Whose Job Goes Abroad? – International Outsourcing and Individual Job Separations*

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Abstract

This paper focuses on the adjustment costs of globalization by studying the effects of international outsourcing on individual transitions out of jobs in the Danish manufacturing sector for the period 1990-2003. Estimation of a single risk duration model, where no distinction is made between different types of transitions out of the job, shows that outsourcing has a negative effect on the job separation rate. A competing risks duration model that distinguishes between job-to-job and job-to-unemployment transitions is also estimated. Outsourcing is found to increase the unemployment risk of low-skilled workers, but the quantitative impact is modest. Outsourcing is also found to reduce the job change hazard rate for all education groups. Thus, the paper provides evidence for small adjustment costs of globalization that should be held up against theoretically relatively important long run overall gains from outsourcing.

Keywords: International outsourcing, job separations, competing risks duration model.

JEL Codes: F16, J68, C23, C41

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1 Introduction

The public debate over outsourcing is intense in most advanced countries with commentators, politicians and journalists often painting a bleak picture of the situation on the labour market claiming that outsourcing leads to massive losses of jobs to low-wage countries which in particular hurt low-skilled workers. This picture is often based on specific examples of firms moving jobs abroad and rarely is the debate accompanied by solid evidence showing that labour markets are deteriorating in general. Economists, on the other hand, typically argue that outsourcing at most gives rise to short run adjustment costs in the form of spells of unemployment following job displacement. In the long run there is full employment where some workers may lose through lower wages, but outsourcing is just another type of trade that has the usual long run gains, and overall these gains more than outweigh the costs.

In this paper I focus on the impact of outsourcing on short run labour market dynamics in the form of individual job separations, and I do not consider questions related to any long run efficiency gains from outsourcing. That short run adjustment costs should be taken seriously is for example suggested by Davidson & Matusz (2004) who show – by calibrating a general equilibrium model of trade with unemployment and training – that adjustment costs are a significant fraction of the gross benefits of a reform that removes trade barriers. It is clear that from the individual perspective costs related to displacement may be substantial, see e.g. Farber (2005) for a recent account. Job loss is associated with lower re-employment earnings, long spells of unemployment for some workers and a higher probability of being part-time employed when reemployed. However, such costs may very well be small at the aggregate level if there is only a modest impact of outsourcing on the job separation rate. The purpose of this paper is to give an assessment of the quantitative importance of the effects of international outsourcing on the individual job separation rate.

Outsourcing here refers to the splitting up of the production process into stages of which the components can be produced outside the domestic plant, possibly in low-wage
countries. Thus outsourcing is defined as the use of imported intermediate inputs in production, and such trade in intermediates has increased significantly over recent decades, see e.g. Hummels, Ishii & Yi (2001). I consider two different measures of outsourcing – a broad and a narrow measure. Following Feenstra & Hanson (1999) the broad measure is defined in terms of the value of all imported intermediate inputs of an industry, while the narrow measure restricts attention to intermediate inputs that are purchased from the same industry as the good being produced. The idea behind the narrow measure is that it only includes imported production activity that could have been done within the domestic industry.

Only very few papers have studied the impact of outsourcing on job separations which is surprising given the strong media attention. Using aggregate data for job displacement rates at the industry level in the US Kletzer (2000) and Kletzer (2002) find that imported intermediate goods do not have a significant impact on displacement rates. This approach can be criticized on two accounts. First, as acknowledged by Kletzer, regressing industry displacement rates on industry-level trade data may produce biased results due to endogeneity. Endogeneity in the form of omitted variables could still be a problem in studies using micro data as e.g. unobserved industry specific shocks could affect turnover of many individuals and aggregate outsourcing. However, endogeneity through reverse causality is less likely to be a problem when estimating individual transition rates using industry-level outsourcing measures because individual workers plausibly do not affect industry level outsourcing. Second, international outsourcing has consequences for micro units (i.e. workers and firms), and they may possibly be affected in opposite directions, so using individual-level data may uncover effects that would not otherwise be found. Also, by controlling for individual heterogeneity spurious results due to changes in worker composition are avoided and a richer analysis is possible by studying the destination states when workers leave their jobs.

This paper follows the substantial literature that study job turnover at the individual level. This literature shows for example that the transition from job to nonemployment differs between gender and education groups (Royalty (1998)), highlighting the impor-
tance to control for such characteristics. It is a well established fact that job turnover rates decline with time on the job supposedly due to accumulation of match specific human capital (see e.g. Farber (1999)), so it is also important to control for duration dependence. Furthermore worker characteristics often have distinct impacts on different destination states for the transition out of jobs. For example, Royalty (1998) distinguishes between job-to-job and job-to-nonemployment transitions and Zavodny (2003) distinguishes between voluntary and involuntary separations. To accommodate for these facts I set up a competing risks duration model that distinguishes between job-to-job and job-to-unemployment transitions and estimate it using a very detailed register based Danish data set with information about a long list of worker characteristics.

The results from a single risk duration model, where no distinction is made between different types of transitions out of the job, show that outsourcing has a negative effect on the job separation rate. This result covers the fact that in a competing risks model outsourcing is found to increase the unemployment risk and decrease the job change hazard rate. It is in particular low-skilled workers that face a higher unemployment risk, thus giving some support to the concern about the state of domestic labour markets put forth in the media. However, the quantitative impact is not dramatic, so there is evidence of only modest adjustment costs of globalization.

The rest of the paper is organized as follows. The next section discusses the possible relationship between international outsourcing and individual labour market outcomes. Section 3 describes the data. Section 4 sets up the empirical model, and section 5 presents the estimation results. Section 6 concludes.

2 International outsourcing and labour demand

From a theoretical standpoint the impact of outsourcing on the demand for labour is ambiguous, since depending on assumptions and time horizon outsourcing may increase or reduce the demand for labour of certain types. Feenstra & Hanson (1996) develop a model with one final good produced from capital and many intermediate goods with
varying skill intensities. They show that outsourcing in the form of capital out-migration has the consequence that production of the least skill intensive components in the home country is shifted to a low-wage country which leads to lower demand for low-skilled labour in the home country. The main mechanism is that outsourcing corresponds to de-location of production processes that are unskilled-intensive from the point of view of the high-wage home country, but that are skill intensive from the point of view of the low-wage country.\footnote{Venables (1999) develops a $2 \times 2 \times 2$ model with trade costs and shows that lower trade costs on an intermediate good leads to fragmentation of the final good using this intermediate good. This has the same implications for the relative demand for unskilled labour in the outsourcing country as in Feenstra & Hanson (1996).} However, this conclusion is disputed by among others Arndt (1997), who uses a Hecksher-Ohlin model with two final goods with fixed world prices to show that outsourcing of the most unskilled-intensive production stage of the unskilled-intensive good corresponds to a cost saving in this sector that brings about higher output of this good. This means that employment in this sector and the relative wage of unskilled labour rise. The potential of the cost saving effect from outsourcing to dominate the reduced demand for labour following from a higher domestic capital intensity has more recently been further elaborated on by Kohler (2004) and Grossman & Rossi-Hansberg (2008).

These studies consider the long term effects of outsourcing. In contrast Kohler (2001) shows that if the shorter run is analysed by taking capital to be sector specific, the conclusion of Arndt (1997) does not hold. Here the sector specificity of capital means that labour released by outsourcing may be redeployed only subject to diminishing marginal returns. This is particularly important in the present context, since I am concerned with the short-run employment effects of outsourcing. Outsourcing is by definition about removal of stages in the production process such that the demand for some workers shifts abroad, so one should clearly see increased job separations in the short run as a result.

The empirical literature on outsourcing and labour demand has shown that low skilled workers tend to lose relative to skilled workers (see e.g. Feenstra & Hanson (1999) for the US and Hijzen, Görg & Hine (2005) for the UK). These papers use data on wage shares of high- and low-skilled workers at the industry level, and so it is unclear whether lower
demand is manifested through falling wages or falling employment or both. To study this issue the effects on employment and wages must be analysed separately, which is possible with micro data containing information on wages and/or employment histories.

Geishecker & Görg (2008) use German micro data to assess the impact of international outsourcing (at the industry level) on the individual wage level in a human capital framework. They find that outsourcing generally reduces the wages of low-skilled workers and increases the wages of high-skilled workers. Similar results are found for Denmark by Munch & Skaksen (2009). In addition Geishecker & Görg (2005) show that their findings depend on the industries under consideration. Low-skilled workers only lose if they are employed in low-skill intensive industries, while high-skilled workers only gain from positive wage effects if they are employed in high-skill intensive industries.

The impact of international outsourcing on individual employment in advanced countries has not been the subject of intense scrutiny. The study that comes closest to this paper is Egger, Pfaffermayr & Weber (2007), since they also assess the effects of trade variables on individual labour market transitions. Estimating a fixed effects multinomial logit model for transitions of Austrian males between six different labour market states (unemployment, out of the labour force and employment in four different sectors), they find that increases in industry imports and outsourcing (measured as the share of imported intermediate inputs in total imports) reduce the probability of changing into the manufacturing sector and in particular industries with a comparative disadvantage. They are mainly interested in the transitions into specific industries, but in an extension of their model they also find that rising import competition and outsourcing reduce the probability of workers in a comparative disadvantage industry to stay there. In contrast, since the major part of the public debate on outsourcing is concerned with the associated loss of jobs, I focus exclusively on the transitions out of jobs. Another important difference between the present paper and Egger et al. (2007) is that they do not control for individual characteristics (except age). I find that the effects of outsourcing differ in  

\(^2\)To the best of my knowledge Egger et al. (2007) and the present paper are the first to investigate the effects of trade on individual transitions in the labour market.
interesting ways across skill groups, so it is clearly important to be able to control for e.g. educational background.

3 Data description

The data consists of information about individual employment histories coupled with outsourcing measures at the industry level. The Danish labour market is an interesting case to analyze because employment protection is weak (Nicoletti, Scarpetta & Boylaud (2000)), and this has 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). At the same time Denmark is a very open economy that have experienced significant increases in outsourcing volumes in recent decades.

3.1 Micro data

The dataset is a 10 % sample of the Danish population for the years 1990-2003. In each year detailed information about the labour market states of all individuals is available along with information about demographic and socio economic characteristics – see Appendix A for variable definitions. These variables are extracted from the integrated database for labour market research (IDA) and the income registers in Statistics Denmark.\(^3\) Of particular importance is that a workplace identity is associated with each worker in week 48 in each year. Job spells are then straightforwardly constructed from successive years at the same workplace.

It is the duration of job spells in manufacturing industries and the different transitions out of the current job that are of interest. Following the standard approach in duration modelling the job spells are flow sampled such that only spells starting in 1991 and later are included in the analysis (thus avoiding problems with left-censoring). The destination

\(^3\)For more details on the IDA data see Abowd & Kramarz (1999).
state for all spells that end before 2004 is known and I focus on spells that end with a
transition into a new job (i.e. a new workplace identity), into unemployment and into
nonparticipation. If job spells are uncompleted in 2003 then they are treated as right
censored observations. Also job spells are treated as right censored observations if they
end because of a firm closure. To increase the homogeneity of the sample all part time
employed, self employed, students with jobs and persons below the age of 18 have been
excluded.

Outsourcing is about removal of production processes in the domestic economy, so
this should give rise to workers being laid off. However, it is not possible to distinguish
between quits and lay offs in the data. Instead the transition from jobs to unemployment is
considered, since in the event of a lay off it is likely that the worker is unemployed for some
time. Also, what is particularly relevant from a welfare perspective is the quantitative
importance of the effect of outsourcing on the transition rate into unemployment. Because
the job spells are based on annual observations it is possible that the workers have had
intermediate unemployment spells of duration less than a year between two jobs. Thus
to focus on "pure" job changes a transition is only counted as a job-to-job change if the
worker has not collected UI benefits in the year of job change. If the worker received UI
benefits in the year of the transition out of the job then this transition is counted as a job-
to-unemployment transition. It should be noted that even for job-to-job changes without
intermediate spells of unemployment a high fraction is caused by a lay-off.4 Workers
typically get advance warning and with the high turnover in the Danish labour market
they often find a job before they are laid off. It is therefore also possible that outsourcing
affects the job change probability.

The empirical hazard rates for transitions into a new job, unemployment and nonpar-
ticipation are simply defined as the fraction of those making a given transition in year $t$
among those surviving until that year, and they are depicted in Figure 1. The transition
rate into a new job is highest after the first year, followed by the transition into unemploy-

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4According to Browning, Danø & Heineсен (2006) more than half of displaced workers in the Danish
labour market have no unemployment at all in the displacement year.
ment, and they are both declining with time on the job perhaps reflecting accumulation of match specific human capital. In contrast, the transition rate into nonemployment is a relatively rare event and this transition rate is roughly constant over the job spell (this transition rate is not modelled in the econometric analysis).

3.2 Industry-level data

The other important variables are the measures for international outsourcing. Information about outsourcing activities is not available at the firm level, so I follow much of the literature and measure outsourcing at the industry level (55 manufacturing industries based on a Danish industry code which is between the two-digit and three-digit NACE definition) in terms of imported intermediates in production. This information is provided by Statistics Denmark from annual Input-Output Tables with an explicit distinction between intermediate purchases from domestic and foreign supplies. As noted in the introduction using industry-level measures of outsourcing has the advantage of reducing potential endogeneity problems that might arise if firm-specific outsourcing measures were used. That is, the outsourcing intensity of an industry is likely to be exogenous to the individual worker, since individual behaviour does not affect aggregated variables for the industry.

Feenstra & Hanson (1999) suggest two different measures of outsourcing – a broad and a narrow measure. The broad measure is defined here as the value of all imported intermediate inputs of an industry divided by the industry’s production value, while the narrow measure restricts attention to intermediate inputs that are purchased from the same industry as the good being produced (again divided by the industry’s value of production). The idea behind the narrow measure is that it only includes imported

\footnote{For example a firm with low job turnover and few voluntary quits might be more inclined to outsource parts of it’s production thus creating reverse causality. If outsourcing is measured at the industry level and the firm is small compared to the rest of the industry such effects are less likely to matter.}
production activity that could have been done within the domestic industry. These two measures are constructed from input-output tables for imports from Statistics Denmark and shown for the years 1980-2002 in Figure 2 as a weighted average (weighted by industry output) for all manufacturing industries. For the sample period the broad measure of outsourcing rises from 18.8 percent in 1991 to 21.5 percent in 2002, and the narrow measure rises from 4.3 percent to 5.4 percent.

Among industries with a relatively high level of outsourcing are manufacture of wearing apparel, manufacture of leather and leather products, manufacture of radio, television and communication equipment – in terms of the broad measure they all have outsourcing ratios of almost 40 percent.

I also control for several other industry characteristics that may have an impact on individual job separation rates. Technological change is often found to affect labour demand and could thus have an influence on employment transitions. To control for such effects the industry’s research and development intensity is included. Furthermore, to control for other industry performance characteristics, the capital output ratio and a concentration ratio – defined as the market share of the four biggest firms of each industry. The concentration ratio acts as a proxy for the level of domestic competition in the product market. Also, the shares of the industry workforce with basic and further education (the share with vocational education is the omitted category) are included to capture the skill intensity of the industries. Finally, any time invariant industry characteristics are captured by industry dummies, and to control for business cycle effects time dummies and local unemployment rates are included.

In the final data set there are 281,551 observations (person-years). The number of job spells is 101,884 and they come from 62,152 individuals. Descriptive statistics for the
data set are presented in Table 1.

Insert Table 1 about here

4 Econometric model

In studies of individual job separations, it is essential to control for state dependence since the job separation rate typically declines with time on the job due to the accumulation of match specific human capital (see e.g. Farber (1999) for an overview). To that end this section sets up a fairly standard duration model, which accommodates for right censored job spells and allows for duration dependency in the transition process out of the current job. Further, to distinguish between transitions from employment to unemployment and a new job a competing risks duration model is specified (Sueyoshi (1992)). Even if there is access to a dataset that facilitates control for much individual heterogeneity, there might still be some unobserved heterogeneity left. Thus, a mixed proportional hazard model for the job transitions is specified, i.e. the destination specific hazard rates are:

\[ \theta_i(t|x_t, v_i) = \lambda_i(t) \exp(x_t \beta_i + v_i), \]

where \( i = e, u \) indicates the different destination states for transitions out of the job spell (i.e. employment and unemployment), \( \lambda_i(t) \) is the baseline hazard capturing the time dependence, and \( \exp(x_t \beta_i + v_i) \) is the systematic part giving the proportional effects of observed and time-varying characteristics at time \( t \), \( x_t \), and unobserved characteristics, \( v_i \) (see e.g. van den Berg (2001) for a survey of this class of duration models). All job spells that end with a transition to other states than those modelled are treated as right censored.

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

\[
\alpha_k = P(T \geq t_k \mid T \geq t_{k-1}, x, v) = \exp \left[ - \sum_{i \in \{e,u\}} \int_{t_{k-1}}^{t_k} \theta_i(t \mid x_i, v_i) dt \right] = \exp \left[ - \sum_{i \in \{e,u\}} \exp(x_k \beta_i + v_i) \Lambda_{i,k} \right] = \prod_{i \in \{e,u\}} \alpha_{i,k},
\]

where \( \Lambda_{i,k} = \int_{t_{k-1}}^{t_k} \lambda_i(t) dt \) and \( \alpha_{i,k} = \exp \left[ - \exp(x_k \beta_i + v_i) \Lambda_{i,k} \right] \).

The contribution to the likelihood function from a job spell is found by observing that the probability that a spell ends in interval \( k \) is given by the conditional probability of failure in that interval times the probability that the spell survives until interval \( k \), or \( (1 - \alpha_k) \prod_{j=1}^{k-1} \alpha_j \). Some spells are right censored and they contribute to the likelihood with the survivor function, \( \prod_{j=1}^{k} \alpha_j \). Thus the contribution to the likelihood function from a job spell can be written

\[
\mathcal{L}_s = (1 - \alpha_{e,k})^{d_e} (1 - \alpha_{u,k})^{d_u} \alpha_k^{1-d_e-d_u} \prod_{j=1}^{k-1} \alpha_j,
\]

where \( d_e \) and \( d_u \) are destination state indicators. If the job spell is right censored then \( d_e = d_u = 0 \). Instead of imposing a functional form on the baseline hazard I allow for a flexible specification by simply estimating the interval specific baseline parameters \( \Lambda_{i,k} \).

The unobserved heterogeneity is specified by the stochastic variables \( V_e \) and \( V_u \). It is assumed that the unobserved heterogeneity is time invariant and since each worker possibly contributes with more than one job spell, the draw from the distribution of unobservables is restricted to be the same across job spells for the same individual. Thus,
the complete contribution to the likelihood function for a worker with $S$ job spells is

$$
\mathcal{L} = \prod_{s=1}^{S} \int_{V_u} \int_{V_e} \mathcal{L}(t|x_t, V_e, V_u) dF(V_e, V_u),
$$

(4)

where $F$ is the joint CDF for the unobserved heterogeneity. I follow Heckman & Singer (1984) by choosing a discrete distribution, and it is assumed that each stochastic variable can take two values, $v_{i,1}$ and $v_{i,2}$, each with an associated probability.\footnote{One of the support points in each destination specific hazard is normalized to one, i.e., $v_{i,1} = 1$, $i = c, u$.} Thus, altogether there are four points of support. There is evidence that such discrete distributions are sufficiently flexible to capture random effects unobserved heterogeneity, see e.g. van den Berg (2001).

## 5 Results

This section presents two different sets of results. First, the model is estimated without a distinction between the different destination states for the job separations, so this reduces to a single risk duration model. Second, estimation results from the main specification – the competing risks model – are presented to show that outsourcing has very different effects on the job-to-job and job-to-unemployment hazard rates, which sheds light on the adjustment costs associated with outsourcing.

### 5.1 The single risk model

Four versions of the single risk model with different sets of industry-level variables included are estimated; see Table 2. It is first noted that for all four models the estimated baseline parameters reveals that as expected the probability of a job separation declines with job tenure even after controlling for individual heterogeneity (not shown).
The effects of the individual specific variables are robust to the inclusion of the different sets of industry specific variables. It is seen that e.g. younger workers and low skilled workers have shorter job spells (i.e. a higher job separation rate). Labour market experience reduces the risk of a job separation, and membership of UI funds increases the separation rate.

In model 1 the broad outsourcing measure has been included along with the other industry specific variables but without industry dummies. First, it is noted that the capital output ratio has a positive impact on the job separation rate while the R&D intensity reduces the probability of a job separation. This could perhaps reflect that workers in industries with high capital intensities are easier to substitute, while firms in industries with high R&D intensities may provide more training in firm-specific skills and thus try harder to retain workers.

Turning to the main variable of interest, there is a significant positive impact on the job separation rate of working in industries with high intensities of broad outsourcing. The quantitative importance of the estimated coefficient of 0.450 can be assessed by calculating the relative (percentage) change in the separation rate in response to a 1 percentage point increase in the outsourcing measure as follows: \[ \exp(0.45 \times 0.01) - 1 = 0.00451. \]
That is, the separation rate rises 0.45 percent if the broad outsourcing measure rises one percentage point. This effect is identified from both within and across industry variation in outsourcing, but using the cross section variation may lead to spurious results as unobserved industry characteristics that affect both the job separation rate and the level of outsourcing may be picked up.

The aim is to determine the impact of an increase in outsourcing on job separations, so ideally the effect of outsourcing should be identified from changes in outsourcing within industries only, which is accomplished by including industry fixed effects as in model 2. It is seen that an increase in broad outsourcing now reduces the individual job separation rate, so important unobserved industry effects appear to bias the results in model 1. Therefore, the preferred specification will be with industry dummies included in the following.
It is possible to study the importance of distinguishing between outsourcing of activities that could have been produced within the domestic industry and activities from other industries by using the narrow outsourcing measure as in model 3. The coefficient on narrow outsourcing is more than tripled compared to the coefficient on broad outsourcing in model 2, but recall that the coefficients are semi-elasticities. Evaluated at the mean of the regressor these coefficients correspond to elasticities of -0.078 for broad outsourcing and -0.058 for narrow outsourcing. Since broad outsourcing captures all types of imported intermediates I will continue with this measure as the main outsourcing variable, but in section 5.3 below I will also report results for narrow outsourcing.

It is often claimed that outsourcing hurts low skilled workers in particular, while other skill groups may gain from outsourcing. To see if this is true when it comes to the job separation rate I have in model 4 included interaction terms between broad outsourcing and dummies for the three individual education groups basic education, vocational education and further education. Two results are noteworthy. First, the interaction terms absorb the direct effects of individual education as these are no longer significant, so it is only through the industry’s outsourcing intensity that individual education matters for job separation rates. Second, outsourcing reduces job separation rates for all three worker types, but the effect is stronger the more educated the worker is. To sum up, the single risk model did not lend support to the claim that outsourcing increases the individual job separation risk, but this could be because the effects are blurred by opposing effects on the job change hazard rate and the unemployment hazard rate. This issue is considered next.

5.2 The competing risks model

Some factors may have unequal and even opposite influence on the destination-specific hazard rates (i.e. the transitions from employment into a new job, unemployment or non-participation). In that case the estimates from the single risk model mask these differences, and so important results may be overlooked if only the single risk model
is considered. In the present context this is particularly important as outsourcing of production activities to other countries is mainly associated with short run costs if it leads to unemployment or withdrawal from the labour force. If most workers get a new job immediately this is less of a problem although they could still face a lower wage in the new job. To investigate this issue the competing risks formulation of the empirical model with a distinction between job-to-job and job-to-unemployment transitions is estimated, the results of which are presented in Table 3. Labour market experience is an example of a variable that affects the two hazard rates differently as the job change probability is rising with experience (see the first column with coefficients of Table 3) while the unemployment hazard falls with experience (see the second column with coefficients of Table 3). In the single risk models the negative effect dominated thus covering the fact that there is a positive influence on the likelihood of a job change. Education and gender are other examples of variables with opposite effects on the two hazard rates. As also suggested by Royalty (1998) these results underline the importance of controlling for individual heterogeneity in studies of transitions in the labour market.

Insert Table 3 about here

The competing risks model also uncovers many interesting results regarding the industry-level variables. It is seen that employment in industries that use capital and workers with further education relatively intensively is associated with higher job change probabilities but unchanged unemployment transition rates. It is also revealed that the negative effects of R&D intensity in the single risk models are mainly driven by a negative effect on the job change hazard rate.

With respect to the impact of international outsourcing in the competing risks model I have included the broad outsourcing measure interacted with individual education dummy.

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7 In the next section I also report results from estimating the job-to-nonparticipation transition rate. These transitions are here treated as right censored observations.

8 Note that the probabilities in the unobservables distribution, $P(v_{j,2}, v_{u,1})$ and $P(v_{j,1}, v_{u,2})$, converged to 0. Therefore, these probabilities are fixed at 0 (as is usual practice in this literature) in the iteration of the maximum likelihood procedure and standard errors are conditional on this.
mies. For the job change hazard in the first column of Table 3 there are negative effects of outsourcing for all three education groups. These results are consistent with the idea that outsourcing entails cost savings and thus increased labour demand and reduced job turnover as discussed in section 2.

Turning to the job-to-unemployment transition rate it is seen from the second column with coefficients in Table 3 that outsourcing now has a positive impact for low skilled workers. That is, outsourcing only increase the unemployment risk of workers with basic education and vocational education. Thus, in line with the idea that outsourcing mostly is about relocation of production processes that are intensive in the use of low-skilled labour, there is evidence for adjustment costs of outsourcing for workers with just basic education or vocational education. The question now is whether these costs are quantitatively important.

Given the worker’s education type the coefficients on the interaction term correspond to elasticities of 0.28 and 0.25 when evaluated at the sample mean of the broad outsourcing variable. Another way to assess the quantitative importance is to relate it to the actual rise in average outsourcing over the sample period. For workers with just basic education the parameter estimate correspond to a 3.5 percent higher unemployment risk if broad outsourcing rises 2.7 percentage points, which is what happened during the sample period from 1991 to 2002. Likewise workers with vocational education have a 3.1 percent higher unemployment risk. This means for example that a standard person characterised by being a 30-39 year old male with basic education who is in the first year of his job spell\(^9\) will see his unemployment risk rise from 26.1 to 27.1 percent when broad outsourcing rises 2.7 percentage points. Thus outsourcing clearly hurts workers in the manufacturing industries in terms of increased unemployment risk, but these change are not annual – they are changes over a 12 year period – so the quantitative importance of the effect is best described as being modest.

\(^9\)The standard person is assumed to have the following other characteristics: single, 15 years experience, no membership of UI funds, without children, working in a small firm, average industry characteristics and a high draw from the unobservables distribution.
5.3 Extensions and robustness

This section briefly reports the results of a number of extensions of the model. First, with the individual level data at hand it is of course also possible to study whether outsourcing affects the unemployment risk differently across other worker characteristics. It is well known that men and women often behave differently in the labour market, but both men and women have higher unemployment risk if the industry’s outsourcing intensity rises with a slightly stronger impact for men (the coefficients on the interaction terms are 1.2 and 0.9 for men and women respectively). Furthermore, it is sometimes claimed that outsourcing affects elderly workers in particular, and I have studied this question by interacting broad outsourcing with dummies for the worker being more or less than 50 years old. I find support for the claim in that the coefficient is highest for workers above 50 (the coefficients on the interaction terms are 1.7 and 1.0 for older and younger workers respectively).

Second, it is reasonable to suspect that the impact of outsourcing on the job change hazard rate depends on whether it is a job change within the current industry or between industries. One would expect that workers in industries that increase their outsourcing intensities are more likely to change jobs to other industries than to remain in the same industry (i.e., a push effect). However, another possible effect is that outsourcing may also create better job opportunities in the same or in other industries for some worker types (a pull effect). To study this question I have estimated a competing risks model with a distinction between within and between industry job changes, and the results are as follows. For the within industry transition broad outsourcing reduces the job training hazard rate for all three education with roughly the same coefficient. The same holds for the between industry transition but the coefficients are closer to zero (but still significant). Thus there are no sign that outsourcing induces workers to change jobs more often within or between industries – instead outsourcing appears to improve job prospects especially within the same industry by increasing the duration of jobs.

Third, It may also be the case that the effects of outsourcing depend on the indus-
tries under consideration. For example Geishecker & Görg (2005) find that outsourcing only reduce the wages of low-skilled workers if they are employed in low-skill intensive industries. Likewise it may be hypothesized that outsourcing primarily displaces workers in industries with a comparative disadvantage, see Egger et al. (2007). To analyse this issue I divide the manufacturing industries into two groups along two different dimensions; according to the fraction of workers with further education in the industry and according to the net export ratio of the industry. Some differences are found across industries. For low-skill intensive industries outsourcing does not reduce the job change hazard significantly, while, in accordance with the findings by Geishecker & Görg (2005), the impact on the unemployment hazard for workers with basic and vocational education is stronger than for the full sample. For high-skill intensive industries outsourcing has a stronger negative impact on the job change hazard and no significant effect on the unemployment hazard for workers with basic and vocational education, while it is negative for workers with further education. The heterogeneity in the outsourcing effects are less pronounced with respect to comparative advantage differences across industries. Outsourcing reduces the job change hazard rate for all three worker types in both comparative advantage and comparative disadvantage industries, and it increases the unemployment hazard for workers with basic education in both industry groups and for workers with vocational education in comparative advantage industries.

Fourth, in the competing risks model in the previous section transitions from jobs to nonparticipation were treated as right censored observations, but to check if outsourcing tends to push workers out of the labour force I also estimated a competing risks model with a distinction between transitions to participation (i.e. job or unemployment) or non-participation. Since the nonparticipation transition is particularly relevant for elderly workers I interacted broad outsourcing with dummies for the worker being more or less than 50 years old. However, outsourcing is found to reduce the nonparticipation hazard rate for both younger and older workers with roughly the same impact.

Fifth, it may be important to better control for growth of the industry under consideration since industries that grow rapidly could also tend outsource a lot and at the same
time have lower job separation rates. As a robustness check I tried to include industry output and industry output growth separately even though these variables are endogenous because outsourcing directly reduces output and output growth. As expected these variables enter the model with a negative coefficient in both the job-to-job hazard rate and the job-to-unemployment hazard rate, but their inclusion had almost no impact on the estimated coefficients on the outsourcing variables.

Finally, to explore the importance of the different types of outsourcing I have estimated the competing risks model with the narrow outsourcing measure along with the difference between broad and narrow outsourcing interacted with individual education dummies. For the job change hazard there are negative effects of both narrow outsourcing and the difference measure for all three education groups and the coefficients are somewhat higher for narrow outsourcing than for the difference measure. For the job-to-unemployment transition rate it is found that narrow outsourcing only affects workers with basic education while the other two education groups are unaffected. The difference between broad and narrow outsourcing also increases the unemployment risk – here it both hits workers with basic and vocational education.

6 Conclusion

Outsourcing may induce long run productivity gains from cost savings and reallocation of workers to new firms and industries, but in the short run there may be individual losses in terms of unemployment and lower re-employment earnings. By investigating the consequences of international outsourcing for individual job separations in the Danish labour market, this paper has exclusively focused on the importance of short run labour market dynamics. How large these costs will be should depend on the flexibility of the labour market and from this point of view the Danish case is interesting since the Danish labour market is one of the most flexible in continental Europe.

Contrary to most of the empirical literature on outsourcing the paper uses micro data on labour market transitions, which is appropriate because outsourcing influences individ-
ual workers. The empirical model is a duration model that controls for individual worker heterogeneity and duration dependence. This is essential because worker characteristics clearly influences the transition rates out of employment, and it is also a well established fact that job separation rates declines with time on the job.

A feature of the model is that different destination states for the transition rates out of the job can be estimated. This is important because many variables – outsourcing included – have unequal and even opposite influence on the job-to-job and job-to-unemployment transitions. Outsourcing is found to increase the unemployment risk of workers and in particular relatively low-skilled workers. This means that some workers experience short run welfare losses due to spells of unemployment, but the quantitative impact is not dramatic. For example a standard person characterised by being a 30-39 year old male with basic education who is in the first year of his job spell faces an increase in his unemployment risk from 26.1 to 27.1 percent when outsourcing rises from 18.8 to 21.5 percent as it did over the 12 year sample window. Thus, while it should be remembered that outsourcing in theory leads to overall gains in the long run, evidence for small short run adjustment costs particularly for low skilled workers is provided.

References


Andersen, A. K. (2000), Commuting Areas in Denmark, AKF Forlaget, Copenhagen.


A Appendix: Variable definitions

This section describes the control variables included in the empirical analysis. All variables are measured annually and are thus time varying.

A.1 Individual level variables

Age groups: Dummy variables are constructed for the following age groups: 18-24 years, 25-29 years, 30-39 years, 40-49 years and 50-65 years.

Female: A dummy variable for gender (1 = female).

Children 0-6 years: A dummy variable for the individual having 0-6 year old children.

Married: A dummy for being married.

Education groups: Dummies for three education groups are constructed – basic education, vocational education and further education. This classification of education levels relies on Danish educational codes. Further education corresponds to the two highest categories (5 and 6) in the International Standard Classification of Education (ISCED), i.e., a tertiary education. Vocational education is defined as the final stage of secondary education encompassing programmes that prepare students for direct entry into the labour market. Thus, persons with just high school or equivalent are not included in this category but in the basic education category.

Experience: Labour market experience measured as actual time spent employed since 1964.

UI fund member: Membership of unemployment insurance funds is voluntary in Denmark and a dummy for not being a member has been constructed.

Firm size 50+: A dummy variable for whether the worker’s workplace has 50 or more employees.
A.2 Regional level variables

Local unemployment rate: Unemployment is measured in commuting areas that are defined such that the internal migration rate is 50% higher than the external migration rate, cf. Andersen (2000).

A.3 Industry level variables

Education shares: Based on the individual level education variables 'basic education' and 'further education' defined above the shares of the industry workforce with basic and further education are calculated for 55 manufacturing industries.

Capital output ratio: Information about the industry level capital stock was only available for 13 manufacturing industries from Statistics Denmark.

R&D intensity: R&D data at the two digit industry level were obtained from the OECD ANBERD data base and is measured relative to the industry’s value added. The data was not available for 2000 so here the R&D intensity was imputed as the average over the years 1998, 1999, 2001 and 2002.

Concentration ratio: A concentration ratio defined as the market share of the four biggest firms in each industry were obtained from the Danish Competition Authority. Data was not available for 1991 so here the concentration ratio was imputed with a linear trend.

Outsourcing: See text.
# Appendix: Tables and figures

## Table 1. Sample means

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean</th>
<th>Min</th>
<th>Max</th>
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<td>1.000</td>
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<td>1.000</td>
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<td>1.000</td>
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<td>1.000</td>
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<td>0.000</td>
<td>1.000</td>
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<td>0.536</td>
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Table 2. Estimation results: single risk model

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<th>Variables</th>
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<th>Model 4</th>
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<td>-0.028</td>
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<td>0.005</td>
<td>0.010</td>
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<tr>
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<tr>
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<td></td>
<td></td>
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<tr>
<td>$P(v_2)$</td>
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<td>0.301</td>
<td>0.036</td>
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</table>

Note: Bold numbers indicate a significant parameter estimate (5% level).
<table>
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<tr>
<th>Variables</th>
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<tr>
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</tbody>
</table>

\[ v_{j,2} \]
\[ v_{u,2} \]
\[ P(v_{j,1}, v_{u,1}) \]
\[ P(v_{j,2}, v_{u,2}) \]

Note: Bold numbers indicate a significant parameter estimate (5% level). Year and industry dummies are included.
Figure 1: Empirical destination specific hazard rates

Figure 2: Outsourcing in Danish manufacturing industries