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Are Skills Firm-Specific? Evidence From Danish Micro Data

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Working Paper 2003:4

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ISSN 0907-2977 (Working Paper - Danish Economic Council)
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Are Skills Firm-Specific? Evidence From Danish Micro Data

Jakob Roland Munch
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Abstract: This paper studies the relationship between the probability of job change and tenure. Theory about worker-firm specific capital predicts that the job change hazard declines with time on the job, and this has frequently been confirmed by empirical evidence. However, it is shown that if much worker heterogeneity is accounted for, then the job change hazard is constant through the first 5-6 years of tenure, after which it declines. This dismisses the role of firm-specific human capital in the first several years of employment relationships. Further, if a distinction between within and between industry job changes is made, then evidence for industry-specific capital is found. Also, support is found for a new "skill-weights" approach to human capital in which all skills are general, cf. Lazear (2003).

Keywords: Job mobility, specific human capital, heterogeneity.

JEL: C41, J41, J63

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1 Introduction[1]

This paper is concerned with the distinction between firm-specific human capital and general human capital. According to Becker (1964) firm-specific human capital is by definition not useful to the firm or the worker outside their relationship, whereas general human capital increases productivity of the worker in many firms. In empirical studies firm-specific human capital is almost always measured by the workers tenure at the current employer, and a substantial literature have found large returns to tenure that are often equal in size with the general experience effect (see Farber (1999) for an overview). These positive returns to tenure are regarded as evidence for significant investments in firm-specific human capital. However, this literature has also been put into question by empirical findings by e.g. Neal (1995) and Parent (2000), who show that human capital tend to be industry-specific rather than firm-specific. Also Lazear (2003) has recently proposed a new theory of human capital in which all skills are general, but where the individual composition of general skills is firm-specific. Based on a rich Danish micro data set I study whether there can be found evidence for firm-specific human capital, and I also investigate if the findings by Neal (1995) and Parent (2000) can be further supported. In addition I test an empirical implication by the theoretical framework of Lazear (2003), that go beyond the traditional view of firm-specific human capital.

The returns-to-tenure approach implicitly takes it for given that the job change probability declines with tenure, because otherwise it is not clear that tenure measures firm-specific human capital in any way. Search theory predicts that if firm-specific human capital accumulates with tenure and if the return to the specific capital is split between the worker and the firm, then the job change hazard starts out high and declines with time on the job, since the loss associated with a job change rises (Jovanovic (1979*a*)). The theory about specific capital in the form of worker-firm matches also gives a prediction about the relationship between the separation rate and tenure, cf. Jovanovic (1979*b*). Early in the match the quality of the match is unknown so the separation rate is low due to job change costs for both the worker and firm. The match quality of workers and firms reveals itself over time, and so most bad matches are ended after some time in the job. That is, the separation rate first rises and then declines when mostly good matches remain.

It has indeed been a well established empirical fact that the probability of job change is declining with tenure if the first few months are disregarded. Farber (1994) uses monthly

[1]This paper has benefitted from comments from colleagues at the Danish Economic Council. Thanks to Daniel le Maire for research assistance and to Michael Svarer for computer code.

data and controls for some worker characteristics to investigate this issue and finds that the hazard rate peaks after 3 months of employment after which it declines. In fact in his review article Farber (1999) notes that "virtually all of the literature uses annual data on job change to investigate the relationship between tenure and the probability of job change, and, without exception, finds a monotonic negative relationship".

This paper takes another look at the job change hazard rate. In doing so it is important to control for worker heterogeneity because, as pointed out by Farber (1994), worker heterogeneity by itself can generate a declining job change hazard, if heterogeneity is not accounted for.[2] Taken together if worker heterogeneity is accounted for and if firm-specific capital is important, then one should expect a declining job change hazard perhaps after an initial rise during the first few months of tenure.

I use an exceptionally rich dataset for the Danish labour market, which allows to uncover the shape of the hazard rate and to estimate effects of explanatory variables with great precision. In particular a long list of covariates is available such that much worker heterogeneity is accounted for, and in addition the econometric framework attempts to control for remaining unobserved heterogeneity. I find that the job change hazard is roughly constant through the first 5-6 years of tenure after which it declines. This seems to contradict the notion of firm-specific human capital, as one would expect investments in specific human capital to take place early in the employment relationship in order to reap the rewards of the investment over a longer period.

Even if skills are not firm-specific they need not be general in the sense that they are useful to all firms. In particular they could still be specific to the industry, and Neal (1995) finds that tenure with the predisplacement employer is positively correlated with the wage earned in the post-displacement job only for those workers who stay in the same industry. Parent (2000) finds additional support for this view, as the return to tenure in the earnings function is reduced substantially when within-industry labour market experience is included. Therefore it is argued that what matters most for the wage profile in terms of human capital is not firm-specific but industry-specific. To investigate this issue a distinction between within and between industry job changes is made, such that two destination specific job change hazard rates are estimated. I find that the

[2]This is realized by the following example. Suppose there are only two types of workers, stable and unstable workers, with equally many of each type. The two types have a high and a low but constant hazard rate. In the beginning the observed hazard rate is just the average of the two constant hazard rates. However, over time more unstable than stable workers leave their jobs such that stable workers with low hazard rates come to dominate the sample. Thus, the observed hazard rate is declining and so failure to control for heterogeneity leads to negative duration dependence in the job change hazard rate.

within-industry job change hazard is roughly constant through the first 6 years while the between-industry job change hazard is declining throughout the job spell. Thus I confirm the finding that if human capital is specific then it tends to be specific to the industry rather than the firm.

Furthermore, Lazear (2003) has recently proposed a new theory of human capital that puts emphasis on the individual composition of skills. It is argued that it is the weighting of (general) skills that is firm-specific and not the skills *per se*. This approach has the novel empirical implication that tenure effects should be smaller in thick markets than in thin markets, because in markets where job offers are rare or where firms have very different skill weights, the loss associated with a job separation is higher. Clearly, this implication can also be studied in terms of the shape of the job change hazard, since skill specificity rises with tenure as shown by Lazear (2003), and so the job change hazard must start out high and decline with time on the job.

The rest of the paper is organized as follows. The next section describes the data set and points out some distinguishing characteristics of the Danish labour market. Section 3 sets up the duration model and section 4 presents the estimation results. Section 5 concludes.

2 Data and the Danish labour market

There is access to a very rich longitudinal dataset covering the total Danish population for the years 1988-2000. In each year detailed information about the labour market states of all individuals along with information on socio economic characteristics is available. These socio economic variables are extracted from the integrated database for labour market research (IDA) and the income registers in Statistics Denmark. Of particular importance is that a workplace identity is associated with each worker at the end of each year. A firm can have more than one workplace so if a worker changes between two workplaces within the same firm, then this is counted as a job change in the present analysis. Job spells are then straightforwardly constructed from successive years at the same workplace.

Here we are interested in the duration of job spells and transitions between jobs, and for the present purposes job spells are flow sampled such that only spells starting in 1989 and later are included in the analysis. The destination state for all spells that end before 2000 is known and I focus in particular on spells that end with a transition into a new job with the possibility to distinguish between a new job in the same industry and a new job in a different industry. If job spells end with transitions into other states than employment (e.g. unemployment, out of the labour force) or if spells are uncompleted in 2000 then they are treated as right censored observations. Also, if job spells end because of a firm closure then they are treated as right censored observations. To increase the homogeneity of the sample all students with jobs have been excluded.

In the resulting data set there is an abundance of observations, so a 5 % random sample is extracted which amounts to 287,524 job spells for 127,715 persons. Table 1 gives descriptive statistics for all explanatory variables in three sub samples, where distinctions between spells ending with jobs in the same industry, spells ending with jobs in different industries and spells not yet completed or completed with transitions to other states than employment have been made. Self explanatory dummies for age, gender, the presence of children, the presence of two adults in the household, citizenship and education are included. Further, information on the hourly wage rate is available, but there are some discontinuities in the definition of this variable over the years which primarily affects the level of the wage. Therefore to minimize measurement error wage quartiles are constructed in each year (based on all jobs in the full population). There is also a dummy for not being a member of an unemployment insurance fund and dummies for the labour market state prior to the job spell with a distinction between employment, unemployment, self-employment and out of the labour force. There are dummies for the size of the firm (or more precisely workplace) in terms of the workforce and indicators for whether the firm is growing more than 5 %, declining more than 5 % or not. In addition, 9 aggregated industry dummies are included. To capture business cycle effects the GDP growth rate and local unemployment rates based on 51 local labour markets[3] are included, and finally three geographic dummies are included to distinguish between the capital Copenhagen, 5 large cities and all other localities. Except for GDP growth and local unemployment all variables have been measured in the last year of the job spell. Because the job change transition takes place in the year after the last job spell year, the business cycle variables are taken from this year.

Insert Table 1 about here

The empirical job change hazard rate, which is simply defined as the fraction of those changing jobs in year t among those surviving until that year, is depicted in Figure 1, and it is clearly declining with time on the job. The question is to what extent this decline can be attributed to worker heterogeneity or specific capital.

Insert Figure 1 about here

[3] The local labour markets are socalled commuting areas that are defined such that the internal migration rate is 50 % higher than the external migration rate, cf. Andersen (2000).

Compared to other continental European labour markets the Danish labour market is often described as being very flexible as employment protection is weak (Nicoletti, Scarpetta & Boylaud (2000)), while at the same time replacement rates of UI benefits are high. This have led to turnover rates and an average tenure which are in line with those of the Anglo-Saxon countries. In 1995 the average tenure in the Danish labour market was the lowest in continental Europe with 7.9 years exceeding only the numbers for Australia, USA and UK (6.4, 7.4 and 7.8 years respectively), cf. OECD (1997). However, there are important differences with respect to institutions and wage formation. The Danish labour market is heavily unionized and the wage structure is relatively compressed even for European standards.

3 Econometric model

Different econometric approaches to modelling job change transition have been undertaken in the literature. Abraham & Farber (1987) estimate a Weibull hazard model for job change transitions and find that the hazard declines sharply with tenure. However this parametric specification of the baseline hazard is not capable of handling potential non-monotonicities in the true duration dependence. Parent (1999) also estimates a duration model which controls for unobserved heterogeneity, but he does not assess the question of duration dependence in the hazard. Farber (1994) estimates logit models by years of tenure to obtain a picture of the duration dependence in the hazard rate, and as previously noted he finds a peak in the hazard after three months of employment.

Here I set up a duration model with a flexible non-parametric specification of the baseline hazard. Even if there is access to a comprehensive dataset there might still be some unobserved heterogeneity left, as no measures for e.g. ability or motivation are available. Therefore I try to capture unobserved worker characteristics by specifying a mixed proportional hazard model for the job-to-job transitions:

$$\theta(t|x, v) = \lambda(t) \exp(x\beta + v), \tag{1}$$

where $\lambda(t)$ is the baseline hazard capturing the time dependence, and $\exp(x\beta + v)$ is the systematic part giving the proportional effects of observed, x, and unobserved, v, characteristics. All job spells that end with a transition to other states than a new job (e.g. unemployment and out of the labour force) are treated as right censored observations.

The annual observations in the data imply that the duration variable T is grouped into $K + 1$ intervals $\{[0, t_1), [t_1, t_2), .., [t_k, \infty)\}$ which must be accounted for in the econometric setup. Following Kiefer (1990) the interval specific survival rate is defined as

$$\begin{aligned} P(T &\geq t_k | T \geq t_{k-1}, x, v) = \exp(-\int_{t_{k-1}}^{t_k} \theta(t|x,v)dt) \\ &= \alpha_k(x,v). \end{aligned} \qquad (2)$$

To find the likelihood function it is noted that the probability that a spell ends in interval k conditional on x and v is given by the conditional probability of failure in that interval times the probability that the spell survives until interval k, or $(1-\alpha_k(x,v)) \prod_{j=1}^{k-1} \alpha_j(x,v)$. Some spells are right censored and they contribute to the likelihood with the survivor function, $\prod_{j=1}^{k} \alpha_j(x,v)$. Thus the individual contribution to the likelihood function can be written

$$\mathcal{L} = \int (1-\alpha_k(x,v))^c \alpha_k(x,v)^{1-c} \prod_{j=1}^{k-1} \alpha_j(x,v) dF(v), \qquad (3)$$

where $F(v)$ is the pdf of the unobserved heterogeneity term, and where $c = 1$ if the spell is completed and $c = 0$ if it is censored.

With the proportional hazard specification in (1) the probability of surviving interval k conditional on survival until t_{k-1} may be expressed as

$$\alpha_k(x,v) = \exp\left(-\exp(x\beta + v)\Lambda_k\right), \qquad (4)$$

where $\Lambda_k = \int_{t_{k-1}}^{t_k} \lambda(t)dt$. Instead of imposing a functional form on the baseline hazard I allow for a flexible specification by simply estimating the interval specific baseline parameters Λ_k, $k = 1, .., K$.

The distribution of the unobserved characteristics, $F(v)$, remains to be specified. It is suggested by Heckman & Singer (1984) that discrete distributions can approximate any arbitrary distribution functions, and here I assume that v can take two values, v_1 and v_2, each with an associated probability, p_1 and $p_2 = 1 - p_1$. One of the support points, v_1, is normalized to zero, so the distribution is characterized by estimates of v_2 and p_1. Such a specification of unobservables is very flexible and widely applied.[4]

4 Estimation results

Before turning to the shape of the estimated baseline hazard rate I go through the effects of some of the control variables. The first two columns of Table 2 give the effects of covariates and their standard deviations for the model where no distinction between within and

[4]See van den Berg (2001) for more details and e.g. Belzil (2001) and Jensen, Rosholm & Svarer (2003) for applications in grouped duration models.

between industry job changes are made. Most variables have the expected signs; younger workers, men and more educated workers change jobs more frequently while children and cohabitation are stabilizing. A lower wage rate seems to increase the likelihood of a job change. However, the coefficients to the wage dummies should be interpreted with caution, since they might be endogenous, see e.g. Abowd & Kang (2002). For the present purposes I include the wage dummies mainly to control for heterogeneity. It is also seen that, if workers were unemployed, self-employed or out of the labour force prior to the job spell, then their job spells tend to be longer when compared to workers who had another job prior to the present job. Somewhat surprisingly workers employed in large firms tend to change jobs more frequently and workers in declining or growing firms change jobs more often than workers in stable firms. A higher GDP growth rate leads to a lower job change hazard rate, while a higher local unemployment rate leads to more job changes.

Insert Table 2 about here

The estimated hazard rate is depicted in Figure 2 for the reference person.[5] It is seen that when worker heterogeneity is controlled for the job change hazard rate is roughly constant through the first 5-6 years on the job after which it declines. This is in stark contrast to the empirical hazard rate, that showed a sharp decline from the first year. If anything there is now a small rise in the hazard during the first two years, which seems to suggest that bad job matches might survive longer than just a few months as found by Farber (1994). The flat hazard rate through the first 5-6 years contradicts the notion of firm-specific human capital, as one would expect investments in specific human capital to take place early in the employment relationship in order to reap the rewards of the investment over a longer period. The reasoning here resembles that of the standard model of investment in general human capital over the life cycle (cf. Ben-Porath (1967)), where investment decreases over time.

This result is in contrast to previous studies of the relationship between tenure and the job change probability, cf. Farber (1999), so what could explain this divergence? First, the data set used here is much more detailed with respect to worker and firm characteristics. This facilitates better control for individual heterogeneity, and contrary to other studies I also try to correct for any remaining unobserved heterogeneity, such that negative bias in the duration dependence is avoided.

[5] The reference person in Figures 2-4 is defined in a year with GDP growth rate of 2 % and a local unemployment rate of 6 %. The remaining characteristics are given from Table 2, i.e. it is a single male between 30 and 39 years without children aged 0-6 years etc. The estimated baseline parameters and standard errors are shown in Appendix B.

A second issue that could explain the divergent results is the fact that the Danish wage structure is relatively compressed due to unionized wage setting. If this means that firms find it harder to reward individual workers for investments in firm-specific or general human capital then workers have greater incentives to change jobs. However, average tenure is not lower than in the Anglo-Saxon countries, and as discussed by Bingley & Westergaard-Nielsen (2002) the Danish labour market has undergone a reform process in the late 1980's and early 1990's where wage bargaining were decentralized to the firm or industry level. This has enabled firms to pay wages that are in better accordance with individual productivity, and Bingley & Westergaard-Nielsen (2002) find evidence for this by estimating the return to tenure over the period 1980-1998. They show that the return to tenure for displaced workers rises shaply in the beginning of the 1990's although it is still lower than comparable numbers for the US as reported by Farber (1999). The results here suggest that the return to tenure should not be interpreted as a return to firm-specific human capital. Tenure might be correlated with individual productivity and human capital, but it does not seem to be human capital that is useless to other firms, since the job change hazard rate is not declining for the first several years of the employment relationship.

Insert Figure 2 about here

An interesting extension of the analysis is to investigate whether skills might be specific to the industry instead of the firm, since, as noted in the introduction, Neal (1995) and Parent (2000) have found evidence showing that there is a significant industry-specific element in the return to tenure. This issue can be analysed in terms of the shape of the job change hazard by distinguishing between within- and between-industry job changes, such that two destination specific job change hazard rates are estimated. The last four columns of Table 2 give estimation results for the effects of covariates in the within- and between-industry job change hazards. These are simply estimated by treating all observations that do not end with a job change within the same industry (or between industries) as right censored.[6] Most explanatory variables have the same sign as before, but there are also differences. Workers with just basic schooling change jobs more often between industries than workers with a vocational education, which is different compared to the within-industry job change hazard and the overall job change hazard. The effect of wage quartiles also differs between the two destination specific hazard rates. Workers in the higher wage quartiles are relatively less inclined to change jobs between industries.

[6] Attempts were made to estimate a competing risks duration model, but I was unable to identify the distribution of unobservables.

This could indicate that by switching industry well paid workers would face a drop in the wage rate, perhaps because they lose some industry-specific human capital.

This point finds further support when the shape of the destination specific hazard rates are considered. The within-industry job change hazard is first rising somewhat and then it is roughly constant until the 6th year after which it declines as before, see Figure 3. However, the between-industry job change hazard is clearly declining through the first couple of years after which it shows a weak decline. Thus these results provide evidence for investments in specific human capital during the first 6 years of employment relationships, and it tends to be industry-specific rather than firm-specific capital.

Insert Figure 3 about here

If a finer industry definition is used to distinguish between within and between industry job changes (111 industries) then the between industry job change hazard is constant in the first 5-6 years. This means that only when significant industry switches are considered is there evidence of industry-specific capital.

Another line of criticism comes from Lazear (2003), who argues that it is usually very hard to come up with good examples of firm-specific human capital that approaches the importance of general human capital. Instead he proposes a new theory of specific human capital that builds on the assumptions that all skills can be utilized in other firms and that firms vary in their weighting of the different general skills. The problem for the worker in this set up is to choose the human capital investment strategy that maximizes net expected earnings while taking into account the outside job offer distribution (and its implicit demand for combinations of skills). The worker typically chooses to invest somewhat idiosyncratically to meet the skill demands of the present firm. This means that when the worker changes job he faces a loss because he is unlikely to find a new job that utilizes his skills perfectly. An important and novel empirical implication of this framework is that the loss associated with a job change depends on the thickness of the local labour market, since in thick markets workers are more likely to find a new job where skill demands match those of the present job. In the traditional view of firm-specific human capital this loss does not depend on the thickness of the local labour market. This implication can also be studied in terms of the shape of the job change hazard, because (as shown by Lazear (2003)) skill specificity rises with tenure, and so the loss associated with a job change rises, but it rises more steeply in thin labour markets. In this case the job change hazard must start out high and decline with time on the job, but in thick markets this should be less pronounced if present at all.

As noted by Lazear (2003) empirical proxies for market thickness could be regional population densities and industry concentration ratios. I choose to divide the data set into three local labour markets (socalled commuting areas, cf. section 2), the Copenhagen metropolitan area, the local labour markets with the five largest cities outside Copenhagen and the remaining relatively rural parts of Denmark. The Copenhagen metropolitan area is by far the largest local labour market in Denmark and comprises almost 40 % of all job spells in the sample. Such a regional division according to city size is also justified in terms of industry concentration ratios, since it is a stylized fact that larger cities tend to be more diversified, cf. Puga & Duranton (2000).

The three panels of Figure 4 show the job change hazard rates for the three local labour markets, and it is immediately apparent that market thickness matters for the shape of the job change hazard. For the "rural regions" the job change hazard is clearly declining throughout the job spell, which is in accordance with the prediction from the "skill-weights" view that the loss associated with job change is high and rising with tenure in thin local labour markets. For the medium sized local labour markets, "Large cities", the job change hazard rate is roughly flat during the first six years of time on the job after which it declines. In stark contrast is the job change hazard rate for the Copenhagen metropolitan area, where the job change hazard rate actually is rising during the first eight years. This result is somewhat surprising since theory only predicts a rising hazard until bad job matches are revealed and terminated (Jovanovic (1979*b*)), and bad job matches should be revealed relatively quickly. However, the wage rate plays an important role in the job changing decision (Topel & Ward (1992)), and if workers in thick labour markets are in better position to use job changes as a way to increase their wage, then this mechanism could lead to a rising job change hazard. In any case, the results show that market thickness is important for job turnover and that tenure seems to be a very poor measure for firm-specific human capital.

Insert Figure 4 about here

5 Conclusion

This paper has investigated the relevance of the notion of firm-specific human capital. Instead of estimating the return to tenure in wage equations I have taken a step back and considered the shape of the job change hazard rate. This is relevant because if tenure is to measure firm-specific human capital in any way, then the job change probability must be declining with time on the job.

Job change hazard rates for workers in the Danish labour market have been estimated by use of an exceptionally rich dataset and by specifying a duration model with a flexible non-parametric baseline hazard. In addition to much observed worker heterogeneity also unobserved heterogeneity is accounted for and three main findings emerged from the estimation results. First, it is found that the job change hazard is roughly constant through the first 5-6 years of tenure after which it declines. This questions the relevance of firm-specific human capital, as a declining job change hazard rate is implied by the theory of specific capital. Furthermore it also calls for a reinterpretation of the large returns-to-tenure coefficients found in the literature. Tenure might be correlated with human capital, but it does not seem to be human capital that is specific to the firm, since only for between-industry job changes and in thin labour markets is the job change hazard declining.

Second, a more detailed investigation of within and between industry job changes reveals some evidence for the presence of industry-specific human capital. The within-industry job change hazard is roughly constant until the 6th year after which it declines. In contrast, the between-industry job change hazard is declining through the first couple of years after which it shows a weak decline. That is, evidence is found for investments in industry-specific human capital, and this supports earlier findings by Neal (1995) and Parent (2000), who show that there is a significant industry-specific element in the return to tenure.

Third, there is an important influence of market thickness in the shape of the job change hazard. In thin markets the job change hazard is declining while in thick markets it is somewhat surprisingly rising. This latter result raises some issues for future research, since based on existing theories on job turnover it is difficult to explain the rising job change hazard rate for thick local labour market. The result nevertheless suggests that there is a loss associated with job change in thin markets which is not present in thick local labour markets, and this is in accordance with the predictions of the “skill-weights” approach to human capital (Lazear (2003)), where it is argued that it is the weighting of (general) skills that is firm-specific. Overall the three main results call into question the relevance of firm-specific human capital. Human capital seems to be more general, and the results concering industry-specific capital and market thickness are consistent in the sense that here human capital is not completely specific to the firm.

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A Appendix: Tables and figures

TABLE 1

Sample means

	Job change within industry		Job change between industr.		Right censored spells	
Variables	Mean	Stdv.	Mean	Stdv.	Mean	Stdv.
Age 19-24	0.1947	0.3960	0.3391	0.4734	0.1484	0.3554
Age 25-29	0.1818	0.3857	0.1872	0.3901	0.1396	0.3465
Age 30-39	0.3054	0.4606	0.2560	0.4364	0.2701	0.4440
Age 40-49	0.2046	0.4034	0.1423	0.3493	0.2125	0.4091
Age 50-59	0.0968	0.2957	0.0632	0.2434	0.1670	0.3730
Age 60+	0.0166	0.1278	0.0122	0.1097	0.0625	0.2420
Female	0.4531	0.4978	0.3829	0.4861	0.4780	0.4995
Children 0-6 years	0.2939	0.5598	0.2517	0.5271	0.2658	0.5367
Two adults	0.6443	0.4787	0.5554	0.4969	0.6597	0.4738
Non OECD country	0.0177	0.1318	0.0170	0.1293	0.0334	0.1797
Basic schooling	0.3362	0.4724	0.4673	0.4989	0.4234	0.4941
Vocational education	0.3941	0.4887	0.3832	0.4862	0.3803	0.4855
Higher edu. short	0.0422	0.2011	0.0429	0.2026	0.0408	0.1979
Higher edu. medium	0.1504	0.3575	0.0531	0.2242	0.1015	0.3021
Higher edu. long	0.0771	0.2667	0.0535	0.2251	0.0539	0.2258
Wage quartile 1	0.1242	0.3298	0.2021	0.4016	0.1536	0.3605
Wage quartile 2	0.2860	0.4519	0.3163	0.4650	0.3149	0.4645
Wage quartile 3	0.2884	0.4530	0.2339	0.4233	0.2678	0.4428
Wage quartile 4	0.3014	0.4589	0.2478	0.4317	0.2636	0.4406
Non insured	0.1671	0.3731	0.2451	0.4302	0.1936	0.3951
Employed	0.7786	0.4152	0.7164	0.4507	0.6473	0.4778
Unemployed	0.1033	0.3043	0.1323	0.3388	0.1692	0.3750
Self-employed	0.0168	0.1285	0.0210	0.1432	0.0389	0.1934
Out of labour force	0.1013	0.3017	0.1304	0.3367	0.1446	0.3517
Firm size 1-10	0.1806	0.3847	0.2243	0.4171	0.2361	0.4247
Firm size 11-50	0.3063	0.4609	0.3213	0.4670	0.2976	0.4572
Firm size 51-200	0.2497	0.4329	0.2304	0.4211	0.2380	0.4258
Firm size 200+	0.2634	0.4405	0.2240	0.4169	0.2283	0.4197
Stable firm size	0.2509	0.4335	0.2493	0.4326	0.2643	0.4410
Declining firm	0.5206	0.4996	0.4877	0.4999	0.3416	0.4742
Growing firm	0.2284	0.4198	0.2630	0.4403	0.2373	0.4254
Manufacturing	0.1488	0.3559	0.2156	0.4112	0.1931	0.3947
Agriculture	0.0231	0.1501	0.0414	0.1992	0.0282	0.1657
Construction	0.0022	0.0473	0.0060	0.0770	0.0045	0.0666
Energy	0.0781	0.2683	0.0762	0.2652	0.0662	0.2486
Trade	0.1516	0.3586	0.2304	0.4211	0.1716	0.3770
Transport	0.0757	0.2646	0.0767	0.2660	0.0727	0.2596
Finance	0.0481	0.2139	0.0273	0.1629	0.0306	0.1721
Business	0.0487	0.2152	0.1021	0.3028	0.0797	0.2708
Public	0.4237	0.4941	0.2244	0.4172	0.3535	0.4781
GDP growth	0.0239	0.0135	0.0241	0.0130	0.0246	0.0117
Local unempl. rate	0.0773	0.0256	0.0756	0.0257	0.0692	0.0273
Copenhagen	0.2589	0.4380	0.2390	0.4265	0.2301	0.4209
Large city	0.1458	0.3529	0.1337	0.3403	0.1475	0.3546
Rural	0.5953	0.4908	0.6274	0.4835	0.6224	0.4848
# observations	81,718		48,100		157,706	

TABLE 2

ESTIMATION RESULTS: EFFECTS OF COVARIATES[a]

	Job change		Job change within industry		Job change between industries	
Variables	Coeff.	Stdv.	Coeff.	Stdv.	Coeff.	Stdv.
Age 19-24	0.6731	0.0122	0.3778	0.0150	0.7597	0.0248
Age 25-29	0.3143	0.0106	0.2454	0.0127	0.3109	0.0171
Age 40-49	-0.3077	0.0110	-0.2489	0.0127	-0.3472	0.0187
Age 50-59	-0.8352	0.0158	-0.7087	0.0177	-0.8703	0.0303
Age 60+	-1.7191	0.0338	-1.5359	0.0392	-1.5217	0.0560
Female	-0.1826	0.0076	-0.0949	0.0096	-0.2605	0.0123
Children 0-6 years	-0.0734	0.0072	-0.0655	0.0087	-0.0583	0.0108
Two adults	-0.0312	0.0079	0.0007	0.0099	-0.0675	0.0116
Non OECD country	-0.2988	0.0271	-0.1523	0.0336	-0.4064	0.0384
Basic schooling	-0.0209	0.0081	-0.1460	0.0106	0.1379	0.0119
Higher edu. short	0.1786	0.0175	0.0928	0.0216	0.2150	0.0255
Higher edu. medium	0.2420	0.0124	0.3280	0.0138	-0.2742	0.0242
Higher edu. long	0.3410	0.0153	0.3340	0.0176	0.1703	0.0243
Wage quartile 1	0.1284	0.0108	0.0423	0.0149	0.1953	0.0150
Wage quartile 3	-0.0354	0.0092	0.0562	0.0114	-0.1896	0.0143
Wage quartile 4	-0.0110	0.0100	0.0928	0.0124	-0.1704	0.0149
Non insured	0.0814	0.0096	0.0087	0.0128	0.1280	0.0138
Unemployed	-0.2927	0.0113	-0.4245	0.0151	-0.0242	0.0147
Self-employed	-0.4562	0.0273	-0.6054	0.0353	-0.1319	0.0343
Out of labour force	-0.3418	0.0115	-0.3443	0.0151	-0.2087	0.0160
Firm size 11-50	0.0620	0.0098	0.0577	0.0128	0.0561	0.0136
Firm size 51-200	0.1375	0.0108	0.1380	0.0137	0.0939	0.0153
Firm size 200+	0.1656	0.0111	0.1406	0.0140	0.1622	0.0165
Declining firm	0.7467	0.0101	0.7677	0.0124	0.5246	0.0177
Growing firm	0.4955	0.0107	0.4346	0.0131	0.4403	0.0175
Agriculture	0.2491	0.0212	0.2529	0.0312	0.0837	0.0267
Construction	0.2997	0.0144	0.4809	0.0191	0.0000	0.0208
Energy	-0.0191	0.0591	-0.5475	0.0977	0.3645	0.0646
Trade	0.1824	0.0119	0.2079	0.0164	0.0880	0.0154
Transport	0.3050	0.0149	0.4587	0.0194	0.0306	0.0206
Finance	0.3371	0.0196	0.6203	0.0231	-0.2552	0.0321
Business	0.1463	0.0161	-0.1436	0.0235	0.3929	0.0215
Public	0.3131	0.0109	0.6755	0.0152	-0.3806	0.0178
GDP growth	-0.6099	0.0253	-0.7245	0.0318	-0.2936	0.0384
Local unempl. rate	1.3297	0.0148	1.5042	0.0194	0.7722	0.0267
Large city	-0.2486	0.0115	-0.2458	0.0140	-0.1923	0.0174
Rural	-0.1268	0.0084	-0.1609	0.0104	-0.0483	0.0123

[a]To aid maximization of the likelihood function the variables GDP growth and Local unemployment rate have been scaled by 10.

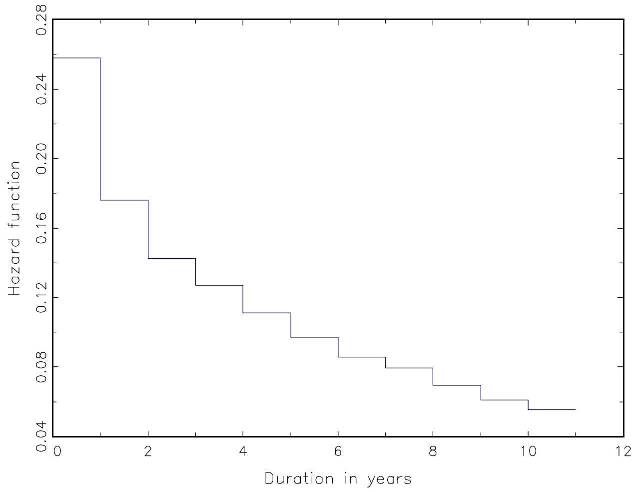

Figure 1: The empirical job change hazard rate

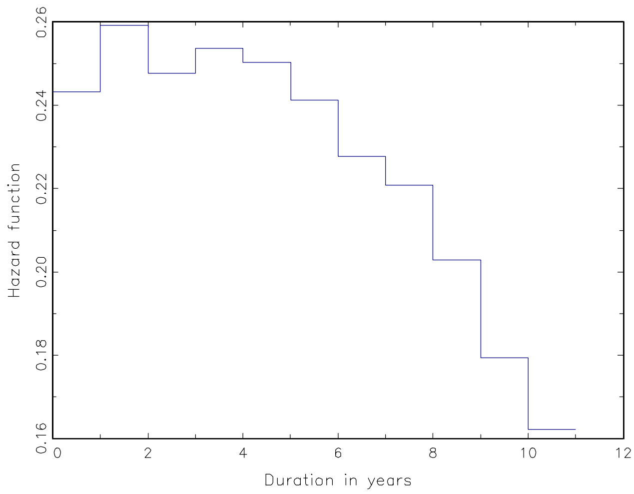

Figure 2: The estimated job change hazard rate.

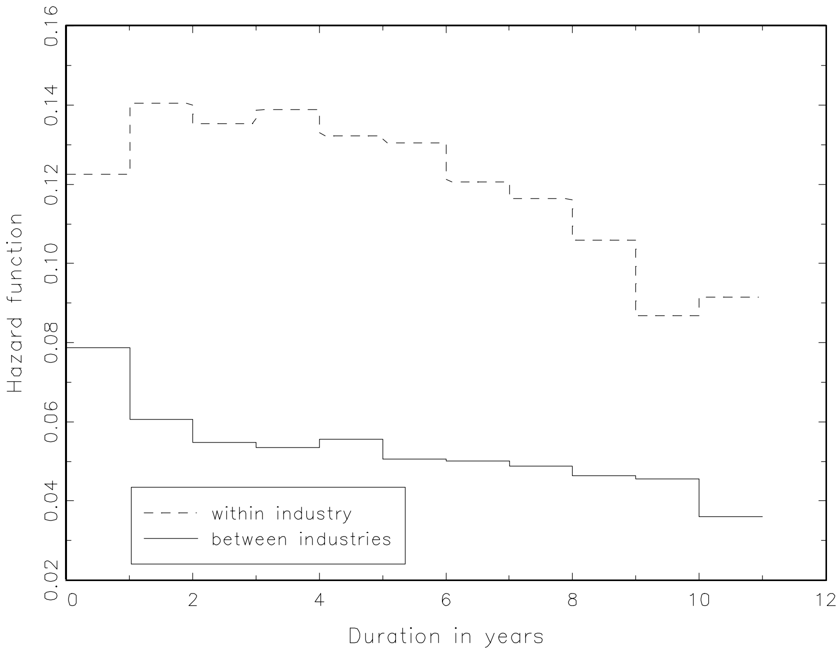

Figure 3: Destination specific job change hazard rates.

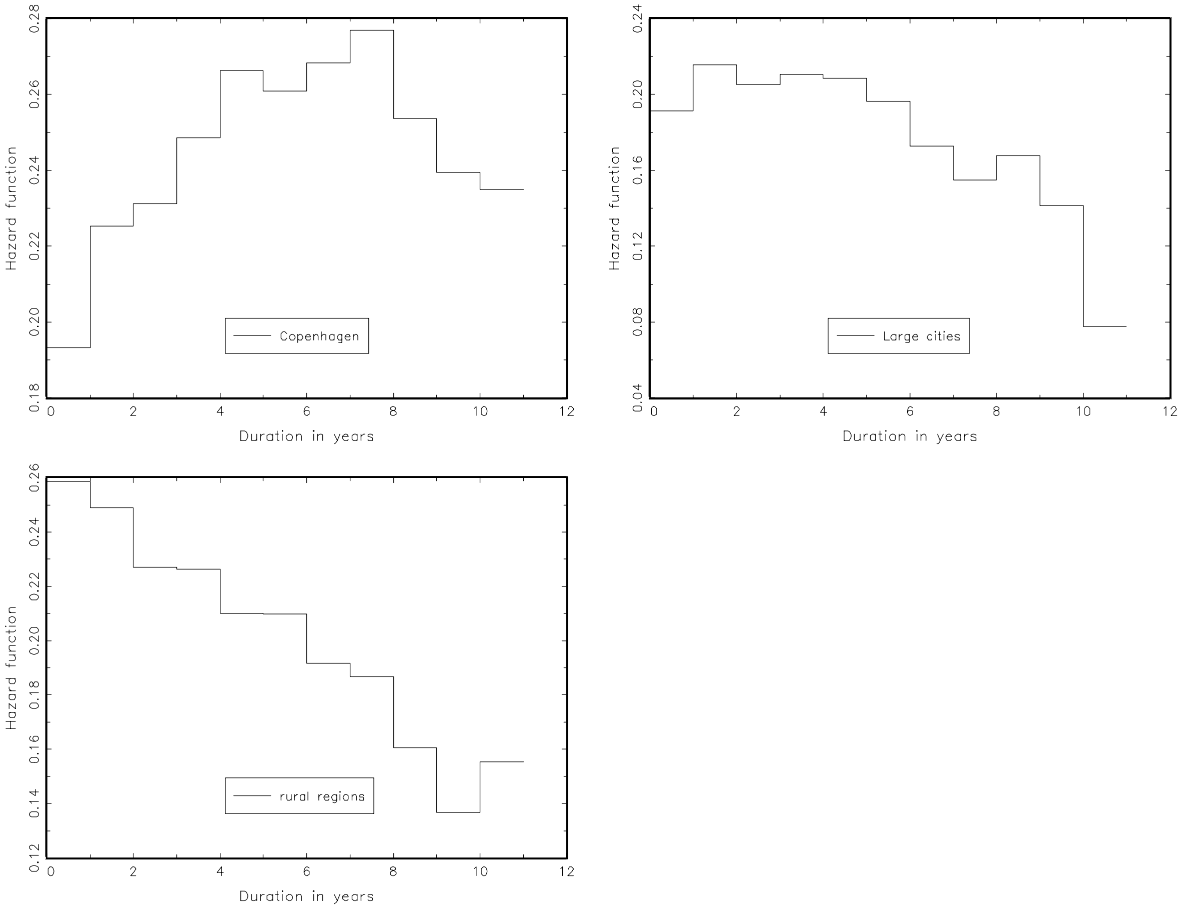

Figure 4: Region-specific job change hazard rates.

B Appendix: Supplementary tables

TABLE B1

Estimation results: Baseline parameters and unobservables

	Job change		Job change within industry		Job change between industries	
Parameters	Coeff.	Stdv.	Coeff.	Stdv.	Coeff.	Stdv.
1. year, Λ_1	0.0479	0.0018	0.0216	0.0010	0.0430	0.0040
2. year, Λ_2	0.0510	0.0014	0.0247	0.0009	0.0331	0.0022
3. year, Λ_3	0.0488	0.0013	0.0238	0.0008	0.0299	0.0017
4. year, Λ_4	0.0499	0.0013	0.0244	0.0008	0.0292	0.0015
5. year, Λ_5	0.0493	0.0014	0.0233	0.0008	0.0304	0.0016
6. year, Λ_6	0.0475	0.0014	0.0230	0.0009	0.0276	0.0015
7. year, Λ_7	0.0448	0.0015	0.0212	0.0009	0.0273	0.0016
8. year, Λ_8	0.0435	0.0017	0.0205	0.0010	0.0267	0.0018
9. year, Λ_9	0.0399	0.0019	0.0187	0.0011	0.0253	0.0020
10. year, Λ_{10}	0.0353	0.0022	0.0153	0.0012	0.0249	0.0025
11. year, Λ_{11}	0.0319	0.0030	0.0161	0.0018	0.0197	0.0034
υ_2	2.8216	0.0384	3.3605	0.0502	2.2370	0.2550
$P(\upsilon_1)$	0.8997	0.0044	0.9402	0.0033	0.9735	0.0129
$P(\upsilon_2)$	0.1003	0.0044	0.0598	0.0033	0.0265	0.0129

TABLE B2

Estimation results: Effects of covariates

	Copenhagen		Large cities		Rural regions	
Variables	Coeff.	Stdv.	Coeff.	Stdv.	Coeff.	Stdv.
Age 19-24	0.6232	0.0194	0.6175	0.0255	0.7118	0.0203
Age 25-29	0.2750	0.0167	0.2993	0.0224	0.3251	0.0177
Age 40-49	-0.2940	0.0176	-0.3122	0.0234	-0.3265	0.0182
Age 50-59	-0.7639	0.0240	-0.9265	0.0353	-0.8817	0.0271
Age 60+	-1.7455	0.0498	-1.8005	0.0760	-1.7473	0.0596
Female	-0.1082	0.0119	-0.2066	0.0167	-0.2693	0.0131
Children 0-6 years	-0.0823	0.0120	-0.0692	0.0152	-0.0775	0.0116
Two adults	-0.0206	0.0125	-0.0252	0.0170	-0.0296	0.0133
Non OECD country	-0.3218	0.0355	-0.3381	0.0704	-0.2945	0.0551
Basic schooling	-0.0594	0.0135	-0.0599	0.0175	0.0416	0.0129
Higher edu. short	0.1760	0.0262	0.1715	0.0373	0.1480	0.0312
Higher edu. medium	0.2099	0.0194	0.2520	0.0260	0.2743	0.0213
Higher edu. long	0.2737	0.0217	0.4012	0.0329	0.4676	0.0304
Wage quartile 1	0.1361	0.0185	0.1922	0.0221	0.1009	0.0170
Wage quartile 3	-0.0263	0.0152	-0.0739	0.0198	-0.0529	0.0146
Wage quartile 4	-0.0296	0.0163	0.0021	0.0212	-0.0389	0.0163
Non insured	0.1083	0.0144	0.0972	0.0221	0.0298	0.0167
Unemployed	-0.2554	0.0193	-0.2987	0.0230	-0.2776	0.0179
Self-employed	-0.4858	0.0466	-0.3929	0.0589	-0.4395	0.0415
Out of labour force	-0.3375	0.0190	-0.3031	0.0237	-0.3574	0.0187
Firm size 11-50	0.1090	0.0171	0.0644	0.0203	0.0159	0.0152
Firm size 51-200	0.1855	0.0181	0.1295	0.0223	0.0933	0.0173
Firm size 200+	0.2274	0.0180	0.1212	0.0238	0.0995	0.0188
Declining firm	0.7846	0.0164	0.7661	0.0217	0.6966	0.0164
Growing firm	0.5645	0.0174	0.5162	0.0228	0.4314	0.0173
Agriculture	0.2527	0.0696	0.2504	0.0408	0.2166	0.0289
Construction	0.3294	0.0260	0.3294	0.0290	0.2517	0.0225
Energy	-0.0021	0.0916	0.0199	0.1388	-0.1332	0.0993
Trade	0.2339	0.0209	0.1894	0.0254	0.0987	0.0188
Transport	0.2682	0.0248	0.3740	0.0323	0.2943	0.0246
Finance	0.3109	0.0281	0.3420	0.0478	0.3082	0.0409
Business	0.1458	0.0249	0.1659	0.0352	0.1374	0.0301
Public	0.3398	0.0197	0.3283	0.0235	0.2730	0.0165
GDP growth	-0.7978	0.0382	-0.4403	0.0516	-0.5632	0.0439
Local unempl. rate	1.9735	0.0323	1.3798	0.0329	0.9807	0.0217
# observations	114,747		68,445		104,332	

TABLE B3

Estimation results: Baseline parameters and unobservables

	Copenhagen		Large cities		Rural regions	
Parameters	Coeff.	Stdv.	Coeff.	Stdv.	Coeff.	Stdv.
1. year, Λ_1	0.0240	0.0015	0.0327	0.0030	0.0702	0.0073
2. year, Λ_2	0.0280	0.0013	0.0368	0.0027	0.0676	0.0056
3. year, Λ_3	0.0287	0.0019	0.0349	0.0028	0.0617	0.0035
4. year, Λ_4	0.0309	0.0016	0.0359	0.0022	0.0615	0.0026
5. year, Λ_5	0.0331	0.0016	0.0355	0.0020	0.0570	0.0023
6. year, Λ_6	0.0324	0.0015	0.0335	0.0019	0.0570	0.0023
7. year, Λ_7	0.0333	0.0016	0.0294	0.0017	0.0520	0.0022
8. year, Λ_8	0.0344	0.0017	0.0264	0.0017	0.0507	0.0023
9. year, Λ_9	0.0315	0.0017	0.0286	0.0021	0.0436	0.0023
10. year, Λ_{10}	0.0298	0.0018	0.0241	0.0021	0.0371	0.0023
11. year, Λ_{11}	0.0292	0.0022	0.0132	0.0013	0.0422	0.0033
υ_2	2.7260	0.0460	2.9117	0.0746	2.8271	0.0824
$P(\upsilon_1)$	0.8677	0.0069	0.8965	0.0085	0.9189	0.0078
$P(\upsilon_2)$	0.1323	0.0069	0.1035	0.0085	0.0811	0.0078

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