Regional Variations in Unemployment Duration and Discouragement Probabilities

Ott Toomet*
Department of Economics, University of Aarhus
AKF, Institute for Local Government Studies – Denmark

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Abstract

We analyse the transitions from unemployment into employment and non-participation, using a mixed proportional hazard framework. The regional differences in transition intensities, individual effects and discouragement probabilities are investigated using Danish registry data for 1985-1998. The study reveals two regions with distinct labour market properties: the Copenhagen area and Western-Jutland. The former one is characterised by a long unemployment duration and a high discouragement rate, the situation is opposite in the latter region. Regional differences in workers composition are roughly as important as differences in labour demand in explaining the variation. A high discouragement probability is associated with a long unemployment duration but not with a high unemployment rate. We show that the hazard rate from unemployment into non-participation increased in most of the counties, even during the economic growth-period.

Keywords: Discouragement, Denmark, Regional composition effect, duration analysis

JEL-code: J64, R23

1 Introduction

Since the seventies, long-term unemployment has been a problem for most of the industrialised world. As a consequence, economies are operating below

*Address: Department of Economics, University of Aarhus, Building 322, 8000 Århus C, Denmark. email: otoomet@econ.au.dk

their full capacities and there are additional costs in the form of e.g. large social security benefit payments. The problem of ageing is becoming more and more apparent in Europe, stressing the need for optimal use of all available human capital.

On the individual level, long-term unemployment is associated with poverty, loss of productivity and deterioration in psychological well-being[1]. Although the unemployed have more leisure time, there is much evidence that involuntary unemployment is indeed related with psychological costs (Prause and Dooley, 1997; Montgomery, Cook, Bartley, and Wadsworth, 1999; Dooley, Prause, and Ham-Rowbottom, 2000) which may further decrease labour market performance. Long-term unemployment may be regarded as a negative signal by the employers, decreasing additionally the chances for finding a job (stigmatisation).

The purpose of the present study is, first, to describe regional differences in the outflows from unemployment. Having established these differences, our second aim is to analyse the extent to which they can be related to differences in the characteristics of the workers residing in different regions.

There are large variations in the unemployment rate across different regions in Denmark, for a more detailed description of these differences, see section 3.3. Unless all these differences are explained by differences in the inflow into unemployment, they will naturally lead to differences in unemployment duration, and they may even lead to differences in discouragement rates. Because discouragement has severe consequences for the individual, and a large pool of discouraged workers impose large costs on society, we believe that a disaggregated analysis of discouragement processes may be of some value in designing policies to prevent discouragement, not least because many of these policies must be implemented at the regional (or even local) level.

Moreover, there are several advantages to conduct regional analyses: population within a country shares a common cultural and institutional background, and large homogeneous data sets which cover a single country are widely available. The previous cross-country analyses have stressed the importance of the labour costs, industry mix (Taylor and Bradley, 1997), and the employment protection (Blanchard and Portugal, 2001). The current analysis is descriptive, the possible causes of regional differences are postponed for future analysis.

The data for different Danish counties (*amter*) is modelled independently

[1]Jahoda (1982, p. 59) points out five different psychological "goods" of employment: time structure, social contacts outside the family, participation in a collective purpose, status and identity, and regular activity. These goods, present in almost every type of employment, are typically absent in state of unemployment.

using a rich register based dataset. Most of the previous studies have used a single statistical model for the national labour market. A data set, containing a large number of observations, such as that, used in the current analysis, allows the estimation of the parameters for different regions independently, without making additional hypotheses about a common parametric form. While previous analyses on the Danish data have concentrated on the estimation of the transition rate between employment and unemployment, the present study investigates movements from unemployment into employment and inactivity using a competing risk framework.

A decomposition of inter-regional variation in unemployment rates reveals the presence of two types of low-unemployment counties, either with low inflow into unemployment (e.g. Frederiksborg and Roskilde) or with short unemployment duration (Ribe, Ringkøbing and Viborg). The typical high-unemployment counties most often have high inflow (Storstrøm and North-Jutland) while the situation in Bornholm and Copenhagen county is more complex.

The econometric analysis shows that the transition intensity from unemployment into employment is decreasing in elapsed time, while that into inactivity is U-shaped. The effect of individual characteristics reveals a few distinct regional patterns. The labour market in Copenhagen favours young well-educated individuals, while unskilled workers have a relative advantage in Western-Jutland. The discouragement probability, which will be defined in section 5.3.1, is rising in elapsed time, it is relatively high in Copenhagen and low on the island of Bornholm. Discouragement increased during the economic down-turn at the end of 1980's, but there has been only a minor fall in the discouragement probability after the beginning of the new growth period in 1993-1994.

The decomposition of the regional variation in the discouragement probability indicates that the composition effect and the regional effect are roughly of the same magnitude. Surprisingly, there seems to be no relationship between the unemployment rate and the discouragement probability. However, a high discouragement probability is, not surprisingly, associated with long unemployment duration.

The paper is organised as follows: the next Section reviews briefly the main facts about the Danish labour market and labour market policy. Section 3 presents the data, decomposes the inter-regional variation in unemployment rates, and provides Kaplan-Meier plots. Section 4 describes the econometric models; Section 5 presents and discusses the estimation results, and the last section is devoted to a short conclusion.

2 A short overview of the Danish labour market

We briefly review main facts about the Danish Labour market. For more detailed analyses see Jensen (1996) and Westergaard-Nielsen (1999).

The Danish unemployment rate increased dramatically during the oil shocks in the 1970s as in most of the countries of continental Europe, but unlike in the other Nordic countries. Since that time it showed an upward trend until 1993, in the sense that unemployment rates at business cycle peaks and troughs were increasing over time. During the period 1994-2001 the unemployment rate was falling again.

About a quarter of the labour force experiences some unemployment in a given year but on the other hand it is very unevenly distributed over individuals, across gender, education and age. Unemployment in Denmark is characterised by high inflow and short average duration in an international context, thus in some sense resembling the U.S. labour market. As in US, temporary layoffs are common in Denmark, accounting for 40% of all unemployment spells and 16% of total unemployment.

Unemployment compensation in Denmark is quite generous, especially with respect to the maximum benefit period. Before the increase in unemployment in the late 1970s, the maximum entitlement duration of unemployment benefits was limited to 2.5 year. As the long-term unemployment soared, the unemployment benefits legislation was reformed in a way which gave the workers right to be re-entitled to the benefits after participation in an active labour market program (ALMP). In this way, the actual entitlement period was virtually unlimited. At the same time the early retirement schemes for the age group 60-66 years were introduced in order to decrease labour supply. During 1992-1995 a transition allowance was available which in practice made it possible for 50-60 year old unemployed people to leave the labour force.

The replacement rate of the unemployment benefits is 90% of the previous wage. However, as a result of a ceiling to weekly benefits (2690DKK in 1998), more than half of the unemployed workers receive the maximum amount and hence the average replacement rate is around 70%. A serious disincentive problem may still exist for low-wage jobs. In addition to the unemployment benefits, lower means-tested unemployment assistance benefits are available for non-insured workers.

Since the early 1990s, increasing attention has been payed to active labour market measures. Commencing from the middle of the decade, most of the labour market policy instruments have been directed toward increasing the

participation rate. The maximum duration of benefit entitlement has been decreased and the ALMP participation has been shifted towards earlier start. Participation was obligatory after 4 years of unemployment in 1994, later this period has been shortened to 2 years (1996) and 1 year (1999). At the same time several programs have been created which are directed toward a particular group, e.g. youth measures (in 1996) and measures for immigrants.

3 Data

3.1 10% sample

The current study uses a representative 10%-sample of the Danish population aged 16-59 and covers the period 1985-1998. The sample is compiled from various administrative registers by Statistics Denmark for the Danish Institute of Local Government Studies (AKF). The data set includes demographic characteristics, income, labour market history, education, and the place of residence. Data for most of the variables is collected once a year, but information about social security payments and certain taxes is based on monthly records.

The current analysis follows the definition of the labour market states as given by AKF. In particular, open unemployment and participation in active labour market programmes (ALMPs) is aggregated into unemployment. The more in-deep description of the construction of labour market histories is presented in the appendix A.

Although there are formal job search requirements in order to be officially registered as unemployed, the recorded transitions between unemployment and out-of-labour force may to some extent reflect institutional settings and not the underlying individual behaviour. However, the question how, and whether, to distinguish unemployment and non-participation has been a problem for economists since Clark and Summers (1979). Recent studies suggest that neither of these states are homogeneous but rather different ends of a continuous spectrum of search intensity (Jones and Riddell, 1999, 2002). Hence, the distinction between these two states is always an approximation.

From this data set, we extract a sample consisting of all fresh unemployment spells commenced during the observation period 1985-1998. That is, the analyses conducted in the paper is based on a sample of the inflow into unemployment. For each unemployment spell, we know the observed duration, and we know whether the unemployment spell ended with a transition into employment, non-participation, or whether it was censored. Censoring occurs only at the end of the observation period, or if the person dies or

emigrates. In other words, the three states employment, unemployment, and non-participation are exhaustive. Moreover, the attrition problem apparent in many studies based on survey data is not expected to be very severe in this data set, as emigration rates are quite small. We further restrict the analysis to persons aged 15-59, who are not currently in education.

The data set was split into regional samples by county of residence in January the year the spell started. In addition to the county samples, we analysed a sub-sample of the entire country for reference purposes. A map of the Danish county structure is presented in Appendix B. The total number of unemployment spells in different regions (see tables 6 and 7 in the appendix) varies between 6000 (Bornholm) and 114 000 (Copenhagen).

The unemployment spells for males are shorter than those for females, correspondingly 8.66 and 13.23 months (Tables 5-7 in the Appendix D). For both genders, spells ending in employment are shorter than those ending in non-participation. This fact suggests that the corresponding hazard rate into non-participation is significantly lower than that into employment. The regional distribution of the spell length indicates some differences between counties: spell are short for both gender in Western-Jutland. In Copenhagen, spells are long for males and short for females.

As the study covers a 14-years time span, there are in average several spells observed for each individual. The number of censored spells is below 10%.

3.2 Variables

The regional analysis is based on the county of residence. The transition intensities are modelled using controls for various individual- and job-specific characteristics and other explanatory variables, described in the Table 1. Note that wealth-related variables and the partners' income are measured in current year while individual's own income is measured the year before. This is because it is expected that current wealth and partners' income have a direct impact on the individual's search behaviour and reservation wage. The previous years' income is meant to proxy for unobserved personal characteristics. The income for the current year may not be a reliable proxy due to simultaneity and endogeneity.

A summary of the distribution of the variables is presented in the appendix in Table 5, the Tables 6 and 7 provide all the county-specific averages.

Significant regional differences tend to be common for males and females. The tables suggest that all the family-related variables have low values in the large urban centres Copenhagen and Aarhus. The maximum values are reached in Western-Jutland. This is probably related with the population

Table 1: *Explanatory variables used in the analysis*

	Demographic characteristics:
married	married or co-habiting (the reference group is *single*)
smallch	children 0–6 years in the household
schoolch	7–17
immigrant	not native Danish (the reference is native Danish)
age groups: 16–24, 25–34, 35–49, 50–59; 35–49 is the reference group	
	Education levels:
prim.edu	primary education (less than high school)
high.school	high school, vocational education, some college (the reference group)
university	university degree (Bachelor and above)
	Labour market history:
exper	working experience, years divided by 10
$first$	no previous working experience (in that case *inactive* = 1 and *exper*= 0)
inactive	spell of non-participation immediately preceding the unemployment spell
$notUI$	not a member of unemployment insurance system
agric	previous occupation in the agricultural sector
constr	construction
trade	trade, hotels and restaurants
other	the reference group, is not occupied in any of these sectors
	Income and wealth:
income	income, year preceding the unemployment spell
pincome	partner's income in the current year (0, if do not have a partner)
wealth	wealth in the beginning of current year
house	real estate, owned in Denmark, current year
Yearly dummies for the start year of the spell (1985-1998)	
Quarterly dummies for the start quarter of the spell	

Notes: All of the variables, except *experience*, *income*, *pincome*, *wealth* and *house*, are dummies. *income*, *pincome* and *wealth* are bounded between 0 and 5, *house* between 0 and 10. Monetary values are measured in 100 000 Danish kroner.

composition. Comparison of age, education and experience suggests that there are more young and well-educated individuals in the big urban and university centres Copenhagen, Fyn and Aarhus, while the share of such individuals is relatively low in Bornholm, Storstrøm and Western-Jutland. The share of immigrants in the Copenhagen area is much larger than in

any other region. Low average working experience, high rates of first-time entrants and low share of UI-members in Copenhagen confirms the picture of a large share of young inexperienced workers. However, the situation is less clear for women.

Being out-of-labour force immediately before the start of an unemployment spell is more common in big cities. Income and wealth variables show an interesting picture. According to most of the indicators, income and wealth are low in Copenhagen itself but high in the two neighbouring counties in commuting distance, Frederiksborg and Roskilde. These patterns suggest the presence of residential selection. This may, to some extent, produce a bias in the results obtained in this study, but it is beyond the scope of this analysis to model the choice of residual and working area.

3.3 A decomposition of the inter-regional variation in unemployment rates

The population of Danish counties differs between more than 600 000 (Copenhagen and Aarhus) and 45 000 (Bornholm), see Table 4 in the Appendix. Copenhagen is situated in the capital region (*Storkøbenhavn*) with more than 1.1 million inhabitants in this commuting area. The population composition and economic situation differs quite a lot across the counties, e.g. the educated labour force tends to be located in the largest cities where the new jobs in the service sector are rising. The traditional industry is distributed more evenly.

The development of regional unemployment 1980-1998 across Danish counties is shown in Figure 1. For most of the time, the three counties with the highest unemployment rate have been North-Jutland, Storstrøm and Fyn. Bornholm was a typical mean-unemployment county until the end of the economic downturn around 1994, but has recently had the highest unemployment rate as the recovery has been slow. Unemployment in Fyn, on the contrary, has decreased rapidly since 1995. During the period of observation, the three counties with the lowest unemployment rate have been those of the Copenhagen area (Copenhagen, Frederiksborg and Roskilde counties). The industrial Western-Jutland – Ringkøbing, Viborg and Ribe are doing relatively well too, in fact unemployment in Western-Jutland was lower than that in the Copenhagen area around 1995.

Assuming that the unemployment rate is stationary, the difference between county-specific and the average unemployment rate can be decomposed as

$$u_k - \bar{u} = \lambda_k T_k - \bar{\lambda}\bar{T} = \lambda_k(T_k - \bar{T}) + \bar{T}(\lambda_k - \bar{\lambda}), \tag{1}$$

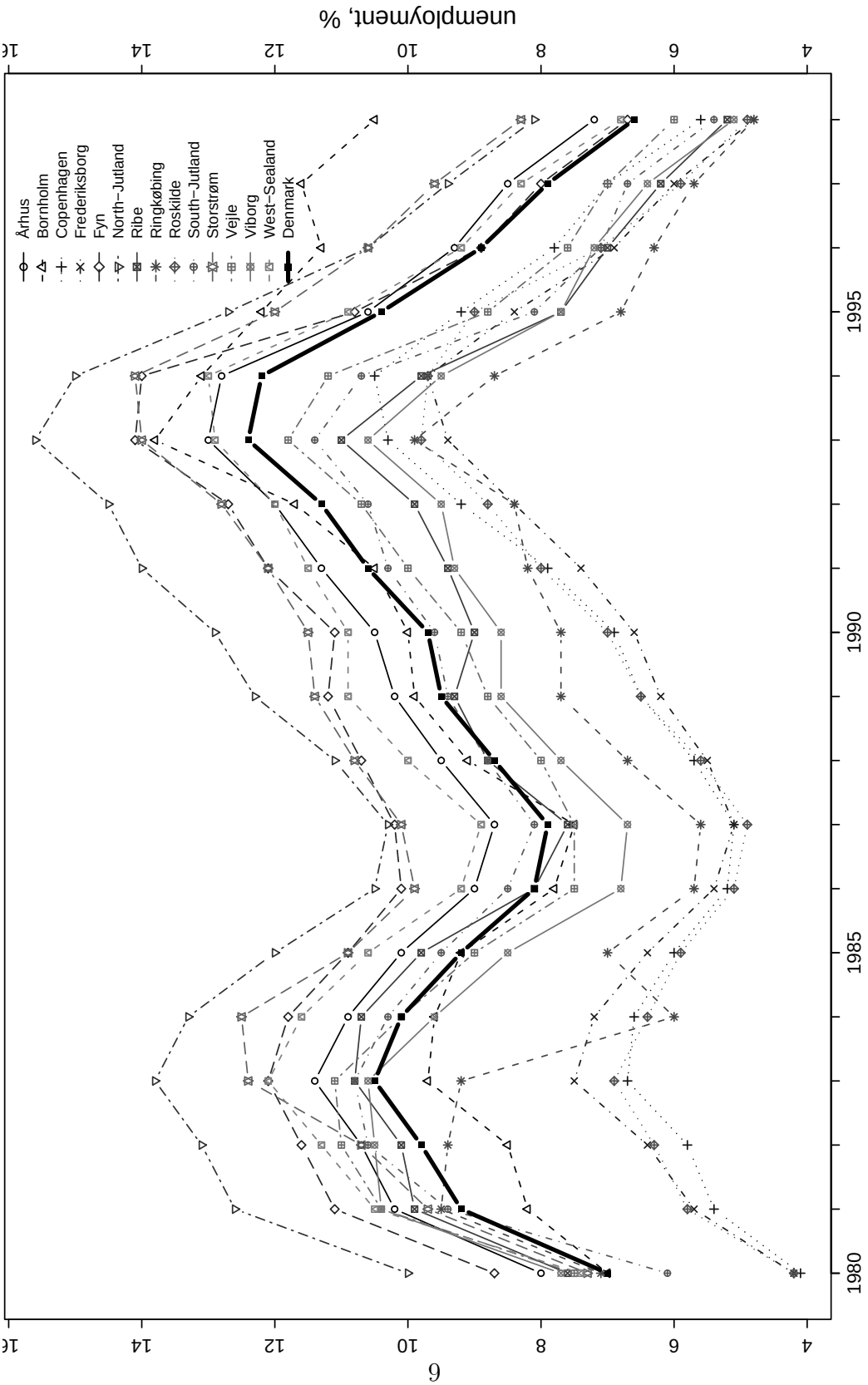

Figure 1: *Yearly average unemployment in selected Danish counties 1980-1998. Source: Statistics Denmark. Thick line represents Danish average.*

where λ is the monthly inflow rate into the unemployment, T is the average unemployment duration in months, subscript k denotes the county-specific value, and the upper bar denotes the average national value. The first term on right-hand-side captures the effect of differences in average duration (outflow- or duration effect), the second term the effect of differences in the inflow rate (inflow- or incidence effect).

The decomposition was done using the monthly aggregated labour market states (see appendix A). The states and transitions between them were aggregated over the whole time period 1985-1998. The results are presented separately for males and females in Figure 2. Note that the decomposed terms do not exactly sum to the differences in unemployment due to several reasons: first, unemployment is not stationary; second, the average duration is affected by censoring; and third, unemployment rate is calculated excluding the inactive population, while there is a certain flow between inactivity and unemployment. The inflow effect explains 100% and the duration effect 30% of the variation of the regional unemployment rate for males (leaving -30% for covariance). For females, inflow effect accounts for 55% and duration effect for 40% of the variation. Similar decomposition of the inter temporal variation in unemployment rate leads to similar conclusions: inflow and outflow effects are of roughly equal magnitude, the former being slightly more important than the latter (Abbring, van den Berg, and van Ours, 2001).

All the previously identified high-unemployment counties show high inflow rates on the Figure 2. Two of those, Storstrøm and North-Jutland have long unemployment duration also (for females only), while the duration in Fyn is around the national average. Bornholm has a very high inflow rate but short average duration, resulting in moderately high unemployment rate for women and an average unemployment rate for men. The counties in the Copenhagen area have very low inflow rates. Roskilde and Frederiksborg have short unemployment duration too, which results in low unemployment rates in those counties. Unemployment duration in Copenhagen is long for men and hence the male unemployment rate is high. Western-Jutland (Ringkøbing, Viborg, and Ribe) has low average duration while the inflow rate is around the average.

The average duration of unemployment spells, ending in employment, shows quite similar picture (Tables 6 and 7 in the Appendix). The spells, ending with transitions to non-participation, are long in high-unemployment counties North-Jutland and Storstrøm.

In summary, one can distinguish between four different types of regions:

- Low-unemployment regions where the low unemployment rate is caused by low inflow (Roskilde, Frederiksborg).

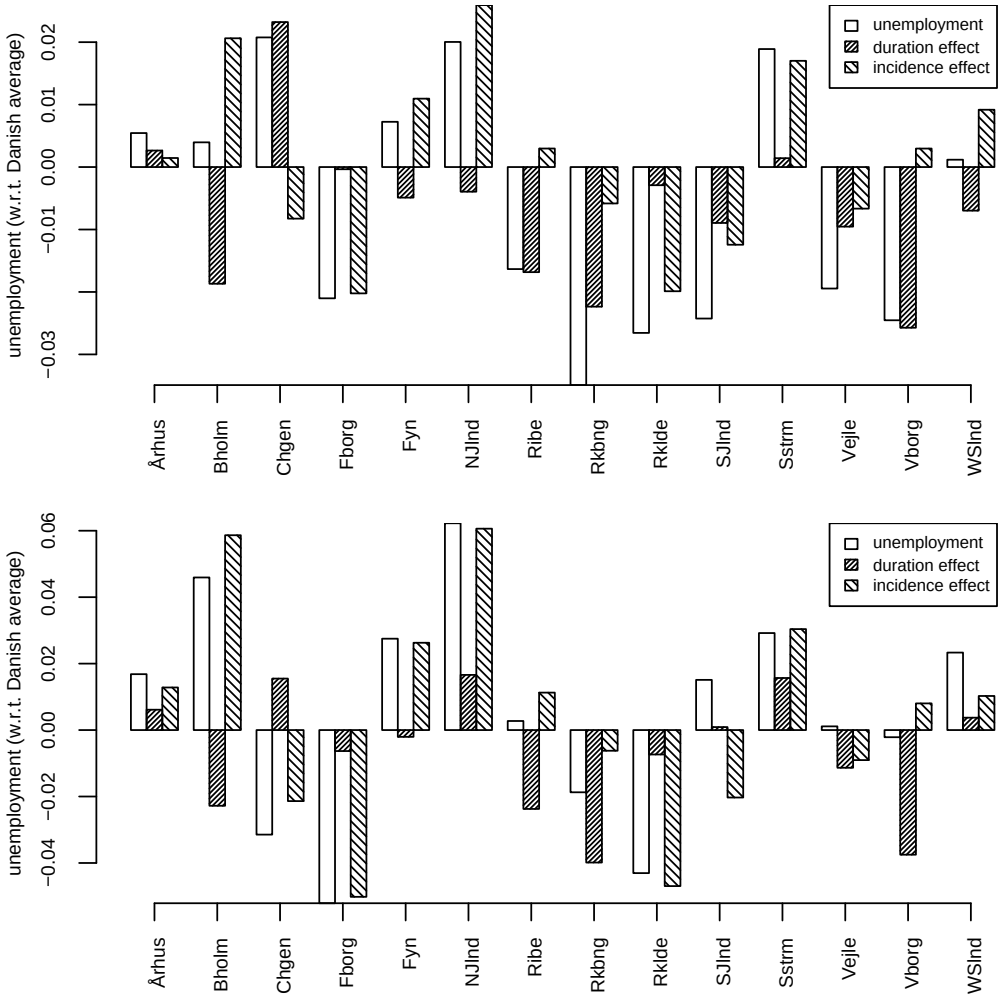

Figure 2: *Decomposition of Danish unemployment rates 1985-1998. Male (upper panel) and female (lower panel).*

- Low-unemployment regions where low unemployment rate is caused by short average duration (Ribe, Ringkøbing, Viborg).
- High-unemployment regions where the high unemployment rate is caused by high inflow (North-Jutland, Storstrøm).
- A high-unemployment region with low inflow and long duration (Copenhagen).

A number of counties did not really fit into any of the four categories and hence they are left out of this grouping.

3.4 Kaplan-Meier estimate of the transition intensities

While the decomposition revealed that more than 50% of the variation in unemployment rates across counties was caused by differences in inflow rates, these differences are not of serious concern to us, because high inflows apparently is not associated with increased risks of long-term unemployment (and discouragement). Hence, we will proceed by ignoring most of the variation in unemployment across counties and concentrate on that part of the variation which leads to different durations. That is, we are now interested in investigating the different durations in, say, North-Jutland and Storstrøm counties on one side and Copenhagen on the other side. All these counties have high unemployment rates, but judging from the, admittedly, crude decomposition exercise long-term unemployment should be much more of a problem in Copenhagen than in the other two counties. The first part of this analysis is to look at the raw data.

The observed transition intensities for selected regions are plotted in the Figures 3 and 4. The complete plots are in the appendix (Figures 16 – 19). All the intensities are decreasing in elapsed time, however, the decrease in the unemployment to employment ($U \to E$) intensity is much larger than in the unemployment to non-participation ($U \to N$) intensity. For spells longer than two years, the latter intensity is roughly constant.

Although the general shape of the hazard rates is similar in all the counties, a number of regional differences appear. The $U \to E$ hazard rate in Copenhagen is low for men during the first year of unemployment (Figure 3, upper panel), while for women the corresponding intensity is close to the national average. In Bornholm, there is a huge hump for females during 6-10 months of elapsed unemployment duration, a similar effect between 18-24 months is not significantly different from the trend. An analogous effect for men is much smaller, but still significant. In the counties of Western-Jutland (Viborg, Ringkøbing and Ribe) the $U \to E$ hazard rate significantly exceeds the national average. This effect is stronger for men but it is present for women also. In two high-unemployment regions, North-Jutland and Storstrøm, the hazard rate is slightly above the average though the difference is statistically significant only for males.

Female $U \to E$ transition intensity is lower than that of males in all the counties. However, the difference is almost non-existent in Copenhagen, due to the exceptionally low male hazard rate in that county. It is interesting to note that a similar relationship is valid for regional male-female unemployment rates too (Hummelgaard, Baadsgaard, and Nielsen, 1998).

The $U \to N$ transition intensity is much lower than the $U \to E$ intensity, confirming the outcome of the crude comparison of completed spell durations

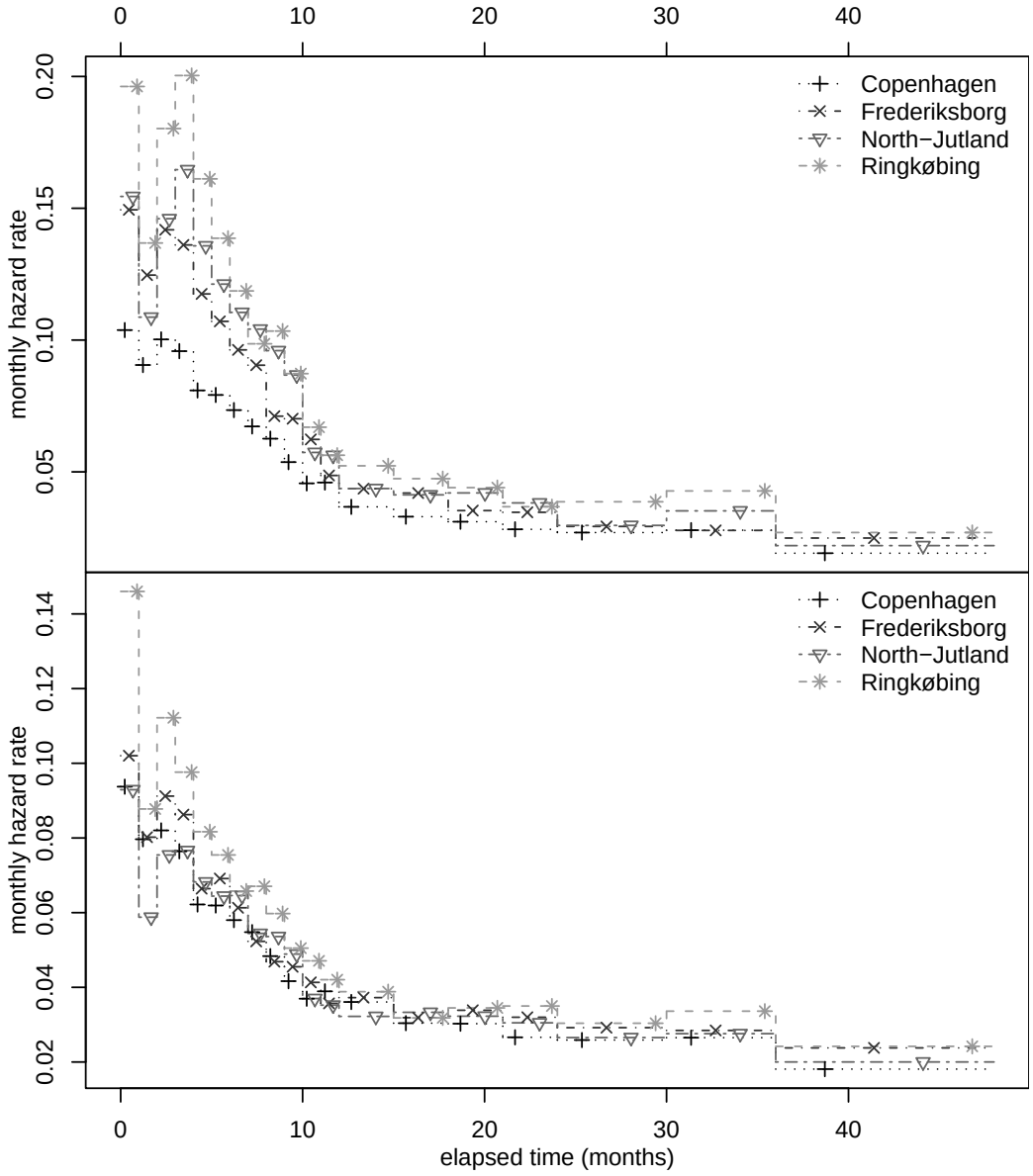

Figure 3: *Average monthly transition intensity for unemployment to employment ($U \rightarrow E$) transition in selected counties. Kaplan-Meier estimator, male (upper panel) and female (lower panel).*

(see Section 3.1). Accordingly, the number of completed spells is low too, and hence no inference can be made for the order of counties for unemployment duration above one year. During the first year, the transition intensity is exceptionally high in Copenhagen and low in Bornholm for both genders. There

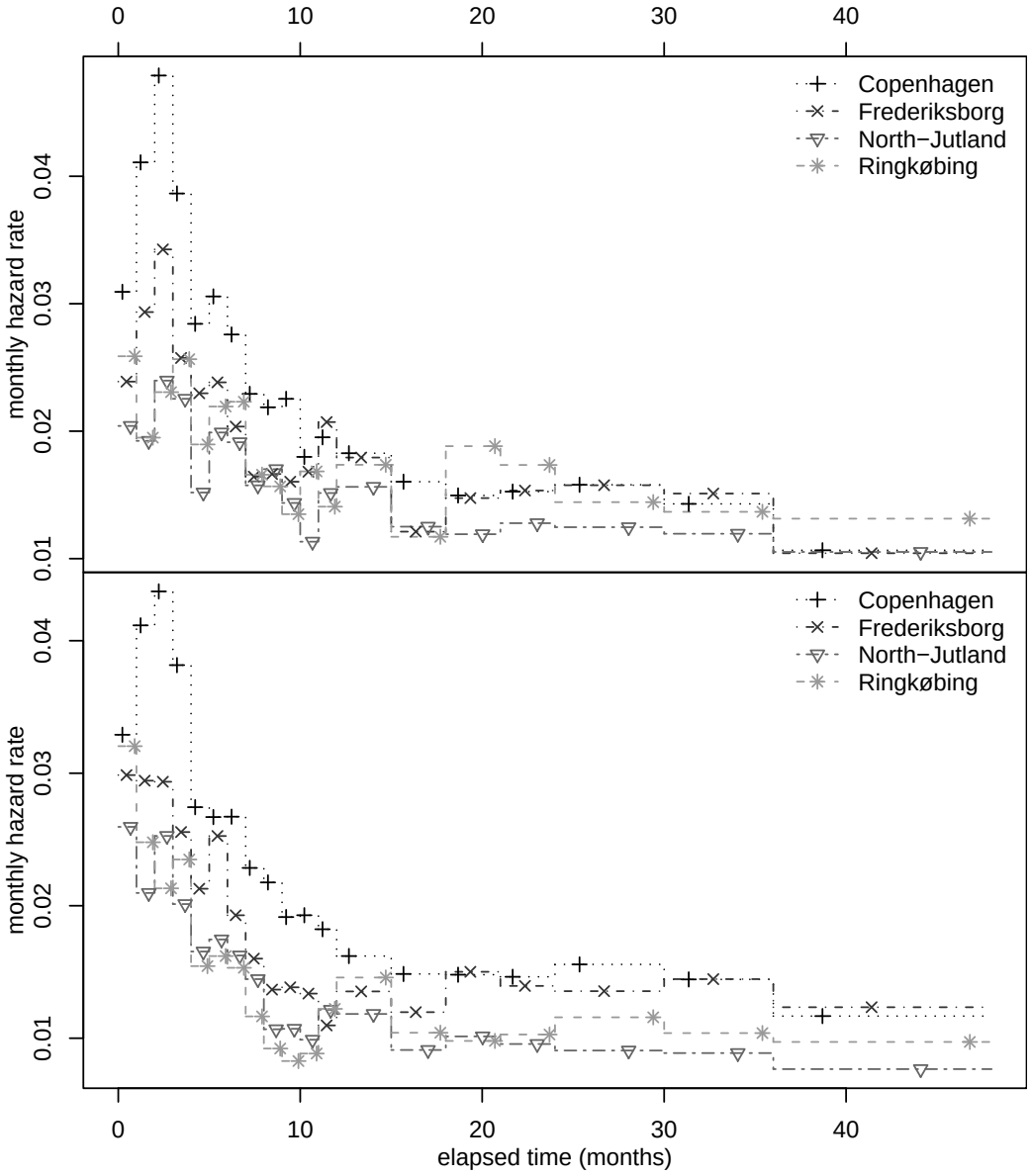

Figure 4: *Average monthly transition intensity for unemployment to non-participation ($U \rightarrow N$) transition in selected counties. Kaplan-Meier estimator, male (upper panel) and female (lower panel).*

seems to be no clear relationship between the level of the $U \rightarrow N$ transition intensity and the unemployment rate: both in low-unemployment Western-Jutland, and in high-unemployment counties North-Jutland and Storstrøm, the intensity lies below the national average.

None of the hazard rates in the other counties of the Copenhagen area (Frederiksborg and Roskilde) and the other main urban centres, Aarhus and Fyn, differ significantly from the national average.

In general, the results fit well with those of the average durations. However, there are some differences, e.g. the average duration of $U \rightarrow E$ spells is short in Copenhagen for females (Table 7) while the corresponding transition intensity lies rather below the national average. This illustrates the fact that average durations do not give a complete picture for competing risks data.

4 Econometric specification

We will investigate the outflow from unemployment into employment and non-participation using a mixed proportional hazard (MPH) framework. The MPH specification is one of the most widely used specifications for duration models in economics. The baseline hazard is specified as a piecewise constant function. A piecewise constant baseline specification is much more flexible than e.g. Weibull baseline while being still easy to handle. Although it is possible to let the length of the intervals go to zero as the number of observations approaches infinity, in finite sample estimation one still uses finite length predetermined intervals. This means we have a fully parametric baseline hazard.

4.1 The likelihood function

Two destination states m, employment E and non-participation N are distinguished. The destination specific hazard rate into state m is specified as:

$$\theta^m(\tau|\boldsymbol{x}, v^m) = v^m \lambda^m(\tau) \mathrm{e}^{\boldsymbol{\gamma}^m \boldsymbol{x}'}, \tag{2}$$

where $\boldsymbol{x}$ is a vector of explanatory variables, v^m is unobserved heterogeneity, and $\lambda^m(\tau)$ is the baseline intensity as a function of elapsed time τ. It is assumed to be a piecewise constant function with a large number of intervals. The unobserved heterogeneity terms are assumed to have a discrete distribution with two mass-points, one of them normalised to unity, and to be distributed independently of $\boldsymbol{x}$.

As we have two destination states, there are in all four possible combinations of (v^E, v^I), and hence three independent values for the corresponding probabilities. The parameter vectors $\boldsymbol{\gamma}^m$, the parameters of the shape for $\lambda^m(\tau)$ and parameters for the distribution of (v^E, v^N) must be estimated.

In competing-risks framework the transition times into different destination states are independent, conditional on observed and unobserved covari-

ates. The model can be treated as two independent models, where transitions into the other state are treated as censored for estimating the intensity into a particular state. Let $\boldsymbol{\beta}$ denote the vector of parameters in the model. The contribution of a single spell j of the individual i to the likelihood function of a particular transition, conditional on $\boldsymbol{x}$ and (v^E, v^N) is accordingly

$$\mathcal{L}_{ij}(\boldsymbol{\beta}; \tau_{ij}, \boldsymbol{x}_{ij}, v^E, v^N) = \left[\vartheta^E(\tau_{ij}|\cdot)\right]^{\delta_{ij}^E} \left[\vartheta^N(\tau_{ij}|\cdot)\right]^{\delta_{ij}^N} S(\tau_{ij}|\boldsymbol{x}_{ij}, v^E, v^N) \quad (3)$$

where δ_{ij}^m is a destination indicator which equals one if the spell j was observed to end in destination state m. The terms in brackets describe the probability of the particular transition at elapsed time τ and $S(\tau|\cdot)$ is the probability of staying in unemployment until τ:

$$S(\tau|\boldsymbol{x}, v^E, v^N) = \exp\left(-\int_0^{\tau_i} \vartheta^E(s|\boldsymbol{x}, v^E)\,\mathrm{d}s - \int_0^{\tau_i} \vartheta^N(s|\boldsymbol{x}, v^N)\,\mathrm{d}s\right) \quad (4)$$

Individual i, who has N_i observed unemployment spells, contributes to the likelihood function, conditional on (v^E, v^N) with

$$\mathcal{L}_i(\boldsymbol{\beta}; v^E, v^N) = \prod_{j=1}^{N_i} \mathcal{L}_{ij}(\boldsymbol{\beta}; v^E, v^N) \quad (5)$$

and to the observed likelihood:

$$\mathcal{L}_i(\boldsymbol{\beta}) = \int \mathcal{L}_i(\boldsymbol{\beta}; v_i)\,\mathrm{d}F_v(v^E, v^N), \quad (6)$$

where $F_v(\cdot)$ is the probability distribution function of (v^E, v^N). In the case of a discrete distribution, the integral collapses to a sum. Note that this likelihood function cannot be written as a product of two independent destination-specific likelihoods any more due to the presence of unobserved heterogeneity which may be correlated across different destinations.

4.2 Identification and specification issues

The MPH competing risks model is identified on relatively weak assumptions given that data satisfies some reasonable regularity conditions (Heckman and Honoré, 1989). In the presence of multiple spell data, identification is even better than with single-spell data, but we still need additional assumptions (Honoré, 1993; Abbring and van den Berg, 2003). In current case an additional source of identification is the assumption of known parametric form of the baseline hazard (Heckman and Taber, 1994).

Although the specification of the distribution of unobserved heterogeneity as a 2×2-point discrete distribution may not seem to be flexible enough, even a small number of mass-points is able to describe the underlying unobserved heterogeneity distribution reasonably well (Heckman and Singer, 1984). There is also some Monte-Carlo indication that the Heckman-Singer method combined with a flexible baseline hazard may lead to over-parametrisation and a related bias (Baker and Melino, 2000; Zhang, 2003).

5 Results

The model is estimated separately for residents in each county, and within each county, it is estimated separately for men and women. The explanatory variables included are those described in Table 1. Each sample is described in the Tables 5-7 in the Appendix.

5.1 Duration dependence of the hazard rate

The estimated transition intensity depends on the observed and unobserved covariates. In order to compare the hazard rates between different counties we construct a reference person and calculate the hazard rates for this individual. Needless to say, since the model is estimated separately for each county, to the extent that the estimated coefficients differ between counties, the results could be different if a different reference individual were chosen. The individual was chosen close to the median of the data set (young, single, Danish-born individual with elementary education and 4 years of working experience, 1992). The same approach may be used with respect to the unobserved heterogeneity, fixing the v value for the reference group. However, as suggested in the literature, the estimated distribution of unobserved heterogeneity cannot be interpreted as individual types, but rather as a mere approximation of the true distribution (Zhang, 2003). Corresponding attempts in the current study led to an enormous variation in hazard rates and were therefore inappropriate. Instead, we present transition intensities for the expected value of v in the inflow, though according to the model there are no individuals with such a v value. Here one has to depart from the model and follow interpretation of Zhang (2003). Note that the expected value of v differs between regions.

Transition intensities in selected counties are plotted in the Figures 5 and 6. The full plots are presented in the appendix (Figures 20 – 23). As the reference individual is the same in every region, the differences between counties in the Figures correspond to a "regional effect" only, and possibly

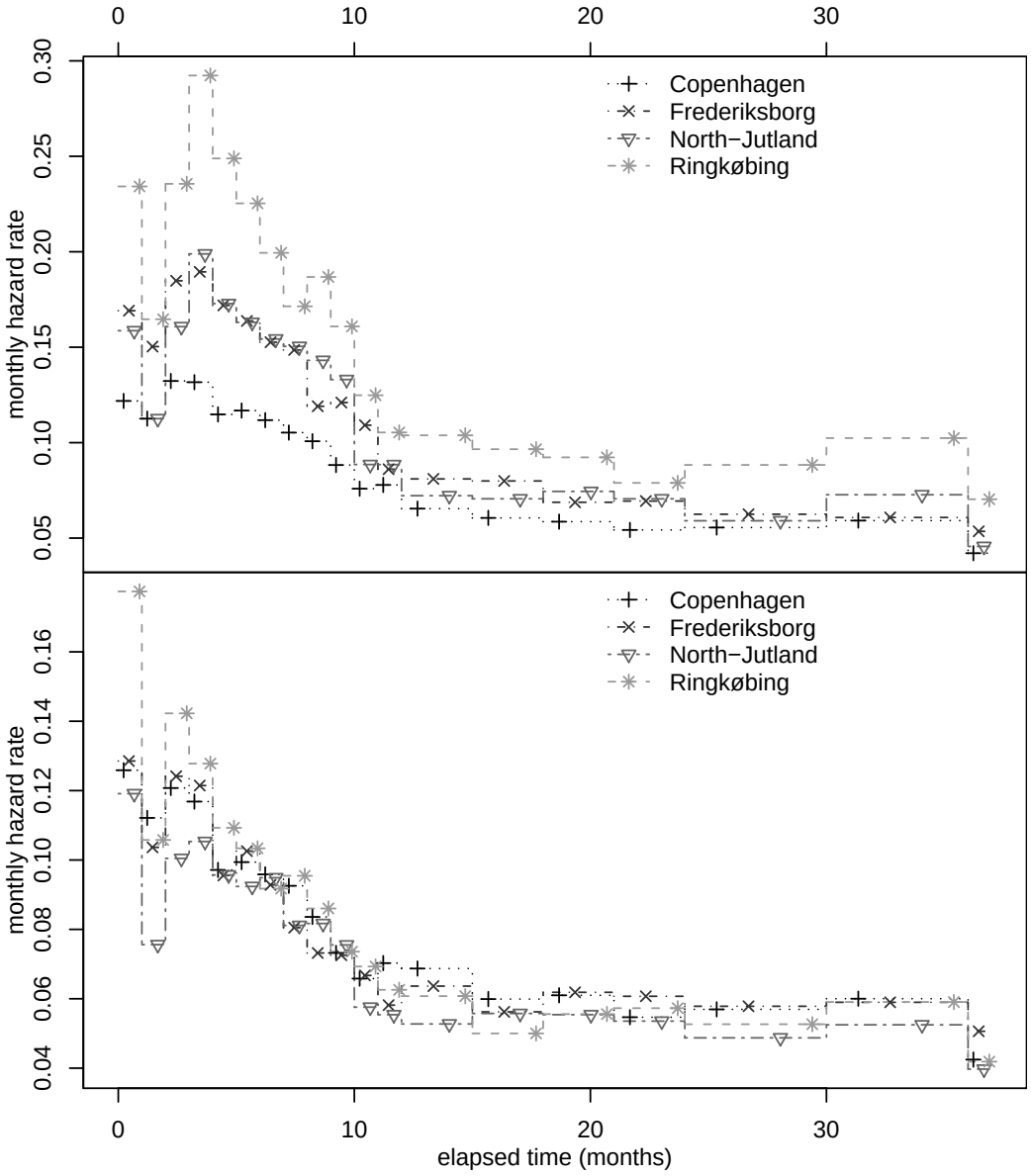

Figure 5: *Monthly transition intensity for $U \to E$ transitions in selected counties. Male (upper panel) and female (lower panel).*

to an unobserved "composition effect".

The monthly $U \to E$ transition intensity (Figure 5) is decreasing in elapsed time. The fall is smaller than for the Kaplan-Meier estimator (Figure 3) and it stabilises around 0.08 after a year of unemployment. The relative position of regions is quite similar to the case of the Kaplan-Meier

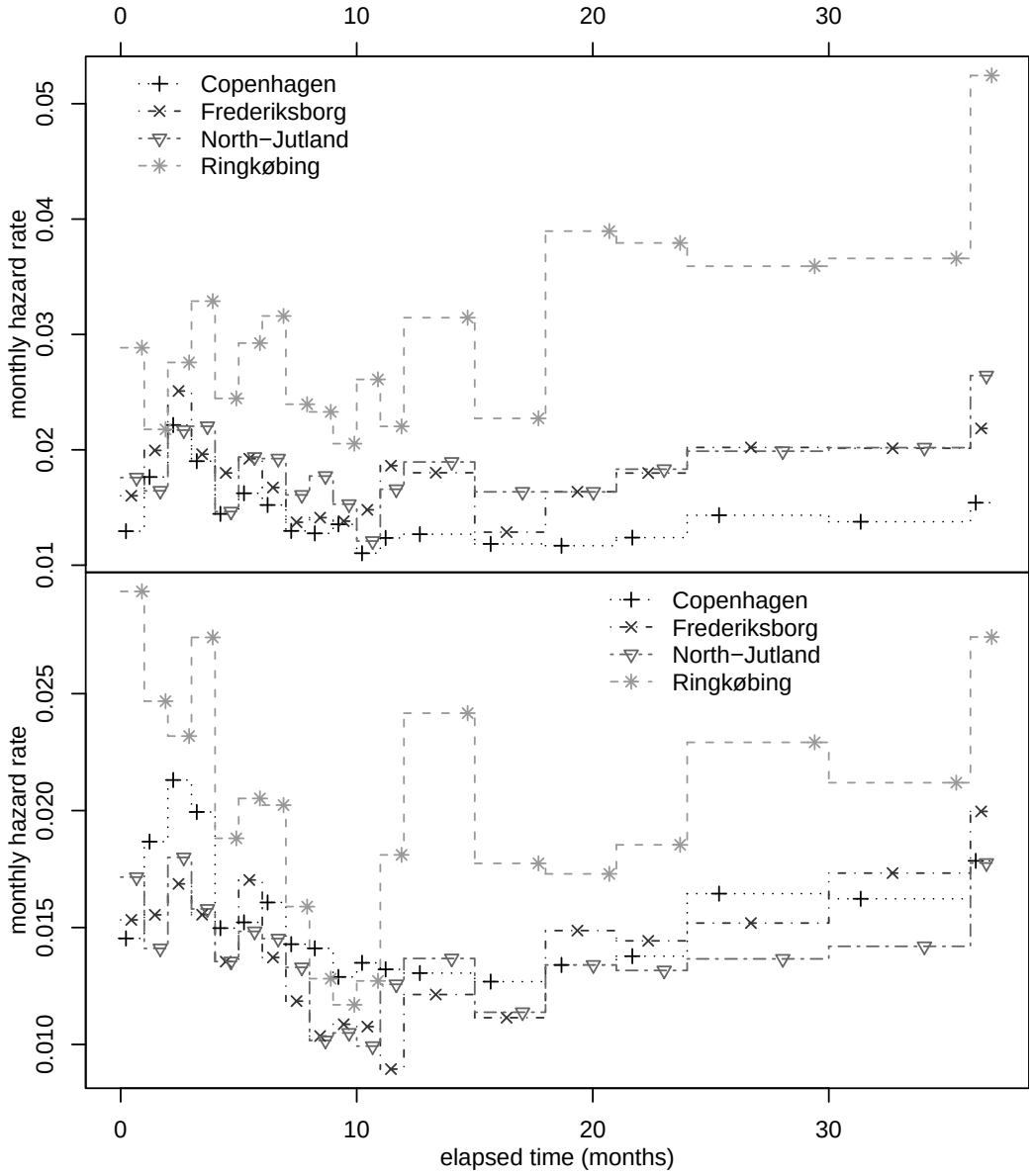

Figure 6: *Monthly transition intensity for $U \rightarrow N$ transitions in selected counties. Male (upper panel) and female (lower panel).*

estimator. The male $U \rightarrow E$ hazard rate is low in Copenhagen and high in the counties of Western Jutland. For Bornholm it has a maximum between 6-10 months, exactly as in the case of Kaplan-Meier estimate.

The transition intensity into non-participation (Figure 6) decreases during the first year and starts to increase thereafter. For men, the probability for

leaving the labour market is high in Ringkøbing and low in Copenhagen. For women, none of the regional differences are statistically significant. The large standard errors for this hazard rate, compared to $U \to E$ transition intensity, are related to the fact that there are significantly fewer observed transitions to non-participation (as reported in Tables 6 and 7 in the appendix).

The unobserved heterogeneity terms show a quite similar pattern across the counties. Namely, the low value of v^E is around 0.4 (the high value is normalised to unity) while the low value of v^N is somewhat smaller (see Table 12), the variance of the former is slightly lower than that of the latter. The values are more stable for men and for $U \to E$ transitions. Surprisingly, in most cases the correlation coefficient is positive, suggesting that individuals who are finding a job more easily are also more likely to leave the labour market[2]. The most frequent types may be characterised as "slow" and "fast", not as "job-oriented" and "leisure-oriented". This result differs from that by Frijters and van der Klaauw (2003), where they find a strong negative correlation between job- and leisure orientedness. However, the current analysis reveals an important exception – the Copenhagen area, where the latter division is more applicable. Otherwise, the positive correlation dominates in Western-Jutland and Storstrøm, while the values for Eastern-Jutland are lower and mostly insignificant. These patterns are much more clear for men, but still present for women, too. Still, even if the correlation coefficient is positive, it is most often fairly small, indicating the presence of the "job-oriented" and "leisure-oriented" workers too.

5.2 Impact of the individual characteristics

The estimates for the individual characteristics are presented in the Tables 8 and 9 in the Appendix for $U \to E$ transitions and in the Tables 10 and 11 for $U \to N$ transitions. A selection of the variables are plotted in the Figures 7 and 8 ($U \to E$ transition) and 9 ($U \to N$ transition). The $U \to E$ transition reveals more significant variables and the regional differences are easier to interpret.

For men, marriage seems to be associated with better job possibilities everywhere in the country, except for Bornholm. For females, married persons generally have a lower probability of finding a job. A small child in the family leads to the well-known discouraging effect for women and to an encouraging effect for men. The effect depends on the age of the child though: both for men and women it holds that unemployed workers with children in schooling

[2]This result is robust to changes in starting values for the maximisation of the likelihood function, that is, it is not a local maximum we have found.

Figure 7: *Selected effects on $U \rightarrow E$ transitions. Males in the left and females in the right column.*

Figure 8: *Selected effects on $U \rightarrow E$ transitions. Males in the left and females in the right column.*

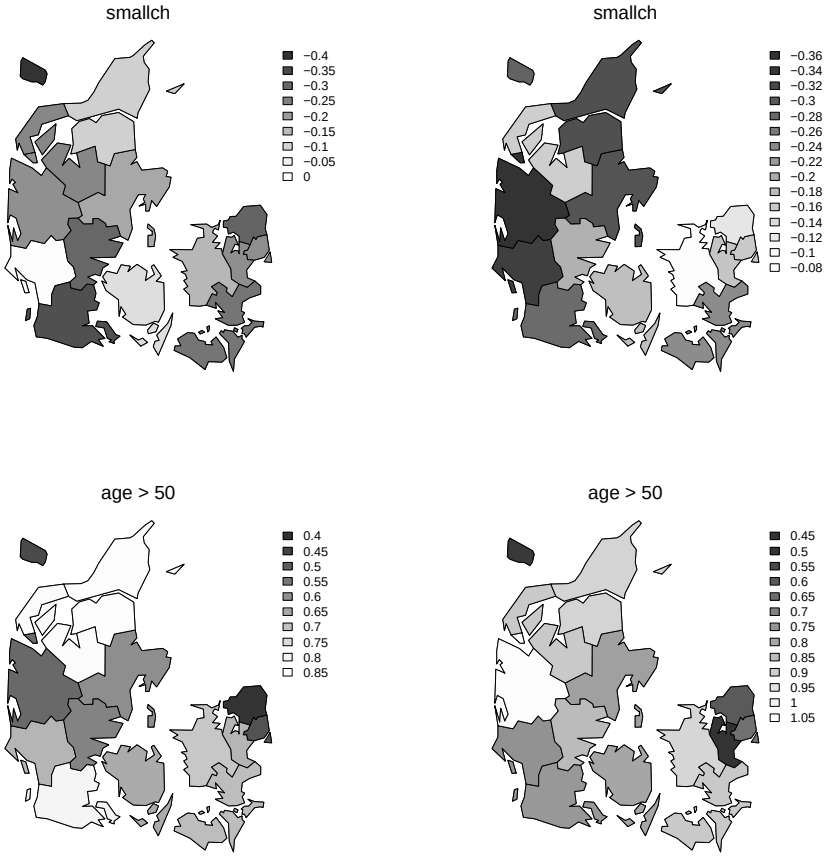

Figure 9: *Selected effects on $U \rightarrow N$ transitions. Males in the left and females in the right column.*

ages are more likely to find jobs than those without children.

Turning to the relation between demographic variables and the $U \rightarrow N$ transitions, we find that, surprisingly, married (and co-habiting) men are more likely to leave the labour market than single men. Perhaps even more surprisingly, the opposite is the case for women. Moreover, for men the effect of marriage appears to be particularly large in counties with a large city, that is, Copenhagen, Aarhus, Fyn, and North-Jutland. Having small children is associated with smaller probabilities for leaving the labour market than not having any children. For men this is perhaps not so surprising, while we had expected *a priori* to find the opposite for women. Children in schooling ages tend also to be associated with lower $U \rightarrow N$ transition rates. Hence, the well-known pattern found in the $U \rightarrow E$ transition rates are not found in the

$U \rightarrow N$ transition rates, which should perhaps lead to a modification of our perception of women with children in the labour market. At least this result warrants further analysis, as it may also be caused simply by the possibility of using UI-benefits and/or unemployment assistance to prolong a maternity leave period while still being on a fairly generous income transfer scheme compared to the possibilities outside the labour market.

The age variables show a familiar and very strong pattern – young individuals have better chances to find a job and old persons become more easily inactive. The transition intensity into inactivity seems to be U-shaped, the lowest point is at age 35-49. The comparison of counties reveals that young women find it relatively easy to find a job in the Copenhagen area and in South-Jutland, while it is relatively difficult in Bornholm. For old individuals the picture is opposite – it is relatively easy in Bornholm and difficult in the Copenhagen area. In the latter region older individuals are somewhat less inclined to become non-participants.

Better education is associated with better job chances. The effect is much more important for females. Individuals with elementary education do relatively worse in the Copenhagen area. For men, having a higher education is often associated with longer unemployment duration than for those with secondary education. For transitions out of the labour market, we find that those with no education are less likely to leave the labour market than those with secondary education, which is surprising. For those with higher education, the association with the $U \rightarrow N$ transition rate shows large variation across regions.

The job-chances of immigrants are clearly worse than those of Danes in all counties except Bornholm. The difference to native Danes is largest in the Copenhagen area (for females) and in Western-Jutland (for males).

The coefficient for working experience shows, as expected, a positive concave effect for the $U \rightarrow E$ transition and a negative effect on $U \rightarrow N$ transition. The maximum of the former effect is reached at around 12 years for females, for males the effect rises until 16 years. Experience is less valued in the Copenhagen area where the effect levels out between 10-15 years. Newcomers who enter the labour market first time have lower $U \rightarrow E$ and slightly higher $U \rightarrow N$ transition intensity. Their job chances are low in Bornholm. Individuals who have previously been out of the labour market have more difficulty finding a job. This effect is strongest in the Copenhagen area and Fyn. Moreover, their probability to leave the labour force is remarkably high. The effect of the previous industry is quite different across the counties. Previous work in agriculture seems to be associated with a high $U \rightarrow E$ transition rate for men, while for women this is only the case if Fyn and Storstrøm. Having worked in construction also leads to much better job

chances for men. The previous industry has no obvious effect on the $U \rightarrow N$ transition rate.

The individuals who do not have unemployment insurance are a little less likely to move to employment and much more likely to drop out of labour force. These results could be explained in many ways. For example, persons not receiving UI benefits often have a loose connection to the labour market, and may even have low expected wages, hence making them less employable. This should also make it more attractive for them to leave the labour market. Note that persons who do not receive UI benefits typically receive unemployment assistance (*kontanthjælp*) instead. Unemployment assistance is typically lower than UI benefits, but it is means tested, which UI benefits are not, making it difficult to say anything regarding incentive effects of UI benefits (for an analysis of incentive effects, see Rosholm and Toomet (2004); Toomet (2004)). The disadvantage of not being insured seems low in the Copenhagen area where the share of insured workers is low too (see Table 6).

The previous year's income is related with a positive effect on the probability of finding a job for males in most of the counties, suggesting that a strong factor behind income and transition intensity is unobserved ability. In Copenhagen, the effect decreases initially but starts to increase at around 150 000 kroner yearly (this is close to this county's average 167 000 kroner). The effect on females is negative and convex in all the counties, the minimum appears to be around 250 000 kroner yearly. The relationship between income and the $U \rightarrow N$ hazard rate is negative for men in most of the counties, for women the effects are insignificant. Partner's income (in current year) is associated with better chances of finding a job for both men and women, and the effect is strong in Copenhagen for females. This finding suggests that a possible negative incentive effect of family income is dominated by other effects like information sharing within the families (Montgomery, 1994) or selection effects (assortative matching). However, higher wealth may well be related with lower search incentive: current wealth is associated with somewhat lower probability of getting a job (though for most of the counties, the coefficients are insignificant) and with a tendency to drop out from the labour force. The effect of real estate is the opposite, probably reflecting the need to be employed in order to be able to pay mortgages.

In summary, the analysis in this section complements the decomposition analysis above. There seems to be different types of regions: the Copenhagen area where the labour market favours young and well-educated individuals. Western-Jutland, on the contrary, is relatively favourable to less-educated workers with families.

5.2.1 The effect of the business cycle

A high growth rate in the mid-eighties was followed by a depression lasting until 1993-94 in Denmark. Thereafter the annual growth rate has been around 2-3% again. Unemployment has behaved counter-cyclically with a slight lag. The peak in unemployment, 12.4%, was in the beginning of the new growth period, in 1994 (see Figure 1). In the current model, the effect of the business cycle on the transition intensities is captured by year dummies. The effects for selected counties are presented in the Figures 10 and 11 for $U \rightarrow E$ and $U \rightarrow N$ transitions respectively, the full plots are in the Appendix (Figures 24 – 27).

In nearly all the counties the $U \rightarrow E$ transition intensity decreased during the downturn and increased again after the beginning of the upturn, showing an expected pro-cyclical pattern (Figure 10). In the trough of the cycle, around year 1992, the intensity was lower in all counties than before the recession. The fall was more severe for men (25-40%) than for women (5-30%). This may reflect the fact that for females it is more common to be employed in the public sector. Since that time, the $U \rightarrow E$ hazard rate has increased again. The hazard rate for women was higher in 1997 than in 1985 in most of the counties, but for men, in contrary, by 1997 it had not yet reached the level of 1985. The counties where the female job chances have improved the most are South-Jutland and Fyn. The only notable exception to this general trend is Ringkøbing where the female chances have declined, and Ribe where the male hazard rate has grown quite a lot. Bornholm shows a general falling trend through the whole period for both genders.

The $U \rightarrow N$ transition intensity shows a different picture (Figure 11). For males, this hazard rate increased in the beginning of the downturn, followed by a decrease around year 1992 and a new increase thereafter. The picture for females is dominated by a general increasing trend, as there is no fall around 1992 as for males. An exception is Copenhagen where the increasing trend seems to be missing. For the other two counties in the Copenhagen area (Roskilde and Frederiksborg) the level is in general below the national average, most notably around 1994 (compare with the Figure 1). The curve for Bornholm is too noisy for any inference.

In summary, it is worrisome that there is a general trend toward increasing exit rates from the labour market for unemployed workers during the 1990s. Still, some of this may be explained by new possibilities for taking temporary leave from the labour market, which were introduced in 1994. These possibilities were open to both men and women. To the extent that these increases reflect temporary leave, the problem is also temporary in nature. However, the increase is caused by both a temporary component but also a

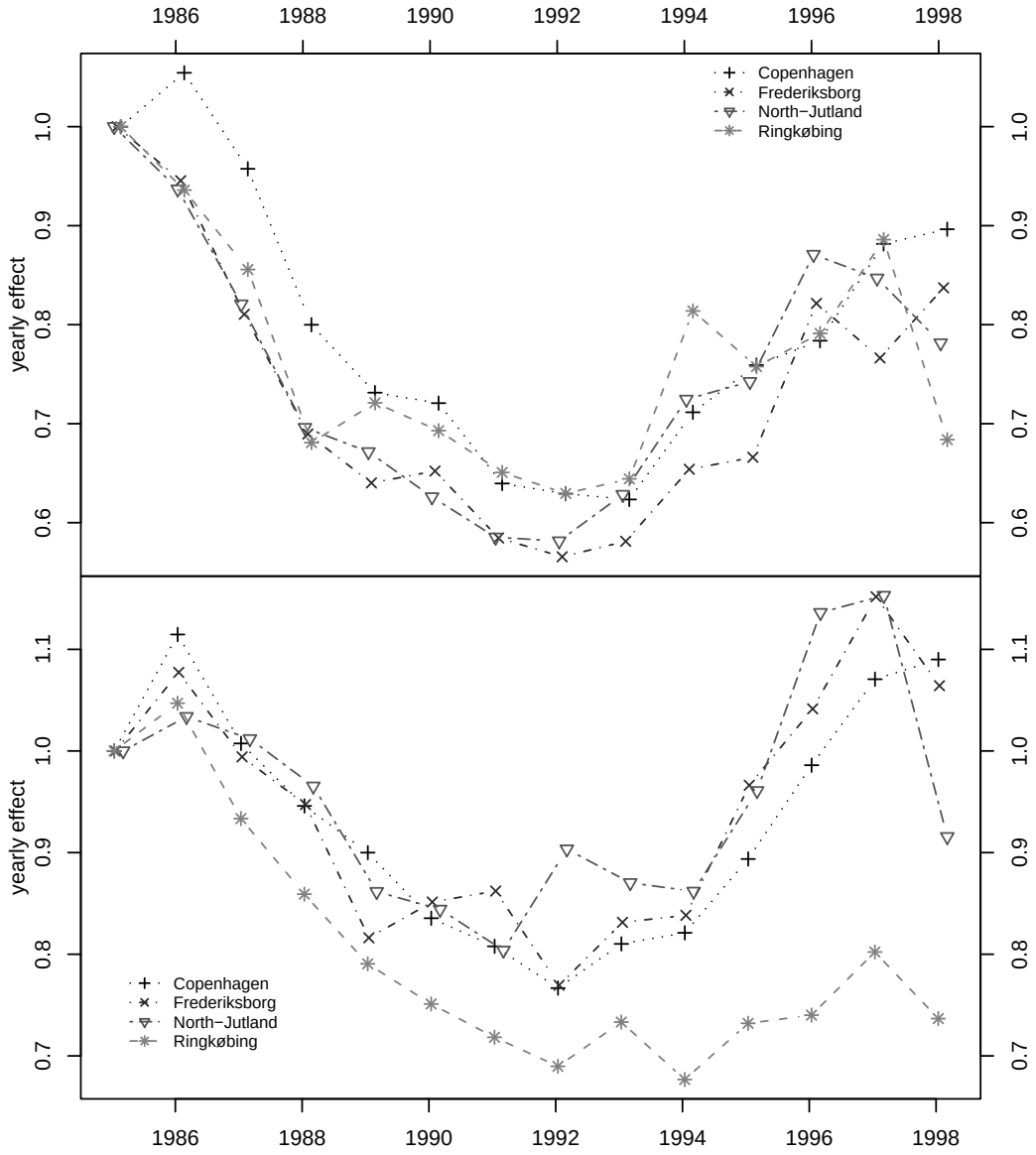

Figure 10: *Yearly multiplicative effects for $U \rightarrow E$ transition intensity in selected counties. Males (upper panel) and females (lower panel). 1985 is the reference year. Data for 1998 is disturbed by boundary effects.*

permanent one, that is, there is also a fairly large increase in permanent exits from the labour market (Mikkelsen, 2004).

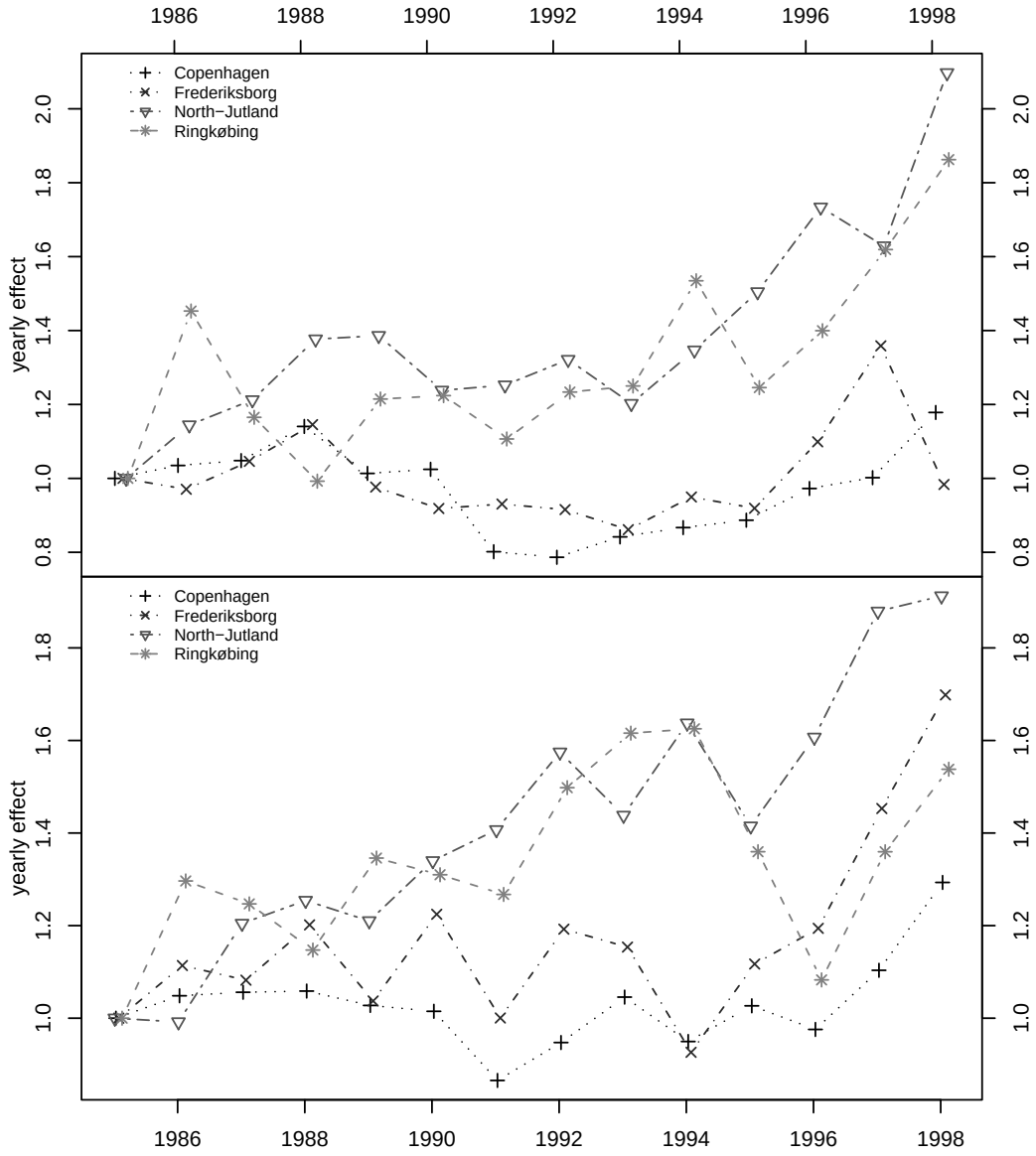

Figure 11: *Yearly multiplicative effects for $U \rightarrow N$ transition intensity in selected counties. Males (upper panel) and females (lower panel). 1985 is the reference year. Data for 1998 is disturbed by boundary effects.*

5.3 Discouragement probability

5.3.1 The effect of elapsed unemployment duration

The focus of this study is on regional aspects of long-term unemployment and discouragement, the latter of which has not been given a clear defini-

tion, neither in the literature, nor in this paper. Discouragement has to do with the gradual deterioration of the beliefs that an unemployed worker has, concerning his or her ability to eventually find a job. Empirically, we have established the existence of "fast" and "slow" worker types, so it would seem appropriate to have a relative measure of discouragement, that reflects the probability of leaving the labour market *relative* to the probability of finding a job. We will define a measure of discouragement, *the discouragement probability* $m(\tau)$, which is the probability of leaving the labour market at elapsed unemployed duration τ given that the person leaves unemployment. This probability, conditional on observable covariates $\boldsymbol{x}$ and unobservables (v^N, v^E), may be expressed accordingly as

$$m(\tau|\boldsymbol{x}, v^N, v^E) = \frac{\vartheta^N(\tau|\boldsymbol{x}, v^N)}{\vartheta^N(\tau|\boldsymbol{x}, v^N) + \vartheta^E(\tau|\boldsymbol{x}, v^E)}. \tag{7}$$

One has to integrate it over the distribution of (v^N, v^E) in order to get the expected discouragement probability. We will integrate over the unconditional distribution of unobservables, that is, we will not take into account that this distribution depends on elapsed duration since we are interested in the discouragement probability of a particular reference person (see Section 5.1).

The results for selected counties are shown in the Figure 12, the full plots are in the Appendix (Figures 28 and 29). As one can see, most of the regions follow a common increasing general trend from a discouragement probability around 0.1 to around 0.3 during three years of elapsed time. The trend is slightly steeper for men (from 0.1 to 0.3) than for women (from 0.15 to 0.3). The discouragement probability increases sharply at the end of the first year of unemployment.

The probability is low in Bornholm and in two counties in Western-Jutland, Ribe and Viborg (the latter one for males only). High discouragement probability counties are the main urban centres of Denmark – Copenhagen and Aarhus (during the first year of unemployment). The other counties in the Copenhagen area have values near the Danish average and in one of the counties of Western-Jutland, Ringkøbing, the probability is rather high starting from the second year.

In conclusion, discouragement is not only a real phenomenon in Danish regions, it is also a real problem in the sense that the discouragement doubles or triples over an unemployment period of two to three years. This is not really surprising, but it is a worrying finding, as it implies that among those unemployed for around two years, around 30% will eventually leave the labour market. Moreover, the picture of discouragement probability suggests that there are slightly more labour market leavers in the large urban areas and slightly fewer in Western-Jutland.

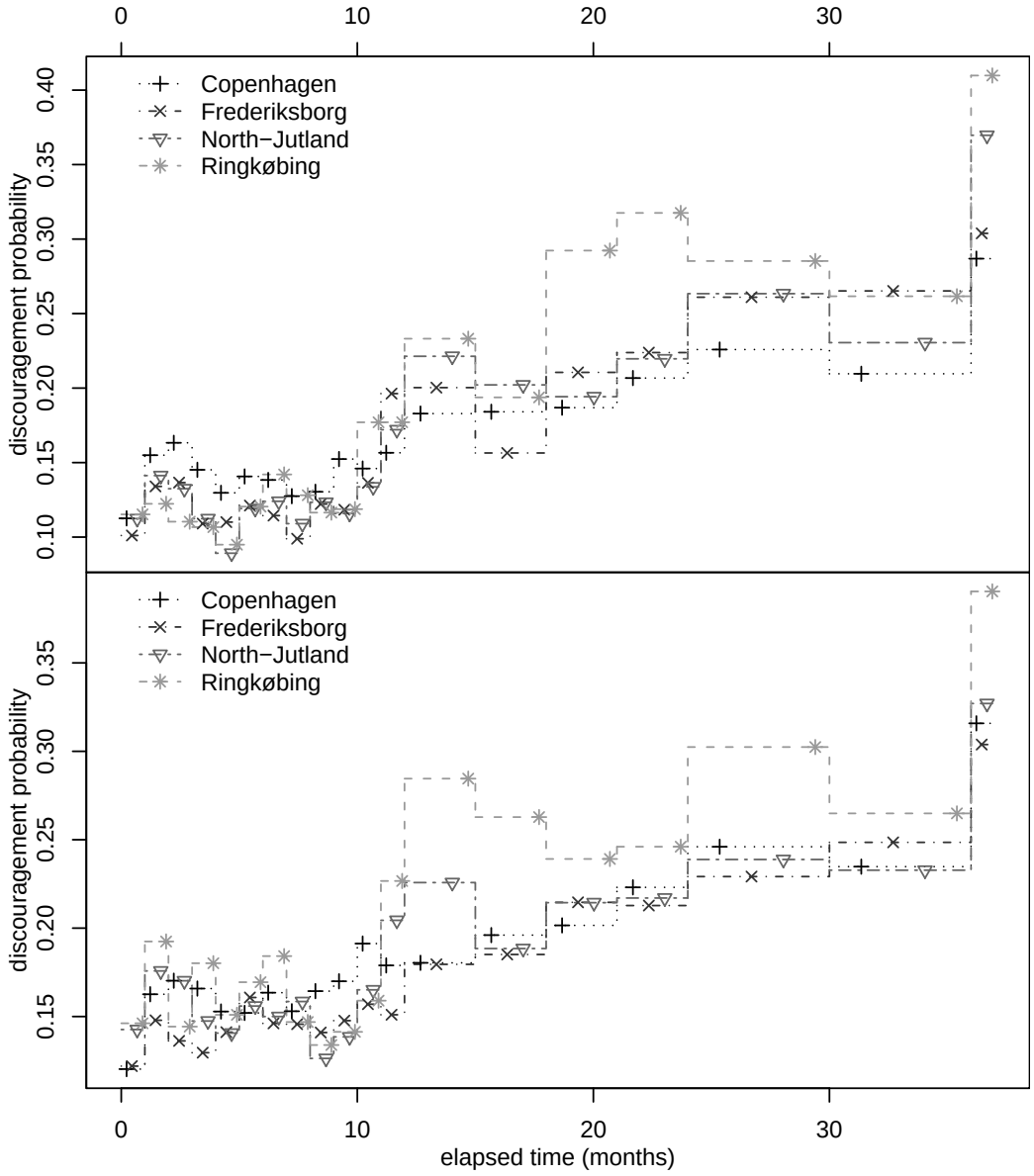

Figure 12: *Discouragement probability as a function of elapsed unemployment duration in selected counties. Male (upper panel) and female (lower panel).*

It is possible to define a measure for the discouragement probability in the same way as in (7), fixing the length of the spell and looking at the effect of year dummies. Figure 13 shows the development of the discouragement probability for selected the counties for 12-15 months long unemployment spells for the reference person. The full plots are in the Appendix (Figures 30

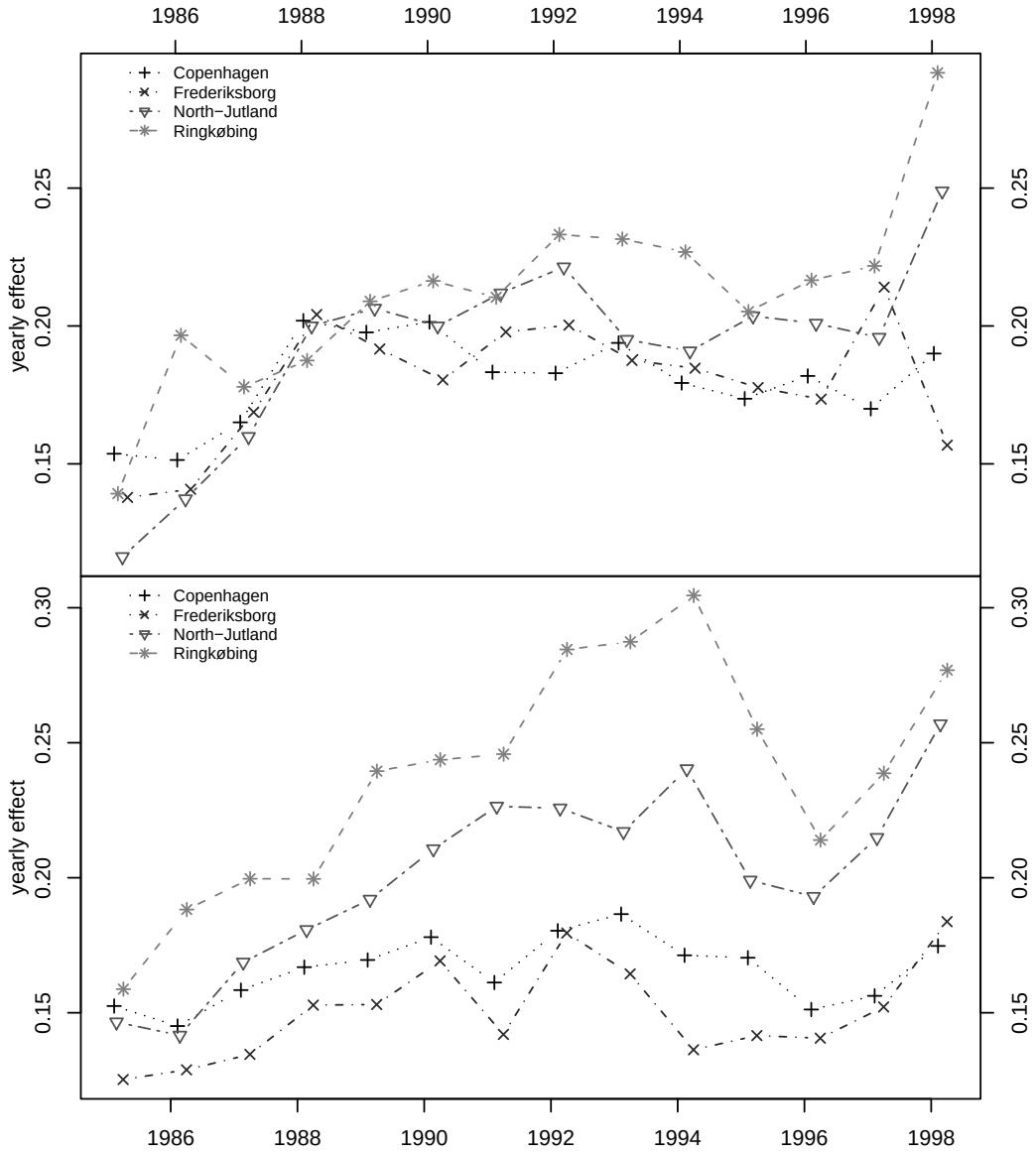

Figure 13: *Discouragement probability in selected counties for the reference group and elapsed time 12-15 months. Male (upper panel) and female (lower panel) The high value in 1998 is related with boundary effects.*

and 31). The probability increases in all counties quite rapidly until 1990 and stays more or less constant thereafter. There is only a minor fall in the probability after the beginning of the new growth period in the mid-nineties because of the continuing rise of the $U \rightarrow N$ transition intensity.

This picture is consistent with that found by Mikkelsen (2004) on a different data set for Denmark. The trend is slightly smaller in Copenhagen for both genders, perhaps even missing for females. The high-unemployment counties Bornholm, Fyn and North-Jutland seem to follow the average trend.

In summary, in most of the counties the discouragement probability behaves counter-cyclically with an increasing trend. An exception is the Copenhagen county where the trend is missing. The fact that the discouragement probability does not fall during the cyclical upturn in the 1990s is probably in part caused by the new leave schemes introduced in 1994. Mikkelsen (2004), however, shows that these schemes do not account for nearly all of the increase in the exit rate from the labour market. So it would seem that the labour market during the 1990s have become more polarised, in the sense that the hazard rates out of unemployment have increased in both directions, into employment and out of the labour force. One might then begin to speculate about the cause of this tendency, and there are several possible explanations. One is that labour market reforms to wards more active labour market policies have helped those who are close to the job market – the immediately employable – while it has acted as an additional stress factor for those with fewer qualifications, making them more prone to labour market exit. The tendency of increased labour market exit is undeniable a bad one, but to the extent that it reflects some kind of sorting of unemployed workers, it may actually allow policy makers to concentrate efforts on employable workers. Whether one wants to give up on those who are not employable is an entirely different matter.

5.3.2 Decomposition of the discouragement probability

The overall regional discouragement probabilities depend on the regional transition intensities (parameters) and on the composition of the pool of unemployed workers (composition effect). There is a large number of studies where various labour-market variables are decomposed in time. In general, the results indicate that most of the variation is explained by the disaggregate (business cycle-) effect, the composition effect plays only a minor role (Baker, 1992; van den Berg and van der Klaauw, 2001; Rosholm, 2001; Dejemeppe and Saks, 2002). In the current study, the regional variation in the discouragement rate is decomposed in a similar way. This decomposition is also similar in spirit to the decomposition technique of Oaxaca (1973) for wage differences between men and women. We believe such an analysis is interesting, though we admit that regional differences are much less comparable than differences in time series.

Let $m(\tau|\boldsymbol{x}, v^N, v^E)$ denote the discouragement probability as defined in (7)

for an individual with observable covariates $\boldsymbol{x}$ and unobservables v^N and v^E. The discouragement probability for elapsed time τ months, not conditioned for the time of exit from unemployment, may be defined as:

$$M(\tau|\boldsymbol{x}) = \int \left[\int_{\tau}^{\infty} m(s|\boldsymbol{x}, v^N, v^E) \, \mathrm{d}F(s|\boldsymbol{x}, v^N, v^E) \right] \mathrm{d}G(v^N, v^E). \quad (8)$$

First, the discouragement probability $m(\cdot)$ is integrated over time from τ to infinity, conditional on unobserved heterogeneity terms (the inner integral in the brackets), and thereafter the observed value is found by integrating over the unobserved heterogeneity distribution.

The average probability in county k is approximated by $M_k(\tau|\boldsymbol{x}_k)$ where $\boldsymbol{x}_k$ denotes the average $\boldsymbol{x}$-value in the corresponding region. Further, the difference between the discouragement probability in the region k and in a certain reference region with certain standard individuals may be decomposed in the same way as in (1):

$$M_k(\tau|\boldsymbol{x}_k) - \bar{M}(\tau|\bar{\boldsymbol{x}}) = \left[M_k(\tau|\boldsymbol{x}_k) - \bar{M}(\tau|\boldsymbol{x}_k) \right] + \left[\bar{M}(\tau|\boldsymbol{x}_k) - \bar{M}(\tau|\bar{\boldsymbol{x}}) \right]. \quad (9)$$

Here $\bar{M}(\tau|\boldsymbol{x}_k)$ is the discouragement probability in the reference region for the (observable) individual characteristics $\boldsymbol{x}_k$; $\bar{M}(\tau|\bar{\boldsymbol{x}})$ is the probability in the reference region for the standard individual characteristics $\bar{\boldsymbol{x}}$. In the current study, a random sample for all of Denmark was used as the reference region and the average characteristics of it were used as that the standard characteristics $\bar{\boldsymbol{x}}$.

The first term in brackets on the right-hand side of (9) may be interpreted as a regional effect which describes the differences in discouragement probability "explained" by different parameters of the estimated models (regional effect). These different parameters may reflect different behaviour of unemployed workers in different regions but more likely they reflect different regional labour markets. The second term is the composition effect, which captures the part of the deviation in the discouragement probability from the national average which is explained by differences in characteristics of the unemployed workers in different regions (composition effect). Note that the unobserved individual characteristics are treated as regional effects, not as a compositional effect (they are integrated out in (8)). It would be more consistent to treat the unobserved heterogeneity exactly as the observed one and to use the average values in the decomposition (9). However, due to the issues discussed in Section 5.1, the unobserved heterogeneity was simply integrated out. Hence our estimate represents the lower bound for the importance of the composition effect.

The regional decomposition of the discouragement probability $M(\cdot)$ is plotted in the Figure 14 for $\tau = 3$ months. For men, the parameters explains

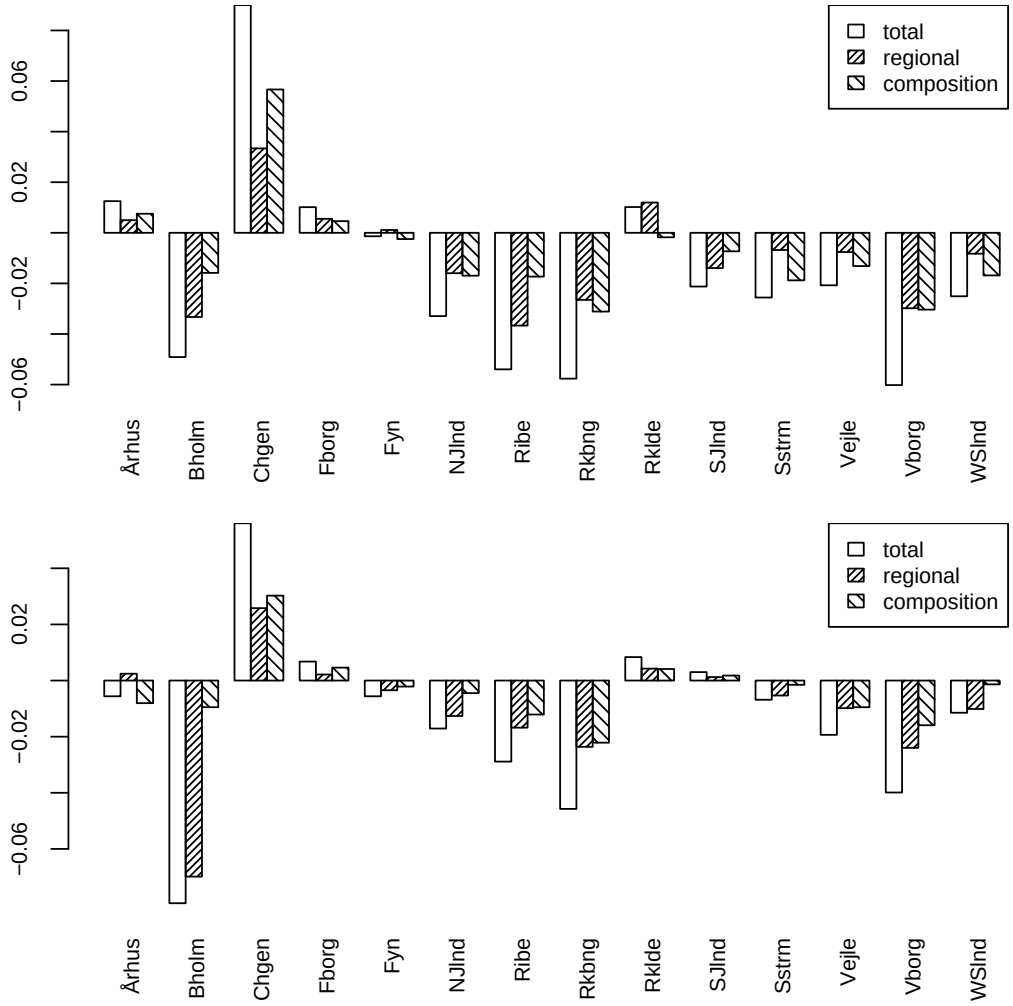

Figure 14: *Decomposition of the regional differences for probability of leaving the labour force after 3 months of unemployment. Differences in discouragement probability with respect to Danish average. Male (upper panel) and female (lower panel).*

24% and the composition effect 30% of the variance of regional discouragement probabilities (remaining 46% are due to the covariance). For women, the corresponding numbers are 48 and 16%. This result suggests that the observed regional differences in composition play a significantly larger role in explaining the total regional effects, compared to compositional differences in time, especially for men.

It can be seen from the figure that in most of the counties, the probability lies below the Danish average. The only counties where the case is opposite

for both genders are Copenhagen, Frederiksborg and Roskilde – those three counties together form the Copenhagen area. The probability in minor urban centres, Aarhus and Fyn, lies slightly below zero in most cases, only the value in Aarhus for males is positive. In Copenhagen, the dominating factor behind a high value of discouragement probability seems to be the composition effect. For the other urban counties (Frederiksborg, Roskilde, Aarhus and Fyn), the two effects are of roughly equal size in most cases.

The counties with the lowest probability are Bornholm, Ribe, Ringkøbing and Viborg. The latter three form the industrial area in Western-Jutland. The low value for Bornholm is related with the parameter effect, for Western-Jutland the regional and composition effects are roughly equal. In high-unemployment counties Storstrøm and North-Jutland, the probability lies slightly below the average. In fact, the results of those counties are similar to the area of Western-Jutland.

Somewhat surprisingly, the regional discouragement probability is not correlated with the regional unemployment rate (the correlation is negative for females and positive for males, but none of them are significant at the 10% level). There are high-unemployment counties with low discouragement rate (e.g. Bornholm and North-Jutland) and vice versa (e.g. Roskilde and Frederiksborg). A clear positive relationship exists between the average unemployment duration and the discouragement probability: longer unemployment duration is related to higher probability of leaving the labour force. The reason is obvious – longer unemployment duration is associated with lower transition intensity into employment, and given that the the two destination specific hazard rates are less than perfectly correlated, the probability that an unemployment spell will end with a transition into non-participation is accordingly higher.

The relationship between the inflow rate into unemployment and the discouragement probability is negative (though not significant for males) – counties with higher incidence rate have a lower marginalisation probability. However, this relationship depends heavily on two outliers, Copenhagen and Bornholm. It is, though, possible that in an environment with high incidence rate, the stigma of unemployment is low.

6 Conclusions

We investigate the regional differences in the Danish labour market using a representative 10% register based data set for years 1985-1998.

The decomposition of the variation of the regional unemployment rate indicates that the inflow into unemployment and unemployment duration

explain a roughly equal share of the total variation. High regional unemployment is related to a high inflow rate in some counties, and to a long duration in other counties. In a similar way, it is either a low inflow rate or a short average duration which results in a low regional unemployment. We practically never observe counties where inflow and duration are both high, nor the opposite.

The unemployment to employment ($U \rightarrow E$) Kaplan-Meier hazard rates follow a similar falling pattern in all the regions while the unemployment to non-participation ($U \rightarrow N$) hazard rate is virtually constant commencing from the second year of unemployment. Copenhagen county is characterised by a low $U \rightarrow E$ and a high $U \rightarrow N$ transition intensity while in the three counties of Western-Jutland (Viborg, Ringkøbing and Ribe) the $U \rightarrow E$ hazard rate is relatively high.

The econometric analysis, using a mixed proportional hazard framework, reveals that the $U \rightarrow E$ baseline hazard is indeed falling while that of $U \rightarrow N$ transition is falling during the first year of unemployment and starts to increase thereafter. Most of the individual characteristics have the expected effect. The regional differences outline two distinct areas: the Copenhagen area (Copenhagen, Frederiksborg and Roskilde counties) and Western-Jutland. In the former, there is a relative advantage for young well-educated individuals while there are good job chances for older and less educated workers in the latter. Working experience is less valued in the Copenhagen area while non-participation before an unemployment spell is a more serious obstacle there.

During the time period, the $U \rightarrow E$ transition intensity has behaved counter-cyclically as expected. However, the $U \rightarrow N$ intensity has increased not only during the economic downturn, but during the following economic upturn too. This is a worrying tendency which needs a future analysis. There is some indication that the situation in the Copenhagen county has turned more favourable during the time period under study.

The discouragement probability, defined as the probability to leave the labour force at a certain unemployment duration, given that one leaves the unemployment, is increasing in the elapsed unemployment duration. The high-discouragement regions coincide with the major urban centres, Copenhagen and Aarhus, while the discouragement probability is low in two of the counties of Western-Jutland and in Bornholm. The probability has increased in all the counties, except in Copenhagen, during the observed time period.

The decomposition of the regional variation in the discouragement probability indicates that the disaggregate regional effect (the effect of regional coefficients) and the regional composition effect explain a roughly equal share of the variation. The high discouragement probability in Copenhagen is dom-

inated be the composition effect, the low probability in Bornholm by the regional effect, in other counties the effects are roughly of equal magnitude.

The analysis indicates two counties which differ clearly from the rest of the country: Copenhagen and Bornholm. Those counties are unique not only in economic sense. Bornholm is a little island far from the rest of Denmark. The seasonal effects, revealed by the duration analysis, point to the importance seasonal employment.

Copenhagen county forms the central region of the Copenhagen area, the main economic and cultural centre of the country. The significant differences between the labour markets in three counties in that area indicate the presence of the residential selection. While the other two counties have pretty favourable indicators, those in the Copenhagen are mixed. Low $U \rightarrow E$ and high $U \rightarrow N$ transition intensities indicate that a significant share of unemployed workers have difficulties in finding a suitable job, and thus the motivation to continue job-search may be low. The decomposition analysis suggests that much of the reason is related with the composition effect, namely the abundance of immigrants, and inexperienced workers with weak work commitment. Part of the explanation is probably the residential selection, in the sense that weak unemployed individuals prefer to live close to the main urban centre while a number of the skilled workers is moving to the neighbouring counties due to lower housing prices and better environment. However, it is unclear whether such an explanation may apply for the other urban centres which show a higher than average discouragement probability too. Another explanation may be that in large urban labour markets labour demand may be more skill-biased than in the rest of the country, leading in this way to a more polarised outcome. These issues need a further analysis.

Three counties in Wester-Jutland: Viborg, Ringkøbing and Ribe form a distinct group. This group is characterised by a low unemployment rate caused mainly by a high $U \rightarrow E$ transition intensity. There are no major urban or education centres in these counties. Both of the components of discouragement probability, the composition effect and the regional effect, are favourable. The pool of unemployed workers is to some extent the opposite to that in Copenhagen: In Western-Jutland there is a low share of inexperienced workers with weak labour-market attachment. However, the industrial composition seems to be more favourable too for the low-skilled people, as having only elementary education is not a significant disadvantage for finding a job.

During the period under study, 1985-1998, the discouragement probability increased in most of the counties. This is related with the fact that unemployed workers are increasingly leaving the labour market. A possible

relationship with the changes in labour market policy is left for a further analysis.

There is no indication that the discouragement probability is closely related with the unemployment rate. Instead, it is positively associated to average unemployment duration, and negatively to the monthly inflow into unemployment. This finding suggests that for a discouragement-related analysis, average unemployment duration may be a better proxy for labour demand than the unemployment rate.

The analysis indicates that policymakers have to take into account the participation decision when designing an active labour market policies, since transitions into non-participation make up a non-negligible part of the exits from unemployment. It is necessary to analyse whether related stricter participation requirements for ALMPs lead workers to completely leave the labour market, or whether they just cease to be registered while the job-search behaviour remains essentially unaffected.

A Construction of longitudinal data

This appendix describes the main principles for the establishment of monthly labour market states and corresponding labour market spells. This is a summary of the full description in Arendt, Heinesen, Husted, Colding, and Andersen (2004) and is reproduced here for the sake of completeness.

A detailed labour market state is determined for each person for each month, and thereafter the detailed states are aggregated into final states (employment, unemployment and non-participation). The process, how the detailed states are determined, is based on the reliability and accuracy of the information on the various states. The unemployed (e.g. persons who are registered with the Danish Public Employment Service or are eligible for unemployment assistance benefits) are the only group for which we have data on how many days of unemployment they had in a month. This information is used in connection with assessing the duration of the various spells. The determination of the monthly states for each person is done as follows:

1. First, for every individual the months of unemployment (i.e. months where the person is registered at the Employment Office) are found.

2. Thereafter unemployment is determined for those who qualify for subsidised employment, other local authority activation schemes, retirement, transitional allowance, leave of absence schemes and various types of activation schemes.

3. Further, education is determined based on start and end date of education, and annual data on education in progress (as of 1st of October).

4. Months in employment are determined based on start and end date of the job and information on annual Danish Labour Market Supplementary Pension (ATP) payments.

5. If a person has full ATP payments for a year, she is assumed to be in employment even though she is registered as in education.

6. If the person is registered as self-employed or as an assisting spouse, the person is assumed to be in employment for the months with an unspecified state.

7. If the person, according to the annual figures for labour market attachment, belongs to the group of "others outside the labour force" or is retired, these states are allocated to unspecified months.

Aggregated state	Description	Detailed states
E	Employment	70,71,72,73,74,75,76,77,78,79,-7
U	Unemployment	10,11,12,41,42,43,431,432,433,44,45,47,48
N	Non-participation	All other states

Table 2: *Aggregation of the detailed labour market states*

8. Finally, a few other corrections are made. Among them, periods on sickness benefits that follow a period of unemployment are respecified as unemployment. Similarly, leave of absence and activation following unemployment are redefined as unemployment. Finally, periods of one or two months in duration with unspecified states are attributed to the same state as in the previous month.

Table 3 shows an overview of the detailed labour market states, constructed in the way described above, and Table 2 shows how they are aggregated to the three final states.

The final states are thereafter gathered to form continuous labour market spells, each of which is characterised by a state and duration. The data is corrected for the duration of the unemployment spell based on the information on the number of days of unemployment in the first and last months of an unemployment spell. The duration of the other spells is determined based on the number of months in the state and, if the spell falls immediately prior to or following an unemployment spell, on information on the duration of this unemployment spell also.

State	Description
0	unspecified
	Unemployment
10	unemployment on unemployment benefits
11	unemployment on unemployment benefits, previous month on sickness benefits
12	unemployment on unemployment benefits, previous month on leave of absence
13	active labour market program following unemployment
	Retirement
21	transitional allowance
22, 221	early retirement
23	disability pension
24, 241	state pension
	Leave of absence schemes
31	childcare leave
32	sabbatical leave
33	study leave
	Types of activation
41	AF job training (private sector) and special activation jobs (*puljejob*)
42	AF job training (public sector), individual job training and job rotation appointment
43	AF education, in general
431	AF education, adult vocational training centre (AMU)
432	AF education, adult day school
433	AF education, adult education centre (VCU) + other county authorities
44	Study leave as unemployed
45	Start-up allowance
46	Enterprise allowance
47	AF activation of young people through education
48	AF activation through education
49	Local authority activation, other
50	Unemployment assistance benefits outside KIS
51	Local authority job training and flexible jobs
52	Specially arranged local authority courses of education
53	Study leave following unemployment assistance benefits
54	Individual local authority job training and voluntary unpaid work
	Illness
60	Sickness benefits
	Employment
70	Employment
71	Self-Employed
72	Assisting spouse
73	Remaining employment, distributed from January
74	Employment, previous period on sickness benefits
-7,75	Temporary layoff
76	Employment, previous period on leave of absence
	Other
80	Education
90	Out of labour force
91	Out of labour force, distributed to adjacent months

Table 3: *Description of the detailed labour market states*

B Danish county structure

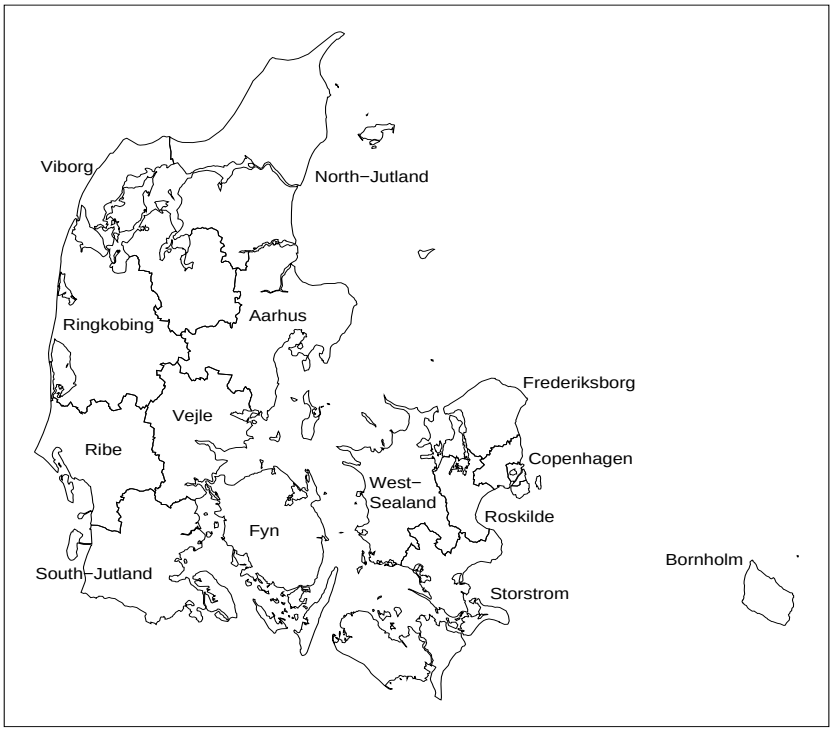

Figure 15: *Danish county structure*

Denmark is divided into 14 counties (*amt*). The following Table gives the Danish and English names; 5-letters acronyms which are used in several tables in this study, and corresponding population in 1995. Note that Bornholm is placed west for North-Jutland on data plots.

Danish	English	acronyme	pop (1995)
Århus	Aarhus	Århus	619 232
Bornholm	Bornholm	Bholm	45 049
København	Copenhagen	Chgen	605 868
Frederiksborg	Frederiksborg	Fborg	350 236
Fyn	Fyn	Fyn	467 695
Nordjylland	North-Jutland	NJlnd	488 303
Ribe	Ribe	Ribe	221 750
Ringkøbing	Ringkøbing	Rkbng	270 128
Roskilde	Roskilde	Rklde	224 052
Sønderjylland	South-Jutland	SJlnd	251 992
Storstrøm	Storstrøm	Sstrm	256 562
Vejle	Vejle	Vejle	336 663
Viborg	Viborg	Viborg	230 778
Vestsælland	West-Sealand	WSlnd	288 221
Danmark	Denmark	DMark	5 215 718

Table 4: *Regions used in this study*

C Figures

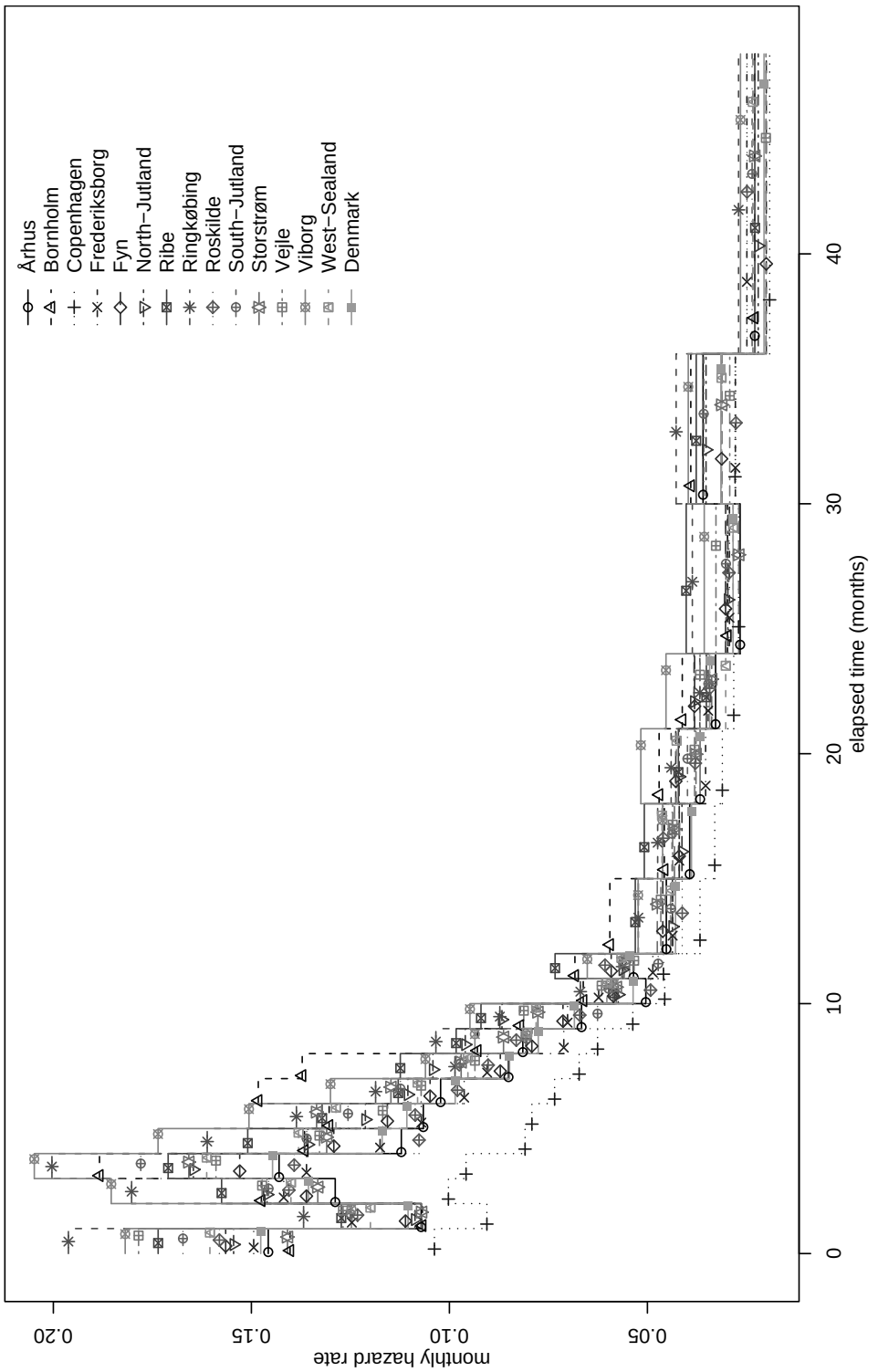

Figure 16: *Kaplan-Meier estimate for $U \rightarrow E$ transitions. Males*

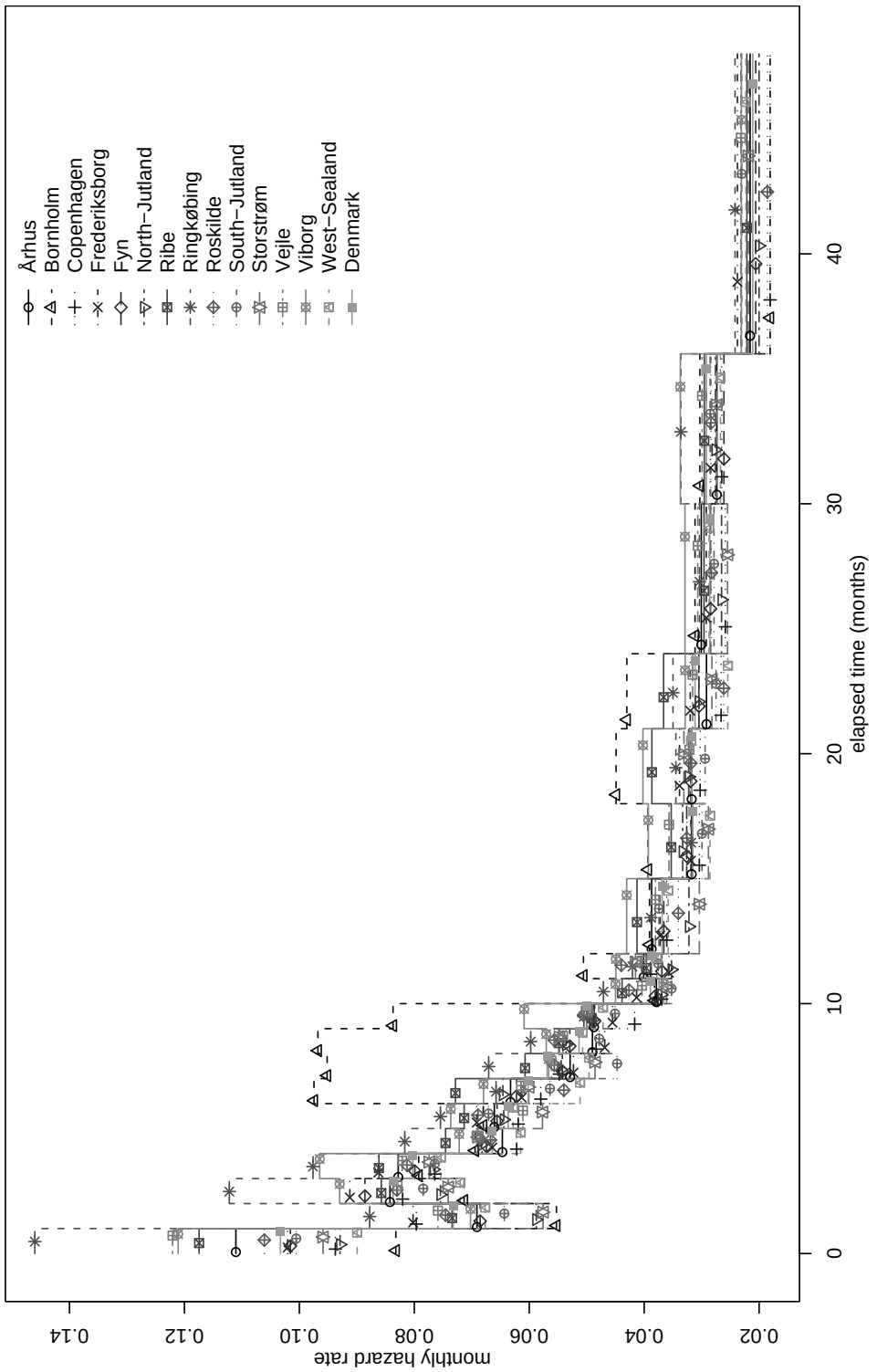

Figure 17: *Kaplan-Meier estimate for $U \rightarrow E$ transitions. Females*

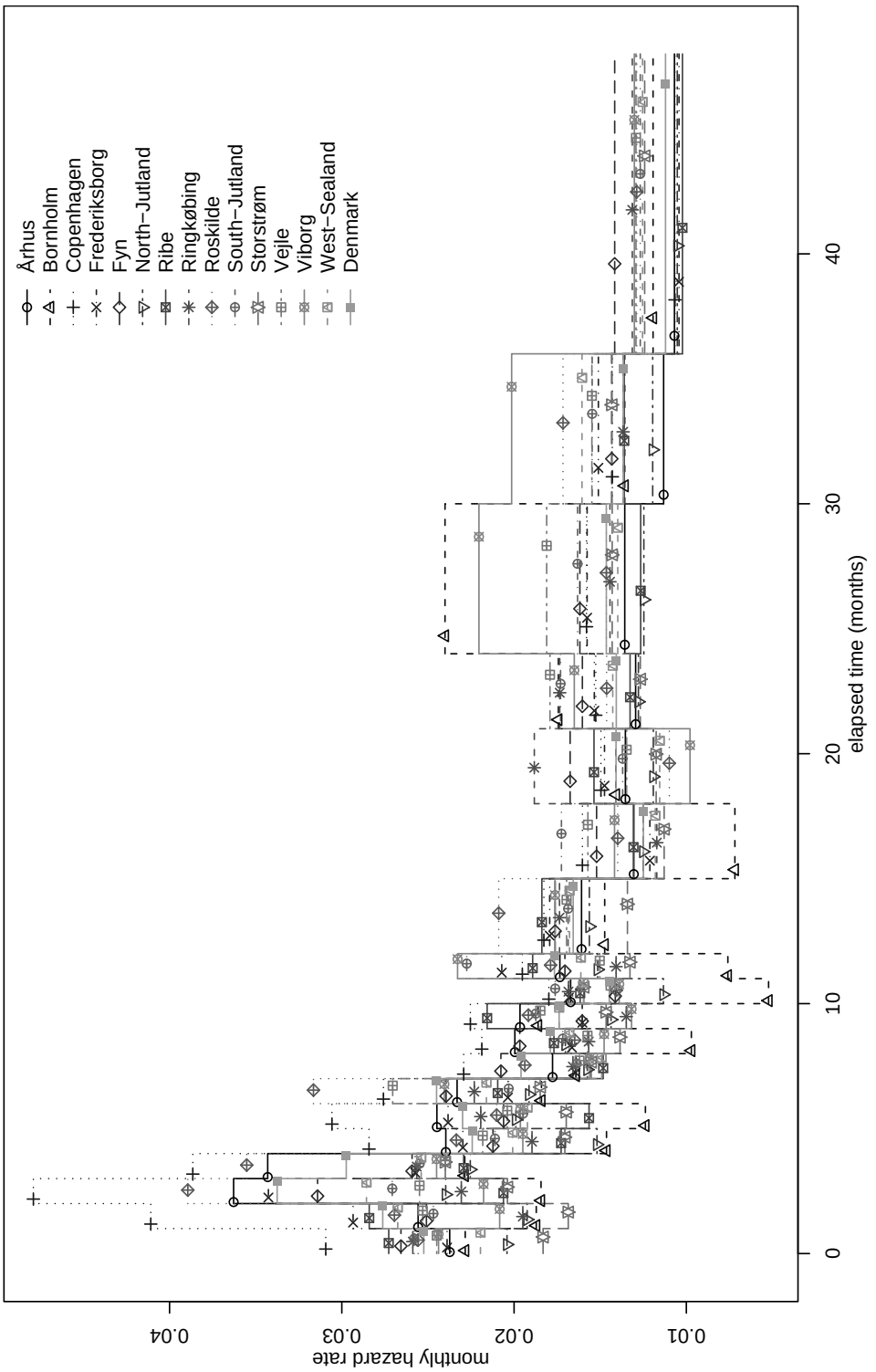

Figure 18: *Kaplan-Meier estimate for $U \rightarrow N$ transitions. Males*

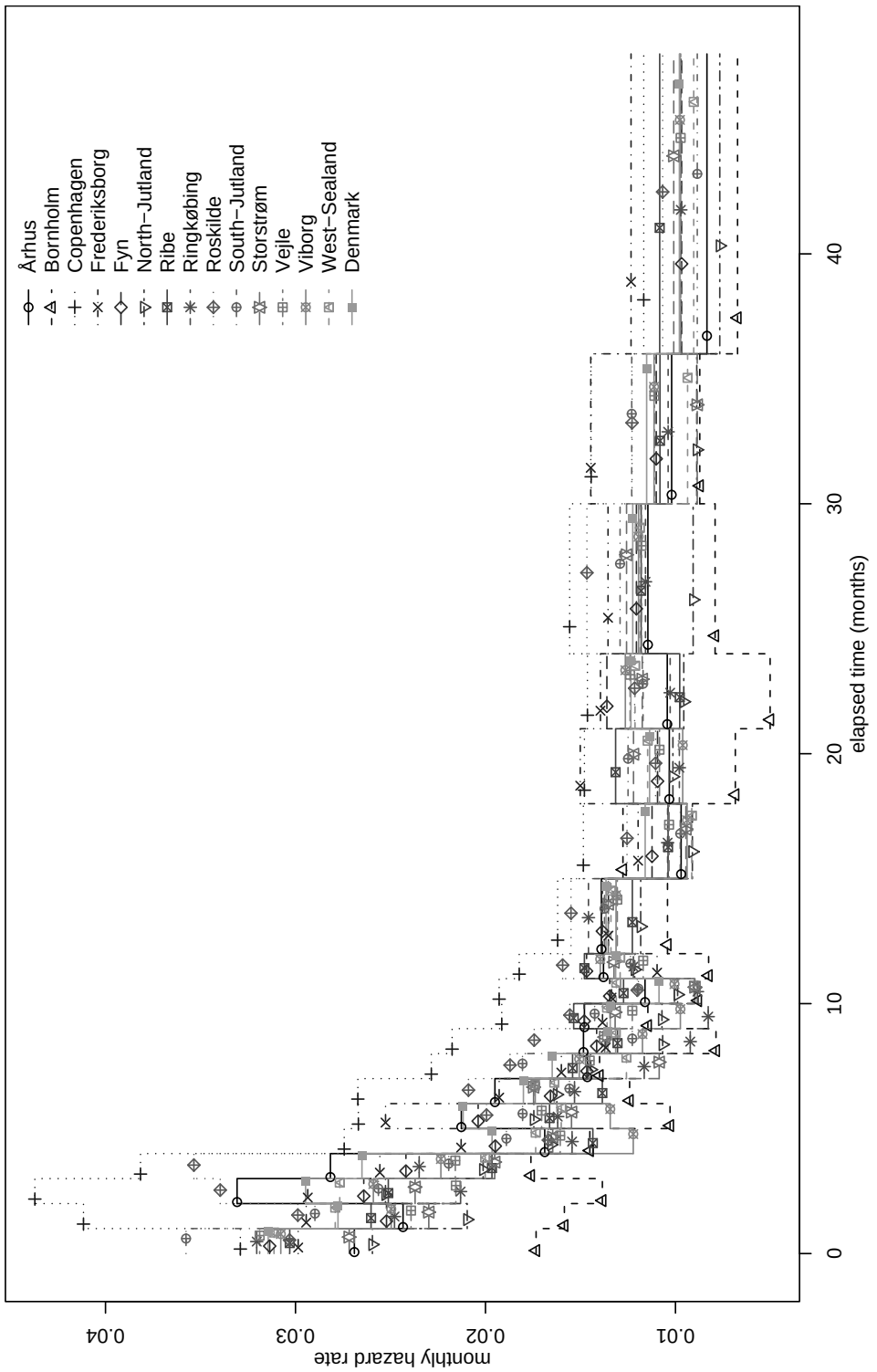

Figure 19: *Kaplan-Meier estimate for $U \rightarrow N$ transitions. Females*

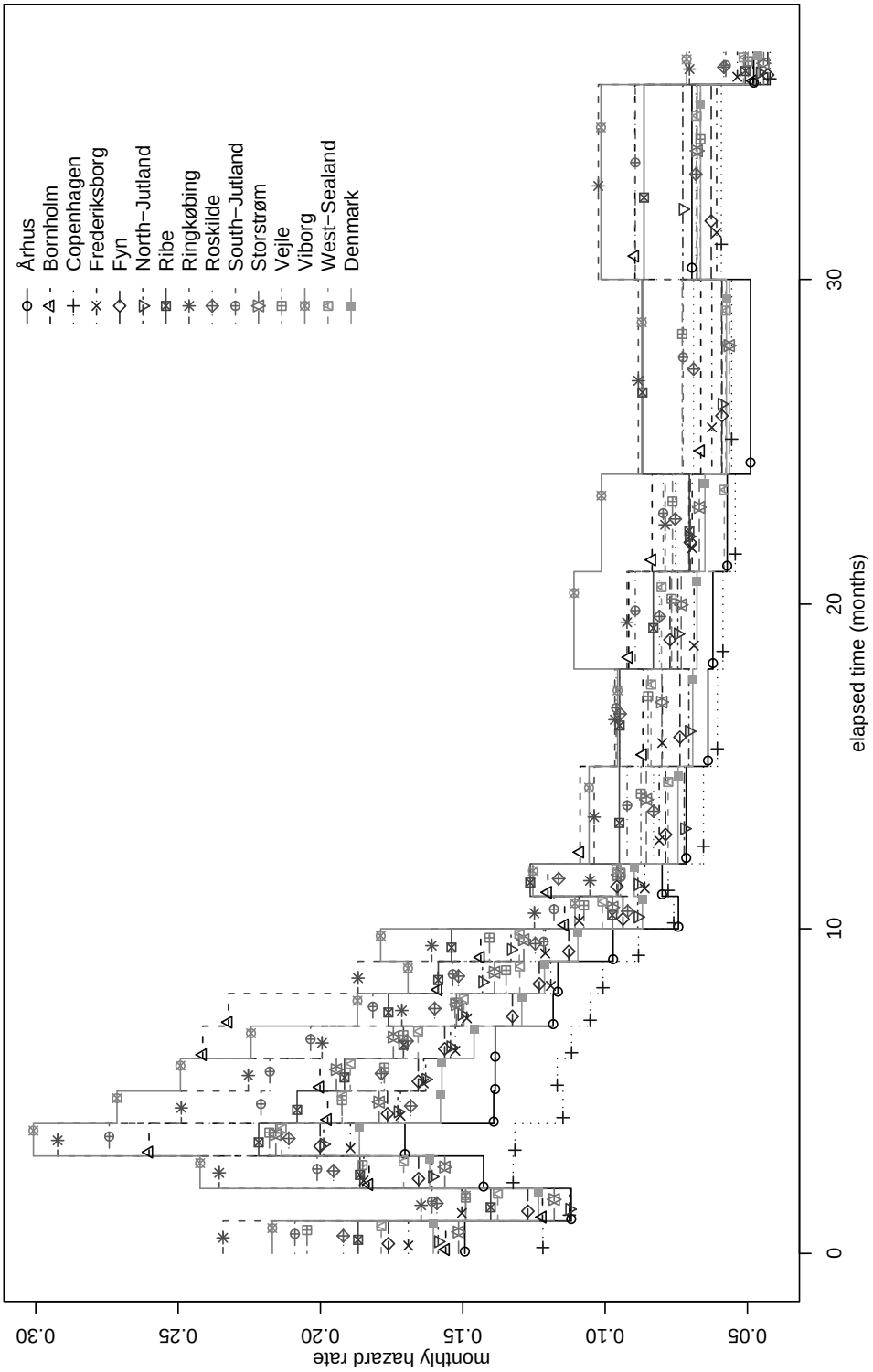

Figure 20: *Estimated baseline hazard for $U \rightarrow E$ transitions. Males*

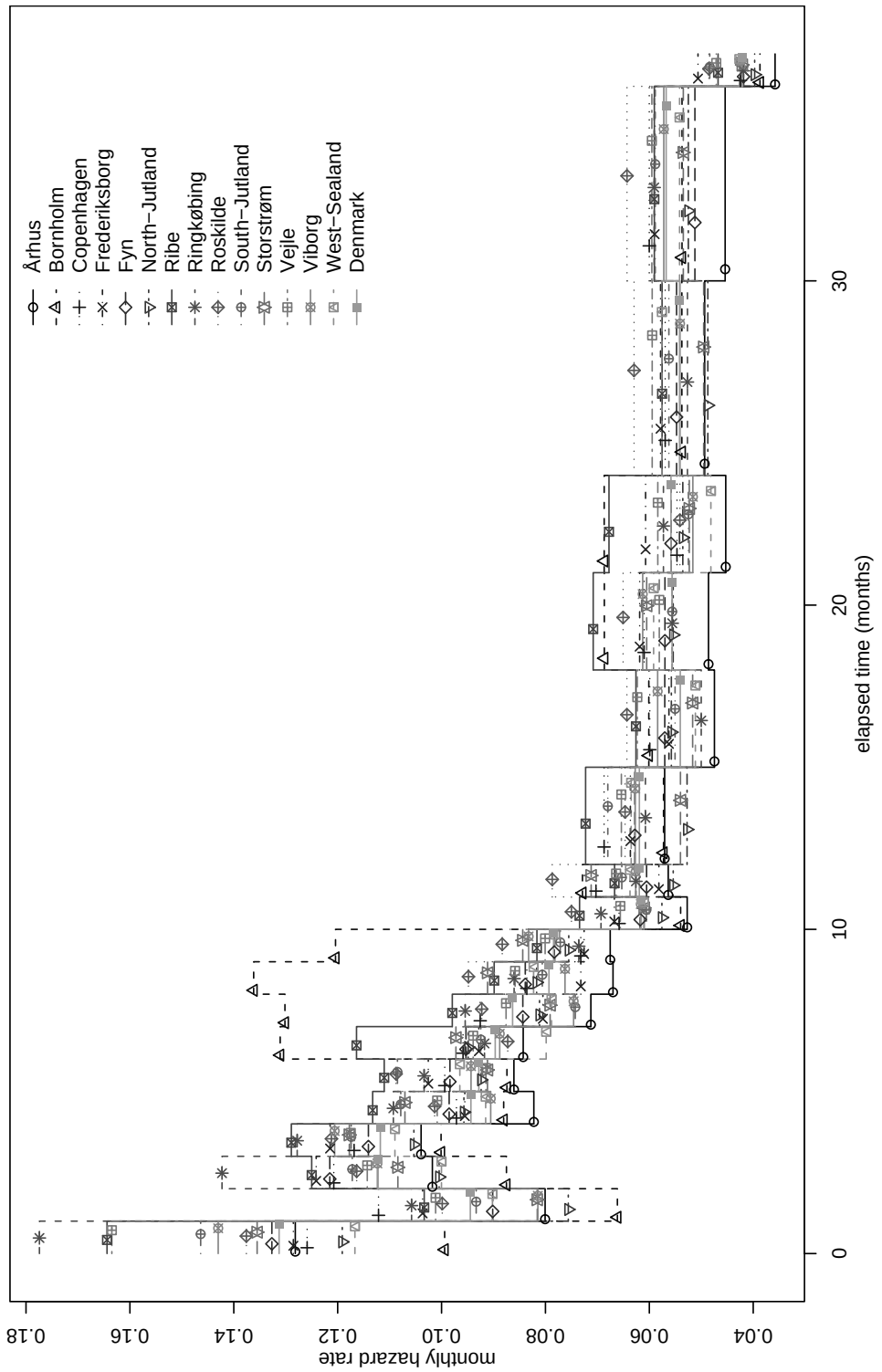

Figure 21: *Estimated baseline hazard for $U \rightarrow E$ transitions. Females*

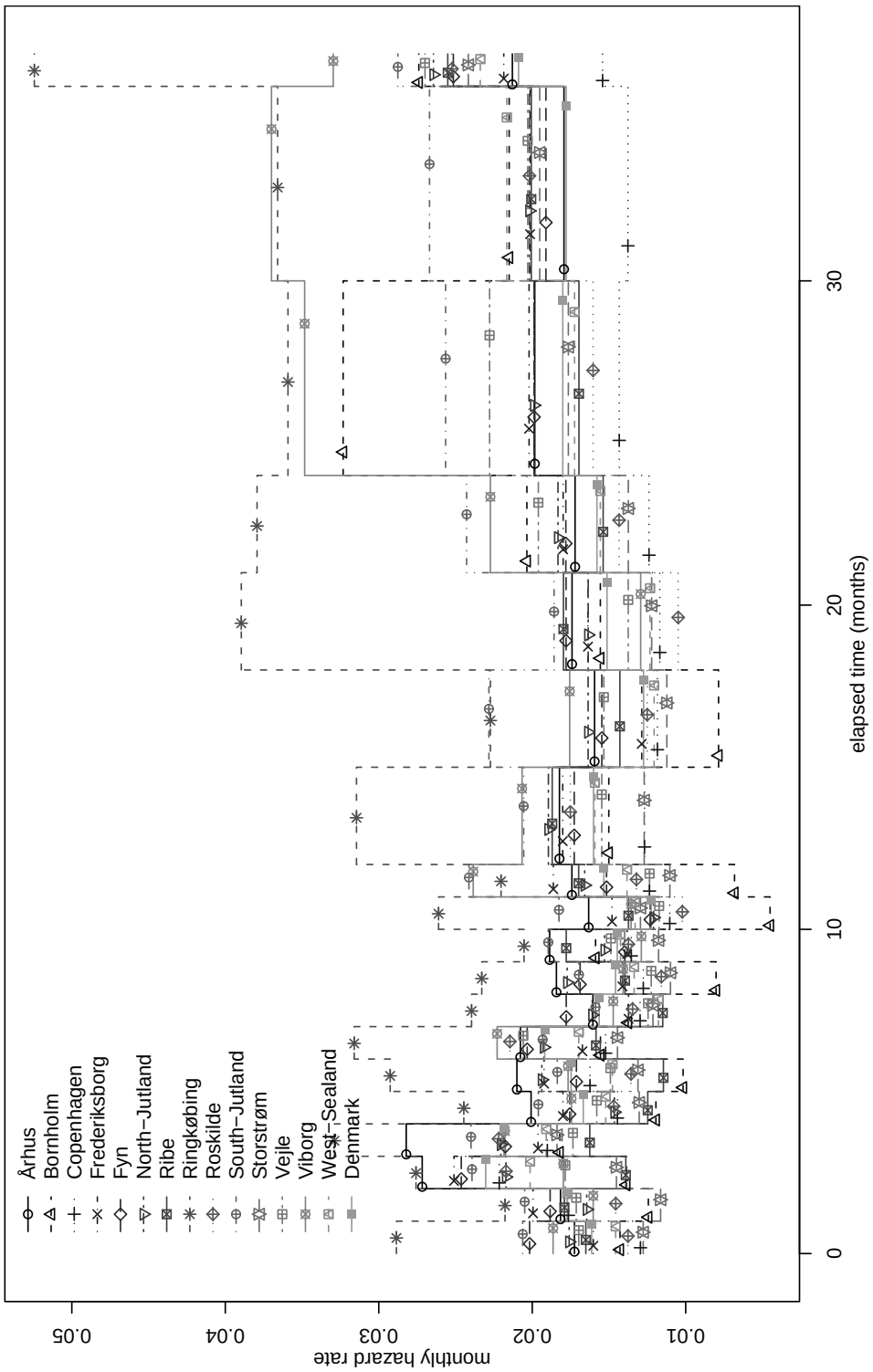

Figure 22: *Estimated baseline hazard for $U \rightarrow N$ transitions. Males*

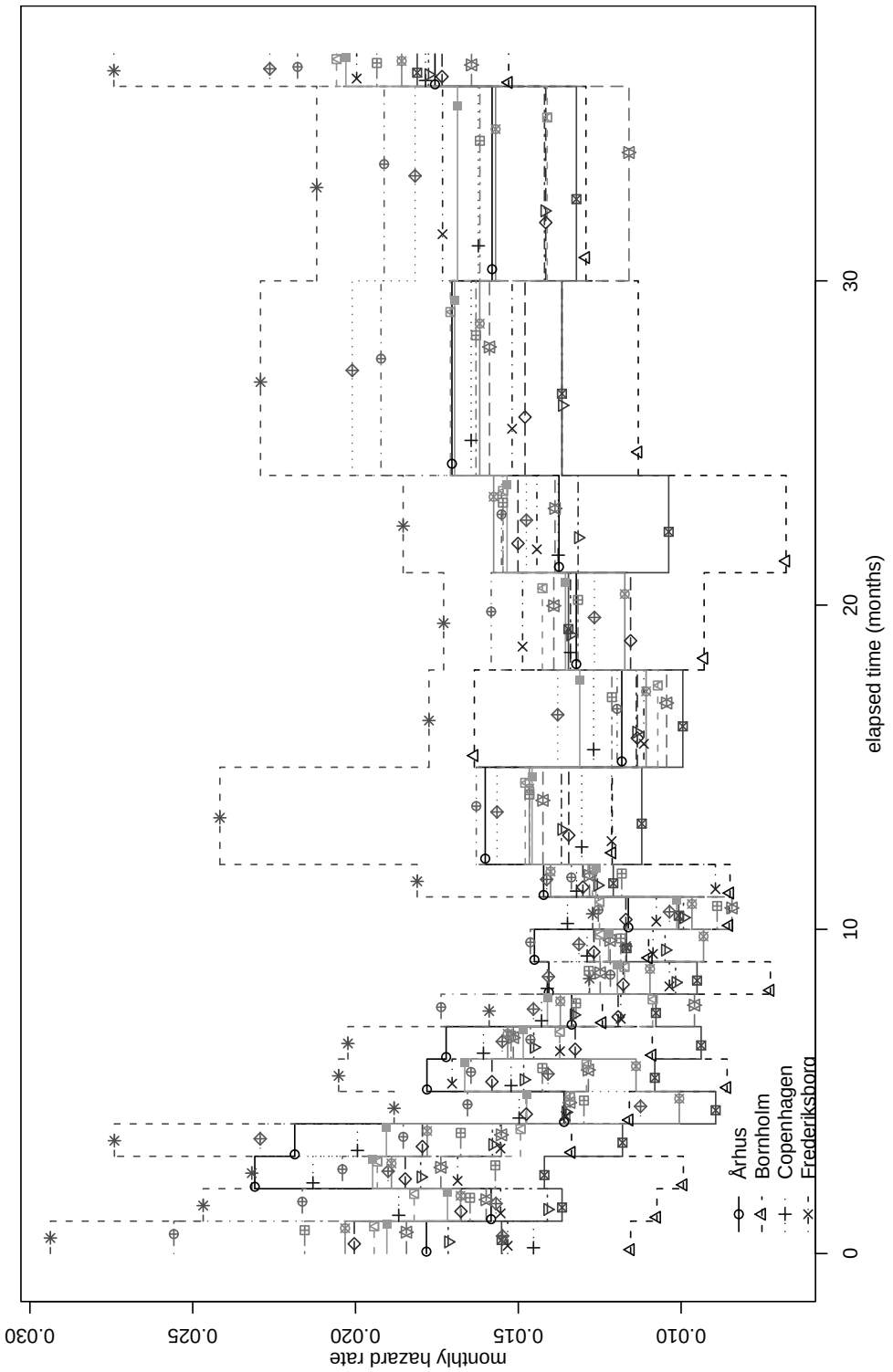

Figure 23: *Estimated baseline hazard for $U \rightarrow N$ transitions. Females*

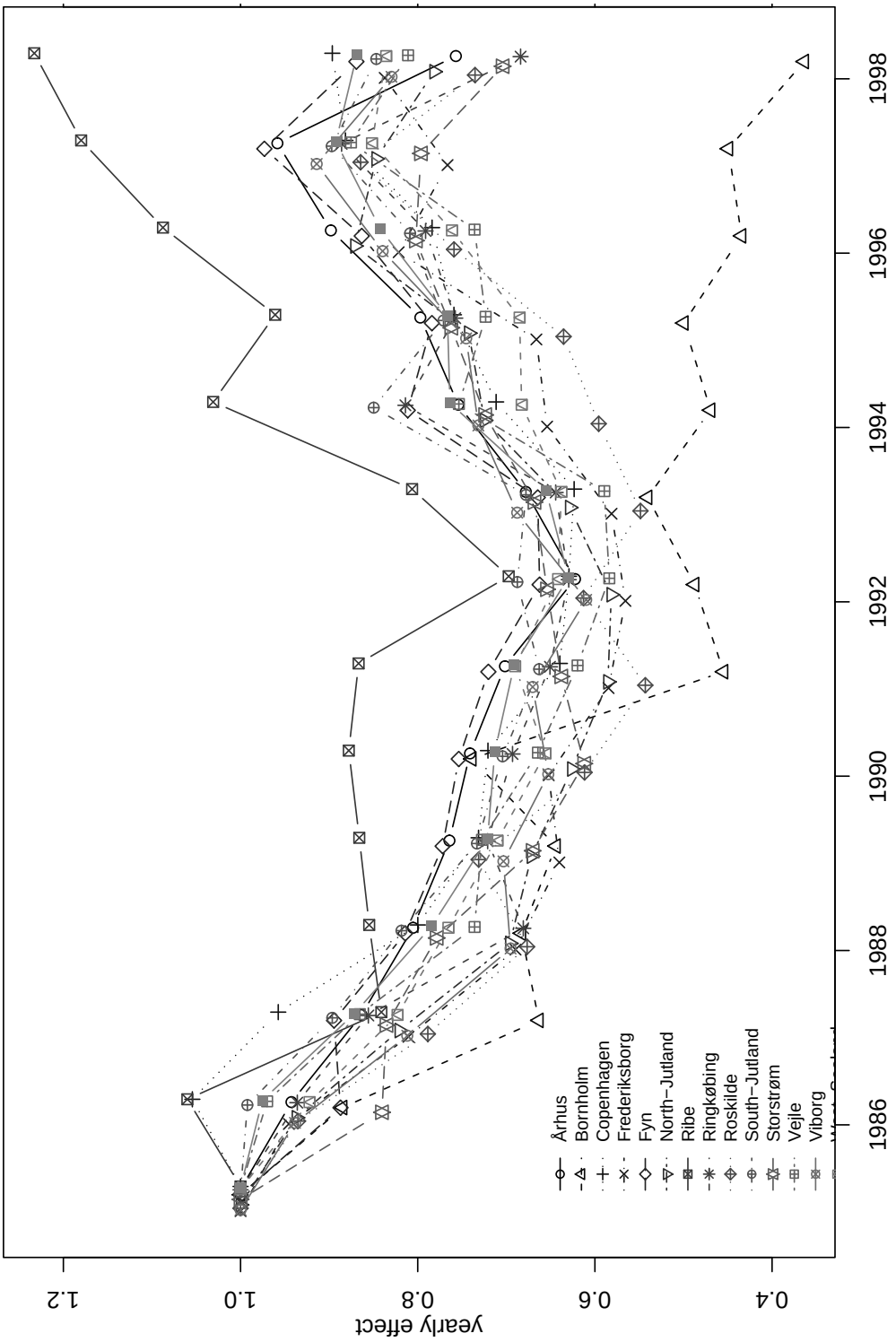

Figure 24: *Yearly multiplicative effect $U \rightarrow E$ transitions. Males. 1985 is the reference year, data for 1998 is disturbed by boundary effects.*

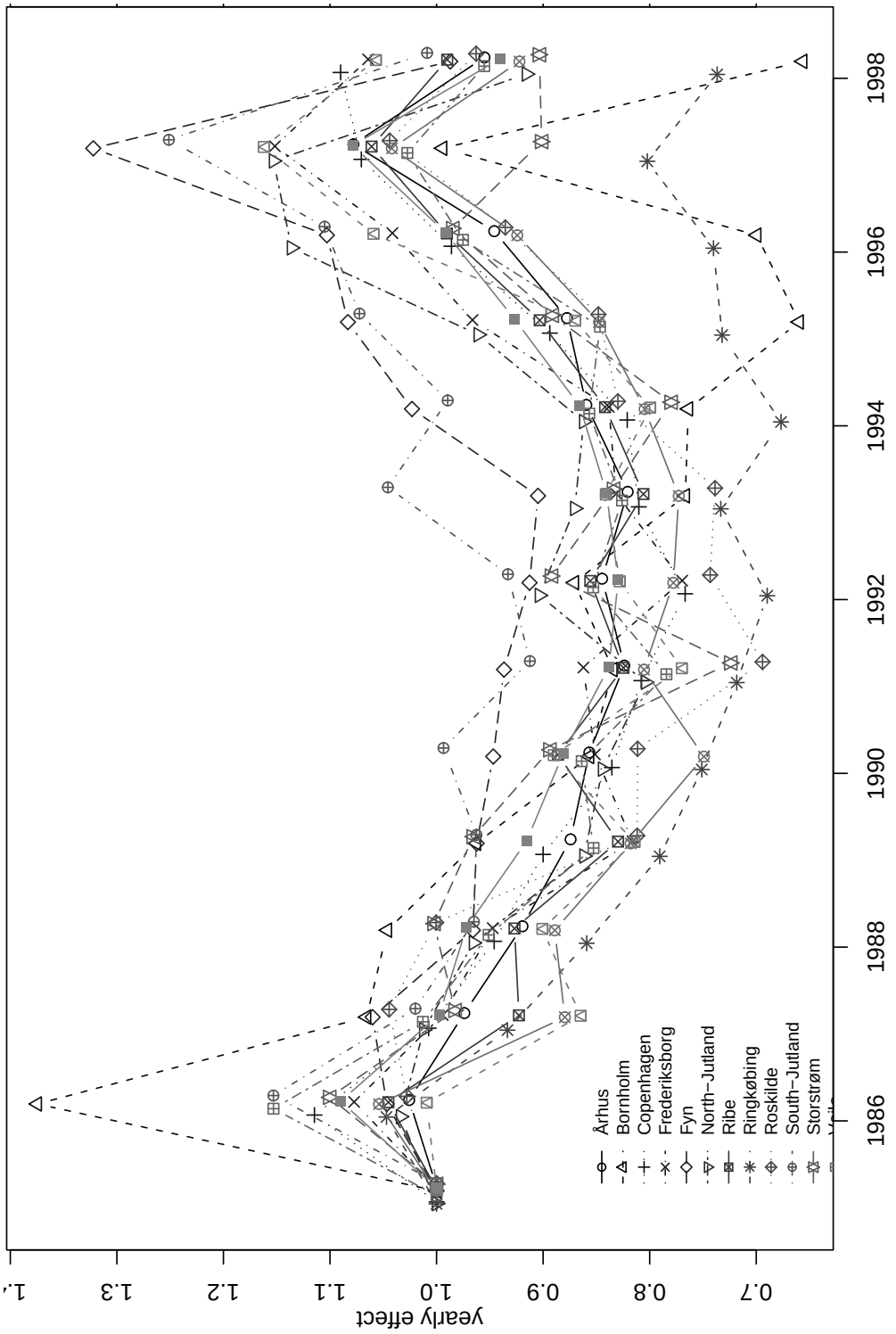

Figure 25: *Yearly multiplicative effect $U \rightarrow E$ transitions. Females. 1985 is the reference year, data for 1998 is disturbed by boundary effects.*

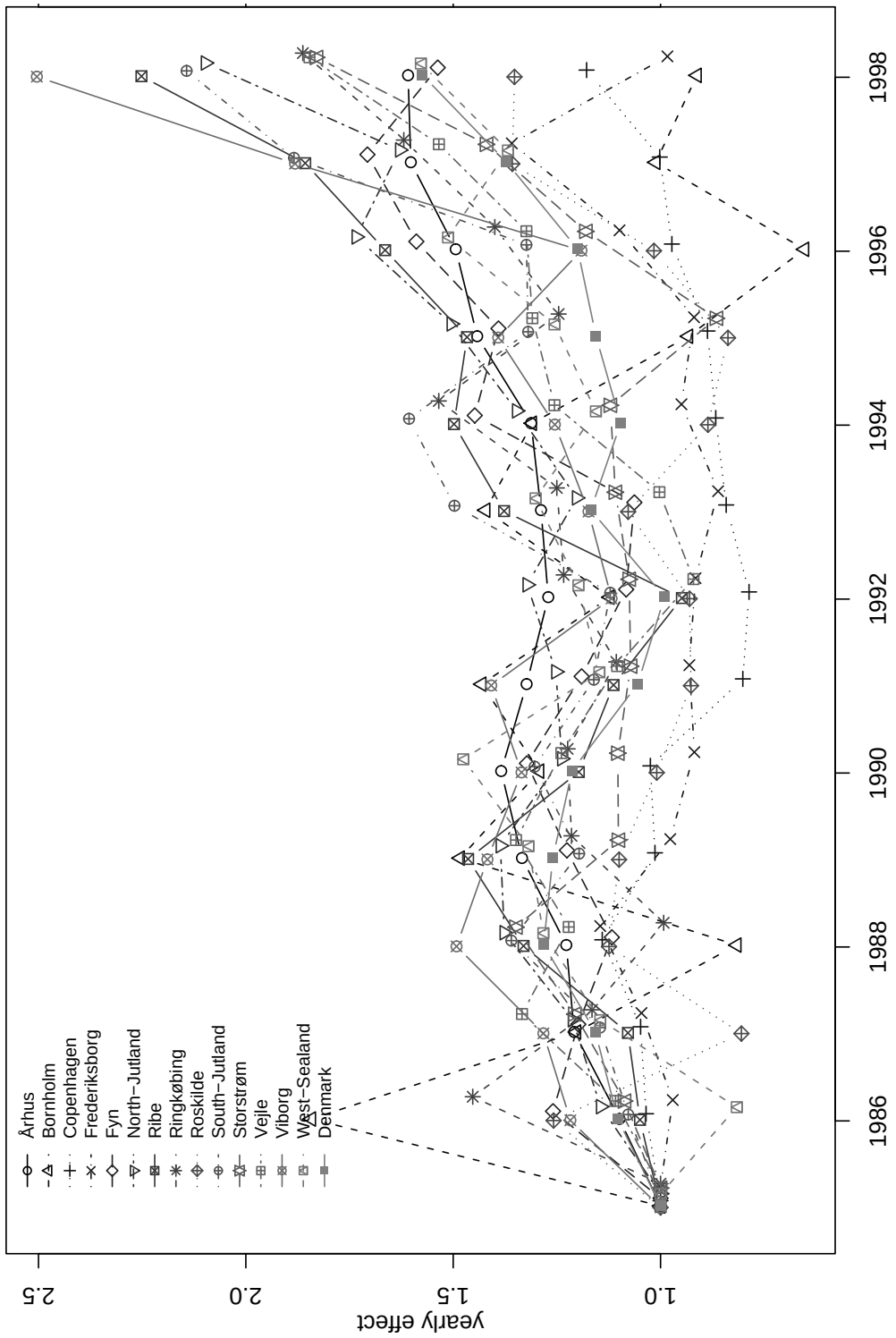

Figure 26: *Yearly multiplicative effect $U \rightarrow N$ transitions. Males. 1985 is the reference year, data for 1998 is disturbed by boundary effects.*

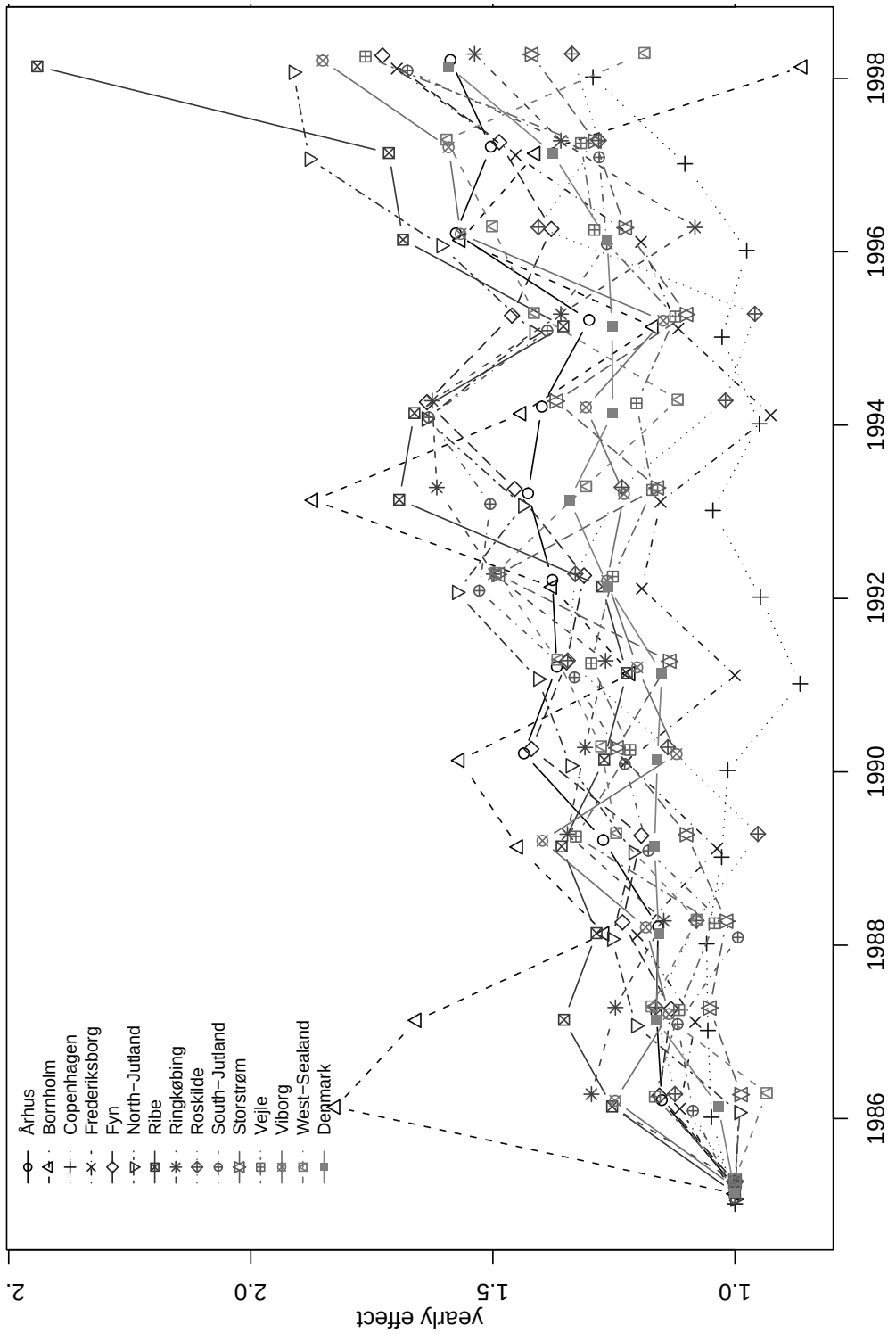

Figure 27: *Yearly multiplicative effect $U \rightarrow N$ transitions. Females. 1985 is the reference year, data for 1998 is disturbed by boundary effects.*

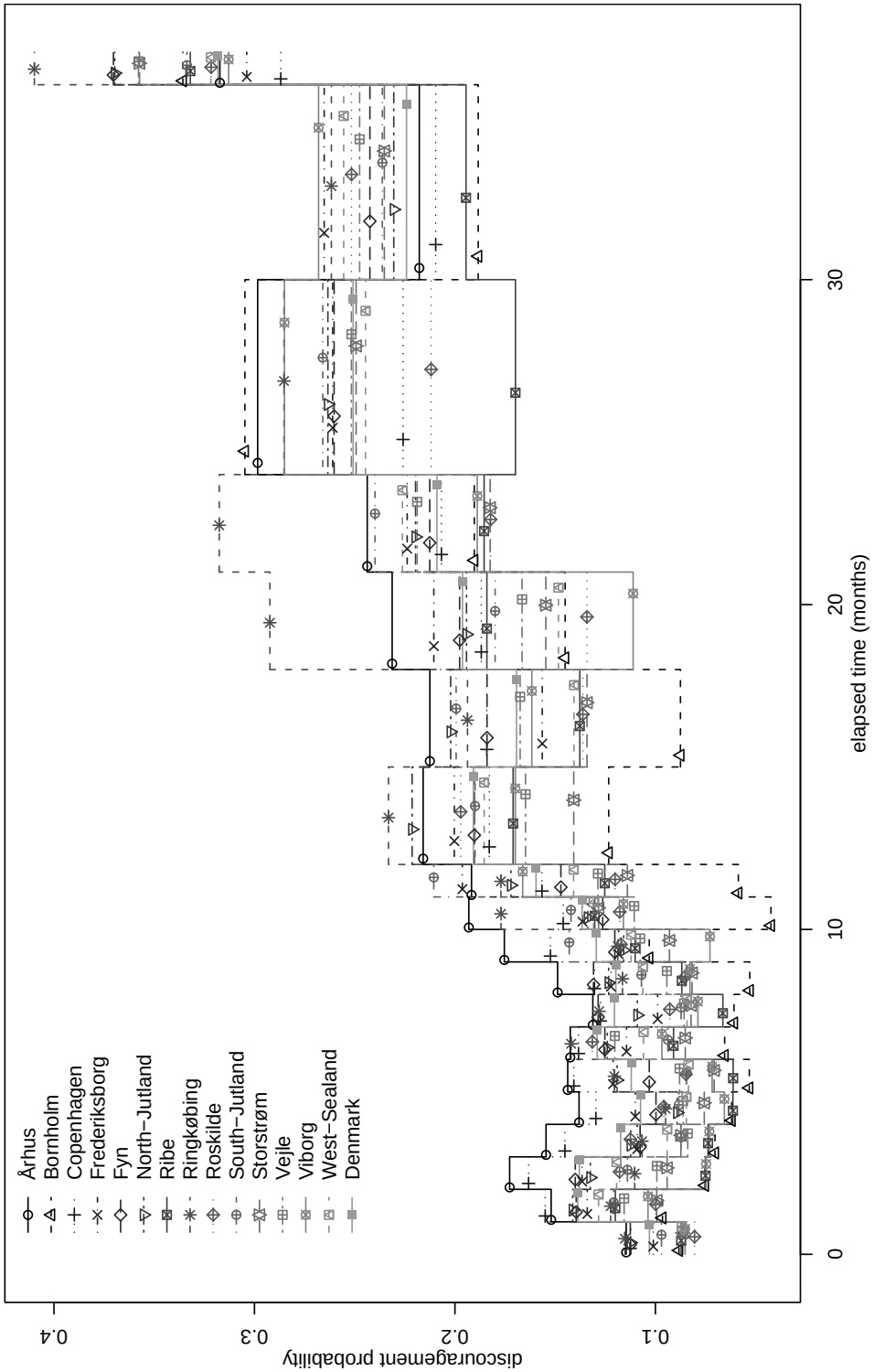

Figure 28: *Discouragement probability as a function of elapsed unemployment duration. Males.*

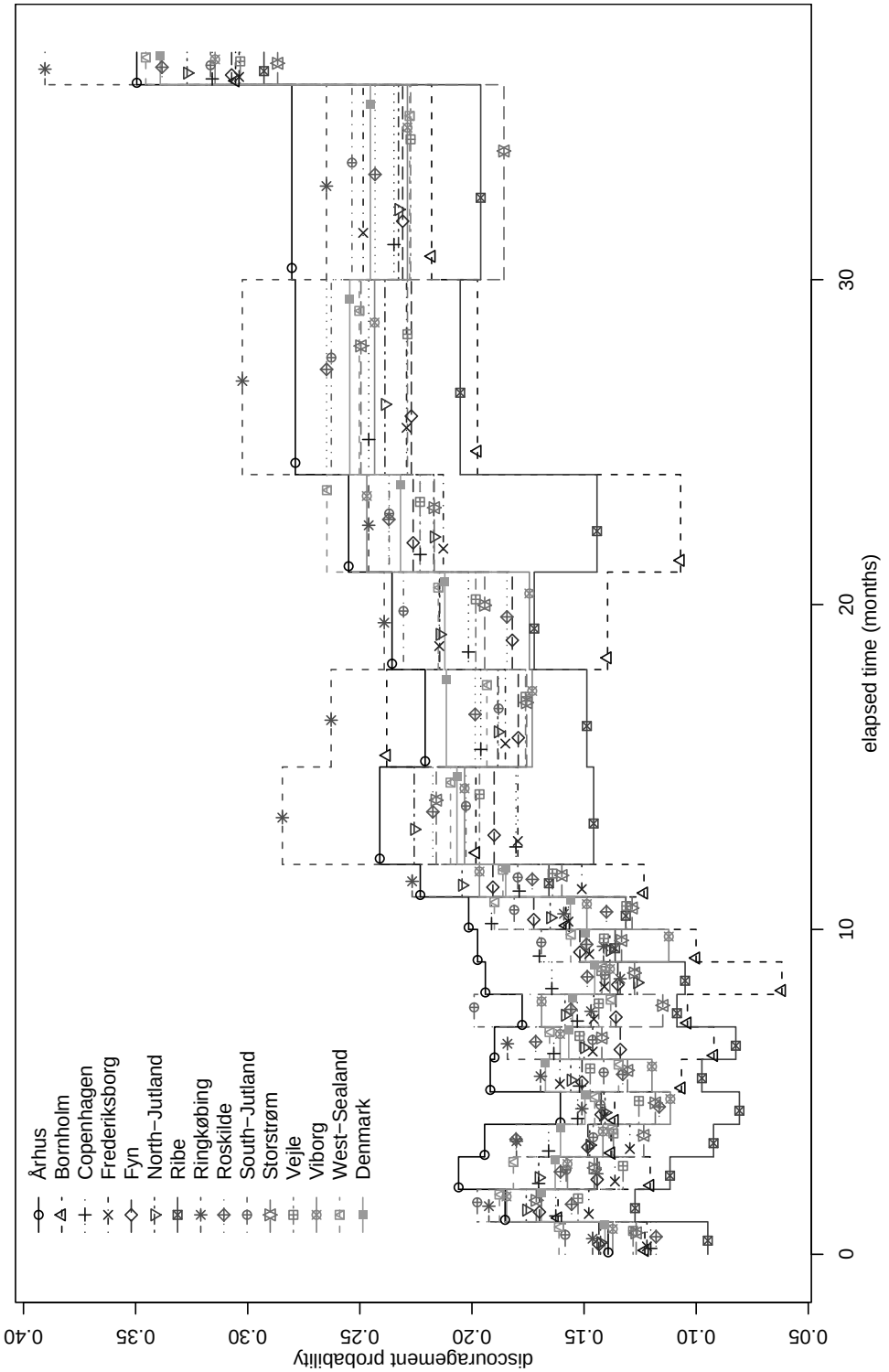

Figure 29: *Discouragement probability as a function of elapsed unemployment duration. Females.*

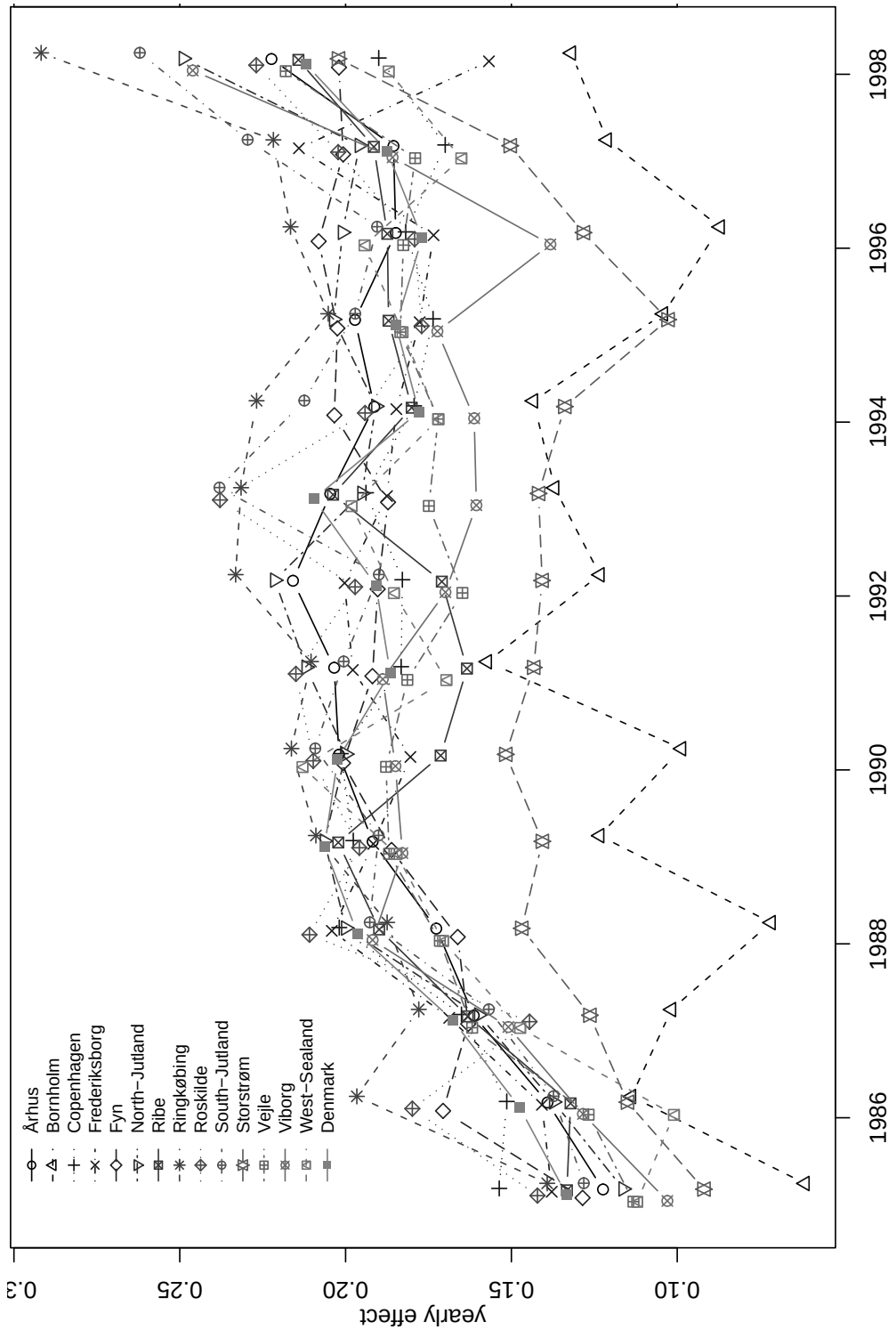

Figure 30: *Development of the discouragement probability in time. Males.*

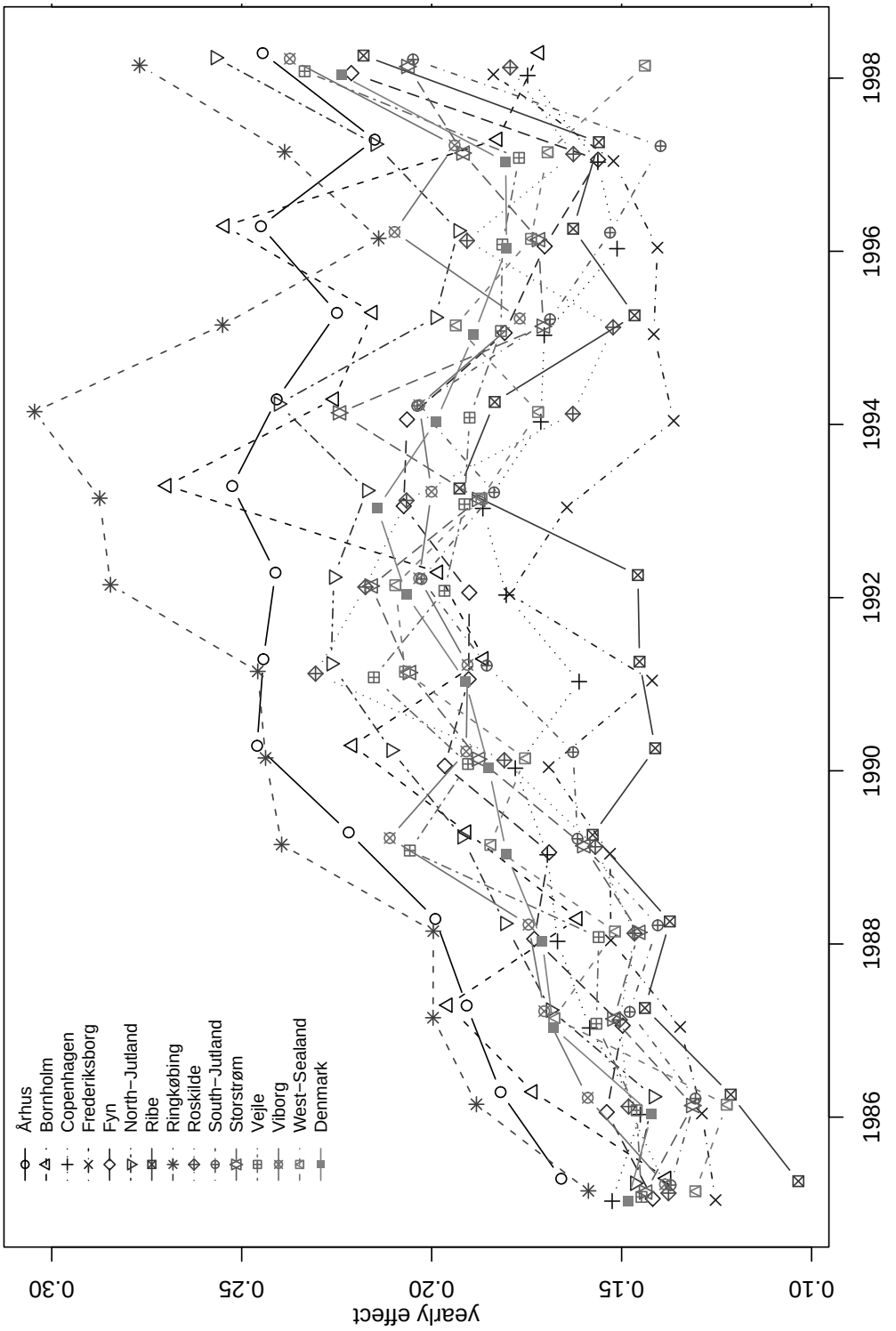

Figure 31: *Development of the discouragement probability in time. Females.*

D Tables

	Male					Female				
	min		median	max		min		median	max	
married	0.403	Chgen	0.487	0.521	NJlnd	0.487	Chgen	0.619	0.649	Rkbng
smallch	0.132	Rklde	0.154	0.169	Vborg	0.234	Chgen	0.257	0.277	Ribe
schoolch	0.109	Chgen	0.175	0.199	Vborg	0.171	Chgen	0.253	0.270	Bholm
age≤24	0.271	Chgen	0.306	0.343	Rklde	0.269	DMark	0.307	0.353	Vborg
age25-34	0.252	Bholm	0.277	0.348	Chgen	0.264	Bholm	0.303	0.355	Chgen
age35-49	0.234	Århus	0.249	0.282	Sstrm	0.227	Chgen	0.250	0.284	Bholm
age≥50	0.126	Århus	0.155	0.177	Bholm	0.115	Århus	0.135	0.150	Fborg
prim.edu	0.342	Århus	0.414	0.475	Bholm	0.371	Chgen	0.478	0.534	Bholm
high.school	0.478	Bholm	0.531	0.561	Århus	0.396	Bholm	0.443	0.499	Chgen
university	0.036	Sstrm	0.059	0.109	Chgen	0.053	Sstrm	0.076	0.131	Chgen
immigrant	0.030	Bholm	0.056	0.138	Chgen	0.022	Vborg	0.038	0.104	Chgen
exper	0.738	Chgen	0.857	0.919	Sstrm	0.655	SJlnd	0.695	0.764	Fborg
first job	0.033	Rkbng	0.043	0.060	Chgen	0.042	Bholm	0.053	0.072	SJlnd
inactive	0.175	Bholm	0.218	0.304	Chgen	0.185	Bholm	0.257	0.326	Chgen
agric	0.005	Chgen	0.041	0.094	Bholm	0.002	Chgen	0.015	0.031	Fyn
building	0.080	Chgen	0.130	0.188	WSlnd	0.007	Rkbng	0.009	0.016	Fborg
trade	0.103	Bholm	0.122	0.167	Rklde	0.136	Bholm	0.145	0.175	Rklde
notUI	0.142	Rkbng	0.189	0.299	Chgen	0.137	Rkbng	0.182	0.261	Chgen
income	1.672	Chgen	1.815	1.902	Fborg	1.331	SJlnd	1.394	1.497	Fborg
pincome	0.710	Chgen	0.794	0.846	Rklde	1.279	Chgen	1.617	1.713	Rklde
wealth	0.518	Chgen	0.801	0.872	Vborg	0.379	Vejle	0.424	0.575	Fborg
house	0.950	Chgen	1.760	1.994	Rklde	0.749	Chgen	0.948	1.290	Fborg
$\bar{T}$	6.33	Vborg	8.04	10.71	Chgen	11.29	Rkbng	12.86	14.83	Sstrm
$\bar{T}^E$	5.53	Vborg	6.66	9.06	Chgen	9.49	Rkbng	11.04	13.11	NJlnd
$\bar{T}^N$	9.80	Vborg	11.86	13.97	Sstrm	13.40	Chgen	15.32	17.14	NJlnd

Table 5: *Minimum, median and maximum values of the regional averages with corresponding county names.*

Table 6: *Average values for the selected explanatory variables in different counties. Males.*

	Århus	Bholm	Chgen	Fborg	Fyn	NJlnd	Ribe	Rkbng	Rklde	SJlnd	Sstrm	Vejle	Vborg	WSlnd	DMark
married	0.46	0.50	0.40	0.44	0.49	0.52	0.49	0.48	0.45	0.49	0.50	0.49	0.50	0.48	0.48
smallch	0.15	0.16	0.14	0.15	0.16	0.16	0.15	0.16	0.13	0.15	0.15	0.16	0.17	0.16	0.15
schoolch	0.15	0.19	0.11	0.18	0.16	0.18	0.17	0.19	0.16	0.18	0.19	0.17	0.20	0.18	0.16
age$\leq$24	0.30	0.31	0.27	0.30	0.31	0.29	0.33	0.33	0.34	0.33	0.29	0.31	0.33	0.30	0.28
age25-34	0.34	0.25	0.35	0.27	0.30	0.30	0.28	0.28	0.26	0.27	0.26	0.29	0.28	0.27	0.30
age35-49	0.23	0.26	0.25	0.27	0.24	0.25	0.24	0.24	0.25	0.24	0.28	0.25	0.24	0.26	0.26
age$\geq$50	0.13	0.18	0.13	0.16	0.15	0.16	0.15	0.15	0.15	0.16	0.17	0.15	0.15	0.16	0.16
prim.edu	0.34	0.47	0.35	0.37	0.39	0.42	0.43	0.43	0.40	0.41	0.45	0.41	0.46	0.46	0.39
high.school	0.56	0.48	0.54	0.54	0.54	0.52	0.52	0.53	0.54	0.54	0.51	0.53	0.50	0.50	0.54
university	0.10	0.05	0.11	0.09	0.07	0.06	0.05	0.04	0.06	0.04	0.04	0.06	0.04	0.04	0.08
immigrant	0.06	0.03	0.14	0.08	0.06	0.04	0.06	0.05	0.06	0.06	0.04	0.05	0.03	0.05	0.07
exper	0.77	0.88	0.74	0.86	0.83	0.84	0.84	0.87	0.86	0.84	0.92	0.86	0.86	0.90	0.84
first job	0.05	0.04	0.06	0.04	0.05	0.04	0.04	0.03	0.04	0.05	0.04	0.04	0.03	0.04	0.05
inactive	0.27	0.18	0.30	0.23	0.24	0.22	0.20	0.18	0.23	0.22	0.19	0.21	0.18	0.20	0.23
agric	0.03	0.09	0.00	0.02	0.04	0.05	0.06	0.08	0.02	0.05	0.05	0.03	0.07	0.04	0.03
building	0.10	0.12	0.08	0.14	0.12	0.13	0.13	0.12	0.14	0.13	0.16	0.13	0.13	0.19	0.12
trade	0.13	0.10	0.14	0.16	0.11	0.11	0.11	0.12	0.17	0.13	0.12	0.12	0.12	0.12	0.13
notUI	0.19	0.21	0.30	0.25	0.19	0.15	0.16	0.14	0.25	0.17	0.19	0.18	0.16	0.19	0.20
income	1.72	1.75	1.67	1.90	1.73	1.79	1.83	1.84	1.90	1.74	1.81	1.82	1.82	1.85	1.81
pincome	0.76	0.78	0.71	0.84	0.79	0.84	0.77	0.79	0.85	0.76	0.81	0.81	0.81	0.79	0.83
wealth	0.72	0.83	0.52	0.87	0.77	0.82	0.79	0.81	0.86	0.77	0.80	0.77	0.87	0.86	0.79
house	1.59	1.86	0.95	1.91	1.68	1.84	1.68	1.77	1.99	1.47	1.76	1.69	1.79	1.80	1.67
T	8.74	7.19	10.71	8.47	8.12	8.24	7.08	6.36	8.18	7.58	8.62	7.60	6.33	7.95	8.66
$\bar{T}^E$	7.53	6.01	9.06	7.00	6.76	6.88	6.16	5.53	6.72	6.29	6.92	6.21	5.53	6.61	7.19
$\bar{T}^N$	11.29	11.81	12.23	12.04	12.07	12.96	10.66	10.12	11.60	11.60	13.97	11.91	9.80	11.94	12.14
# individuals	13291	963	24061	6352	9851	10522	4440	5099	4332	4576	5262	6672	4541	6006	20184
# spells	35344	3109	61329	16116	29171	34198	12942	14220	10558	12405	16105	17968	13411	17585	62674
# $U \rightarrow E$	26568	2500	40323	12271	22367	27335	10417	11725	7975	9750	12836	14085	11088	13841	47302
# $U \rightarrow N$	6897	419	17338	3082	5423	5182	1963	1972	2122	2107	2448	3034	1853	2957	12218
# censored	1879	190	3668	763	1381	1681	562	523	461	548	821	849	470	787	3154

Notes: $\bar{T}$, $\bar{T}^E$ and $\bar{T}^N$ are respectively the mean lengths of all unemployemnt spells, spells ending with employment and spells ending with inactivity. Censored spells are included.

Table 7: *Average values for the selected explanatory variables in different counties. Females.*

	Århus	Bholm	Chgen	Fborg	Fyn	NJlnd	Ribe	Rkbng	Rklde	SJlnd	Sstrm	Vejle	Vborg	WSlnd	DMark
married	0.57	0.61	0.49	0.56	0.60	0.63	0.63	0.65	0.57	0.65	0.62	0.63	0.62	0.63	0.60
smallch	0.25	0.26	0.23	0.25	0.25	0.25	0.28	0.27	0.24	0.27	0.25	0.27	0.27	0.26	0.26
schoolch	0.21	0.27	0.17	0.24	0.24	0.26	0.26	0.25	0.23	0.26	0.26	0.25	0.26	0.26	0.24
age$\leq$24	0.30	0.31	0.29	0.29	0.31	0.31	0.32	0.31	0.32	0.30	0.30	0.31	0.35	0.31	0.27
age25-34	0.34	0.26	0.36	0.29	0.31	0.30	0.31	0.30	0.28	0.30	0.27	0.32	0.29	0.29	0.32
age35-49	0.24	0.28	0.23	0.27	0.24	0.25	0.24	0.25	0.26	0.25	0.28	0.25	0.24	0.26	0.26
age$\geq$50	0.12	0.15	0.13	0.15	0.13	0.14	0.13	0.13	0.14	0.15	0.15	0.13	0.12	0.13	0.14
prim.edu	0.37	0.53	0.37	0.41	0.46	0.48	0.49	0.49	0.45	0.49	0.53	0.48	0.48	0.51	0.45
high.school	0.50	0.40	0.50	0.48	0.45	0.44	0.43	0.44	0.48	0.44	0.42	0.45	0.44	0.42	0.46
university	0.13	0.07	0.13	0.11	0.09	0.08	0.07	0.08	0.08	0.07	0.05	0.07	0.08	0.07	0.10
immigrant	0.04	0.04	0.10	0.07	0.04	0.03	0.04	0.03	0.05	0.05	0.03	0.04	0.02	0.04	0.06
exper	0.66	0.72	0.68	0.76	0.67	0.66	0.66	0.72	0.76	0.66	0.74	0.69	0.66	0.72	0.71
first job	0.06	0.04	0.06	0.05	0.06	0.06	0.05	0.05	0.04	0.07	0.05	0.05	0.05	0.06	0.05
inactive	0.29	0.18	0.33	0.27	0.28	0.26	0.25	0.23	0.26	0.26	0.25	0.26	0.26	0.26	0.26
agric	0.01	0.01	0.00	0.01	0.03	0.02	0.02	0.02	0.01	0.02	0.02	0.01	0.02	0.02	0.01
building	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
trade	0.14	0.14	0.14	0.16	0.14	0.15	0.14	0.14	0.18	0.15	0.15	0.14	0.15	0.15	0.15
notUI	0.18	0.20	0.26	0.24	0.19	0.17	0.16	0.14	0.24	0.17	0.19	0.18	0.17	0.20	0.18
income	1.39	1.43	1.45	1.50	1.35	1.37	1.37	1.39	1.47	1.33	1.40	1.39	1.36	1.40	1.43
pincome	1.51	1.47	1.28	1.70	1.53	1.62	1.68	1.71	1.71	1.69	1.55	1.67	1.60	1.63	1.61
wealth	0.43	0.45	0.43	0.58	0.40	0.42	0.39	0.43	0.52	0.41	0.42	0.38	0.41	0.41	0.45
house	0.99	1.08	0.75	1.29	0.93	0.94	0.89	0.95	1.14	0.80	0.99	0.94	0.89	0.97	0.99
$\bar{T}$	13.38	12.84	12.51	12.58	13.53	15.06	12.53	11.29	12.69	13.95	14.83	12.88	12.13	14.66	13.23
$\bar{T}^E$	11.73	11.00	10.65	10.80	11.80	13.11	10.92	9.49	10.85	12.42	12.72	11.09	10.70	12.71	11.48
$\bar{T}^N$	14.47	15.51	13.40	14.65	15.87	17.14	15.23	13.98	14.34	16.03	17.10	15.41	14.25	16.70	14.88
# individuals	14533	958	24047	6775	10302	11112	4926	5776	4593	5331	5427	7483	4941	5941	20787
# spells	34014	2884	52275	13731	25767	28938	11946	14107	9435	12611	13027	17311	11958	13909	55319
# $U \rightarrow E$	23511	2163	32571	9378	17715	20284	8588	10407	6299	8544	8968	12231	8765	9387	37758
# $U \rightarrow N$	7886	464	16003	3436	6227	6373	2579	2697	2433	3163	3030	3762	2469	3410	13481
# censored	2617	257	3701	917	1825	2281	779	1003	703	904	1029	1318	724	1112	4080

Notes: $\bar{T}$, $\bar{T}^E$ and $\bar{T}^N$ are respectively the mean lengths of all unemployemnt spells, spells ending with employment and spells ending with inactivity. Censored spells are included.

Table 8: *Estimation results for the $U \to E$ transition intensity. Males.*

	Århus	Bholm	Chgen	Fborg	Fyn	NJlnd	Ribe	Rkbng	Rklde	SJlnd	Sstrm	Vejle	Vborg	WSlnd	DMark
married	0.067*	−0.109	0.049*	0.098*	0.028	0.054*	0.160*	0.114*	0.115*	0.150*	0.054	0.046	0.152*	0.081*	0.110*
smallch	0.100*	0.106	0.048*	0.041	0.056*	0.024	0.041	0.046	0.064	0.068	0.012	0.097*	0.004	0.023	0.042*
schoolch	0.171*	0.165*	0.130*	0.165*	0.113*	0.141*	0.126*	0.141*	0.236*	0.144*	0.101*	0.180*	0.093*	0.132*	0.164*
age≤24	0.732*	0.639*	0.786*	0.811*	0.765*	0.734*	0.770*	0.732*	0.845*	0.890*	0.847*	0.803*	0.819*	0.728*	0.783*
age25-34	0.333*	0.379*	0.400*	0.404*	0.389*	0.382*	0.384*	0.355*	0.504*	0.446*	0.407*	0.371*	0.350*	0.333*	0.406*
age≥50	−0.455*	−0.412*	−0.546*	−0.554*	−0.504*	−0.447*	−0.470*	−0.489*	−0.685*	−0.363*	−0.482*	−0.534*	−0.474*	−0.539*	−0.475*
prim.edu	−0.107*	−0.094	−0.181*	−0.149*	−0.109*	−0.137*	−0.089*	−0.059*	−0.125*	−0.102*	−0.077*	−0.103*	−0.104*	−0.075*	−0.088*
university	−0.082*	0.026	0.066*	−0.086	−0.057	−0.073	−0.151*	−0.193*	−0.114	−0.124	−0.029	−0.076	−0.217*	−0.200*	−0.048
immigrant	−0.372*	−0.274	−0.460*	−0.474*	−0.357*	−0.349*	−0.511*	−0.529*	−0.562*	−0.282*	−0.279*	−0.458*	−0.496*	−0.399*	−0.468*
exper	0.766*	−0.332	0.377*	0.107	0.720*	0.414*	0.552*	0.586*	−0.135	0.526*	0.613*	0.682*	0.866*	0.497*	0.523*
exper^2	−0.226*	0.312*	−0.091*	0.060	−0.204*	−0.023	−0.140*	−0.152*	0.202*	−0.082	−0.124	−0.171*	−0.255*	−0.120*	−0.107*
first job	−0.247*	−0.758*	−0.429*	−0.393*	−0.189*	−0.475*	−0.592*	−0.439*	−0.534*	−0.578*	−0.630*	−0.305*	−0.416*	−0.443*	−0.400*
inactive	−0.164*	−0.109	−0.218*	−0.189*	−0.214*	−0.130*	−0.208*	−0.192*	−0.240*	−0.114*	−0.144*	−0.170*	−0.171*	−0.182*	−0.206*
agric	0.271*	0.189*	0.267*	0.420*	0.303*	0.266*	0.234*	0.181*	0.179	0.241*	0.402*	0.306*	0.238*	0.284*	0.349*
building	0.359*	0.494*	0.482*	0.380*	0.331*	0.299*	0.318*	0.285*	0.500*	0.297*	0.402*	0.289*	0.271*	0.397*	0.353*
trade	−0.047*	0.115	0.069*	0.072*	0.007	−0.079*	0.004	−0.076*	0.029	−0.026	0.005	−0.006	−0.074	0.088*	0.041*
notUI	−0.075*	−0.003	−0.013	0.001	−0.168*	−0.113*	−0.071	−0.050	−0.069	−0.184*	−0.125*	−0.144*	−0.095*	−0.135*	−0.095*
income	0.014	0.222*	−0.075*	0.084*	0.055	0.009	−0.011	0.127*	0.049	−0.017	0.043	0.080*	0.013	0.103*	−0.001
income^2	0.005	−0.032	0.027*	−0.007	−0.007	0.006	0.015*	−0.017*	−0.007	0.001	0.014	−0.007	0.006	−0.014	0.004
pincome	0.044*	0.091	0.067*	0.022	0.064*	0.058*	−0.020	0.029	0.017	0.022	0.053*	0.046*	−0.027	0.020	0.022*
wealth	0.002	−0.045*	−0.039*	−0.002	−0.012	−0.012*	−0.017*	0.009	0.032*	−0.008	−0.019*	−0.011	−0.014	−0.004	−0.002
house	0.028*	0.046*	0.034*	0.023*	0.037*	0.029*	0.030*	0.015*	0.017*	0.027*	0.035*	0.034*	0.046*	0.039*	0.035*
Q2	−0.085*	−0.280*	0.017	−0.048	−0.098*	−0.139*	−0.133*	−0.164*	−0.048	−0.126*	−0.101*	−0.126*	−0.131*	−0.038	−0.070*
Q3	−0.084*	−0.395*	−0.005	−0.082*	−0.131*	−0.229*	−0.206*	−0.182*	−0.123*	−0.208*	−0.177*	−0.241*	−0.264*	−0.144*	−0.124*
Q4	−0.013	−0.104	0.015	−0.062*	−0.025	−0.092*	−0.068*	−0.079*	−0.076*	−0.059	−0.107*	−0.075*	−0.121*	−0.070*	−0.045*

Table 9: *Estimation results for the $U \rightarrow E$ transition intensity. Females.*

	Århus	Bholm	Chgen	Fborg	Fyn	NJlnd	Ribe	Rkbng	Rklde	SJlnd	Sstrm	Vejle	Vborg	WSlnd	DMark
married	−0.013	−0.054	−0.150*	−0.062	−0.091*	0.039	−0.121*	−0.094*	−0.015	−0.096*	0.004	−0.002	−0.007	−0.175*	−0.063*
smallch	−0.260*	−0.156*	−0.338*	−0.328*	−0.270*	−0.296*	−0.309*	−0.238*	−0.305*	−0.323*	−0.357*	−0.308*	−0.289*	−0.280*	−0.313*
schoolch	0.052*	0.071	0.043*	0.097*	0.046*	0.117*	0.043	0.046	0.131*	0.048	0.035	0.083*	0.113*	0.099*	0.075*
age≤24	0.403*	0.433*	0.645*	0.628*	0.459*	0.542*	0.527*	0.432*	0.640*	0.605*	0.404*	0.526*	0.418*	0.582*	0.516*
age25-34	0.194*	0.175*	0.330*	0.269*	0.231*	0.275*	0.265*	0.231*	0.269*	0.308*	0.156*	0.260*	0.203*	0.278*	0.252*
age≥50	−0.539*	−0.161	−0.718*	−0.585*	−0.569*	−0.583*	−0.447*	−0.566*	−0.683*	−0.550*	−0.691*	−0.675*	−0.782*	−0.650*	−0.611*
prim.edu	−0.053*	−0.080	−0.178*	−0.110*	−0.115*	−0.131*	−0.131*	−0.024	−0.115*	−0.134*	−0.151*	−0.062*	−0.093*	−0.139*	−0.112*
university	0.396*	0.680*	0.370*	0.317*	0.370*	0.553*	0.444*	0.343*	0.435*	0.452*	0.488*	0.515*	0.440*	0.533*	0.444*
immigrant	−0.411*	0.149	−0.560*	−0.333*	−0.525*	−0.057	−0.452*	−0.503*	−0.524*	−0.098	−0.285*	−0.304*	−0.300*	−0.580*	−0.411*
exper	0.981*	1.046*	0.508*	0.391*	0.917*	0.996*	0.943*	0.663*	0.330*	1.091*	0.465*	0.827*	0.852*	0.695*	0.759*
exper^2	−0.456*	−0.507*	−0.213*	−0.138*	−0.465*	−0.439*	−0.447*	−0.217*	−0.161	−0.502*	−0.153*	−0.373*	−0.353*	−0.290*	−0.338*
first job	−0.630*	−0.900*	−0.702*	−0.734*	−0.532*	−0.663*	−0.686*	−0.718*	−0.822*	−0.712*	−0.712*	−0.735*	−0.556*	−0.705*	−0.705*
inactive	−0.080*	0.028	−0.162*	−0.122*	−0.114*	−0.011	−0.021	−0.013	−0.046	−0.011	−0.091*	−0.071*	0.052	−0.002	−0.080*
agric	0.037	0.239	0.208	0.035	0.222*	0.070	−0.099	−0.094	0.268	0.080	0.382*	0.042	0.051	0.104	0.186*
building	−0.085	−0.075	0.136*	0.066	0.066	−0.022	0.159	0.144	0.176	−0.099	0.032	0.081	0.216	0.135	0.152*
trade	−0.047*	−0.023	0.056*	0.027	0.016	−0.032	0.067	−0.117*	0.083*	−0.044	0.023	−0.055	−0.056	0.061	−0.004
notUI	−0.009	0.200	0.006	0.075	−0.154*	−0.070*	0.011	−0.026	0.126*	−0.039	−0.094*	−0.065	−0.001	−0.110*	0.006
income	−0.450*	−0.234	−0.302*	−0.314*	−0.392*	−0.402*	−0.397*	−0.322*	−0.234*	−0.392*	−0.255*	−0.384*	−0.346*	−0.442*	−0.372*
income^2	0.089*	0.055	0.061*	0.066*	0.076*	0.082*	0.069*	0.058*	0.054*	0.077*	0.040*	0.081*	0.074*	0.101*	0.077*
pincome	0.021*	0.023	0.069*	0.021	0.031*	−0.003	0.041*	0.020	0.021	0.048*	0.008	0.028*	0.009	0.054*	0.026*
wealth	−0.029*	−0.042	−0.018*	−0.029*	−0.022*	−0.011	−0.018	−0.021	−0.013	−0.009	−0.013	−0.017	−0.015	−0.016	−0.015*
house	0.019*	0.027	0.023*	0.026*	0.016*	0.016*	0.032*	0.025*	0.030*	0.017*	0.026*	0.019*	0.001	0.012	0.018*
Q2	−0.042*	−0.187*	−0.022	−0.028	−0.085*	−0.065*	−0.071	−0.096*	−0.045	−0.145*	−0.055	−0.139*	−0.095*	0.001	−0.079*
Q3	0.013	−0.107	0.033*	0.015	0.035	0.012	0.007	−0.061*	−0.004	−0.048	−0.001	−0.050	−0.043	0.066*	0.001
Q4	0.135*	0.201*	0.074*	0.098*	0.148*	0.161*	0.088*	0.101*	−0.020	0.117*	0.115*	0.087*	0.100*	0.130*	0.129*

Table 10: *Estimation results for the $U \rightarrow N$ transition intensity. Males.*

	Århus	Bholm	Chgen	Fborg	Fyn	NJlnd	Ribe	Rkbng	Rklde	SJlnd	Sstrm	Vejle	Vborg	WSlnd	DMark
married	0.230*	1.076*	0.082*	−0.020	0.150*	0.129*	−0.057	0.299*	0.039	0.210*	0.154	0.138	0.118	0.227*	0.134*
smallch	−0.179*	−0.398	−0.229*	−0.300*	−0.080	−0.106	−0.027	−0.222*	−0.226*	−0.340*	−0.272*	−0.299*	−0.240*	−0.154*	−0.223*
schoolch	−0.112*	−0.222	−0.058	−0.078	−0.099*	−0.114*	0.030	−0.311*	−0.042	−0.207*	−0.153*	−0.038	−0.016	−0.167*	−0.110*
age≤24	0.559*	0.119	0.406*	0.498*	0.605*	0.701*	0.800*	0.583*	0.509*	0.673*	0.486*	0.548*	0.600*	0.446*	0.541*
age25-34	0.212*	−0.168	0.217*	0.129*	0.179*	0.220*	0.177	0.141	0.050	0.241*	0.088	0.128	0.178	0.101	0.188*
age≥50	0.599*	0.462	0.476*	0.409*	0.656*	0.819*	0.677*	0.521*	0.677*	0.803*	0.694*	0.575*	0.817*	0.713*	0.567*
prim.edu	−0.046	0.087	0.004	0.030	−0.121*	−0.127*	−0.201*	−0.054	0.058	−0.128*	0.026	−0.110*	−0.202*	−0.075	−0.043*
university	−0.034	−0.372	0.024	0.195*	−0.176*	0.161*	−0.037	−0.225	0.097	−0.168	−0.001	−0.139	0.044	0.039	0.090
immigrant	−0.107*	0.109	−0.206*	−0.249*	−0.194*	−0.119	−0.117	−0.374*	−0.355*	−0.105	0.138	−0.338*	−0.254	−0.154	−0.155*
exper	−0.135	0.264	−0.711*	−0.627*	−0.176	−0.637*	−0.046	−0.150	−0.774*	−0.036	−0.688*	−0.646*	−0.545	−0.794*	−0.588*
exper^2	0.020	−0.259	0.305*	0.289*	0.072	0.273*	−0.009	−0.034	0.284*	−0.041	0.272*	0.290*	0.214	0.303*	0.219*
first job	0.216*	0.368	0.086*	0.194*	0.174*	0.232*	0.247*	0.194	0.192	0.069	−0.228*	0.161	0.312*	0.011	0.128*
inactive	0.784*	1.228*	0.738*	0.821*	0.805*	0.949*	0.939*	0.963*	0.869*	0.797*	0.838*	0.783*	1.002*	0.923*	0.732*
agric	−0.179	0.163	0.057	0.063	0.000	−0.042	0.106	−0.079	−0.142	−0.265	0.126	0.227	−0.139	−0.167	−0.089
building	0.126*	0.188	0.014	0.019	−0.003	0.054	0.116	0.057	0.203*	−0.054	0.204*	0.007	0.117	0.039	0.099*
trade	0.024	−0.036	−0.007	0.117	0.038	0.073	0.037	−0.033	0.136	−0.033	0.245*	0.003	0.123	−0.032	0.026
notUI	1.067*	0.948*	0.969*	0.891*	0.907*	1.037*	1.008*	0.927*	0.917*	1.025*	1.076*	0.963*	1.014*	1.126*	1.044*
income	−0.079	−0.233	−0.098*	−0.046	−0.197*	−0.080	−0.191*	−0.080	−0.106	−0.143	−0.203*	−0.109	0.022	0.067	−0.092*
income^2	−0.005	0.007	0.007	0.001	0.023*	0.005	0.008	−0.016	0.002	0.001	0.033*	0.011	−0.022	−0.038*	0.004
pincome	−0.166*	−0.645*	−0.054*	0.005	−0.113*	−0.065	−0.014	−0.120*	−0.011	−0.197*	−0.057	−0.092*	−0.026	−0.128*	−0.075*
wealth	0.071*	0.024	0.045*	0.032	0.066*	0.082*	0.054	0.079*	0.041	0.079*	0.071*	0.045*	0.060*	0.089*	0.059*
house	−0.033*	0.001	−0.013	−0.020	−0.036*	−0.054*	−0.058*	−0.062*	−0.028	−0.028	−0.071*	−0.017	−0.070*	−0.053*	−0.032*
Q2	−0.036	−0.144	−0.016	−0.129*	−0.113*	−0.168*	0.219*	−0.271*	−0.096	0.116	−0.054	−0.087	−0.073	0.065	−0.072*
Q3	−0.131*	−0.168	−0.075*	−0.023	−0.147*	−0.187*	−0.037	−0.177*	−0.089	−0.012	−0.092	−0.141*	−0.089	0.058	−0.123*
Q4	−0.091*	−0.058	−0.019	−0.048	−0.135*	−0.162*	0.148*	−0.226*	0.020	−0.006	−0.195*	−0.084	−0.096	−0.007	−0.112*

Table 11: *Estimation results for the $U \rightarrow N$ transition intensity. Females.*

	Århus	Bholm	Chgen	Fborg	Fyn	NJlnd	Ribe	Rkbng	Rklde	SJlnd	Sstrm	Vejle	Vborg	WSlnd	DMark
married	0.018	−0.173	0.000	−0.055	−0.045	−0.006	−0.247*	−0.142*	−0.143	0.017	0.018	−0.116	−0.152	−0.059	−0.060
smallch	−0.306*	−0.288	−0.161*	−0.127*	−0.174*	−0.311*	−0.333*	−0.351*	−0.166*	−0.279*	−0.237*	−0.192*	−0.157*	−0.099*	−0.299*
schoolch	−0.148*	−0.024	−0.133*	−0.046	−0.181*	−0.064	−0.176*	−0.001	−0.149*	−0.095	−0.100*	−0.105*	−0.086	0.006	−0.127*
age≤24	0.374*	−0.142	0.397*	0.316*	0.349*	0.430*	0.352*	0.538*	0.265*	0.372*	0.339*	0.273*	0.333*	0.348*	0.305*
age25-34	0.233*	−0.384	0.227*	0.146*	0.095*	0.168*	0.227*	0.222*	0.194*	0.156*	0.226*	0.025	0.189*	0.096	0.178*
age≥50	0.784*	0.516*	0.660*	0.601*	0.797*	0.918*	0.742*	1.019*	0.491*	0.763*	0.887*	0.852*	0.889*	0.918*	0.748*
prim.edu	−0.162*	−0.323*	−0.033	−0.042	−0.095*	−0.157*	−0.130*	−0.066	−0.046	−0.069	0.057	−0.068	−0.161*	−0.107*	−0.087*
university	−0.062	0.097	0.099*	0.110	−0.107	0.162*	0.106	−0.084	0.059	0.171	0.157	0.284*	−0.238	0.037	0.039
immigrant	−0.123*	0.142	−0.335*	−0.299*	−0.062	0.015	−0.205*	−0.021	−0.325*	0.145	0.093	−0.082	−0.126	0.045	−0.244*
exper	−0.464*	−1.077	−0.502*	−0.684*	−0.078	−0.055	−0.402	−0.580*	−0.670*	−0.451*	−0.585*	−0.472*	−0.944*	−0.790*	−0.465*
exper^2	0.226*	0.529	0.210*	0.368*	0.066	0.040	0.220	0.288*	0.349*	0.275*	0.326*	0.204	0.545*	0.425*	0.216*
first job	0.205*	−0.002	0.097*	0.134	0.246*	0.148*	0.126	−0.038	0.166	0.167*	0.064	0.053	0.118	0.141*	0.136*
inactive	0.625*	0.519*	0.690*	0.662*	0.749*	0.696*	0.715*	0.809*	0.731*	0.586*	0.747*	0.703*	0.658*	0.728*	0.694*
agric	−0.259*	0.338	0.022	−0.044	0.019	−0.129	0.081	−0.090	0.251	0.084	−0.048	0.135	0.008	−0.235	−0.007
building	−0.028	−0.756	−0.341*	−0.224	0.225	−0.229	0.199	0.153	0.534*	−0.220	0.231	0.319	0.120	0.205	−0.019
trade	−0.119*	−0.256	0.003	−0.048	−0.023	−0.030	−0.009	−0.110	−0.014	−0.047	0.001	−0.036	−0.118	−0.084	−0.034
notUI	1.410*	1.704*	1.261*	1.345*	1.210*	1.431*	1.379*	1.385*	1.318*	1.365*	1.192*	1.278*	1.274*	1.468*	1.310*
income	−0.009	0.003	0.052	0.018	0.047	−0.089	−0.051	0.122	−0.002	−0.088	0.010	0.107	0.015	0.249*	−0.070
income^2	−0.001	−0.088	−0.021*	−0.022	−0.030	−0.015	−0.029	−0.042	−0.035	−0.004	−0.033	−0.052*	−0.006	−0.076*	0.006
pincome	−0.058*	0.004	−0.017	−0.001	−0.033	−0.054*	0.046	−0.036	−0.007	−0.049	−0.043	−0.032	−0.023	−0.039	−0.043*
wealth	0.094*	0.078	0.055*	0.054*	0.084*	0.067*	0.025	0.069*	0.109*	0.045	0.087*	0.086*	0.014	0.034	0.065*
house	−0.054*	−0.064	−0.031*	−0.033*	−0.058*	−0.053*	−0.032	−0.047*	−0.046*	−0.018	−0.059*	−0.053*	−0.027	−0.046*	−0.040*
Q2	−0.114*	−0.215	−0.079*	−0.033	−0.125*	−0.013	0.082	−0.031	−0.048	−0.053	−0.006	0.018	0.001	−0.145*	−0.104*
Q3	−0.080*	−0.162	−0.052*	−0.024	−0.103*	−0.036	0.054	−0.091	−0.024	−0.062	−0.029	−0.033	0.045	−0.060	−0.081*
Q4	−0.011	−0.286	−0.021	0.018	−0.002	−0.028	0.074	−0.027	0.118	0.012	−0.008	−0.034	0.083	−0.037	−0.009

Table 12: *Parameters of the distribution of unobserved heterogeneity.*

	Århus	Bholm	Chgen	Fborg	Fyn	NJlnd	Ribe	Rkbng	Rklde	SJlnd	Sstrm	Vejle	Vborg	WSlnd	DMark
							male								
v^E	0.399*	0.401*	0.371*	0.364*	0.433*	0.384*	0.421*	0.418*	0.392*	0.392*	0.413*	0.407*	0.420*	0.407*	0.395*
v^N	0.368*	0.116*	0.354*	0.322*	0.328*	0.347*	0.276*	0.264*	0.265*	0.320*	0.160*	0.184*	0.250*	0.306*	0.337*
p_{11}	0.290*	0.481*	0.349*	0.519*	0.456*	0.246*	0.234*	0.320*	0.143*	0.436*	0.138*	0.114*	0.244*	0.220*	0.340*
p_{21}	0.207*	0.454*	0.213*	0.238*	0.344*	0.336*	0.123*	0.154*	0.152*	0.230*	0.021	0.078*	0.121*	0.204*	0.266*
p_{12}	0.180*	0.030	0.292*	0.192*	0.097*	0.143*	0.201*	0.186*	0.506*	0.100*	0.374*	0.341*	0.224*	0.296*	0.175*
p_{22}	0.324*	0.035*	0.145*	0.051*	0.103*	0.275*	0.441*	0.340*	0.198*	0.234*	0.467*	0.466*	0.411*	0.280*	0.219*
$\mathrm{Var}\, v^E$	0.090*	0.090*	0.091*	0.083*	0.080*	0.090*	0.082*	0.085*	0.084*	0.092*	0.086*	0.087*	0.084*	0.088*	0.092*
$\mathrm{Var}\, v^N$	0.100*	0.048*	0.103*	0.085*	0.072*	0.104*	0.120*	0.135*	0.112*	0.103*	0.094*	0.104*	0.131*	0.118*	0.105*
ϱ	0.227*	0.024	−0.049	−0.098*	0.068	0.082	0.331*	0.320*	−0.224*	0.336*	0.309*	0.136	0.304*	0.005	0.113*
							female								
v^E	0.337*	0.423*	0.351*	0.402*	0.330*	0.365*	0.395*	0.367*	0.345*	0.367*	0.369*	0.379*	0.420*	0.304*	0.368*
v^N	0.315*	0.294	0.350*	0.167*	0.060*	0.430*	0.372*	0.057*	0.310*	0.128*	0.122*	0.277*	0.383*	0.417*	0.408*
p_{11}	0.185*	0.026	0.288*	0.073*	0.797*	0.472*	0.194*	0.744*	0.219*	0.787*	0.793*	0.651*	0.513*	0.421*	0.427*
p_{21}	0.040*	0.210	0.114*	0.038	0.195*	0.163*	0.008	0.243*	0.077*	0.190*	0.184*	0.251*	0.227*	0.052	0.095*
p_{12}	0.620*	0.423*	0.475*	0.597*	0.005*	0.295*	0.611*	0.002	0.543*	0.023*	0.010	0.042*	0.211*	0.405*	0.317*
p_{22}	0.156*	0.341	0.124*	0.292*	0.002*	0.070*	0.187	0.011*	0.160*	0.000	0.013*	0.056*	0.049*	0.123*	0.162*
$\mathrm{Var}\, v^E$	0.069*	0.082*	0.076*	0.079*	0.071*	0.072*	0.057	0.076*	0.078*	0.061*	0.063*	0.082*	0.067*	0.070*	0.076*
$\mathrm{Var}\, v^N$	0.082*	0.090*	0.101*	0.068*	0.007*	0.075*	0.063*	0.011*	0.099*	0.017*	0.017*	0.046*	0.073*	0.085*	0.087*
ϱ	0.026	−0.378	−0.088*	−0.010	0.025	−0.073	0.197*	0.156*	−0.034	−0.075*	0.148*	0.188*	−0.115	0.162*	0.180*

Notes:
* – statistically significant at 95% level
ϱ – correlation of v^E and v^N.

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