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International Outsourcing and Individual Job Separations*

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Abstract

This paper studies the effects of international outsourcing on individual transitions out of jobs in the Danish manufacturing sector for the period 1992-2001. 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 clear significant positive effect on the job separation rate, but the effect corresponds to a limited number of lost jobs. 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 workers and in particular low-skilled workers, but again the quantitative impact is not dramatic. Outsourcing also increases the job change hazard rate and mostly so for high-skilled workers.

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 form 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 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 firm, 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 (1996) 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 (see Feenstra & Hanson (1999)). 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, regressing industry displacement rates on industry-level trade data may produce biased results due to endogeneity, since turnover rates may instead influence trade as argued by Davidson & Matusz (2005). Second, international outsourcing has consequences for micro units (i.e. workers and firms), so preferably it should be studied using micro-level data and not industry level data. In addition, estimating individual transition rates using industry-level outsourcing measures may help to overcome potential endogeneity problems.

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 importance 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 (1994) and 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 there is access to a very detailed register based 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 clear significant positive effect on the job separation rate, but the effect corresponds to a limited number of lost jobs. Furthermore, outsourcing is also found to increase the unemployment risk of workers and in particular low-skilled workers, thus giving some support to the concern about the state of domestic labour markets put forth in the media. However, the quantitative impact is again not dramatic. In contrast to popular belief high-skilled workers are also adversely affected by outsourcing, but this is mostly through an increased job change hazard rate. That is, outsourcing influence all skill groups, but high-skilled workers appear to be capable of avoiding unemployment.

The rest of the paper is organized as follows. The next section discusses the possible

relationship between international outsourcing and labour demand. 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 (see e.g. Arndt (1997), Venables (1999), Kohler (2001) and Kohler (2004)). One the one hand outsourcing of production processes to low wage countries means lower costs, which could lead to higher labour demand in the long run. On the other hand outsourcing is by definition about removal of stages in the production process such that the demand for some workers shifts abroad, so one should obviously see increased job separations in the short run as a result. It is therefore largely an empirical question whether labour demand falls or rises as a consequence of outsourcing.

The empirical literature on outsourcing and labour demand has shown that low skilled workers tend to lose relative to skilled workers (see Feenstra & Hanson (1996) and Feenstra & Hanson (1999) for the US, Geishecker (2002) for Germany and Hijzen, Görg & Hine (2005) for the UK). These papers use aggregate data for industries, 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, and in this case access to micro data is called for.

Geishecker & Görg (2004) 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. In addition Geishecker & Görg (2005) show that these results 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 histories in advanced countries has not been the subject of intense scrutiny. The study that comes closest to this paper is Egger, Pfaffermayr & Weber (2003), since they also assess the effects of trade variables on individual labour market transitions.[1] Estimating a fixed

[1] To the best of my knowledge this is the only other paper that investigates the effects of trade on

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. One concern with the results of Egger et al. (2003) is that they do not control for individual characteristics (except age), so it is not clear if the effect of outsourcing instead could be attributed to e.g. education. For example outsourcing intensive industries could also be intensive in the use of workers with specific skills and these skills may be the determinant of turnover and not outsourcing.

3 Data description

The empirical analysis is based on data from the Danish labour market, and it 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 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). 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 1992-2001. In each year detailed information about the labour market states of all individuals is available along with information about demographic and socio economic characteristics. These variables are extracted from the integrated database for labour market research (IDA) and

individual transitions in the labour market.

the income registers in Statistics Denmark. 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. The job spells are flow sampled such that only spells starting in 1993 and later are included in the analysis (thus avoiding problems with left-censoring)[2]. The destination state for all spells that end before 2002 is known and I focus on spells that end with a transitions into a new job (i.e. a new workplace identity), into unemployment and into nonparticipation. If job spells are uncompleted in 2001 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 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.[3] This is possible in flexible labour markets as the Danish, and it is therefore also likely that outsourcing affects the job change probability.

The empirical hazard rates for transitions into a new job, unemployment and nonpar-

[2]Flow sampling means that the sample is not representative of the stock of manufacturing workers, as relatively long job spells are undersampled. The resulting sample of workers (see Table 1) is on average younger and have less labour market experience than manufacturing workers in general. For example the 13 years of labour market experience in the sample is 3 years less than manufacturing workers in general. However, since the econometric model controls for many individual characteristics – age and experience included – this should not matter for the estimated impact of international outsourcing.

[3]According to Browning, Danø & Heinesen (2004) more than half of displaced workers in the Danish labour market have no unemployment at all in the displacement year.

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, followed by the transition into unemployment, 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 unlikely event and this transition rate is roughly constant over the job spell.

Insert Figure 1 about here

A long list of socio economic characteristics are used as control variables in the analysis. Self explanatory dummies for age, gender, the presence of children, the presence of two adults in the household, education and experience are included. There are dummies for not being a member of an unemployment insurance fund and trade union membership. There is also a dummy for the size of the workplace in terms of the workforce. The hourly wage rate is also used as a control variable in the analysis, and the available wage rate variable from the IDA register in a given year is calculated as total labour income divided by the total number of hours worked. To capture business cycle effects the GDP growth rate and local unemployment rates based on 51 local labour markets[4] are included.

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. 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 (1996) and 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

[4]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).

by the industry's value of production). The idea behind the narrow measure is that it only includes imported 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 1980-2000 in Figure 2 for all manufacturing industries. For the sample period the broad measure of outsourcing rises from 17.0 percent in 1993 to 19.9 percent in 2000 representing an increase of 17 percent, and the narrow measure rises from 4.3 percent to 5.4 percent corresponding to a rise of 22 percent.

Insert Figure 2 about here

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. The industry experiencing the highest growth (90 percent) in the broad outsourcing measure in the sample period from 1993-2000 was manufacture of wearing apparel.

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.[5] Furthermore, to control for other industry performance characteristics, the capital output ratio, a concentration ratio – defined as the market share of the four biggest firms of each industry – and following Davidson & Matusz (2005) net exports in terms of total production has been included. Also the industry's output growth is included along with the share of the industry workforce with basic and further education respectively.

In the final data set there are 150,463 observations where one observation is one year in on job spell. The number of job spells is 60,570 and they come from 43,447 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

[5]R&D data at the two digit industry level were obtained from the OECD ANBERD data base and is in the empirical model measured in terms of the industry's value added. The data were only available for the years 1993-1999, and so the R&D intensity for 2000 was imputed with a linear trend.

match specific human capital (see e.g. Farber (1999) for an overview). To that end this section sets up a 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 e.g. 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:

$$\theta_i(t|x_t, \upsilon_i) = \lambda_i(t) \exp(x_t\beta_i + \upsilon_i), \tag{1}$$

where $i = 1, .., m$ indicates the different destination states for transitions out of the job spell, $\lambda_i(t)$ is the baseline hazard capturing the time dependence, and $\exp(x_t\beta_i + \upsilon_i)$ is the systematic part giving the proportional effects of observed and time-varying characteristics at time t, x_t, and unobserved characteristics, υ_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

$$\begin{aligned} \alpha_k &= P(T \geq t_k | T \geq t_{k-1}, x, \upsilon) \\ &= \exp\left[-\sum_{i=1}^{m} \int_{t_{k-1}}^{t_k} \theta_i(t|x_t, \upsilon_i) dt \right] \\ &= \exp\left[-\sum_{i=1}^{m} \exp(x_k\beta_i + \upsilon_i) \Lambda_{i,k} \right] \\ &= \prod_{i=1}^{m} \alpha_{i,k}, \end{aligned} \tag{2}$$

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

To find the contribution to the likelihood function from a job spell it is noted 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

$$\mathcal{L}_e = \prod_{i=1}^{m} (1 - \alpha_{i,k})^{d_i} \alpha_k^{1 - \Sigma_i^m d_i} \prod_{j=1}^{k-1} \alpha_j, \tag{3}$$

where $d_1, .., d_m$ are destination state indicators. If the job spell is right censored then $d_1 = .. = d_m = 0$. 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 $V_1, .., V_m$. It is assumed that the unobserved heterogeneity is time invariant and since each worker possibly contribute 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 J job spells is

$$\mathcal{L} = \prod_{l=1}^{J} \int_{V_1} .. \int_{V_m} \mathcal{L}_e^l(t|x_t, V_1, .., V_m) dF(V_1, .., V_m), \tag{4}$$

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 each with an associated probability. Thus, altogether there are 2^m points of support.

5 Results

In the first set of results I have estimated the model without a distinction between the different destination states for the job separations, so this reduces to a single risk duration model. Four versions of the 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 the probability of a job separation declines with job tenure (not shown).

Insert Table 2 about here

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 and unions increases the separation rate. A higher wage rate seems to increase the likelihood of a job separation, although the effect is insignificant in model 4. However, this effect should be interpreted with caution, since it may be endogenous. For the present purposes I include the wage variable mainly to control for heterogeneity.

The main variable of interest is the outsourcing measure, and in model 1 the broad measure has been included as the only industry specific variable. There is a significant

positive impact on the job separation rate of working in industries with high intensities of broad outsourcing. In model 2 all the other industry characteristics are included as control variables, which implies that the coefficient to broad outsourcing doubles. The quantitative importance of the estimated coefficient of 0.4754 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(0.4754*0.01)-1=0.004765. That is, the separation rate rises 0.48 percent if the broad outsourcing measure rises one percentage point.

With respect to the other industry variables it is noteworthy that the R&D intensity reduces the probability of a job separation while the net export ratio increases the job separation rate. The latter result is perhaps surprising if the perception is that imports displace domestic jobs (which is what Kletzer (2000) find for the US). However, here a higher job separation rate is not necessarily the same as a higher job displacement rate, since the job separation rate also encompasses quits and voluntary job changes. That is, the result could simply reflect that export industries have a higher level of churning.

In model 3 the broad measure of outsourcing is replaced with the narrow measure, where focus is on imported goods that could have been produced within the domestic industry. Again there is a positive effect on the job separation rate, but it is not as strong, and it is only significant at the 10 percent level. Therefore if one seeks an upper bound on the impact of outsourcing on job separations then the broad measure should be considered since it includes the narrow measure plus imported intermediates from other industries.

Suppose one were given the task to find the level of the job separation rate in the rather unrealistic world of no outsourcing. Then, according to the parameter estimate from model 2 for the year 2000 where the average level of outsourcing was 0.199, up to 9.9 percent of the overall job separation rate can be explained by broad outsourcing. With 65.000 annual job separations in the manufacturing sector this amounts to around 6.400 separations. Provided that the impact of outsourcing in other sectors than the manufacturing sector is negligible this number should be compared to a total annual destruction of jobs in the Danish economy of 260.000 (cf. Danish Economic Council (2002)), so in that light the employment consequences of outsourcing seem rather modest. Of course this is only a very crude approximation and should not be taken too seriously, but it nevertheless illustrates that outsourcing in the worst case has a fairly small impact on the probability of a job separation.

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 the broad outsourcing measure and dummies for whether the individual has basic education or further education (the reference is vocational education). Neither of the interaction terms enter the model with a significant coefficient, 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.

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[6]. 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 while the unemployment hazard falls with experience. 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. Another example is union membership; members tend to change jobs less frequently while they are more exposed to becoming unemployed than non-members. Furthermore gender and the wage rate have opposite effects on the 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 workers with further education relatively intensively is associated with higher job change probabilities and lower unemployment transition rates. It is also revealed that the negative effect of R&D intensity in the single risk models is driven by a negative effect on the unemployment risk

[6]I did not estimate the job-to-nonparticipation hazard rate partly because this transition is a rather rare event (see Figure 1) and preliminary results suggest that outsourcing only have a small (negative) impact on this hazard rate, and partly to save space. Instead these transitions are treated as right censored observations.

while there is no significant impact on the job change hazard rate. The interaction terms between the R&D intensity and the individual education dummies are insignificant so R&D has a uniform effect across skill groups.

The net export ratio was found to have a positive impact on the job separation rate in the single risk models, and the results from the competing risks model reveal that there is a positive effect on both the job-to-job and job-to-unemployment transition rates. However, the interaction terms show that all three skill groups have a higher job change transition rate the higher the industry's net export ratio, but this effect is significantly stronger for workers with further education. Also the positive effect on the unemployment risk can exclusively be attributed to a positive effect for workers with further education, while the unemployment hazard for workers with basic and vocational education is unaffected by the net export ratio. Thus it appears that it is particularly high-skilled workers that experience a higher job turnover rate in relatively export intensive industries.

With respect to the impact of international outsourcing I have in the competing risks model included the narrow outsourcing measure along with the difference between broad and narrow outsourcing thus capturing imported intermediates not from the same industry. In addition these two outsourcing measures are interacted with individual education dummies. For the job change hazard it is found that there is a positive effect of narrow outsourcing, but again this effect can be attributed to workers with further education. The effect of the variable measuring the difference between broad and narrow outsourcing also differs for different skill groups, i.e. workers with just basic education appear to change jobs less frequently the higher the outsourcing intensity, while the opposite is true for the remaining two skill groups. In flexible labour markets such as the Danish it is often the case that displaced workers find jobs immediately thus resulting in a job-to-job transition. Therefore the results indicate that high-skilled workers may be affected by outsourcing, but that they are capable of finding a new job without intermediate spells of unemployment.

Turning to the effects of outsourcing on the job-to-unemployment transition rate it is seen that only workers with just basic education have their unemployment risk increased by narrow outsourcing. The parameter estimate for this effect corresponds to a 1.3 percent higher unemployment risk if narrow outsourcing rises 1 percentage point, which is what happened during the sample period from 1993 to 2000. The difference between broad and narrow outsourcing also increases the unemployment risk, but here it hits all three skill groups uniformly. Thus outsourcing clearly hurts workers in the manufacturing industries in terms of increased unemployment risk, but the quantitative importance of the effects is fairly modest.

5.1 Extensions and robustness of the results

This section briefly reports the results of a number of extensions of the model. First, 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 outsourcing intensive industries are more likely to change jobs to other industries than to remain in the same industry. 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 expected. Outsourcing (broad or narrow) has a clear positive impact on the between industry job change hazard, while the effect on the within industry job change hazard is smaller but still positive.

Second, it may be the case that the effects of outsourcing depend on the industries 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. (2003). To analyse this issue I divide the manufacturing industries into two groups along two different dimension; according to the fraction of workers with further education in the industry and according to the net export ratio of the industry. Somewhat surprisingly outsourcing seems to have fairly similar effects across industries. In all four cases workers with further education tend to change jobs more often as a response to narrow outsourcing compared to other skill groups. The same holds true for the difference between broad and narrow outsourcing except for industries that use high-skilled workers most intensively. This group of industries also differs with respect to the effect of narrow outsourcing in that it seems to disappear for workers in these industries. Otherwise it is always workers with basic education that are hurt by narrow outsourcing. Finally the difference between broad and narrow outsourcing tend to affect the unemployment risk in the same way as in Table 3 across all four industry groupings.

A third issue is that the individual wage is likely to be endogenous. As previously stated I have included the wage variable to control for heterogeneity, but to the extent that it is endogenous it may enter the model and affect other variables in an unpredictable way. For that reason I also estimated the model without the wage variable, but it did not affect the sign or size of the effects of outsourcing.

6 Conclusion

This paper has investigated the consequences of international outsourcing for individual job separations in the Danish labour market. Contrary to most of the empirical literature on outsourcing the paper uses micro data on labour market transitions, which is appropriate because outsourcing influences individual 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.

Overall it is found that outsourcing has a clear significant positive effect on the job separation rate, but that it is of limited quantitative importance. A very crude approximation of an upper bound on the number of jobs lost as a consequence of outsourcing is 6.400 annual separations in the manufacturing sector. If outsourcing is unimportant in other sectors than manufacturing then this should be compared to a total annual destruction of jobs in the Danish economy of 260.000, in which case outsourcing only has a modest contribution.

Another 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 sometimes 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. Thus some workers experience short run welfare losses due to spells of unemployment, but again the quantitative impact is not dramatic. Furthermore many layoffs leads to job-to-job transitions without intermediate spells of unemployment, and outsourcing is also found to increase the job change hazard rate – particularly so for relatively high-skilled workers.

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A Appendix: Tables and figures

TABLE 1. SAMPLE MEANS

Variables	Mean	Stdv.
Age 18-24	0.1610	0.3675
Age 25-29	0.1741	0.3792
Age 30-39	0.2031	0.4023
Age 40-49	0.3277	0.4694
Age 50 +	0.1341	0.3408
Female	0.2960	0.4565
Children 0-17 years	0.2490	0.4324
Two adults	0.6722	0.4694
Basic education	0.4134	0.4924
Vocational education	0.4236	0.4941
Further education	0.1630	0.3693
Labour market experience (years/100)	0.1311	0.0891
Non insured	0.1056	0.3073
Union member	0.8356	0.3707
Log wage (DKR/10)	0.5091	0.0389
Firm size 50+	0.6911	0.4621
Local unemployment rate (/10)	0.6773	0.2396
Industry characteristics:		
Basic education share	0.3847	0.0919
Further education share	0.1522	0.1045
Output growth	0.0281	0.0952
Capital output ratio (/10)	0.1017	0.0313
R&D	0.0514	0.0634
Concentration ratio	0.5338	0.1783
Net exports	-0.0509	0.2517
Outsourcing broad	0.2035	0.0807
Outsourcing narrow	0.0508	0.0484
# observations	150,463	

TABLE 2. ESTIMATION RESULTS: SINGLE RISK MODEL

	Model 1		Model 2		Model 3		Model 4	
Variables	Coeff.	Std. err.	Coeff.	Std. err.	Coeff.	Std. err.	Coeff.	Std. err.
Age 18-24	**0.2148**	0.0193	**0.2104**	0.0195	**0.2080**	0.0195	**0.2086**	0.0195
Age 25-29	**0.0940**	0.0160	**0.0910**	0.0162	**0.0878**	0.0162	**0.0902**	0.0162
Age 40-49	**-0.1032**	0.0174	**-0.1071**	0.0177	**-0.1056**	0.0177	**-0.1047**	0.0177
Age 50 +	-0.0313	0.0226	-0.0396	0.0229	-0.0359	0.0229	-0.0334	0.0229
Female	0.0141	0.0125	-0.0010	0.0129	-0.0043	0.0129	0.0000	0.0129
Children 0-17 years	**0.0322**	0.0146	**0.0310**	0.0147	**0.0300**	0.0147	**0.0335**	0.0147
Two adults	**-0.1162**	0.0130	**-0.1207**	0.0131	**-0.1193**	0.0131	**-0.1226**	0.0131
Basic education	**0.0656**	0.0123	**0.0405**	0.0125	**0.0389**	0.0126	**0.0742**	0.0319
Further education	**-0.0903**	0.0176	**-0.0763**	0.0183	**-0.0791**	0.0184	**-0.1257**	0.0464
Labour market experience	**-1.1446**	0.1015	**-1.1388**	0.1034	**-1.1759**	0.1035	**-1.1579**	0.1034
Non insured	**-0.2038**	0.0204	**-0.2062**	0.0208	**-0.2056**	0.0208	**-0.2051**	0.0208
Union member	**0.0603**	0.0161	**0.0529**	0.0163	**0.0579**	0.0164	**0.0550**	0.0164
Log wage	**0.6716**	0.1734	0.3092	0.1789	0.3214	0.1790	0.2520	0.1791
Firm size 50+	**-0.1616**	0.0116	**-0.1761**	0.0120	**-0.1759**	0.0120	**-0.1767**	0.0120
Local unemployment rate	0.0400	0.0231	0.0174	0.0234	0.0151	0.0234	0.0208	0.0234
Basic education share			**0.7457**	0.0927	**0.7984**	0.0963	**0.7682**	0.0926
Further education share			**0.5225**	0.1053	**0.4194**	0.1037	**0.5392**	0.1064
Output growth			**-0.3546**	0.0550	**-0.3466**	0.0549	**-0.3604**	0.0550
Capital output ratio			0.0554	0.1959	0.0121	0.1966	0.0775	0.1942
Concentration ratio			**0.1123**	0.0373	0.0475	0.0367	**0.1045**	0.0374
R&D intensity			**-0.4772**	0.1485	-0.1035	0.1384	**-0.4653**	0.1493
Net exports			**0.1625**	0.0225	**0.1448**	0.0238	**0.1604**	0.0225
Outsourcing broad	**0.2366**	0.0676	**0.4754**	0.0786			**0.4936**	0.1115
Outsourcing narrow					0.2653	0.1357		
Outsourcing broad × basic edu.							-0.1768	0.1441
Outsourcing broad × further edu.							0.2510	0.2069
υ_2	**0.7440**	0.0817	**0.8394**	0.0616	**0.8436**	0.0601	**0.8478**	0.0619
$P(\upsilon_1)$	**0.3930**	0.1093	**0.7898**	0.0540	**0.7865**	0.0535	**0.7939**	0.0523
$P(\upsilon_2)$	**0.6070**	0.1093	**0.2102**	0.0540	**0.2135**	0.0535	**0.2061**	0.0523

Note: Bold numbers indicate a significant parameter estimate (5 % level).

TABLE 3. ESTIMATION RESULTS: COMPETING RISKS MODEL

	Job change hazard		Unemployment hazard	
Variables	Coeff.	Std. err.	Coeff.	Std. err.
Age 18-24	**0.5569**	0.0303	0.0229	0.0336
Age 25-29	**0.2257**	0.0236	-0.0100	0.0288
Age 40-49	**-0.3176**	0.0263	**0.1709**	0.0313
Age 50 +	**-0.6490**	0.0371	**0.4193**	0.0399
Female	**-0.2251**	0.0204	**0.1378**	0.0230
Children 0-17 years	0.0092	0.0213	**0.0691**	0.0267
Two adults	0.0058	0.0197	**-0.3007**	0.0227
Basic education	0.0793	0.0499	0.0342	0.0610
Further education	**-0.1296**	0.0653	**-0.3266**	0.1015
Experience	**0.7879**	0.1613	**-4.3790**	0.1889
Non insured	-0.0313	0.0294	**-1.7172**	0.0492
Union member	**-0.0672**	0.0222	**0.5065**	0.0352
Log wage	**2.7439**	0.2567	**-6.7234**	0.3468
Firm size 50+	**-0.1971**	0.0175	**-0.2959**	0.0211
Local unemployment	**-0.1930**	0.0352	**0.4553**	0.0403
Basic education share	**0.6698**	0.1375	**0.4942**	0.1705
Further education share	**1.0414**	0.1512	**-1.4758**	0.2121
Output growth	**-0.7155**	0.0798	-0.1233	0.0961
Capital output ratio	0.1565	0.2825	**-1.5424**	0.4045
Concentration ratio	0.0543	0.0575	**0.3000**	0.0687
R&D intensity	-0.2977	0.2706	**-2.0498**	0.3803
R&D intensity × basic edu.	0.0386	0.3064	0.5891	0.4293
R&D intensity × further edu.	0.4178	0.3207	-0.0934	0.5788
Net exports	**0.1472**	0.0514	0.0685	0.0648
Net exports × basic edu.	-0.0765	0.0744	-0.0717	0.0854
Net exports × further edu.	**0.3166**	0.0954	**0.3602**	0.1575
Outsourcing narrow	0.0909	0.2985	-0.2610	0.3792
Outsourcing narrow × basic edu.	-0.5243	0.4095	**1.2864**	0.4755
Outsourcing narrow × further edu.	**1.3785**	0.5070	0.6424	0.8149
Outsourcing diff.	**0.6729**	0.1912	**1.7191**	0.2466
Outsourcing diff. × basic edu.	**-1.0892**	0.2681	-0.3048	0.3196
Outsourcing diff. × further edu.	**0.9950**	0.3450	0.1712	0.5349
$\upsilon_{j,2}$	**1.8027**	0.0368		
$\upsilon_{u,2}$	**2.2145**	0.0391		
$P(\upsilon_{j,1}, \upsilon_{u,1})$	**0.8258**	0.0052		
$P(\upsilon_{j,2}, \upsilon_{u,1})$	0.0001	0.0035		
$P(\upsilon_{j,1}, \upsilon_{u,2})$	0.0001	0.0052		
$P(\upsilon_{j,2}, \upsilon_{u,2})$	**0.1740**	0.0065		

Note: Bold numbers indicate a significant parameter estimate (5 % level).

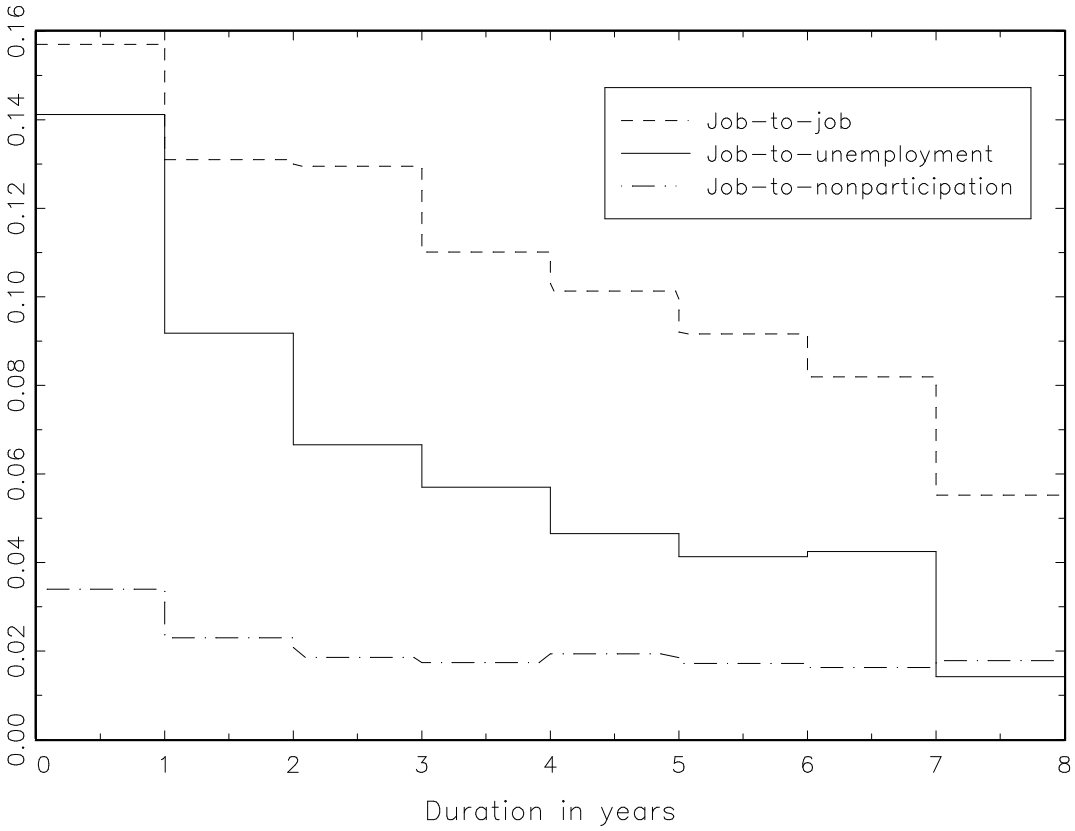

Figure 1: Empirical destination specific hazard rates

Figure 2: Outsourcing in Danish manufacturing industries