

TRADE UNIONS IN AN ERA OF GLOBALISATION

by

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Abstract

The objectives of this thesis are twofold. First, to investigate the link between foreign competition and the decline of unionisation in Britain during the 1980s and early 1990s. Second, to examine the impact of international trade on the wage bargaining strength of trade unions as measured by the union wage gap of individual workers.

The study focuses primarily on the manufacturing sector given that it has suffered the heaviest decline in unionisation and is the most tradable and open sector of the UK economy. An important aspect of the thesis is the data used. The empirical analyses are carried out using labour market information from large individual and firm level surveys such as the New Earnings Survey Panel Dataset and the Workplace Industrial Relations Survey matched with industry trade data compiled from the OECD's International Trade by Commodities Statistics.

The results demonstrate that foreign competition had, at most, a weak impact on the extent of unionisation in UK manufacturing. It seems more likely that the anti-union policy pursued by Thatcher's Conservative Government restricted the exercise of union power whilst providing employers with the opportunity to reaffirm their prerogatives and marginalize the union movement. On the other hand, we do find that increased openness to international trade served to moderate union wage demands during the 1980s. Although, it would appear that the disciplining effect of foreign competition diminished over time as the union mark up was not adversely affected towards the mid-1990s.

1

Introduction

The British industrial relations landscape of the post-war period changed dramatically in the closing decades of the 20th century following an unprecedented decline of trade union presence and influence at the workplace. Aggregate membership density fell from 53% in 1980 to 29% in 1999, reflecting a loss in excess of five and a half million union members. There was a steady collapse of the collective bargaining process as the proportion of establishments recognising trade unions for bargaining purposes dropped from 64% in 1980 to 42% in 1998 (Millward et al., 2000) and coverage¹ by major union agreements fell from 48% to 29% between 1980 and 1995.

A number of explanations have been put forward for declining unionisation in the UK. Business cycle models (Bain and Elsheikh, 1976; Booth, 1983; Carruth & Disney, 1988) contend that the rise in real earnings, particularly amongst white-collar workers, and the high levels of unemployment that accompanied the economic recession of the early 1980s were not conducive to the union movement. Similarly, anti-union legislative and public policy changes introduced by Thatcher's Conservative Government is also blamed for the decline of trade unions (Freeman

¹ Computed from the New Earnings Survey Panel Dataset.

and Pelletier, 1990). Other common explanations include structural changes in the economy such as the shift in employment from traditional union strongholds in manufacturing to the less unionised service sector, privatisation and an increased prominence of small firms (Towers, 1989; Green, 1992; Millward et al., 2000). Changes in the composition of the labour force, with a greater participation of part-timers, female and youths, are also believed to have been a contributory factor (Towers, 1989; Green, 1992). Furthermore, empirical evidence points to the failure of trade unions to achieve recognition in newer plants established after 1980 as an important factor explaining the decline of union presence and influence at the workplace (Disney et al., 1995; 1996; Machin, 2000). This could be due to increased employer resistance and weak organising efforts by trade unions, which in turn, may have been motivated by greater product market competition (Machin, 2000) and rising foreign competition during the 1980s and 1990s.

In fact, international trade and investment have grown consistently faster than the world economy in recent decades as a consequence of the globalisation process. Driven by lower costs of transportation, better communication systems and the removal of major barriers to trade, globalisation has led to greater integration of world economies and an intensification of foreign competition in the product market. The escalation of international competition in Britain is particularly pronounced in the manufacturing sector, where the share of foreign goods in domestic demand has risen from 26% in 1980 to 34% in 1990 and over 40% in 1995.

The aim of this thesis is to examine the implications of trade openness for labour unions in the UK. Because foreign competition may affect both the extent of

unionisation and the bargaining strength of unions, the study provides an empirical assessment of:

1. the role of foreign competition in explaining the decline of trade unions during the 1980s and early 1990s and;
2. the effect of international competition on the union wage gap of individual workers.

No previous empirical study looks at the relationship between international trade and unionisation in Britain while the evidence from UK data on the influence of foreign competition on union wage bargaining is very sparse.

Our study focuses primarily on the manufacturing sector given that it has suffered the heaviest decline² in unionisation and is the most tradable and open sector of the UK economy. An important aspect of the thesis is the data used. The empirical analyses are carried out using labour market information from large individual and firm level surveys such as the New Earnings Survey Panel Dataset (NESPD) and the Workplace Industrial Relations Survey (WIRS) matched with 4 digit SIC industry-level trade data compiled from the OECD's International Trade by Commodities Statistics (ITCS).

The structure of the thesis is as follows. Chapter 2 explains the economic theory of trade unions in an open economy context. We consider the different channels through which international trade may influence union bargaining. Theory suggests that

² The proportion of manufacturing workplaces with union members fell from 77% in 1980 to 42% in 1998 compared to a decline from 50% to 35% over the same period in private services. Union recognition in manufacturing declined from 65% to 30% between 1980 and 1998. The corresponding figures for services are 41% and 23% (Millward et al., 2000).

increased foreign competition is likely to reduce union employment but the impact on the union mark up is less clear-cut, depending on parameters such as factor shares and the elasticity of substitution between labour and capital. Using these theoretical predictions, we then infer the effect of foreign competition on the extent of unionisation.

Chapter 3 investigates the empirical link between industry coverage of collective bargaining agreements and import competition in the product market. We distinguish between the compositional and non-compositional impact of foreign competition on union coverage. Import penetration may lead to a change in industry composition, shifting employment from the highly unionised industries to the least unionised ones (the compositional effect) while, at the same time, causing particular sectors to become intrinsically less unionised, irrespective of any shifts in industry composition (the non-compositional effect). Hence, the empirical strategy involves the use of a basic shift share analysis to quantify the decline in coverage caused by foreign competition altering the employment composition of manufacturing industries. The non-compositional effect of import competition is examined through a multivariate econometric model that includes controls for some of the main hypotheses explaining union decline in the UK. The analysis uses 4-digit industry-level data on national union coverage from the NESPD matched with industry trade variables for UK manufacturing during the period 1983-95.

Chapter 4 provides further evidence on the relationship between unionisation and openness. It examines the influence of foreign competition on the probability of trade unions achieving recognition at the workplace, using establishment-level data from

WIRS. It extends the industry-level analysis in chapter 3 as follows. First, the use of establishment-level data enables one to capture the micro-processes behind the impact of foreign competition on trade union presence and influence at the workplace. Second, the union measure here comprises all types of bargaining agreements and not just major agreements. Third, the chapter not only considers foreign competition at current time but also at (or around) the establishment set-up date. In essence, we test the hypothesis that trade unions are less likely to gain recognition where firms are faced with international competition in the product market using three different measures of foreign competition. The first is created from management responses to a question in WIRS regarding whether the firm operates in international markets. Since firms operating primarily in international markets have to compete with foreign rivals, this serves as a fitting basis on which the influence of foreign competition on union recognition can be analysed. The second measure relates to industry trade variables at current time, i.e. at the relevant year of survey. Thirdly, it is argued that the probability of recognition may depend on product market conditions around the establishment set-up date (Disney et al. 1995, 1996). This is captured by age-dated trade measures of foreign competition.

The second objective of the thesis is to examine how international competition affects the wage bargaining strength of trade unions. In this context, chapter 5 matches individual earnings and union status from the NESPD with industry trade variables such as to analyse the influence of foreign competition on the union wage gap of British manufacturing workers during the period 1982 to 1995. Because of the endogenous selection of union status by workers, different estimation techniques are used such as to reach a better assessment of the true effect of openness on the union

mark up. Given the long time series of the dataset, it is also possible to describe the movement of the foreign competition effect on union wage setting over time. In addition, we consider the case of blue-collar and white-collar workers separately since international competition and union bargaining are likely to have dissimilar implications for the wages of the skilled and unskilled.

Finally, chapter 6 summarises the main empirical results and offers some avenues for future research.

2

The Theory of Trade Unions In An Open Economy

2-1 Introduction

The process of globalisation, driven by lower transport costs, technological advances and political measures designed to unilaterally reduce man-made barriers to trade, has led to a closer integration of world economies, enabling a freer movement of goods, services, capital and people. The scale of the changes witnessed in recent years has inevitably sparked an ongoing debate about the likely economic outcomes of a global market and at the heart of these discussions lies the effect of international trade liberalisation and expansion on labour. In fact, increased imports from newly industrialised and low wage countries and a greater exchange of similar goods between the major developed economies have led to rising foreign competition in the product market. It has, in turn, motivated the outsourcing of activities to cheaper locations as firms seek to remain competitive. What are the implications of these developments for the bargaining abilities of trade unions and for the union movement itself?

To examine these issues, this chapter considers the specific theory of trade unions in the context of an open¹ economy. We separate the impact of trade on union bargaining into two channels. First, product market/rent sharing models suggest that foreign competition may influence union bargaining strength by changing the degree of competition in the industry and the profits/quasi-rents² available to be shared between unions and firms. This is explained in section 2-2. Second, in section 2-3, we examine how international trade may alter the strategic behaviour of trade unions in the sense that they can make trade-offs between wages and employment when faced with foreign competition in the product market. Then, drawing from the model predictions, section 2-4 explores the effect of foreign competition on the extent of unionisation. Finally, section 2-5 concludes.

2-2 Product market models

The relationship between foreign competition and union bargaining can be analysed within a product market or rent sharing model whereby international trade influences union bargaining through increased competition in the product market and reduced profitability or quasi-rents. In Layard et al.'s (1991) model, bargaining is over wages only while employment is set unilaterally by the firm. The union's utility function is linear in wages (i.e. union members are risk neutral),

$$U = Lw + (m - L)r \tag{1}$$

¹ For a review of the theory of trade unions in the closed economy see Oswald (1985), Ulph and Ulph, (1990) and Booth (1995).

² Abowd and Farber (1990) define quasi-rents as revenue minus material and labour costs.

where w is the union wage and r is the alternative wage earned from employment in the non-union sector. L and m are union employment and membership levels respectively.

The firm's profit function is

$$\pi = pf[L(w)] - wL(w) - k \quad (2)$$

where p is the product price, $f[.]$ is the production function, w is the wage rate and k is fixed capital costs. Assuming zero fallback profit for the firm in the event of a strike, the resulting union wage gap from the maximisation of the generalised Nash bargain can be written as

$$\frac{w - r}{w} = \frac{1}{\varepsilon} + \frac{\alpha\pi}{(1 - \alpha)wL} \quad (3)$$

The parameter α is the relative bargaining strength of the trade union and ε is the elasticity of labour demand. Equation (3) also expresses the union wage differential as a positive function of profits/quasi-rents (π), indicating that the union is able to achieve a higher mark-up the greater the level of profit earned by the firm.

Suppose product demand is determined by a constant elasticity of substitution (CES) function, $q = p^{-\eta}$, where p is price and η is the price elasticity of product demand and, the production function is Cobb Douglas, $q = L^\lambda K^{1-\lambda}$, where λ represents labour share. Profit maximisation now implies

$$\begin{aligned}
\text{Max}_w \pi &= pq - wL - k \\
&= q^\kappa - wL - k \\
&= [L^\lambda K^{1-\lambda}]^\kappa - wL - k
\end{aligned} \tag{4}$$

where $\kappa = 1 - 1/\eta$. κ is the product market competition parameter and shows that the higher the degree of competition in the product market, the greater the elasticity of product demand.

Solving the first order condition from (4) yields $q^\kappa = \frac{wL}{\lambda\kappa}$ such that the firm's profit function (ignoring capital costs) in the short run becomes

$$\pi = \frac{wL}{\lambda\kappa} - wL \tag{5}$$

It implies that profit is inversely related to product market competition. Rearranging equation (5) as $\frac{\pi}{wL} = \frac{1 - \lambda\kappa}{\lambda\kappa}$ and substituting in (3) generates the following expression for the union wage differential,

$$\frac{w - r}{w} = \frac{1}{\varepsilon} + \frac{\alpha(1 - \lambda\kappa)}{(1 - \alpha)\lambda\kappa} \tag{6}$$

Equation (6) shows that the union wage gap depends on union power (α), the elasticity of labour demand (ε), labour intensity (λ) and product market competition (κ). As such, the underlying implication of Layard et al.'s analysis is that increased

foreign competition in the product market may serve to reduce the union mark up through a decrease in the amount of quasi-rents available to be shared between the union and the firm.

Vandenbussche and Konings (1998) examine the impact of international competition on union wages in terms of a change in the domestic product market structure. They consider a domestic unionised monopoly firm employing one unit of labour (L) to produce one unit of a homogenous good X . The production function is $Q=L$ and product demand is given by a linear function of the form $P(Q) = a - bQ$, where Q is the monopolist's output. Using the production and demand functions, the firm's profit is given by

$$\pi = \frac{(a - w)^2}{4b} \quad (7)$$

where w is domestic union wages. The union's utility depends on both wages (w) and employment (L),

$$U(w, L) = (w - w_a)^\theta L \quad (8)$$

w_a is the alternative wage and θ is a parameter of wage preference. Since there is no production in case of conflict between the firm and the union the threat points of the two parties are zero. Hence, with no trade, maximisation of the Nash bargain yields the equilibrium union wage (w^m) and union employment (L^m),

$$w^m = \frac{a\beta}{2} \quad (9)$$

$$L^m = \frac{a(2 - \beta)}{3b} \quad (10)$$

where β is the relative bargaining strength of the trade union.

International competition in the form of a foreign firm exporting to the domestic market may erode some of the monopoly power of the domestic firm and influence national wage negotiations and employment. Assuming the domestic and foreign firms engage in Cournot competition, equilibrium output and the profit of the domestic firm will depend on the given foreign wage rate (w_2). It can be shown that under competitive conditions the union wage (w_1) and employment (L_1) are determined by

$$w_1 = \frac{\beta(a + w_2)}{4} \quad (11)$$

$$L_1 = \frac{(a + w_2)(2 - \beta)}{6b} \quad (12)$$

From equation (11) if $w_2 = a$, foreign wage is too high to allow import penetration in the domestic market and the equilibrium wage and employment are equal to those under monopoly. For $a > w_2 \geq 0$ there is international competition in the domestic market. The firm's market share decreases and as a consequence the domestic union's wage is reduced (since $w_1 < w^m$). The effect of import competition on domestic union employment depends on both the foreign wage and the bargaining

strength of the trade union. Foreign competition in the domestic market is likely to result in job losses, especially under weak union power.

2-3 International trade and the strategic behaviour of trade unions

The product market models do not fully capture the strategic behaviour of trade unions. In face of foreign competition, unions may typically trade off wages for employment or vice versa. And so the predictions about the outcomes of union bargaining in an open economy context may not be clear-cut.

2-3-1 Foreign competition and union behaviour

Hill (1984) examines union behaviour in response to import competition within a general equilibrium trade model. He assumes an open economy with two sectors: a unionised import-competing sector 1 and a non-union, non import-competing sector 2. The unionised industry is made up of perfectly competitive firms which take the price level as given and use only labour (L) and capital (K) to produce good 1, an imperfect substitute for imports. The union takes into account the trade-off between the union wage and union employment and chooses the optimal wage-employment policy by

$$Max \frac{L_1}{M} U\left\{\frac{w_1(L_1)}{c(p)}\right\} + \frac{M-L_1}{M} U\left\{\frac{w_2}{c(p)}\right\} \quad (13)$$

subject to $L_I \leq M$, where M is union membership, L_I is union employment; w_1 and w_2 are the union and non-union wages respectively; p is the relative price of commodity 1 and $c(p)$ is a cost of living index; $\frac{L_1}{M}$ is the probability of finding a union job and $\frac{M-L_1}{M}$ is the probability of being employed elsewhere.

Assuming union members are risk neutral, the optimal union wage gap is derived as function of the elasticity of demand for union labour (η),

$$\frac{w_1}{w_2} = \frac{\eta}{\eta-1} \quad (14)$$

$\eta = \sigma_l / \theta_{k_1}$ where σ_l and θ_{k_1} are the elasticity of factor substitution and the share of capital in the union sector.

The change in the union wage gap from differentiating (14) is obtained as

$$\hat{w}_1 - \hat{w}_2 = \left(\frac{\sigma_1 - 1}{\sigma_1 - \theta_{K_1}} \right) \theta_{K_1} \theta_{L_1} (\hat{w}_1 - \hat{r}_1) \equiv \omega (\hat{w}_1 - \hat{r}_1) \quad (15)$$

where r_l is the return to capital and θ_{L_1} is the share of labour in sector 1. ω is the elasticity of the union differential with respect to the wage-rental ratio. This depends on σ_l . For instance, $\omega < 0$ when $\sigma_l < 1$ and $\omega > 0$ when $\sigma_l > 1$. As such, equation (15) expresses the percentage change in the union wage gap ($\hat{w}_1 - \hat{w}_2$) as a function of the

elasticity of factor substitution (σ_I) and the percentage change in relative factor prices ($\hat{w}_1 - \hat{r}_1$) in the unionised sector.

The model assumes sector-specific capital and that wages and capital rents can only vary in response to changes in commodity prices. Thus, taking the product price in sector 2 as the numeraire and \hat{p} as the percentage change in the relative price of the union good, the relationship between product prices and factor prices can be written as

$$\theta_{L_1} \hat{w}_1 + \theta_{K_1} \hat{r}_1 = \hat{p} \quad (16)$$

$$\theta_{L_2} \hat{w}_2 + \theta_{K_2} \hat{r}_2 = 0 \quad (17)$$

To see how the model works, consider an increase in import competition. This reduces the relative price of the import-competing union good (p) and factor prices in the union sector. Labour is redistributed from the union sector 1 to sector 2. The marginal product of labour in the non-union sector decreases and consequently, so does the non-union wage. However, the union mark up (determined by the change in union wages relative to non-union wages) will depend on the value of the elasticity of factor substitution (σ_I) and factor intensity in the union sector. If sector 1 is capital intensive, the decline in product price will lead to a drop in the rental rate of capital (r_I) relative to the union wage (w_I) causing the wage-rental ratio in the union sector ($\hat{w}_1 - \hat{r}_1$) to rise. Supposing the elasticity of factor substitution is less than unity ($\sigma_I < 1$), from equation (15) it follows that union wage gap decreases (since ($\hat{w}_1 - \hat{w}_2$) is negative).

Intuitively, the relative decline in the cost of capital serves to lower the capital share (θ_{k_1}) and increase the elasticity of labour demand (η) in the unionised sector. Therefore, the union wage differential is lowered. But, for a higher elasticity of factor substitution in sector 1 ($\sigma_1 > 1$), the wage differential will rise in response to an intensification of international competition. This is because unionised firms can substitute relatively cheap capital for labour. As capital's share increases, the union labour demand elasticity falls and the trade union is in a better position to bargain for higher wages. Opposite results are expected where production of the import competing good is relatively more labour intensive.

Hill subsequently extends the model to accommodate perfect capital mobility between the two sectors, thereby allowing the economy to move towards a long run equilibrium state characterised by equal rental rates of capital, unit cost equal to the price of each commodity and full employment of both labour and capital. The main short run conclusions from the specific-factors model are preserved and union response to import penetration is dependent on the characteristics of the unionised industry, particularly with regards to the elasticity of substitution between capital and labour and the factor intensities. Hill's predictions are summarised in table 2.1 below.

Table 2.1: Effect of an increase in foreign competition on the union wage mark up

<i>Union Sector</i>	Capital intensive	Labour intensive
Factor substitution > 1	Increase	Decrease
Factor substitution < 1	Decrease	Increase

Unlike Hill, Lawrence and Lawrence (1985) use a partial equilibrium framework to illustrate the effect of foreign competition on union bargaining and model the trade impact in terms of a demand shock rather than a change in relative prices. They assume production in the unionised import-competing industry is organised according to the CES technology with labour and sector-specific, long-lived capital as the only factors of production. The union wage is determined by the maximisation of an aggregate union welfare function subject to the industry's derived demand for labour. The optimum condition is obtained as

$$\frac{U'(w_1)w_1}{U(w_1) - U(w_2)} = \varepsilon \quad (18)$$

where $\varepsilon \equiv \sigma(1 - \theta_L) + \theta_L \beta$

w_1 and w_2 are the union and reservation wage rates. ε is the elasticity of labour demand, expressed as a function of the elasticities of product demand (β), factor substitution (σ) and the share of labour (θ_L) in the union sector.

Lawrence and Lawrence argue that the change in union wages following an import-induced downward shift in product demand can be divided into two stages. First, the demand shock may lead to permanent capacity³ reductions or a decline in capacity growth. In both cases, the elasticity of substitution between labour and capital and the elasticity of derived demand for labour are significantly reduced. This is referred

³ Lawrence and Lawrence (1985) refer to the permanent reduction in capacity as the end-game and the decline in capacity growth as the slow game.

to as the elasticity or substitution effect. Second, there is a contraction or demand effect which shifts the labour demand curve to the left, as a result of the fall in the product demand per se. The elasticity effect alone pushes unions to raise wages and the more industry-specific or long-lived capital is, the greater the rise in union wages will be. The contraction effect, on the other hand, lowers union wages. Therefore, the wage outcome will depend on the strength of these two forces, although it can be shown that the elasticity effect will unambiguously dominate when the production technology is Cobb-Douglas (i.e. elasticity of substitution is equal to 1).

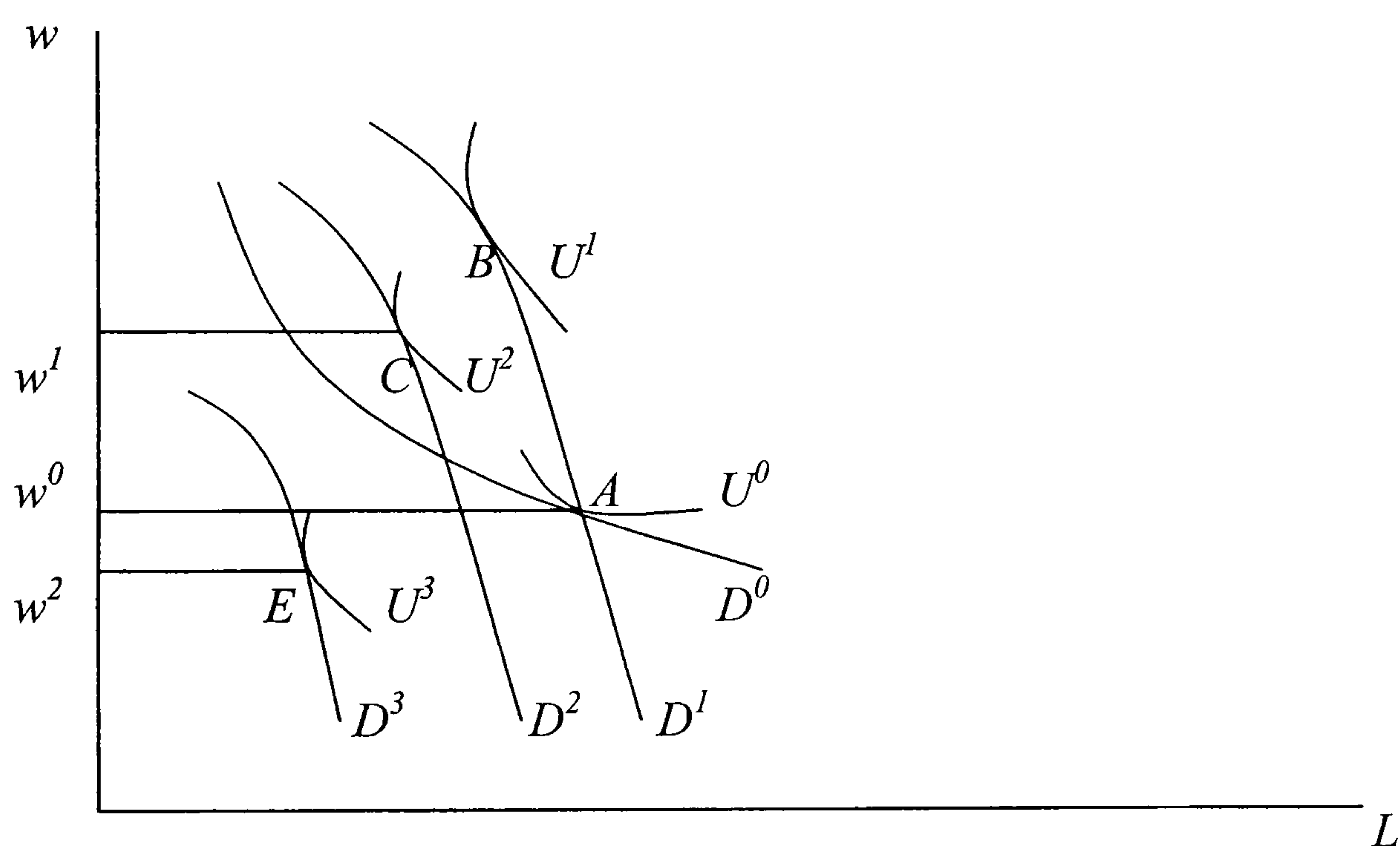


Figure 2.1: The elasticity and demand effects of international competition

Consider figure 2.1. Suppose the initial equilibrium is at point A . the elasticity effect of international competition is shown by the demand curve rotating from D^0 to D^1 . The demand effect shifts D^1 down to D^2 where a new equilibrium is obtained at C . Since the elasticity effect is greater than the demand effect, the corresponding union wage rate w^1 imply that trade unions are able to secure higher wages without a significant loss in employment. However, union wage demands are ultimately

bounded by a shut down point. As competition from imports gets more intense, a sequence of declines in demand could threaten plants with closure. Unions would then be forced to accept lower negotiated wages. This is illustrated by the equilibrium point E . Note that the trade shock unequivocally reduces the level of union employment in the industry. Table 2.2 summarises Lawrence and Lawrence's main predictions.

Table 2.2: Effect of declining demand for domestic product due to import competition

	Employment	Union wage
Elasticity effect > Demand effect	Fall	Rise
Demand effect > Elasticity effect	Fall	Fall

Staiger (1988) also examines the relationship between union behaviour and declining demand in the union sector due to foreign competition. His analysis differs from Lawrence and Lawrence (1985) to the extent that it is based on a two-country, three-sector general equilibrium model and considers a range of heterogeneous union goods rather than a single homogenous product. In the domestic country, sector 1 is an import-competing union sector, producing commodities heterogeneous in labour intensity. Sector 2 uses non-union labour and capital in fixed proportions to produce a composite good and sector 3 produces an intermediate good using only non-union labour. The wage rate in sector 1 is set by a single rent maximising union. Domestic union rents are written as

$$\Pi(w) = (w - \bar{w})L(w) \quad (19)$$

where w and \bar{w} are the union and non-union wages respectively. $L(w)$ is union employment. The first order condition of the union maximisation problem yields an optimal union mark up (ρ),

$$\rho = \frac{1}{\eta} \quad (20)$$

η is the elasticity of the derived demand for domestic union labour, which will be determined by changes in the demand for each union good and changes in the scope of domestic production.

Assuming there is no technological cost advantage between the two countries, the only basis for trade is the existence of a domestic union wage premium. With free trade, the availability of cheap imports causes a reduction in the demand for the domestically produced union goods. It is the most labour intensive goods that are worst hit by foreign competition. Since labour costs at home are relatively high, labour intensive domestic firms cannot compete in the product market. And so, as the production of the marginal or relatively more labour intensive products is lost to foreign rivals and the domestic import-competing union sector eventually tends to specialise in the least labour intensive range of union products. Thus, the scope of domestic production is reduced leading to a higher elasticity of the derived union labour demand and lower union wage demands. Further, as idle resources from the union sector are reallocated to the non-union sector, a greater demand for the services of domestic non-union labour is generated, thereby raising the non-union wage. So the union wage mark up decreases. However, there will be a decline in the average labour intensity of production in the union sector as the most labour

intensive production is shifted abroad. This serves to reduce the elasticity of derived demand for union labour such that it is possible for the rent maximising union to raise its mark up. Therefore, the overall impact of foreign competition on the union wage differential depends on the strengths of these two effects.

The implications of the model for union employment is less ambiguous to the extent that a reduction in the domestic scope of production due to foreign competition leads to lower employment for union labour. Table 2.3 sums up the main predictions as follows.

Table 2.3: Foreign competition, the scope of production and union behaviour

	Employment	Union mark up
Foreign competition	Fall	Depends on the elasticity of demand for union labour following: <ol style="list-style-type: none"> change in scope of production change in labour intensity
$1 > 2$	Fall	Decline
$1 < 2$	Fall	Rise

Whilst Hill (1984), Lawrence and Lawrence (1985) and Staiger (1988) assume exogenous union membership, Grossman (1984) examines the implications of international competition in a formal model of endogenous membership and where the process of decision-making within the trade union is determined by the seniority system. He considers a small open economy with two tradable sectors. The nonunion sector uses labour alone to produce commodity X whereas the union sector requires labour and sector-specific capital to produce the union good Y . Employment in the

union sector is characterised by a lay-off and rehire rule based entirely on seniority. Union members are indexed by $i \in [0, L]$ where L is the size of the union. The index $i = 0$ represents the most senior member, $i = L$ is the least senior member and $i = L/2$ the median worker. All workers are aware of their relative ranking. The probability of employment for a union member with seniority index i is given by

$$\pi_i = pr[vmp(i) \geq w] \quad (21)$$

where vmp is the value of marginal product and w is the union wage demand. The union has monopoly power and sets wages by maximising the expected utility of the median member given by

$$U_{L/2} = \pi_{L/2} u(w) + (1 - \pi_{L/2}) u(r) \quad (22)$$

where $\pi_{L/2}$ is the probability of employment of the median worker and r is the reservation wage.

An intensification of foreign competition in the union sector raises the probability of the least senior workers being made redundant first. For a given union size, they will vote for a lower wage. But at the same time, international competition may cause the union to shrink (at a given wage) as the worsening conditions in the industry force workers to exit the union sector and seek for a more secured position elsewhere. Under the seniority rule, those who leave first are least senior and have the lowest wage demands. Thus, a more senior median worker emerges who may be less concerned with employment and vote for a higher wage demand.

For a flexible production technology with the elasticity of substitution between labour and capital greater than one, it is plausible that union wages will rise as the size of the union decreases. However, for very low elasticities of factor substitution and risk averse union members a large union could continue to exist, preferring to safeguard union jobs at the expense of wages. In these circumstances, the trade union could even expand with foreign competition. The Cobb-Douglas production function (the elasticity of factor substitution equal to unity) causes workers to simply move in and out of the union sector. Here the union wage is said to be sticky since it does not change with import competition. It follows that union wages and employment may either fall, rise or stay constant depending on the underlying production function in the industry. Table 2.4 shows the key conclusions from the Grossman (1984) model.

Table 2.4: Effect of foreign competition on union size, seniority, union wage and employment

	Union size	Median voter	Wage	Employment
$\sigma_1 > 1$	Small	More senior	Rise	Fall
$\sigma_1 < 1$	Large	Less senior	Decrease	Increase

Note: σ_1 denotes elasticity of factor substitution in the union sector

2-3-2 International competition, outsourcing and union bargaining

Foreign competition in the domestic market may also result in the outsourcing of activities to cheaper locations abroad by domestic firms seeking to remain competitive. Mezzetti & Dinopoulos (1991) analyse the bargaining outcome between a union and a domestic multinational firm where the latter has the option of shifting production to cheaper locations abroad in response to increased import competition.

They develop a simple partial equilibrium model of a unionised domestic firm competing with a foreign firm in the home market. Both firms use only labour to produce a homogeneous commodity. Domestic union wage and employment are determined by efficient Nash bargaining. The objective function of the labour union is given by

$$U(w, L) = (w - \bar{w})^\theta L^\gamma \quad (23)$$

where w is the union wage, \bar{w} is the non-union wage and L is employment in the union sector. The union cares for both employment and wages. It is wage oriented if $\theta > \gamma$.

Profits for the domestic firm are

$$\pi(x, y) = P(x + y)x - wx \quad (24)$$

where $P(\cdot)$ is the inverse demand function and x and y are the outputs of the home and foreign firms respectively. A bargaining disagreement produces zero levels of union utility and profits associated with no employment in the union sector so that the generalised Nash product is

$$G = [Px - wx]^{1-a} [(w - \bar{w})^\theta x^\gamma]^a \quad (25)$$

where a denotes the relative bargaining power of the union. The first order condition yields the negotiated wage,

$$w = (1-k)(P + xP') + kP \quad (26)$$

where k is a positive constant.

Now, suppose the home firm can credibly threaten to switch production abroad (at no cost⁴) if domestic labour costs are too high and it faces increased competition from imports in the product market. Then in the case of a conflict between the union and the firm the threat point of the union remains zero but by supplying the domestic market from abroad, the firm can earn a reservation profit,

$$\psi = P\hat{x} - w^*\hat{x} - t\hat{x} \quad (27)$$

where \hat{x} is the home firm's output when producing abroad, w^* is the foreign wage and t is a specific tariff imposed on goods when entering the domestic market. The generalised Nash bargain becomes

$$G = [Px - wx - \psi]^{1-a} [(w - \bar{w})^\theta x']^a \quad (28)$$

Maximising (28) with respect to x and w generates the bargained wage rate in the presence of a threat to shift production abroad,

$$w = (1-k)(P + xP') + k(P - \psi/x) \quad (29)$$

⁴ For instance, assuming the domestic firm already has production plants abroad.

Equation (29) above reveals a lower union wage compared to the negotiated wage level obtained in (23) when there is no threat of relocation. The model, therefore, implies that in face of foreign competition the domestic firm can improve its bargaining position vis a vis the trade union and reduce the bargained wage when it can credibly threaten of relocate abroad.

2-3-3 Distinguishing between one-way and two-way trade

According to Naylor (1998; 1999) unions may respond to increased openness in different ways depending on the nature of the prevailing trade regime, i.e. whether one-way (inter-industry) or two-way (intra-industry). Under one-way trade domestic firms face competition from imports but cannot export to foreign markets. Two-way trade indicates the presence of both import and export activities. Consider a domestic firm 1, organised by a monopoly union and, a non-unionised foreign firm 2. If trade costs (t) are initially prohibitive, both firms supply their respective markets. But as t falls, the domestic firm will face increasing competition from imports. When trade is only one-way, the implications for the union wage outcome can be explained as follows.

In figure 2.2, starting from the equilibrium point a , import penetration causes labour demand (L_d) to become more elastic and shifts it from L_d to L_{dl} . The union trades off wages (w) for employment (L) so that the equilibrium is at point b . However, further increases in import competition could eventually lead to plant closures reducing union wages even more as well as decreasing union employment. This is shown by the equilibrium point c .

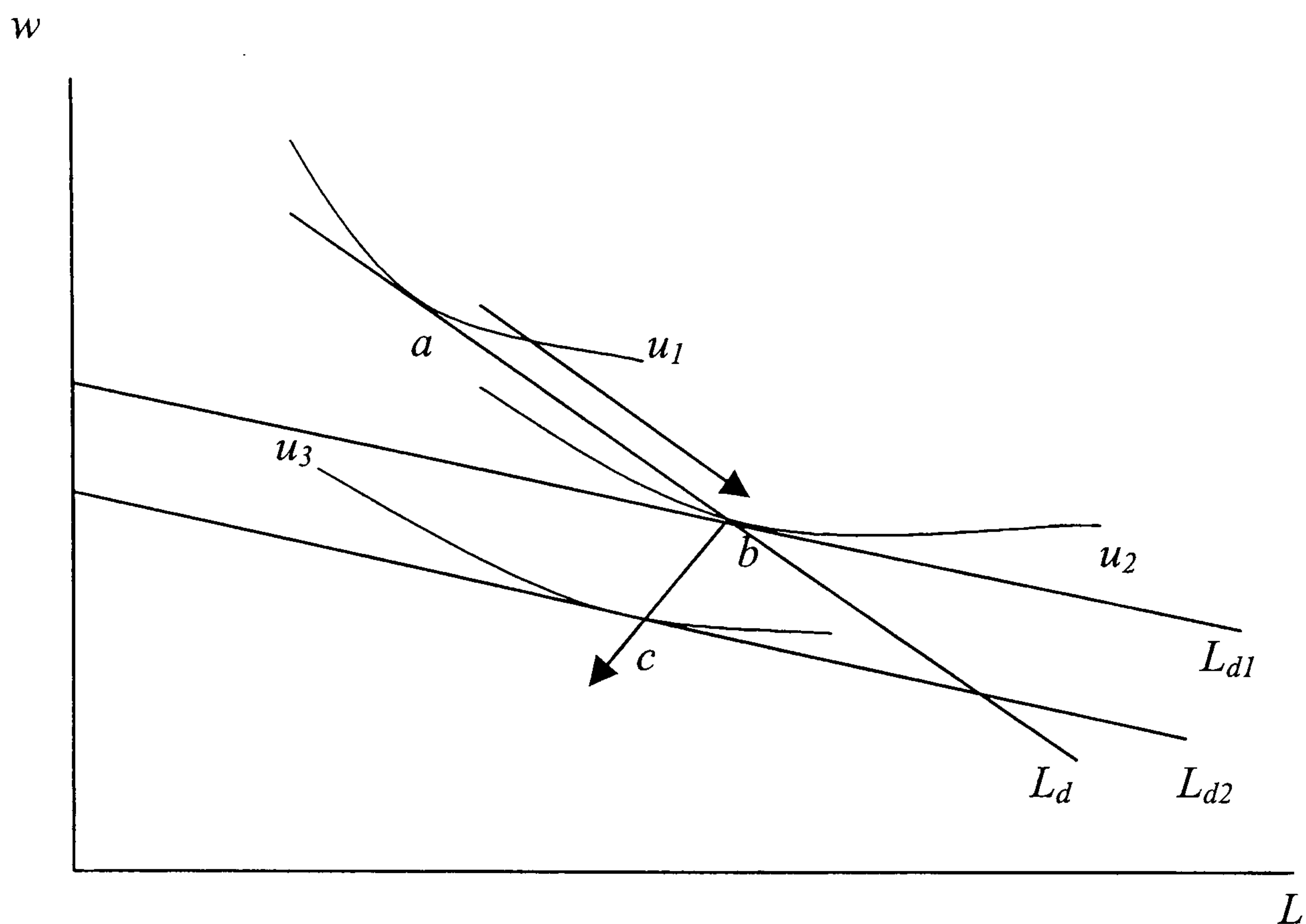


Figure 2.2: Union bargaining under one-way trade

Figure 2.3 illustrates the equilibrium union wage rate under two-way trade when firm 1 not only faces competition from abroad but can also export. The total amount of union labour demanded is derived from the demand for the firm's product arising from both domestic consumption and the export market. This particular feature produces a kink in the downward sloping total labour demand curve, with an upper inelastic portion and a lower more elastic segment. At high wages, the home firm does not export but at sufficiently low wages it is able to produce for home as well as foreign consumers. A fall in trade costs, from t to t^* increases foreign competition and reduces domestic demand for firm 1's product. However, if the rise in exports outweighs the fall in domestic demand, total labour demand will increase. Increased import competition causes the upper segment of the labour demand curve to shift to the left while the growth of exports shifts the lower part to the right. Assuming the union's preferred wage lies on the lower portion of the labour demand schedule, it is

possible for the monopoly union to raise the wage rate as shown by the equilibrium moving from e to e^* .

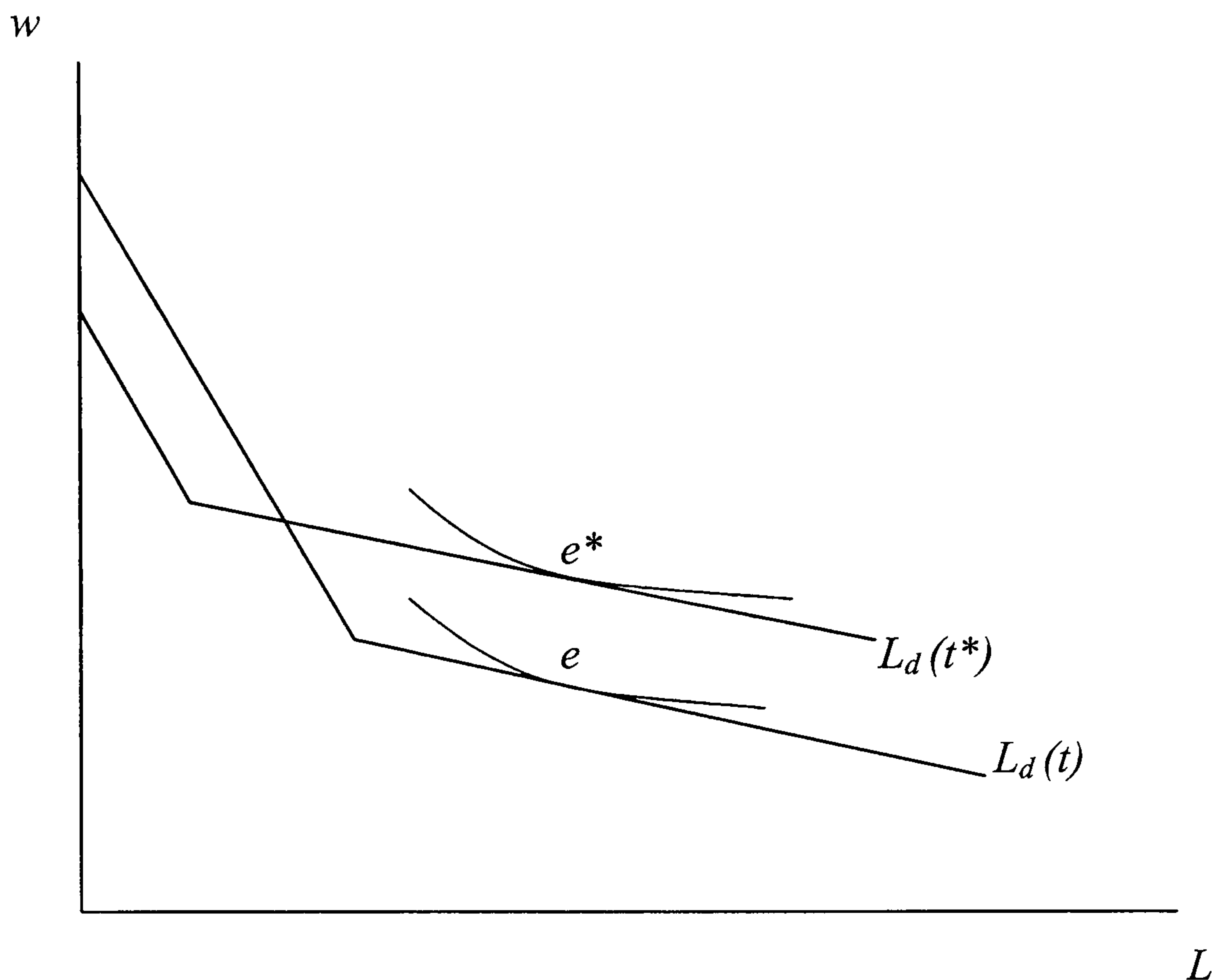


Figure 2.3: Equilibrium under two-way trade

Hence, it can be argued that increased openness enables labour unions in exporting firms to demand higher wages, whilst those in non-exporting establishments are likely to accept wage concessions.

2-3-4 Endogenous trade

Using the above model, Naylor (1999) argues that pattern of international trade is likely to be endogenous. Typically, the prevailing trade regime (i.e. whether one-way or two-way) is dependent upon the union wage strategies. For instance, if utility derived by the union under one-way trade is greater than that under two-way trade

($U^{one-way} > U^{two-way}$) the union chooses a high wage strategy. This does not allow the firm to compete in the export market and as a result, trade is of the inter-industry nature. On the other hand, when $U^{one-way} < U^{two-way}$ the union chooses a low wage strategy promoting two-way or intra-industry trade. The union is indifferent between the two regimes when $U^{one-way} = U^{two-way}$. It can be shown that this occurs at a critical initial level of trade cost (t_c). As such, if the actual level of trade cost exceeds the critical level ($t > t_c$), the utility associated with a high wage strategy is greater and so the union is concerned with selling exclusively to the home market. For low initial trade costs ($t < t_c$), the union chooses a low wage strategy enabling two-way trade to take place.

2-4 The effect of international competition on the extent of unionisation

Having explored the influence of openness on union bargaining, this section examines the implications of international competition for unionisation. Changes in the extent of unionisation can be analysed in terms of fluctuations in the supply of and demand for union representation (Abowd and Farber, 1982; Farber, 1983; Farber 1990). The simple supply-demand model assumes that unionisation is determined by two main factors: the level of worker demand for union representation and employer resistance to union organisation.

2-4-1 Foreign competition and the demand for union representation

The demand for union representation relates to the benefits of unionisation and is primarily governed by the union's ability or workers' perception of the union's ability to improve pay and conditions (Farber and Saks, 1980). It implies that workers' demand for union representation is a positive function of union wages. As such, it seems plausible that international competition may affect the attractiveness of unionism through its effect on the union-firm wage bargaining outcome. From section 2-2, the product market models of union bargaining suggest that foreign competition reduces union bargaining power and therefore, we expect a negative impact of trade on unionisation. However, as seen from the model predictions in section 2-3, when trade unions display strategic behaviours, much will depend on industry characteristics, in particular, factor intensities and the elasticity of substitution between labour and capital. The nature of the trade regime may also be important (Naylor, 1999). Under inter-industry trade, union wages and the demand for union representation are more likely to decline than under intra-industry trade. Similarly, if domestic firms have the option of shifting production abroad, trade unions may be forced to accept lower wages, thereby reducing the benefits of unionisation (Mezzetti and Dinopoulos, 1991).

Further, Grossman's (1984) analysis suggest that the underlying demand for unionisation amongst union workers may be positively related to their employment prospects. The worsening probability of employment in unionised industries hit by rising international competition may force workers out of the union sector in search

of more secured positions elsewhere. The extent of unionisation shrinks, *ceteris paribus*.

2-4-2 Foreign competition and employer resistance to unionisation

Employer resistance to unionisation aims at reducing the success of organising efforts by trade unions. It may take the form of positive labour relations, improving pay and conditions, providing union-like fringe benefits, increasing communication with workers and individualising the employee-employer rapport (Abowd and Farber, 1990). This is likely to reduce the demand for representation among union and nonunion workers. Employers may also implicitly or explicitly engage in unfair practices and lobbying designed to discourage worker interest in unions and undermine union organisation (Abowd and Farber, 1990; Farber, 1990). Therefore, as we explain below, foreign competition may decrease the opportunity and propensity to unionise by directly and indirectly increasing management incentives to oppose trade unions at the workplace.

Increased competition from abroad reduces profitability/quasi-rents and wears down the market power of domestic firms (Layard et al., 1991; Konings and Vandenbussche, 1998). As a consequence, firms may not be able to continue operating alongside rent-sharing trade unions (Abowd and Farber, 1990; Disney et al., 1996) especially if the latter can extract higher wages despite the declining industry demand caused by imports (Lawrence and Lawrence, 1985; Staiger, 1988). Hence, in the face of economic threat, employers may resist unions more strongly, reducing the likelihood of unionisation. On the other hand, it is possible that foreign

competition may induce unions to moderate their wage demands (as indicated by the model predictions in section 2.3). But this may lead to more resources being available for management to fight unionisation harder.

Foreign competition may also represent an indirect opportunity for employers to oppose trade unions through organisational changes. The pressure to compete internationally is a key factor motivating the restructuring of production and work systems. In general, the survival of domestic firms relies on the ability to reduce product development time and enhance innovation; improved performance and productivity; and a commitment to quality and flexibility that allows swift adjustments to market conditions (Committee on Techniques for the enhancement of Human Performance: Occupational Analysis, 1999). These factors would normally necessitate extensive reorganisations of the labour force along the following lines.

Improving functional flexibility. This requires employees to work within versatile and resourceful teams, engage in job rotation and multitasking as well as collaborating in problem solving. However, it can be detrimental to union organisation since management can seize the opportunity to enhance its control over the workforce and manipulate workers into associating themselves more closely to the cause and mission of the firm rather than that of labour unions.

Achieving numerical flexibility. Firms can adjust the size of the workforce and the number of hours worked. In particular, part-time, temporary and shift working arrangements can be introduced, targeting more female and youths participation. But part-timers, women and youths are less likely to be unionised. The use of capital

intensive technology can also play in favour of management as the scope of trade union influence in the production process would be considerably constrained.

On a wider note, since unions may cause efficiency losses (Kuhn, 1998), generate higher costs and lower profits (Addison & Hirsh, 1989), in times of increasing global competition firms, governments and the public in general may cultivate negative views toward labour unions and collective bargaining. Eventually, this could not only motivate adverse management policies against trade union representation at the workplace but also facilitate the introduction of anti-union legislation designed to weaken the whole process of collective bargaining.

2-5 Summary and Conclusion

This chapter has explored the implications of openness for union bargaining and the extent of unionisation. Product market models suggest that foreign competition reduces the bargaining abilities of trade unions by decreasing the level of quasi-rents and firms' market power in the domestic market. It is also argued that international trade may influence the strategic behaviour of unions to the extent that they can trade-off wages for employment or vice-versa. As a result, foreign competition may have a negative or positive impact on union wages, depending on factor shares and the elasticities of substitution between capital and labour in the import competing union sector. The effect of foreign competition on union employment is, however, less ambiguous and, in most cases, international competition seems likely to result in a decline in employment. We found that the existence of a threat to shift production abroad, in response to increased foreign competition in the domestic market, acts as a

significant restraint on union bargaining power. In addition, the effect of international trade on union bargaining may depend on the nature of the trade regime, i.e. one-way (inter-industry) and two-way (intra-industry). Under one-way trade, unions may choose to moderate their wage demands in order to protect employment while it is possible to raise wages under two-way trade, when both import and export activities take place. Besides, the pattern of trade may itself be endogenously determined by the wage policies adopted by trade unions. For instance, a high (low) union wage strategy promotes inter- (intra-) industry trade. This will have implications for any empirical estimation.

Given the predictions from the models of international trade and union bargaining, the second part of the chapter inferred the effect of foreign competition on unionisation through a simple supply-demand model. Two important determinants of unionisation are the demand for union representation and employer opposition to trade unions at the workplace. As such, foreign competition may influence the demand for union representation by altering the bargained wage rate and the employment prospects of workers in the union sector. It may also impact upon employer resistance to union organising both directly, via changes in profitability and indirectly, as a result of the restructuring of production and work systems.

Thus, in theory there may be a link between openness to international trade and the extent of unionisation. If so, could rising international competition in the product market explain the decline of trade unionism observed in the UK since 1980? Using the theoretical background developed in this chapter we investigate this issue empirically in chapters 3 and 4. Another interesting implication of the literature

survey presented here is that the predictions about trade unions' abilities to bargain higher wages in the presence of foreign competition are crucially dependent upon the specific assumptions of the model in question. It would appear that this is essentially an empirical issue. Therefore, in chapter 5, we examine the influence of international competition on the union bargaining strength using data from the UK manufacturing sector.

3

Import Competition and the Decline of Coverage in Britain : Is There a Link?

3-1 Introduction

The closing decades of the 20th century was an era of rapid globalisation marked in particular by the liberalisation and growth of international trade. At the same time, union representation of employees was in decline and trade unions found their institutional position in the labour market increasingly undermined. In Britain, the weakening of organised labour has been explained by a combination of factors, such as legislative changes, the political and macroeconomic climate, sectoral shifts and changes in the composition of the workforce, hostile management practices, falling demand for unionisation and a lack of union organising efforts. Whilst some authors (for example, Freeman, 1985; Machin, 2000; Farber and Western, 2001) also argue that increased competitive pressures in the product market may have reduced the benefits of collective action and increased management incentives to exclude trade

unions at the workplace, there is no detailed evidence of any link between international competition and the diminishing scope of trade unionism in the UK. We aim to make an empirical contribution by investigating whether the rapid decline in the coverage of collective bargaining in the manufacturing sector, during the course of the 1980s and early 1990s, can be explained by import competition in the goods market.

In this context, this chapter matches 4-digit industry level data on major coverage from the New Earnings Survey Panel Dataset (NESPD) to industry trade variables compiled from the OECD's International Trade by Commodities Statistics. The empirical strategy is divided into two parts. First, a shift share analysis is used to quantify the compositional effect of import penetration on union coverage. This is defined as an import-induced industry re-composition, causing the employment share in highly unionised sectors to fall while raising the share of employment in the least unionised industries. Second, we examine the influence of foreign competition on the extent of union coverage, irrespective of any compositional shifts, by formulating a multivariate econometric model whereby different sets of hypotheses explaining union decline in the UK are taken into account. Moreover, since the pattern of trade may depend on union strategies (Naylor, 1999) we test for the potential endogeneity of trade flows.

The chapter is organised as follows. Section 3-2 describes the union and trade data sources and briefly reviews the existing literature on trade union decline in Britain. Section 3-3 considers the predictions about foreign competition and unionisation from the theory and sets out the empirical strategy. We perform the shift share

computations in section 3-4. Section 3-5 explains the econometric analysis and the main findings are summarised in section 3-6.

3-2 Data description

3-2-1 Union data: The New Earnings Survey Panel Dataset

The analysis in this chapter uses the New Earnings Survey Panel Dataset (NESPD) for data on coverage. This is the longitudinal version of the New Earnings Survey (NES), conducted under the 1947 Statistics of Trade Act by the Office for National Statistics (ONS). The survey has a potential sample, conditional on a 100% response rate, of around 1 percent of all civilian employees covered by the tax and national insurance system in the UK (Elias and Gregory, 1994). Since the data are collected from employers, there is a high response rate and accuracy of the information provided. The sampling frame is based on individuals whose National Insurance numbers (NINO) end in the digits “14” (ONS, 1997) and as the NINO is issued in a completely random way to each individual employee of minimum school leaving age, this method provides a random sample of employees in the UK. The coverage of the survey is, however, subject to the following caveat. Because of its reliance on tax records, the NESPD under-represents a proportion of employees, especially part time workers, whose earnings fall below the ‘pay as you earn’ taxation threshold (Elias and Gregory, 1994). This is also likely to result in a series of discontinuous records for individuals who do not appear in the panel dataset in particular years when their earnings are below the tax threshold.

One of the main features of the NESPD is the relative stability of its sample design. It provides a consistent source of labour market data on individual workers observed during the 1975-2001 period. Aggregation of information from the individual to the industry level (up to 4 digit SIC) is quite straightforward and the availability of a longitudinal component makes it possible to control for unobservable fixed effects. Another advantage is that the data can be matched with other datasets especially at the industry level, enabling the analysis of a wide range of economic issues.

The principal variables contained in the survey are as follows. There are three measures of earnings: weekly, hourly and annual. It also records the total number of hours worked in a week; job tenure, i.e. whether an employee has spent more than 12 months in the same job; the type of employment, whether the individual is working part time or full time; occupation; industry; sector (private or public); and region. But there is very little information on personal characteristics apart from age and gender. For instance, the survey does not provide any measure of educational attainment of individuals. Similarly, many firm-level characteristics are not included.

Our main interest, for the purposes of analysis in this chapter, lies in the union measure available in the dataset. The NESPD gives coverage by a major¹ union agreement excluding any type of company/district/local bargain. However, the use of this variable as a measure of unionism may be problematic for two reasons. First, in a study of union coverage differentials for the period 1975 to 1994, Andrews et al. (1998a) argue that major coverage represents only two thirds of all union agreements in the UK. Second, government policy to decentralise pay bargaining implies that

¹ Major agreements refer to union bargaining at the national or industry level.

national/industry level agreements may have become relatively less important over time compared to local agreements (Andrews et al., 1998a).

To assess the extent of these problems, in table 3.1 we compare major coverage from the NESPD, i.e. the proportion of workers covered by a major union agreement, and union recognition, measuring the proportion of workplaces that recognise trade unions for bargaining purposes. This variable is taken from the Workplace Industrial Relations Survey (WIRS) and comprises all types of collective bargaining agreements. We find that major coverage is much lower than recognition at the workplace. This could be due to the fact that the NESPD considers the proportion of individuals while WIRS measures the proportion of firms. Although if we look at the ratio² of major coverage to recognition, it appears to decrease over time, suggesting that collective bargaining at the national/industry level has indeed fallen more rapidly than local bargains and so major coverage will be considerably lower than the coverage by all union agreements. Consequently, union decline measured by major agreements may be misleading.

Nonetheless, the variable in NESPD does represent a consistent annual measure of union coverage, recorded over a period of time spanning two decades. In addition, as we describe below, different measures of union presence and influence, including major coverage, show a similar declining trend of trade unionism since the 1980s.

² The ratio of overall major coverage to overall recognition falls from 0.75 in 1980 to 0.66 in 1990.

Table 3.1: Trade union presence, overall and by broad sectors, 1980-1998

	1980	1984	1990	1995	1998
Major Coverage^a					
Manufacturing	27	28	15	10	
Private services	14	16	7	8	
Public Sector	89	90	85	74	
Overall	48	49	35	29	
Recognition^b					
Manufacturing	65	56	44		30
Private services	41	44	36		23
Public Sector	94	99	87		87
Overall	64	66	53		42
Workplace presence^b					
Manufacturing	77	67	58		42
Private services	50	53	46		35
Public Sector	99	100	99		97
Overall	73	73	64		54
Membership density^c					
Manufacturing			39	31	27
Private services			18	15	13
Public Sector				60	58
Overall	53	43	38	32	30

Source: a. New Earnings Survey Panel Dataset; b. Millward et al. (2000); c. Broad sectors computed from Labour Force Survey (LFS) and overall membership density obtained from the Employment Gazette and Labour Market Trends.

Notes:

1. Major Coverage means the proportion of workers whose pay is set by a major agreement; Recognition: proportion of workplaces that recognise unions for collective bargaining purposes; Workplace presence: proportion of establishments with union members; Density: the proportion of all paid employees who are union members.

2. All figures are in percentages.

Overall workplace presence (the proportion of workplaces with union members) and aggregate membership density (proportion of all paid employees who are union members) fell from 73% in 1980 to 54% in 1998 and 53% in 1980 to 30% in 1998 respectively. There is a similar pattern for the coverage of collective bargaining. The NESPD suggests a steady collapse of coverage by major union agreements in recent decades. Major coverage in all sectors fell from 48% in 1980 to 29% in 1995 and likewise, union recognition at the workplace fell from 64% in 1980 to 42% in 1998.

Figure 3.1 below plots the movement over time of overall major coverage from the NESPD and union recognition from WIRS. As can be seen, the two measures of collective bargaining share an almost identical declining trend. Thus, it can be argued that when examining union coverage over time, major coverage may represent an appropriate proxy, albeit being at a lower level than coverage by all union agreements.

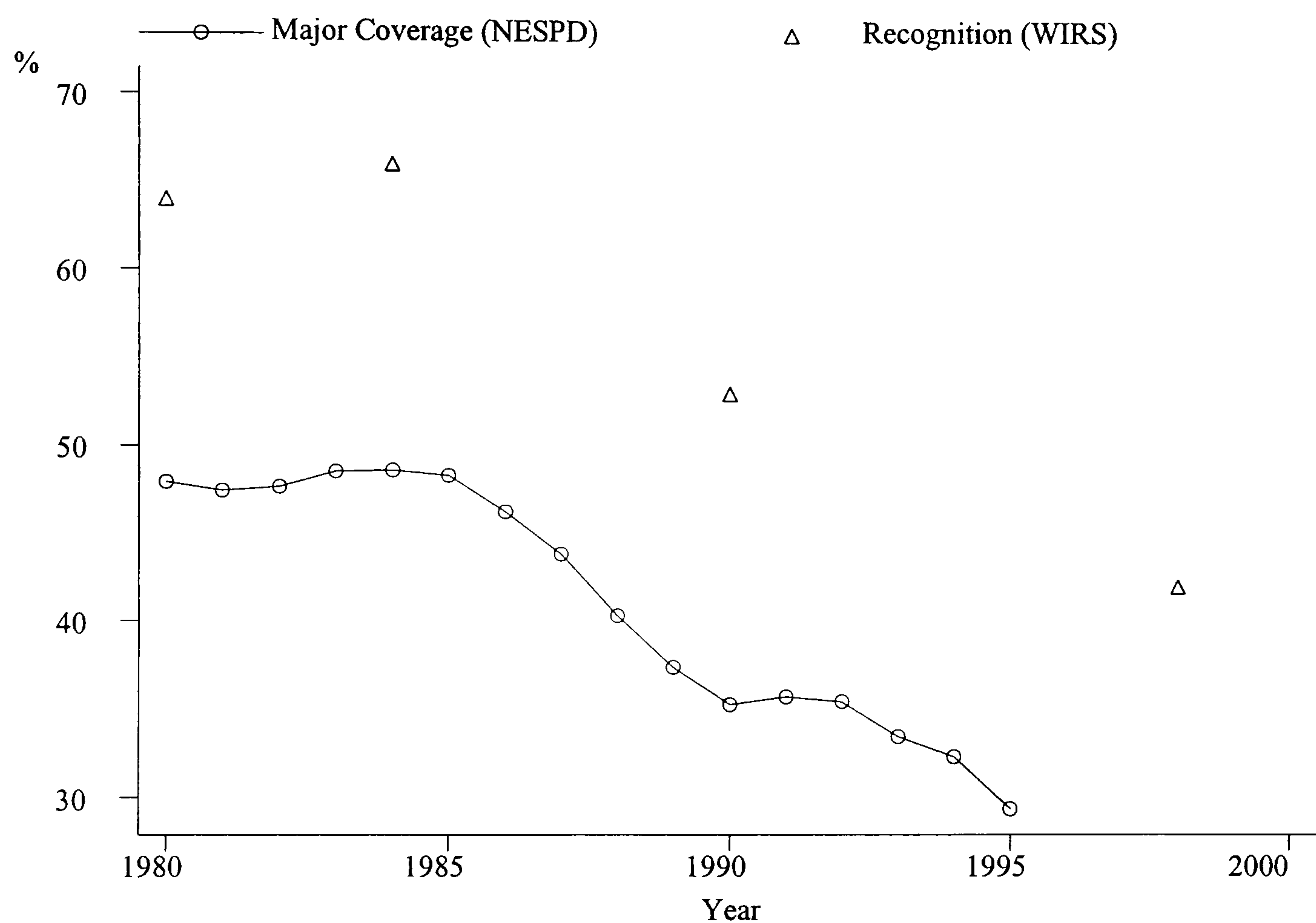


Figure 3.1: Major coverage and union recognition over time

3-2-2 Union decline in Britain revisited

Table 3.1 and figure 3.1 above highlight the unprecedented decline in British trade unionism since 1980. Union presence and influence fell in all sectors of the economy but it would appear that manufacturing suffered the heaviest decline. For instance, workplace presence in manufacturing fell from 77% in 1980 to 42% in 1998 and

aggregate density dropped from 39% to 27% between 1990 and 1998. Coverage by a major agreement and union recognition in manufacturing industries were more than halved over the same period, falling from 27% in 1980 to 10% in 1995 and 65% in 1980 to 30% in 1998 respectively. The decline of trade unions was somewhat less dramatic in services and the public sector. At this stage it is useful to revisit some of the common explanations advanced by researchers for the weakening of the union movement in the UK.

The business cycle explanation. The business cycle theory of unionisation stems from the seminal work of Bain and Elsheikh (1976), predicting that unionism is likely to decline during a depression when the rate of price inflation is falling and unemployment is high. In effect, a decrease in inflation raises real earnings and reduces workers' incentives to unionise while high unemployment lowers the proportion of union workers in employment and increases the bargaining power of employers (Booth, 1983). Conversely, union presence is expected to grow when there is economic prosperity. UK evidence from Carruth and Disney (1988) reveals that union decline was only partly related to the business cycle. They argue that in the steady state union density is negatively related to real wage growth but that it exhibits dynamics over the cycle related to unemployment and inflation.

Industrial relations reforms. The aggressive trade union reforms enacted by Mrs. Thatcher's Conservative government is an important explanation of union decline in the UK. Six³ pieces of industrial relations legislation were passed by successive Tory administrations during the 1980-93 period. They aimed at directly undermining

³ 1980, 1982, 1988 and 1990 Employment Acts, 1984 Trade Union Act and 1993 Trade Union Reform and Employment Rights Act.

union organisation and union bargaining power. There are some disagreements regarding the relative significance of these legislative changes on the extent of unionisation. Freeman and Pelletier (1990) blame most of the 1980s union decline on the unfavourable legislation endorsed by the Thatcher government. Though, critics argue that their approach is undermined by the assumption of a unilateral 'cause and effect' relationship between legislation and union decline. In fact, Disney (1990) suggests that falling unionisation may have helped the introduction of anti-union legislative changes. This is supported by the cautious stance adopted by the government in the beginning of the 1980s and the 'step by step' changes in legislation introduced afterwards. Moreover the precipitate decline in the early 1980s cannot be statistically explained by legislation that took place throughout the period. Brown and Wadhwani (1990) also question the effectiveness of the early union reforms and the slowing of the rate of union decline after 1983 is contrary to the legislative change explanation. Meanwhile, Waddington (1992) points out that the impact of legislation was conditioned by a range of other influences especially the structural and economic changes at the time.

Compositional changes in the make-up of the labour force. Compositional changes, resulting mainly from a shift in employment from the traditional union strongholds in male dominated, blue-collar manufacturing to white-collar services and the increased labour market participation of women and part-timers, are also believed to be a significant contributory factor in the decline of unionisation (Towers, 1989; Booth, 1989). An increasing number of small firms operating in the service sector emerged in place of the larger manufacturing workplaces and there was also a spatial shift in employment to less unionised, south-eastern areas of Britain (Millward et al., 2000).

The privatisation of public workplaces was also an important factor. Whilst Carruth and Disney (1988) and Freeman and Pelletier (1990) report no evidence of compositional effects on unionisation up to the mid-1980s, Green (1992) shows that the combined effect of compositional change according to industry, gender, occupation, age, region, establishment size and full time or part time status may have accounted for around 30% of the fall in union density in the late 1980s. It is also argued that the change in the sectoral structure of employment from manufacturing to services was relatively more important than other workforce composition changes (Waddington, 1992; and Green 1992). But when compared to within industry behavioural influences, the contribution of compositional change to union decline in the 1980s and 1990s is found to be quite small (Green 1992; Forth, 2000; Bryson and Gomez, 2002; Machin, 2002; Charlwood, 2003).

Worker attitudes. A shift in worker preferences against union representation is another reason cited for declining trade unionism in Britain. It is plausible that workers' perception of the effectiveness of labour unions, which arguably lost some of their 'power appeal' in the 1980s, changed over time. In addition, the attraction of joining the union movement may have diminished as a consequence of union-like services being provided by employers themselves. The growth of individualist attitudes and values amongst workers may have also reduced their willingness to unionise. Further, Millward et al. (2000) argue that the introduction of 'alternative work practices' (AWPs) such as profit sharing, employee involvement and team working is likely to have decreased the demand for trade unions. However, recent micro-level studies fail to confirm that AWP's contributed to union decline (Machin and Wood, 2004) and generally speaking, there is little evidence that the extent of

unionisation in Britain fell because of employee attitudes changing the propensity to unionise (Charlwood, 2003). Charlwood (2003) argues that the aggregate attitude towards trade unions in the 1990s was favourable yet union decline continued. It would seem that the weakness and ineffectiveness of union organisation were probably more to blame.

Management initiatives to restrict union availability. Another factor explaining the decline of unionisation is management resistance to union organising. This is evidenced by the failure of trade unions to achieve recognition at new establishments set up after 1980 (Disney et al., 1995, 1996; Machin, 2000). While formal de-recognition has generally been rare in the UK (Beaumont and Harris, 1995), trade union coverage fell at continuing workplaces as a result of the de-collectivisation of pay bargaining (Charlwood, 2003). This refers to a situation whereby management discontinues bargaining relationships with the union although the latter is allowed to retain institutional presence at the workplace. In fact, during the 1980s and the 1990s, management initiatives were increasingly aimed at establishing greater influence over employees, reasserting managerial power and reducing the role of trade unions (Waddington and Whitston, 1997; Fairbrother, 2000). By weakening the collective bargaining process, employers also undermined the social custom of unionism, leading to a decline in the incentives to unionise (Charlwood, 2003). These developments suggest that management took advantage of existing legislative restrictions on union power to marginalize the process of collective bargaining and the union movement. Moreover, it is argued that economic changes such as increased competition in the product market could increase management motivations to restrict union availability at the workplace whilst raising the costs and lowering the benefits

of collective action by trade unions (Machin, 2000; Farber and Western, 2001; Charlwood, 2003).

3-2-3 Industry trade data

None of the above studies consider the role of foreign competition in any detail, so to investigate the influence of international competition on unionisation, we match industry trade variables to union coverage from the NESPD. However, the trade data is available for the manufacturing sector only and so the present analysis is unable to control for sectoral shifts from manufacturing to services which, as argued above, is an important explanation of union decline in the UK. Compilation of the industry trade data involves the following steps.

1. We gather a detailed record of UK merchandise trade from the OECD's International Trade by Commodities Statistics (ITCS, Revision 2) database which, gives the values of annual UK imports and exports for each tradable good. The commodities are classified into five major groups according to the Standard International Trade Classification (SITC):
 - (1) food, beverages and tobacco;
 - (2) crude materials, animal and vegetable oils and fats;
 - (3) mineral fuels and lubricants;
 - (4) chemicals and manufactured goods classified by materials;
 - (5) machinery and transport equipment.

2. Matching the commodities to their corresponding industries is achieved through the concordance⁴ of the SITC codes (at the 4-digit level of disaggregation) to the 4-digit 1980 UK Standard Industrial Classification (SIC80). For instance, ‘butter’ (SITC code: 0230) and ‘cheese’ (SITC code: 0240) are matched to the industry ‘preparation of milk and milk products’ (SIC80: 4130). Hence, for any given year, aggregating over the import and export values of all goods within each respective industry yields the total yearly import and export by 4-digit manufacturing industries.
3. The industry trade values are then merged to gross industry output (at the 4-digit level) from the Census of Production. Data on output is available from 1982 to 1995, with 1992 missing. Since the UK industry codes changed from SIC80 to SIC92 in 1992, we map⁵ all data based on SIC92 from 1993 onwards to SIC80 before merging.

Using the combined coverage-trade dataset⁶, annual import penetration ratios and export shares for industry i at time t are computed as follows.

$$Import\ Penetration_{it} = \frac{(import_{it})}{(grossoutput_{it} - export_{it} + import_{it})} \quad (1)$$

$$Export\ share_{it} = \frac{export_{it}}{grossoutput_{it}} \quad (2)$$

⁴ This is shown in table 3A.2 in the appendix.

⁵ The SIC80-SIC92 correspondence is available from the Office for National Statistics.

⁶ Construction of the coverage-trade dataset is summarised in table 3A.1 in the appendix.

The (coverage-trade) dataset contains 2380 observations, corresponding to an unbalanced panel of 200 4-digit manufacturing industries observed during the period 1982-95 (excluding 1992).

In figure 3.2 below, we plot the overall trend in import penetration calculated from the industry trade data and union coverage for manufacturing over the period 1982-95. It reveals an increasing level of foreign competition, with the share of foreign manufactured goods in the UK domestic market rising from 26% in 1982 to 34% in 1990 and over 40% in 1995. On the other hand, there is a declining pattern in union coverage, falling from 28% in 1982 to 10% in 1995.

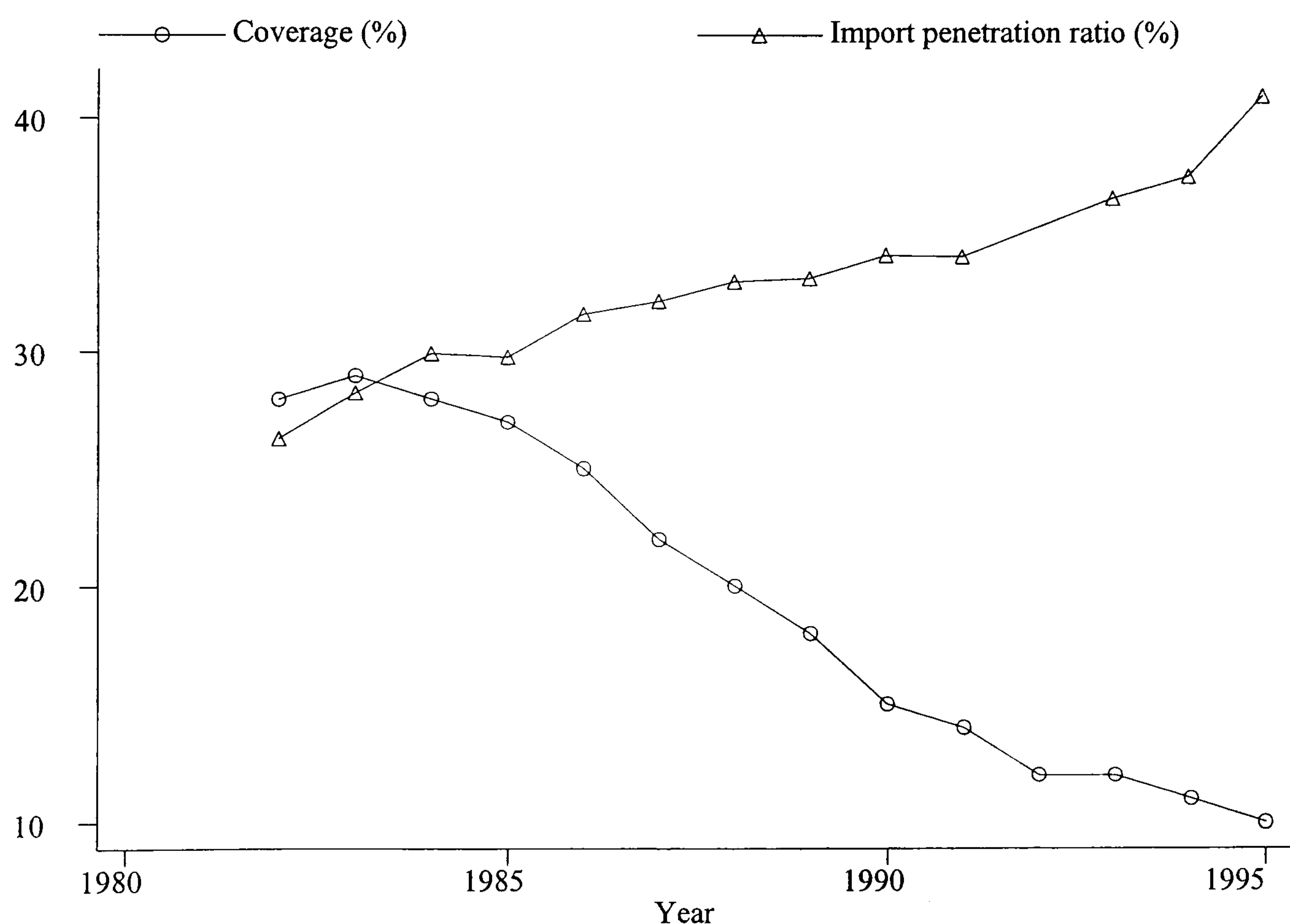


Figure 3.2: Import penetration and union coverage in UK manufacturing 1982-95

3-3 Accounting for the decline of union coverage in UK manufacturing: the role of foreign competition

From the above discussion, it appears that the decline of trade unions coincided with increased international competition in the product market. However, the overall association between the variables does not necessarily prove that foreign competition had a causal effect on coverage. As such, this section examines the theoretical predictions about international competition and unionisation and presents our empirical strategy for assessing the role of foreign competition in the decline of coverage in UK manufacturing.

3-3-1 Predictions from theory

The theoretical review in chapter 2 suggests two channels through which import penetration is likely to influence unionisation. These will have important implications for our empirical methodology.

1. Import competition as a compositional factor. Grossman (1984) provides some clear predictions about the relationship between foreign competition and union size. His median voter model shows that, in the presence of rising foreign competition, where there is a high elasticity of substitution between labour and capital, senior union members will prefer to maintain wages at the expense of future employment, thereby reducing the size of the trade union. Under such circumstances, import competition may effectively lead to a decrease in the size of the union intensive sectors. Therefore, the decline of union coverage in manufacturing could be explained by import penetration causing industries with high proportion of workers

covered by bargaining agreements to shrink. Consequently, this could lead to an import-induced industry re-composition whereby the share of employment in sectors associated with high import competition and low rates of coverage would rise whilst employment share in the traditionally highly unionised but less import penetrated industries would decline.

2. Import competition as a non-compositional effect. Import competition can also reduce unionisation irrespective of any compositional change. The demand for unionisation is likely to be a positive function of the wage outcome of union-firm bargaining so that a negative import competition effect on wages implies that there are fewer workers willing to stay unionised. As union wages and hence, the perceived benefits of unionism falls, there will also be a reduced incentive for labour unions to engage in efficient collective action. The theoretical models in chapter 2 show that import competition may lower the union wage gains under given conditions. According to Layard et al. (1991), increased product market competition reduces the amount of rents available to be shared between the firm and the union, thus decreasing the union mark up. Hill (1984) predicts a negative impact of import penetration on the union wage gap when the union sector is labour intensive and the elasticity of factor substitution is greater than one. Grossman (1984) shows that increased competitive pressure from abroad may lead to lower negotiated wages if the median voter chooses to safeguard employment. The union mark up may also fall if import competition causes a sufficiently large fall in the demand for goods produced in the domestic union sector (Lawrence and Lawrence, 1985) and leads to production of import competing union goods being lost to foreign rivals (Staiger, 1988). In addition, a credible threat of firms relocating abroad due to increased import penetration is also likely to discipline union wage demands (Mezzetti and

Dinopoulos, 1991). Although, Naylor (1999) argues that the overall effect of foreign competition may depend on exports too.

Furthermore, increased foreign competition can provide greater incentives for management to oppose rent-sharing trade unions. Employers may adopt various anti-union tactics aimed at reducing the appeal of unions to workers and increasing the costs of union organising by directly confronting union presence at the workplace. By the same token, the pressure to compete with international rivals may motivate an extensive restructuring of production and work systems as well as reorganisations of the labour force, which can be detrimental to union organisation within industries. Rising global competition may also induce firms, governments and the public in general to take on negative attitudes toward labour unions, regarding union organisation as upholding economic inefficiency.

In general, changes in the demand for unionisation, management practices, work methods and attitudes toward trade unions are likely to arise from increased foreign competition causing union sectors to become intrinsically less unionised (regardless of changes in industry composition).

3-3-2 The empirical strategy

The empirical analysis is, therefore, carried out in two separate steps.

1. Import competition as a compositional effect is quantified using a basic shift share technique. The shift share analysis represents a simple and straightforward approach

for separating out the decline of union coverage caused by import competition changing the employment composition of manufacturing industries (the compositional effect) and behavioural changes occurring within industries (such as changes in firm, industry and labour force characteristics).

2. We use an econometric analysis to model the non-compositional influences of import competition on union coverage. A pooled multivariate regression model, taking into account the main industry determinants of unionisation, is specified. Since the pattern of trade may depend on union strategies (Naylor, 1999) we also test for the potential endogeneity of trade flows

3-4 Foreign competition as a compositional factor

In order to examine the changing composition of employment according to foreign competition, we merge data for 4-digit industries on coverage and import penetration ratios from the combined coverage-industry trade dataset to industry employment⁷ from the Census of Production. A basic shift share analysis is then used to decompose the change in coverage between 1983 and 1995 as follows.

$$\Delta C = \sum_{i=L}^{n=H} (C_i^{95} - C_i^{83}) E_i^{83} + \sum_{i=L}^{n=H} (E_i^{95} - E_i^{83}) C_i^{83} + \sum_{i=L}^{n=H} (C_i^{95} - C_i^{83}) (E_i^{95} - E_i^{83}) \quad (3)$$

⁷ 4 digit employment data is available from 1983 onwards.

In equation (3), C is coverage, L and H represent the group of industries with low and high foreign competition⁸ respectively and E_i is the proportion of workers employed in each category. The first term on the right hand side measures the change in industry coverage attributed to behavioural changes among manufacturing sectors, keeping employee composition constant at the 1983 level. The second term denotes the compositional effect of foreign competition and is defined as the change in coverage caused by an import-led shift in employment composition, assuming coverage is not subject to any behavioural change. The last term is an interaction of the two effects and is typically expected to be quite small.

Results from the shift share computations in table 3.2 below show that import competition as a compositional factor is trivial, accounting for around 2.1% of the overall decline in coverage between 1983 and 1995. Clearly, most of the fall in union coverage is explained by behavioural changes amongst industries rather than by the reallocation of workers brought about by import competition.

Table 3.2: Fall in coverage explained by compositional and behavioural changes

% Explained by behavioural changes	99.7
% Explained by compositional effect of import competition	2.1

Source: Computed using equation (3)
Note: The percentages do not sum to 100 because of the interactive term⁹.

We must point out that the shift-share technique is a descriptive tool and does not account for many factors determining industry coverage. A further limitation is that it only gives a ‘snap-shot’ of the manufacturing sector at two points in time, 1983 and

⁸ High (low) import competition refers to industries with import penetration ratios greater (less) than the median import share.
⁹ The interaction of the between and within effects yields a positive impact of 1.8% on coverage.

1995. In addition, the results may be sensitive to the time period chosen and the manner in which industries are grouped into different categories.

3-5 Estimating the non-compositional impact of import competition on union coverage

3-5-1 Simple univariate analysis

Given the very small compositional-effect of import penetration and the underlying limitations of the shift-share analysis, this section investigates whether increased foreign competition in the product market in the 1980s and early 1990s could explain union decline in UK manufacturing industries, irrespective of any shift in industry composition. Typically, this can be achieved through a regression analysis. Consider the following pooled OLS¹⁰ univariate model,

$$c_{it} = \alpha + \beta m_{it} + \mu_{it} \tag{4}$$

i = 4-digit manufacturing industries; t = year (1983-1995)¹¹

where c is the proportion of workers in the industry covered by a major union agreement, m is industry import share and μ_{it} is a random error term.

¹⁰ Although the dependent variable, coverage (c_{it}), is bounded between 0 and 1, we do not control for this via a non-linear transformation such as the logit, since in general, the data has a continuous pattern (rather than a discrete one).

¹¹ We consider the period 1983-95 in order to be consistent with the analysis in the previous section.

We could formulate equation (4) in terms of the group (industry) means to show how import competition influences coverage when it differs between industries and in terms of the deviations from the group means to capture the effect of changing import penetration within industries (Greene, 1997). These are shown by expressions (5) and (6) respectively.

$$\bar{c}_i = \alpha + \beta_b \bar{m}_i + \bar{\mu}_i \quad (5)$$

$$c_{it} - \bar{c}_i = \beta_w (m_{it} - \bar{m}_i) + \mu_{it} - \bar{\mu}_i \quad (6)$$

It follows that the overall effect of foreign competition, given by the pooled estimator β , is a weighted average of the between-groups estimator, β_b , and the within-groups estimator, β_w . Note that β_b uses the cross-section (or between) information in the data while β_w is based on the time series (or within) variations. As such, before proceeding to the formal econometric investigation, the descriptive analysis below takes a closer look the between and within variations in the dataset.

3-5-1-1 Import competition between industries

The theoretical predictions imply that disproportionate declines in coverage would be in industries with the greatest rise in import penetration and conversely, the smallest decline or even gain in coverage should be observed where import penetration has fallen. Hence, one way of analysing the effect of foreign competition on coverage is in terms of the changes in import penetration across industries. Table 3.3 below ranks 4-digit industries by the change in import penetration between 1983 and 1995.

Table 3.3: Ranking industries by the change import penetration between industries

SIC80	Description	Change in import share	Change in coverage
Highest increase in import penetration			
4560	Fur goods manufacturing	366	-15
4290	Tobacco	326	-1
4959	Miscellaneous manufacturing	239	-0.4
4920	Musical Instruments	181	-5
4321	Spinning and doubling on the cotton system	112	-15
3442	Electrical instruments	82	-14
3289	Marine precision components	77	-19
2564	Essential oils and flavouring materials	58	-12
2471	Flat glass manufacturing	57	-1
3444	Manufacturing components other than active components	54	-11
Smallest increase in import penetration			
4214	Cocoa, chocolate, sugar confectionery	1.8	-14
3302	Electronic data processing equipment	1.8	-2
4725	Packaging products of board	1.4	-13
4751	Printing and publishing of newspapers	1	-66
4723	Stationery manufacturing	0.8	-7
4130	Preparation of milk and milk products	0.7	-13
3204	Fabricated constructional steelwork	0.6	-14
3111	Ferrous metal foundries	0.6	-40
2479	Glass products	0.4	-8
4396	Rope, twine and net	0.1	3
Biggest decrease in import penetration			
2235	Miscellaneous drawing, cold rolling and forming of steel	-264	-26
3283	Compressors and fluid power equipment	-125	-29
4385	General carpet, rugs and matting	-106	-3
4910	Jewellery and coins	-102	-4
3275	Machinery for working wood	-101	-23
3290	Ordnance, small arms and amunition	-92	-62
3710	Measuring and precision equipments	-87	-15
3288	Industrial valves	-73	-1
2599	General chemical products	-69	-5
3435	Electrical and general equipment for industrial use	-61	-12

SIC80	Description	Change in import share	Change in coverage
Smallest decrease in import penetration			
3137	Bolts, nuts, washers, rivets, springs and non precision chains	-2.5	-23
4832	Plastic semi manufactures	-2.3	-6
4533	Women's tailored outerwear	-2	1
4650	Miscellaneous wooden articles	-1.5	-7
2247	Non ferrous metals and their alloys	-1.3	-11
4557	Household textiles	-1.2	-4
4510	Footwear	-0.9	-11
4350	Jute and polypropylene yarns and fabrics	-0.6	-2
4538	Gloves	-0.2	18
4196	Bread baking and flour confectionery	-0.1	-24

Source: Combined coverage-industry trade dataset
Notes: Figures show changes in percentage points

The table presents industries with the highest and smallest increase as well as the greatest and lowest decrease in import penetration. The statistics reveal that between 1983 and 1995 coverage declined in almost all industries. The magnitudes of the change in coverage are fairly comparable across the different groups and, in general, we do not detect any systematic difference between industries with the highest increase in import penetration and those where the rise in foreign competition has been minimal. A similar observation can be made when examining the change in coverage where import penetration has declined. In essence, the ranking of industries does not generate an unambiguous observable pattern between the changes in coverage and import competition between industries. Union coverage appears to have fallen in all industries more or less irrespective of how import penetration differs across manufacturing sectors, suggesting that the between-industry variations are not very significant.

Furthermore, we consider the importance of the differences in import penetration between industries for union coverage by examining the group/industry means. Figure 3.3 below plots industry coverage and import share averaged over the period 1983-95.

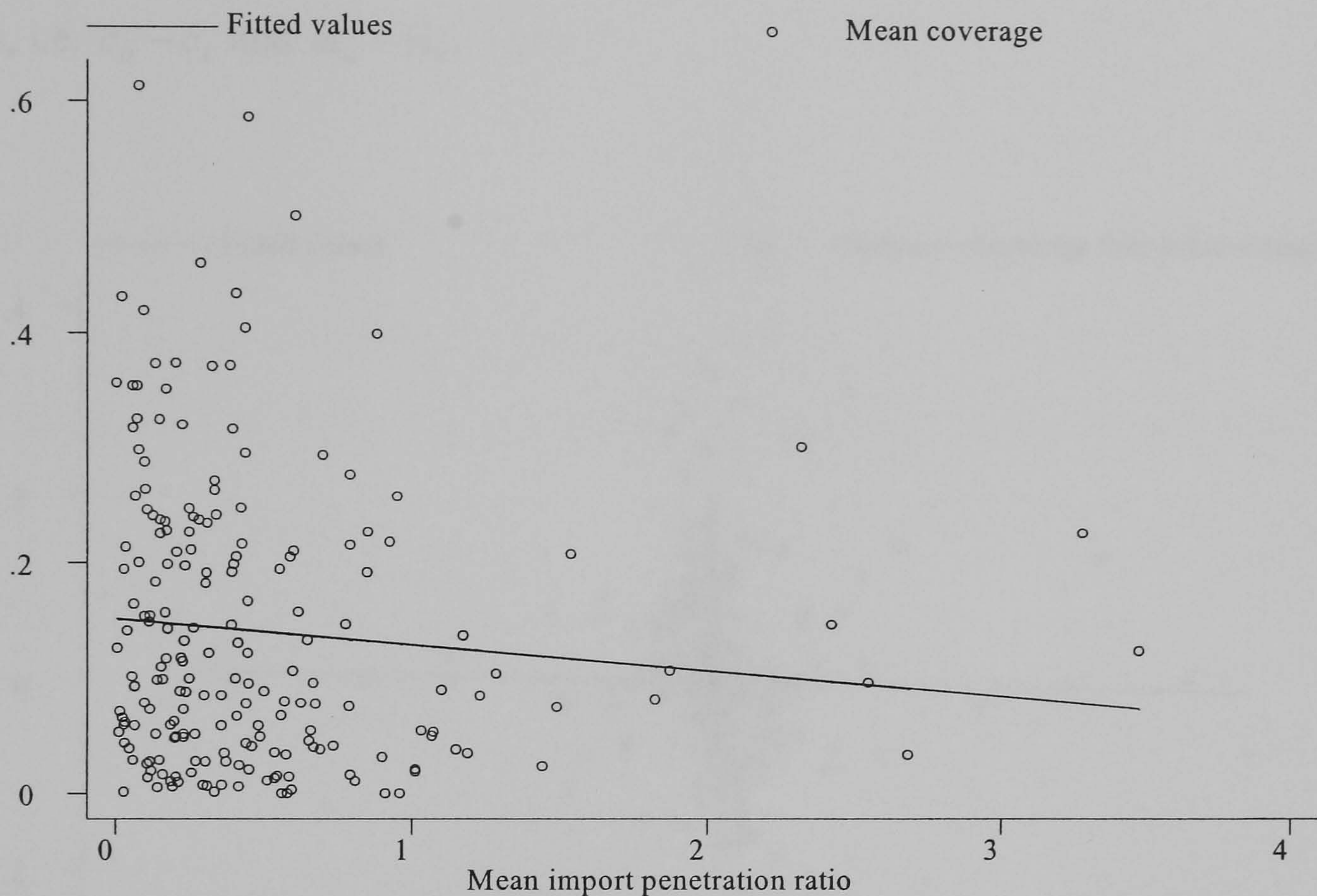


Figure 3.3: Mean coverage and import share by industry, 1983-95

The regression line corresponds to equation (5). Its estimated coefficients are given below, with the standard errors in parentheses.

$$\bar{c}_i = 0.15 - 0.02 \bar{m}_i \quad (7)$$

(0.012) (0.016)

The coefficient on import share implies that changing import penetration between industries has a negative effect on coverage, however, it is only significant at 17%. It confirms the view that the variations across industries are not particularly large.

3-5-1-2 Import competition within industries

In order to examine the within variations in the data and the influence of import competition on union coverage when it changes within industries, figure 3.4 plots the deviations of the coverage and import penetration from their respective industry means, i.e. $c_{it} - \bar{c}_i$ and $m_{it} - \bar{m}_i$.

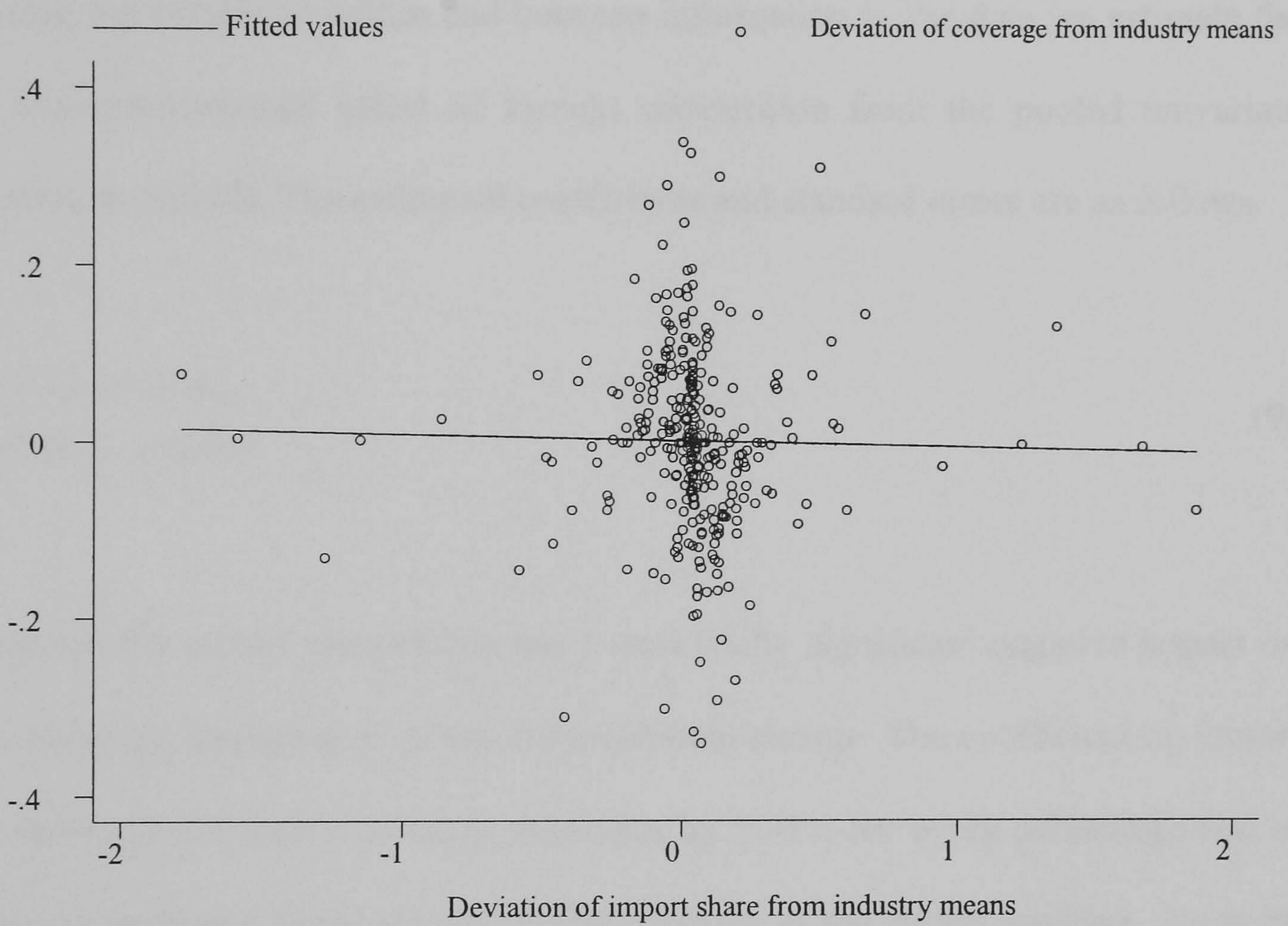


Figure 3.4 Deviation of coverage and import share from group means

The regression line, which relates to equation (6), is given by

$$(c_{it} - \bar{c}_i) = 0.002 - 0.007(m_{it} - \bar{m}_i) \quad (8)$$

(0.002) (0.006)

The slope coefficient (standard errors in parentheses) in equation (8) is not statistically different from zero, suggesting that the within¹²-industry changes are not important. In essence, there seems to be no significant link between changing import competition within industries and within-industry change in union coverage.

3-5-1-3 Univariate pooled OLS regression

So, using the combined within and between information in the data we estimate the total non-compositional effect of foreign competition from the pooled univariate regression model (4). The estimated coefficients and standard errors are as follows.

$$c_{it} = 0.15 - 0.01 m_{it} \quad (9)$$

(0.004) (0.003)

In equation (9) import competition has a statistically significant negative impact on union coverage, irrespective of any compositional change. The coefficient on import share shows that industry coverage decreases by 0.01% for every percentage rise in foreign competition. From the descriptive analysis in the earlier sections, it can be argued that the significant foreign competition effect on coverage is more likely to be explained by the cross-section variations in import penetration rather than the within-industry changes. However, a major caveat of the univariate regression is that it suffers from omitted variable bias. There are many other factors that affect unionisation and these will need to be taken into account.

¹² The within industry changes can also be gauged from a first differenced regression of coverage on import penetration. The results are as follows: $\Delta c_{it} = -0.01 - 0.001 \Delta m_{it}$. The slope coefficient is not significant, confirming the above observations about changing import competition within industries.

(0.002) (0.001)

3-5-2 Multivariate econometric model

The basic union coverage equation (4) can be augmented by including a vector of control variables (X) as follows,

$$c_{it} = \alpha + \beta m_{it} + X_{it}\beta_1 + \mu_{it} \quad (10)$$

As such, we match¹³ the combined coverage-trade dataset to other industry variables at the 4-digit SIC level taken from the NESPD, the Labour Force Survey and the Census of Production. The control variables included are essentially drawn from previous studies¹⁴ on the determinants of unionisation and some of the main explanations of union decline reviewed in section 3-2. As we discuss below, the pattern of union coverage is likely to be a function of age, gender, part-time employment, education and training, occupation, region, sector, size of establishment, market structure and the export performance of the industry.

Age. Two age variables are constructed using data from the NESPD: the proportion of workers aged 25 or below and the proportion of workers between the age of 25 and 45. Younger workers may feel less loyal to management than older workers and may show a greater propensity to unionise. On the other hand, to the extent that younger workers are more educated they may not feel the need to be unionised in order to progress in their careers. They may also tend to overlook the historical role of labour unions. It is, therefore, difficult to predict the a priori sign of the regression coefficients of the age variables.

¹³ See table 3A.1 in the appendix describing the construction of the final dataset used for estimation.

Gender. We include the proportion of female workers in the industry as a proxy for gender. The higher the proportion of women the lower the extent of unionisation in the industry. It is argued that women are less attached to the labour market since they are often in part time employment and are not employed continuously due to marriage or family commitments. The data source for this variable is the NESPD.

Part-time employment. There is a negative association between part time employment and unionisation. Part time workers are basically less concerned about joining trade unions than full time workers. Because of the under-representation of part-time employees in the NESPD, we compute the proportion of part time workers in the industry from the Labour Force Survey (LFS).

Education and Training. Proxies for education and training are also taken from the LFS. We include the proportion of workers in the industry with further and higher education, the proportion of workers with secondary education and the proportion of workers with job-related training. Better-educated and well-trained workers have greater individual bargaining power. They may also identify more closely with management and are less inclined to seek union representation. There may be a positive correlation between job-related training and unionisation if trade unions encourage firms to provide more training than they otherwise would (Booth and Chatterji, 1998). This is because workers would be more willing to take up jobs in unionised firms and benefit from increased performance, productivity and pay as a consequence of the higher levels of job-related training.

¹⁴ Bain and Elsheikh (1979); Farber (1983); Hirsch and Berger (1984); Booth (1986, 1995); Magnani and Prentice (2003).

Occupation. The NESPD provides information on the proportion of white-collar and blue-collar workers. Skilled workers are generally less unionised than manual workers. They are more educated, better paid and able to negotiate with employers individually. They may also be more closely associated with management. We expect a negative sign for the regression coefficient of the proportion of white-collar workers and a positive sign for blue-collar workers.

Region. The model includes the proportion of workers from ten different regions in the UK. These are defined in table 3.4 below and the main source for these variables is the NESPD

Sector. The vector X also contains a variable measuring the proportion of workers in the private sector. This is taken from the NESPD. The higher the proportion of workers in the private sector, the lower the level of unionisation in the industry. Privatisation is often cited as a causal factor explaining the decline of trade unions in Britain.

Size of establishment. Another explanation for falling unionisation in the UK is the increased prominence of small firms. So we include the proportion of small firms (firms with 25 workers or less) from LFS. Trade unions are more interested in organising larger than smaller establishments because of economies of scale and similarly, employees in larger firms are more likely to engage in collective bargaining to determine their pay and conditions than in smaller firms. Hence, the greater the proportion of small firms in the industry the lower union coverage will be.

Market structure. Concentration ratios from the Census of Production are used to proxy the domestic market structure. Data on two different measures of concentration are available: the 4-firm concentration ratio from 1983 to 1991 and the herfindahl ratio from 1993 to 1995. In order to arrive at a consistent measure of market structure, we construct dummy variables corresponding to different levels of concentration in the industry. This is made possible as both indices have values ranging between 0 and 1, where a value closer to 1 indicates a high degree concentration. Three dummy variables are created, relating to concentration ratios in the following ranges: less or equal to 0.2; greater than 0.2 but less or equal to 0.5; and greater than 0.5. The latter is used as the reference dummy.

High industry concentration may be associated with greater levels of unionisation as trade unions are attracted to greater wage gaining opportunities in the presence of high oligopolistic and monopolistic rents. In less competitive industries, firms have a greater ability to pass cost increases on to consumers and are in better positions to allow union practices (Bain and Elsheikh, 1979). The smaller number of firms and the existence of barriers to entry in concentrated sectors also imply that once organised it is easier for labour unions to maintain jurisdictional control over the industry. However, it is plausible that firms in less competitive industries are more willing and have more resources to resist union organisation (Disney et al., 1996).

Export performance. We include export share to control for the export performance of the industry. Exports may lead to increased labour demand and higher union wages (Naylor, 1999), thereby raising the demand for and the extent of unionisation in the industry. On the other hand, improved export performance may necessitate

cost reductions and changes in technology and production methods, which may not be conducive to union organisation at the workplace.

Time dummies. Finally, the model incorporates time dummies to capture the influence of public policy, especially the drastic changes in industrial relations legislation and, the general macroeconomic and political climate of the 1980s and early 1990s. As explained in section 3-2, these factors generally had an adverse impact on trade unions in the UK.

Table 3.4 shows the definitions, data sources, mean values and standard deviations of all variables used in the present analysis.

Table 3.4: Definition of variables, data sources and descriptive statistics

Variable	Definition	Source	Mean n=2060	Standard Deviation
Coverage	Proportion of workers covered by a major collective agreement	NESPD	0.15	0.15
Age25	Proportion of worker aged 25 or below	“	0.2	0.08
Age25-45	Proportion of worker above 25 but below 45 years old	“	0.46	0.08
Female	Proportion of female workers in industry	“	0.28	0.17
White collar	Proportion of skilled workers in industry	“	0.18	0.09
Blue collar	Proportion of unskilled workers	“	0.55	0.17
Private	Proportion of workers in the private sector		0.98	0.12
London	Proportion of workers living in London	“	0.08	0.08
South East	Proportion of workers living in South East	“	0.15	0.12
East	Proportion of workers living in East	“	0.04	0.05
South West	Proportion of workers living in South West	“	0.07	0.07
West Midlands	Proportion of workers living in West Midlands	“	0.12	0.12
East Midlands	Proportion of workers living in East Midlands	“	0.10	0.12
Yorkshire	Proportion of workers living in Yorkshire and Humberside	“	0.11	0.11
North West	Proportion of workers living in North West	“	0.15	0.13
North	Proportion of workers living in North	“	0.05	0.06
Wales	Proportion of workers living in Wales	“	0.04	0.05
Part-time	Proportion of workers employed part-time	LFS	0.09	0.09
Further	Proportion of workers with further/higher education	“	0.10	0.09
Secondary	Proportion of workers with secondary qualifications	“	0.36	0.14
Job related training	Proportion of workers with job-related training	“	0.10	0.08

Variable	Definition	Source	Mean n=2060	Standard Deviation
Small firms	Proportion of small firms in industry (no. of employees less or equal to 25)	“	0.30	0.33
Concentration20	Dummy=1 if 4-firm concentration ratio/herfindhal ratio less or equal to than 0.2	Census of Production	0.50	0.50
Concentration50	Dummy=1 if 4-firm concentration ratio/herfindahl ratio greater than 0.2 and less or equal to 0.5	“	0.33	0.47
Import penetration	Import penetration ratio	See section 3-2	0.47	0.99
Export share	Export share	“	0.48	1.05

Source: Mean and standard deviations of variables computed from compiled dataset

Note: n is the number of observations

3-5-2-1 Endogenous trade

It is argued that trade flows are dependent on wage costs and more specifically, on the wage strategies adopted by trade unions (Naylor, 1999). Hence, prior to estimation, we test for the potential endogenous nature of trade by applying the Durbin-Wu-Hausman test for endogeneity (Davidson and MacKinnon, 1993). There are three stages to the test. First we obtain the residuals from separate OLS regressions of import penetration and export share on all industry characteristics in the dataset and one period lagged values of the trade variables. Second, the predicted residuals are included amongst the explanatory variables in the union coverage equation (10) and the model is estimated using OLS. Finally, an F-test for the joint significance of the residuals of import penetration and export share is performed. If they are jointly significant, the null hypothesis that import penetration and export

share are exogenous is rejected. In this instance, our data does not provide sufficient evidence¹⁵ for the endogeneity of trade. The F statistic is equal to 1.60 and has a p-value of 0.2.

3-5-2-2 Results from pooled OLS regression

Results from the pooled OLS estimation of equation (10), using our industry-level dataset, are presented in table 3.5 below. Specification (1) is the univariate regression of coverage on import penetration. Specification (2) shows the model augmented by variables depicting the general characteristics of the labour force. The effects of firm size and privatisation are accounted for in column (3). Specification (4) includes other industry characteristics such as the concentration dummies and export share. Lastly, the time dummies are added in column (5). We generate robust standard errors to control for minor deviations from the least squares assumptions and problems related to outliers and influential observations.

¹⁵ This finding also concurs with previous studies considering endogenous trade, for example Gaston and Trefler (1994), Freeman and Katz (1991) and Karier (1991).

Table 3.5: Results from pooled OLS estimation

	1	2	3	4	5
Import penetration	-0.011 (2.73)**	-0.008 (2.89)**	-0.010 (2.44)*	-0.005 (1.49)	-0.004 (1.07)
Export share				-0.005 (1.47)	-0.006 (1.75) [†]
Female		-0.065 (2.58)*	-0.017 (0.73)	-0.026 (1.15)	-0.001 (0.03)
Age25		-0.079 (1.47)	-0.086 (1.68) [†]	-0.093 (1.79) [†]	-0.111 (2.14)*
Age25-45		-0.053 (1.08)	-0.035 (0.76)	-0.059 (1.29)	-0.020 (0.44)
Part time		-0.124 (2.61)**	-0.068 (1.55)	-0.082 (1.85) [†]	-0.043 (0.95)
Further		-0.059 (1.37)	-0.075 (1.83)	-0.077 (1.83) [†]	-0.041 (1.00)
Secondary		-0.065 (2.54)*	-0.038 (1.53)	-0.040 (1.56)	0.024 (0.95)
Job related training		-0.073 (1.68) [†]	-0.079 (1.83) [†]	-0.073 (1.56)	0.007 (0.16)
White collar		-0.324 (5.84)**	-0.269 (5.23)**	-0.265 (5.20)**	-0.300 (5.94)**
Blue collar		0.050 (1.87) [†]	0.043 (1.64) [†]	0.052 (1.99)*	-0.024 (0.75)
London		0.057 (1.12)	0.073 (1.51)	0.101 (2.09)*	0.029 (0.63)
South East		-0.049 (1.12) [†]	-0.014 (0.35)	-0.023 (0.56)	-0.048 (1.15)
South West		-0.092 (1.71) [†]	-0.055 (1.11)	-0.059 (1.21)	-0.046 (0.93)
North		0.115 (1.80) [†]	0.050 (0.92)	0.039 (0.71)	0.031 (0.58)
North West		-0.067 (1.67) [†]	-0.026 (0.71)	-0.030 (0.81)	-0.033 (0.86)
East		-0.148 (2.75)**	-0.077 (1.52)	-0.082 (1.59)	-0.084 (1.61) [†]
East Midlands		0.073 (1.42)	0.094 (1.92) [†]	0.112 (2.30)*	0.128 (2.62)**

	1	2	3	4	5
West Midlands		0.054 (1.25)	0.066 (1.63) [†]	0.053 (1.29)	0.075 (1.84) [†]
Yorkshire		0.101 (2.03)*	0.129 (2.84)**	0.121 (2.69)**	0.139 (3.08)**
Wales		-0.091 (1.04)	-0.222 (3.29)**	-0.207 (2.94)**	-0.146 (2.13)*
Small firms			-0.038 (4.28)**	-0.035 (4.02)**	-0.047 (2.08)*
Private			-0.446 (11.96)**	-0.470 (11.78)**	-0.446 (11.41)**
Concentration20				0.043 (5.32)**	0.044 (5.64)**
Concentration50				0.045 (4.95)**	0.045 (5.04)**
1984					-0.004 (0.24)
1985					-0.008 (0.50)
1986					-0.027 (1.72) [†]
1987					-0.059 (3.88)**
1988					-0.064 (4.20)**
1989					-0.038 (1.95) [†]
1990					-0.062 (3.30)**
1991					-0.056 (2.85)**
1993					-0.095 (5.63)**
1994					-0.104 (5.94)**
1995					-0.124 (8.31)**
Constant	0.151 (38.04)**	0.284 (5.27)**	0.678 (11.28)**	0.678 (11.14)**	0.693 (11.04)**
Observations	2091	2066	2066	2060	2060
R-squared	0.01	0.24	0.33	0.34	0.40

Notes: Absolute value of t-statistics in parentheses
[†] significant at 10% * significant at 5%; ** significant at 1%

Overall, the econometric model performs well, providing some key insights into the determinants of changing union coverage within manufacturing industries during the period 1983-95.

Labour force characteristics. From column (4), rising proportions of youths aged 25 or below, part-timers, non-manuals and educated employees appear to reduce the extent of union coverage while the proportion of blue-collar workers is positively correlated with unionisation. The introduction of time dummies in column (5), however, only leaves the variable *age25* and the proportion of white-collar workers statistically significant. Although most of the variables for region are insignificant, we note that industry coverage is higher in the Midlands and Yorkshire but lower in Wales and the east of England.

Other industry characteristics. The prominence of small firms and privatisation reduced coverage significantly over the period 1983-95. For instance, a rise of 1% in the proportion of workers employed in the private sector decreases coverage by 0.45%. On the other hand, we find that a low degree of industry concentration is associated with a greater proportion of workers covered in the sector.

Time dummies. The time dummies are generally strongly significant at the 1% level¹⁶. The coefficients are negative and increase in magnitude over time relative to the base year (1983). This finding is consistent with the notion that legislative changes and the political and macroeconomic conditions adversely affected trade unions in Britain during the 1980s and early 1990s.

¹⁶ 1984 and 1985 are not significant. 1986 and 1989 are weakly significant at 10%.

Trade Variables. The coefficient on export share is weakly significant in specification (5), suggesting that the need to reduce costs and inefficiency may act as an incentive for firms to drive unions out.

As discussed previously, the univariate regression of import penetration on union coverage generates a negative and significant foreign competition effect on coverage. The size of the coefficient decreases slightly when we include variables portraying the characteristics of the workforce and proxies for privatisation and small firms but remains negative and is significant at the 5% level. Column (3) predicts that union coverage in manufacturing industries is reduced by 0.01%, on average, for every percentage increase in the share of imports. However, the coefficient is not robust to the introduction of other industry characteristics and time dummies. Whilst we still observe a negative import coefficient in specifications (4) and (5), its magnitude is more than halved and it is not statistically significant.

3-5-2-3 Industry fixed effects

The pooled OLS estimator of the effect of foreign competition on coverage will be biased if unobserved industry fixed-effects are correlated with import penetration. To control for the unobservables, we include a full set of 4-digit industry dummies. As such, the regression model with industry fixed-effects can be written as

$$c_{it} = \alpha_i + \beta m_{it} + X_{it}\beta_1 + \mu_{it} \quad (11)$$

The results in table 3.6 indicate that import penetration is not statistically significant. This is consistent with our earlier descriptive analysis indicating a lack of the variations in foreign competition within industries. The least squares dummy variable model estimated here, in effect, generates the within-effects estimator of the impact of foreign competition on coverage. No evidence of an export effect on coverage is found. On the other hand, the time dummies are strongly significant, especially from the mid 1980s onwards. Other significant coefficients relate to part-time employment, educated and white-collar workers, the proportion of employees in the private sector and industry concentration. Note that the signs of the coefficients on the concentration dummies have changed from positive to negative. It is possible that although, on the whole, lower levels of concentration may be positively correlated with coverage, lower concentration within industries leads to a smaller extent of unionisation.

Table 3.6: Results from OLS estimation with industry fixed effects

	1	2	3
Import penetration	-0.003 (1.38)	-0.002 (1.34)	-0.002 (0.93)
Export share		-0.001 (0.36)	0.001 (0.15)
Female	-0.052 (1.02)	-0.053 (1.07)	-0.064 (1.35)
Age25	0.040 (0.70)	0.045 (0.80)	0.033 (0.59)
Age25-45	-0.149 (3.42)**	-0.110 (2.54)*	-0.055 (1.32)
Part time	-0.058 (1.65) [†]	-0.056 (1.66) [†]	-0.054 (1.63) [†]
Further	-0.202 (5.41)**	-0.162 (4.92)**	-0.074 (2.20)*
Secondary	-0.176 (8.77)**	-0.123 (6.03)**	-0.045 (2.31)*
Job related training	-0.010 (0.23)	-0.012 (0.31)	0.058 (1.60)
White collar	-0.209 (4.21)**	-0.183 (3.93)**	-0.123 (2.61)**
Blue collar	0.073 (3.35)**	0.055 (2.62)**	0.014 (0.51)
London	0.048 (0.58)	0.058 (0.69)	-0.009 (0.10)
South East	-0.153 (1.78) [†]	-0.092 (1.07)	-0.063 (0.72)
South West	-0.097 (1.16)	-0.024 (0.30)	0.033 (0.40)
North	-0.065 (0.71)	-0.056 (0.63)	-0.005 (0.05)
North West	-0.102 (1.10)	-0.060 (0.65)	-0.010 (0.10)
East	-0.199 (1.85) [†]	-0.143 (1.35)	-0.079 (0.72)
East Midlands	-0.075 (0.82)	-0.017 (0.20)	0.071 (0.82)

	1	2	3
West Midlands	0.038 (0.40)	0.015 (0.16)	0.085 (0.93)
Yorkshire	0.034 (0.34)	0.075 (0.75)	0.146 (1.42)
Wales	-0.102 (1.06)	-0.105 (1.12)	-0.021 (0.22)
Small firms		-0.024 (4.31)**	-0.016 (1.07)
Private		-0.335 (7.54)**	-0.324 (7.34)**
Concentration20		-0.039 (3.20)**	-0.033 (2.80)**
Concentration50		-0.021 (1.92)	-0.017 (1.59)
1984			-0.007 (0.82)
1985			-0.013 (1.54)
1986			-0.024 (2.91)**
1987			-0.053 (6.71)**
1988			-0.060 (7.13)**
1989			-0.055 (4.82)**
1990			-0.078 (6.78)**
1991			-0.060 (4.57)**
1993			-0.084 (5.98)**
1994			-0.101 (7.45)**
1995			-0.100 (7.48)**
Constant	0.618 (5.52)**	0.759 (8.29)**	0.678 (7.19)**
Observations	2066	2060	2060
R-squared	0.75	0.78	0.81

Notes: Absolute value of *t*-statistics in parentheses
[†] significant at 10% * significant at 5%; ** significant at 1%

3-5-2-4 *Are these results robust?*

In order to check the robustness of our findings, we estimate an employment-weighted version of our model using OLS. Employment-weighted regressions are intended to control for industry size and also the presence of any outliers and/or influential observations. The results are presented in table 3.7. The weighted regression without industry fixed effects generates a statistically insignificant import penetration coefficient. This is consistent with the unweighted results from the same specification (column (5)) in table 3.5, although it should be noted that there is a change in the sign of the coefficient. The negative effect of export performance has magnified and is now strongly statistically significant as compared to the export coefficient in column (5) from table 3.5. The inclusion of industry fixed effects in the weighted regression gives rise to a negative and significant import competition effect. The coefficient has also increased in magnitude. This is in contrast to the corresponding import coefficient from the unweighted specification (3) in table 3.6, which indicates the absence of any significant impact of import penetration on union coverage. When controlling for industry fixed effects, the coefficient on export share in the weighted regression is significant and positive. Whilst the change of sign (from negative to positive) is somehow consistent with the unweighted fixed effects results, the level of statistical significance is not.

In sum, the evidence on the impact of international competition on union coverage appears to be rather mixed. On the other hand, there is a striking consistency of the time dummy coefficients. They remain highly significant and robust in all specifications.

Table 3.7: Results from employment weighted regressions

	Without industry fixed effects	With industry fixed effects
Import penetration	0.002 (0.41)	-0.015 (3.15)**
Export share	-0.041 (6.03)**	0.031 (2.46)*
Female	-0.116 (3.21)**	-0.292 (3.96)**
Age25	-0.276 (3.23)**	-0.059 (0.92)
Age25-45	-0.282 (3.35)**	-0.139 (2.52)*
Part time	0.253 (2.41)*	-0.078 (1.82) [†]
Further	-0.081 (1.06)	-0.128 (2.60)**
Secondary	0.110 (2.45)*	-0.093 (3.27)**
Job related training	-0.272 (3.35)**	-0.006 (0.12)
White collar	-0.402 (4.01)**	-0.325 (4.07)**
Blue collar	-0.111 (2.04)*	0.096 (2.65)**
London	0.326 (3.25)**	-0.191 (1.94) [†]
South East	-0.097 (1.52)	-0.321 (3.68)**
South West	0.208 (2.06)*	-0.164 (1.27)
North	0.032 (0.33)	-0.215 (1.80) [†]
North West	0.032 (0.59)	-0.204 (2.19)*
East	-0.500 (5.92)**	-0.298 (2.25)*
East Midlands	0.266 (3.80)**	-0.068 (0.76)

	Without industry fixed effects	With industry fixed effects
West Midlands	0.075 (1.15)	0.020 (0.22)
Yorkshire	0.162 (2.56)*	0.035 (0.39)
Wales	-0.163 (1.16)	-0.210 (1.74)
Small firms	0.041 (1.07)	-0.006 (0.38)
Private	-0.447 (8.94)**	-0.182 (2.52)*
Concentration20	0.048 (3.89)**	-0.052 (1.39)
Concentration50	0.063 (4.51)**	-0.051 (1.44)
1984	0.014 (0.67)	-0.003 (0.31)
1985	0.008 (0.38)	-0.009 (1.07)
1986	-0.001 (0.01)	-0.027 (2.95)**
1987	-0.027 (1.32)	-0.046 (5.24)**
1988	-0.035 (1.64) [†]	-0.058 (5.31)**
1989	-0.092 (3.23)**	-0.065 (5.27)**
1990	-0.119 (4.04)**	-0.094 (7.21)**
1991	-0.128 (3.93)**	-0.048 (2.63)**
1993	-0.105 (3.96)**	-0.049 (2.80)**
1994	-0.116 (4.37)**	-0.062 (2.94)**
1995	-0.137 (5.54)**	-0.081 (4.06)**
Constant	0.906 (9.80)**	0.919 (9.84)**
Observations	1952	1952
R-squared	0.44	0.90

Notes: Absolute value of t-statistics in parentheses
** significant at 5%; ** significant at 1%*
Weighted sample size is smaller due to missing observations for employment

3-6 Summary and conclusion

During the 1980s and 1990s trade unionism in the UK fell markedly whilst, at the same time, there was rising competitive pressure from imports in the product market. So, in this chapter we examined the potential link between unionisation and import competition using 4-digit industry level data from the manufacturing sector for the period 1983-95. For the purpose of analysis, we used major coverage from the NESPD as our main measure of unionism and computed trade variables from a specially compiled industry trade dataset.

The empirical analysis was divided into two parts, distinguishing between the compositional and non-compositional effects of import penetration. Using a basic shift-share technique, we found that foreign competition as a compositional factor explained only around 2.1% of the total decline in union coverage between 1983 and 1995. Clearly, behavioural changes among industries were more important.

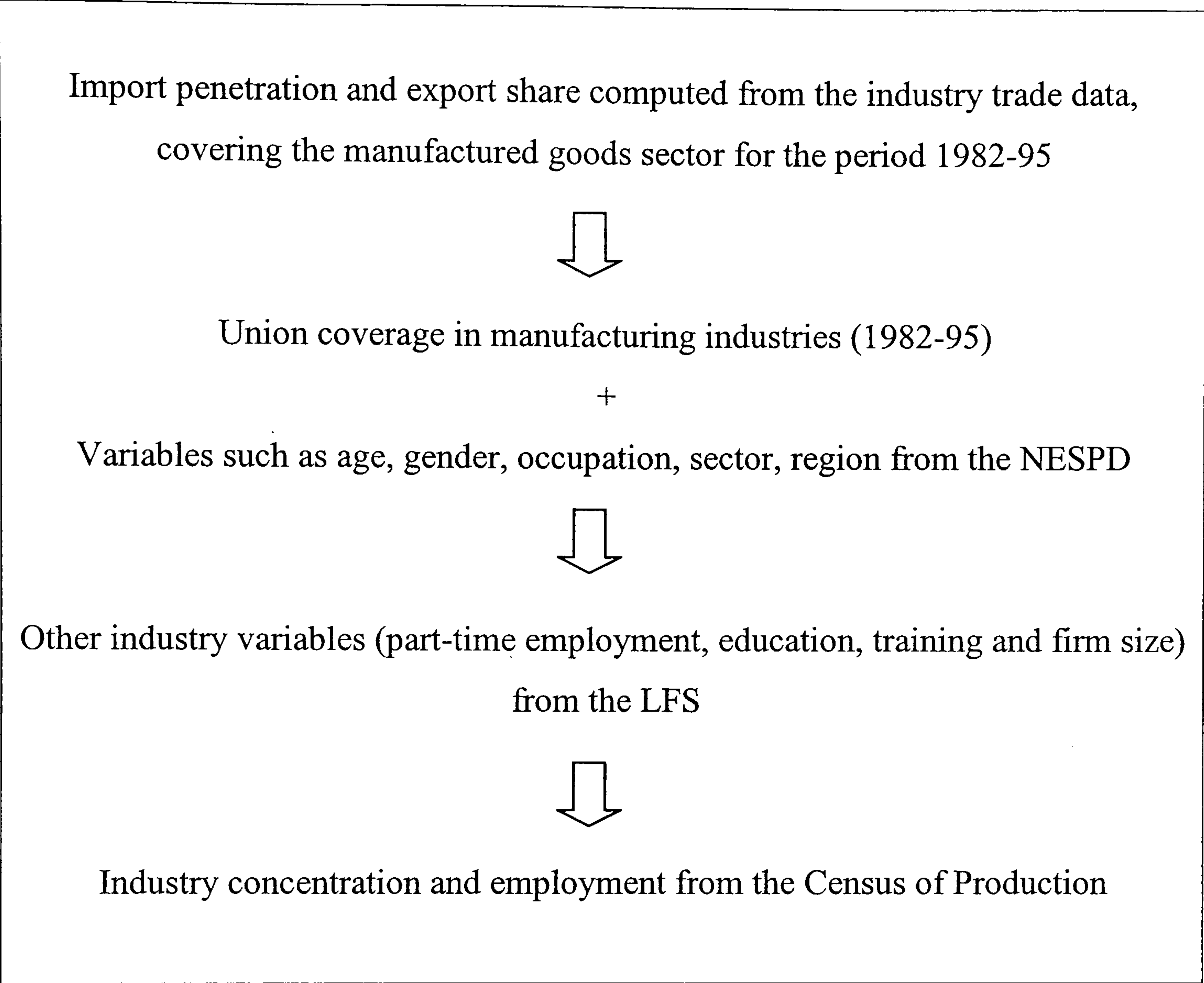
In order to examine the effect of import competition on coverage, irrespective of any compositional shifts, we specified a multivariate regression model that included controls for some of the main determinants of unionisation. Our pooled OLS regressions (both excluding and including industry fixed effects) did not generate statistically significant coefficients on import penetration. However, we also estimated weighted regressions and here some evidence of a negative and significant import competition effect on coverage was revealed when controlling for industry fixed effects.

Hence, the findings in this chapter lead us to conclude that there could be a role for foreign competition in the decline of unionisation in the UK. Though, it seems likely that the influence of import penetration may have been overshadowed by legislative changes and the hostile political and macroeconomic climate, especially from the mid-1980s onwards, and to some degree by privatisation and changes in workforce composition.

Finally, it should be noted that our analysis focused on coverage by major agreements only. To the extent that collective bargaining at the national/industry level has become less important relative to local agreements, it is sensible to think that the decline of major coverage observed throughout the 1980s and 1990s could have been mostly due to government policy aiming at decentralising union bargaining, hence the lack of overwhelming support for a significant import competition effect. Thus, in chapter 4, we provide further evidence on the relationship between foreign competition and unionisation by looking at establishment-level data on union recognition, which encompasses all types of union agreements.

APPENDIX 3A

Table 3A.1: Construction of the final industry-level dataset



Note: Arrows indicate “merged to”

Table 3A.2: Concordance of SITC to SIC 80

SITC	Description	SIC80	Description
0111	Meat of bovine animals, fresh, chilled or frozen	4121	Slaughterhouses
0112	Meat of sheep and goats, fresh, chilled or frozen	4121	Slaughterhouses
0113	Meat of swine, fresh, chilled or frozen	4121	Slaughterhouses
0114	Poultry, dead & edible offals except liver, fresh/frozen	4123	Poultry slaughter and processing
0115	Meat of horses, asses, etc., fresh, chilled, frozen	4121	Slaughterhouses
0116	Edible offals of animals in headings 001.10001.5	4121	Slaughterhouses
0118	Other fresh, chilled, frozen meat or edible offals	4121	Slaughterhouses
0121	Bacon, ham & other dried, salted, smoked meat/ swine	4122	Bacon curing and meat processing
0129	Meat & edible offals, n.e.s. salt.in brine dried/smok.	4122	Bacon curing and meat processing
0141	Meat extracts and meat juices; fish extracts	4122	Bacon curing and meat processing
0142	Sausages & the like, of meat, meat offal or blood	4122	Bacon curing and meat processing
0149	Other prepared or preserved meat or meat offals	4122	Bacon curing and meat processing
0223	Milk & cream, fresh, not concentrated or sweetened	4130	Preparation of milk and milk products
0224	Milk & cream, preserved, concentrated or sweetened	4130	Preparation of milk and milk products
0230	Butter	4130	Preparation of milk and milk products
0240	Cheese and curd	4130	Preparation of milk and milk products
0341	Fish, fresh (live/dead) or chilled, excl.filletts	4150	Fish processing
0342	Fish, frozen (excluding filletts)	4150	Fish processing
0343	Fish filletts, fresh or chilled	4150	Fish processing
0344	Fish filletts, frozen	4150	Fish processing

SITC	Description	SIC80	Description
0350	Fish, dried, salted or in brine; smoked fish	4150	Fish processing
0360	Crustaceans and molluscs, fresh, chilled, frozen etc.	4150	Fish processing
0371	Fish, prepared or preserved, n.e.s. including caviar	4150	Fish processing
0372	Crustaceans and molluscs, prepared or preserved	4150	Fish processing
0421	Rice in the husk or husked, but not further prepared	4160	Grain milling
0422	Rice semi0milled or wholly milled, broken rice	4160	Grain milling
0460	Meal and flour of wheat and flour of meslin	4160	Grain milling
0470	Other cereal meals and flours	4160	Grain milling
0481	Cereal grains, worked/prepared, (breakfast foods)	4160	Grain milling
0482	Malt, roasted or not (including malt flour)	4160	Grain milling
0483	Macaroni, spaghetti and similar products	4239	General foods manufacturing including coffee,tea,snack,infant and diabetic
0484	Bakery products (e.g., bread, biscuits, cakes) etc.	4196	Bread baking and flour confectionery
0488	Malt extract; preparations of flour etc, for infant food	4160	Grain milling
0546	Vegetables, frozen or in temporary preservative	4147	Processing of fruit and vegetables
0548	Vegetable products, roots & tubers, for human food	4147	Processing of fruit and vegetables
0561	Vegetables, dried, dehydrated or evaporated	4147	Processing of fruit and vegetables
0564	Flours, meals & flakes of potatoes fruits & vegetables	4147	Processing of fruit and vegetables
0565	Vegetables, prepared or preserved, n.e.s.	4147	Processing of fruit and vegetables
0582	Fruit, fruit0peel & parts of plants, preserved by sugar	4147	Processing of fruit and vegetables
0583	Jams, fruit jellies, marmalades, fruit puree, cooked	4147	Processing of fruit and vegetables
0585	Juices; fruit & vegetable (including grape must) unfermented	4283	Soft drinks manufacturing

SITC	Description	SIC80	Description
0586	Fruit, temporarily preserved	4147	Processing of fruit and vegetables
0589	Fruit otherwise prepared or preserved, n.e.s.	4147	Processing of fruit and vegetables
0611	Sugars, beet and cane, raw, solid	4200	Sugar and sugar by0products manufacturing
0612	Refined sugars and other prod. of ref. beet/cane	4200	Sugar and sugar by0products manufacturing
0615	Molasses, whether or not decolourized	4200	Sugar and sugar by0products manufacturing
0619	Other sugars;sugar syrups;artificial honey; caramel	4200	Sugar and sugar by0products manufacturing
0620	Sugar confectionery and other sugar preparations	4214	Cocoa,chocolate and sugar confectionery manufacturing
0711	Coffee, whether or not roasted or freed of caffeine	4239	General foods manufacturing including coffee,tea,snack,infant and diabetic
0712	Extracts, essences/concentrates of coffee & chicory	4239	General foods manufacturing including coffee,tea,snack,infant and diabetic
0721	Cocoa beans, whole or broken, raw or roasted	4214	Cocoa,chocolate and sugar confectionery manufacturing
0722	Cocoa powder, unsweetened	4214	Cocoa,chocolate and sugar confectionery manufacturing
0723	Cocoa butter and cocoa paste	4214	Cocoa,chocolate and sugar confectionery manufacturing
0730	Chocolate & other food preptions containing cocoa	4214	Cocoa,chocolate and sugar confectionery manufacturing
0741	Tea	4239	General foods manufacturing including coffee,tea,snack,infant and diabetic
0742	Mate	4239	General foods manufacturing including coffee,tea,snack,infant and diabetic
0751	Pepper; pimento	4239	General foods manufacturing including coffee,tea,snack,infant and diabetic
0752	Spices (except pepper and pimento)	4239	General foods manufacturing including coffee,tea,snack,infant and diabetic
0811	Hay and fodder, green or dry	4222	Pet foods and non0compound animal feeds manufacturing
0812	Bran, sharps & other residues derived from sifting	4222	Pet foods and non0compound animal feeds manufacturing
0813	Oil0cake & other residues (except dregs)	4221	Compound animal feeds manufacturing
0814	Flours & meals, of meat/fish, unfit for human food	4222	Pet foods and non0compound animal feeds manufacturing

SITC	Description	SIC80	Description
0819	Food wastes and prepared animal feeds, n.e.s	4221	Compound animal feeds manufacturing
0913	Lard, other pig fat & poultry, rendered/solvent0ext.	4115	Margarine and compound cooking fats manufacturing
0914	Margarine, imitat.lard & other prepared edible fats	4115	Margarine and compound cooking fats manufacturing
0980	Edible products and preparations n.e.s.	4239	General foods manufacturing including coffee,tea,snack,infant and diabetic
1110	Non alcoholic beverages, n.e.s.	4283	Soft drinks manufacturing
1121	Wine of fresh grapes (including grape must)	4261	Wines,cider and perry production
1122	Other fermented beverages n.e.s (cider, perry mead)	4261	Wines,cider and perry production
1123	Beer made from malt (includ.ale, stout and porter)	4270	Brewing and malting
1124	Spirits; liqueurs, other spirituous beverages, n.e.s	4240	Spirit distilling and compounding
1211	Tobacco, not stripped	4290	Tobacco industry
1212	Tobacco, wholly or partly stripped	4290	Tobacco industry
1213	Tobacco refuse	4290	Tobacco industry
1221	Cigars and cheroots; cigarillos	4290	Tobacco industry
1222	Cigarettes	4290	Tobacco industry
1223	Tobacco, manufactured (including smoking, chewing tobacco)	4290	Tobacco industry
2111	Bovine & equine hides (other than calf), raw	4126	Animal by0product processing
2112	Calf skins, raw (fresh, salted, dried, pickled/limed)	4126	Animal by0product processing
2114	Goat & kid skins, raw (fresh, salted, dried, pickled)	4126	Animal by0product processing
2116	Sheep & lamb skins with wool on, raw (fresh, salted)	4126	Animal by0product processing
2117	Sheep & lamb skins without the wool, raw (fresh etc)	4126	Animal by0product processing
2119	Hides and skins, n.e.s waste and used leather	4126	Animal by0product processing

SITC	Description	SIC80	Description
2120	Furskins, raw (including astrakhan, caracul, etc.)	4126	Animal by0product processing
2331	Synthetic rubber latex; synthetic rubber factice made from oils	2515	Synthetic rubber manufacturing
2440	Cork, natural, raw & waste (including in blocks/sheets)	4610	Sawmilling,planing etc of wood
2450	Fuel wood (excluding wood waste) and wood charcoal	4610	Sawmilling,planing etc of wood
2460	Pulpwood (including chips and wood waste)	4610	Sawmilling,planing etc of wood
2471	Sawlogs and veneer logs, of coniferous species	4610	Sawmilling,planing etc of wood
2472	Sawlogs and veneer logs, of non coniferous species	4610	Sawmilling,planing etc of wood
2479	Pitprops, poles, piling, posts & other wood in rough	4610	Sawmilling,planing etc of wood
2481	Railway or tramway sleepers (ties) of wood	4610	Sawmilling,planing etc of wood
2482	Wood of coniferous species, sawn, planed, tongued etc	4610	Sawmilling,planing etc of wood
2483	Wood of non0coniferous species, sawn, planed, tongued	4610	Sawmilling,planing etc of wood
2511	Waste paper, paperboard; only for use paper0making	4710	Pulp,paper and board manufacturing
2512	Mechanical wood pulp	4710	Pulp,paper and board manufacturing
2516	Chemical wood pulp, dissolving grades	4710	Pulp,paper and board manufacturing
2517	Chemical wood pulp, soda or sulphate	4710	Pulp,paper and board manufacturing
2518	Chemical wood pulp, sulphite	4710	Pulp,paper and board manufacturing
2519	Other cellulosic pulps	4710	Pulp,paper and board manufacturing
2665	Synth.fibr.not carded, combed or otherwise prepared	2600	Production of man0made fibres
2666	Continuous filament tow for the manufac.of fibres	2600	Production of man0made fibres
2667	Synth.fibres, carded, combed or otherwise prepared	2600	Production of man0made fibres
2671	Regenerated fibres suitable for spinning	2600	Production of man0made fibres

SITC	Description	SIC80	Description
2672	Waste of man0made fibres, not carded, combed	2600	Production of man0made fibres
2681	Seep's or lambs' wool, greasy or fleece0washed	4126	Animal by0product processing
2682	Sheep's or lambs'wool, degreased, in the mass	4126	Animal by0product processing
2683	Fine animal hair, not carded or combed	4126	Animal by0product processing
2685	Horsehair & other coarse animal hair (excl.wool)	4126	Animal by0product processing
2686	Waste of sheep's/lamb's wool or of other anim.hair	4126	Animal by0product processing
2687	Sheep's/lamb's wool/other aimal hair, carded/combed	4126	Animal by0product processing
2690	Old clothing and other old textile articles; rags	4399	Miscellaneous textiles
2911	Bones, horns, ivory, hooves, claws, coral, shells etc.	4126	Animal by0product processing
2919	Other materials of animal origin, n.e.s	4126	Animal by0product processing
4111	Fats and oils of fish and marine mammals	4116	Processing organic oils and fats (other than crude animal fat production)
4113	Animal oils, fats and greases, n.e.s	4116	Processing organic oils and fats (other than crude animal fat production)
4232	Soya bean oil	4116	Processing organic oils and fats (other than crude animal fat production)
4233	Cotton seed oil	4116	Processing organic oils and fats (other than crude animal fat production)
4234	Groundnut (peanut) oil	4116	Processing organic oils and fats (other than crude animal fat production)
4235	Olive oil	4116	Processing organic oils and fats (other than crude animal fat production)
4236	Sunflower seed oil	4116	Processing organic oils and fats (other than crude animal fat production)
4239	Other soft fixed vegetable oils	4116	Processing organic oils and fats (other than crude animal fat production)
4241	Linseed oil	4116	Processing organic oils and fats (other than crude animal fat production)
4242	Palm oil	4116	Processing organic oils and fats (other than crude animal fat production)
4243	Coconut (copra) oil	4116	Processing organic oils and fats (other than crude animal fat production)

SITC	Description	SIC80	Description
4244	Palm kernel oil	4116	Processing organic oils and fats (other than crude animal fat production)
4245	Castor oil	4116	Processing organic oils and fats (other than crude animal fat production)
4249	Fixed vegetable oils, n.e.s	4116	Processing organic oils and fats (other than crude animal fat production)
4311	Oils, animal & vegetable, boiled, oxidized, etc.	2563	Chemical treatment of oils and fats
4312	Anim./veget.oils & fats, wholly/partly hydrogenated	2563	Chemical treatment of oils and fats
4313	Fatty acids, acid oils, and residues	2563	Chemical treatment of oils and fats
4314	Waxes of animal or vegetable origin	2563	Chemical treatment of oils and fats
5111	Acyclic hydrocarbons	2512	Basic organic chemicals manufacturing (except specialised pharmaceutical chemicals)
5112	Cyclic hydrocarbons	2512	Basic organic chemicals manufacturing (except specialised pharmaceutical chemicals)
5113	Halogenated derivatives of hydrocarbons	2512	Basic organic chemicals manufacturing (except specialised pharmaceutical chemicals)
5114	Sulphonated nitrated /nitrosated derivatives of hydrocarbons	2512	Basic organic chemicals manufacturing (except specialised pharmaceutical chemicals)
5121	Acyclic alcohols & their halogenated, derivatives	2512	Basic organic chemicals manufacturing (except specialised pharmaceutical chemicals)
5122	Cyclic.alcohols & their halogenated derivatives	2512	Basic organic chemicals manufacturing (except specialised pharmaceutical chemicals)
5123	Phenols & phen.Oalco.& their halogenat.derivatives	2512	Basic organic chemicals manufacturing (except specialised pharmaceutical chemicals)
5137	Monocarboxylic acids & their anhydrides, halides	2512	Basic organic chemicals manufacturing (except specialised pharmaceutical chemicals)
5138	Polycarboxylic acids & their anhydrides, etc.	2512	Basic organic chemicals manufacturing (except specialised pharmaceutical chemicals)
5139	Carboxylic acids with alcohol, phenol etc.function	2512	Basic organic chemicals manufacturing (except specialised pharmaceutical chemicals)
5145	Amine0function compounds	2512	Basic organic chemicals manufacturing (except specialised pharmaceutical chemicals)
5146	Single or complex oxygen0function amino0compounds	2512	Basic organic chemicals manufacturing (except specialised pharmaceutical chemicals)
5147	Carboxyamide0function compounds; & other compounds	2512	Basic organic chemicals manufacturing (except specialised pharmaceutical chemicals)
5148	Other nitrogen0function compounds	2512	Basic organic chemicals manufacturing (except specialised pharmaceutical chemicals)

SITC	Description	SIC80	Description
5154	Organo0sulphur compounds	2512	Basic organic chemicals manufacturing (except specialised pharmaceutical chemicals)
5155	Other organo0inorganic compounds	2512	Basic organic chemicals manufacturing (except specialised pharmaceutical chemicals)
5156	Heterocyclic compounds; nucleic acids	2512	Basic organic chemicals manufacturing (except specialised pharmaceutical chemicals)
5157	Sulphonamides, sultones and sultams	2512	Basic organic chemicals manufacturing (except specialised pharmaceutical chemicals)
5161	Ethers, alcohol peroxides, ether perox., epoxides etc	2512	Basic organic chemicals manufacturing (except specialised pharmaceutical chemicals)
5162	Aldehyde0, ketone0, & quinone0function compounds	2512	Basic organic chemicals manufacturing (except specialised pharmaceutical chemicals)
5163	Inorganic esters, their salts, & their derivatives	2512	Basic organic chemicals manufacturing (except specialised pharmaceutical chemicals)
5169	Organic chemicals, n.e.s	2512	Basic organic chemicals manufacturing (except specialised pharmaceutical chemicals)
5221	Chemical elements	2511	Inorganic chemicals manufacturing (except industrial gases)
5222	Inorganic acids and oxygen compounds of non0metals	2511	Inorganic chemicals manufacturing (except industrial gases)
5223	Halogen and sulphur compounds of non0metals	2511	Inorganic chemicals manufacturing (except industrial gases)
5224	Metallic oxides of zinc, chromium, manganese, iron,	2511	Inorganic chemicals manufacturing (except industrial gases)
5225	Inorganic bases & metallic oxides, hydroxides & peroxides	2511	Inorganic chemicals manufacturing (except industrial gases)
5231	Metallic salts and peroxysalts of inorganic acids	2511	Inorganic chemicals manufacturing (except industrial gases)
5232	Metallic salts and peroxysalts of inorganic acids	2511	Inorganic chemicals manufacturing (except industrial gases)
5233	Salts of metallic acids; etc.	2511	Inorganic chemicals manufacturing (except industrial gases)
5239	Inorganic chemical products, n.e.s	2511	Inorganic chemicals manufacturing (except industrial gases)
5241	Fissile chemical elements and isotopes	2511	Inorganic chemicals manufacturing (except industrial gases)
5249	Other radio0active and associated materials	2512	Basic organic chemicals manufacturing (except specialised pharmaceutical chemicals)
5311	Synthetic organic dyestuffs	2516	Dyestuffs and pigments manufacturing
5312	Synthetic organic luminophores; optical bleaching agents	2516	Dyestuffs and pigments manufacturing

SITC	Description	SIC80	Description
5322	Tanning extracts of vegetable origin; tan.& derivatives	2516	Dyestuffs and pigments manufacturing
5323	Synth.org.tanning substances, & inorganic tanning substances	2516	Dyestuffs and pigments manufacturing
5331	Other colouring matter, inorganic products	2516	Dyestuffs and pigments manufacturing
5332	Printing ink	2552	Printing ink manufacturing
5334	Varnishes and lacquers; distempers, water pigments	2551	Paints, varnishes and painters fillings manufacturing
5335	Colour.preptions of a kind used in ceramic, enamelling	2551	Paints, varnishes and painters fillings manufacturing
5411	Provitamins & vitamins, natural/reprod.by synthesis	2570	Pharmaceutical products manufacturing
5413	Antibiotics n.e.s., not including in 541.7	2570	Pharmaceutical products manufacturing
5414	Vegetab.alkaloids, natural/reproduced by synthesis	2570	Pharmaceutical products manufacturing
5415	Hormones, natural or reproduced by synthesis	2570	Pharmaceutical products manufacturing
5416	Glycosides; glands or other organs & their extracts	2570	Pharmaceutical products manufacturing
5417	Medicaments (including veterinary medicaments)	2570	Pharmaceutical products manufacturing
5419	Pharmaceutical goods, other than medicaments	2570	Pharmaceutical products manufacturing
5513	Essential oils, concretes & absolutes; resinoids	2564	Essential oils and flavouring materials manufacturing
5514	Mixtures of two or more odoriferous substances	2564	Essential oils and flavouring materials manufacturing
5530	Perfumery, cosmetics and toilet preparations	2582	Perfumes, cosmetic and toilet preparations manufacturing
5541	Soap; organic surface0active products & preparatns	2581	Soap and synthetic detergents manufacturing
5542	Organic surface0active agents, n.e.s.	2581	Soap and synthetic detergents manufacturing
5543	Polishes & creams, for footwear, furniture or floors	2599	General chemical products manufacturing including polish & wax products
5621	Mineral or chemical fertilizers, nitrogenous	2513	Fertilizers manufacturing
5622	Mineral or chemical fertilizers, phosphatic	2513	Fertilizers manufacturing

SITC	Description	SIC80	Description
5623	Mineral or chemical fertilizers, potassic	2513	Fertilizers manufacturing
5629	Fertilizers, n.e.s.	2513	Fertilizers manufacturing
5721	Propellent powders and other prepared explosives	2565	Explosives manufacturing
5722	Safety fuses, detonating fus.; percussion & det.caps	2565	Explosives manufacturing
5723	Pyrotechnic articles: (firework, railway fog etc.)	2565	Explosives manufacturing
5821	Phenoplasts	2514	Synthetic resins and plastics materials manufacturing
5822	Aminoplasts	2514	Synthetic resins and plastics materials manufacturing
5823	Alkyds and other polyesters	2514	Synthetic resins and plastics materials manufacturing
5824	Polyamides	2514	Synthetic resins and plastics materials manufacturing
5825	Polyurethanes	2514	Synthetic resins and plastics materials manufacturing
5826	Epoxide resins	2514	Synthetic resins and plastics materials manufacturing
5827	Silicones	2514	Synthetic resins and plastics materials manufacturing
5828	Ion exchangers of condensation, polycondensation etc.	2514	Synthetic resins and plastics materials manufacturing
5829	Other condensation, polycondensation/polyaddition products	2514	Synthetic resins and plastics materials manufacturing
5831	Polyethylene	2514	Synthetic resins and plastics materials manufacturing
5832	Polypropylene	2514	Synthetic resins and plastics materials manufacturing
5833	Polystyrene and its copolymers	2514	Synthetic resins and plastics materials manufacturing
5834	Polyvinyl chloride	2514	Synthetic resins and plastics materials manufacturing
5835	Copolymers of vinyl chloride and vinyl acetate	2514	Synthetic resins and plastics materials manufacturing
5836	Acrylic polymers, methacrylic polymers, etc.	2514	Synthetic resins and plastics materials manufacturing
5837	Polyvinyl acetate	2514	Synthetic resins and plastics materials manufacturing

SITC	Description	SIC80	Description
5838	Ion exchangers of polymerization/copolymeriz.type	2514	Synthetic resins and plastics materials manufacturing
5839	Other polymerization and copolymerization products	2514	Synthetic resins and plastics materials manufacturing
5841	Regenerated cellulose	2514	Synthetic resins and plastics materials manufacturing
5842	Cellulose nitrates	2514	Synthetic resins and plastics materials manufacturing
5843	Cellulose acetates	2514	Synthetic resins and plastics materials manufacturing
5849	Other chemical derivatives of cellulose, vulc.fibr.	2514	Synthetic resins and plastics materials manufacturing
5851	Natural resins modified by fusion; artificial resins	2514	Synthetic resins and plastics materials manufacturing
5852	Other artificial plastic materials, n.e.s.	2514	Synthetic resins and plastics materials manufacturing
5911	Insecticides packed for sale etc.	2568	Formulated pesticides manufacturing
5912	Fungicides packed for sale etc.	2568	Formulated pesticides manufacturing
5913	Weed killers (herbicides) packed for sale etc.	2568	Formulated pesticides manufacturing
5914	Disinfect., anti0sprouting prod.etc.packed for sale	2568	Formulated pesticides manufacturing
5921	Starches, inulin and wheat gluten	4180	Starch manufacturing
5922	Albuminoidal substances; glues	2562	Formulated adhesives and sealants manufacturing
5981	Wood0 and resin0based chemical products	2599	General chemical products manufacturing including polish & wax products
5982	Anti0knock preparations, oxidation inhibitors etc.	2599	General chemical products manufacturing including polish & wax products
5983	Organic chemical products, n.e.s.	2599	General chemical products manufacturing including polish & wax products
5989	Chemical products and preparations, n.e.s.	2567	General chemical products manufacturing for industrial use including gases
6112	Composition leather fibre, in slabs etc., sheets, etc	4410	Leather (tanning and dressing) and fellmongery
6113	Calf leather	4410	Leather (tanning and dressing) and fellmongery
6114	Leather of other bovine cattle and equine leather	4410	Leather (tanning and dressing) and fellmongery

SITC	Description	SIC80	Description
6115	Sheep and lamb skin leather	4410	Leather (tanning and dressing) and fellmongery
6116	Leather of other hides or skins	4410	Leather (tanning and dressing) and fellmongery
6118	Leather, specially dressed or finised	4410	Leather (tanning and dressing) and fellmongery
6121	Articles of leather or of composition leather	4420	Leather goods manufacturing
6122	Saddlery and harness, or any material for animals	4420	Leather goods manufacturing
6123	Parts of footwear	4420	Leather goods manufacturing
6129	Other articles of leather or of composit. leather	4420	Leather goods manufacturing
6130	Furskins, tanned/dressed, pieces/cuttings of furskin	4410	Leather (tanning and dressing) and fellmongery
6210	Materials of rubber (e.g., pastes, plates, sheets, etc)	4812	Rubber products (excluding rubber tyres and inner tubes) manufacturing
6251	Tyres, pneumatic, new, of a kind used on motor cars	4811	Rubber tyres and inner tubes manufacturing
6252	Tyres, pneumatic , new, of a kind used on buses, lorries	4811	Rubber tyres and inner tubes manufacturing
6253	Tyres, pneumatic, new, of a kind used on aircraft	4811	Rubber tyres and inner tubes manufacturing
6254	Tyres, pneum.new.of a kind used on motor/bicycles	4811	Rubber tyres and inner tubes manufacturing
6259	Other tyres, tyre cases, inner tubes	4811	Rubber tyres and inner tubes manufacturing
6281	Hygienic and pharmaceutical articles of rubber	4812	Rubber products (excluding rubber tyres and inner tubes) manufacturing
6282	Transmission, conveyor/elevator belts of rubber	4812	Rubber products (excluding rubber tyres and inner tubes) manufacturing
6289	Other articles of rubber, n.e.s.	4812	Rubber products (excluding rubber tyres and inner tubes) manufacturing
6330	Cork manufactures	4664	Manufacturing articles of cork and basketwear, wickerwork and other plaiting materials
6341	Wood sawn lengthwise, sliced/peeled, but not prepar.	4620	Semi0finished wood products and further processing and treatment of wood
6342	Plywood consisting of sheets of wood	4620	Semi0finished wood products and further processing and treatment of wood
6343	Improved wood and reconstituted wood	4620	Semi0finished wood products and further processing and treatment of wood

SITC	Description	SIC80	Description
6344	Woodbased panels, n.e.s.	4620	Semi0finished wood products and further processing and treatment of wood
6349	Wood, simply shaped, n.e.s.	4620	Semi0finished wood products and further processing and treatment of wood
6351	Wooden packing cases, boxes, crates, drums etc.	4640	Wooden containers manufacturing
6352	Casks, barrels, vats, tubs, buckets & oth.coopers'prod	4640	Wooden containers manufacturing
6353	Builders' carpentry and joinery	4630	Builders carpentry and joinery
6354	Manufactures of wood for domestic/decorative use	4650	Manufacturing miscellaneous wooden articles (except furniture)
6359	Manufactured articles of wood, n.e.s.	4650	Manufacturing miscellaneous wooden articles (except furniture)
6411	Newsprint	4710	Pulp,paper and board manufacturing
6412	Printing paper & writing paper, in rolls or sheets	4710	Pulp,paper and board manufacturing
6413	Kraft paper and paperboard, in rolls or sheets	4710	Pulp,paper and board manufacturing
6415	Paper and paperboard, in rolls or sheets, n.e.s.	4710	Pulp,paper and board manufacturing
6416	Building board of wood pulp or of vegetable fibre	4710	Pulp,paper and board manufacturing
6417	Paper & paperboard, corrugated, creped, crinkled etc.	4710	Pulp,paper and board manufacturing
6418	Paper & paperboard, impregnated coat.surface0coloured	4710	Pulp,paper and board manufacturing
6419	Converted paper and paperboard, n.e.s.	4710	Pulp,paper and board manufacturing
6421	Boxes, bags & oth.packing containers, of paper/papbd	4725	Manufacturing packaging products of board
6422	Writing blocks, envelopes, etc.correspondence cards	4723	Stationery manufacturing
6423	Registers, exercise books, note books, etc.	4723	Stationery manufacturing
6424	Paper and paperboard, cut to size or shape, n.e.s.	4728	General manufacturing paper and board products including papier mache and woodpulp
6428	Art.of paper pulp, paper, paperboard, cellu.wadding	4728	General manufacturing paper and board products including papier mache and woodpulp
6511	Silk yarn & yarn spun from noil/other silk waste	4321	Spinning and doubling on the cotton system

SITC	Description	SIC80	Description
6512	Yarn of wool or animal hair (including wool tops)	4310	Woollen and worsted industry
6513	Cotton yarn	4321	Spinning and doubling on the cotton system
6514	Yarn containing 85% by weight of synthetic fibres, not for sale	4336	Throwing, texturing, etc. of continuous filament yarn
6515	Yarn containing 85% by weight of synthetic fibres, for sale	4321	Spinning and doubling on the cotton system
6516	Yarn of discontinuous synthetic fibres, containing less than 85%	4321	Spinning and doubling on the cotton system
6517	Yarn of regenerated fibres, not for retail sale	4350	Jute and polypropylene yarns and fabrics manufacturing
6518	Yarn of regenerated fibres, put up for retail sale	4321	Spinning and doubling on the cotton system
6519	Yarn of textile fibres, n.e.s., including yarn of glass fib.	4350	Jute and polypropylene yarns and fabrics manufacturing
6521	Cotton fabrics, woven, unbleached, not mercerized	4322	Weaving of cotton, silk and man-made fibres
6522	Cotton fabrics, woven, bleach-mercerized dyed, printed	4322	Weaving of cotton, silk and man-made fibres
6531	Fabrics, woven of continuous synthetic textile materials	4322	Weaving of cotton, silk and man-made fibres
6532	Fabrics, woven containing 85% discontinuous synthetic fibres	4322	Weaving of cotton, silk and man-made fibres
6534	Fabrics, woven, of discontinuous synthetic fibres	4322	Weaving of cotton, silk and man-made fibres
6535	Fabrics woven of continuous regenerated textile materials	4322	Weaving of cotton, silk and man-made fibres
6536	Fabrics, woven containing 85% discontinuous regenerated fibre	4322	Weaving of cotton, silk and man-made fibres
6538	Fabrics, woven of discontinuous regenerated fibres	4322	Weaving of cotton, silk and man-made fibres
6539	Pile & chenille fabrics, woven of man-made fibres	4322	Weaving of cotton, silk and man-made fibres
6541	Fabrics, woven, of silk, of noil or other waste silk	4322	Weaving of cotton, silk and man-made fibres
6542	Fabrics, woven, contain.85% of wool/fine animal hair	4310	Woollen and worsted industry
6543	Fabrics, woven, of wool or of fine animal hair n.e.s	4310	Woollen and worsted industry
6544	Fabrics, woven, of flax or of ramie	4340	Woollen and worsted industry

SITC	Description	SIC80	Description
6545	Fabrics, woven, of jute or of other textile bast fibre	4350	Woollen and worsted industry
6546	Fabrics of glass fibre, pile fab.tulle, lace, knitted	4322	Weaving of cotton,silk and man0made fibres
6549	Fabrics, woven, n.e.s.	4322	Weaving of cotton,silk and man0made fibres
6551	Knitted/crocheted fabrics not elastic nor rubberized fibre	4364	Warp knitted fabrics manufacturing
6552	Knitted/crocheted fabrics of fibres other than synthetic	4364	Warp knitted fabrics manufacturing
6553	Knitted/crocheted fabrics elastic or rubberized	4364	Warp knitted fabrics manufacturing
6560	Tulle, lace, embroidery, ribbons, & other small wares	4398	Narrow fabrics manufacturing
6571	Felt & articles of felt, nes, whether/not impregnated	4399	General textiles manufacturing including felt,needlefelt,tufted fabrics,kapok
6572	Bonded fibre fabrics, similar bonded yarn fabrics	4399	General textiles manufacturing including felt,needlefelt,tufted fabrics,kapok
6573	Coated/impregnated textile fabrics & products nes.	4831	Plastic coated textile fabric manufacturing
6574	Elastic fabrics and trimmings	4398	Narrow fabrics manufacturing
6575	Twine, cordage, ropes & cables & manufactures thereof	4396	Rope,twine and net manufacturing
6576	Hat shapes, hat0forms, hat bodies and hoods	4537	Hats,caps and millinery manufacturing
6577	Wadding.textil.fabrics for use in machinery/plant	4322	Weaving of cotton,silk and man0made fibres
6579	Special products of textile materials	4322	Weaving of cotton, silk and man-made fibres
6581	Sacks and bags, of textile materials	4556	Canvas goods,sacks and other made up materials manufacturing
6582	Tarpaulins, sails, awnings, sunblinds, tents etc.	4556	Canvas goods,sacks and other made up materials manufacturing
6583	Travelling rugs and blankets, not knitted/crocheted	4310	Woollen and worsted industry
6584	Bed linen, table linen, toilet & kitchen linen etc.	4557	Household textiles manufacturing
6589	Other made0up articles of textile materials, n.e.s.	4363	Hosiery and other weft knitted goods and fabrics manufacturing
6591	Linoleum and similar floor coverings	4833	Plastic floor coverings manufacturing

SITC	Description	SIC80	Description
6592	Carpets, carpeting and rugs, knotted	4385	General carpet, carpeting, rugs and matting manufacturing
6593	Kelem, schumacks and karamanie rugs and the like	4384	Pile carpets, carpeting and rugs manufacturing
6594	Carpets, carpeting, rugs, mats & matting, of wool etc.	4384	Pile carpets, carpeting and rugs manufacturing
6595	Carpets, rugs etc. of man0made textile materials nes	4384	Pile carpets, carpeting and rugs manufacturing
6596	Carpets, rugs etc. of other textile materials n.e.s.	4384	Pile carpets, carpeting and rugs manufacturing
6597	Plaits and similar products of plaiting materials	4385	General carpet, carpeting, rugs and matting manufacturing
6611	Quicklime, slaked lime and hydraulic lime	2420	Cement, lime and plaster manufacturing
6612	Portland cement, ciment fondu, slag cement etc.	2420	Cement, lime and plaster manufacturing
6613	Building & monumental stone, worked, & artic. thereof	2450	General working of stone and other non0metallic minerals including processed
6618	Constructn.mater. of asbestos0cement & fibre0cement	2440	Asbestos goods manufacturing
6623	Refractory bricks & other refract.construct.mater.	2410	Structural clay products manufacturing
6624	Non0refract.ceramic bricks, tiles, pipes & sim.prod.	2489	Ceramic goods manufacturing
6631	Hand polishing stones, whetstones, oilstones, hones	2450	General working of stone and other non0metallic minerals including processed
6632	Natural or artificial abrasive powder or grain	2460	Abrasive products manufacturing
6633	Manufactures of mineral materials, n.e.s.	2437	Manufacturing building products of concrete, cement, plaster, sand0lime bricks and pitch
6635	Slag wool, rock wool and similar mineral wools	2437	Manufacturing building products of concrete, cement, plaster, sand0lime bricks and pitch
6637	Refractory goods (eg., retorts, crucibles etc) n.e.s	2481	Refractory goods manufacturing
6638	Manufactures of asbestos; friction materials	2440	Asbestos goods manufacturing
6639	Articles of ceramic materials, n.e.s.	2489	Ceramic goods manufacturing
6641	Glass in the mass, in balls, rods/tubes; waste glass	2471	Flat glass manufacturing
6642	Optical glass and elements of optical glass	2471	Flat glass manufacturing

SITC	Description	SIC80	Description
6643	Drawn or blown glass, unworked, in rectangles	2471	Flat glass manufacturing
6644	Cast, rolled, drawn or blown glass, in rectangles	2471	Flat glass manufacturing
6645	Cast or rolled glass, unworked, whether figured/not	2471	Flat glass manufacturing
6646	Bricks, tiles, slabs & oth.art.of pressed/moul.glass	2471	Flat glass manufacturing
6647	Safety glass consisting of toughened/laminat.glass	2471	Flat glass manufacturing
6648	Glass mirrors (including rear0view mir.) , unframed, framed	2471	Flat glass manufacturing
6649	Glass, ne.es.	2471	Flat glass manufacturing
6651	Containers, of glass, used for conveyance or packing	2478	Glass containers manufacturing
6652	Glassware used for table, kitchen, indoor decoration	2479	Glass products manufacturing (excluding flat glass and glass containers)
6658	Articles made of glass, n.e.s	2479	Glass products manufacturing (excluding flat glass and glass containers)
6664	Tableware & other articles of porcelain or china	2489	Ceramic goods manufacturing
6665	Tableware & other articles of oth.kinds of pottery	2489	Ceramic goods manufacturing
6666	Statuettes & oth.ornaments, & articles of adornment	2489	Ceramic goods manufacturing
6671	Pearls, unworked/worked, not mounted, set or strung	2450	General working of stone and other non0metallic minerals including processed
6672	Diamonds, unwork.cut/otherwise work.not mounted/set	2450	General working of stone and other non0metallic minerals including processed
6673	Oth.precious & semi0precious stones, unwork.cut etc	2450	General working of stone and other non0metallic minerals including processed
6674	Synthetic/reconstructed precious/semi0prec.stones	2450	General working of stone and other non0metallic minerals including processed
6712	Pig iron, cast iron and spiegeleisen, in pigs, blocks	2210	Iron and steel industry
6713	Iron or steel powders, shot or sponge	2210	Iron and steel industry
6716	Ferro0alloys	2210	Iron and steel industry
6724	Puddled bars and pilings; ingots, blocks, lumps etc.	2210	Iron and steel industry

SITC	Description	SIC80	Description
6725	Blooms, billets, slabs & sheet bars of iron or steel	2210	Iron and steel industry
6727	Iron or steel coils for re0rolling	2210	Iron and steel industry
6731	Wire rod of iron or steel	2235	Miscellaneous drawing,cold rolling and cold forming of steel
6732	Bars & rods, of iron/steel; hollow mining drill st.	2235	Miscellaneous drawing,cold rolling and cold forming of steel
6733	Angles, shapes & sections & sheet piling, of iron/st	2235	Miscellaneous drawing,cold rolling and cold forming of steel
6741	Universal plates of iron or steel	2235	Miscellaneous drawing,cold rolling and cold forming of steel
6744	Sheets & plates, rolled >4.75mm of iron/steel	2235	Miscellaneous drawing,cold rolling and cold forming of steel
6745	Sheets & plates, rld.thickns.3mm to 4, 75mm iron/stl.	2235	Miscellaneous drawing,cold rolling and cold forming of steel
6746	Sheets & plates, rolled; thickness of less than 3mm.	2235	Miscellaneous drawing,cold rolling and cold forming of steel
6747	Tinned sheets and plates, of steel	2235	Miscellaneous drawing,cold rolling and cold forming of steel
6749	Other sheets and plates, of iron or steel, worked	2235	Miscellaneous drawing,cold rolling and cold forming of steel
6750	Hoop & strip, of iron/steel, hot0rolled/cold0rolled	2235	Miscellaneous drawing,cold rolling and cold forming of steel
6760	Rails and railway track construction material	2210	Iron and steel industry
6770	Iron/steel wire/wheth/not coated, but not insulated	2234	Drawing and manufacture of steel wire and steel wire products
678	Tubes, pipes and fittings, of iron or steel	2220	Steel tubes manufacturing
6781	Tubes and pipes, of cast iron	2220	Steel tubes manufacturing
6782	`seamless` tubes and pipes; blanks for tubes & pipes	2220	Steel tubes manufacturing
6783	Other tubes and pipes, of iron or steel	2220	Steel tubes manufacturing
6784	High0pressure hydro0electric conduits of steel	2220	Steel tubes manufacturing
6785	Tube & pipe fittings (joints, elbows) of iron/steel	2220	Steel tubes manufacturing
6793	Steel & iron forgings & stampings, in rough state	3120	Forging,pressing and stamping

SITC	Description	SIC80	Description
6794	Castings or iron or steel, in the rough state	3111	Ferrous metal foundries
6811	Silver, unwrought, unworked or semi0manufactured	2247	Production of non0ferrous metals and their alloys other than aluminium,copper and brass
6812	Platinum and other metals of the platinum group	2247	Production of non0ferrous metals and their alloys other than aluminium,copper and brass
6821	Copper and copper alloys, refined or not, unwrought	2246	Copper,brass and other copper alloys manufacturing
6822	Copper and copper alloys, worked	2246	Copper,brass and other copper alloys manufacturing
6831	Nickel & nickel alloys, unwrought (ingots, pigs, etc)	2247	Production of non0ferrous metals and their alloys other than aluminium,copper and brass
6832	Nickel and nickel alloys, worked	2247	Production of non0ferrous metals and their alloys other than aluminium,copper and brass
6841	Aluminium and aluminium alloys, unwrought	2245	Aluminium and aluminium alloys manufacturing
6842	Aluminium and aluminium alloys, worked	2245	Aluminium and aluminium alloys manufacturing
6851	Lead and lead alloys, unwrought	2247	Production of non0ferrous metals and their alloys other than aluminium,copper and brass
6852	Lead and lead alloys, worked	2247	Production of non0ferrous metals and their alloys other than aluminium,copper and brass
6861	Zinc and zinc alloys, unwrought	2247	Production of non0ferrous metals and their alloys other than aluminium,copper and brass
6863	Zinc and zinc alloys, worked	2247	Production of non0ferrous metals and their alloys other than aluminium,copper and brass
6871	Tin and tin alloys, unwrought	2247	Production of non0ferrous metals and their alloys other than aluminium,copper and brass
6872	Tin and tin alloys, worked	2247	Production of non0ferrous metals and their alloys other than aluminium,copper and brass
6880	Uranium depleted in u235 & thorium, & their alloys	2247	Production of non0ferrous metals and their alloys other than aluminium,copper and brass
6891	Tungsten, molybdenum, tantalum & magnesium, unwrought	2247	Production of non0ferrous metals and their alloys other than aluminium,copper and brass
6899	Base metals, n.e.s.and cermets, unwrought	2247	Production of non0ferrous metals and their alloys other than aluminium,copper and brass
6911	Structures & parts of struc.; iron/steel; plates	3204	Fabricated constructional steelwork manufacturing
6912	Structures & parts of struc.; aluminium; plates, rods	3204	Fabricated constructional steelwork manufacturing
6921	Reservoirs, tanks, vats and similar containers	3163	Metal storage vessels (mainly non0industrial) manufacturing

SITC	Description	SIC80	Description
6924	Casks, drums, boxes of iron/steel for packing goods	3164	Manufacturing packaging products of metal
6931	Stranded wire, cables, cordages and the like	2234	Drawing and manufacture of steel wire and steel wire products
6932	Wire, twisted hoop for fencing of iron or steel	2234	Drawing and manufacture of steel wire and steel wire products
6935	Gauze, cloth, grill of iron steel or copper	2234	Drawing and manufacture of steel wire and steel wire products
6940	Nails, screws, nuts, bolts etc.of iron, steel, copper	3137	Bolts,nuts,washers,rivets,springs and non0precision chains manufacturing
6951	Hand tools of a kind used in agriculture etc	3161	Hand tools and implements manufacturing
6953	Other tools for use in the hand	3161	Hand tools and implements manufacturing
6954	Interchangeable tools for hand & machine tools	3161	Hand tools and implements manufacturing
6960	Cutlery	3162	Cutlery,spoons,forks and similar tableware;razors manufacturing
6973	Domestic0type, non0electric heating, cooking appar.	3165	Domestic heating and cooking appliances (non0electrical) manufacturing
6974	Art.commonly used for dom.purposes, pot scourers	3167	Manufacturing domestic and similar utensils of metal
6975	Sanitary ware for indoor use, and parts	3167	Manufacturing domestic and similar utensils of metal
6978	Household appliances, decorative art., mirrors etc.	3167	Manufacturing domestic and similar utensils of metal
6991	Locksmiths wares, safes, strong rooms of base metal	3166	Metal furniture and safes manufacturing
6992	Chain and parts thereof, of iron or steel	3137	Bolts,nuts,washers,rivets,springs and non0precision chains manufacturing
6993	Pins & needles, fittings, base metal beads, etc.	3169	General finished metal products manufacturing
6994	Springs & leaves for springs, of iron/steel/copper	3137	Bolts,nuts,washers,rivets,springs and non0precision chains manufacturing
6996	Miscellaneous articles of base metal	3169	General finished metal products manufacturing
6997	Articles of iron or steel, n.e.s.	3169	General finished metal products manufacturing
6998	Art., nes.of copper, nickel, aluminium, lead, zinc, tin	3169	General finished metal products manufacturing
6999	Semi0manufactures of tungsten, molybdenum etc.	3169	General finished metal products manufacturing

SITC	Description	SIC80	Description
7111	Steam & other vapour generating boilers	3205	Boilers and process plant fabrications
7112	Auxiliary plant for use with boilers, of 711.10	3205	Boilers and process plant fabrications
7119	Parts of boilers & aux.plant of 711.10/711.20	3205	Boilers and process plant fabrications
7126	Steam & other vapour power units, steam engines	3205	Boilers and process plant fabrications
7129	Parts of the power units of 712.60	3205	Boilers and process plant fabrications
7131	Internal combustion piston engines for aircraft	3640	Aerospace equipment manufacturing
7132	Int.combustion piston engines for propelling veh.	3510	Manufacturing motor vehicles and their engines
7133	Int.combustion piston engines for marine propuls.	3281	Manufacturing internal combustion engines and other prime movers (except for motor vehicles)
7138	Int.comb.piston engines, n.e.s.	3281	Manufacturing internal combustion engines and other prime movers (except for motor vehicles)
7139	Parts of int.comb.piston engines of 713.20/30/80	3281	Manufacturing internal combustion engines and other prime movers (except for motor vehicles)
7144	Reaction engines	3281	Manufacturing internal combustion engines and other prime movers (except for motor vehicles)
7148	Gas turbines, n.e.s.	3281	Manufacturing internal combustion engines and other prime movers (except for motor vehicles)
7149	Parts of the engines & motors of 71400and 718.88	3281	Manufacturing internal combustion engines and other prime movers (except for motor vehicles)
7161	Motors & generators, direct current	3420	Basic electrical equipment manufacturing
7162	Elect.motors & generators, generating sets	3420	Basic electrical equipment manufacturing
7163	Rotary converters	3420	Basic electrical equipment manufacturing
7169	Parts of rotating electric plant	3420	Basic electrical equipment manufacturing
7187	Nuclear reactors and parts	3283	Compressors and fluid power equipment manufacturing
7188	Engines & motors, n.e.s.such as water turbines etc.	3283	Compressors and fluid power equipment manufacturing
7211	Agricultural & horticult.mach. for soil preparat.	3211	Agricultural machinery manufacturing
7212	Harvesting & treshing machinery and parts	3211	Agricultural machinery manufacturing

SITC	Description	SIC80	Description
7213	Dairy machinery and parts	3211	Agricultural machinery manufacturing
7219	Agric.mach.& appliances, n.e.s.and parts	3211	Agricultural machinery manufacturing
7223	Track0laying tractors	3212	Wheeled tractors manufacturing
7224	Wheeled tractors, not including in 744.11/783.20	3212	Wheeled tractors manufacturing
7233	Road rollers, mechanically propelled	3254	Construction and earth moving equipment manufacturing
7234	Construction and mining machinery, n.e.s.	3254	Construction and earth moving equipment manufacturing
7239	Parts of the machinery of 723.41 to 723.46	3254	Construction and earth moving equipment manufacturing
7243	Sewing machines, furniture for sewing mach.& parts	3230	Textile machinery manufacturing
7244	Mach.for extruding man0made textiles and parts	3230	Textile machinery manufacturing
7245	Weaving, knitting mach. for preparing yarns, parts	3230	Textile machinery manufacturing
7246	Auxil.machinery for headings 724.51/52/53/61	3230	Textile machinery manufacturing
7247	Mach.for washing, cleaning, drying, bleaching text.	3230	Textile machinery manufacturing
7248	Mach.for preparing, tanning or working hides	3230	Textile machinery manufacturing
7251	Mach. for mak./finis. cellul. pulp, paper, paperbo.	3275	Manufacture of machinery for working wood,rubber,plastics,leather,papermaking,glass,bricks
7252	Paper & paperboard cutting mach.of all kinds	3275	Manufacture of machinery for working wood,rubber,plastics,leather,papermaking,glass,bricks
7259	Parts of the mach. of 72500	3275	Manufacture of machinery for working wood,rubber,plastics,leather,papermaking,glass,bricks
7263	Mach., appar., access.for type founding or setting	3276	Printing,bookbinding and paper goods machinery manufacturing
7264	Printing presses	3276	Printing,bookbinding and paper goods machinery manufacturing
7267	Other printing mach.for uses ancillary to printing	3276	Printing,bookbinding and paper goods machinery manufacturing
7268	Bookbinding machinery and parts	3276	Printing,bookbinding and paper goods machinery manufacturing
7269	Parts of the machines of 726.31, 726.40, 726.70	3276	Printing,bookbinding and paper goods machinery manufacturing

SITC	Description	SIC80	Description
7271	Mach.for working of cereals or dried vegetables	3244	Food,drink and tobacco processing machinery;packaging and bottling machinery manufacturing
7272	Other food processing machinery and parts	3244	Food,drink and tobacco processing machinery;packaging and bottling machinery manufacturing
7281	Mach.tools for specialized particular industries	3275	Manufacture of machinery for working wood,rubber,plastics,leather,papermaking,glass,bricks
7283	Mach.for sorting, screening, separating, washing ores	3251	Mining machinery manufacturing
7284	Mach.& appliances for specialized particular ind.	3275	Manufacture of machinery for working wood,rubber,plastics,leather,papermaking,glass,bricks
7361	Metal cutting machine0tools	3221	Metal working machine tools manufacturing
7362	Metal forming machine tools	3221	Metal working machine tools manufacturing
7367	Other mach.0tools for working metal or met.carbide	3221	Metal working machine tools manufacturing
7368	Work holders, self0opening dieheads & tool holders	3221	Metal working machine tools manufacturing
7369	Parts of the machine0tools of 73600	3221	Metal working machine tools manufacturing
7371	Converters, ladles, ingot moulds and casting mach.	3221	Metal working machine tools manufacturing
7372	Rolling mills, rolls therefor and parts	3221	Metal working machine tools manufacturing
7373	Welding, brazing, cutting, soldering machines & parts	3221	Metal working machine tools manufacturing
7411	Producer gas and water gas generators and parts	3284	Refrigerating machinery,space heating,ventilating and air conditioning equipment
7412	Furnace burners for liquid fuel and parts	3245	Manufacturing chemical industry machinery; packaging and bottling machinery
7413	Ind.& lab.furnaces and ovens and parts	3245	Manufacturing chemical industry machinery; packaging and bottling machinery
7414	Refrigerators & refr.equipment, except household, parts	3284	Refrigerating machinery,space heating,ventilating and air conditioning equipment
7415	Air conditioning mach.self0contained and parts	3284	Refrigerating machinery,space heating,ventilating and air conditioning equipment
7416	Mach.plant & sim.lab.equip.involv.a temp.change	3284	Refrigerating machinery,space heating,ventilating and air conditioning equipment
7421	Reciprocating pumps, other than 742.81	3287	Pumps manufacturing
7422	Centrifugal pumps, other than 742.81	3287	Pumps manufacturing

SITC	Description	SIC80	Description
7423	Rotary pumps, other than 742.81	3287	Pumps manufacturing
7428	Other pumps for liquids & liquid elevators	3287	Pumps manufacturing
7429	Parts of the pumps & liq.elevators of 74200	3287	Pumps manufacturing
7431	Air pumps, vacuum pumps & compressors	3283	Compressors and fluid power equipment manufacturing
7432	Parts of the pumps & compressors of 743.10	3283	Compressors and fluid power equipment manufacturing
7433	Free0piston generators for gas turbines, parts	3283	Compressors and fluid power equipment manufacturing
7434	Fans, blowers and the like, and parts	3283	Compressors and fluid power equipment manufacturing
7435	Centrifuges	3283	Compressors and fluid power equipment manufacturing
7436	Filtering & purifying mach.for liquids & gases	3283	Compressors and fluid power equipment manufacturing
7439	Parts of the machines of 743.50, 743.60	3283	Compressors and fluid power equipment manufacturing
7441	Work trucks, mechanically propelled, for short dist.	3255	Mechanical lifting and handling equipment manufacturing
7442	Lifting, handling, loading mach.conveyors	3255	Mechanical lifting and handling equipment manufacturing
7449	Parts of the machinery of 744.20	3255	Mechanical lifting and handling equipment manufacturing
7451	Tools for working in the hand, pneumatic, parts	3222	Engineers' small tools manufacturing
7452	Other non0electrical mach.amp parts	3286	Miscellaneous industrial and commercial machinery manufacturing
7491	Ball, roller or needle roller bearings	3262	Ball,needle and roller bearings manufacturing
7492	Taps, cocks, valves etc.for pipes, tanks, vats etc	3288	Industrial valves manufacturing
7493	Transmission shafts, cranks, bearing housings etc.	3261	Precision chains and other mechanical power transmission equipment manufacturing
7499	Other non0electric parts & accessories of mach.	3289	Marine,precision components and general mechanical engineering
7511	Typewriters; cheque0writing machines	3301	Office machinery manufacturing
7512	Calculating machines, cash registers, ticket & sim.	3301	Office machinery manufacturing

SITC	Description	SIC80	Description
7518	Office machines, n.e.s.	3301	Office machinery manufacturing
7521	Analogue & hybrid data processing machines	3302	Electronic data processing equipment manufacturing
7522	Complete digital data processing machines	3302	Electronic data processing equipment manufacturing
7523	Complete digital central processing units	3302	Electronic data processing equipment manufacturing
7524	Digital central storage units, separately consigned	3302	Electronic data processing equipment manufacturing
7525	Peripheral units, including control & adapting units	3302	Electronic data processing equipment manufacturing
7528	Off0line data processing equipment. n.e.s.	3302	Electronic data processing equipment manufacturing
7591	Parts of and accessories suitable for 751.10, 751.8	3302	Electronic data processing equipment manufacturing
7599	Parts of and accessories suitable for 751.20, 75200	3302	Electronic data processing equipment manufacturing
7611	Television receivers, colour	3454	General electronic consumer goods and other electronic equipment manufacturing
7612	Television receivers, monochrome	3454	General electronic consumer goods and other electronic equipment manufacturing
7621	Radio0broadcast receivers for motor vehicles	3434	Manufacturing electrical equipment for motor vehicles,cycles and aircraft
7622	Radio0broadcast receivers portable, sound recorders	3443	Radio and electronic capital goods manufacturing
7628	Other radio0broadcast receivers	3443	Radio and electronic capital goods manufacturing
7631	Gramophones & record players, electric	3454	General electronic consumer goods and other electronic equipment manufacturing
7638	Other sound recorders and reproducers	3454	General electronic consumer goods and other electronic equipment manufacturing
7641	Elect.line telephonic & telegraphic apparatus	3441	Telegraph and telephone apparatus and equipment manufacturing
7642	Microphones, loudspeakers, amplifiers	3443	Radio and electronic capital goods manufacturing
7643	Radiotelegraphic & radiotelephonic transmitters	3441	Telegraph and telephone apparatus and equipment manufacturing
7648	Telecommunications equipment	3441	Telegraph and telephone apparatus and equipment manufacturing
7649	Parts of apparatus of division 76000	3444	Manufacturing components, other than active components

SITC	Description	SIC80	Description
7711	Transformers, electrical	3420	Basic electrical equipment manufacturing
7712	Other electric power machinery, parts of 77100	3420	Basic electrical equipment manufacturing
7721	Elect.app.such as switches, relays, fuses, plugs etc.	3420	Basic electrical equipment manufacturing
7722	Printed circuits and parts thereof	3420	Basic electrical equipment manufacturing
7723	Resistors, fixed or variable and parts	3420	Basic electrical equipment manufacturing
7731	Insulated, elect.wire, cable, bars, strip and the like	3410	Insulated wires and cables manufacturing
7732	Electric insulating equipment	3410	Insulated wires and cables manufacturing
7741	Electro0medical apparatus	3720	Medical and surgical equipment and orthopeadic appliances manufacturing
7742	App.based on the use of x0rays or of radiations	3720	Medical and surgical equipment and orthopeadic appliances manufacturing
7751	Household type laundry equipment	3460	Domestic0type electric appliances manufacturing
7752	Household type refrigerators & food freezers	3460	Domestic0type electric appliances manufacturing
7753	Dish washing machines of household type	3460	Domestic0type electric appliances manufacturing
7754	Shavers & hair clippers with motor and parts	3460	Domestic0type electric appliances manufacturing
7757	Elec.0mech., domestic appliances and parts	3460	Domestic0type electric appliances manufacturing
7758	Electro0thermic appliances, n.e.s.	3460	Domestic0type electric appliances manufacturing
7761	Television picture tubes, cathode ray	3453	Active components and electronic sub0assemblies manufacturing
7762	Other electr.valves and tubes	3453	Active components and electronic sub0assemblies manufacturing
7763	Diodes, transistors and sim.semi0conductor devices	3453	Active components and electronic sub0assemblies manufacturing
7764	Electronic microcircuits	3453	Active components and electronic sub0assemblies manufacturing
7768	Piezo0electric crystals, mounted, parts of 77600	3453	Active components and electronic sub0assemblies manufacturing
7781	Batteries and accumulators and parts	3432	Batteries and accumulators manufacturing

SITC	Description	SIC80	Description
7782	Elect.filament lamps and discharge lamps	3470	Electric lamps and other electric lighting equipment manufacturing
7783	Electr.equip.for internal combustion engines, parts	3442	Electrical instruments and control systems manufacturing
7784	Tools for working in the hand with elect.motor	3435	Manufacturing electrical & general equipment for industrial use
7788	Other elect.machinery and equipment	3435	Manufacturing electrical & general equipment for industrial use
7810	Passenger motor cars, for transport of pass.& goods	3510	Manufacturing motor vehicles and their engines
7821	Motor vehicles for transport of goods/materials	3510	Manufacturing motor vehicles and their engines
7822	Special purpose motor lorries and vans	3510	Manufacturing motor vehicles and their engines
7831	Public0service type passenger motor vehicles etc.	3510	Manufacturing motor vehicles and their engines
7832	Road tractors and semi0trailers	3522	Trailers and semi0trailers manufacturing
7841	Chassis fitted with engines for motor vehicles	3521	Motor vehicle bodies manufacturing
7842	Bodies for the motor vehicles of 722/781/782/783	3521	Motor vehicle bodies manufacturing
7849	Other parts & accessories of motor vehicles	3530	Motor vehicle parts manufacturing
7851	Motorcycles, auto0cycles and cycles with an aux.mot	3633	Motor cycles and parts manufacturing
7852	Cyles, not motorized	3634	Pedal cycles and parts manufacturing
7853	Invalid carriages, motorized or not, parts	3650	Baby carriage, wheelchair, invalid carriage, cart and wagon manufacturing
7861	Trailers & specially designed containers	3522	Trailers and semi0trailers manufacturing
7868	Other vehicles, not mechanically propelled, parts	3522	Trailers and semi0trailers manufacturing
7911	Rail locomotives, electric	3620	Railway and tramway vehicles manufacturing
7912	Other rail locomotives; tenders	3620	Railway and tramway vehicles manufacturing
7913	Railway & tramway coaches, vans, trucks etc.	3620	Railway and tramway vehicles manufacturing
7914	Railway & tramway passenger coaches & luggage vans	3620	Railway and tramway vehicles manufacturing

SITC	Description	SIC80	Description
7915	Rail&tramway freight and maintenance cars	3620	Railway and tramway vehicles manufacturing
7919	Rail&tramway track fixtures&fittings, signall.equi.	3620	Railway and tramway vehicles manufacturing
7921	Helicopters	3640	Aerospace equipment manufacturing and repairing
7922	Aircraft not exceeding an unladen weight 2000 kg	3640	Aerospace equipment manufacturing and repairing
7923	Aircraft not exceeding an unladen weight 15000 kg	3640	Aerospace equipment manufacturing and repairing
7924	Aircraft exceeding an unladen weight of 15000 kg	3640	Aerospace equipment manufacturing and repairing
7928	Aircraft, n.e.s.balloons, gliders etc and equipment	3640	Aerospace equipment manufacturing and repairing
7929	Parts of heading 79200, excl.tyres, engines	3640	Aerospace equipment manufacturing and repairing
7931	Warships of all kinds	3610	Shipbuilding and repairing
7932	Ships, boats and other vessels	3610	Shipbuilding and repairing
7933	Ships, boats and other vessels for breaking up	3610	Shipbuilding and repairing
7938	Tugs, special purpose vessels, floating structures	3610	Shipbuilding and repairing
8121	Boilers & radiators for central heating	3284	Refrigerating machinery,space heating, ventilating and air conditioning equipment
8122	Sinks, wash basins, bidets, water closet pans, etc	2489	Ceramic goods manufacturing
8124	Lighting fixtures and fittings and parts	3470	Electric lamps and other electric lighting equipment manufacturing
8211	Chairs and other seats and parts	4671	Wooden and upholstered furniture manufacturing
8212	Furniture for medical, surgical, dental etc.practice	4671	Wooden and upholstered furniture manufacturing
8219	Other furniture and parts	4671	Wooden and upholstered furniture manufacturing
8310	Travel goods, handbags, brief0cases, purses, sheaths	4420	Leather goods manufacturing
8421	Overcoats and other coats, men, s	4532	Men's and boys' tailored outerwear manufacturing
8422	Suits, men's, of textile fabrics	4532	Men's and boys' tailored outerwear manufacturing

SITC	Description	SIC80	Description
8423	Trousers, breeches etc.of textile fabrics	4532	Men's and boys' tailored outerwear manufacturing
8424	Jackets, blazers of textile fabrics	4532	Men's and boys' tailored outerwear manufacturing
8429	Other outer garments of textile fabrics	4532	Men's and boys' tailored outerwear manufacturing
8431	Coats and jackets of textile fabrics	4533	Women's and girls' tailored outerwear manufacturing
8432	Suits & costumes, women's, of textile fabrics	4533	Women's and girls' tailored outerwear manufacturing
8433	Dresses, women's, of textile fabrics	4533	Women's and girls' tailored outerwear manufacturing
8434	Skirts, women's, of textile fabrics	4533	Women's and girls' tailored outerwear manufacturing
8435	Blouses of textile fabrics	4533	Women's and girls' tailored outerwear manufacturing
8439	Other outer garments of textile fabrics	4533	Women's and girls' tailored outerwear manufacturing
8441	Shirts, men's, of textile fabrics	4535	Men's and boys' shirts,underwear and nightwear manufacturing
8442	Under garments, excl.shirts, of textile fabrics	4535	Men's and boys' shirts,underwear and nightwear manufacturing
8443	Under garments, women, s, of textile fabrics	4536	Women's and girls' light outerwear,lingerie and infants wear manufa
8451	Jerseys, pullOovers, twinsets, cardigans, knitted	4531	Weatherproof outerwear manufacturing
8452	Dresses, skirts, suits etc, knitted or crocheted	4536	Women's and girls' light outerwear,lingerie and infants wear manufa
8459	Other outer garments & clothing, knitted	4363	Hosiery and other weft knitted goods and fabrics manufacturing
8461	Under garments, knitted or crocheted of wool	4363	Hosiery and other weft knitted goods and fabrics manufacturing
8462	Under garments, knitted of cotton	4363	Hosiery and other weft knitted goods and fabrics manufacturing
8463	Under garments, knitted, of synthetic fibres	4363	Hosiery and other weft knitted goods and fabrics manufacturing
8464	Under garments, knitted of other fibres	4363	Hosiery and other weft knitted goods and fabrics manufacturing
8465	Corsets, brassieres, suspendres and the like	4363	Hosiery and other weft knitted goods and fabrics manufacturing
8471	Clothing accessories of textile fabrics	4363	Hosiery and other weft knitted goods and fabrics manufacturing

SITC	Description	SIC80	Description
8472	Clothing accessories, knitted or crocheted, n.e.s.	4363	Hosiery and other weft knitted goods and fabrics manufacturing
8481	Art.of apparel & clothing accessories, of leather	4420	Leather goods manufacturing
8482	Art.of apparel & clothing accessories, of plastic	4836	General plastics products manufacturing
8483	Fur clothing, articles made of furskins	4560	Fur goods manufacturing
8484	Headgear and fittings thereof, n.e.s.	4537	Hats,caps and millinery manufacturing
8510	Footwear	4510	Footwear manufacturing
8710	Optical instruments and apparatus	3732	Optical precision instruments manufacturing
8720	Medical instruments and appliances	3720	Medical and surgical equipment and orthopaedic appliances manufacturing
8731	Gas, liquid, electricity meters	3710	Measuring,checking and precision instruments and apparatus manufacturing
8732	Revolution counters, taximeters and the like	3710	Measuring,checking and precision instruments and apparatus manufacturing
8741	Surveying, hydrographic, compasses etc.	3710	Measuring,checking and precision instruments and apparatus manufacturing
8742	Drawing, marking0out, disc calculators and the like	3710	Measuring,checking and precision instruments and apparatus manufacturing
8743	Instr.non electrical, for measuring, checking flow	3710	Measuring,checking and precision instruments and apparatus manufacturing
8744	Instr.& app.for physical or chemical analysis	3710	Measuring,checking and precision instruments and apparatus manufacturing
8745	Measuring, controlling & scientific instruments	3710	Measuring,checking and precision instruments and apparatus manufacturing
8748	Electrical measuring, checking, analysing instrum.	3710	Measuring,checking and precision instruments and apparatus manufacturing
8749	Parts, n.e.s.accessories for 87300, 87430, 87454, 8748	3710	Measuring,checking and precision instruments and apparatus manufacturing
8811	Photographic, cameras, parts & accessories	3733	Photographic and cinematographic equipment manufacturing
8812	Cinematographic cameras, projectors, sound0rec, parts	3733	Photographic and cinematographic equipment manufacturing
8813	Photographic & cinematographic apparatus n.e.s.	3733	Photographic and cinematographic equipment manufacturing
8821	Chemical products & flashlight materials	2591	Photographic materials and chemicals manufacturing

SITC	Description	SIC80	Description
8822	Photographic film, plates, paper	2591	Photographic materials and chemicals manufacturing
8830	Cinematograph film, exposed0developed, neg.or pos.	2591	Photographic materials and chemicals manufacturing
8841	Lenses, prisms, mirrors, other optical elements	3731	Spectacles and unmounted lenses manufacturing
8842	Spectacles and spectacle frames	3731	Spectacles and unmounted lenses manufacturing
8851	Watches, watch movements and cases	3740	Clocks watches and other timing devices manufacturing
8852	Clocks, clock movements and parts	3740	Clocks watches and other timing devices manufacturing
8921	Books, pamphlets, maps and globes, printed	4753	Printing and publishing of books
8922	Newspapers journals, periodicals	4751	Printing and publishing of newspapers
8924	Picture postcards, greeting cards	4754	Printing and publishing (excluding newspapers periodicals and books)
8928	Printed matter, n.e.s.	4754	Printing and publishing (excluding newspapers periodicals and books)
8931	Art.for the conveyance or packing of goods	4835	Plastics packaging products manufacturing
8932	Sanitary or toilet art.of materials of div.58	4836	General plastics products manufacturing
8933	Ornamental art.and objects of mat.of div.58	4836	General plastics products manufacturing
8935	Art.of electric lighting of materials of div.58	4836	General plastics products manufacturing
8939	Miscellaneous art.of materials of div.58	4836	General plastics products manufacturing
8941	Baby carriages, and parts	3650	Baby carriage, wheelchair,invalid carriage,cart and wagon manufacturing
8942	Children s toys, indoor games, etc.	4941	Toys and games manufacturing
8946	Non0military arms and ammunition therefor	4942	Sports goods manufacturing
8947	Other sporting goods and fairground amusements	4942	Sports goods manufacturing
8951	Office and stationery supplies, of base metal	4954	General stationers' goods manufacturing including,pens,pencils,inks & office accessories
8952	Pens, pencils and fountain pens	4954	General stationers' goods manufacturing including,pens,pencils,inks & office accessories

SITC	Description	SIC80	Description
8959	Other office and stationery supplies	4954	General stationers' goods manufacturing including,pens,pencils,inks & office accessories
8972	Imitation jewellery	4910	Jewellery and coins manufacturing
8973	Jewellery of gold, silver or platinum	4910	Jewellery and coins manufacturing
8974	Other articles of precious metal	4910	Jewellery and coins manufacturing
8981	Pianos and other string musical instuments	4920	Musical instruments manufacturing
8982	Other musical instruments; not 898.10	4920	Musical instruments manufacturing
8983	Gramophone records and sim.sound recordings	4920	Musical instruments manufacturing
8989	Parts of and accessories for musical instruments	4920	Musical instruments manufacturing
8991	Art.& manuf.of carving or moulding materials	4959	Miscellaneous manufactures not elsewhere specified
8993	Candles, matches, pyrophoric alloys etc.	4959	Miscellaneous manufactures not elsewhere specified
8994	Umbrellas, parasols, walking sticks, parts	4959	Miscellaneous manufactures not elsewhere specified
8996	Orthopaedic appliances, surgical belts and the like	3720	Medical and surgical equipment and orthopeadic appliances manufacturing
8997	Basketwork, wickerwork etc. of plaiting materials	4664	Manufacturing articles of cork and basketwear, wickerwork and other plaiting materials
8998	Small0wares and toilet art., feather dusters etc.	4959	Miscellaneous manufactures not elsewhere specified
8999	Manufactured goods, n.e.s.	4959	Miscellaneous manufactures not elsewhere specified
9510	Armoured fighting vehicles, arms of war & ammunit.	3290	Ordnance,small arms and ammunition manufacturing
9610	Coin (other than gold) not being legal tender	4910	Jewellery and coins manufacturing
9710	Gold, non0monetary	4910	Jewellery and coins manufacturing

4

The Influence of Foreign Competition on Trade Union Recognition at the Workplace

4-1 Introduction

This chapter aims to extend the industry-level analysis presented in chapter 3 and provide further evidence on the link between unionisation and foreign competition by using establishment-level data from the Workplace Industrial Relations Survey (WIRS). More specifically, we examine the influence of international competition on the probability of trade unions achieving recognition for bargaining purposes. The study offers four key advantages. First, the use of firm-level data enables to capture the micro-processes behind the impact of foreign competition on union presence and influence at the workplace. Second, unlike the previous chapter, the union measure here comprises all types of union agreements. Third, we are able to look at foreign competition in both manufacturing and services and fourth, the empirical analysis investigates the significance of international competition at (or around) the

establishment set-up date. This is important to the extent that the likelihood of union recognition may be dependent upon product market conditions surrounding the time of plant set-up (Disney et al., 1995; 1996).

According to Disney et al. (1995, 1996) and Machin (2000), the failure of trade unions to gain recognition at new workplaces set up in the 1980s and early 1990s is a key rationale for union decline in Britain. This may suggest a role for globalisation and increased international competition observed in product markets in recent decades. Foreign competition may reduce the expected level of quasi-rents¹ to be allocated between unions and employers, thereby causing greater management resistance to union presence and less aggressive union organising activities at the workplace. It may also moderate the bargaining strength of trade unions directly, decreasing the union wage premium and workers' attraction to union representation.

Hence, in this chapter, we hypothesise that trade unions are less likely to attain recognition in the presence of foreign competition. Three measures of international competition are considered. First, we focus on management responses to a question in WIRS about whether the firm's products or services are traded internationally. Since firms operating primarily in international markets have to compete with foreign rivals, this serves as a fitting basis on which the influence of foreign competition on the likelihood of union recognition can be analysed. Second, for the purpose of comparison, we employ trade variables at current time, corresponding to the relevant year of survey, in place of the WIRS foreign competition variable. Third,

¹ Abowd and Farber (1990) define quasi-rents as revenue less costs of materials and labour.

age-dated trade measures are used to model foreign competition at the establishment set-up date.

The remainder of the chapter is structured as follows. Section 4-2 sets out the theoretical issues concerning the relationship between foreign competition and union recognition. Section 4-3 describes the data and provides some summary statistics. Section 4-4 explains the econometric modelling. The results are presented in section 4-5 and finally, section 4-6 concludes.

4-2 Theoretical Issues

4-2-1 Foreign competition and the probability of recognition

The probability of trade unions achieving recognition for bargaining purposes at the workplace can be modelled as a function of workers' support for union representation and employer opposition to union organising. Abowd and Farber (1990) relate these two factors to the expected level of quasi-rents to be allocated between trade unions and employers. This provides an important channel through which foreign competition may affect union recognition. As such, the Layard et al. (1991) product market model shows that, by lowering the amount of quasi-rents available to be captured by trade unions, foreign competition reduces the union mark up and the benefits of union organisation. The model also implies that firms expecting relatively lower levels of quasi-rents because of international competition may resist trade unions more strongly. In particular, they cannot afford to share, with

the unions, the minimum rent needed to continue operating (Abowd and Farber, 1990; Disney et al., 1996). Management may typically seek to oppose union presence at the workplace in ways that would reduce the attraction of unionisation to employees and increase the costs of union organisation. In fact, Abowd and Farber (1990) argue that in times of increased competition managers may spend more resources than is necessary fighting unions in order to keep the firm in business and/or maintain their own positions as managers.

Foreign competition may also reduce union bargaining power directly, hence decreasing workers' perceived benefits of unionisation and future union organising efforts. Chapter 2 identifies the main channels through which international competition influences the bargained wage outcome. Theoretical models such as Hill (1984), Grossman (1984), Lawrence and Lawrence (1985), Staiger (1988) and Mezzetti and Dinopoulos (1991) predict that foreign competition may (under given circumstances) undermine the bargaining strength of labour unions, forcing them to moderate their wage demands. Although, Naylor (1999) argues that, in the context of intra-industry trade, union wages may rise.

4-2-2 The importance of establishment set-up date, union recognition and foreign competition

Union recognition in Britain can be widely thought of as a once-for-all decision made at some point close to the time of establishment set-up rather than being continually reviewed (Disney et al. 1995, 1996). This is supported by previous

studies² indicating that instances of derecognition at existing workplaces have generally been a rare feature of the industrial relations picture in the UK. Beaumont and Harris (1995) point out that the extent of derecognition involved less than 10% of establishments in the late 1980s and in fact, in a large majority of cases there was no change in union status. In this light, it can be argued that the likelihood of union recognition may be influenced by the extent of foreign competition in the industry around the time the firm was set up. For instance, if foreign competition at the time of plant set-up decreases the benefits of unionism and increases the costs to firms of 'living' with unions, a lower probability of union recognition can be expected. Therefore, it is important that we consider whether international competition at the establishment set-up date could have impeded trade unions in gaining recognition at the workplace during the 1980s and 1990s.

4-3 Data characteristics

4-3-1 The WIRS Time-Series dataset

The empirical analysis in this chapter uses establishment-level data from the Workplace Industrial Relations Survey (WIRS) Time-Series dataset, formed by pooling the four WIRS cross-section surveys (1980, 1984, 1990 and 1998). Although there is a small number of establishments that are observed in more than one time period, the dataset is not a panel. It is constructed by matching data items (not plants)

² For example, Claydon (1989), Gregg and Yates (1991), Smith and Morton (1993), Gall and McKay (1994), Beaumont and Harris (1995), Towers (1997) and Machin (2000).

present in the 1998 main management questionnaire to similar questions identified in at least one of the three previous cross-section surveys. Hence, it contains a wide range of consistently defined variables, which can be used to analyse the change in specific issues pertaining to the state of employee relations in the UK during the time period 1980 to 1998. The sampling of establishments is based upon the Census of Employment³. This is built from comprehensive tax records from employers in almost all industrial sectors and is believed to be a virtually complete and accurate sample frame of UK organisations and establishments (Millward, 1991). However, workplaces with 25 workers or less are excluded⁴ in WIRS because small plants typically lack the formal industrial relations institutions and practices. Thus, the WIRS Time-Series dataset comprises 8049⁵ observations, corresponding to workplaces with 25 or more employees surveyed in the cross-section series.

The dataset also contains workplace weights from each of the four surveys. These are important given that the stratified sample design of WIRS implies that workplaces have differing probabilities of selection depending on the size and industry strata. And so, to maintain the profile of the sample with that of the population, the data must be weighted.

³ The sampling frame for the 1980, 1984 and 1990 surveys is the relevant Census of Employment three years before. The 1998 survey uses the Inter-Departmental Business Register (IDBR) and this is derived in large part from the Census of Employment.

⁴ Smaller workplaces were surveyed in 1998 but are not included in the Time-Series dataset to maintain a consistent basis of comparison.

⁵ 2040, 2019, 2061 and 1929 observations for the 1980, 1984, 1990 and 1998 surveys respectively.

4-3-2 The measures of foreign competition

Our aim is to investigate the impact of foreign competition on union recognition. In this context, we consider three measures of foreign competition.

1. The first is a question in WIRS about whether the firm operates in the international market. Since firms operating primarily in international markets have to compete with foreign rivals, this serves as a fitting basis on which the influence of foreign competition on the likelihood of union recognition can be analysed. The precise question asked to the principal management respondent in each establishment is: “*Is the market of your (main) product or service primarily local, regional, national or international?*”. In effect, responses to the question can be used to create a dummy variable indicating whether a firm faces foreign competition in the product market by assigning the value 1 to all answers corresponding to ‘*international*’ and zero otherwise.

Because this is an unorthodox measure of foreign competition, it is worth discussing the relative advantages and limitations of using this variable in our analysis. The first disadvantage is that the question only appears in the management questionnaire from 1984 onwards and in consequence, we have to exclude the 1980 cross-section survey. Second, the variable only provides qualitative information and the subjective nature of the responses may be a source of concern. Third, the question measures foreign competition at current time, i.e. the year in which the survey was carried out, and so cannot be related to the establishment set-up date. But it does have some key merits. For instance, it has previously been used as a measure of foreign competition,

notably by Stewart (1990). Furthermore, this measure is a reflection of managers’ perception of the extent of foreign competition in the product market, which may have some bearing on the decision to resist labour unions at the workplace. Another advantage is that the question applies equally to manufacturing and services. The variable also provides a means of comparison with other more common, trade-related measures of foreign competition. In addition, we are encouraged by its statistically significant correlation with industry trade variables in manufacturing⁶. This is shown in table 4.1 below. It reports the estimated coefficients from separate univariate logit regressions⁷ of the WIRS foreign competition dummy variable on import penetration ratios and export shares for the 4-digit industry affiliation of each workplace in the survey.

Table 4.1 Estimated coefficients of univariate logit regressions of the foreign competition dummy variable from WIRS on import penetration and export share

Import penetration	Export share
0.93**	0.99**
(0.19)	(0.18)

Notes: Regressions weighted by workplace weights. Standard errors in parentheses. ** significant at 1% level. The regressions are performed using data from sample 2 described in sub-section 4-3-3 below.

2. The foreign competition measure from WIRS reflects international competition in the product market at the time of the survey. Thus, for the purpose of comparison we also employ industry trade variables at current time (i.e. at the relevant year-of-survey).

⁶ Trade variables, taken from the industry trade data described in chapter 3, are only available for the manufacturing sector.

⁷ Blanchflower and Machin (1995) use the same approach to test the correlation between a qualitative variable for market structure and industry concentration ratios.

3. In order to evaluate the importance of the foreign competition around the establishment set-up date, age-dated import penetration and export shares are used.

4-3-3 Sample construction

Three separate samples of plants from the WIRS Time-series dataset are created (referred to as sample 1, 2 and 3 hereafter). We examine the effect of foreign competition using the WIRS measure alone from sample 1. This is constructed by excluding all observations from the 1980 survey since, as mentioned above, the WIRS foreign competition variable is only available from 1984 onwards. The sample contains information on private sector plants from manufacturing and services⁸. Dropping missing values yields a sample size of 2505 observations.

Samples 2 and 3 are created by mapping 4-digit industry trade variables for manufacturing, from the trade dataset described in chapter 3, to the corresponding industries firms in the survey are affiliated to. Thus, sample 2 matches trade variables measured at current time to manufacturing plants in the 1984, 1990 and 1998⁹ surveys. It consists of 982 observations when excluding missing values. In sample 3 we merge trade variables dated at the time of plant set-up to the WIRS dataset. A similar approach to Disney et al. (1996) is adopted. Establishment age is determined by a question in the survey about the number of years the firm has been operating at

⁸ The broad service sectors subject to foreign competition are banking, finance and business services; distribution, hotels and catering; transport and communications; and other services.

⁹ Trade information is only available until 1995, therefore, we use values for the year 1995 to proxy foreign competition in 1998. Given the rising trend in import penetration (as seen from figure 3.2 in chapter 3) this is likely to underestimate the true impact of foreign competition. Further, we do not include observations from the 1980 WIRS survey so as to remain consistent with sample 1.

the current address. Because this information is grouped establishments are assigned to the midpoint of the relevant age-band. The main reservation of using this age variable is that it measures the number of years since the establishment moved from a previous address and not its actual age. But, as Disney et al. (1996) argue, moving location may also imply instating a largely new workforce such that the decision about recognition may be linked to the time of the move. The trade data contains information from 1982¹⁰ onwards and so, we only consider firms born in the 1980s and 1990s. Using the same method, age-dated unemployment rates from the Labour Force Survey (LFS) are also included. Sample 3 contains 129¹¹ observations with all missing values dropped.

4-3-4 Some descriptive statistics

From the above samples, table 4.2 shows the proportion of firms recognising unions for bargaining purposes by different measures of international competition. Overall, we find that union recognition decreases with international competition. According to the WIRS measure of foreign competition, the proportion of establishments recognising unions in the presence of foreign competition is 0.30 compared to 0.38 where firms do not face any competition from abroad. This is mirrored across private sector manufacturing and services although it would appear that the difference in union recognition between plants facing international competition and those facing domestic competition is greater in the services sector.

¹⁰ The first age band is '*less than five years*' which implies that the sample is made up of plants observed from the pooled 1984, 1990 and 1998 WIRS cross-section surveys.

¹¹ The number of manufacturing firms in the sample set up after 1980 is 254 such that when dropping missing values a small sample size of only 129 observations is obtained.

The table also gives recognition according to various levels of import penetration in manufacturing. There is a smaller proportion of establishments recognising trade unions at higher levels of import penetration. Union recognition falls from 0.58 for the 1st quartile of import penetration at current time to 0.34 in the 4th quartile. The corresponding figures for import share at the establishment set-up date are 0.46 and 0.10 respectively. It should be noted that recognition is lower, the greater the extent of foreign competition at the establishment set-up date than at current time.

Table 4.2 Proportion of plants recognising unions by international competition

	All Establishments	Private Manufacturing	Private Services
WIRS measure			
International	0.30	0.39	0.18
Domestic	0.38	0.43	0.37
Import Penetration			
at current time			
4 th Quartile		0.34	
3 rd Quartile		0.37	
2 nd Quartile		0.45	
1 st Quartile		0.58	
Age-dated Import			
Penetration			
4 th Quartile		0.10	
3 rd Quartile		0.11	
2 nd Quartile		0.34	
1 st Quartile		0.46	

Source: Computed from matched WIRS time-series-industry trade dataset

Notes:

- 1. International refers to firms operating primarily in international markets and facing competition from foreign rivals. Domestic refers to establishments facing domestic competition by serving markets at the local, regional or national level.*
- 2. Figures correspond to the weighted proportion of establishments that recognise trade unions for bargaining purposes.*
- 3. Import penetration only available for manufacturing.*

However, while the descriptive statistics point to a possible negative association between international competition and union recognition, it is important that we take into account other factors that are likely to determine the probability of unions achieving recognition.

4-4 Econometric methodology

4-4-1 The variables used

We postulate that the probability of union recognition at the workplace is likely to be lower in the presence of foreign competition in the product market. The empirical test of our main hypothesis involves the estimation of an econometric model that explicitly allows for the effect of international competition and also incorporates several other explanatory variables. The dependent variable, *recognition*, is described by a dummy variable, which is equal to 1 if an establishment recognises trade unions for bargaining purposes and zero otherwise.

As discussed in sub-section 4-3-2, three approaches to modelling the effect of foreign competition on union recognition are considered. First, we examine foreign competition at current time by making use of the survey question in WIRS regarding whether establishments operate in an international environment. Second, for the purpose of comparison we use trade variables at current time in place of the WIRS foreign competition measure. The third method emphasises the influence of

international competition around the time of establishment set-up through age-dated trade measures.

Control variables, reflecting the following sets of factors, are included.

The post-1980 environment. Existing evidence on the main determinants of recognition identify establishments set up after 1980 as being the least likely to recognise trade unions for bargaining purposes (Disney, 1995 1996; Machin, 2000). It is argued that legislative changes and the political and macroeconomic climate at the time were generally hostile to trade unions. We model these conditions in two ways.

1. A dummy variable for firms set up after 1980 is included in the model. This variable also captures the influence of international competition at the establishment set-up date during the 1980s and 1990s when age-dated measures of foreign competition are not included in the model.
2. Union membership, measured by the proportion of firms with union members by 2-digit industries, and age-dated unemployment rates are used as proxies for the conditions in the labour market and the state of the macroeconomy.

Characteristics of the establishment and market structure. The probability of recognition is also determined by the characteristics of the establishment. We include controls for foreign ownership, the proportion of part time employees, establishment size, single independent establishments and whether management is part of an employer's association. Foreign ownership may decrease the likelihood of recognition because there is a greater threat of relocation. Trade unions are also less

likely to be present at workplaces employing large proportions of part-time workers. On the other hand, the larger the size of the firm the greater the possibilities for achieving recognition. Similarly, trade unions may be more willing to organise establishments with multiple sites than single independent firms because of the benefits of economies of scale. Employer's associations tend to promote positive relations between management and labour unions, thereby increasing the chances for unions to be recognised for bargaining purposes. The model also contains a proxy for domestic market structure, constructed from a question in WIRS about whether the firm has no competitors, few (five or less) competitors or many competitors. In less competitive market structures, high levels of quasi-rents may act as an incentive for unions to pursue aggressive organising activities but, then again, firms may have more resources and be more willing to resist labour unions.

Table 4.3 gives the definitions and sources of all the explanatory variables used.

Table 4.3: Variable definitions and sources

Variable	Definition	Source
Established after 1980	Dummy = 1 if establishment set up in the 1980s and 1990s	WIRS
50-99 employees	Dummy = 1 if establishment employs between 50 and 99 employees	''
100-199 employees	Dummy = 1 if establishment employs between 100 and 199 employees	''
200-499 employees	Dummy = 1 if establishment employs between 200 and 499 employees	''
500-999 employees	Dummy = 1 if establishment employs between 500 and 999 employees	''
1000+ employees	Dummy = 1 if firm employs more than 1000 employees	''
Single site	Dummy = 1 if single independent firm	''
Part-time proportion	Proportion of part time employees in establishment	''
Affiliated to employer's association	Dummy = 1 if management affiliated to an employer's association	''
Foreign ownership	Dummy = 1 if any foreign ownership	''
Domestic competition	Dummy = 1 if firm has many competitors	''
International competition	Dummy = 1 if firm operates primarily in international markets	''
Union membership	Proportion of establishments with union members by 2-digit industries	''
Unemployment	Age-dated unemployment rate	Labour Force Survey
Import penetration	4-digit import penetration ratios	See chapter 3
Export share	4-digit export share	''

4-4-2 Specifications

Three specifications of the model are considered.

Specification 1

Recognition = f (established after 1980 dummy, firm size, single establishment, part-time proportion, employer's association, foreign ownership, domestic competition, international competition dummy, year-of-survey dummies, 2-digit industry dummies)

Specification 2

Recognition = f (established after 1980 dummy, firm size, single establishment, part-time proportion, employer's association, foreign ownership, domestic competition, import penetration and export share at current time, year-of-survey dummies, 2-digit industry dummies)

Specification 3

Recognition = f (age-dated import penetration and export share, age-dated unemployment rates, proportion of firms in industry with union members, firm size, single establishment, part-time proportion, employer's association, foreign ownership, domestic competition, foreign competition dummy, year-of-survey dummies, 2-digit industry dummies)

Specification 1 includes foreign competition as a current characteristic of the establishment, i.e. whether it operates primarily in the international market and faces competition from foreign rivals. In specification 2, the WIRS foreign competition measure is replaced by trade variables at current time. Both models include the ‘established after 1980’ dummy variable. Specification 3 assesses the importance of foreign competition at the establishment set-up date for the probability of recognition by incorporating age-dated import and export shares. These relate to firms set-up in the 1980s and 1990s and are used in place of the ‘established after 1980’ dummy. Another time-varying variable namely, unemployment rates and the proportion of firms in the industry with union members are included. Note that specifications 1, 2 and 3 are estimated from sample 1 (containing establishments from all sectors) and the manufacturing samples 2 and 3 respectively. Also, the controls for firm characteristics are unchanged in all three specifications and we include dummy variables for the year-of-survey and 2-digit industries to capture time and industry specific effects.

4-4-3 Estimation method

Since the dependent variable is dichotomous, taking the value zero or one probit regressions of the above specifications are estimated using the maximum likelihood method. We specify heteroscedasticity-consistent robust¹² standard errors. A potential source of concern when including trade flows in the model is that they may be endogenous. In particular, wage strategies adopted by trade unions may influence

¹² Huber/White/Sandwich estimate of standard errors from STATA

the pattern of trade (Naylor, 1999). However, no empirical support for the endogeneity of the trade variables is found from the Durbin-Wu-Hausman test in chapter 3. Hence, we do not use instruments for import and export shares in our regressions.

4-5 Empirical results

4-5-1 Foreign competition at current time

Table 4.4 reports the results for specification 1. Column (1) represents all establishments in sample 1. The sectoral differences between private manufacturing and private services are shown in columns (2) and (3). Our primary interest is in the coefficient on the international competition dummy. It is negative and statistically significant in all three cases, albeit only weakly significant in manufacturing. The results indicate an overall negative influence of international competition on the probability of union recognition in UK establishments. Converting the probit coefficients from column (1) into marginal¹³ effects reveal that an establishment operating primarily in international markets is, on average, 16.1% less likely to recognise labour unions for bargaining purposes.

¹³ The marginal effect shows the change in the probability of union recognition caused by a discrete change from 0 to 1 in a dummy variable or an infinitesimal change in a continuous independent variable. It is computed by $\beta_j \phi(\bar{X}\beta)$ where β_j is the coefficient on the variable for which the marginal effect is being calculated, e.g. the foreign competition dummy, and $\phi(\bar{X}\beta)$ is probability density function of the standard normal distribution evaluated at the means of the independent variables.

In private manufacturing and services, the marginal effects are of the order of 9.1% and 20.4% respectively. The bigger magnitude of the foreign competition effect in the services sector compared to manufacturing confirms our earlier descriptive analysis of the data in sub-section 4-3-4.

The coefficients on the control variables are generally as expected. Firm size and management's affiliation to employer's associations are positively correlated with union recognition. The coefficient on foreign ownership is negative and significant in the pooled and manufacturing samples. Single independent establishments tend to be less unionised and the greater the proportion of part-time workers, the lower the likelihood of recognition in manufacturing. The domestic competition dummy is largely insignificant except in manufacturing where it is positive and significant at the 10% level. We also report a significant and negative establishment age effect. From column (1), the marginal effect of the 'established after 1980' dummy variable is 0.172, indicating that a plant established after 1980 is 17.2 % less likely to recognise unions for bargaining purposes¹⁴. The coefficient is larger for private manufacturing as compared to services.

¹⁴ Disney et al. (1996) obtain a marginal effect of 16.4% for firms established in the 1980s and Machin (2000) generates a marginal effect of 11.2% for firms set up in the 1980s and 1990s.

Table 4.4: Maximum likelihood estimation of specification 1

	All Establishments (1)	Private Manufacturing (2)	Private Services (3)
Established after 1980	-0.436 [-0.172] (4.19)**	-0.864 [-0.302] (5.05)**	-0.264 [-0.098] (2.09)*
50-99 employees	0.153 [0.061] (1.61)	0.324 [0.090] (1.79)	0.110 [0.042] (0.99)
100-199 employees	0.538 [0.207] (5.23)**	1.021 [0.230] (5.30)**	0.314 [0.121] (2.56)*
200-499 employees	0.873 [0.323] (7.80)**	1.279 [0.286] (6.38)**	0.622 [0.242] (4.37)**
500-999 employees	1.197 [0.402] (8.74)**	2.164 [0.356] (8.28)**	0.373 [0.146] (2.12)*
1000+ employees	1.328 [0.427] (8.53)**	2.135 [0.334] (6.68)**	0.815 [0.316] (3.90)**
Single site	-0.672 [-0.261] (6.61)**	-0.599 [-0.202] (3.66)**	-0.676 [-0.235] (5.26)**
Part-time proportion	-0.285 [-0.114] (1.23)	-2.564 [-0.779] (2.30)*	-0.263 [-0.991] (1.13)
Affiliated to employer's association	0.665 [0.254] (6.26)**	0.688 [0.187] (4.25)**	0.678 [0.264] (4.77)**
Foreign ownership	-0.262 [0.-104] (2.17)*	-0.361 [-0.117] (2.02)*	-0.224 [-0.082] (1.40)
Domestic competition	0.101 [0.040] (1.06)	0.238 [0.072] (1.66) [†]	0.022 [0.008] (0.19)
International competition	-0.407 [-0.161] (3.81)**	-0.283 [0.091] (1.73) [†]	-0.600 [-0.204] (4.11)**
Constant	0.261 (0.76)	-0.176 (0.50)	1.418 (1.77)
Year dummies	Yes	Yes	Yes
2-digit industry dummies	Yes	Yes	Yes
Observations	2505	1038	1467
Pseudo R²	0.18	0.32	0.12
χ² for inclusion of industry effects	37.12**	29.48**	10.29**

Notes:
1. Absolute values of robust t-statistics in parentheses
2. Marginal effects in square brackets
3. [†] significant at 10%; * significant at 5%; ** significant at 1%
4. Regressions weighted by workplace weights

Table 4.5 presents the regression results for specification 2. As can be seen, the main predictions from the control variables are quite comparable to those from private manufacturing in table 4.4. On examination of the trade variables, column (1) reveals a weakly significant and negative coefficient on import penetration although when we include export share, time and industry dummies in column (2) the trade measures are not significant. As such, it can be argued that, in manufacturing at least, the evidence on the effect of foreign competition at current time on union recognition is somewhat mixed. While the coefficient on the international competition dummy variable in specification 1 is weakly significant (at the 10% level), the results obtained from using the trade measures in specification 2 are not particularly robust. In contrast, the ‘established after 1980’ dummy is consistently significant at the 1% level.

Table 4.5: Maximum likelihood estimation of specification 2

	(1)	(2)
Established after 1980	-0.823 [-0.287] (4.70)**	-0.843 [-0.285] (4.62)**
50-99 employees	0.310 [0.086] (1.61)	0.372 [0.088] (1.96) [†]
100-199 employees	0.882 [0.206] (4.51)**	0.945 [0.198] (4.88)**
200-499 employees	1.219 [0.275] (6.06)**	1.343 [0.267] (6.46)**
500-999 employees	1.810 [0.327] (7.26)**	2.172 [0.324] (8.01)**
1000+ employees	2.059 [0.331] (7.55)**	2.433 [0.322] (7.40)**
Single site	-0.456 [-0.150] (2.67)**	-0.568 [-0.174] (3.27)**
Part-time proportion	-2.295 [-0.695] (2.35)**	-2.900 [-0.813] (2.58)**
Affiliated to employer's association	0.806 [0.215] (4.70)**	0.727 [0.181] (4.28)**
Foreign ownership	-0.278 [-0.089] (1.51)	-0.275 [-0.082] (1.44)
Domestic competition	0.355 [0.106] (2.39)*	0.300 [0.088] (2.01)*
Import penetration	-0.351 [-0.106] (1.89) [†]	-0.356 [-0.106] (1.25)
Export share		-0.005 [-0.012] (0.04)
Constant	-0.272 (1.29)	-0.690 (1.94)
Year-of-survey dummies	No	Yes
2-digit industry dummies	No	Yes
Observations	986	982
Pseudo R²	0.26	0.33
χ² for inclusion of industry effects		38.87**

Notes:
1. Absolute values of robust t-statistics in parentheses
2. Marginal effects in square brackets
3. [†] significant at 10%; * significant at 5%; ** significant at 1%
4. Regressions weighted by workplace weights

4-5-2 Foreign competition at the establishment set-up date

Table 4.6 shows the results from the Maximum Likelihood estimation of specification 3, which includes age-dated trade variables in place of the establishment age dummy variable. Column (1) indicates that import competition at the establishment set-up date, in the 1980s and 1990s, has a statistically significant negative effect on the probability of union recognition. However, the inclusion of age-dated export share, age-dated unemployment rates and proportion of firms with union members in the industry generates insignificant coefficients on the foreign competition measures. The foreign competition dummy variable, included to proxy international competition at current time, is also not statistically significant. As for the coefficient on the cyclical indicator, unemployment rate, it displays a negative sign but is not statistically different from zero. On the other hand, there is a significant positive association between the proportion of workplaces with union members in the industry and union recognition.

Thus, it is likely that the declining probability of recognition in manufacturing plants set up after 1980 may have been driven by the lack of union power to organise workplaces, arising from falling union membership in the labour market. This would lend support to the view that management took advantage of the anti-union legislation in the 1980s and 1990s to reassert their prerogatives at the workplace and marginalize the union movement. However, we should not totally dismiss the implications of international competition at the time of plant set on the sole basis of the statistical insignificance of the foreign competition coefficients. After all, this could simply be the result of the small sample size used to estimate specification 3.

Table 4.6: Maximum likelihood estimation of specification 3

	(1)	(2)
50-99 employees	0.321 [0.108] (0.65)	0.213 [0.071] (0.44)
100-199 employees	1.120 [0.398] (2.41)*	1.291 [0.462] (2.67)**
200-499 employees	0.789 [0.284] (1.28)	0.717 [0.257] (1.19)
500-999 employees	3.614 [0.811] (4.04)**	3.591 [0.811] (3.89)**
1000+ employees	0.645 [0.260] (0.44)	0.506 [0.201] (0.33)
Single site	-1.967 [-0.462] (3.99)**	-1.944 [-0.456] (4.06)**
Part-time proportion	-2.570 [-0.839] (0.87)	-2.660 [-0.850] (0.85)
Affiliated to employer's association	0.432 [0.150] (1.03)	0.512 [0.178] (1.18)
Foreign ownership	-0.913 [-0.224] (1.73) [†]	-1.006 [-0.237] (1.89) [†]
Domestic competition	0.127 [0.035] (0.30)	0.121 [0.037] (0.30)
International competition	-0.528 [0.152] (1.30)	-0.613 [-0.177] (1.49)
Age-dated import penetration	-1.152 [-0.366] (1.89) [†]	-0.969 [-0.313] (0.43)
Age-dated export share		-0.213 [-0.059] (0.10)
Age-dated unemployment		-0.073 [-0.025] (0.57)
Union membership		2.881 [0.915] (2.26)*
Constant	0.518 (0.48)	-0.685 (0.34)
Year dummies	Yes	Yes
2-digit industry dummies	Yes	Yes
Observations	129	129
Pseudo-R ²	0.47	0.50
χ ² for inclusion of industry effects	19.69**	14.53*

Notes: 1. Absolute values of robust t-statistics in parentheses; 2. Marginal effects in square brackets; 3. [†], *, ** significant at 10%, 5% and 1% respectively; 4. Regressions weighted by workplace weights

4-5-3 Testing for functional specification errors

In order to check the reliability of the functional form of our models, we perform a link test for functional specification error. Functional mis-specifications can occur for two reasons. First, if the probit regression assumed here is not the right function to use and second, if we have not included all relevant variables and/or included any variable that should not be in the model. The link test uses the predicted value of the dependent variable (\hat{y}) and the predicted value squared (\hat{y}^2) as regressors in the model. If the model is properly specified, the variable \hat{y} should be significant as it is the predicted value from the model but \hat{y}^2 should not have much predictive power other than by chance. Table 4.7 below shows the coefficients and t-ratios of the variables \hat{y} and \hat{y}^2 for the different specifications and samples used. \hat{y} is strongly significant in each case whilst \hat{y}^2 is not statistically different from zero. Therefore, we report no evidence of functional mis-specification.

Table 4.7: Results from the link test

	All establishments	Private manufacturing	Private services
Specification 1			
Hat	0.995 (15.66)**	0.991 (13.67)**	0.944 (7.33)**
Hatsq	-0.008 (-0.07)	-0.104 (-1.83)	-0.69 (-0.38)
Specification 2			
Hat		0.996 (11.92)**	
Hatsq		-0.04 (-0.57)	
Specification 3			
Hat		0.946 (6.42)**	
hatsq		-0.07 (-0.77)	

Notes:
1. ** Significant at 1%;
2. t-ratios in parentheses
3. Link test performed in STATA using command 'linktest'

4-6 Summary and Conclusion

This chapter has tested the hypothesis that foreign competition reduces the probability of trade unions gaining recognition for bargaining purposes. We argued that international competition may constrain union bargaining power, decreasing the union wage gain and workers' attraction to unionism. It may also lower the expected level of quasi-rents available to be shared between the firm and the union, thereby causing increased employer opposition to trade unions and diminished union organising activities. The empirical analysis was based on establishment-level data

from the Workplace Industrial Relations Survey (WIRS) and considered the influence of foreign competition at current time and at the establishment set-up date. The modelling of foreign competition at current time was achieved by using a question in the survey about whether the establishment operates primarily in international markets. Since firms operating in international markets have to compete with foreign rivals, this served as a fitting basis on which the influence of foreign competition on the likelihood of union recognition could be analysed. As such, we found that the probability of recognition was 16% lower in firms operating in international markets. Splitting the data by sector revealed that firms facing foreign competition in private services were relatively less likely to recognise trade unions compared to their counterparts in private manufacturing. However, we could not confirm the negative foreign competition effect in private manufacturing. The use of trade variables corresponding to the relevant year-of-survey in place of the WIRS measure failed to produce robust predictions.

Meanwhile our results strongly supported existing evidence (Disney et al., 1995; 1996; Machin, 2000) that trade unions failed to achieve significant recognition in establishments set up after 1980, especially in private manufacturing. This could suggest a role for foreign competition at (or around) the establishment set up date in the 1980s and 1990s. Therefore, we used age-dated trade measures to proxy international competition at the time of plant set-up in manufacturing. Unemployment rates and the proportion of establishments with union members by 2-digit industries were included to account for the effects of the macroeconomic cycle and labour market conditions at the time. The coefficients on the foreign competition variables were not statistically significant most probably because of the small sample

size. On the other hand, the results pointed to a strong impact of labour market forces on the likelihood of recognition.

The conclusions from this chapter are consistent with those in chapter 3. The mixed results indicate that foreign competition could indeed have had an impact on unionisation in UK manufacturing during the 1980s and 1990s. In general, the evidence mostly emphasises the importance of legislative changes. It seems likely that the anti-union policy pursued by successive Conservative governments presented employers with the opportunity to reaffirm their prerogatives and establish management control at the workplace. The limited statutory rights for labour organisations provided increased incentives for management to exclude unions from the workplace either by offering workers higher benefits and better working conditions as an alternative to unionism, by restructuring production and work systems or by simply resisting union presence more strongly. These measures, aimed at marginalizing the union movement, would have diminished the enthusiasm of the workforce towards trade unions even further over time. Finally, it is plausible that the ineffectiveness of union organisation could also have played a part in the decline of union presence and influence.

Despite only a weak link, at most, between foreign competition and unionisation, it is still possible that trade openness may impact upon trade unions' ability to extract rents and modify their strategic bargaining behaviour, which would be reflected in the union wage premium. In chapter 5, we use micro-level panel data to investigate whether foreign competition has significantly reduced the union wage gap of manufacturing workers.

5

Foreign Competition and the Union Wage Gap : The Case of UK Manufacturing

5-1 Introduction

This chapter examines the impact of openness to international trade on union bargaining power, as measured by the union-nonunion wage differential. From a review of the theory in chapter 2, we find that the influence of foreign competition on the union mark up may not be predicted a priori. Trade shocks may either reduce or even enhance union bargaining strength and so, determining which effect is likely to dominate calls for empirical research. There is so far very scant evidence on the topic for the UK, hence, we aim to provide an empirical contribution and extend the existing literature.

A specially constructed individual-level data set is used, combining labour market information on individual workers from the New Earnings Survey Panel Dataset

(NESPD) with disaggregated industry trade data for the period 1982 to 1995. Given the long time series of our dataset, it is possible to explain the movement of the foreign competition effect on union wage setting over time. Moreover, because of the potential limitations of the estimation methods used for measuring the union wage gap, we consider results from three different approaches so as to reach a better assessment of the true impact of openness on the union mark up. The simultaneity between trade flows and wages is also explicitly tested. Finally, we argue that the effect of foreign competition on union bargaining may have dissimilar implications for blue-collar and white-collar workers. This is because both international competition and union bargaining tend to affect the wages of the skilled and unskilled differently. For instance, whilst trade unions are able to generate higher wage premiums¹ for the unskilled workers, there is the notion that globalisation may have adversely influenced the labour market outcomes² of unskilled workers relative to the skilled.

The remainder of the chapter is organised as follows. Section 5-2 reviews the empirical literature from previous UK and US studies. Section 5-3 provides a description of the data and explains the empirical strategy. We report the empirical results in section 5-4. Section 5-5 summarises the main findings of the chapter.

¹ Booth (1995) and Blanchflower and Bryson (2002) provide a review of the empirical evidence on the union wage differential.

² See Greenaway and Nelson (2001) for a comprehensive survey of studies on globalisation and labour markets.

5-2 A review of the empirical literature

5-2-1 Studies using UK data

Three previous studies, namely Stewart (1990), Konings and Vandebussche (1995) and Brown and Sessions (2001), examine the implications of international competition for the wage outcome of the union-firm bargaining process in the UK. Stewart (1990) considers a sample of private sector establishments employing semi-skilled manual workers from the 1984 Workplace Industrial Relations Survey. He estimates a basic single wage equation with a union dummy equal to 1 if the establishment recognises trade unions for bargaining purposes and zero otherwise. A qualitative openness variable indicating whether the firm operates primarily in the international market is used as a proxy for foreign competition. The effect of international competition on the union mark up is captured by the interaction between the union and foreign competition variables. The model includes a number of controls for establishment size and other firm characteristics, workforce composition, sector and foreign ownership. As such, results from the maximum likelihood estimation of the wage equation suggest that the influence of trade unions on wages is significantly restrained by foreign competition to the extent that unions are unable to establish any wage differential in firms that operate primarily in international markets while there is a significant positive union wage gap in establishments that do not face foreign competition.

Konings and Vandenbussche (1995) use data from the EXSTAT company account dataset complemented with survey information on union presence and foreign competition for a panel of establishments during the period 1982-89. They consider separate union and non-union wage equations and model foreign competition by a qualitative variable indicating whether the firm has experienced an increase in international competition. The other main explanatory variables included are employment, output, industry wage, and domestic competition. They employ the Generalised Methods of Moments (GMM) approach for estimating panel data with endogenous variables. While no significant effect of an increase in foreign competition on union and non-union wages is found for the entire sample, there appears to be a significant negative influence of increased foreign competition on wages in unionised establishments in the manufacturing sector. The authors explain this finding by the Stolper-Samuelson reasoning, on the premise that unionised manufacturing firms employ more blue-collar workers.

Brown and Sessions (2001) investigate the union response to international competition by combining 2-digit industry trade data with micro data on manufacturing employees from the British Social Attitudes Surveys over the period 1985 to 1991. Their empirical methodology is based upon the inter-industry wage differentials approach (Dickens and Katz, 1987) whereby, in a first stage, they regress individual wages on a vector of worker characteristics and 2-digit industry dummies to obtain the inter-industry wage premium (i.e. the wage component explained by the individual's affiliation to a particular industry). Then, in the second stage, they estimate an industry wage premium equation containing a number of industry-level variables likely to determine the industry premia, such as industry

concentration, union density, capital-labour ratio, and foreign competition. Foreign competition is measured by the ratio of net imports to industrial GDP. In order to avoid any potential simultaneity bias they instrument the trade variable by lagged values. One of the key findings of the study is that foreign competition significantly reduces the union, but not the non-union, industry wage premia. Brown and Sessions argue that non-union wages are set competitively whereas unions may accept wage concessions such as to maintain the employment prospects of their members.

5-2-2 Studies using US data

Several empirical studies analyse the relationship between foreign competition and union wage bargaining using US data. Lawrence and Lawrence (1985) estimate cross-industry wage regressions for 1960, 1970, 1980 and 1984 using aggregate industry data for US manufacturing. The model includes import share amongst a range of other explanatory variables depicting industry and worker characteristics. They find a significant negative effect of import share on wages for the years 1980 and 1984, however, are unable to provide robust evidence as to whether the impact is different in unionised and non-unionised industries.

Another early study by Mishel (1986) uses a pooled sample of unionised establishments across the manufacturing sector over the period 1968-72. A standard wage equation for production workers augmented by import penetration is estimated. The results reveal a strongly significant and negative import effect on union wages

although the growth in import share is not associated with the pay of unionised production workers.

Macpherson and Stewart (1990) examine the impact of foreign competition on the union wage gap of blue-collar manufacturing workers by matching individual level data from the US Current Population Surveys (CPS) for the period 1975-81 to industry import penetration. Their main empirical strategy involves the estimation of separate union and non-union wage equations together with a union status model using the Heckman two-step method. They find that that a 10% increase in import share decreases the union wage differential by about 2% but the negative foreign competition effect on wages appears to depend on the extent of unionisation in the industry, declining as union density rises.

Partridge (1993) uses a sample of production workers from the CPS, observed over the period 1984 to 1987. He estimates separate wage equations for individual union and non-union workers and measure the impact of trade by industry import penetration ratio and export share. Controls for a range of individual and industry characteristics are also included. The results indicate that trade has little influence on non-union wages but the effect on union wages depends on union density in the industry. Increased import competition (export share) reduces (increases) union wages at low union densities with the opposite occurring in highly unionised industries. Partridge argues that at low union densities, import penetration (exports) decreases (increases) product market profits/rents such that union wages tend to fall (rise). On the other hand, the union wage adjustment to foreign competition at high union densities is consistent with Lawrence and Lawrence's (1985) predictions.

Greater imports (exports) leads to slow (rapid) product demand growth and less (more) investment in new plant and equipment. Thus, unions can extract higher (lower) wage settlements as it is more difficult (easier) to substitute capital for labour.

Gaston and Trefler (1995) investigate the role of international trade and protection on wage determination using data from various sources on trade and trade policy measures, such as import and export flows, tariffs and non-tariff barriers (NTB). These are combined to data from the 1984 CPS on individual earnings and other worker characteristics from the manufacturing sector. They adopt the inter-industry wage differential approach and generate OLS as well as Instrumental Variable (IV) estimates to allow for endogenous trade and protection. The main instruments used are factor shares and other exogenous regressors in the wage premium equation. They find that increased import penetration and high levels of tariffs lead to lower union wages. The coefficients on export and NTBs are neither robust nor statistically significant.

Blumenfeld and Partridge (1996) employs union contract data from the Bureau of Labour Statistics collective bargaining agreement file to examine the impact of international trade on the wage bargaining outcome in the manufacturing sector for the period 1972-85. Their empirical specification for the average union wage rate includes the changes in import and export shares as well as the trade share levels in order to distinguish between the short run and long run effects of foreign competition. The trade statistics are obtained from the NBER industry trade database. Results from OLS and Two Stage Least Squares (2SLS) estimations indicate that

changes in import and export shares are negatively related to union wages. This is explained by the reasoning that increased trade activity raises the extent of uncertainty amongst management and trade unions, inducing both parties to display risk averse behaviour. The union may, therefore, accept lower wages in exchange for future employment guarantees. There is little long run influence of foreign competition in industries with low import and export shares while in industries with increased exposure to trade, the long run impact of international competition depends on union density. Import (export) share reduces (increases) union wages in less unionised industries. This is consistent with the rent-sharing argument. The effect of import (export) is positive (negative) in more unionised industries as a result of trade unions trading off higher (lower) wages for lower (greater) employment. On the whole, the average net impact of import and export in the long run is relatively small compared to the short run.

Cebula and Usha Nair-Reichert (2000) focuses on the effect of import penetration on the union-nonunion wage differential, using individual-level data from the CPS and NBER industry trade data for manufacturing industries from 1975 to 1984. They use the inter-industry wage differential approach and a generalised 2SLS estimation technique to correct for heteroscedasticity and simultaneity between imports and the union wage gap. The results from this study suggest that foreign competition significantly reduces the union wage effect. Moreover, a greater extent of union organisation does not appear to dampen the effect of import competition on the union wage differential. It is argued that trade unions favour employment during periods of rising international competition.

Finally, Shippen and Lynch (2002) estimate separate union and non-union wage equations using matched data on individual workers from the CPS and industry-level data on imports and exports from the NBER during 1983-94. Pooled regression results for the whole sample indicate that import share significantly reduces the average union wage. However, there is evidence of the negative import effect declining over time. On separating the dataset into 3 sub-samples (1983-86, 1987-90, 1991-94), they find that increased pressure from international trade has no adverse impact on union wages after 1986. Shippen and Lynch attribute their findings to the predictions from Grossman's (1984) model. It is possible that, in the face of declining union density, senior union members vote to maintain wage premiums at the expense of future employment prospects for younger workers. The results also reveal that import competition has no influence on the wage growth of union workers over the period 1983-94.

5-3 Data and empirical methodology

The review of the literature presented above draws attention to the fact that, unlike the US, there is a remarkable lack of empirical research on the relationship between international competition and union bargaining in the UK. Moreover, two out of the three UK studies only use qualitative measures of foreign competition and although Brown and Sessions (2001) consider industry trade data, it is not at a disaggregated level. Also previous researchers using UK data do not specifically look at individual wages and more importantly, they do not analyse the implications of foreign competition for the union wage gap of individual workers. One of the contributions

of our study is the individual-level dataset used. This section, therefore, explains the construction of the data, outlining the main variables and some descriptive statistics. It also describes the econometric modelling and estimation strategy adopted in order to examine the effect of foreign competition on the union wage gap in the UK.

5-3-1 Data

The main data³ sources are: the New Earnings Survey Panel Data-set (NESPD) and the specially assembled trade data from the OECD's International Trade by Commodities Statistics (ITCS, Revision 2). We also include industry level variables from the Labour Force Survey (LFS) and the Census of Production. The final⁴ data used for the empirical analysis in this chapter is compiled as follows.

1. Detailed information on earnings, union status and other individual characteristics, pertaining to a sample of workers observed from 1982 to 1995 and whose earnings are not affected by absence are extracted from the NESPD.
2. These are merged at the 4-digit level of industry aggregation to import and export shares contained in the trade data set. The combined NES/trade data is restricted to manufacturing industries because of the lack of disaggregated trade information on other sectors of the UK economy and 1992 is omitted because of other missing data.
3. As discussed in chapter 3, the NESPD provides very little information on individual characteristics apart from age and gender, so we combine industry-level (4-digit SIC) proxies for job-related training and the level of education from

³ A detailed description of these databases is given in chapter 3.

⁴ See appendix 5B for a summary of how the final data is constructed.

the LFS. A variable for industry union membership density is also included.

4. The data is merged to other industry characteristics taken from the Census of Production. In particular, concentration ratios and the average size of establishments are used as proxies for the domestic market structure and firm size respectively.

In chapter 3, we underlined that the UK industrial classification scheme changed in 1992. Hence, the industry-level variables were not originally in single encompassing 4-digit codes. For the period 1982-91 the variables were classified according to the 1980 Standard Industrial Classification (SIC 80) whilst for the years 1993-95 they were consistent with the 1992 industrial codes (SIC 92). Since the NESPD classifies industries based on SIC80 from 1982 to 1995 we use concordances⁵ to map all data based on SIC92 to SIC80 prior to merging.

We do not construct a single compatible dataset that combines all the variables from the different sources. The data is split into two sub-samples for the time periods 1982-91 and 1993-95 for the two main reasons. Firstly, there are a few potentially important variables that are not available for the whole of the period 1982-95. For instance, establishment size is only observed from 1982 to 1991 and union density from 1993 to 1995. Also, we do not have a consistent measure of industry concentration over time: four-firm concentration ratios are available from 1982 to 1991 and the Herfindahl ratio from 1993 onwards.

⁵ Made available by the Office for National Statistics.

Secondly, in their study of the union wage differential in Britain during the years 1975 to 1995, Andrews et al. (1998a) highlight two phases in the movement of the union mark up over time (see figure 5.1 in sub-section 5-3-2-2). They show that the union wage effect remained fairly constant throughout the 1980s and early 1990s but there was a sharp rise from 1993 onwards. The considerable rise in the union mark up during the 1993-95 period was confirmed by estimates from different data sources. We test the hypothesis that the earnings functions⁶ in the 1982-91 and 1993-95 periods are statistically the same using a Chow test. The null hypothesis is rejected at the 1% level⁷, strengthening the case for analysing the data separately in terms of two distinct time periods. This, in effect, also enables us to examine the foreign competition effect over time.

In order to examine the effects of foreign competition on the union wage gap for different skill groups, we split the data further into skilled and unskilled occupations⁸. Our main motivation is explained by the fact that both international competition and union bargaining tend to affect the wage outcomes of skilled and unskilled workers differently. There is the notion that globalisation may have led to a deterioration of the returns to labour market participation of blue collar workers relative to those of white collar workers (Greenaway and Nelson, 2001). On the other hand, trade unions have traditionally been more active within manual occupations, producing higher wage premiums for unskilled workers compared to the skilled (Booth, 1995; Blanchflower and Bryson, 2002).

⁶ The same specifications are used for 1982-91 and 1993-95 when performing the Chow test.

⁷ $F=14.74$ and $\text{Prob} > F = 0.000$

⁸ Skilled includes managers and administrators, professional, associate professional and technical occupations. The unskilled sample contains plant and machine operatives and other manual occupations.

Overall, we consider four sub-samples⁹ altogether, each consisting of an unbalanced panel of individual workers. Table 5.1 summarises the number of observations and individuals in the different sub-samples, after dropping all missing observations.

Table 5.1: Number of observations in the different sub-samples

	Unskilled		Skilled	
	Observations	Individuals	Observations	Individuals
1982-91	181060	54448	50943	16781
1993-95	23955	13832	16937	9453

Source: Computed from compiled dataset

5-3-2 The variables

5-3-2-1 The dependent variable

The earnings data collected in the NESPD include individual workers' weekly, hourly and annual pay. Information on weekly and hourly wages is divided into gross and basic pay. The total gross earnings are inclusive of overtime rates while the basic wage of the employee excludes the amount earned from working overtime. Note that hourly earnings are recorded for employees whose pay is not affected by absence. We use the log of basic hourly earnings (at 1990 prices) as the dependent variable. It is argued that the hourly pay is more consistent with the theoretical literature on union wage effects, which is specifically based on wage rates and not the number of hours worked (Andrews et al., 1998a).

⁹ There is no evidence suggesting that globalisation impacts on male and female earnings differently. Hence, we do not stratify the samples according to sex.

5-3-2-2 *The union status variable*

The main union status variable used in this study is union coverage, indicating whether the individual is covered by a collective bargaining agreement. This is a more appropriate proxy for the influence of trade unions over wages than membership. The NESPD contains a constant measure of coverage over time, although one key limitation of the variable is that it identifies workers covered by a major union agreement only and excludes company/district/local bargaining. This has important implications for estimating the union wage differential. As discussed in chapter 3, major agreements represent only two thirds of all UK agreements and have fallen rapidly throughout the 1980s and 1990s. In contrast, it would appear that local agreements have become more prominent over the years, particularly due to government decentralisation policy (Andrews et al., 1998a). More significantly, Andrews et al. (1998a) find that the major coverage differentials are considerably lower than wage premiums achieved from coverage by company/district/local agreements. Cooperation between unions and firms may lead to higher rents at the local level. In addition, assuming high union density at the establishment, trade unions can be more powerful and successful in extracting part of the firm's rents when bargaining occurs locally. Therefore, union mark ups based on major coverage may be misleading and the true overall coverage differential severely underestimated.

But a main advantage of the major coverage variable is that it is consistently recorded on an annual basis by the NESPD during the whole of the period analysed by the present study. As a result, it provides a potentially rich source of information

that can be used to examine the relationship between foreign competition, unionisation and earnings over time. Moreover, Andrews et al. (1998a) argue that the major coverage differential broadly reflects the movement over time of the overall coverage differential, albeit being around one-third to two-thirds smaller in magnitude. Figure 5.1 below, reproduced from Andrews et al. (1998a), plots major coverage differentials from the NESPD and the coverage differentials from the British Household Panel Survey (BHPS) for 1991 and 1995 and the LFS for years 1993 to 1995 estimated by OLS and using identical specifications.

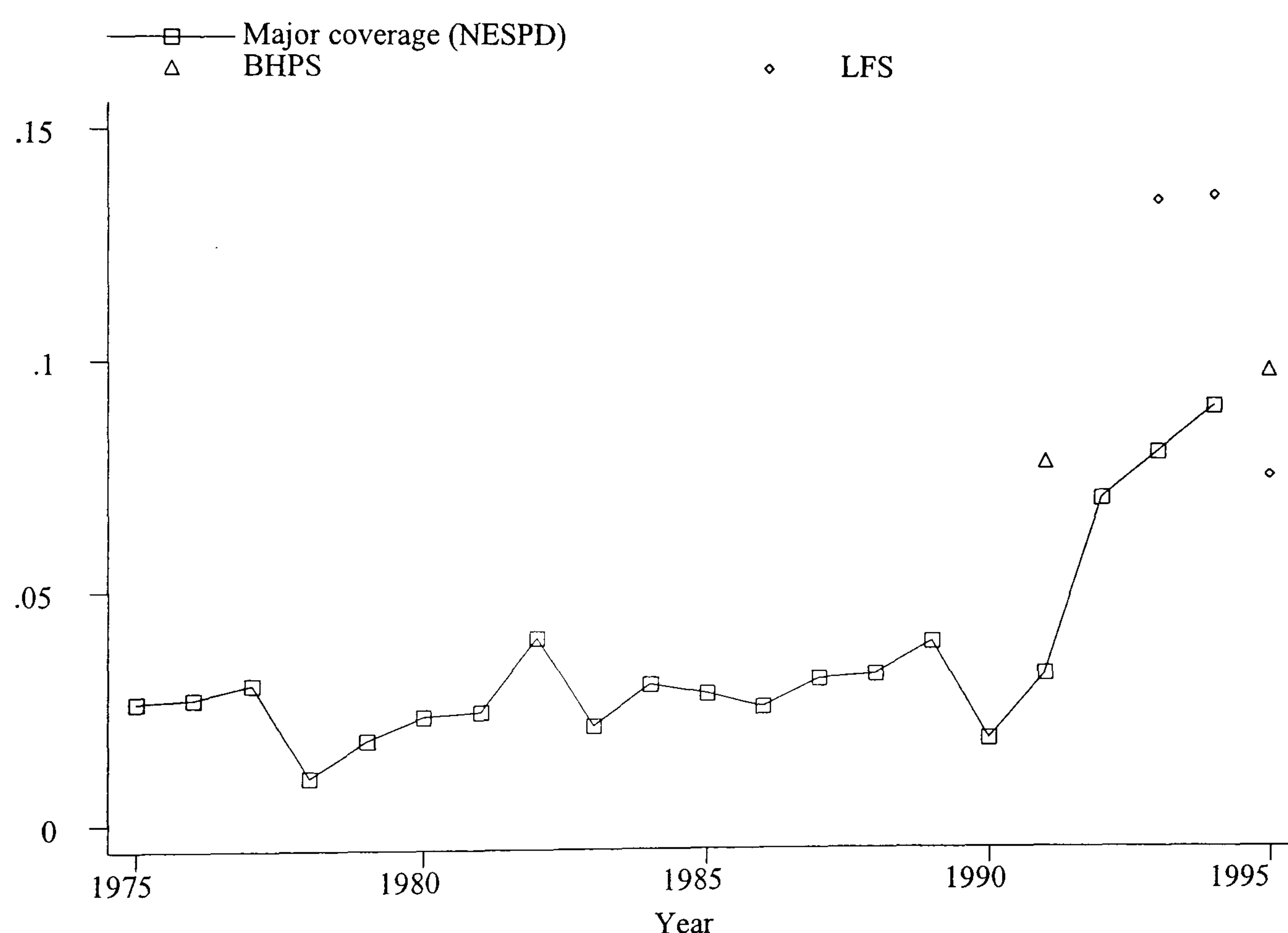


Figure 5.1: Coverage differentials from Andrews et al. (1998a)

Notwithstanding the outlier (from the LFS specification), the pattern in the coverage differentials from the BHPS and LFS in the 1990s matches the movement in the major coverage differential from the NESPD over the same period. It can be argued

that, in general, the use of major coverage may provide a guide to the trends in the effect of foreign competition on union wage bargaining.

5-3-2-3 The explanatory variables

Worker characteristics. The observable individual characteristics available in the NESPD are: age, gender, tenure (whether worker employed in current job for more than 12 months), the type of job (whether employee is employed full time or part time), sector (private or public), the industry affiliation of workers and location. A variable indicating whether the individual is a trainee is included in the 1993-95 subsamples.

Industry-level variables. An important criticism of the NESPD is that it contains no measures of the worker's educational attainment. Hence, we include industry level proxies for the average quality of the labour force, computed from the LFS. These are: the proportion of workers in each 4-digit industry with higher and further education, the proportion of workers with secondary education and the proportion of workers with job-related training.

We also include industry union membership density amongst the explanatory variables. The estimated coverage differential may be biased if membership is not included. The greater the level of union presence in the industry, the higher the wage rate paid to labour. Membership density may also reflect the influence of bargaining arrangements such as closed shops. The variable is, however, not available for the 1980s and appears in the 1993-95 period only.

Firm size is an important determinant of pay and because of the positive correlation with unionism, differentials may be biased upwards if controls are not included (Andrews et al., 1998b). We use the average size of establishment in the industry, constructed from the Census of Production, as a proxy. This is defined as the log of the ratio between industry employment and the number of establishments. Unfortunately, the figures are only available for the period 1982-91.

Concentration ratios are used to capture the characteristics of domestic market structure and proxy domestic competition. As discussed previously, we do not have a consistent single measure of industry concentration over time. The four-firm concentration and the Herfindahl ratios from the Census of Production are used for the periods 1982-91 and 1993-95 respectively. Economic theory suggests that concentrated industries pay higher wages not only because of monopoly rents but also to attract better quality and more productive workers. Moreover, concentrated industries use sophisticated technologies, well-trained and skilful labour units such that higher marginal productivity of labour may explain the relatively higher wages paid. An alternative hypothesis is that threatened unionisation in less competitive industries may induce firms to share part of their economic profits with their employees.

We introduce an interaction between the union status and concentration variables in view of testing union rent-seeking in concentrated industries. Because of the high oligopoly rents and the greater ability of firms in concentrated industries to pass on cost increases to consumers, there is more scope for labour unions to achieve higher wage premiums. Also, given the small number of firms, unions find it easier to

extensively organise concentrated industries and maintain jurisdictional control. However, the union wage advantage may be restricted by a larger reduction in employment and typically the employer's willingness and ability to resist union pressure may be greater in less competitive markets. Further, unions may not be able to add much to the already existing high pay in concentrated industries and higher levels of concentration may actually hinder the wage gaining ability of trade unions (Lewis, 1963; Weiss, 1966).

Foreign competition variables. The extent of foreign competition in the industry is captured by the trade variables, import penetration ratio and export share. Import penetration is defined as the ratio of imports over domestic demand¹⁰. Export share is the ratio between exports and domestic output. Construction of these variables is explained in greater detail in chapter 3. The use of trade flows as proxy for international competition is consistent with the theoretical and empirical literature.

Table 5.2 summarises the definitions of all variables used in the analysis and the main data sources.

¹⁰ Domestic demand is equal to imports plus domestic production minus exports.

Table 5.2: Variable definitions and data sources

Variable	Definition	Source	Years available
Individual characteristics			
ln w	Log of Hourly Earnings	NESPD	1982-95
Union	Dummy = 1 if worker covered by major bargaining agreement	“	“
Age	Age of worker	“	“
Age square	Age square	“	“
Male	Dummy = 1 if worker male	“	“
Full time	Dummy =1 if worker employed full time	“	“
Tenure	Dummy = 1 if worker has been employed in current job for more than 12 months	“	“
Private	Dummy = 1 if worker employed in private sector	“	“
Trainee	Dummy = 1 if worker is a trainee	“	1993-95
<i>Industry dummies</i>			
Metal	Worker employed in metal manufacturing	“	1982-95
Metal goods	Worker employed in metal goods manufacturing	“	“
Other minerals	Worker employed in other minerals	“	“
Instrument	Worker employed in instrument engineering	“	“
Chemicals	Worker employed in chemicals manufacturing	“	“
Mechanical	Worker employed in mechanical engineering	“	“
Electronic	Worker employed in electronic and electrical engineering	“	“
Office	Worker employed in office machinery	“	“
Motor	Worker employed in motor vehicles	“	“
Other transport	Worker employed in other transport equipment	“	“
Food	Worker employed in food and beverages	“	“
Textiles	Worker employed in textiles manufacturing	“	“
Clothing	Worker employed in clothing industry	“	“
Leather	Worker employed in leather manufacturing	“	“
Wood	Worker employed in wood manufacturing	“	“
Paper	Worker employed in paper manufacturing	“	“
Plastic	Worker employed in plastic and rubber manufacturing	“	“
Other	Worker employed in other manufacturing	“	“

Variable	Definition	Source	Years available
<i>Location dummies</i>			
London	Worker resides in London	“	“
South East	Worker resides in South East	“	“
East	Worker resides in East	“	“
South West	Worker resides in South West	“	“
West Midlands	Worker resides in West Midlands	“	“
East Midlands	Worker resides in East Midlands	“	“
Yorkshire	Worker resides in Yorkshire and Humberside	“	“
North West	Worker resides in North West	“	“
North	Worker resides in North	“	“
Scotland	Worker resides in Scotland	“	“
Wales	Worker resides in Wales	“	“
Industry characteristics			
Density	Union membership density in industry	LFS	1993-95
Training	Proportion of workers with job-related training in industry	“	1982-95
Further	Proportion of workers with higher/further education	“	“
Secondary	Proportion of workers with secondary education	“	“
Size	Average size of establishment in industry = $\log \left(\frac{\text{employment}}{\text{number of establishments}} \right)$	Census of Production	1982-91
Concentration	4-firm concentration ratio (1982-91)	“	“
	Herfindahl ratio (1993-95)	“	1993-95
Foreign competition			
Import	Import penetration ratio = $\frac{\text{import}}{\text{import} + \text{grossoutput} - \text{export}}$	ITCS (OECD) (gross ouput from Census of Production)	1982-95
Export	Export share = $\frac{\text{export}}{\text{grossoutput}}$	“	“

Notes:
NESPD: New Earnings Survey Panel Data set; LFS: Labour Force Survey; ITCS: International Trade by Commodities Statistics

5-3-2-4 *Some descriptive statistics*

Tables 5.3 and 5.4 show some descriptive statistics for covered and uncovered workers from the different sub-samples. We find that, on average, unskilled union workers are better remunerated than their non-union counterparts while skilled employees are paid less in the union sector than in the non-union sector. Overall, workers in union jobs share similar characteristics. They are, on average, more likely to be older¹¹, male and working in full time positions. They also tend to remain in the same job for a longer period than non-union workers but are less likely to work in the private sector. More workers with secondary education are unionised as compared to those with further/higher education. On the other hand, the degree of industry concentration is roughly the same for union and non-union workers. The summary statistics also demonstrate that the average establishment size is larger in the union sector as compared to the non-union sector. Additionally, individuals in union jobs appear to face lower levels of foreign competition although when considering the change in trade shares from the 1982-91 to the 1993-95 period, we note that some of the biggest increases actually occurred in the union sector. For example, the rise in import and export shares has been particularly significant for covered skilled workers. But the increase in international competition for unskilled workers, union and non-union, has been more or less comparable. Another observation transpiring from the data is that skilled workers are, in general, relatively more exposed to trade openness than unskilled workers.

¹¹ Although, the 1982-91 sample shows that skilled union workers are marginally younger on average.

Table 5.3: Mean values and standard deviations of variables for the period 1982-91

Variable	Union						Non-union					
	Skilled			Unskilled			Skilled			Unskilled		
	Mean	Standard Deviation		Mean	Standard Deviation		Mean	Standard. Deviation		Mean	Standard Deviation	
ln w	2.024	0.417		1.529	0.343		2.122	0.447		1.464	0.364	
Age	40.356	11.817		39.230	13.259		40.473	11.337		37.837	13.411	
Male	0.901	0.300		0.785	0.411		0.900	0.300		0.731	0.443	
Full time	0.986	0.116		0.958	0.201		0.991	0.093		0.936	0.244	
Tenure	0.877	0.328		0.884	0.321		0.827	0.378		0.827	0.378	
Private	0.872	0.335		0.926	0.262		0.974	0.158		0.981	0.137	
Size	6.152	8.298		6.385	8.513		5.837	7.942		6.102	8.224	
Concentration	0.422	0.275		0.394	0.243		0.422	0.224		0.379	0.232	
Import	0.193	0.241		0.254	0.309		0.318	0.330		0.298	0.330	
Export	0.184	0.222		0.223	0.304		0.301	0.317		0.262	0.335	
Further	0.101	0.061		0.081	0.058		0.144	0.098		0.092	0.070	
Secondary	0.383	0.106		0.332	0.106		0.381	0.107		0.340	0.109	
No. of Observations		4390			54920			46553			126140	

Source: Computed from compiled data

Table 5.4: Mean values and standard deviations of variables for the period 1993-95

Variable	Union			Non-union		
	Skilled		Unskilled	Skilled		Unskilled
	Mean	Standard Deviation	Mean	Standard. Deviation	Mean	Standard. Deviation
In w	2.297	0.427	1.652	0.351	2.367	0.486
Age	41.582	10.823	40.493	11.785	40.113	10.960
Male	0.835	0.372	0.788	0.408	0.834	0.372
Full time	0.985	0.124	0.934	0.248	0.980	0.140
Tenure	0.926	0.262	0.931	0.254	0.864	0.343
Trainee	0.010	0.097	0.007	0.085	0.011	0.103
Private	0.895	0.307	0.986	0.119	0.999	0.027
Concentration	0.133	0.097	0.167	0.126	0.163	0.128
Import	0.360	1.271	0.283	1.736	0.476	1.921
Export	0.432	0.537	0.401	0.805	0.467	0.852
Further	0.160	0.076	0.138	0.078	0.210	0.110
Secondary	0.485	0.111	0.437	0.098	0.457	0.101
Density	0.370	0.134	0.372	0.127	0.309	0.140
No. of Observations	839		3181		16098	20774

Source: Computed from compiled data

5-3-3 Econometric Modelling

The relationship between unionisation and wages can be examined in terms of a general model comprising separate union and non-union wage equations,

$$\ln w_{ui} = X_{ui} \beta_u + \varepsilon_{ui} \quad (1)$$

$$\ln w_{ni} = X_{ni} \beta_n + \varepsilon_{ni} \quad (2)$$

and a union status equation of the form

$$U_i^* = \gamma_1 Y_i + \gamma_2 (\ln w_{ui} - \ln w_{ni}) + \varepsilon_i \quad (3)$$

where w_i is the wage rate for individual i , X and Y are sets of worker, firm and industry characteristics determining wages and union status, the subscripts u and n stand for union and non-union respectively and ε is a random error term. U_i^* is a latent union status indicator. Assuming an individual worker i is unionised if $U_i^* > 0$ and s/he does not belong to a union otherwise, U_i^* can be defined by a discrete variable U_i such that,

$$U_i = 1 \text{ if } U_i^* > 0 \text{ and}$$

$$U_i = 0 \text{ otherwise}$$

The model implies that estimation of the wage equations (1) and (2) will be subject to the sample selection rule since we observe union wages only if $U_i^* > 0$ ($U_i = 1$) and non-union wages if $U_i^* \leq 0$ ($U_i = 0$). In other words, the availability of data is determined by the union status of workers, i.e. whether the each individual worker is part of a union agreement or not. As such, the regression functions for the separate wage equations can be written as:

$$E(\ln w_{ui} | X_{ui}, U_i^* > 0) = X_{ui} \beta_u + E(\varepsilon_{ui} | U_i^* > 0) \quad \text{and,}$$

$$E(\ln w_{ni} | X_{ni}, U_i^* \leq 0) = X_{ni} \beta_n + E(\varepsilon_{ni} | U_i^* \leq 0)$$

As we explain in section 5-3-4 below, the union and non-union samples are not drawn from a random population of workers. As a consequence, $E(\varepsilon_{ui} | U_i^* > 0) \neq 0$ and $E(\varepsilon_{ni} | U_i^* \leq 0) \neq 0$. Under classical assumptions, the conditional expectations of the error terms take the values zero and are systematically omitted as regressors when the sample regression functions are estimated by simple OLS. Thus, unbiased estimates of the union wage gap can be obtained by using sample selection estimation methods such as the Heckman two-step methodology.

An important characteristic of the model is that it allows for different slope coefficients in the wage equations. However, we are primarily interested in the impact of foreign competition on the union wage differential and not particularly in how the influence of the regressors differ across by union status. So by imposing a

restriction for the constancy of the coefficients on the control variables, i.e. $\beta_u = \beta_n$, we can model the effect of foreign competition on the union wage gap via an augmented single wage specification of the form,

$$\begin{aligned} \ln w_{it} = & X_{1it} \beta_1 + X_{2it} \beta_2 + \delta U_{it} + \lambda_1 Import_{it} + \lambda_2 Export_{it} + \delta_1 (U * Import)_{it} \\ & + \delta_2 (U * Export)_{it} + time + \varepsilon_{it} \end{aligned} \quad (4)$$

$i = 1, 2, \dots N \text{ workers}$

$t = 1, 2, \dots T \text{ years}$

$$U = \begin{bmatrix} 1 & \text{if worker covered by major collective bargaining agreement} \\ 0 & \text{otherwise} \end{bmatrix}$$

$\ln w_i$ is the log of individual hourly wages, U_i denotes the union status of worker i , taking the value 1 if the worker is covered by a collective bargaining agreement and the value 0 otherwise. δ shows the union wage premium. Time specific effects are captured by time dummies contained in the variable *time* while ε_i is a random error term. X_1 is a vector of worker characteristics and X_2 consists of the industry level variables.

$Import_i$ and $Export_i$ are import penetration ratio and export share by the individual's industry of affiliation. The impact of international competition on union bargaining is captured by the combined effect of import competition and export performance on the union wage gap, that is the sum of δ_1 and δ_2 , the coefficients on the variables

$U*Import$ and $U*Export$ respectively. The latter are interactions between the individual's union status, U_i and the trade variables, $Import_i$ and $Export_i$. The use of both import and export follows from Naylor's (1999) argument, outlined in chapter 2, regarding the importance of two-way trade for the bargained wage outcome. In particular, increased openness may enable labour unions in exporting firms to demand higher wages, whilst those in non-exporting establishments may be forced to accept wage concessions. Thus, the overall effect of trade on the union wage effect will depend on the strength of the two forces.

Recall that the restriction imposed on the single wage equation (4) implies that the earnings determination process is the same for union and non-union workers. In other words, the union wage differential (δ) is conditional on the assumption that the effects of the regressors do not differ across by union status. For example, the effect of age on wages is the same regardless of whether or not an individual is covered by a union agreement.

One advantage of the single equation is that the union wage gap is easily estimated. In the case of separate wage equations for the union and non-union sectors an average wage differential between covered and uncovered workers has to be calculated. This procedure raises the issue of which mean is appropriate to evaluate the average differential: should it be over covered workers, uncovered workers or a weighted average of the two groups? This is commonly known as the 'index number problem' and as shown in Andrews et al. (1998b), it is of considerable importance for the estimation of the union mark up.

5-3-4 Estimation strategy

The estimation strategy aims at generating results from three main approaches: Ordinary Least Squares (OLS), Instrumental Variable technique (IV) and Fixed-effects panel estimation (FE). We describe the application of each estimation method below and give an account of their limitations.

5-3-4-1 *Ordinary Least Squares (OLS)*

Equation (4) is estimated using OLS first. We specify heteroscedasticity-consistent robust¹² standard errors that also control for other minor deviations from the classical assumptions of least squares regressions and problems about outliers and influential observations. In line with Moulton (1986; 1990), adjustment¹³ is made for within-group correlation between errors, arising from industry-level variables being combined with data on individual workers.

OLS may not necessarily yield unbiased estimates for the union mark up because the union status of workers may be endogenous if individuals are self-selected into the union or non-union sector. For instance, high wages in unionised firms are likely to attract higher quality workers with unobserved productivity-enhancing characteristics, causing a positive correlation between union status and the specific effects of the individual. Consequently OLS estimates of the union wage differential

¹² Huber/White/Sandwich estimate of standard errors from STATA.

¹³ This is done by using the ‘Cluster’ option in STATA.

will not only reflect the influence of unionism on wages but also that of the unobservables. The estimated union differential will be biased upward. On the other hand, suppose that most union workers have lower unobserved abilities. Those with higher ability would then prefer to leave the union sector and bargain for themselves if the scale of remuneration at the union recognised workplace did not match their capability. The remaining workers would be negatively selected into the union sector, as they require the union to maintain their level of pay. In this case, the workers' fixed effects are negatively correlated with their union status, and OLS estimates are downward biased, understating the 'true' effect of unionism on wages.

Union endogeneity may also arise as a result of queuing and employer selection. If there are more workers wanting to work in the union sector than there are jobs available, employers may choose to hire only the best of the workers queuing for union jobs (Abowd and Farber, 1982). This leads to a positive bias in the OLS estimated union premium. By extension, estimating the effect of foreign competition on the union mark up using OLS would not produce unbiased results. Hence, we provide estimates from two different approaches dealing with union endogeneity namely, IV and fixed-effects methods.

5-3-4-2 Instrumental Variable (IV) method

The problem of endogenous selection can be solved by a simultaneous equation approach that involves the use of either IV or sample selection models. As shown earlier, the latter requires the simultaneous estimation of a union status model and

separate union and non-union wage equations. Given our single equation modelling procedure in equation (1), we adopt the IV technique¹⁴. This approach makes use of instruments or proxies that are correlated with the union status of workers (U_i) but uncorrelated with the disturbance term (ε_i). Our choice of instruments is motivated by previous studies like Farber (1983), Bain and Elias (1985) and Booth (1986) which identify the attributes of the individual and the industry to which the worker is affiliated to as key microeconomic determinants of union status. Moreover, the econometric literature often uses lagged values of the endogenous variables as instruments. Hence, for the purpose of estimation, we instrument coverage by the available worker and industry characteristics in the data and the one-period lagged union status. However, since the variables that qualify as instruments need to be highly correlated with the union status variable, they may in turn be correlated with the unobserved individual characteristics (Jakubson, 1991; Greene, 1997). If this is the case, then the IV estimator will not be consistent. Another disadvantage of the IV methodology is the lack of robustness and reliability. IV estimates are also very susceptible to inclusion of additional variables, assumptions about error terms and the data used (Lewis, 1986; Booth, 1995).

5-3-4-3 Fixed-effects estimation

The availability of longitudinal data allows us to consider an alternative to the cross-sectional IV corrections for union endogeneity. Assuming unmeasured personal characteristics are time invariant, we estimate equation (4) using the fixed-effects

¹⁴ Robust standard errors are specified and adjustments are made for within group correlation.

method such as to control for the unobserved individual attributes and eliminate the source of self-selection. The FE estimation is subject to two main caveats, originating from the fact that panel estimates are based on individuals changing¹⁵ union status over time. The first is measurement error bias. It is argued that some of the observed changes in union status may not be true changes but rather the consequence of mere misclassification or misreporting (Mincer, 1983; Freeman, 1984; Chowdhury and Nickell, 1985). Moreover, the number of misclassified workers will be greater in longitudinal data than in one period cross sectional data and because of the relatively small number of workers changing union status, a greater proportion of incorrect observations will be present in panel data. Thus, the measurement error bias will be severely inflated in fixed-effects estimates (Freeman, 1984). The second drawback concerns potential endogenous changes in union status. If workers moving from union to non-union jobs or vice versa are motivated by wages, estimates of the union wage effect will suffer from the common problem of simultaneity bias (Jakubson, 1991; Booth, 1995). Generally speaking, the fixed-effects estimators will be biased downward as a consequence of the potentially very large measurement errors present in longitudinal data while the possibility of non-random changes in union status could produce estimates that are biased in either direction, upward or downward (Freeman, 1984; Swaffield, 2001; Disney and Gosling, 2003).

In sum, OLS estimates are biased because of unobserved worker heterogeneity whilst the use of IV may not yield convincing results due to concerns about the choice of

¹⁵ See table 5B.2 in the appendix for the number of workers changing union status in the data.

instruments and the lack of robustness of the estimates. On the other hand, measurement errors and endogenous changes in union status will lead to biased fixed-effects estimates. In view of these estimation difficulties, it is therefore necessary to examine the results from all three different methods so as to reach a better assessment of the interactions between foreign competition, unionisation and wages.

5-3-4-4 Is trade endogenous?

Before proceeding to the empirical estimation and results, we consider the possible endogeneity of trade. Trade flows arguably depend on wage costs and as seen from the theoretical review in chapter 2, Naylor (1999) suggests that the pattern of trade may be determined by union wage strategies. This poses a potential simultaneity problem between trade, wages and the union-mark up. In order to test whether the foreign competition variables need instrumenting, we perform a standard augmented regression test, also known as the Durbin-Wu-Hausman (DWH) test (Davidson and MacKinnon, 1993). The test follows the same procedure explained in chapter 3 whereby the residuals obtained from OLS regressions of import penetration and export share are included in the original wage determination model. The latter is then estimated by OLS and an F-test for the joint significance of the incorporated residuals of the foreign competition variables is performed. This is equivalent to the test of the null hypothesis that import penetration and export share are exogenous. The test statistics and high p-values in table 5.5 suggest that the null cannot be rejected in any of the different sub-samples considered. As such, we do not find

sufficient statistical support for the endogeneity of trade from our data and so the estimation of equation (4) is carried out using the methods described in the previous sections without instrumenting for the international competition variables. The test results in this section are consistent with the findings in chapter 3 and also Gaston and Trefler (1994) who conclude that the endogeneity of trade flows plays no role in influencing the response of wages to trade. Similarly, Freeman and Katz (1991) argue that the simultaneity bias between trade and wages is typically small and Karier (1991) reports that import and export shares are not strongly influenced by wage levels or the union wage differential.

Table 5.5: Results from DWH test for endogeneity of import penetration and export share

1982-91		1993-95	
Unskilled	Skilled	Unskilled	Skilled
F value = 1.8	F value = 2.03	F value = 2.17	F value = 0.97
Prob > F = 0.17	Prob > F = 0.18	Prob > F = 0.11	Prob > F = 0.38

Note: Null hypothesis, H_0 : import penetration and export share are exogenous; large p -values indicate that H_0 is not rejected.

5-4 Results

This section explains the empirical results reported in the appendix tables 5A.1 to 5A.6. Two wage specifications are considered. The column labelled (1) shows the basic wage equation (4) estimated without the foreign competition variables. This is meant to capture the effect of coverage on wages in a closed economy setting. We introduce import penetration and export share in column (2).

Individual characteristics. The effects of individual characteristics on wages are, on the whole, consistent throughout the different specifications although for some variables the coefficients do vary with the estimation methods and time period considered. We find that male workers (skilled and unskilled) are paid more than their female counterparts. Earnings are positively related to age while apprentices are paid less than fully trained employees. On average, full time employment significantly increases¹⁶ the hourly wage rate of the unskilled, though the results are mixed¹⁷ in the case of skilled workers. According to the 1993-95¹⁸ samples, working in the private sector generates higher pay for the unskilled but there appears to be no significant relationship between sector and skilled pay. In general, tenure has a significant¹⁹ positive effect on unskilled earnings. The effect on skilled earnings is, however, rather mixed. For the period 1982-91, OLS generates a positive and significant coefficient on tenure while the IV coefficient is negative. The OLS results do not show any significant effects of tenure on skilled earnings during 1993-95 but IV remains negative and significant. Fixed effects estimates are statistically insignificant in both time periods.

Industry characteristics. In most cases, the greater the proportion of workers with further/higher education and job related training, the better the pay. Secondary education appears to be positively correlated with the earnings for the unskilled in particular. The unskilled wage rate rises with union membership density although

¹⁶ This is confirmed by the OLS and IV estimates.

¹⁷ IV estimations show no significant results. The fixed effects estimates are significant and negative. OLS coefficients are positive and significant for the 1993-95 sample but insignificant for 1982-91.

¹⁸ No association between sector and wages is found for the period 1982-91.

¹⁹ IV estimates are not significant for the period 1993-95 though.

only our OLS estimates show a positive and statistically significant influence of density on skilled pay. There is also a positive association between the average size of establishments in the industry and individual earnings. We find support²⁰ for the concentration-earnings hypothesis, as pay appears to be rising with the extent of industry concentration. When considering the interaction between coverage and industry concentration, the evidence from the unskilled sub-samples (1982-91 and 1993-95) suggests that trade unions cannot add to the already high wages paid in concentrated manufacturing industries. However, there are indications of successful union rent seeking in concentrated industries by skilled workers, especially during the 1982-91 period.

Foreign competition and wages. Table 5.6 shows the regression results for the effects of import penetration and export share on unskilled and skilled earnings.

Table 5.6: International competition and wages

	Unskilled				Skilled			
	1982-91		1993-95		1982-91		1993-95	
	Import	Export	Import	Export	Import	Export	Import	Export
OLS	-4.7**	2**	-0.2**	-0.2	-6.3*	10.0**	-0.2	-0.5
	(6.4)	(2.9)	(3.3)	(0.8)	(2.0)	(2.8)	(1.2)	(1.1)
IV	-3.6**	1.8*	0.2	-0.8	-7.6*	12.8**	0.0	-1
	(4.2)	(2.3)	(0.7)	(1.3)	(2.1)	(3.1)	(0.1)	(1.1)
Fixed effects	-0.7	-0.4	0.0	-0.0	-3.8**	4.9**	0.1	-0.0
	(1.4)	(0.7)	(0.3)	(0.1)	(3.2)	(3.7)	(0.7)	(0.1)

Source: Column (2) from tables 5A.1 – 5A.6 in the appendix
*Notes: t-statistics in parentheses; *, ** significant at 5% and 1% respectively; coefficients are in % and correspond to the effect on wages of a 10% rise in import penetration and export share.*

²⁰ Except for panel estimates.

The results are interpreted as follows. A 10% rise in import competition causes a decline in unskilled earnings by up to 4.7% and lowers skilled wages by 3.8% to 7.6% for the period 1982-91. There is no significant import competition effect on skilled earnings for the years 1993-95 while OLS suggests a negative impact of 0.2% on unskilled wages for a 10% rise in import share. Export performance is, in general, positively associated with wages, though the impact is limited to the 1982-91 period only. The effect on skilled earnings, of a 10% increase in export share, ranges between almost 5% to 13%. OLS and IV estimates show that the unskilled wage rate rises by around 2%.

Import penetration and export share actually increased²¹ by 8 and 6 percentage points respectively from 1982 to 1991. According to our results, this would have produced a combined negative trade effect, reducing the earnings of the unskilled by up to 2.6% (calculated from the OLS estimates above). In contrast, skilled workers would have gained from a positive combined effect of import penetration and export performance of up to 1.6% (from the IV estimates) during the same period. In effect, these findings are broadly consistent with the Stolper-Samuelson predictions. Blue-collar operations are dominated by import competition from developing countries in the South, which explains the negative trade effect on unskilled pay. On the other hand, in industrialised countries like the UK, skilled workers are likely to be involved in capital intensive net-exporting sectors of the economy. They are, therefore, positively rewarded by increased trade. Besides, skilled workers earn a better return to human

²¹ Figures from the industry trade data reveal an aggregate rise in import penetration and export share in the manufacturing sector from 26% and 25% to 34% and 31% respectively between 1982 and 1991.

capital and are more highly remunerated for export performance than unskilled employees. The positive effect of openness on skilled wages also reflects the North-North intra-industry trade element (Helpman and Krugman, 1985) that characterises the markets of developed economies. Since intra-industry trade is related to aspects like innovation, research and development and product differentiation, it tends to benefit skilled workers most. The 1993-95 period, however, reveals very little evidence of a significant international competition effect on wages. While the result is unexpected, it could be due to the short time period and insufficient variability in the data. Similarly, the relative insignificance of the fixed-effects estimates, shown in table 5.6, could stem from a general lack of time variation.

Coverage. Assuming a closed economy (column (1)), the coverage differential for unskilled workers lies in the range²² of 1.5% to 12.3% for the period 1982-91 and – 3% to 9% for the period 1993-95²³. In the case of skilled employees, the 1982-91 sub-sample reveals that their average hourly wage rate is lowered by as much as 3% to 19.7% by virtue of being covered by a major bargaining agreement. Only the IV estimate is statistically significant for the 1993-95 skilled sub-sample, showing a union wage gap of around -13%. The skilled group is composed of managers, administrators, professionals and workers in technical positions who are better off bargaining for themselves, hence the negative influence of union coverage on skilled

²² The variations across specifications may be due to the fact that controlling for union endogeneity via IV often results in a moderate to substantial rise in the OLS estimates of the union wage gap (Robinson, 1989) while fixed effects has been found to halve the coverage differential relative to OLS (Andrews et al., 1998a).

²³ The exclusion of controls for firm size in the 1993-95 sub-samples may cause an upward bias in the estimated differentials (Andrews et al., 1998b).

pay. In general, the results confirm previous empirical studies (Booth, 1995) suggesting that trade unions are more successful in securing higher wages for blue collar relative to white-collar workers. We find that the OLS estimates of the union mark up are smaller in magnitude than the IV coefficients. This concurs with the IV literature on union wage effects, which usually reports higher estimates compared to OLS (Robinson, 1989). It could imply that workers are negatively selected into unions and that OLS is biased downwards. The fixed-effects coefficients, on the other hand, are much smaller possibly due to measurement error bias and/or non-random changes in union status (Swaffield, 2001).

Foreign competition and the union wage gap. Now, turning to the effects of international trade on the union mark up, table 5.7 below summarises the estimated coefficients on the union dummy ($\hat{\delta}$) and the interaction between coverage and import ($\hat{\delta}_1$) and coverage and export ($\hat{\delta}_2$) from column (2) in the result tables. $\hat{\delta}_1$ and $\hat{\delta}_2$ are estimates of the influence of import penetration and export share on the union wage differential. Three sets of estimations are presented: OLS, IV and fixed-effects. Results from OLS and IV are more or less comparable. The fixed-effects coefficients are relatively small, possibly due to measurement error and/or selectivity (i.e. non-random changes in union status) causing a downward bias in the estimates (Swaffield, 2001). They are also not significantly different from zero, which could be attributed to a lack of variation within observations.

Table 5.7: International competition and the union wage gap

	OLS	IV	Fixed Effect
	Unskilled		
1982-91	$\hat{\delta} = 8.5^{**}$ (17.3)	$\hat{\delta} = 13.9^{**}$ (13.5)	$\hat{\delta} = 1.4^{**}$ (4.9)
	$\hat{\delta}_1 = -5.9^{**}$ (4.3)	$\hat{\delta}_1 = -9.5^{**}$ (6.0)	$\hat{\delta}_1 = -0.4$ (0.5)
	$\hat{\delta}_2 = 3.7^{**}$ (2.8)	$\hat{\delta}_2 = 4.3^{**}$ (3.2)	$\hat{\delta}_2 = 0.8$ (1.0)
1993-95	$\hat{\delta} = 6.8^{**}$ (5.8)	$\hat{\delta} = 9.2^{**}$ (4.3)	$\hat{\delta} = -3.1^{**}$ (2.4)
	$\hat{\delta}_1 = 0.7^{**}$ (2.8)	$\hat{\delta}_1 = 1.6^*$ (2.5)	$\hat{\delta}_1 = -0.2$ (0.8)
	$\hat{\delta}_2 = 1$ (1.3)	$\hat{\delta}_2 = 0.2$ (0.1)	$\hat{\delta}_2 = -0.2$ (0.3)
	Skilled		
1982-91	$\hat{\delta} = -7.7^{**}$ (3.6)	$\hat{\delta} = -19.5^{**}$ (4.9)	$\hat{\delta} = -2.2^{**}$ (2.2)
	$\hat{\delta}_1 = 10.5$ (1.1)	$\hat{\delta}_1 = 13$ (1.1)	$\hat{\delta}_1 = 1.3$ (0.3)
	$\hat{\delta}_2 = -26.9^{**}$ (2.5)	$\hat{\delta}_2 = -22.3^\dagger$ (1.7)	$\hat{\delta}_2 = -6.9$ (1.5)
1993-95	$\hat{\delta} = -1.2$ (0.4)	$\hat{\delta} = -13.4^*$ (2.4)	$\hat{\delta} = 2.5$ (1.0)
	$\hat{\delta}_1 = 0.8$ (0.7)	$\hat{\delta}_1 = -0.4$ (0.3)	$\hat{\delta}_1 = 0.2$ (0.3)
	$\hat{\delta}_2 = -2.1$ (0.6)	$\hat{\delta}_2 = 1.3$ (0.3)	$\hat{\delta}_2 = -0.9$ (0.4)

Source: Column (2) from tables 5A.1 – 5A.6 in the appendix

Notes: *t*-statistics in parentheses. [†], *, ** significant at 10%, 5% and 1% respectively. Coefficients are in %. $\hat{\delta}_1$ and $\hat{\delta}_2$ correspond to the effect on the union wage gap of a 10% rise in import penetration and export share respectively.

From table 5.7, the OLS and IV estimates during the period 1982-91 show that a 10% increase in import competition reduces the average union wage differential for unskilled workers by 5.9% and 9.5% respectively whilst the impact of a 10% increase in the industry's export share is between 3.7% (OLS) and 4.3% (IV). We find that foreign competition influences the skilled union wage differential mainly via export. The OLS results reveal that a 10% increase in export share reduces the skilled union wage gap by 26.9% while the IV estimate indicates a reduction of 22.3%, albeit being weakly significant at the 10% level. There is, however, a different picture emerging for the period 1993-95. While we observe no significant export effect, the impact of import competition on the unskilled union wage gap is generally positive and significant, ranging from 0.7% (OLS) to 1.6% (IV). There is no significant foreign competition effect on the union mark up for skilled workers.

5-4-1 An analysis of the results

Although our results are not directly comparable to previous UK studies, in particular, because of the different samples, empirical methodologies and foreign competition measures used, they are generally in line with some of the theoretical predictions discussed in chapter 2. For instance, the negative import effect on the union wage gap of unskilled workers during the 1982-91 period is consistent with the product market/rent-sharing model of Layard et al. (1991) and Vandebussche and Konings (1998). Import penetration increases product market competition and reduces the monopoly power of domestic firms, thereby lowering profits/quasi-rents

and the union-mark up. Moreover, Lawrence and Lawrence (1985) argue that import penetration may threaten domestic plants with closure by significantly decreasing the demand for domestically manufactured goods. Import competition can also lead to labour intensive production, typically involving unskilled workers, being lost to foreign producers (Staiger, 1998) while Mezzetti and Dinopoulos (1991) show that domestic multinationals may credibly threaten to relocate abroad when faced with increased import competition. These factors imply that labour unions may be forced to accept lower wages in order to safeguard future employment. Conversely, improved export performance is linked to high product and labour demands, enabling trade unions to negotiate higher wages for the unskilled without the fear of future job losses (Naylor, 1999).

On the whole, the combined impact of the actual 8 percentage point rise in import penetration and the 6 percentage point increase in export share during the period 1982-91 would have generated a negative trade effect on the unskilled union wage differential. It appears that in the 1980s the perceived risks of job loss associated with import competition was considerably greater than the employment opportunities arising from increased export share. As such, labour unions chose to moderate wage demands and maintain unskilled union jobs.

Following the earlier discussion of the results on foreign competition and wages, it is perhaps not surprising that (during the 1982-91 period) the skilled union mark up is primarily influenced by exports. Although, contrary to unskilled workers, there is a negative export effect on the skilled union wage gap. This may relate to the

following. According to Lawrence and Lawrence (1985) an increase in the demand for domestic goods (for instance, caused by improved export performance) may lead to higher industry growth and investment. However, a larger share of new investment in the production process entails a higher elasticity of factor substitution and greater labour demand elasticity. As a result, the union wage gap is curtailed. It can be argued that manufactured exports in the 1982-91 period did not lead to sufficiently high demands for skilled labour such as to outweigh the elasticity effect and enable trade unions to extract positive wage premiums. Trade unions may also face the threat of multinationals relocating closer to their export markets abroad if domestic wage demands are too high (Mezzetti and Dinopoulos, 1991). Hence, union workers may accept lower wages in exchange for future job guarantees. Similarly, Naylor (1999) contends that trade unions may deliberately adopt low wage strategies in order to allow export to take place and at the same time, ensure higher levels of employment. The negative export effect on the skilled union wage gap may also reflect the idea that organisations are forced to improve performance, productivity and the way they function, reducing costs, X-inefficiency and especially managerial slack in order to compete with international rivals in export markets. In particular, unionised manufacturing firms are subject to more managerial diseconomies than non-unionised firms which, are often claimed to be more competitive and efficient internationally (Konings & Vandenbussche, 1995). It is, therefore, likely that trade unions may opt for an adjustment in pay to offset any cuts in employment, which would accompany the rationalisation and restructuring of managerial operations in unionised establishments.

The contrasting results obtained for the period 1993-95 represents a key finding of the study. The absence of any adverse foreign competition effect on the union wage differential by the mid 1990s could be due to the hypothesis that the decline of trade unions over time left behind smaller unions with more senior workers who voted to maintain wages (or even increase earnings in the case of the unskilled) at the expense of future employment of younger workers (Grossman, 1984). However, we do not abstract from the possibility that some of the statistical insignificance of the trade effects, especially for the skilled sub-sample, may simply be the result of small sample size and a lack of variation in the data.

5-4-2 The effect of international competition over time

We examine the movement of the effect of foreign competition on the union-nonunion wage differential over time further by splitting the 1982-91 samples into 3 time periods: 1982-85, 1986-88, and 1989-91. The effects of import penetration and export share on the union mark up, estimated by OLS and IV regressions, are summarised in table 5.8.

It follows that a 10% rise in import competition and export share reduces the union wage gap for unskilled workers by 3.2% (OLS) to 6.2% (IV) during the period 1982-85. There is a notable decline in the negative foreign competition effect between 1986 and 1988 and no significant impact of international competition on the unskilled union mark-up is observed from 1989 to 1991. Results from table 5.7 for

the period 1993-95 indicate that foreign competition has a positive influence on the unskilled coverage differentials.

A similar observation can be made for the group of skilled workers. Whilst the 1982-85 period reveals a negative influence of foreign competition on the skilled union wage gap, there are suggestions that, from the mid-1980s onwards, it was not adversely affected by international competition.

Table 5.8: International competition and the union wage effect over time

		Unskilled			Skilled		
		1982-85	1986-88	1989-91	1982-85	1986-88	1989-91
OLS	$\hat{\delta}_1$	-6.9**	$\hat{\delta}_1$ = -3.9**	$\hat{\delta}_1$ = -0.2	$\hat{\delta}_1$ = 27.4*	$\hat{\delta}_1$ = -0.7	$\hat{\delta}_1$ =13.2
		(3.8)	(-2.4)	(-0.1)	(2.23)	(-0.05)	(1.0)
	$\hat{\delta}_2$	3.7**	$\hat{\delta}_2$ = 2.6 [†]	$\hat{\delta}_2$ = 2.5	$\hat{\delta}_2$ =-58.2**	$\hat{\delta}_2$ = -10.7	$\hat{\delta}_2$ =-15.4
		(2.3)	(1.8)	(1.1)	(-4.62)	(-0.7)	(-1.0)
IV	$\hat{\delta}_1$	-9.8**	$\hat{\delta}_1$ = -9.6**	$\hat{\delta}_1$ = -3.4	$\hat{\delta}_1$ = 20	$\hat{\delta}_1$ = -0.4	$\hat{\delta}_1$ = 46.9*
		(-4.3)	(-4.8)	(-1.4)	(1.4)	(-0.0)	(2.8)
	$\hat{\delta}_2$	3.6*	$\hat{\delta}_2$ = 3.9**	$\hat{\delta}_2$ = 3.6	$\hat{\delta}_2$ = -43.8*	$\hat{\delta}_2$ = -10.2	$\hat{\delta}_2$ = -36.9*
		(2.0)	(2.6)	(1.6)	(-2.8)	(-0.6)	(-2.1)

Source: OLS and IV estimations of wage equation (1)

Notes: *t*-statistics in parentheses; [†], *, ** significant at 10%, 5%, and 1% respectively; coefficients are in % and correspond to a 10% rise in import penetration and export share; $\hat{\delta}_1$ and $\hat{\delta}_2$ are estimates of the coefficients on *U*Import* and *U*Export* from wage equation (2). For the IV estimation, union status and the interaction variables are instrumented by lagged values and the variables contained in *X*₁ and *X*₂ from equation (1).

Figures 5.2 and 5.3 below plot the combined effect of import competition and export share on the skilled and unskilled union wage differentials between 1982 and 1995 using the estimates in tables 5.7 and 5.8.

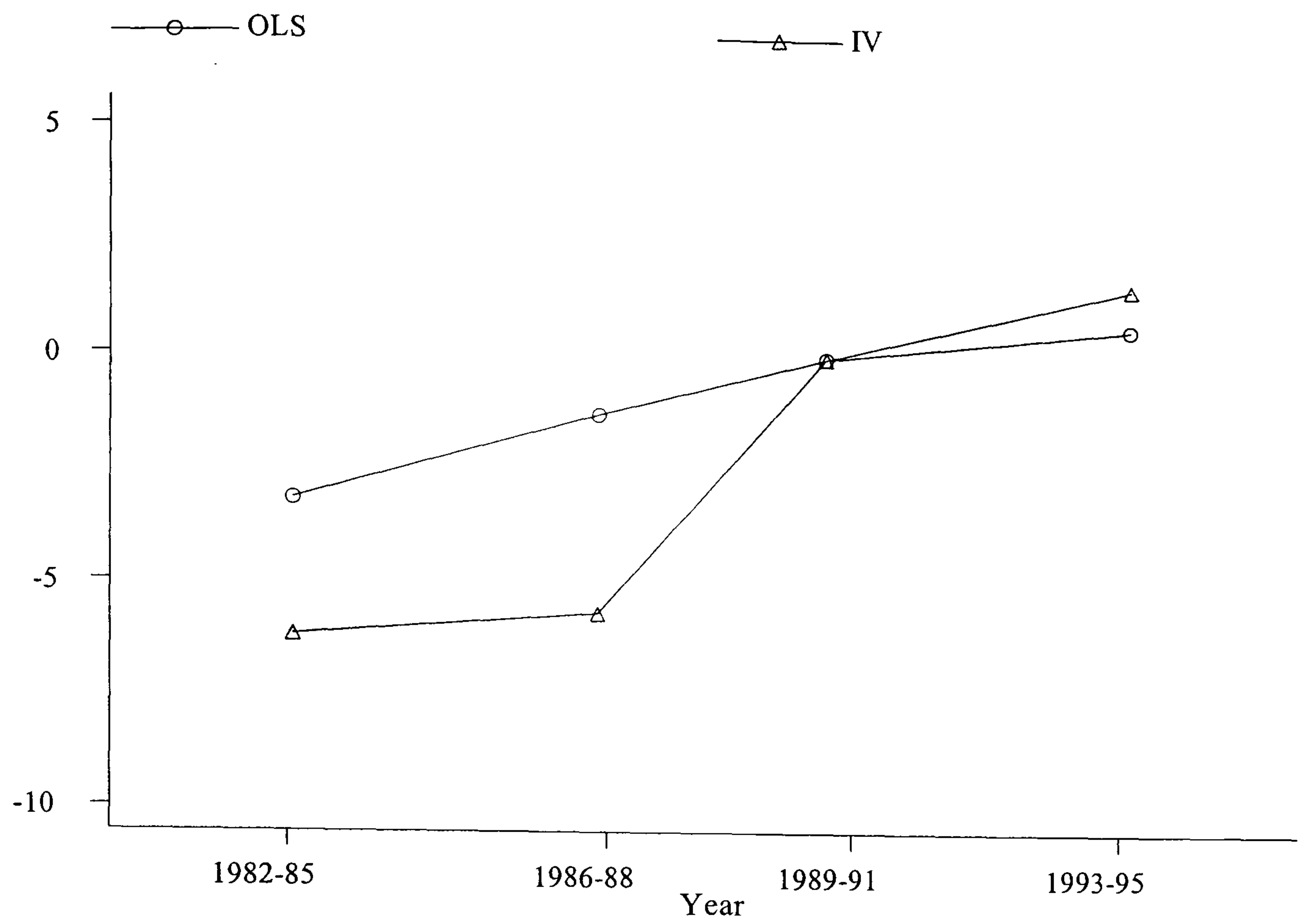


Figure 5.2: The effect of international competition on the unskilled union wage gap over time

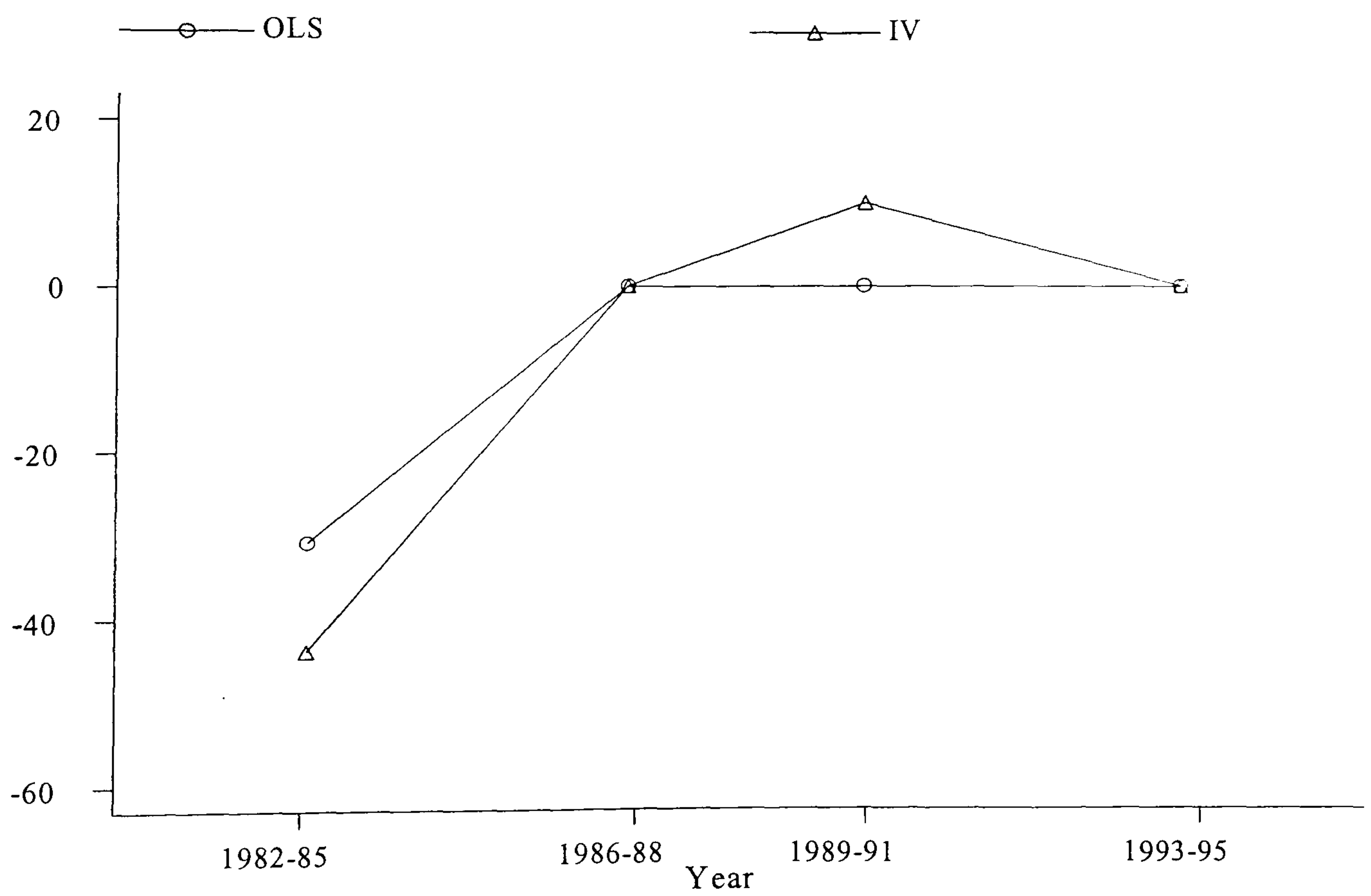


Figure 5.3: The effect of international competition on the skilled union wage gap over time

It is clear that the disciplining effects of international competition on union wage setting fell consistently as the 1980s progressed and by the mid 1990s, there was no significant impact on the skilled union mark up whilst unskilled workers benefited from a positive foreign competition effect. We postulate the following plausible explanations for observed trend.

1. As discussed earlier, the decline of trade unionism in the UK during the 1980s and 1990s probably resulted in smaller unions with more senior median members choosing to maintain or even increase their wage demands at the expense of future employment prospects for younger workers.
2. It is possible that the de-unionisation of British manufacturing resulted in weak unions having to make way for stronger ones (Andrews et al., 1998a) that were more capable of standing up to the challenges posed by globalisation.
3. To some extent, the trend in the mid-1990s could also reflect the end of 'Thatcherism'.
4. Finally, the lack of significant foreign competition effect in the later years could be due to small samples and limited variation in the data, especially for the skilled sub-samples.

5-5 Summary and conclusion

This chapter has investigated the effect of foreign competition on the union wage differential of skilled and unskilled workers in UK manufacturing during the period 1982 to 1995. We used a specially constructed individual level data set that

combined worker characteristics with 4-digit industry data on import penetration and export share. The econometric modelling consisted of a basic single wage equation and because of the problem of endogenous selection of workers into unions, we generated estimates from OLS, IV and fixed-effects regressions in order to provide a better assessment of the true effect of foreign competition on the union mark up. OLS and IV yielded comparable results while the fixed-effects coefficients were relatively small, possibly due to measurement error and/or selectivity. In addition, they were mostly insignificant, which we attributed to a lack of time variation in the data.

The empirical results suggested that foreign competition generally served to moderate union wage demands during the 1982-91 period. In the case of unskilled workers, a positive export effect was more than offset by a negative impact of import penetration on the union wage gap. Presumably, the loss of domestic market share to foreign rivals and the threat of multinationals relocating elsewhere as a result of increased import competition had greater negative implications for union wage setting relative to the benefits of improved export performance. Import competition did not affect the skilled union mark up but the negative impact of export share indicated that unionised firms needed considerable reductions in costs and management diseconomies in order to compete internationally and gain further access to markets abroad.

The disciplining effect of openness gradually faded away over time and by the mid 1990s labour unions' wage setting ability was no longer weakened by foreign

competition. There was no significant impact on the skilled union mark up and unskilled union workers gained from a positive international competition effect during the 1993-95 period. One plausible explanation could be that smaller but stronger unions that were able to fight further reductions in bargained wages and successfully compete in an increasingly global economy. Incidentally, this also coincided with the end of 'Thatcherism'.

The main limitation of the analysis in this chapter is that the union variable from the NESPD relates to coverage by a major union agreement only and excludes company/district/local bargaining. This may have important implications since major agreements represent only two thirds of all UK agreements and have fallen steadily over time whilst local agreements have become more prominent, particularly following the government's decentralisation policy. Further, major coverage differentials are considerably lower than wage premiums achieved from coverage by company/district/local agreements (Andrews et al., 1998a). Therefore, studying the effect of foreign competition on union mark ups based on major coverage only may potentially produce underestimated coefficients and misleading conclusions (especially in the later years when major agreements would have collapsed even further). Nonetheless, we argue that our measure of union status is consistently recorded during the time period considered and perhaps more significantly, major coverage differentials broadly reflect the movement of the overall coverage differentials over time. And so the use of major agreements is likely to provide a good guide to the trends in the effect of foreign competition on the union wage gap.

APPENDIX 5A

Table 5A.1: Results from OLS regressions 1982-91

	Unskilled		Skilled	
	(1)	(2)	(1)	(2)
Age	0.047 (86.70)**	0.047 (85.65)**	0.086 (41.64)**	0.086 (41.36)**
Age square	-0.001 (80.99)**	-0.001 (79.98)**	-0.001 (35.95)**	-0.001 (35.71)**
Male	0.292 (94.33)**	0.293 (93.88)**	0.245 (24.41)**	0.248 (24.28)**
Full time	0.129 (23.96)**	0.128 (23.80)**	0.022 (0.52)	0.033 (0.77)
Tenure	0.101 (49.43)**	0.101 (48.68)**	0.010 (2.13)*	0.010 (2.11)*
Sector	-0.016 (2.80)**	-0.011 (1.93)	-0.030 (2.09)*	-0.025 (1.72)
Establishment size	0.023 (22.80)**	0.023 (22.00)**	0.015 (5.16)**	0.015 (4.89)**
Training	0.164 (8.19)**	0.179 (8.83)**	0.121 (2.35)*	0.126 (2.38)*
Further education	0.358 (18.03)**	0.352 (17.25)**	0.390 (8.47)**	0.400 (8.16)**
Secondary education	0.237 (18.33)**	0.222 (17.15)**	0.078 (2.34)*	0.077 (2.30)*
Concentration ratio	0.090 (11.21)**	0.091 (11.28)**	0.124 (5.26)**	0.130 (5.36)**
Union coverage	0.077 (18.20)**	0.085 (17.25)**	-0.101 (5.18)**	-0.077 (3.62)**
Coverage*concentration	-0.093 (10.36)**	-0.097 (10.78)**	0.080 (2.00)*	0.103 (2.55)*
Import penetration ratio		-0.047 (6.43)**		-0.063 (1.99)*
Coverage*import		-0.059 (4.28)**		0.105 (1.05)
Export share		0.020 (2.93)**		0.100 (2.76)**
Coverage*export		0.037 (2.76)**		-0.269 (2.53)*
Constant	-0.285 (14.37)**	-0.269 (13.07)**	-0.457 (5.64)**	-0.526 (6.28)**
Industry dummies	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
Regional dummies	Yes	Yes	Yes	Yes
Observations	184810	181060	52500	50943
R-squared	0.44	0.44	0.29	0.29

- Notes:
1. OLS regressions with STATA's robust and cluster options
 2. Robust t-statistics in parentheses
 3. * significant at 5%; ** significant at 1%

Table 5A.2: Results from OLS regressions 1993-95

	Unskilled		Skilled	
	(1)	(2)	(1)	(2)
Age	0.040 (29.29)**	0.040 (28.71)**	0.075 (20.47)**	0.076 (20.50)**
Age square	-0.0005 (27.51)**	-0.0005 (26.90)**	-0.001 (17.36)**	-0.001 (17.43)**
Male	0.259 (42.37)**	0.258 (41.82)**	0.216 (17.49)**	0.219 (17.31)**
Full time	0.160 (14.27)**	0.157 (13.81)**	0.123 (2.77)**	0.132 (2.89)**
Tenure	0.099 (16.20)**	0.099 (16.01)**	0.010 (1.06)	0.012 (1.18)
Trainee	-0.339 (17.72)**	-0.343 (17.71)**	-0.488 (16.88)**	-0.494 (16.65)**
Sector	0.176 (6.92)**	0.172 (7.02)**	0.008 (0.21)	0.007 (0.16)
Membership density	0.310 (14.66)**	0.303 (13.80)**	0.124 (3.48)**	0.118 (3.23)**
Training	0.130 (3.37)**	0.127 (3.20)**	0.278 (4.27)**	0.289 (4.38)**
Further education	0.532 (15.01)**	0.521 (14.39)**	0.223 (3.80)**	0.189 (3.03)**
Secondary education	0.202 (7.14)**	0.211 (7.10)**	-0.155 (2.99)**	-0.184 (3.41)**
Concentration	0.069 (2.96)**	0.082 (3.28)**	0.148 (3.86)**	0.145 (3.50)**
Coverage	0.072 (6.20)**	0.068 (5.80)**	-0.021 (0.73)	-0.012 (0.40)
Coverage*concentration	-0.201 (3.94)**	-0.212 (4.10)**	-0.384 (2.42)*	-0.424 (2.52)*
Import penetration		-0.002 (3.34)**		-0.002 (1.20)
Coverage*import		0.007 (2.79)**		0.008 (0.72)
Export share		-0.002 (0.75)		-0.005 (1.05)
Coverage*export		0.010 (1.28)		-0.021 (0.61)
Constant	-0.098 (2.27)*	-0.085 (1.98)*	0.254 (2.51)*	0.248 (2.43)*
Industry dummies	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
Regional dummies	Yes	Yes	Yes	Yes
Observations	24898	23955	17750	16937
R-squared	0.36	0.36	0.25	0.25

Notes:

1. OLS regressions with STATA's robust and cluster options
2. Robust t-statistics in parentheses
3. * significant at 5%; ** significant at 1%

Table 5A.3. Results from Instrumental Variable regression (IV) 1982-91

	Unskilled		Skilled	
	(1)	(2)	(1)	(2)
Age	0.039 (59.62)**	0.039 (58.82)**	0.077 (29.39)**	0.077 (29.11)**
Age square	-0.0001 (57.20)**	-0.0001 (56.41)**	-0.001 (25.92)**	-0.001 (25.65)**
Male	0.305 (85.05)**	0.306 (84.63)**	0.235 (17.66)**	0.238 (17.47)**
Full time	0.121 (18.19)**	0.119 (18.04)**	0.023 (0.42)	0.026 (0.48)
Tenure	0.050 (17.21)**	0.049 (16.81)**	-0.080 (11.54)**	-0.081 (11.46)**
Sector	-0.018 (2.65)**	-0.010 (1.47)	-0.008 (0.36)	-0.004 (0.19)
Establishment size	0.023 (20.11)**	0.023 (19.73)**	0.016 (4.49)**	0.017 (4.47)**
Training	0.217 (10.25)**	0.229 (10.68)**	0.255 (4.36)**	0.223 (3.70)**
Further education	0.380 (17.49)**	0.370 (16.61)**	0.438 (8.29)**	0.478 (8.58)**
Secondary education	0.240 (16.74)**	0.225 (15.60)**	-0.002 (0.04)	0.008 (0.21)
Concentration ratio	0.129 (14.02)**	0.126 (13.67)**	0.160 (5.77)**	0.164 (5.72)**
Union Coverage	0.123 (14.24)**	0.139 (13.54)**	-0.197 (5.41)**	-0.195 (4.89)**
Coverage*concentration	-0.199 (12.91)**	-0.203 (12.92)**	0.253 (4.20)**	0.286 (4.91)**
Import penetration ratio		-0.036 (4.24)**		-0.076 (2.09)*
Coverage*import		-0.095 (5.96)**		0.130 (1.08)
Export share		0.018 (2.28)*		0.128 (3.08)**
Coverage*export		0.043 (3.17)**		-0.223 (1.72) [†]
Constant	0.116 (5.96)**	0.131 (6.61)**	0.016 (0.19)	-0.022 (0.25)
Industry dummies	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
Regional dummies	Yes	Yes	Yes	Yes
Observations	133145	130423	36742	35681
R-squared	0.42	0.42	0.25	0.25

Notes:

1. IV regressions with STATA's robust and cluster options
2. Robust t-statistics in parentheses
3. [†] significant at 10%; * significant at 5%; ** significant at 1%;
4. Union status and the interaction variables are instrumented by lagged values and the variables contained in X_1 and X_2 from wage equation (1).

Table 5A.4: Results from Instrumental Variable regression 1993-95

	Unskilled		Skilled	
	(1)	(2)	(1)	(2)
Age	0.042 (23.89)**	0.042 (23.68)**	0.071 (17.20)**	0.070 (16.79)**
Age square	-0.0001 (22.87)**	-0.0001 (22.60)**	-0.001 (14.72)**	-0.001 (14.36)**
Male	0.273 (36.56)**	0.274 (36.60)**	0.228 (15.29)**	0.232 (15.32)**
Full time	0.154 (9.92)**	0.153 (9.77)**	0.110 (2.04)*	0.107 (1.94)
Tenure	0.007 (0.57)	0.003 (0.24)	-0.116 (6.11)**	-0.114 (5.90)**
Trainee	-0.316 (7.77)**	-0.317 (7.81)**	-0.473 (9.72)**	-0.474 (9.61)**
Sector	0.192 (6.58)**	0.193 (6.72)**	0.018 (0.33)	0.018 (0.33)
Membership density	0.304 (10.61)**	0.278 (9.56)**	0.034 (0.72)	0.021 (0.43)
Training	0.154 (3.16)**	0.165 (3.33)**	0.249 (3.10)**	0.261 (3.20)**
Further education	0.482 (10.77)**	0.437 (9.66)**	0.169 (2.20)*	0.136 (1.69)
Secondary education	0.163 (4.18)**	0.157 (3.88)**	-0.246 (3.82)**	-0.264 (3.99)**
Concentration	0.093 (2.95)**	0.111 (3.33)**	0.168 (3.06)**	0.179 (3.05)**
Coverage	0.090 (4.41)**	0.092 (4.29)**	-0.133 (2.45)*	-0.134 (2.40)*
Coverage*concentration	-0.316 (3.75)**	-0.339 (3.97)**	0.159 (0.51)	0.137 (0.42)
Import penetration		0.002 (0.71)		0.0001 (0.12)
Coverage*import		0.016 (2.48)*		-0.004 (0.32)
Export share		-0.008 (1.34)		-0.010 (1.09)
Coverage*export		0.002 (0.13)		0.013 (0.30)
Constant	-0.043 (0.75)	-0.019 (0.32)	0.542 (4.25)**	0.558 (4.26)**
Industry dummies	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
Regional dummies	Yes	Yes	Yes	Yes
Observations	13208	12947	10180	9929
R-squared	0.35	0.35	0.21	0.21

Notes:

1. IV regressions with STATA's robust and cluster options
2. Robust t-statistics in parentheses
3. * significant at 5%; ** significant at 1%
4. Union status and the interaction variables are instrumented by lagged values and the variables contained in X_1 and X_2 from wage equation (1)

Table 5A.5: Fixed-effects estimates 1982-91

	Unskilled		Skilled	
	(1)	(2)	(1)	(2)
Age	0.053 (40.47)**	0.052 (39.85)**	0.087 (28.88)**	0.087 (28.88)**
Age square	-0.001 (90.84)**	-0.001 (89.12)**	-0.001 (58.41)**	-0.001 (57.48)**
Male	0.192 (11.97)**	0.194 (12.02)**	0.207 (5.41)**	0.206 (5.38)**
Full time	0.006 (1.41)	0.005 (1.09)	-0.157 (10.06)**	-0.151 (9.49)**
Tenure	0.046 (33.93)**	0.046 (33.50)**	0.004 (1.46)	0.005 (1.82)
Sector	0.003 (0.69)	0.003 (0.76)	-0.013 (2.05)*	-0.012 (1.76)
Establishment size	0.003 (5.66)**	0.003 (5.45)**	0.0001 (0.10)	-0.0001 (0.29)
Training	0.038 (3.05)**	0.042 (3.32)**	0.002 (0.10)	-0.007 (0.27)
Further education	0.018 (1.50)	0.025 (1.98)*	0.005 (0.21)	0.009 (0.40)
Secondary education	0.008 (1.13)	0.008 (1.12)	0.001 (0.04)	0.008 (0.51)
Concentration ratio	0.043 (7.40)**	0.038 (6.39)**	0.006 (0.46)	0.015 (1.19)
Union coverage	0.015 (5.92)**	0.014 (4.93)**	-0.030 (3.27)**	-0.022 (2.18)*
Coverage*concentration	-0.003 (0.49)	-0.002 (0.36)	0.051 (2.86)**	0.060 (3.30)**
Import penetration		-0.007 (1.41)		-0.038 (3.17)**
Coverage*import		-0.004 (0.48)		0.013 (0.30)
Export share		-0.004 (0.69)		0.049 (3.66)**
Coverage*export		0.008 (0.96)		-0.069 (1.54)
Constant	0.073 (1.59)	0.082 (1.78)	0.176 (1.67)	0.139 (1.32)
Industry dummies	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
Regional dummies	Yes	Yes	Yes	Yes
Observations	184810	181060	52500	50943
Number of individuals	55285	54448	17233	16781
R-squared	0.24	0.24	0.38	0.38

Notes:

1. Absolute value of t-statistics in parentheses

2. * significant at 5%; ** significant at 1%

Table 5A.6: Fixed-effects estimates 1993-95

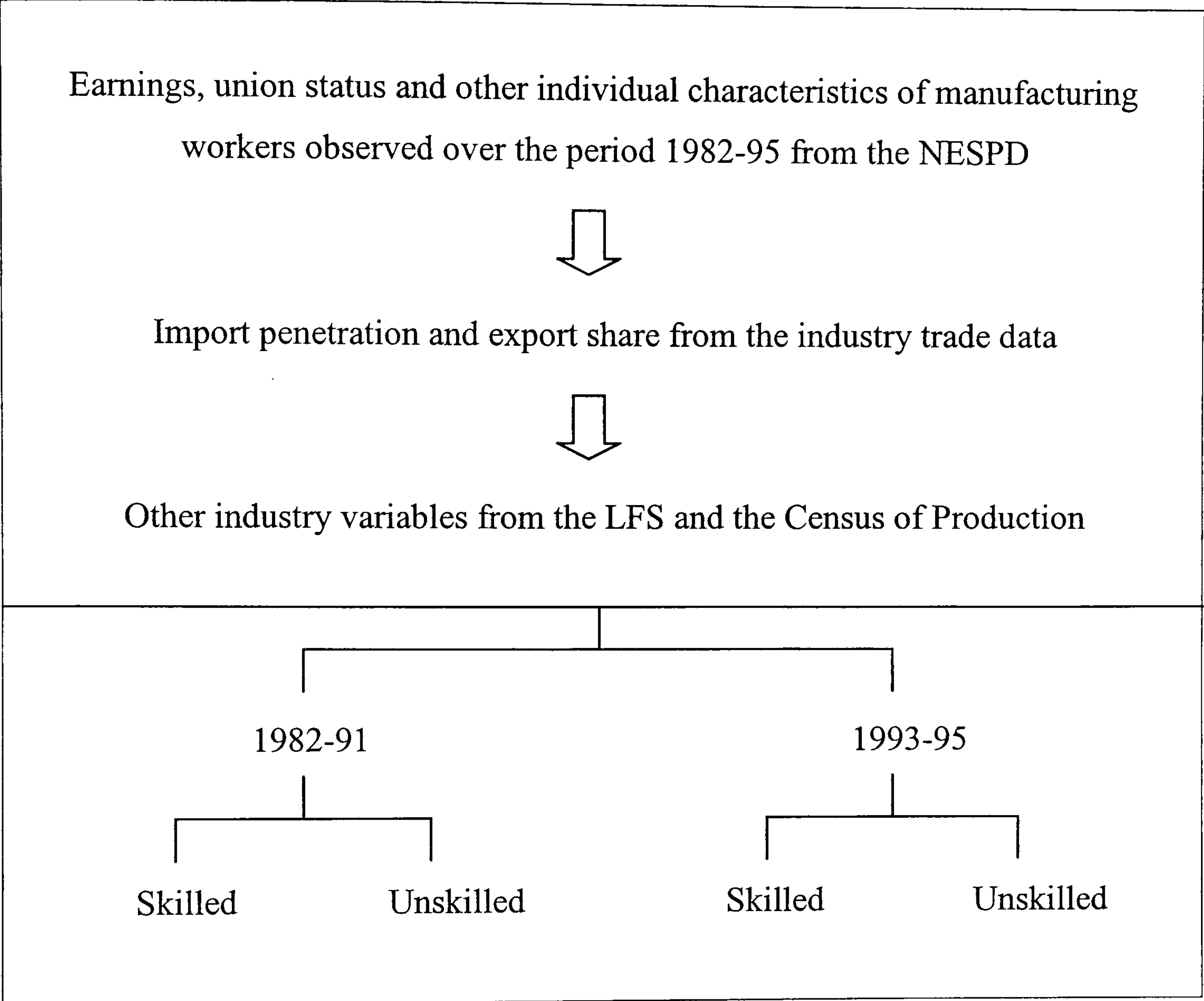
	Unskilled		Skilled	
	(1)	(2)	(1)	(2)
Age	0.014 (0.69)	0.014 (0.71)	0.084 (9.30)**	0.086 (9.20)**
Age square	-0.0004 (7.97)**	-0.0004 (7.74)**	-0.001 (11.39)**	-0.001 (11.06)**
Male ⁴	-1.702 (13.56)**	-1.701 (13.52)**		
Full time	-0.083 (6.55)**	-0.084 (6.45)**	-0.195 (8.23)**	-0.191 (7.63)**
Tenure	0.025 (4.97)**	0.026 (4.92)**	0.007 (1.13)	0.005 (0.74)
Trainee	-0.124 (6.73)**	-0.131 (6.85)**	-0.141 (4.13)**	-0.133 (3.74)**
Sector	0.080 (1.38)	0.075 (1.25)	0.038 (0.45)	0.041 (0.48)
Membership density	0.043 (2.88)**	0.035 (2.15)*	-0.007 (0.32)	-0.014 (0.60)
Training	0.054 (2.43)*	0.061 (2.63)**	-0.016 (0.53)	-0.010 (0.31)
Further education	-0.010 (0.39)	-0.011 (0.42)	-0.011 (0.33)	-0.016 (0.47)
Secondary education	-0.014 (0.72)	-0.012 (0.57)	0.008 (0.26)	0.023 (0.72)
Concentration	0.004 (0.23)	0.004 (0.20)	0.015 (0.60)	0.018 (0.65)
Coverage	-0.030 (2.49)*	-0.031 (2.41)*	0.019 (0.80)	0.025 (1.04)
Coverage*concentration	0.003 (0.07)	0.001 (0.02)	-0.107 (1.00)	-0.118 (1.01)
Import penetration		0.0001 (0.28)		0.0005 (0.65)
Coverage*import		-0.002 (0.83)		0.002 (0.26)
Export share		-0.0001 (0.06)		-0.0002 (0.07)
Coverage*export		-0.002 (0.26)		-0.009 (0.40)
Constant	3.027 (3.95)**	3.079 (4.00)**	0.673 (2.19)*	0.588 (1.86)
Observations	24897	23955	17750	16937
Number of individuals	14113	13832	9668	9453
R-squared	0.06	0.06	0.12	0.12

Notes:

1. Absolute value of t-statistics in parentheses
2. * significant at 5%; ** significant at 1%
3. Male dropped in the skilled sample due to multicollinearity

APPENDIX 5B

Table 5B.1: Construction of the final data



Notes: Arrows indicate “merged to”
Flow chart shows selection of sub-samples used for estimation

Table 5B.2: Number of workers changing union status

Year	Number of changes in union status	
	Skilled	Unskilled
1982-83	396	4730
1983-84	386	3586
1984-85	313	3082
1985-86	346	3523
1986-87	423	3887
1987-88	366	3855
1988-89	401	3972
1989-90	388	3290
1990-91	584	1400
1993-94	161	690
1994-95	172	703

Note: Changes are calculated between 1982 & 1983, 1983 & 1984 and so on.

6

Conclusion

This study has provided empirical evidence on the implications of increased openness to international trade for trade unions in the UK. The objectives of the thesis were twofold. First, to investigate the link between international competition and the decline of unionisation in Britain during the 1980s and early 1990s. Second, to examine the impact of trade on the wage bargaining strength of trade unions as measured by the union wage gap of individual workers. The main conclusions from the empirical chapters are summarised as follows.

Chapter 3 presented an industry-level analysis of the link between union coverage by major agreements and import competition, using data from NESPD and a specially compiled trade data for UK manufacturing during the period 1983-95. The empirical strategy distinguished between the decline in coverage caused by an import-induced industry re-composition, shifting employment from the highly unionised sectors to the least unionised ones (referred to as the compositional effect) and the influence of foreign competition on coverage irrespective of any shifts in employment composition (the non-compositional effect). Using a basic shift-share technique, we found that the compositional effect of foreign competition was trivial, explaining only around 2.1% of the total decline in union coverage between 1983 and 1995. Behavioural changes

among industries were more important. A multivariate regression model was used to examine the non-composition effect of international competition. The results lent support for a possible non-compositional role of foreign competition in the decline of trade unions in the UK. Though, it would appear that the influence of import penetration was possibly overshadowed by legislative and public policy changes, the macroeconomic climate at the time and, to some degree, by privatisation and changes in workforce composition. However, a major caveat of the analysis was that it focused on coverage by major agreements only. It is plausible that decline of major coverage observed throughout the 1980s and 1990s was primarily caused by government policy to decentralise union bargaining. This could explain the lack of overwhelming evidence for a significant foreign competition effect.

Therefore, chapter 4 provided further evidence on the relationship between foreign competition and unionisation by looking at establishment-level data from WIRS. It used union recognition¹ as the main union measure, which encompasses all types of union agreements. In effect, we tested the hypothesis that foreign competition reduces the probability of trade unions gaining recognition for bargaining purposes. Three different approaches were employed in order to model the effect of foreign competition. First, we used a question in the survey about whether the establishment operates primarily in international markets. Since firms operating in international markets have to compete with foreign rivals, this served as a fitting basis on which the influence of foreign competition on the likelihood of union recognition could be analysed. The question applied to firms in all industrial sectors. As such, we found that the probability of recognition was reduced by 16% in firms operating in international

¹ Whether an establishment recognises trade unions for collective bargaining purposes.

markets. Splitting the data by sector revealed that firms facing foreign competition in private services were relatively less likely to recognise trade unions compared to their counterparts in private manufacturing. Second, we used trade variables at current time² for manufacturing, in place of the WIRS measure of foreign competition. However, no robust predictions about the impact of international competition on union recognition were obtained. Third, given that there was evidence of trade unions failing to attain recognition in establishments set up after 1980 (especially in private manufacturing), we investigated whether this could due to foreign competition at (or around) the establishment set up date in the 1980s and 1990s. This was achieved through the use of age-dated trade measures, proxying international competition at the time of plant set-up in manufacturing. The coefficients on the foreign competition variables were not statistically significant and the results pointed to a strong impact of labour market forces (particularly declining aggregate union membership) on the likelihood of recognition.

Thus, chapters 3 and 4 demonstrated that foreign competition had, at most, a weak impact on unionisation in UK manufacturing during the 1980s and 1990s. It seems more likely that the anti-union policy pursued by Thatcher's Conservative Government restricted the exercise of union power whilst providing employers with the opportunity to reaffirm their prerogatives and marginalize the union movement. Despite these results, we argued that it was possible that foreign competition could influence trade unions' ability to extract rents and modify their strategic bargaining behaviour, which would be reflected in the union wage premium.

² Corresponding to the relevant year of survey.

In this context, chapter 5 investigated the effect of foreign competition on the union wage differential of skilled and unskilled workers in UK manufacturing during the period 1982 to 1995. It provided estimates from OLS, Instrumental Variable (IV) and fixed-effects regressions such as to provide a better assessment of the true effect of foreign competition on the union mark up. While the OLS and IV results were consistent, the fixed-effects coefficients did not perform well, possibly due to measurement error, selectivity and a lack of time variation in the data. Overall, openness to international trade served to moderate union wage demands during the 1982-91 period. The loss of domestic market share to foreign rivals and the threat of multinationals relocating elsewhere, as a result of increased import competition, had greater negative implications for the unskilled union wage premium relative to the benefits of improved export performance. The union mark up for skilled workers was, for the most part, negatively affected by exports, suggesting that unionised firms needed considerable reductions in costs and management diseconomies in order to compete internationally and gain further access to markets abroad.

Interestingly, there was evidence of a decline in the disciplining effect of international trade over time. We found no significant trade impact on the skilled union mark up during the 1993-95 period while foreign competition appeared to influence the wage differentials of unskilled union workers positively over the same time period. A plausible rationale for this result could be that the decline of trade unionism in the UK left behind smaller but stronger unions that were able to maintain or even increase their wage demands in face of an increasingly globalised economy. To some extent, this could also reflect the end of 'Thatcherism' in the 1990s.

A main limitation of the empirical analysis in chapter 5 was that we measured union status with coverage by a major union agreement from the NESPD. Since major coverage differentials are considerably lower than wage premiums achieved from coverage by company/district/local agreements (Andrews et al., 1998a), studying the effect of foreign competition on union mark-ups based on major coverage only could potentially produce underestimates of the true coefficients and misleading conclusions. Nonetheless, major coverage represents a consistent measure of union status and perhaps more significantly, it is argued that major coverage differentials broadly reflect the movement of overall coverage differentials over time, albeit at a lower level (Andrews et al., 1998a). And so the use of major agreements is likely to provide a guide to the trends in effect of foreign competition on the union wage gap.

In sum, the thesis has provided some useful insights into the influence of globalisation on unionisation and the wage bargaining strength of trade unions. However, the study focuses solely on international trade while the remarkable growth of foreign direct investment (FDI) in recent decades has also been a major driving force of the global economy. Thus, the impact of multinationals on union presence and bargaining represents quite an interesting avenue for future research.

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