0.401**	0.348**	-0.6
Prev. job in cons. goods ind.	-0.106**	-0.232**	-1.6	0.116**	0.208*	-1.2
Prev. job in construction	0.059	-0.358†	-4.0	-0.053	0.471*	-4.2
Prev. job in services	-0.034	-0.013	0.2	0.081**	-0.017	0.8
Tenure in previous job	-0.006**	-0.006**	0.0	0.007**	0.006**	0.0
Total unemp. duration	-0.004**	-0.013**	-0.1	0.003**	0.013**	-0.1
Recall from prev. employer	0.188**	-0.664**	-7.0	-0.069**	0.655**	-6.0
Prev. unemployment spell	0.277**	0.106†	-1.5	-0.201**	-0.044	-1.0

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... table 5continued

	Model A			Model B		
Fourth quarter	-0.246**	-0.131*	0.8	0.258**	0.107*	0.7
Share of Agriculture	-0.001	-0.088	-1.0	-0.001	0.045	-0.4
Share of Inv. goods ind.	0.007	-0.023	-0.3	0.008	0.022	-0.2
Share of Cons. goods ind.	0.007	-0.025	-0.3	-0.003	0.024	-0.3
Share of Construction	0.000	0.016	0.2	0.008	-0.033	0.4
Share of Services	-0.003	-0.020	-0.2	-0.003	0.013	-0.2
Share of high-skilled emp.	0.031†	0.035	0.1	-0.017	-0.040	0.2
Population - job density	0.011	0.104*	1.1	0.025	-0.123	1.4
Share of male unemployment	0.000	0.001	0.0	0.000	0.004	0.0
Employment growth	0.014**	-0.011	-0.3	-0.016**	0.012	-0.2
Labor turnover	0.011**	0.001	-0.1	-0.011**	-0.003	0.0
U/V	-0.005**	-0.012*	-0.1	0.005**	0.011**	-0.1
$\frac{U_l/V_l}{U_d/V_d}$	-0.080*	0.042	1.4	0.094**	-0.066	1.3
WCS accommodation ratio	-0.018**	-0.039	-0.3	0.018*	0.036†	-0.2
Aggregate hiring rate	0.014†	0.029	0.2	-0.014†	-0.032†	0.2
Time period dummies	X	X		X	X	
180 LMR dummies				X	X	
Constant				4.890**	6.872**	
γ				0.760	0.884	
θ				0.457	2.130	
P-value of H_0: No unobs. het.				0.000	0.000	
Number of strata (LMR)	180	180				
$\chi^2(df)$ clustering test	156.19(41)	74.53(41)				
Number of spells	30743	30743		30743	30743	
Number of exits	16172	2229		16172	2229	
Log-likelihood	-75701.498	-10275.91		-37193.71	-8825.47	
$\chi^2(df)$	2395.51(41)	1715.64(41)		-37193.71(216)	1293.96(216)	

Significance levels : † : 10% * : 5% ** : 1%

Table 6: Marginal effects on the probability of leaving the local area for a distant job within three years of unemployed job search for low-skilled and high-skilled individuals, estimates based on model A[a], IABS 1982-1995

	Low-skilled[b]	High-skilled[b]
Variables	$\bar{\kappa}_d$	$\bar{\kappa}_d$
$\bar{\Pi}_d$ for reference worker[b]	11.0%	28.4%
Population - job density	-0.004	0.025
Share of male unemployment	-0.003	-0.006
Employment growth	-0.006	0.005
Labor turnover	0.000	-0.002
UV-ratio	0.000	0.000
relative UV-ratio	0.011	0.036
WCS accomodation ratio	0.003	-0.004
Aggregate hiring rate	0.003	0.010
Number of spells	22916	5423
Number of local exits	14767	2551
Log-likelihood for h_l	-62919.9	-8547.2
Number of distant exits	1370	1071
Log-likelihood for h_d	-5629.7	-3302.8

[a] Full estimation results may be obtained from the author upon request.

[b] Sub-samples are restricted to low-skilled individuals with only a high-school degree or to high-skilled individuals with a higher education. Except for the education variable, the reference worker refers to a worker with all dummy variables set to the reference category and all continuous variables set to the average value (see table 3 and 2).

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