

Whose Job Goes Abroad? International Outsourcing and Individual Job Separations

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Abstract

This paper focuses on the adjustment costs of globalisation by studying the effects of international outsourcing on individual transitions out of jobs in the Danish manufacturing sector for the period 1990–2003. A competing risks duration model that distinguishes between job-to-job and job-to-unemployment transitions is 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 globalisation.

Keywords: Globalisation; adjustment costs; competing risks duration model

JEL classification: F16; J68; C23; C41

I. Introduction

The public debate over outsourcing is intense in most advanced countries. Commentators, politicians, and journalists paint a bleak picture of the labour market, claiming that outsourcing leads to massive losses of jobs to low-wage countries, which in particular hurts low-skilled workers. This picture is often based on anecdotal evidence, and rarely is the debate accompanied by solid evidence showing that labour markets are deteriorating. 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 the level of unemployment is unaffected, although some workers may suffer lower wages; but like other forms of trade, outsourcing has the usual long-run gains. Overall these gains more than outweigh the costs.

*Financial support from the Danish Social Science Research Council is gratefully acknowledged. The paper has benefited from comments from Martin Browning, Ingo Geishecker, Marc Melitz, Dan Nguyen, Jan Rose Skaksen, James Tybout, and participants at the Danish International Economics Workshop, Aarhus School of Business; the Nordic International Trade Seminars, Helsinki; and Panel Data Conference, Cambridge University.

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 suggested by Davidson and Matusz (2004). They show—by calibrating a general-equilibrium model of trade with unemployment and training—that adjustment costs are a sizeable 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 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 re-employed. However, such costs may 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 splitting up the production process into stages in which intermediate inputs can be produced outside the domestic plant, possibly in low-wage countries. Thus outsourcing is defined as the use of imported components in production, and such trade in intermediates has increased significantly over recent decades; see Hummels, Ishii, and Yi (2001), for example. I consider two different measures of outsourcing—a broad and a narrow measure. Following Feenstra and Hanson (1999), the broad measure is defined in terms of the value of all imported intermediate inputs of an industry. 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 performed within the domestic industry.

Given the strong media attention, surprisingly few papers have studied the impact of outsourcing on job separations. Using aggregate data for job displacement rates at the industry level in the US, Kletzer (2000, 2002) finds that imported intermediate goods do not have a significant impact on displacement rates. This approach can be criticised 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. For example, 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 do not plausibly 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 studies job turnover at the individual level. This literature shows, for example, that transition rates from employment to non-employment differs between gender and education groups (Royalty, 1998), highlighting the importance to control for such characteristics. Job turnover rates decline with time on the job, possibly 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 effects on different destination states for the transition out of jobs. For example, Royalty (1998) distinguishes between job-to-job and job-to-non-employment 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 dataset 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 to decrease the job change hazard rate. Low-skilled workers in particular 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 globalisation.

The rest of the paper is organised as follows. The next section discusses the possible relationship between international outsourcing and individual labour market outcomes. Section III describes the data. Section IV sets up the empirical model, and Section V presents the estimation results. Section VI concludes.

II. 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 and 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 outmigration results in a shift of the production of the least skill-intensive components from the home country to a low-wage country. This in turn 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 require low-skilled labour from the point of view of the high-wage home country, but that require high-skilled labour from the point of view of the low-wage country.¹ However, this conclusion is disputed by others. Arndt (1997) uses a Heckscher–Ohlin model with two final goods and fixed world prices to show that outsourcing of the most low-skilled production stage of the low-skilled good corresponds to a cost saving in this sector that brings about higher output of this good. This means that employment in this sector as well as the relative wage of low-skilled 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 and Rossi-Hansberg (2008).

The studies cited above consider the long-term effects of outsourcing. 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 result is particularly important in the present context, since I am concerned with the short-run employment effects of outsourcing. By definition, outsourcing is the removal of stages in the production process such that the demand for some workers shifts abroad. Job separations should likely increase in the short run as a result.

The empirical literature on outsourcing and labour demand has shown that unskilled workers tend to lose relative to skilled workers—see, for example, Feenstra and Hanson (1999) for the US and Hijzen, Görg, and 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, 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 and Görg (2008) use German micro data to assess the impact of international outsourcing (at the industry level) on the individual

¹ Venables (1999) develops a $2 \times 2 \times 2$ model with trade costs and shows that lower trade costs on an intermediate good lead to fragmentation of the final good using this intermediate good. This has the same implications for the relative demand for low-skilled labour in the outsourcing country as in Feenstra and Hanson (1996).

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 and Skaksen (2009). In addition, Geishecker and Görg (2005) find that the effect of outsourcing on wages varies between industries. Low-skilled workers only lose if they are employed in low-skill industries, while high-skilled workers only gain from positive wage effects if they are employed in high-skill 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, and Weber (2007), since they assess the effects of trade variables on individual labour market transitions.² 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. This particularly holds for transitions into manufacturing industries with a comparative disadvantage. They are mainly interested in the transitions into specific industries. This is their main result, but in an extension of their model they find that rising import competition and outsourcing reduce the probability that workers will stay in a comparatively disadvantaged industry. 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 the latter does not control for individual characteristics (except age). I find that the effects of outsourcing differ in interesting ways across skill groups.

III. Data Description

The data consist of information about individual employment histories coupled with outsourcing measures at the industry level. The Danish labour market is an interesting case to analyse because employment protection is weak (Nicoletti, Scarpetta, and Boylaud, 2000), and this has led to turnover rates and an average tenure that 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, and was comparable to Australia, the US and the UK (6.4, 7.4, and 7.8 years, respectively)

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.

(cf. OECD, 1997). At the same time, Denmark is a very open economy that has experienced significant increases in outsourcing volumes in recent decades.

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 the Appendix 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 for 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 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 non-participation. If job spells are incomplete 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, I have excluded workers who are part-time employed, self-employed, students, and younger than 18.

Outsourcing is about de-location of production processes in the domestic economy, so this should give rise to lay-offs. However, it is not possible to distinguish between quits and lay-offs in the data. Instead, the transition from job to unemployment is considered, since a lay-off is likely to result in the workers being 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 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

³ For more details on the IDA data, see Abowd and Kramarz (1999).

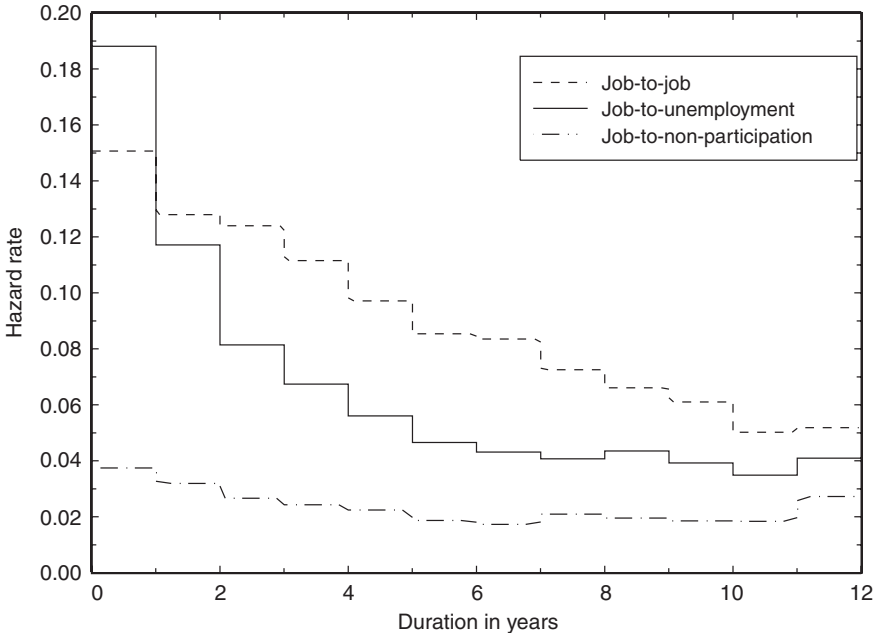


Fig. 1. Empirical destination-specific hazard rates

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 the high turnover in the Danish labour market means that 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 non-participation are simply defined as the fraction of those making a given transition in year t among those employed until that year, and they are depicted in Figure 1. Except for the first year, the transition rate into a new job is highest, followed by the transition into unemployment; both of these decline with time on the job, which perhaps reflects the accumulation of match-specific human capital. In contrast, the transition rate into non-employment 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.

⁴ According to Browning, Danø, and Heinesen (2006), more than half of displaced workers in the Danish labour market have no unemployment at all during the displacement year.

Industry-level Data

The other important variables are the measures for international outsourcing. Ideally, outsourcing activities should be measured at the firm level, but such information is not available. Instead I follow much of the literature and measure outsourcing at the industry level 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. The industry classification in the Danish input–output tables contains 55 manufacturing industries. 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.⁵ 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 and 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. 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 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 are 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% in 1991 to 21.5% in 2002, and the narrow measure rises from 4.3% to 5.4%.

Industries with a relatively high level of outsourcing include manufacture of wearing apparel, manufacture of leather and leather products, and manufacture of radio, television, and communication equipment. In terms of the broad measure, they all have outsourcing ratios of almost 40%.

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

⁵ For example, a firm with low job turnover and few voluntary quits might be more inclined to outsource parts of its 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.

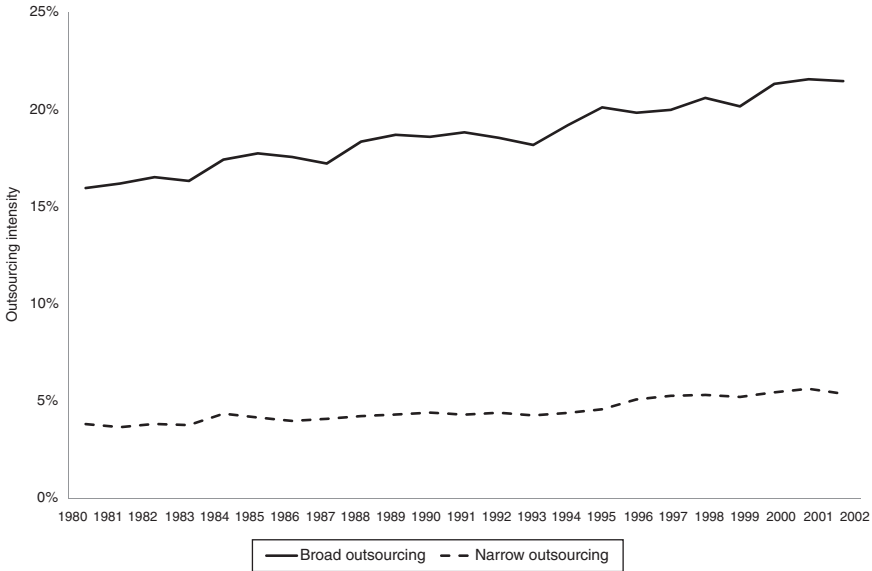


Fig. 2. Outsourcing in Danish manufacturing industries

industry performance characteristics, I include 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.

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

IV. 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, for example, 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

Table 1. *Sample means*

Variables	Mean	Min.	Max.
Age 18–24	0.151	0.000	1.000
Age 25–29	0.171	0.000	1.000
Age 30–39	0.324	0.000	1.000
Age 40–49	0.209	0.000	1.000
Age 50+	0.146	0.000	1.000
Female	0.316	0.000	1.000
Children 0–6 years	0.251	0.000	1.000
Married	0.482	0.000	1.000
Basic education	0.422	0.000	1.000
Vocational education	0.432	0.000	1.000
Further education	0.146	0.000	1.000
Labour market experience (years/100)	0.134	0.000	0.390
UI fund member	0.897	0.000	1.000
Firm size 50+	0.688	0.000	1.000
Local unemployment rate (/10)	0.687	0.316	2.266
<i>Industry characteristics</i>			
Basic education share	0.385	0.120	0.623
Further education share	0.149	0.005	0.536
Capital–output ratio (/10)	0.102	0.048	0.235
Concentration ratio	0.532	0.236	1.000
R&D intensity	0.051	0.000	0.282
Outsourcing broad	0.215	0.012	0.537
Outsourcing narrow	0.050	0.000	0.284
No. of observations		281,551	

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. The destination specific hazard rates are

$$\theta_i(t | x_t, v_i) = \lambda_i(t) \exp(x_t \beta_i + v_i), \quad (1)$$

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, for example, 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 $\{[0, t_1), [t_1, t_2), \dots, [t_k, \infty)\}$, which must be accounted for in the econometric set-up. Following Kiefer (1990) the

interval-specific survival rate is defined as

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

where

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

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

$$\mathcal{L}_s = (1 - \alpha_{e,k})^{d_e} (1 - \alpha_{u,k})^{d_u} \alpha_k^{1-d_e-d_u} \prod_{j=1}^{k-1} \alpha_j, \tag{3}$$

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

$$\mathcal{L} = \prod_{s=1}^S \int_{V_e} \int_{V_u} \mathcal{L}_s(t \mid x_t, V_e, V_u) dF(V_e, V_u), \tag{4}$$

where F is the joint cdf for the unobserved heterogeneity. I follow Heckman and 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.⁶ Thus, there are a total of four points of support. There is evidence that such discrete distributions are sufficiently flexible to capture random effects unobserved heterogeneity; see, for example, van den Berg (2001).

V. Results

This section presents two 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 competing risks model are presented to show that outsourcing has very different effects on the job-to-job and job-to-unemployment hazard rates. This second approach is seen as the main specification, since it sheds light on the adjustment costs associated with outsourcing. At the end of the section, some robustness checks of the main specification are reported.

The Single Risk Model

Results from estimating two different versions of the single risk model are presented in Table 2. Before turning to the effects of outsourcing, first note that the estimated baseline parameters for both models show that the probability of a job separation declines with job tenure even after controlling for individual heterogeneity (not shown). With respect to the effects of the individual specific variables, we see that younger workers and low-skilled workers, for example, have shorter job spells (i.e., a higher job separation rate). Labour market experience reduces the risk of a job separation, and membership for UI funds increases the separation rate.

Regarding control variables measured at the industry level, 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 reflect the fact that workers in industries with high capital intensities are easier to replace, while firms in industries with high R&D intensities may provide more training in firm-specific skills and thus try harder to retain workers.

The broad outsourcing measure has been included in Model 1, and a significantly negative impact on the job separation rate is found. The inclusion of industry fixed effects means that the effect of outsourcing is identified from changes in outsourcing within industries. Therefore, the coefficient to

⁶ One of the support points in each destination-specific hazard is normalised to one; that is, $v_{i,1} = 1$, $i = e, u$.

Table 2. Estimation results: single risk model

Variables	Model 1		Model 2	
	Coeff.	Std. error	Coeff.	Std. error
Age 18–24	0.121	0.014	0.130	0.014
Age 25–29	0.032	0.012	0.036	0.012
Age 40–49	-0.028	0.013	-0.025	0.013
Age 50+	0.118	0.017	0.123	0.017
Female	0.005	0.010	0.002	0.010
Children 0–6 years	0.045	0.010	0.043	0.010
Married	-0.104	0.010	-0.100	0.010
Basic education	0.022	0.009	-0.003	0.024
Further education	-0.092	0.014	-0.030	0.038
Labour market experience	-1.679	0.074	-1.686	0.074
UI fund member	0.323	0.014	0.324	0.014
Firm size 50+	-0.206	0.009	-0.203	0.009
Local unemployment rate	-0.065	0.029	-0.054	0.029
Basic education share	0.390	0.375	0.266	0.374
Further education share	0.710	0.373	0.769	0.373
Capital-output ratio	1.203	0.542	1.454	0.542
Concentration ratio	0.154	0.088	0.243	0.088
R&D intensity	-0.831	0.279	-1.275	0.279
Outsourcing broad	-0.362	0.182		
Outsourcing broad × basic edu.			-0.320	0.191
Outsourcing broad × voc. edu.			-0.435	0.192
Outsourcing broad × further edu.			-0.726	0.222
v_2	0.760	0.025	0.759	0.025
$P(v_1)$	0.699	0.036	0.701	0.036
$P(v_2)$	0.301	0.036	0.299	0.036

Notes: Bold numbers indicate a significant parameter estimate (5% level). Year and industry dummies are included.

the outsourcing variable is consistent with the interpretation that an increase in outsourcing reduces the individual job separation rate.⁷

It is often claimed that outsourcing hurts low-skilled workers in particular, while other skill groups may gain from outsourcing. Model 2 tests this hypothesis, because it includes interaction terms between broad outsourcing and dummies for three individual education groups. These groups are basic education, vocational education, and further education. Two results are noteworthy. First, the interaction terms absorb the direct effects of individual education, 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 as the worker's education increases.

⁷ In the subsection "Extensions and Robustness", I report results from a model that uses the change in outsourcing instead of the level of outsourcing.

The Competing Risks Model

The single risk model did not lend support to the claim that outsourcing of production activities to other countries increases the individual job separation risk and leads to adjustment costs, but this could be because different opposing effects are masked in this specification. For example, the interpretation of the single risk model is conflated by the high fraction of voluntary quits in turnover rates in the labour market—see, for example, Akerlof, Rose, and Yellen (1988)—because outsourcing may have unequal and opposite influence on quits and lay-offs. On the one hand, outsourcing is expected to increase lay-offs. On the other, outsourcing may increase labour demand and thereby reduce quits and job-to-job transitions, as discussed in Section II. An alternative and perhaps equally likely mechanism is that outsourcing could be associated with reductions in the availability of outside offers in the industry, which in turn may reduce voluntary quits. Empirical evidence consistent with this hypothesis is provided by Anderson and Meyer (1994), for example, who show that labour turnover declines sharply during recessions because procyclical quits dominate countercyclical lay-offs.

With the data at hand, I am unable to distinguish between quits and lay-offs, but it is possible to separate job-to-job and job-to-unemployment separations. Quits are more likely to result in a transition into a new job than into unemployment, while the opposite is true for lay-offs. From a welfare point of view, outsourcing is mainly associated with short-run costs if workers become unemployed or withdraw from the labour force. This is less of a problem if most workers get a new job immediately, although they could still face a lower wage in the new job.

To proceed, I therefore estimate the competing risks formulation of the empirical model with a distinction between job-to-job and job-to-unemployment transitions, the results of which are presented in Table 3.^{8,9} Labour market experience is an example of a variable that affects the two hazard rates differently, because the job change probability is rising with experience while the unemployment hazard falls with experience. The negative effect dominated in the single risk models, thus disguising the positive effect 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

⁸ The next section also reports results from estimating the job-to-non-participation transition rate. These transitions are treated here as right-censored observations.

⁹ 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 type of model) in the iteration of the maximum likelihood procedure, and standard errors are conditional on this.

Table 3. *Estimation results: competing risks model*

Variables	Job change hazard		Unemployment hazard	
	Coeff.	Std. error	Coeff.	Std. error
Age 18–24	0.371	0.022	0.010	0.022
Age 25–29	0.153	0.017	– 0.059	0.019
Age 40–49	– 0.270	0.019	0.178	0.020
Age 50+	– 0.600	0.026	0.430	0.025
Female	– 0.263	0.015	0.174	0.015
Children 0–6 years	0.004	0.015	0.039	0.017
Married	0.019	0.014	– 0.268	0.015
Basic education	– 0.112	0.036	0.084	0.040
Further education	0.155	0.049	– 0.297	0.068
Labour market experience	0.675	0.114	– 4.587	0.119
UI fund member	0.046	0.019	1.139	0.025
Firm size 50+	– 0.215	0.013	– 0.319	0.014
Local unemployment rate	– 0.512	0.046	0.404	0.044
Basic education share	0.918	0.577	0.211	0.589
Further education share	2.197	0.528	–0.295	0.650
Capital–output ratio	3.783	0.827	1.294	0.877
Concentration ratio	–0.034	0.130	0.767	0.146
R&D intensity	– 2.497	0.401	– 0.914	0.465
Outsourcing broad × basic edu.	– 1.737	0.289	1.282	0.305
Outsourcing broad × voc. edu.	– 1.494	0.285	1.148	0.311
Outsourcing broad × further edu.	– 1.383	0.311	0.297	0.378
$v_{j,2}$	1.429	0.022		
$v_{u,2}$	1.785	0.021		
$P(v_{j,1}, v_{u,1})$	0.787	0.005		
$P(v_{j,2}, v_{u,2})$	0.213	0.005		

Notes: Bold numbers indicate a significant parameter estimate (5% level). Year and industry dummies are included.

of controlling for individual heterogeneity in studies of transitions in the labour market.

The competing risks model uncovers many interesting results regarding the industry-level variables. It is seen that industries that are relatively intensive in the use of capital and workers with further education have 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 dummies. For the job change hazard, there are negative effects of outsourcing for all three education groups. These results are consistent with the idea that outsourcing entails reduced availability of outside offers or increased labour demand and reduced job turnover, as discussed above.

Turning to the job-to-unemployment transition rate, it is seen that outsourcing now has a positive impact for low-skilled workers. That is, outsourcing only increases the unemployment risk for workers with basic education and vocational education. Thus, in line with the idea that outsourcing is mostly 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 only basic education or vocational education. The question now is whether these costs are quantitatively important.

The estimated coefficient in the unemployment hazard of 1.282 for workers with basic education can be assessed by calculating the relative (percentage) change in the unemployment risk in response to a one percentage point increase in the outsourcing measure as follows: $\exp(1.282 * 0.01) - 1 = 0.0129$. That is, the unemployment risk falls 1.29% if the broad outsourcing measure rises one percentage point. This corresponds to an elasticity of 0.28 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 only basic education, the parameter estimate corresponds to a 3.5% 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% higher unemployment risk. This means, for example, that a standard person characterised as a 30–39-year-old male with basic education who is in the first year of his job spell¹⁰ will see his unemployment risk rise from 26.1% to 27.1% 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 changes are not annual—they are changes over a 12-year period—so the quantitative importance of the effect is best described as modest.

Extensions and Robustness

This section briefly reports the results of a number of extensions of the competing risks model.¹¹ First, with the individual-level data at hand it is 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 a higher unemployment risk if the industry's outsourcing

¹⁰ The standard person is assumed to have the following other characteristics: single, 15 years' experience, no membership for UI funds, no children, working in a small firm, average industry characteristics, and a high draw from the unobservables distribution.

¹¹ An appendix with the full set of results reported in this section is available from the author on request.

intensity rises, with a slightly stronger impact for men (the coefficients to the interaction terms are 1.2 for men and 0.9 for women). 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's age above or below 50. I find evidence that the coefficient is highest for workers above 50 (the coefficients for the interaction terms are 1.7 for older workers and 1.0 for younger workers).

Second, it is reasonable to suspect that the impact of outsourcing differs for within-industry and between-industry job changes. One would expect that workers in industries that increase their outsourcing intensities are more likely to change to jobs in other industries than to change to jobs within their current industry. If outsourcing reduces the availability of outside offers in the industry, then there should be a negative effect of outsourcing on the within-industry job change hazard, but the effect on the between-industry job change hazard could be positive. Another possible effect is that outsourcing may also create better job opportunities within the industry or in other industries for some worker types. To study this question, I have estimated a competing risks model with a distinction between within-industry and between-industry job changes. For the within-industry transition, broad outsourcing reduces the job change hazard rate for all three education groups with roughly the same coefficient. The same holds for the between-industry transition, but the coefficients are closer to zero (though still significant). Thus there are no signs that outsourcing induces workers to change jobs more often within or between industries—instead, outsourcing appears to reduce outside opportunities, especially within the same industry.

Third, it may also be the case that the effects of outsourcing depend on the industries under consideration. For example, Geishecker and Görg (2005) find that outsourcing only reduces the wages of low-skilled workers if they are employed in low-skill 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. In low-skill industries, outsourcing does not reduce the job change hazard significantly. In accordance with the findings by Geishecker and Görg (2005), the impact on the unemployment hazard for workers with basic and vocational education is stronger than for the full sample. In high-skill 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 is 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 non-participation were treated as right-censored observations. To check whether 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 non-participation transition is particularly relevant for elderly workers, I interacted broad outsourcing with dummies for the worker's age above or below 50. However, outsourcing is found to reduce the non-participation 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 might tend to outsource intensively and also have lower job separation rates. As a robustness check, I included 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 only a slight impact on the estimated coefficients to the outsourcing variables. Likewise the local unemployment variable is included in all specifications, but it could also be endogenous and pick up some of the true adjustment costs of outsourcing if the local labour market depends heavily on a particular industry. However, the coefficients to the outsourcing variables in Table 3 are only slightly changed if local unemployment is excluded.

Sixth, 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 hits workers with both basic and vocational education.

Finally, the measure for industry-level outsourcing has been included along with industry dummies, such that the effect of outsourcing is

identified from changes in outsourcing within industries. It also makes sense to assess the impact of changes in the outsourcing variable, because one would in particular expect increases in the unemployment risk in the years immediately after an increase in outsourcing. To study this issue, I estimated a model with the change in outsourcing over the last three years (to allow for some adjustment lags) instead of the level of outsourcing. However, the results are weaker. The three coefficients in the job-to-job transition rate are all still negative, but two are only significant at the 10% level. For the unemployment hazard, the two coefficients for workers with basic and vocational education are now insignificant, and the coefficient to the change in outsourcing interacted with further education is significantly negative.

VI. 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. The flexibility of the labour market will determine how large these costs will be. From this point of view, the Danish case is interesting since the Danish labour market is one of the most flexible in continental Europe.

Unlike most of the empirical literature on outsourcing, this 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 influence the transition rates out of employment, and it is also a well-established fact that job separation rates decline with time on the job.

One of this model's features is the ability to estimate different destination states for the transition rates out of the job. This is important because many variables, including outsourcing, have unequal and even opposite influences on the job-to-job and job-to-unemployment transitions. Outsourcing is found to increase the unemployment risk for workers, 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 as 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% when outsourcing rises from 18.8% to 21.5%, as it did during the 12-year sample window. Thus, while it should be remembered that outsourcing in theory leads to overall gains in the long run, there is evidence for small short-run adjustment costs, particularly for low-skilled workers.

Appendix. Variable Definitions

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

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 children aged 0–6.
- *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); that is, 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, people with only 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.

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).

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 database and is measured relative to the industry's value-added. Data were not available for 2000, so the R&D intensity was imputed here 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 was obtained from the Danish Competition Authority.

Data were not available for 1991 so the concentration ratio was imputed here with a linear trend.

- *Outsourcing*: See text.

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First version submitted December 2006;
final version received October 2009.