Trade, Skills and Adjustment Costs: A Study of Intra-Sectoral Labour Mobility in the UK

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Abstract

The relationship between the ability of workers to change job, sector or industry and the short-run adjustment costs associated with a reallocation of labour is the subject of lively debate among academics. This paper examines recent sector and industry level labour market adjustment in the UK using data from the *Quarterly Labour Force Survey.* We explore the link between the nature of UK international trade patterns and labour adjustment within the manufacturing sector and examine the determinants of "within" and "between" industry mobility. We find a significant link between intra-industry trade and intra-industry labour adjustment as well as some evidence based on individual skill specificity that intra-industry labour adjustment maybe less costly than inter-industry adjustment.

Keywords: Labour mobility, adjustment costs, trade.
JEL: F1, F6

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1 Introduction

The relationship between the ability of workers to change job, sector or industry and the costs associated with a reallocation of labour in reaction to changes in economic circumstances is the subject of lively debate among academics and policy makers. In recent years ever-closer global economic integration, significant changes in the flows and composition of trade, as well as technological advances and changes in government regulations, have contributed to significant temporary and permanent shifts in global employment and production patterns.

The labour markets of industrialised countries are therefore, coming under ever-increasing scrutiny. One current area of interest is the relationship between trade expansion and labour mobility (for example in the context of continued European enlargement and the perceived competitive effects of the EURO). The implication is that trade changes may result in increased job opportunities on the one hand but a possible reduction in job stability on the other. The result in both cases is an increase in the number of job moves that workers experience. Given that each move incurs an adjustment cost it is useful to understand the underlying nature of these costs and whether the type of the trade change affects them. A second and closely related (but relatively under researched) issue is how these costs are allied to the skills of individual workers, skill specificity and hence the transferability of these skills.[1]

One determinant of the flexibility and hence continued competitiveness of an economy is the mobility of factors of production, with labour being the most reactive factor in the short term (Grossman and Shapiro 1982). The decision of a worker to change jobs and the ability of the economy to absorb large employment shifts however, depends on the magnitude of short-run adjustment costs where such costs usually manifest themselves in terms of lost production, reduced wages, unemployment and retraining costs (Davidson and Matusz 2001). Davidson and Matusz

(2000) argue that the flexibility of an economy plays an important role in determining both the gains from trade liberalisation and the level of short-term adjustment costs but go on to state that the trade off between gains and costs depends on the ability and skills of individual workers.[2]

By examining the UK manufacturing sector between 1995 and 2000, this paper contributes to four issues related to the effects of trade and integration on labour market adjustment. First, we document trends in employment changes for sector and industry moves. Second, we investigate whether trade changes (specifically the nature of the trade changes, either intra-industry or inter-industry) influences the ability of workers to move either between or within industries and whether individual characteristics of the two groups of movers differ. Thirdly, we investigate the complex and little explored relationship between skill specificity and short-run adjustment costs and the effects on mobility of the relationship between general skills (e.g. qualifications) and job specific skills. Finally, we address whether there is sufficient evidence to suggest that intra-industry trade changes result in smoother and hence less costly adjustment processes.[3]

The first two issues are relatively straight-forward. The third however, requires a close examination of the relationship between general and specific skills. For example, Davidson and Matusz (2001) estimate that when the cost of retraining is taken into account adjustment costs may be as high as

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[1] The specificity of human capital led Jacoby (1983) to argue that job overall job mobility has been declining in the twentieth century while Thomas (1996) suggests that the manifestation of human capital specificity is longer periods of unemployment.

[2] Economic theory tells us that within a country, labour should be free to relocate until the wage differential exactly compensates for the utility change experienced by the marginal locating worker. If individual's tastes, costs of living and labour endowments are identical and labour is perfectly mobile within the economy, then wage differentials would be fully compensating and welfare equalised. However, imperfections in the labour market (as a result of continued wage differentials across sectors for example) means that compared to the number of job changes within a sector, moves across sectors are limited. Jovanovic and Moffit (1990) and Greenaway *et al*. (2000) both show that, compared to gross flows, between-sector moves are relatively small.

[3] The study of intra-country migration, with a few notable exceptions such as Neal (1999), Greenaway *et al*. (2000), Greenaway and Nelson (2000) and two recent studies of transitional economies that examine labour reallocation and structural change, Bell (2001) and Sabirianova (2002), remains a relatively under researched area of the globalisation and labour markets literature. The main exception follows Lilien (1982) and examines whether a positive relationship exists between sectoral mobility and aggregate unemployment fluctuations as suggested by the sectoral shift hypothesis of mandatory search unemployment (see e.g. Abraham and Katz 1986 and Brainard and Cutler 1993). The other exception is the regional mobility of labour literature that concerns the movement of workers between geographical locations (see for example

ten to fifteen percent of the long run benefits of trade liberalisation but go on to state that these can rise to thirty to ninety percent of the long run gains if the resource costs of this retraining is also taken into account. To address point four therefore, we investigate whether adjustment costs associated with a worker move rise or fall proportionately with the level of academic qualification and degree of industry skill specificity and whether this has any implications for existing estimates of the size of trade induced adjustment costs and how industry skill specificity effects labour mobility.[4]

In terms of the literature on trade and labour market adjustment, labour economists have been the more active (see e.g. Kruse 1988 and Addison *et al.* 1995), possibly because most trade economists believe the long-term gains from trade will always outweigh any short-term adjustment costs and that although there are inevitably some workers who are harmed by trade liberalisation the gains should be large enough for the winners to compensate the losers. In this paper we take ideas from both literatures.[5]

To pursue the objectives of this paper we test a hypothesis from the trade literature that makes clear predictions about the behaviour of the labour market and related adjustment costs in the face of changing trade patterns, known as the *smooth adjustment hypothesis* (SAH). The SAH makes the distinction between traditional Heckscher-Ohlin type trade centred on resource differences and intra-industry trade (IIT) based on economies of scale and increasing returns (where IIT is defined as the simultaneous import and export of goods from the same industry). The SAH has strong intuitive appeal and proposes that if, as a result of trade liberalisation and/or further integration,

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Jackman and Savouri 1992, McCormick 1997 and Henley 1998) and the related work on geographic concentration and trade sensitive employment, Shelburn and Bednarzik (1993).

[4] Magnani (2001), in an investigation of whether industry specific measures of job loss risk are correlated with workers propensity to move industries for a new job demonstrates that that job insecurity (as well as qualifications and being employed) positively affects the chances of moving between sectors. In a study of the wage costs of switching industries, Neal (1995) demonstrates that workers receive compensation for some skills that are neither general nor firm specific but rather are specific to their industry. The greater the skill specificity the more significant the likely adjustment costs associated with an inter-sectoral or inter-industry move. Kletzer (1996) demonstrates however, that reemployment wage loss is minimal if a worker is gains employment within an industry.

trade expansion if intra-industry rather than inter-industry in nature, it will lead to smoother (and hence less costly) factor adjustment.[6]

More specifically, an expansion of trade that is intra-industry in nature means that the changes (either increases or decreases) in imports and exports are "matched" at the industry level. There are however, likely to be changes in demand within an industry (between the firms that constitute a given industry). It is assumed that such factor transfer requirements can be contained within industries or possibly even firms. Conversely, inter-industry trade or net trade changes implies imports and exports are `unmatched'. As a result, factor reallocation pressures are likely to require resources to be transferred between industries, most commonly from those contracting to those expanding.

If we assume that factors of production contain a degree of industry specificity, the SAH implies that adjustment costs will be less forbidding for intra-industry rather than inter-industry labour adjustment. For a given level of general skills, inter-industry labour reallocation requires workers to move from one industry to another and implies a loss of those skills specific to the industry of employment prior to the move and the need to acquire those specific skills necessary for the new industry. Intra-industry labour reallocation on the other hand implies no loss of industry-specific human capital and is assumed therefore, to be relatively less costly. [7]

In assessing the validity or otherwise of the smooth adjustment hypothesis, there have been relatively few attempts to integrate labour market adjustment into a fully specified theoretical framework of trade as traditional Hechscher-Ohlin models assume the free inter-sectoral movement of labour and costless adjustment (see Lovely and Nelson 2000, 2002 for two of the most recent

[5] The general methodological differences between the trade and labour approaches are summarised in Slaughter (1999) in his study of wage inequality.
[6] Krugman (1981), OCED (1994) and Cadot *et al* (1995) are just three of the studies that have alluded directly and indirectly to the smooth-adjustment hypothesis and its properties.

attempts). As Lovely and Nelson (2000) point out however, it is not possible to establish clear priors from trade models about the relative degree of inter to intra-labour adjustment and the relative changes in net intra-industry trade. The question is therefore, essentially an empirical one.

Studies that search for specific evidence of the SAH are limited but include Brülhart (2000), Haynes *et al.* (1999, 2000) and Brülhart and Elliott (2001). One criticism aimed at the existing work in this area however, is the lack of a micro-labour market analysis to take into account not only industry level variables but also as Davidson and Matuz (2001) suggest, the interaction between the characteristics of an individual (such as attained skills).[8]

By utilising a micro-econometric labour market approach that employs a pooled data set of over 160,000 individuals each allocated to a specific industry classification for the years 1995 to 2000, we are able to shed additional light on our four areas of interest. First, after presenting aggregate mobility trends we break down the sample into job movers and job stayers where the former are further broken down into intra-industry and inter-industry movers. Our results show that there are always more intra-industry moves than inter-industry moves and that there are important differences between the individual characteristics of the two types of movers. Second, using various measures of intra-industry trade (static and dynamic) we are able to show that trade not only affects the mobility of labour but that it also affects the type of mobility. Thirdly, our micro-labour market approach means we can assess in detail the importance of academic and industry-specific skills and how they relate to short-run adjustment costs. Although we find some evidence that intra-industry trade expansion leads to greater intra-industry job changes this does not tell us unambiguously whether the adjustment costs are higher or lower than those associated with worker moves across industries (the smooth adjustment hypothesis). When the specificity of skills is taken into account

[7] In the asymmetric shocks literature, Shin (1997) demonstrates that intra-sectoral shocks that require within sector resource reallocation have smoother adjustment processes and lower costs than inter-sectoral shocks that require a reallocation between sectors.

[8] In addition, there are a number of studies that estimate the adjustment costs associated with the removal of trade restrictions that include Baldwin *et al*. (1980), Winters and Takacs (1991) and Davidson and Matusz

however, the indications are that adjustment costs as a result of trade liberalisation may not be as severe as previous estimates.

This paper is organised as follows. Section 2 outlines the econometric model while Section 3 describes the data (sample means for key individual characteristics) and provides an analysis of sectoral as well as inter- and intra-industry adjustment. Section 4 presents the key results of the cross-sectional multinomial logit estimates. The final section concludes.

2 Econometric Model

The econometric model draws upon the matching model of job movement of Jovanovic and Moffitt (1990), where the probability of an individual moving job in a given period is decreasing in the quality of the current firm-worker match and in the costs of moving. Following Greenaway *et al.* (1999, 2000), labour flows depend on the likelihood of individuals attaining a good match (qualifications and experience), costs of moving (housing ownership, region of residence, marital status, age and sex) and shocks to a sector relative to another sector (such as change in trade patterns, technology and/or other changes in demand).

To consider the human capital costs of labour adjustment we need to distinguish between general and industry-specific skills.[9] One would expect general skills to raise the likelihood of both intra-industry and inter-industry moves. We measure general skills using academic qualifications. Second, one might expect industry-specific skills to raise the likelihood of intra-industry moves but not inter-industry moves. We measure industry-specific skills using prior occupation. Consequently, we would expect those workers employed in high skilled professions to have a higher likelihood of intra-industry mobility, relative to those employed in professions that are less

(2001). Matusz and Tarr (2000) in a survey of this work conclude that the costs are relatively small in comparison to the gains from trade.

skilled. Conversely, we would expect the lower skilled to have a higher general mobility because their relative lack of skills makes them more mobile in an absolute sense but also because there is no loss of industry specific skills we might expect greater inter-industry moves. Hence, the likely adjustment costs associated with any move can be ranked in terms of magnitude. The most costly would be individuals with a large degree of industry specific human capital and no academic qualifications that are forced to move between industries whereas those individuals with good academic qualifications but no industry specific skills should be able to move quickly and relatively costlessly within or between industries and are likely to be the first to move in reaction to a shock. This may imply lower overall adjustment costs that previously thought.

The econometric model incorporates a three-regime multinomial logit specification distinguishing between those who move within an industry (m=2), those who move from one industry to another (m=3) and a residual category containing those who have not moved (m=1). These three alternatives are mutually exclusive.

The latent variable Y_m^* takes one of the three discrete values, m, which we have indexed 1, 2 and 3. A transition m occurs when $Y_{im}^*>1$, where i is the individual. The determination of the value of the underlying latent variable for each alternative is therefore

$$Y_{im}^* = Z_{imk}\, b_{mk} + e_{im} \qquad (1)$$

where Z_{imk} includes information on k regressors. These include the different kinds of human capital acquired (academic and occupation) which improve the likelihood of a match between employer and employee, socio-economic characteristics (housing ownership, region of residence,

[9] According to Grossman & Shapiro (1982), the quality of a match between a worker and a firm will be a function of job-specific and general skills. Job specific skills increase the value of an existing match, whilst general skills raise the quality of both existing and prospective matches.

marital status, age and sex) which measure the costs of moving, as well as intra-industry specific shocks (trade patterns, intra-industry wages relative to the average, relative intra-industry unemployment rates, average intra-industry growth and union density). Following McFadden (1973), we assume that e_{im} is extreme value distributed. It follows then that the Probability P_{ir} of belonging to any regime $r \in m$, is given by

$$P_{ir} = \frac{\exp(Z_{ik} b_{rk})}{\sum_{m=4}^{4} \exp(Z_{ik} b_{mk})}, \qquad m = 1, 2, 3 \qquad (2)$$

where the condition $b_{1k} = 0$ is imposed to identify the other parameters in the equation.

This methodology enables us to compare the effects of individual and industry level variables on different types of move. When we examine within-industry moves we expect to observe positive signs on the intra-industry trade, academic qualifications and industry specific skills coefficients. In contrast, for between-industry moves, we expect the trade and industry specific coefficients to be negative (while academic qualifications remain positive).

3 The Data

3.1 Definitions and methodology

We use micro data for males and females taken from the Spring quarters of the *Quarterly Labour Force Survey* for 1995-2000.[10] The main advantage of the *QLFS* is that it contains a wealth of information on the employment and socio-economic characteristics of individuals. In the Spring quarter of the *QLFS* all individuals are asked questions about their circumstances twelve months prior to the survey. Included are questions on economic activity such as employment status,

[10] The *LFS* began in 1973 as a biennial continuous survey as part of Britain's obligations on joining the European Union. The survey became annual in 1983 and has been quarterly since 1992. The *QLFS* is a pseudo panel that follows the same individuals for 5 consecutive quarters. It currently includes a

industry of employment and occupational status. This information enables us to construct our dichotomous transition variable.

One of the central concerns of this paper is how we handle the definition of an industry and the associated aggregation and sensitivity implications. Our choices apply to the level of regional, occupational and most importantly industrial aggregation. Throughout this paper we employ sector/industry definitions based on the Standard Industrial Classification 1992 (SIC92).[11]

First, a "sector" is defined as the one-digit level of the SIC92 and includes eighteen lettered sectors one of which is manufacturing. Second, we define an "industry" at the two-digit SIC92 level (twenty-three industries within the one-digit manufacturing sector). Third, a "sub-industry" is defined at the three-digit level of the SIC92 (103 sub-industries within the manufacturing sector). By splitting one sector into 103 separate classifications (sub-industries) we are able to adequately capture within-industry moves for the first time. To our knowledge, no study at this level of disaggregation has been undertaken before. One reason is that, given cell size considerations, the number of movers in any given year is not large enough. To obtain sufficiently large sample sizes by industry and sub-industry it was necessary to pool the *QLFS* over the six years of our sample.

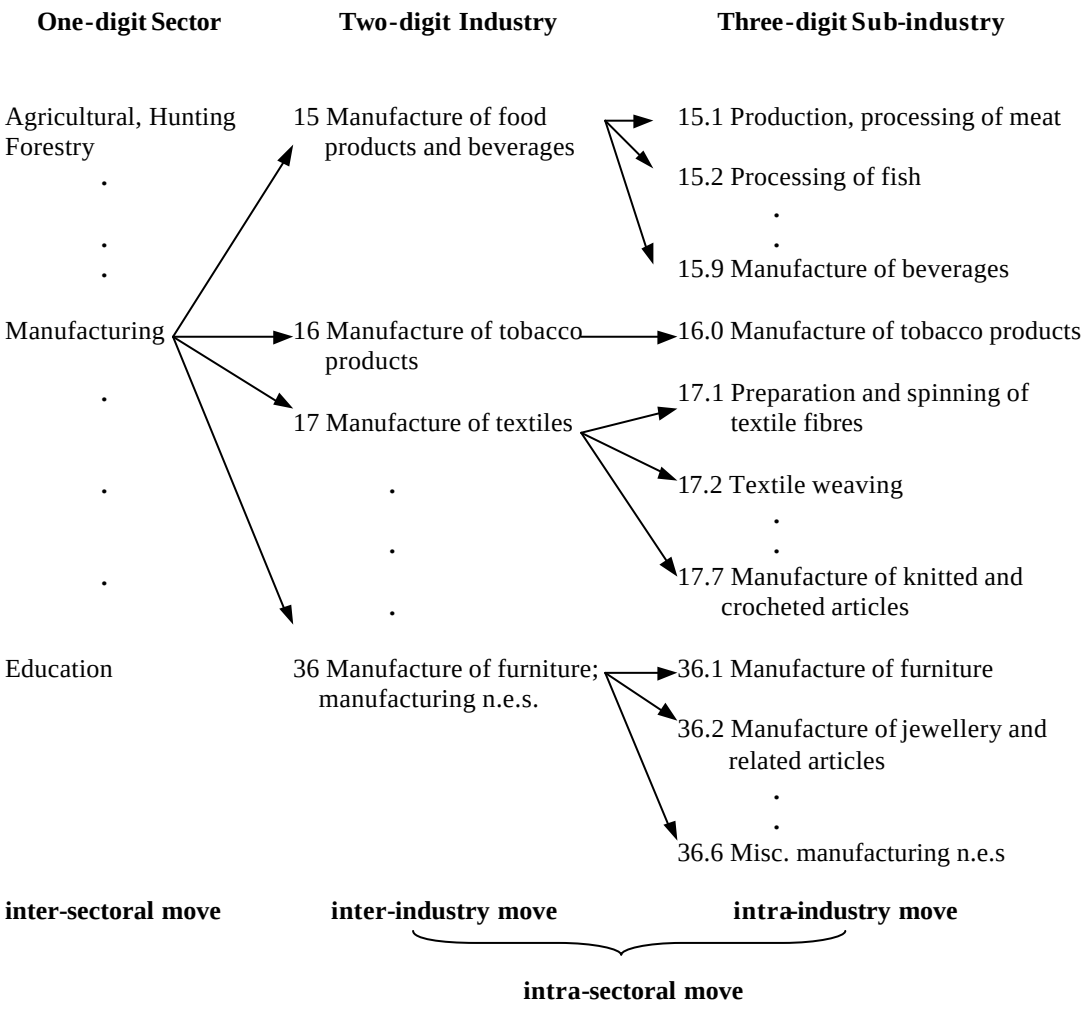
One of the innovations of this paper relates to the definition of within (intra) and between (inter) industry mobility. An individual is assumed to have moved within an industry (an intra-industry mover) if they have moved firm or sub-industry (at the three-digit level) but remained employed within any given industry (at the two-digit level). Analogously, an individual is assumed to have moved between industries (an inter-industry mover) if they have moved to a different industry (at

representative sample of approximately 60,000 households. Our sample is restricted to employees and excludes the self-employed.

[11] Appendices 1 and 2 include descriptions of the two and three-digit levels of SIC 92 (only available in the *LFS* after 1994). Our selection is based partially on accepted definitions of what constitutes an industry and a sector from the trade literature (see Finger 1975, Rayment 1976, Greenaway and Milner 1986 and Elliott *et al*. 2000 for a detailed discussion of the categorical aggregation issue).

the two-digit level) but remained employed within a given one-digit sector. This gives us a simple hierarchical system that is summarised in figure 1.[12]

Figure 1. A hierarchical system of labour mobility based on SIC92



The justification for our precise definitions of intra- and inter-industry mobility is twofold; firstly, a higher level of aggregation (for example, looking only at the two-digit industry level) would mask all intra-industry moves; secondly, a level of disaggregation higher than the three-digit would not provide sensible estimates of human capital transfers and would imply smaller sample sizes and

[12] We only include industries and sub-industries that produce tradable goods. We therefore remove from our sample one industry and eight sub-industries (see appendix 2).

hence require more observations than are available in the *QLFS* (even accounting for the pooling of data). As far as we are aware, no existing study goes beyond the two-digit level.[13]

At the general level therefore, an employed respondent who has moved firm, sub-industry, industry or sector during the 12 months prior to the survey is coded as a 'mover'. An individual who remained within the same firm, sub-industry, industry or sector or remained unemployed over the previous 12 months is coded as a 'stayer'.

3.2 Descriptive statistics

Table 1 provides a summary of the sectoral employment shares at the one-digit level for 1995-2000. This period reveals a relatively stable employment pattern with no individual sector exhibiting a large-scale expansion or contraction relative to the rest of the economy. For the UK the process of de-industrialisation (Rowthorn 2000) where employment systematically moves from manufacturing to services seems to have slowed by 1995.[14] Given that we are concerned with the effects of trade on labour mobility this paper concentrates on the manufacturing (the tradable goods sector) that accounts for an average of 23.5% of the workforce between 1995-2000.

Existing studies that examine mobility only at the sectoral level do not tell us much about the real magnitude of labour mobility since only moves at a very broad classification level are considered. Elliott and Lindley (2001) compare total moves between manufacturing and all one-digit sectors and reveal relatively little labour mobility between manufacturing and other sectors (1.8 percent of the sample or 16.3 percent of total inter-sectoral adjustment). The large number of moves between

[13] Although our approach is highly disaggregated, we acknowledge that we are not picking up more subtle forms of labour mobility that effect true adjustment costs such as intra-firm changes in responsibility or a move onto a different production line within a given firm.
[14] See Greenaway *et al*. (2000) for an overview of UK sectoral employment shares from 1950-2000.

different service sectors where skills are more generic and hence more transferable may explain such trends.[15]

Table 2 reports transition ratios for employees and ex-employees of the manufacturing sector. The first column refers to intra-sectoral adjustment (any individual who has changed firm and/or sub-industry and/or industry within the previous year but remained within the manufacturing sector). Columns two and three split intra-sectoral adjustment for manufacturing into moves within and between two-digit industries. The second column shows that intra-industry adjustment (average of nearly four percent) is everywhere greater than inter-industry adjustment (average of just over two and a half percent). Hence, there is more within-industry than between-industry movement across the whole period (61 percent of total adjustments are intra- and 39 percent are inter-industry adjustments).[16] For completeness we also measure the proportion of our sample that have moved into or out of unemployment in the last twelve months that averages at just over five percent a year. The results are an indication that the intuitive appeal of our hierarchical ease of adjustment system has some empirical grounding. Observe finally, that both intra-sectoral and unemployment adjustment, columns one and five respectively, have remained fairly stable at approximately 6.5 percent and five percent respectively over the six years.[17]

Our results thus far suggest that it is important to consider not only the movement of labour between sectors (which is limited) but also to examine moves within sectors and hence to understand what

[15] In 1999 there were 467 two-digit industry movers who moved within a one-digit sector. Of these, 284 moved within manufacturing showing that this sector is where most of the variability occurs. Elliott and Lindley (2002) investigate the issue of skill specificity and occupational transfers at the sector level where a matrix of worker moves show the job flows into and out of each sector (stayers are represented by the leading diagonal).

[16] Note that each individual move is only counted once. By definition a sub-industry move is either within a two-digit industry or not and is recorded as such. A number of authors including Booth (1997) and Topel and Ward (1992) note that intra-sectoral moves may also occur as a part of a natural career development.

[17] Due to limitations on space this paper concentrates on moves between jobs. To measure moves into or out of unemployment (or unemployment adjustment), employed respondents who were unemployed 12 months ago and unemployed respondents who were employed 12 months ago are also coded as 'movers'. In the broadest sense we consider all moves to be a form of labour market mobility that incurs by definition some degree of short-run adjustment cost. Moves into and out of unemployment are considered in more detail in Elliott and Lindley (2001).

determines whether an individual is more likely to move within or between industries and the costs associated with such a decision.

Table 3 provides some key descriptive statistics (unweighted sample means for socio-economic characteristics affecting labour mobility). All time varying variables are those twelve months previous to the time of the survey.[18] The sample consists of all employed men and women aged between 16 and 65 employed in the manufacturing sector. It should be noted that those unemployed, either twelve months prior or at the time of the survey, are now omitted from the sample. The first column in Table 3 refers to the full sample of 55368 employed movers and stayers, whilst the second and third columns refer to intra-sectoral stayers (51383) and movers (3985) respectively. The final two columns refer to intra-industry and inter-industry movers as defined in Section 2.1.

The first cell in Table 3 shows that sixteen percent of respondents have a *higher* qualification, where *higher* consists of degrees, higher degrees or their equivalent. A further fourteen percent have *further* qualifications ('A' levels or equivalent), while 50 percent have *other* qualifications (generally 'O' levels or GCSE's) and 20 percent have no qualifications. The third column shows movers to be generally better qualified than those that stay. Looking at the intra- and inter-industry movers however, reveals that there are more respondents with *higher* and *further* qualifications amongst the intra-industry movers. Hence these qualifications seem to improve the likelihood of within-industry adjustment, whilst *other* qualifications improve the likelihood of a move between industries. This is an indication that the link between qualifications and skill specificity is complex. On the one hand higher qualifications should increase an individuals ability to move (hence increasing the flexibility of the economy) but on the other hand, those with no qualifications seem to be the ones that are more able to move between industries.

Industry specific skills are measured by using one digit Standard Occupational Classifications (SOC80). Managers and professionals are disaggregated into skilled and semi-skilled categories, whilst sales occupations are disaggregated into semi-skilled and manual categories.[19] Our sample of manufacturing employees mainly consists of plant operators (27 percent), craftsman or tradesmen (24 percent), skilled managers (14 percent), skilled professionals (11 percent) and secretarial or clerical staff (11 percent). The column of movers suggests that plant operators, salesman and skilled professionals are more mobile, whilst managers, semi-skilled professionals, tradesman, secretarial and other manual occupations are less so, with no discernible pattern in the data. Distinguishing between intra- and inter-industry movers does however indicate some interesting differences. Comparing the first and fourth columns reveals an above average numbers of skilled managers (17 percent) and skilled professionals (13 percent) amongst the intra- movers. Comparing the first and final column shows an above average number of plant operators (31 percent) and craftsmen (25 percent) amongst the inter- movers. The raw data therefore, suggest a distinct dichotomy between skilled and less-skilled occupations, where the skilled are more likely to move within industries and the less-skilled are more likely to move between industries.

Finally, Table 3 investigates the extent to which the nature of trade and an industry's trade openness may impact the mobility of an industry's workers. Trade openness is measured as imports (*M*) plus exports (*X*) divided by gross value added. The nature of trade is measured in two ways. First, we use the traditional Grubel and Lloyd (GL) index to measure the sub-industry share of trade that is intra-industry in nature and secondly we test a dynamic measure of trade changes, UMCIT (Menon and Dixon 1997) that measures the change in net trade averaged over the period 1995-2000.[20] All

[18] See Appendix 2 for details on the construction of all variables. Unfortunately we are restricted from including employment tenure since information is only provided at the time of the survey and would imply that all movers would have employment tenure of less than 12 months.

[19] See Appendix 1 for a detailed description of the SOC80 categories and appendix 2 for a description of the occupation groupings we employ in this paper. Since the sample is for the manufacturing sector only it is considered unnecessary to disaggregate these occupational categories further (which would only result in additional cell size difficulties).

[20] The GL index measures the share of trade that is intra-industry in nature and was first presented in Grubel and Lloyd (1975). The GL index is measured as $GL = \frac{(X+M) - |X-M|}{(X+M)}$ where exports (*X*) and imports (*M*)

the trade data are deflated into 1995 prices using the RPI from the ETAS (2000). The raw data suggest that a high level of IIT in a sub-industry is associated with more intra-industry movements (and is one of the first indications that IIT leads to relatively more intra-industry moves). The UMCIT value for intra-industry movers (162.80) is significantly below the inter-industry value (239.32) and again demonstrates that large net trade changes result in more inter-industry moves. For example, if for a specific industry exports remained constant and imports increased, we would expect more inter-industry moves as the industry experiences increased competitive pressures, however if increases in imports and exports were matched we would expect a reallocation of labour within that industry (intra-industry moves) as more subtle changes in product specialisation occurs with the industry.

4 Results

Table 4 provides multinomial logit estimates for inter-industry and intra-industry movers. The default category are married males, with no children, non-home owning, living in the North, born in the UK, have no qualifications, employed as skilled professionals, sampled in the 1995 Spring quarter of the *QLFS* and have not moved firm and/or sub-industry. We include sub-industry specific variables to measure various demand side effects twelve months prior to the survey. These are average union density, relative average pay, relative unemployment rates, annual growth in GVA and an economies-of-scale variable.[21] Since industry specific variables are merged with

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must always be greater than or equal to zero and the index is bounded between zero and one with the latter meaning all trade is all intra-industry trade. The Menon and Dixon (1997) index is measured as $UMCIT = |\Delta X - \Delta M|$ and records the amount of unmatched (net) trade change that requires inter-industry factor reallocation. The argument is that inter-industry trade changes are what directly affect the magnitude of adjustment while the GL index is simply a static measure of the share of trade that is intra-industry. Other measures of dynamic or marginal IIT were examined with varying success (e.g. measures by Brülhart 1994 and Greenaway *et al*. 1994). Due to the large variation in GDP and trade values an unweighted dynamic measure was deemed more appropriate. Results employing weighted measures such as the Brülhart *A* and *B* indices are available from the authors upon request.

[21] Details of these variables are provided in Appendix 2. It should be noted that union membership question is only asked in the Autumn quarter of the *QLFS* and therefore actual union membership is not used. Including a variable to measure whether an individual is a member of a union or not would imply measurement error since it would not be clear whether the individual was a union member prior to any transition. Also the

micro data, all standard errors are corrected for sub-industry clustering using the Moulton (1990) correction.[22]

Of our trade variables we include a dummy variable for the GL index (measured at the three-digit level) that is one is the index is greater then the average of 0.83 and zero otherwise. We include a dummy variable rather than a continuous measure because we are testing whether high (above average) IIT is associated with greater intra-industry rather than inter-industry adjustment.[23] Our UMCIT variable is intended to capture unmatched (net) trade, again at the sub-industry level. All trade values are calculated based on constant prices.

The first two columns in Table 4 refer to inter-industry mobility and the final two to intra-industry mobility (intra-sectoral mobility logit estimates are provided in Table A of Appendix 3) A χ^2 likelihood ratio test for the joint hypothesis of coefficient equality across intra and inter Logit equations, suggests that the null hypothesis of common slope coefficients is rejected.[24]

Turning to the results, the inter-industry mobility/age locus displays a `U' shape suggesting both the young and the old are significantly more likely to move industry. Regional dummies are included primarily to control for any regional effects. Relative to living in the North for example, it seems that living in the Midlands has a 0.95 percentage point increase on inter-industry mobility, whilst those who live in the South East and the South West are 0.36 percentage points and 0.82 percentage points more likely to move respectively. As expected there is a significant housing tenure effect where non-home owners are 0.77 percentage points more likely to move between industries. Interestingly this is also the case for within industry mobility and is discussed later.

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relative average pay and relative average growth in GVA are deflated using the RPI from Economic Trends Annual Supplement (ETAS) (2000).

[22] See Moulton (1990) for a detailed discussion.

[23] This result still holds for a continuous GL index variable.

[24] See the notes to Table 4.

The raw data in Table 3 suggests that those with higher and further qualifications, as well as those in non-manual occupations, are more mobile within rather than between industries. Table 4 shows that above all other characteristics, qualifications also make individuals more mobile between industries (0.66 percentage points for *higher*, 0.71 percentage points for *further* and 0.59 percentage points for *other*), relative to those with no qualifications. Over and above these qualification effects, relative to skilled professionals, skilled managers, semi-skilled professionals and personal employees are less likely to move between industries, whilst semi-skilled managers, semi-skilled salespersons and manual salespersons are more likely to move between industries. This demonstrates how individuals in occupations that are less skill intensive are more likely to between industries relative to those occupations that involve more skills and supports the idea that different skills influence inter and intra-industry mobility in different ways.

Industry characteristics show that average industry hourly pay has a negative and significant impact on inter-industry mobility. There is a 1.5 percentage point change in the probability of moving per unit change in the relative average industry hourly pay. Of the trade variables we observe that trade openness makes a small but significant positive contribution to inter-industrial mobility which is consistent with greater competitive pressures. There is little evidence of variability in mobility over time since the year dummies are generally insignificant.

The final two columns in Table 4 provide estimates for intra-industry labour adjustment. The age variable shows the young to be significantly more likely to move within an industry whilst being single implies 0.6 percentage points less intra-industry mobility compared to those who are married. Compared to natives, immigrants are 0.85 percentage points more likely to move within an industry (although not between industries).

Again housing market rigidities are apparent. The raw data in Table 3 suggest housing tenure effects 'between' rather than 'within' industries. Table 4 however shows a significant housing tenure effect for intra-industrial mobility. Non-home owners are 0.9 percentage points more likely

to move within an industry than owner-occupiers. Hence non-homeowners are more mobile both between and within industries.

The qualification variables demonstrate that those with *higher* as highest qualification attained are 0.9 percentage points more mobile within an industry relative to those with no qualifications. Also there are no significant effects for *further* and *other* qualifications. The first column in Table 4 shows those with all qualifications to be more mobile between industries, where those with further qualifications are the most mobile. It seems therefore that those with higher qualifications have skills that are transferable both within and between industries, but that further qualifications make one more mobile between industries. This supports the idea that general skills (in particular higher qualifications) improve the likelihood of both inter and intra-industry mobility.

Notice that clerical workers are less likely, whilst semi-skilled sales workes are more likely to move within industries, relative to skilled professionals. So some less-skilled workers (semi-skilled managers, semi-skilled sales and manual sales) are more likely to move between industries, whilst only semi-skilled sales workers are more likely to move within industries, relative to professionals. This provides some evidence that less-skilled workers are more likely to move between industries and therefore that occupational skills in the manufacturing sector do posses some industry specificity. This loss of human capital is indirect evidence that adjustment would be smoother for intra-industry than inter-industry adjustment.

The only significant sub-industry variables are those included to capture the nature of trade.[25] These show that individuals employed in sub-industries characterised by a high IIT are 2.01 percentage points more likely to move within an industry than those employed in low IIT sub-industries. Also net trade changes (UMCIT) result in less intra-industry moves and therefore as expected and suggests that matched trade does lead to greater intra-industry moves. This provides

[25] One might expect firm level data to better explain mobility within any two-digit industry classification but is beyond the scope of this paper.

some support for the link between IIT and intra-industry adjustment and is therefore indirect evidence for existence of the smooth adjustment hypothesis. What we have shown is that IIT does lead to significant moves within an industry with the assumption being that this is because the costs of such moves are lower. This is demonstrated by the fact that those with the highest qualifications are more likely to move with an industry and that certain occupations are more likely to move within rather than between.

5 Conclusions

This paper attempts to analyse the effects of trade and integration effects on labour market adjustment within the UK manufacturing sector over the period 1995 to 2000. We show that there are relatively few worker moves between manufacturing and the other sectors but that there is significant labour mobility within the manufacturing sector. Focussing on industrial adjustment within manufacturing, we show that there is more within-industry adjustment than between-industry adjustment. Assuming that there is a difference in the costs of within and between industry moves with the latter being the greater, our evidence that there is more within rather than between industry adjustment suggests that the costs associated with trade liberalization may not be as great as first feared due to the assumptions of the smooth adjustment hypothesis. The link to trade is demonstrated by our finding of a significant relationship between IIT (GL index and UMCIT measures) and intra-industry labour mobility.

We also show that lower qualified workers in less skilled occupations are more mobile between industries than higher qualified skilled workers. This infers that it is higher qualified skilled employees that possess those industry specific skills that make them less transferable between industries, further support for the smooth adjustment hypothesis. The implication is that the labour market adjustment costs associated with trade expansion may not be as severe as first expected if the trade expansion is intra-industry in nature.

Of the other variables, home owner-occupiers are less mobile between and within industries suggesting that there are significant housing tenure costs associated with industrial mobility and higher initial returns in the destination industry also significantly increase inter-industry mobility where these returns are based on lower relative industry wages in the ex-ante industry of origin.

In short, labour reallocation in the manufacturing sector would be costly in terms of the industry specificity of occupational skills, should it be the higher skilled workers that are required to move. In a period of high transition, one would therefore prescribe policies that increase the inter-industry labour mobility of workers such as generalised vocational training that contains a curriculum of transferable skills. Evidence on the success of retraining programmes however is ambiguous (see e.g. Dolton and O'Neill 1996, Kletzer 1998, Heckman *et al*. 1999). Future research will attempt to define job categories that directly capture in detail skill specificities, since occupational skills may not be truly specific to an industry but rather specific to an intersection of certain industries and occupations.

Table 1. *QLFS* employment shares between 1995-2000

One-digit 1992 SIC	1995	1996	1997	1998	1999	2000
Agriculture, Hunting & Forestry	625 (1.32)	515 (1.09)	479 (1.03)	475 (1.03)	444 (0.97)	438 (1.00)
Fishing	10 (0.02)	7 (0.01)	15 (0.03)	14 (0.03)	9 (0.02)	14 (0.03)
Mining & Quarrying	273 (0.58)	257 (0.54)	241 (0.52)	217 (0.47)	296 (0.65)	220 (0.50)
Manufacturing	**11478 (24.27)**	**11781 (24.86)**	**11283 (24.34)**	**10811 (23.52)**	**10443 (22.49)**	**9661 (22.01)**
Electricity, Gas & Water	575 (1.22)	457 (0.96)	419 (0.90)	386 (0.84)	429 (0.94)	407 (0.93)
Construction	2480 (5.24)	2452 (5.17)	2254 (5.44)	2766 (6.02)	2739 (5.98)	2872 (6.54)
Wholesale, Retail Trade & Motor Vehicles	7590 (16.05)	7756 (16.37)	7487 (16.15)	7442 (16.19)	7446 (16.25)	7189 (16.38)
Hotels & Restaurants	2396 (5.07)	2466 (5.20)	2411 (5.20)	2492 (5.42)	2313 (5.05)	2173 (4.95)
Transport, Storage & Communication	3593 (7.60)	3356 (7.08)	3373 (7.28)	3385 (7.36)	3588 (7.83)	3454 (7.87)
Financial Intermediation	2774 (5.87)	2781 (5.87)	2951 (5.59)	2638 (5.74)	2504 (5.46)	2395 (5.46)
Real Estate, Renting & Business	1253 (2.65)	1328 (2.80)	1330 (2.87)	1275 (2.77)	1387 (3.03)	1385 (3.15)
Public Admin & Defence	293 (0.62)	318 (0.67)	327 (0.71)	272 (0.59)	331 (0.72)	359 (0.82)
Education	4855 (10.27)	4956 (10.46)	4812 (10.38)	4819 (10.48)	4973 (10.85)	4805 (10.95)
Health & Social Work	6636 (14.03)	6626 (13.98)	6798 (14.66)	6596 (14.35)	6686 (14.59)	6284 (14.31)
Other Community, Social and Personal Services	2171 (4.59)	2075 (4.38)	2006 (4.33)	2144 (4.66)	2023 (4.41)	2028 (4.62)
Private Households	209 (0.44)	193 (0.41)	189 (0.41)	172 (0.37)	163 (0.36)	157 (0.36)
Extra Territorial	45 (0.10)	43 (0.09)	46 (0.10)	41 (0.09)	35 (0.08)	45 (0.10)
Outside UK	38 (0.08)	22 (0.05)	32 (0.07)	19 (0.04)	18 (0.04)	15 (0.03)
Total	47294	47389	46363	45964	45827	43901

Source: Spring quarters of the *QLFS*. Annual percentage employment shares are in parentheses.

Table 2. Intra-sectoral mobility and unemployment adjustment at the three-digit level, for the manufacturing sector.

	(1) Intra-Sectoral Adjustment*	(2) Intra-industry Adjustment**	(3) Inter-industry Adjustment***	(4) Unemployment Adjustment****	(5) Total Adjustment***** (1) + (4)
1995	0.0628	0.0395	0.0234	0.0583	0.1212
1996	0.0618	0.0366	0.0252	0.0571	0.1188
1997	0.0662	0.0401	0.0261	0.0467	0.1129
1998	0.0684	0.0387	0.0296	0.0464	0.1148
1999	0.0676	0.0402	0.0274	0.0466	0.1142
2000	0.0683	0.0410	0.0272	0.0483	0.1166
Total	**0.0657**	**0.0393**	**0.0264**	**0.0505**	**0.1162**

Notes: Source: Spring quarters of the *QLFS*.

* Intra-sectoral adjustment is the proportion of the total sample that have moved firm and/or sub-industry and/or industry and remained employed in any given year.

** Intra-industry adjustment includes those who have moved firm or sub-industry (at the SIC 3-digit level), but stayed within an industry (at the SIC 2-digit level) in any given year.

*** Inter-industry adjustment consist of those who have moved industry (at the SIC 2-digit level) but remained within the manufacturing sector (at the SIC one-digit level) in any given year.

**** Unemployment adjustment is the proportion of the total sample that have moved into or out of unemployment during the last 12 months

***** Adjustment here refers to the proportion of the total sample that has moved firm and/or sub-industry (at the SIC three-digit level) or into or out of unemployment in any given year.

Table 3. Key sample means for intra-industry and inter-industry adjustment

	(1) Total	(2) Stayers	(3) Movers	(4) Intra-industry Movers*	(5) Inter-industry Movers**
Key Personal Characteristics:					
Highest Qual: Higher	0.1699	0.1687	0.1859	0.2062	0.1554
Highest Qual: Further	0.1360	0.1344	0.1563	0.1640	0.1447
Highest Qual: Other	0.4898	0.4893	0.4972	0.4688	0.5399
No Qualifications	0.2043	0.2076	0.1605	0.1610	0.1600
Skilled Manager	0.1489	0.1496	0.1390	0.1669	0.0969
Semi-Skilled Manager	0.0122	0.0123	0.0120	0.0096	0.0157
Skilled Professional	0.1147	0.1147	0.1157	0.1269	0.0988
Semi-Skilled Professional	0.0205	0.0207	0.0173	0.0217	0.0106
Clerical/Secretarial	0.1110	0.1124	0.0939	0.0813	0.1126
Craft/Trade	0.2423	0.2429	0.2341	0.2253	0.2492
Personal/Security	0.0070	0.0075	0.0047	0.0062	0.0025
Semi-Skilled Sales	0.0259	0.0247	0.0416	0.0459	0.0352
Manual Sales	0.0082	0.0079	0.0123	0.0100	0.0157
Plant Operator	0.2715	0.2704	0.2855	0.2667	0.3140
Other Manual	0.0333	0.0332	0.0339	0.0329	0.0352
Key Industry Characteristics:					
IIT	0.8239	0.8217	0.8512	0.8696	0.8233
UMCIT	224.124	226.51	193.32	162.80	239.32
N	55368	51383	3985	2396	1589

Notes: Source: *QLFS* 1995-2000.

* Intra-industry movers are those who have moved firm or sub-industry (at the SIC three-digit level), but stayed within an industry (at the SIC two-digit level).

** Inter-industry movers consist of those who have moved industry (at the SIC two-digit level) but remained within the manufacturing sector (at the SIC one-digit level).

Table 4. Mobility Multinomial Logit, *QLFS* 1995-2000.
Dependant variable=1 if the individual has not moved inter or intra industry,
Dependant variable=2 if the individual has moved intra-industry
Dependant variable=3 if the individual has moved inter-industry,
12 months prior to the survey.

	(1) Inter-Industry		(2) Intra-Industry	
Variable	**Coefficient (Standard Error)**	**Marginal Effect**	**Coefficient (Standard Error)**	**Marginal Effect**
Age	-0.085 (0.017)*	-0.0020	-0.043 (0.019)*	-0.0013
Age Squared	0.0005 (0.0002)*	0.00001	0.0002 (0.0001)	8.03e-06
Female	-0.058 (0.063)	-0.0012	-0.136 (0.143)	-0.0044
Child	-0.024 (0.052)	-0.0005	-0.057 (0.073)	-0.0019
Single	-0.124 (0.079)	-0.0027	-0.172 (0.069)*	-0.0055
Divorced	0.043 (0.085)	0.0011	-0.090 (0.090)	-0.0030
Midlands	0.365 (0.089)*	0.0095	0.044 (0.153)	0.0011
South East	0.140 (0.071)*	0.0036	-0.192 (0.128)	-0.0063
South West	0.301 (0.088)*	0.0082	-0.213 (0.147)	-0.0069
Home Owner	-0.306 (0.057)*	-0.0077	-0.273 (0.116)*	-0.0098
Foreign Born	-0.036 (0.106)	-0.0010	0.228 (0.091)*	0.0085
Highest Qualification: Higher	0.267 (0.126)*	0.0066	0.260 (0.134)**	0.0092
Highest Qualification: Further	0.280 (0.121)*	0.0071	0.253 (0.188)	0.0090
Highest Qualification: Other	0.249 (0.085)*	0.0059	0.068 (0.057)	0.0021
Skilled Manager	-0.246 (0.130)**	-0.0055	0.095 (0.090)	0.0035
Semi-Skilled Manager	0.421 (0.250)**	0.0125	-0.197 (0.158)	-0.0065
Semi-Skilled Professional	-0.558 (0.256)*	-0.0103	-0.070 (0.172)	-0.0019
Clerical/Secretarial	0.048 (0.128)	0.0014	-0.296 (0.109)**	-0.0090
Craft/Trade	0.041 (0.131)	0.0010	-0.0762 (0.211)	-0.0025
Personal/Security	-0.924 (0.467)*	-0.0147	0.036 (0.294)	0.0018
Semi-Skilled Sales	0.448 (0.153)*	0.0120	0.6273 (0.146)*	0.0274
Manual Sales	0.601 (0.226)*	0.0188	0.200 (0.228)	0.0066
Plant Operator	0.180 (0.131)	0.0044	-0.010 (0.132)	-0.0005
Other Manual	0.137 (0.165)	0.0034	0.066 (0.120)	0.0021
Union Share	-0.373 (0.414)	-0.0096	0.866 (1.419)	0.0296
Relative Average Industry Pay	-0.584 (0.281)*	-0.0148	1.046 (0.946)	0.0359
Relative Unemployment Rate	0.120 (0.112)	0.0027	0.174 (0.519)	0.0058
Annual Growth in GVA	0.0002 (0.003)	-2.16e-06	0.008 (0.013)	0.0002
Scale industry	0.046 (0.117)	0.0004	0.762 (0.471)	0.0258
Trade Openness	0.0004 (0.0001)*	0.00001	0.001 (0.0005)	0.00004
High IIT	0.129 (0.097)	0.0025	0.6244 (0.341)**	0.0201
UMCIT	0.00003 (0.0001)	1.67e-06	-0.001 (0.001)*	-0.0000
Year 1996	0.084 (0.091)	0.0021	-0.073 (0.176)	-0.0025
Year 1997	0.083 (0.104)	0.0020	0.023 (0.250)	0.0007
Year 1998	0.191 (0.101)**	0.0048	-0.009 (0.337)	-0.0005
Year 1999	0.118 (0.089)	0.0029	0.0297(0.299)	0.0009
Year 2000	0.138 (0.107)	0.0033	0.121 (0.347)	0.0041
Constant	-0.963 (0.526)		-3.761 (1.095)	
N	55368		55368	
Pseudo R Squared	0.0394		0.0482	

Notes: Source: *QLFS* 1995-2000
Standard errors in parentheses.
* Denotes statistical significance at the 5% level
** Denotes statistical significance at the 10% level.
The Likelihood Ratio value for coefficient equality across the two Logit equations is 160.314, with χ^2 (38 d.o.f. Critical value 43.773)

References

Abraham, K. and Katz, L. (1986), Cyclical Unemployment: Sectoral Shifts or Aggregate Disturbances?, *Journal of Political Economy*, Vol. 94, pp. 507-22.

Addison, J. T., and Portugal, P. (1989), Job Displacement, Relative Wage Changes and Duration of Unemployment *Journal of Labour Economics*, Vol. 7, No. 3 (July), pp. 281-302.

Addison, J. T., Fox, D. A. and Ruhm, C. R. (1995), Trade and Displacement in Manufacturing, *Monthly Labor Review*, April, pp. 58-67.

Baldwin, R.E., Mutti, J. .H. and Richardson, J. D. (1980), Welfare Effects on the United States if a Significant Multilateral Tariff Reduction, *Journal of International Economics*, Vol. 10: pp. 405-423.

Bell, U.L. (2001), Labour Reallocation During Transition: The Case of Poland, ZEW Discussion Paper 01-38.

Berman, E., Bound, J., and Griliches, Z. (1994), Changes in Demand for Skilled Labour within US Manufacturing: Evidence from the Annual Survey of Manufactures, *Quarterly Journal of Economics*, Vol. 109(2), pp. 367-97.

Booth, A. (1997), Career Mobility in Britain, *ESRC Research Centre on Micro-Social Change Working Paper*, pp. 92-21.

Brainard, S. and Cutler, D. (1993), Sectoral Shifts and Cyclical Unemployment Reconsidered, *Quarterly Journal of Economics*, Vol. 18, pp. 219-43.

Brülhart, M. (1994) Marginal Intra-Industry Trade: Measurement and Relevance for the Pattern of Industrial Adjustment. *Weltwirtschaftliches Archiv*, Vol. 130, pp. 600-613.

Brülhart, M. (2000), Dynamics of Intra-industry Trade and Labour-Market Adjustment, *Review of International Economics*, Vol. 8: pp.420-435.

Brülhart, M. and Elliott, R.J.R. (2000) Labour-Market Effects of Intra-Industry Adjustment: Evidence for the United Kingdom, *GEP Research Paper* 2000/21, University of Nottingham.

Cadot, O., Faini, R. and de Melo, J. (1995), Early Trade Patterns under the Europe Agreements: France, Germany and Italy. European Economic Review (Papers and Proceedings), Vol. 39, pp. 601-610.

Davidson, C. and Matusz, S. (2000), Globalization and Labour-Market Adjustment: How Fast and at What Cost? *Oxford Review of Economic Policy*, Vol. 16, No. 3. pp. 42-56.

Davidson, C. and Matusz, S. (2001), On Adjustment Costs, *GEP Research Paper* 2001/24 University of Nottingham.

Elliott, R.J.R., Greenaway, D. and Hine, R.C. (2000), Tests for Factor Homogeneity and Industry Classification, *Weltwirtschaftliches Archiv*, Vol. 136, pp. 355-71.

Elliott, R.J.R. and Lindley, J.K. (2001), Intra-Sectoral Mobility and Adjustment Costs, CGEP Research Paper 2001/38, University of Nottingham.

Elliott, R.J.R. and Lindley, J.K. (2002), Sectoral Mobility, Skill Specificity and Adjustment, *mimeo* University of Nottingham.

Finger, J.M. (1975), Trade Overlap and Intra-Industry Trade, *Economic Inquiry,* Vol. 13, pp. 581-9.

Greenaway, D. and Milner, C. (1986), The Economics of Intra-Industry Trade. *Basil Blackwell*. Oxford.

Greenaway, D. and Nelson, D. (2000), The Assessment: Globalisation and Labour-Market Adjustment, *Oxford Review of Economic Policy*, Vol. 16, No. 3, pp. 1-11.

Greenaway, D., Upward, R. and Wright, P. (1999), Sectoral Mobility and UK Labour Markets CGEP Research Paper 1999/01, University of Nottingham.

Greenaway, D., Upward, R. and Wright, P. (2000), Sectoral transformation and Labour Market Flows, *Oxford Review of Economic Policy*, Vol. 16, No. 3, pp. 57-75.

Greenaway, D., Hine, R.C., Milner, C.R. and Elliott, R.J.R. (1994), Adjustment and the Measurement of Marginal Intra-Industry Trade. *Weltwirtschaftliches Archiv*, 130: pp. 418-427.

Grossman, G. and Shapiro, C. (1982), A Theory of Factor Mobility, Journal of Political Economy, vol. 90 (5), pp. 1054-1069.

Grubel, H. and Lloyd, P.J. (1975), *Intra-industry Trade.* London. Macmillan.

Haynes, M., Upward, R. and Wright, P. (1999), Estimating the Wage Costs of Intra- and Inter-Sectoral Adjustment, *GLM Research Paper* 99/15, University of Nottingham.

Haynes, M., Upward, R. and Wright, P. (2000), Smooth and Sticky Adjustment: A Comparative Analysis of the US and UK, *Review of International Economics*, Vol. 8, pp. 517-532.

Heckman, J., LaLonde, R. and Smith, J. (1999) The Economics and Econometrics of Active Labor Market Programs in Ashenfelter, D. and Card. D. (Eds.) *Handbook of Labor Economics*, Amsterdam, North-Holland, pp. 1865-2097

Henley, A. (1998), Residential Mobility, Housing Equity and the Labour Market, *The Economic Journal*, Vol. 108, pp. 414-427.

Jackman, R. and Savouri, S. (1992), Regional Migration in Britain: An Analysis of Gross Flows Using NHS Central Register Data, *The Economic Journal*, Vol. 102, pp. 1433-1450.

Jacoby, S. (1983), Industrial Labor Mobility in Historical Perspective, *Industrial Relations*, Vol. 22, pp. 261-82.

Jovanovic, B. and Moffit, R. (1990), An Estimate of a Sectoral Model of Labour Mobility, *Journal of Political Economy*, Vol. 98, pp. 827-852.

Kletzer, L.G. (1996), The Role of Sector-Specific Skills in Postdisplacement Earnings, Industrial Relations, Vol. 35, No. 4, pp. 473-490.

Kletzer, L.G. (1998), Job Displacement, *Journal of Economic Perspectives*, Vol. 12, pp. 115-36.

Krugman, P. (1981) Intraindustry Specialization and the Gains from Trade, *Journal of Political Economy*, Vol. 89, pp. 959-973.

Kruse, D.L. (1988) International Trade and the Labor Market Experience of Displaced Workers. *Industrial and Labor Relations Review*, Vol. 41, No. 3 (April), pp. 402-17.

Lilien, D. (1982), Sectoral Shifts and Cyclical Unemployment, *Journal of Political Economy*, Vol. 890, pp. 777-93.

Lovely, M. and Nelson, D. (2000) On the Economic Relationship Between Marginal Intra-Industry trade and Labour Adjustment in a Division of Labour Model, *Review of International Economics*, Vol. 8, pp. 436-447.

Lovely, M. and Nelson, D. (2002), Intra-industry Trade as an Indicator of Labor Market Adjustment," *Weltwirtschaftliches Archiv*, 138:1-28, 2002.

Magnani, E. (2001), Risk of Labor Displacement and Cross-Industry Labor Mobility, Industrial and Labor Relations Review, Vol. 54, No. 3, pp. 593-610.

Matusz, S. and Tarr, D (2000), Adjusting to Trade Policy Reform, in A. Kruger (ed), *Economic Policy Reform*: The Second Stage, University of Chicago Press.

McCormick, B. (1997), Regional Unemployment and Labour Mobility in the UK, *European Economic Review*, Vol. 41, pp. 581-589.

Menon, J. and Dixon, P. (1997), Intra-Industry Trade verses Inter-Industry Trade: Relevance for Adjustment Costs. *Weltwirtschaftliches Archiv*; Vol. 133 - 1, pp. 146-169.

Moulton, B.R. (1990), An Illustration of a Pitfall in Estimating the Effects of Aggregate Variables on Micro Units, The Review of Economic and Statistics, vol. 72, (2), pp. 334-38.

Neal, D. (1995) Industry-Specific Human Capital: Evidence from Displaced Workers, *Journal of Labor Economics*, Vol. 13, pp. 653-77.

OECD (1994) The OECD Jobs Study: Evidence and Explanations. Paris.

Office for National Statistics (2000), Economic Trends Annual Supplement, Her Majesty's Stationery Office.

Rayment, P.B. (1976), The Homogeneity of Manufacturing Industries with Respect to Factor Intensity: The Case of the UK. *Oxford Bulletin of Economics and Statistics*, Vol. 38, pp. 203-09.

Rowthorn, R. (2000), The Political Economy of Full Employment in Modern Britain, *Oxford Bulletin of Economics and Statistics*, Vol. 62, pp.139-73.

Sabirianova, K. (2002), The Great Human Capital Reallocation: A Study of Occupational Mobility in Transitional Russia, Journal of Comparative Economics, Vol. 30, Issue 1, pg. 191-133.

Shelburn, R. C. and Bednarzik R. W. (1993), Geographical concentration of trade-sensitive employment, *Monthly Labor Review*, June, pp. 15-31.

Shin, K. (1997), Inter- and Intrasectoral Socks: Effects on the Unemployment Rates, *Journal of Labor Economics*, Vol. 15, No. 2. pp. 376-401.

Slaughter, M. (1999), Globalization and Wages: A Tale of Two Perspectives, *World Economy*, Vol. 22 (5), July, pp. 609-630.

Spence, M.A. (1973), Job Market Signaling, *Quarterly Journal of Economics*, August.

Thomas, J.M. (1996), An Empirical Model of Sectoral Movements by Unemployed Workers, *Journal of Labor Economics*, Vol. 14, pp. 126-53.

Topel, R. and Ward, M. (1992), Job Mobility and the Careers of Young Men, *Quarterly Journal of Economics*, Vol. 107(2): pp. 439-79.

Winters, A.L. and Takacs, W.E. (1991), Labour Adjustment Costs and British Footwear Protection, *Oxford Economic Papers*, Vol. 43, pp. 479-501.

Appendix 1 *Two-digit 1992 Standard Industrial Classifications for the manufacturing sector and one-digit 1980 Standard Occupational Classification.*

SIC92	*Two-digit Industry Codes*
15	Manufacture of food products and beverages
16	Manufacture of tobacco products
17	Manufacture of textiles
18	Manufacture of wearing apparel; dressing and dying of fur
19	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear
20	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
21	Manufacture of pulp, paper and paper products
22	Publishing, printing and reproduction of recorded media
23	Manufacture of coke, refined petroleum products and nuclear fuel
24	Manufacture of chemicals and chemical products
25	Manufacture of rubber and plastic products
26	Manufacture of other non-metallic mineral products
27	Manufacture of basic metals
28	Manufacture of fabricated metal products, except machinery and equipment
29	Manufacture of machinery and equipment not elsewhere classified
30	Manufacture of office machinery and computers
32	Manufacture of radio, television and communication equipment and apparatus
33	Manufacture of medical, precision and optical instruments, watches and clocks
34	Manufacture of motor vehicles, trailers and semi-trailers
35	Manufacture of other transport equipment
36	Manufacture of furniture; manufacturing not elsewhere classified
37	Recycling

SOC80	*Occupation Codes*
1	Managers & administrators
2	Professional occupations
3	Associate professional & technical occupations
4	Clerical & secretarial occupations
5	Craft & related occupations
6	Personal & protective service occupations
7	Sales occupations
8	Plant & machine operatives
9	Other occupations

Appendix 2 *Construction of the data*

The survey data are the Spring quarters of the *QLFS* 1995-2000 for the UK provided by the Data Archive at the University of Essex. The sample consists of working age men and women that are economically active at the time of they survey (employed and ILO unemployed). The definition of the variables is presented in a series of 6 tables.

1. Mobility variables

Variable	*Definition*
Intra-sectoral mover	Change in firm status or SIC92 3-digit sub-industry or SIC 2-digit industry of employment
Intra-sectoral stayer	No change in firm status or SIC92 3-digit sub-industry or SIC 2-digit industry of employment
Unemployment mover	Change in employment status: Either employed to unemployed or to unemployed to employed
Unemployment stayer	No change in employment status
Inter-industry mover	Change in SIC92 2-digit industry of employment
Inter-industry stayer	No change in SIC92 2-digit industry of employment
Intra-industry mover	Change in firm or SIC92 3-digit sub-industry of employment, no change in SIC92 2-digit industry of employment
Intra-industry stayer	No change in firm or SIC92 3-digit sub-industry of employment

2. Personal characteristic variables

Variable	*Definition*
Age	year of birth, continuous measure
Female	(0,1): dummy for female
Child	(0,1): dummy for living in a household with children
Foreign born	(0,1): dummy for foreign born (born outside the UK)
Married	(0,1): dummy for marriage
Single	(0,1): dummy for single or unmarried (not married or divorced)
Divorced	(0,1): dummy for divorced (no longer married and not single)
North	(0,1): dummy for living in the North of UK (North or North-West of England, Yorkshire, Scotland and Northern Ireland).
Midlands	(0,1): dummy for living in the Midlands of UK (East or West Midlands)
South East	(0,1): dummy for living in the South East of UK (East Anglia, London, South East England)
South West	(0,1): dummy for living in the South West of UK (South West of England and Wales)
Home Owner	(0,1): dummy for housing owner-occupier

3. Human capital variables

Variable	*Definition*
Higher	(0,1): dummy for having a higher degree, degree or equivalent as the highest qualification attained.
Further	(0,1): dummy for having A-levels or equivalent as the highest qualification.
Other	(0,1): dummy for having any other qualification as the highest qualification.
Employment tenure 1	(0,1): dummy for having less than one year employment with current firm
Employment tenure 2	(0,1): dummy for having one to two years employment with current firm.
Employment tenure 3	(0,1): dummy for having two to three years employment with current firm
Employment tenure 4	(0,1): dummy for having three to four years employment with current firm
Employment tenure 5	(0,1): dummy for having four to five years employment with current firm
Employment tenure 6	(0,1): dummy for having five to ten years employment with current firm
Employment tenure 7	(0,1): dummy for having ten to fifteen years employment with current firm
Employment tenure 8	(0,1): dummy for having more than fifteen years employment with current firm

4. Job grouping and occupational variables

Variable	*Definition*
Occupational Skills:	(0,1): dummy for being employed or previously employed in a given occupation defined as: • Skilled managers & administrators (excludes managers in transport, storing and horticulture) • Semi- skilled managers & administrators (managers in transport, storing and horticulture only) • Semi-skilled professional occupations or associate professional and technical occupations • Clerical & secretarial occupations • Craft & related occupations • Personal & protective service occupations • Semi-skilled sales occupations (buyers, brokers, agents and representatives only) • Manual sales occupations (excludes buyers, brokers, agents and representatives) • Plant & machine operatives
Non-manual worker	(0,1): dummy for being employed or previously employed as a professional, manager, clerical/secretarial or semi-skilled sales worker
Manual worker	(0,1): dummy for being employed or previously employed as a craft/trade, personal/security, manual sales, plant/machine operative and other manual workers

5. Industry variables

The industry data are inputted and vary over time. As a consequence data that refer to 12 months previous to the survey were coded using the appropriate annual averages. For example, when calculating union share 12 months prior to the survey, those people who appeared in the 1995 survey were given industry union density values calculated from the 1994 *QLFS* data. Growth, trade and wage data are all deflated into 1995 prices using the Retail Price Index from the Economic Trends Annual Supplement (2000).

Variable	*Definition*
Union share	The sub-industry union share is calculated separately for each year and is the average number of union members at the 3-digit level from the Spring quarter of the *QLFS*. The union shares were inputted for each individual that is employed or was previously employed in that industry. Therefore, all individuals in the same sub-industry have the same union share value.
Relative average sub-industry pay	Average hourly pay is calculated by averaging the hourly pay for those individuals employed in a given 3-digit sub-industry for a given year. The relative industry pay is calculated by dividing the sub-industry average by the overall average across all manufacturing for a given year. These relative industry average hourly pay values were inputted for each individual employed or previously employed in that sub-industry. All years are calculated separately and individuals in the same sub-industry have the same relative average sub-industry pay.
Relative unemployment rate	Unemployment rates are calculated at the 3-digit level for individuals employed or previously employed (if unemployed at the time of the survey) in a given sub-industry. These are averaged over 1995-2000 because of small numbers of previously employed (unemployed at the time of survey) at this level of disaggregation. The relative sub-industry unemployment rate is calculated by dividing the sub-industry rate by the overall unemployment rate across all manufacturing. Again these relative sub-industry unemployment rates were inputted for each individual employed or previously employed in that sub-industry. Individuals in the same sub-industry in each of the 6 years have the same relative unemployment rate.
Annual growth in	The annual growth rates of Gross Value Added for each sub-industry were

GVA	provided by the Annual Business Inquiry Department at the Office for National Statistics. The data are the annual averages over 1995-2000 because the 2000 data are not yet available. The sub-industry growth rates were inputted for each individual employed or previously employed in that sub-industry
Scale Industry	These are scale intensive industries of employment or previous employment as defined by the OECD (1987). See Table 6.
Trade Openness	Trade openness is defined as imports+exports/GDP. Trade data were provided by the Annual Business Inquiry at the sub-industry level. Trade openness values were inputted for each individual employed or previously employed in that sub-industry. All years are calculated separately and individuals in the same sub-industry have the openness value. Trade values are in constant prices.
IIT	IIT is calculated using the standard Grubel and Lloyd index that measures the share of trade at the 3-digit level that is intra-industry in nature where GL=2*min(exports,imports)/imports+exports. The variable used in a dummy variable that takes the value of 1 if GL is greater than the average (0.83) and zero otherwise.
UMCIT	Calculated as the change in exports minus the change in the imports calculated as UMCIT=$\lvert \Delta exports - \Delta imports \rvert$ and measures the amount of unmatched (net) trade change that requires inter-industry factor reallocation. Trade values are in constant prices.

6. List of 3 digit SIC92 Sub-Industries. * denotes scale industries as defined by the OECD (1987) "Structural Adjustment and Economic Performance", Paris,1987

SIC92	*three digit industry codes*
15.1	Production, processing and preserving of meat and meat products
15.2	Processing and preserving of fish and fish products
15.3	Processing and preserving of fruit and vegetables
15.4	Manufacture of vegetable and animal oils and fats
15.5	Manufacture of dairy products
15.6	Manufacture of grain mill products, starches and starch products
15.7	Manufacture of prepared animal feeds
15.8	Manufacture of other food products
15.9	Manufacture of beverages
16.0	Manufacture of tobacco products
17.1	Preparation and spinning of textile fibres
17.2	Textile weaving
17.3	*Finishing of textiles (non-traded good, removed)*
17.4	Manufacture of made-up textile articles, except apparel
17.5	Manufacture of other textiles
17.6	Manufacture of knitted and crocheted fabrics
17.7	Manufacture of knitted and crocheted articles
18.1	Manufacture of leather clothes
18.2	Manufacture of wearing apparel and accessories
18.3	Dressing and dyeing of fur; manufacture of articles of fur
19.1	Tanning and dressing of leather
19.2	Manufacture of luggage, handbags and the like, saddlery and harness
19.3	Manufacture of footwear
20.1	Sawmilling and planing of wood, impregnation of wood
20.2	Manufacture of veneer sheets; manufacture of plywood, laminboard, particle board, fibre board and other panels and boards
20.3	Manufacture of builders' carpentry and joinery
20.4	Manufacture of wooden containers
20.5	Manufacture of other wood products; manufacture of articles of cork, straw and plaiting materials
21.1	Manufacture of pulp, paper and paperboard
21.2	Manufacture of articles of paper and paperboard
22.1	Publishing
22.2	**Printing and service activities related to printing ***
22.3	***Reproduction of recorded media * (non traded good, removed)***

23.1	Manufacture of coke oven products
23.2	Manufacture of refined petroleum products
23.3	Processing of nuclear fuel
24.1	Manufacture of basic chemicals
24.2	Manufacture of pesticides and other agro-chemical products
24.3	Manufacture of paints, varnishes and similar coatings, printing ink and mastics
24.4	Manufacture of pharmaceuticals, medicinal chemicals and botanical products
24.5	Manufacture of soap and detergents, cleaning preparations, perfumes and toilet preparations
24.6	Manufacture of other chemical products
24.7	Manufacture of man-made fibres
25.1	**Manufacture of rubber products ***
25.2	**Manufacture of plastic products ***
26.1	**Manufacture of glass and glass products ***
26.2	**Manufacture of non-refractory ceramic goods other than for construction purposes; manufacture of refractoryceramic products ***
26.3	**Manufacture of ceramic tiles and flags ***
26.4	Manufacture of bricks, tiles and construction products, in baked clay
26.5	Manufacture of cement, lime and plaster
26.6	Manufacture of articles of concrete, plaster and cement
26.7	Cutting, shaping and finishing of stone
26.8	Manufacture of other non-metallic mineral products
27.1	**Manufacture of basic iron and steel and of ferro-alloys (ECSC) ***
27.2	**Manufacture of tubes ***
27.3	**Other first processing of iron and steel and production of non-ECSC ferro-alloys ***
27.4	Manufacture of basic precious and non-ferrous metals
27.5	***Casting of metals * (non traded good, removed)***
28.1	**Manufacture of structural metal products ***
28.2	**Manufacture of tanks, reservoirs and containers of metal; manufacture of central heating radiators and boilers ***
28.3	**Manufacture of steam generators, except central heating hot water boilers ***
28.4	***Forging, pressing, stamping, roll forming metal; powder metallurgy*(non traded good, removed)***
28.5	***Treatment and coating of metals; general mechanical engineering * (non traded good, removed)***
28.6	**Manufacture of cutlery, tools and general hardware ***
28.7	**Manufacture of other fabricated metal products ***
29.1	Manufacture of machinery for the production and use of mechanical power, except aircraft, vehicle and cycle engines
29.2	Manufacture of other general purpose machinery
29.3	Manufacture of agricultural and forestry machinery
29.4	Manufacture of machine tools
29.5	Manufacture of other special purpose machinery
29.6	Manufacture of weapons and ammunition
29.7	Manufacture of domestic appliances not elsewhere classified
30.0	Manufacture of office machinery and computers
31.1	Manufacture of electric motors, generators and transformers
31.2	Manufacture of electricity distribution and control apparatus
31.3	Manufacture of insulated wire and cable
31.4	Manufacture of accumulators, primary cells and primary batteries
31.5	Manufacture of lighting equipment and electric lamps
31.6	Manufacture of electrical equipment not elsewhere
32.1	Manufacture of electronic valves and tubes and other electronic components
32.2	Manufacture of television and radio transmitters and apparatus for telephony and line telegraphy
32.3	Manufacture of television and radio receivers, sound or video recording or reproducing apparatus and associated goods
33.1	Manufacture of medical and surgical equipment and orthopaedic appliances
33.2	Manufacture of instruments and appliances for measuring, checking, testing, navigating and other purposes, except industrial process control equipment
33.3	*Manufacture of industrial process control equipment (non traded good, removed)*
33.4	Manufacture of optical instruments and photographic equipment

33.5	Manufacture of watches and clocks
34.1	**Manufacture of motor vehicles ***
34.2	**Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers/semi-trailers***
34.3	**Manufacture of parts and accessories for motor vehicles and their engines ***
35.1	**Building and repairing of ships and boats ***
35.2	**Manufacture of railway and tramway locomotives and rolling stock ***
35.3	Manufacture of aircraft and spacecraft
35.4	**Manufacture of motorcycles and bicycles ***
35.5	**Manufacture of other transport equipment not elsewhere classified ***
36.1	Manufacture of furniture
36.2	Manufacture of jewellery and related articles
36.3	Manufacture of musical instruments
36.4	Manufacture of sports goods
36.5	Manufacture of games and toys
36.6	Miscellaneous manufacturing not elsewhere classified
37.1	*Recycling of metal waste and scrap (non traded sector, removed)*
37.2	*Recycling of non-metal waste and scrap (non traded sector, removed)*

Appendix 3

Intra-sectoral mobility Logit, *QLFS* 1995-2000.
Dependant variable=1 if the individual has changed firm or sub-industry (at the 3-digit level) or industry (at the 2-digit level) in the 12 months prior to the survey, and zero otherwise

Variable	Coefficient (Standard Error)	Marginal Effect
Age	-0.066 (0.012)*	-0.0040
Age Squared	0.0004 (0.0001)*	0.00002
Female	-0.097 (0.089)	-0.0057
Child	-0.044 (0.050)	-0.0026
Single	-0.152 (0.056)*	-0.0088
Divorced	-0.037 (0.071)	-0.0022
Midlands	0.162 (0.099)	0.0101
South East	-0.069 (0.098)	-0.0040
South West	-0.004 (0.087)	-0.0002
Home Owner	-0.288 (0.071)*	-0.0189
Foreign Born	0.124 (0.068)**	0.0078
Highest Qualification: Higher	0.266 (0.108)*	0.0173
Highest Qualification: Further	0.265 (0.137)*	0.0173
Highest Qualification: Other	0.146 (0.058)*	0.0088
Skilled Manager	-0.008 (0.072)	-0.0005
Semi-Skilled Manager	0.075 (0.162)	0.0046
Semi-Skilled Professional	-0.205 (0.120)	-0.0113
Clerical/Secretarial	-0.149 (0.078)**	-0.0085
Craft/Trade	-0.026 (0.150)	-0.0015
Personal/Security	-0.245 (0.237)	-0.0132
Semi-Skilled Sales	0.559 (0.111)*	0.0425
Manual Sales	0.375 (0.165)*	0.0265
Plant Operator	0.064 (0.078)	0.0039
Other Manual	0.093 (0.091)	0.0058
Union Share	0.437 (0.994)	0.0263
Relative Average Industry Pay	0.324 (0.571)	0.0194
Relative Unemployment Rate	0.205 (0.316)	0.0123
Annual Growth in GVA	0.004 (0.009)	0.0002
Scale industry	0.468 (0.353)	0.0281
Trade Openness	0.001 (0.0003)**	0.00003
High IIT	0.404 (0.233)	0.0235
UMCIT	-0.001 (0.0003)	-0.0000
Year 1996	-0.002 (0.122)	-0.0001
Year 1997	0.033 (0.173)	0.0020
Year 1998	0.064 (0.223)	0.0039
Year 1999	0.055 (0.209)	0.0034
Year 2000	0.120 (0.229)	0.0075
Constant	-1.768 (0.704)*	
N	55368	
Pseudo R Squared	0.0373	

Notes: Source: *QLFS* 1995-2000
Standard errors in parentheses.
* Denotes statistical significance at the 5% level.
** Denotes statistical significance at the 10% level.