Wage dispersion and the role of multinationals: Evidence from UK panel data

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Abstract

At present there has been little empirical investigation into the impact of multinational firms on the domestic labour market and in particular wage dispersion. This is despite a rapid increase in FDI at around the same time of rising inequality. Using 3 digit industry level data across UK manufacturing from 1983 to 1992 this paper tests whether inward flows of FDI have contributed to increasing wage inequality. Even after controlling for the influence of technology and trade intensity, the two most common explanations of wage dispersion, we find that FDI has a significant effect upon wage dispersion which can be interpreted as evidence of a technology spillover.

Keywords: Wage dispersion; FDI spillovers

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1. Introduction

Over the past two decades a number of studies have documented the relative decline in unskilled wages for a number of countries (Bound and Johnson, 1992; Katz *et al.*, 1992; Machin, 1996; and Berman *et al.*, 1998). Since the relative supply of unskilled workers has also declined in recent years, the trends in relative wages are seen as evidence of a shift away from unskilled workers caused by an increase in relative demand for higher skilled labour. The two most common explanations behind such a demand shift are technological change biased in favour of skilled labour and growing international trade (Levy and Murnane, 1992; Gottschalk and Smeeding, 1997). There is some disagreement about whether technology or trade is the most important factor in causing increasing demand for skilled workers (Machin and Van Reenen, 1998; Wood, 1994, 1998; Taylor, 1999a,b; Desjonqueres *et al.*, 1999), and this is as much a theoretical issue as an empirical one (Haskel, 1999; Slaughter, 1999). However, it is fair to say that the majority of research has focused upon trade and technology as the main causes of changes in labour demand.

Both trade and technological change have arguably accelerated over the past two decades, however foreign direct investment (FDI) by multinational enterprises (MNEs) both into and out of the UK has also grown at a rapid rate in recent years, such that investment by foreign firms has accounted for approximately 20% of total net capital expenditure since 1987, Driffield (1999). This growth of foreign owned manufacturing has occurred at a time of rising UK wage dispersion. Figure 1 shows the UK skill premium, measured as the ratio of total average annual wages of non-operatives (our measure of the skilled) to the average total annual wages of operatives (unskilled), and the share of foreign-owned affiliate employment in total UK manufacturing employment from 1983 to 1992[1]. The skill premium rose from a low of about 0.63 in 1984 to 0.77 in 1992. At the same time, foreign affiliate employment rose from a low of 10% in 1987 to about 15% by 1992. These parallel trends between the skill premium and foreign employment shares suggest that multinational involvement in the UK economy may have contributed to the widening wage dispersion.

<<FIGURE 1 HERE>>

Not only has the trend in foreign employment closely traced wage dispersion, a number of studies in the literature have found differences between domestic firms and foreign owned plants. The advantage that a firm must have in order to be able to compete in an alien environment (Vernon, 1966; Dunning, 1988) has recently been attributed to technological advances which yield productivity differences between national and foreign firms (Cantwell, 1991; Davies and Lyons, 1991). There is growing evidence for this in the UK – Driffield (1996) finds that foreign firms will pay wages above the industry average of around 7%, partly due to productivity differences, Conyon *et al.* (1999) find a wage differential of 3.4% wholly attributable to productivity, and Girma *et al.* (1999) find wage and productivity differentials of 5%. What these and other studies suggest is that foreign owned firms have different factor demands for labour in comparison to domestically owned firms.

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[1] As with much previous research our data only allow us to distinguish between two groups of labour one interpreted as skilled (non-operatives) and the other unskilled (operatives). The disadvantage is that one may lose much information about the subtleties of the wage structure from this degree of aggregation –Autor and Katz (1999), Taylor (1999a). However, Berman *et al.* (1994) and Machin and Van Reenen (1998) find that such aggregations do a reasonable job of matching a high/low educational breakdown in manufacturing.

Figure 1 clearly shows that inward investment penetration has increased alongside wage dispersion. However, much of the work in this area has been concerned with the differences between foreign and domestic plants, rather than the direct impact that increased FDI flows may have on host country labour markets, see for example Driffield (1996), Griffith (1999). Much of the analysis of the likely impacts of inward investment is based on the standard theoretical approach of FDI developed by Vernon (1966), and Dunning (1988). This generally assumes that foreign firms must possess some 'ownership advantage' if they are to compete successfully. These ownership advantages are then in turn generally specified in terms of greater technological capacity (Cantwell, 1991; Davies & Lyons, 1991). This technical efficiency advantage is then in turn related to productivity differentials, and through to a somewhat smaller wage differential between foreign-owned and domestic industry. The inference here is that foreign-owned firms demonstrate markedly different factor demand functions, from their domestic counterparts, and therefore entry by such firms is expected to impact on domestic labour markets. Indeed, Hubert and Pain (1999) suggest that inward investment is virtually solely labour augmenting, and as such, inward investment acts to reduce the demand for unskilled workers.

Nevertheless, much of the work concerning the likely impact on wage dispersion of FDI is contradictory and the theoretical impact of FDI upon wage dispersion is somewhat ambiguous. Although the majority of theoretical work has been based upon general equilibrium trade models with endowment driven comparative advantages the findings are mixed, where it is possible that greater MNE activity can either raise or lower the skill mix (Feenstra and Hansen, 1997; Markusen, 1995; Markusen and Venables, 1998). For example, Feenstra and Hanson (1997) develop a North-South endowment driven model to examine the impact of FDI and find that it raises the skill premium in both regions. An alternative literature on the formation of MNEs is found in Markusen (1995) where the general equilibrium model starts out by maintaining that a MNEs distinguishing characteristic is their firm specific assets such as technology, marketing skills and management skills. Markusen and Venables (1998) use this type of approach to analyse the impact on relative wages in the parent and host country by MNE activity. In general, the overall impact upon wages depends upon the initial equilibrium and underlying parameter changes. Consequently the impact upon unskilled labour can be either positive or negative according to chosen specifications. It is such theoretical ambiguities that highlight the need for empirical work. However, we anticipate two labour market effects as a result of inward investment. Firstly, that foreign firms entering an industry will pay above the average for the industry, causing wages to be bid up in those sectors. Secondly, we anticipate an indirect effect, caused by the increase in technological capability associated with inward investment (one of the firm specific advantages mentioned by Markusen, 1995). It is hypothesised that a learning process will occur, in the manner suggested by Figini and Gorg (1998) and Barrell and Pain (1997). Barrell and Pain (1997) find that in the UK manufacturing sector that a 1% rise in the FDI stock is estimated to raise technical progress by 0.26%. Here, technological advantages are transferred to domestic producers in the form of spillovers, Blomstrom (1989), Haddad and Harrison (1993) and Driffield (2000). It is this indirect effect which is of primary interest in that it will influence wage dispersion.

To our knowledge there has not been any systematic investigation into the impact of FDI upon growing UK wage dispersion (Figini and Gorg, 1998 consider Ireland), and very few studies in the USA (Baldwin, 1995; Blonigen and Slaughter, 1999). In response, this paper examines the impact of inward FDI upon relative wages in UK manufacturing industries at the 3 digit level over the period 1983 to 1992 – a period where wage dispersion was at its most rampant (Machin, 1998).

2. Empirical methodology

To identify the link between inward FDI and within-industry shifts in demand towards higher skilled labour, we exploit variations in FDI across manufacturing industries. The theoretical framework is based upon a flexible translog cost function (Berndt, 1990) following the approach of Berman *et al.* (1994). Each sector has a cost function given as:

$$\begin{aligned} ln\,C_i = {} & \alpha_0 + \alpha_Y\, ln\,Y_i + \frac{1}{2}\alpha_{YY}\, ln\,Y_i^2 + \beta_K\, ln\,K_i + \frac{1}{2}\beta_{KK}\, ln\,K_i^2 + \sum_j \gamma_j\, ln\,W_{ij} \\ & + \frac{1}{2}\sum_j\sum_l \gamma_{jl}\, ln\,W_{ij}\, ln\,W_{il} + \sum_j \delta_{YJ}\, ln\,Y_i\, ln\,W_{ij} + \sum_j \delta_{KJ}\, ln\,K_i\, ln\,W_{ij} + \rho\, ln\,Y_i\, ln\,K_i + \lambda_T\, ln\,T_i \\ & + \frac{1}{2}\lambda_{TT}\, ln\,T_i^2 + \lambda_{YT}\, ln\,T_i\, ln\,Y_i + \lambda_{KT}\, ln\,T_i\, ln\,K_i + \sum_j \phi_{TJ}\, ln\,T_i\, ln\,W_{ij} \end{aligned} \qquad \textbf{(1)}$$

where C is variable costs in industry i, Y is output in industry i, K is the capital stock in industry i, W is the price of the variable factor j in industry i, and T is technology in industry i. Since cost is homogeneous of degree one in prices $\sum_l \gamma_{il} = \sum_j \gamma_{il} = \sum_j \delta_{il} = \sum_j \delta_{Yj} = 0$ then normalising on one of the factor prices and applying Shepard's lemma two factor shares can be derived as:

$$S_{ij} = \alpha_j + \delta_{Yj}\, ln\,Y_i + \delta_{Kj}\, ln\,K_i + \gamma\, ln\left(W_j / W_l\right) + \phi_{Tj}\, ln\,T_i \qquad \textbf{(2)}$$

In our empirical investigation the two variable factors j and l are the low skilled and higher skilled workers respectively and we estimate by random effects the following as a benchmark considering the impact of technology upon the wage bill share following an approach similar to Machin (1996)[2]:

$$SW_{it} = \left(W_{skilled} \div \left(W_{skilled} + W_{unskilled}\right)\right)_{it} = \mathrm{a}\ ln\, K_{it} + \mathrm{b}\ ln\, Y_{it}$$

$$+ \mathrm{r}\ ln\left(R \,\&\, D / Y\right)_{it} + \mathrm{W} + \mathrm{e}_{it} \qquad \textbf{(3)}$$

where SW is the share of the wage bill of higher skilled labour $W_{skilled} \div \left(W_{skilled} + W_{unskilled}\right)$ (here our definition of skill relies upon the distinction between operatives and non-operatives), *R&D* is our measure of technological change and W is a constant. Note that we drop the relative wage rate for the two types of labour $\left(W_j / W_l\right)$ due to the possible introduction of bias into the estimates since the term is unlikely to be exogenous, this is consistent with other work (Berman *et al.*, 1994; Machin, 1996; Haskel and Heden, 1999). Estimation by random effects as a benchmark should yield results similar to Machin (1996), where technological change has a positive impact upon wage dispersion and so is skill biased. To consider the role of FDI upon wage dispersion we control not only for technology but also the impact of trade and so the wage bill share then becomes:

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[2] Much of the literature has sought to explain fluctuations in wage shares by analysing data that has been first differenced or detrended. In the case of panel data an approach often adopted to control for unobserved time invariant industry fixed effects is to first difference data and then estimate by Generalised Method of Moments. However, this type of analysis removes the trend component, where clearly the long term persistent movements of the trend in relative wages is of importance. By first differencing data researchers are only analysing year to year growth rates. The argument made here is that the best way to actually proceed is to analyse the levels of the relevant variables, rather than their differences –consequently we estimate by random effects to control for unobserved industry factors.

$$SW_{it} = \alpha \ ln\, K_{it} + \beta \ ln\, Y_{it} + \rho \ ln(R \,\&\, D / Y)_{it} + \pi \ ln(Im\, ports / Y)_{it}$$

$$+\psi \ ln\, FDI_{it} + \Omega + \varepsilon_{it} \qquad \textbf{(4)}$$

Feenstra and Hanson (1995, 1996) justify the inclusion of trade in the determination of the wage bill share equation by arguing that merely including the factors derived from the translog cost function will not capture other factors such as outsourcing which could influence a firms demand function. Akin to this argument we also justify the inclusion of FDI in the wage share equation. Theoretically, we would expect the following signs $\partial SW_{it} / \partial (R \ \& \ D/Y)_{it} > 0$ implying skill biased technological change, although it is possible for $\partial SW_{it} / \partial (R \ \& \ D/Y)_{it} < 0$ that is low skill technology bias or for skill neutral bias $\partial SW_{it} / \partial (R \ \& \ D/Y)_{it} = 0$. Outsourcing should also lead to an increase in wage dispersion and so $\partial SW_{it} / \partial (Imports/Y)_{it} > 0$. If FDI is considered to only have an impact upon productivity then the impact is ambiguous and will depend upon the distribution of skilled and unskilled labour across industries, however if FDI involves technological transfer from foreign to domestic firms then $\partial SW_{it} / \partial (FDI)_{it} > 0$.

The impact of trade, technology changes and especially technology diffusion through FDI is likely to involve time lags – this is something which most of the work in the area has not been able to get to grips with due to inadequate panel data. The proposed relationship between R&D intensity and wage dispersion is investigated with a lag structure. For example, the interpretation of a significant contemporaneous relation between R&D intensity and wage dispersion is ambiguous. This is because it is anticipated that high R&D activities involve the employment of high quality (relatively more skilled) workers (Autor and Katz, 1999). Moreover Machin and Van Reenen (1998) find that lagged R&D expenditures are associated with skill biased technological changes, and so we include the R&D variable as a one year lag in equation 5 below. Because our data is over a long period of time and is a rich panel we propose to estimate the following in the empirical analysis:

$$SW_{it} = \alpha \ln K_{it} + \beta \ln Y_{it} + \rho \ln(R\&D/Y)_{it-1} + \pi \ln(Imports/Y)_{it} +$$

$$\sum_{z=0} \psi_z \ln FDI_{it-z} + \Omega + \Theta \boldsymbol{M}_{it} + \nu_{it}$$

$$\nu_{it} = \phi_i + \lambda_t + \omega_{it} \qquad \textbf{(5)}$$

Where equation 5 is estimated in levels by random effects with ϕ_i denoting unobservable industry specific effects, λ_t are time specific effects and ω_{it} the remainder of the disturbance. The vector $\boldsymbol{M}$ contains other possible influences upon the wage gap for example a measure of industry concentration (where industries with larger firm size may have higher wages due to the employer–size wage effect, Green *et al.*, 1996), and regional controls (Taylor, 1999b). Given the above empirical model we can investigate (1) the impact that inward FDI has on the wage bill share, (2) whether inward FDI has a greater impact upon the wage bill share than R&D or trade. To interpret FDI as a route of technological change through a learning process we would expect the following $\psi_z \geq \cdots \psi_1 \geq \psi_0$, $\partial^2\psi / \partial t^2 < 0$ that is the FDI coefficient should increase in size over time as technology is transferred but at a decreasing rate. This is a different interpretation of FDI upon wage shares from Figini and Gorg (1998) where the impact of FDI was proposed as a quadratic in a single year. Their empirical approach is based upon a model developed by Aghion and Howitt (1998) in which the introduction of new technologies leads to increasing demand for skilled labour and therefore increasing wage dispersion. The Aghion and Howitt (1998) model shows that wage dispersion first increases but at a decreasing rate after the introduction of new technologies due to a learning process. However, the model suggests that this occurs over a number of decades **not** in a single year as in the approach suggested by Figini and Gorg (1998). Rather, we posit a learning process that is consistent with the impact of new technologies upon wage dispersion having an increasing impact over time, albeit at a diminishing rate.

3. Data

The data used is based at the 3-digit industry level for UK manufacturing sectors (SIC, 1980 sectors 2-4) over the period 1983 to 1992. This provides 101 industries over 10 years giving 1010 observations. All data are converted into natural logarithms and deflated to 1980 prices. Most of the data used in this study are published in *The Annual Production Inquiry*, formerly *Report on the Census of Production*, Office of National Statistics, for various years. The ONS provided data relating to the foreign owned sector of manufacturing at the 3-digit level. Our measure of unskilled workers (operatives) includes all manual wage earners i.e. operatives in power stations, engaged in outside work of erecting, fitting etc., inspectors, maintenance workers and cleaners. Staff engaged in transport (including roundsmen) and employed in warehouses, stores, shops and canteens are also included in the definition. The measure of technological change – research and development was taken from Business Monitors MO14, and various ONS Bulletins. Import data are provided in Business Monitors

<<TABLE 1 HERE>>

MQ10. Both research and development expenditure and import expenditure are weighted by industry value added to gain a measure of their intensity. Table 1, above, defines the variables used in the empirical analysis. Note that we have two measures of FDI impacts – one based upon employment shares (as used by Figini and Gorg, 1998; Blonigen and Slaughter, 1999; and Girma *et al.*, 1999) and the other upon capital expenditure. The FDI measure based upon the share of FDI net capital expenditure shows similar trends to the

employment measure (Figure 1) rising from 16% of total net capital expenditure in 1984 to some 22% by 1992. Both measures of FDI are used in the empirical analysis.

4. Empirical results

We begin by using our data set to assess the impact of technology upon the wage bill share, based upon various specifications of equation 5 estimating by random effects. In order to separate the proposed productivity and spillover effects of multinationals (see above) we restrict the data to industry variables derived from domestically owned firms. Consequently any impact from the FDI variable will be due to spillover effects rather than productivity differences between the domestic and foreign owned sector. The results are shown in column 1 of Table 2, below, and suggest that technological change has a significant impact upon wage dispersion and is biased towards skilled labour, and is consistent with previous findings (Machin, 1996), although somewhat smaller[3]. The second column shows the impact of both technology (defined as R&D intensity) and trade (defined as import intensity) upon wage dispersion, and is consistent with our a priori expectations. Interestingly the impact of trade is larger than that of technology and supports some recent findings (Anderton and Brenton, 1999; and Taylor, 1999a). In the third column we introduce

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[3] Machin (1996) finds that lagged R&D has a coefficient of 0.065 *(2.50).* A possible reason for our findings is that we have yearly data from 1983 to 1992 at the 3 digit level and control for unobserved industry characteristics by random effects. Machin on the other hand uses more highly aggregated data at the 2 digit industry level for only two years 1982 and 1989, controlling for unobserved characteristics by first differencing equation 3. He also uses a different measure of the wage bill share based upon differentiating between manual and non-manual employees.

the FDI variable with time lags along with regional and firm size controls. Again the impact of technology is significantly skill biased and larger than the impact of FDI upon wage dispersion, although the cumulative impact of FDI approaches the size of the technology coefficient. The fourth column of Table 2 shows how the results hold up to introducing the trade variable into the regression[4]. Technology and trade have a significant impact upon wage dispersion as does lagged FDI and the impact of FDI is fairly stable over each lag, although there is some evidence that its impact grows over time. Trade also has a detrimental impact upon the lower skilled and is consistent with theoretical expectations. The results of the fourth column are based upon FDI defined in terms of employment – given as the variable FDI(1) in Table 1. We can also define FDI impacts by foreign capital expenditure, shown in Table 1 by FDI(2), and the results of this specification are shown in column five of Table 2. Again technology appears to be skill biased, but under this specification trade is insignificant. The impact of FDI is only significant in current and second year lags, although again there is evidence that its impact grows over time which is supportive for a learning

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[4] The negative coefficient on capital, throughout each specification shown in Table 2, is inconsistent with most empirical work which generally finds capital skill complementarily (Berman *et al.*, 1994; Machin, 1996), with the exception of Haskel and Heden (1999) who also find negative capital effects. This is probably due to measurement error in that we are proxying capital by net investment after depreciation deflated by industry price indices – which themselves are not likely to measure investment prices very well. We experimented by leaving the capital variable out of the model, but the estimates were largely unaffected.

process interpretation of FDI[5].

In the final two columns of Table 2 we show the impact of FDI upon wage dispersion by entering FDI at its current value in a quadratic form, following Figini and Gorg (1998) without lags. Under this specification the coefficients were FDI=0.0155 *(4.89)* FDI^2=0.0007 *(3.05)* in column six where FDI was defined by employment shares and shown in the final column under the capital expenditure definition FDI=0.0129 *(5.35)* and FDI^2=-0.0752 *(2.6)*. Consequently we only obtain partial support for Figini and Gorg's findings of a quadratic relationship between FDI and wage dispersion and prefer the lagged specifications as given in Table 2, columns four and five. We suggest that the explanation of this is that the learning effect of FDI occurs over a period of time longer than a single year.

<<TABLE 2 HERE>>

Although from a theoretical viewpoint the impact of FDI upon wage dispersion is somewhat ambiguous, our results for the UK based upon a random effects panel model (chosen in preference to estimates from fixed effects by a Hausman test with the null hypothesis of fixed effects rejected, see final row of Table 2) show that FDI has a large positive impact upon dispersion, stronger than technology or trade when FDI is defined by capital expenditure. When FDI is defined by foreign employment shares the coefficient is outweighed by technology and trade, although its cumulative impact (i.e. summing all the lags) is large. There is some evidence that the impact of FDI (under both measures) increases over time, although the penultimate row of Table 2 shows that the hypothesis that the FDI

[5] We also introduced longer lags into equation 5 but it appears that the full impact of FDI upon wage dispersion (under both measures) only takes two years, longer lag specifications were insignificant.

coefficients over time are of equal size can not be rejected $y_0 = y_1 = y_2$. These results are the first we are aware of for the UK and are in contrast to US work where FDI was found to have an insignificant impact upon the wage bill share, Blonigen and Slaughter (1999).

To check the robustness of our results we also estimated equation 5 in first differences by Generalised Method of Moments based upon Arellano and Bond (1991) to control for unobserved industry effects. The model is complicated by the correlation between the lagged dependent variable and the disturbance term. However, the Arellano and Bond (1991) method uses lags of the endogenous variables as instruments and yields unbiased and consistent estimates of the regression coefficients as long as the differenced equation is free of second and higher order serial correlation. Based upon the specification in equation 5 after first differencing we find that for the FDI impact defined by employment shares coefficients of FDI=0.0107 *(3.83)*, FDI_{t-1}=0.0131 *(5.63)*, FDI_{t-2}=0.0018 *(0.82)* with a Sargan p-value of 0.467 and the p-value of second order serial correlation equal to 0.477. Similarly when FDI is defined by net capital share coefficients of FDI=0.0052 *(3.28)*, FDI_{t-1}=0.0090 *(6.67)*, FDI_{t-2}=0.0018 *(2.46)* with a Sargan p-value of 0.159 and the p-value of second order serial correlation equal to 0.571. These results confirm our preferred specification shown in Table 2 columns 4 and 5, in that FDI has a strong effect upon wage dispersion and again there is some evidence that its impact increases over time.

5. Conclusions

This paper has considered the role of multinational firms operating in the UK upon the growing wage dispersion between higher and lower skilled workers over the period 1983 to 1992. Governments have provided incentives to multinational corporations to attract inward investment, presumably because they believe that there is some kind of spillover effect from FDI which benefits the domestic market. However, despite evidence of such spillover effects in terms of productivity and wages (Driffield, 1996; Conyon *et al.*, 1999; Girma *et al.*, 1999) along with the benefits of FDI are some undesirable affects upon the labour market. We find that FDI has a strong impact upon wage dispersion (and is robust to different measures of FDI) in current levels and with time lags, even after controlling for the two most common explanations of wage dispersion – technology and trade. As far as we are aware these results are the first to investigate the impact of foreign firms upon the UK wage dispersion and to benefit from the use panel data to control for fixed effects over time.

References

Aghion, P. and Howitt, P., 1998. Endogenous Growth Theory, Cambridge, MA: MIT Press.

Anderton, B. and Brenton, P., 1999. Outsourcing and low skilled workers in the UK. Bulletin of Economic Research, 51, 267-85.

Arellano, M. and Bond, S., 1991. Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. Review of Economic Studies, 58, 277-97.

Autor, D. and Katz, L., 1999. Changes in the wage structure and earnings inequality. In O. Ashenfelter and D. Card (Eds.), Handbook of Labor Economics: Volume 3A, Elsevier Science, Amsterdam, The Netherlands.

Baldwin, R., 1995. The effect of trade and foreign direct investment on employment and relative wages. NBER Working Paper No:5037.

Barrell, R. and Pain, N., 1997. Foreign direct investment, technological change and economic growth within Europe. Economic Journal, 107, 1770-86.

Berman, E., Bound, J. and Griliches, Z., 1994. Changes in the demand for skilled labour within US manufacturing industries. Quarterly Journal of Economics, 109, 367-98.

Berman, E., Bound, J. and Machin, S., 1998. Implications of skill biased technological change: International evidence. Quarterly Journal of Economics, 113, 1245-79.

Berndt, E., 1990. The Practice of Econometrics, Reading, Mass.: Addison–Wesley.

Blomstrom, M., 1989. Foreign Investment and Spillovers, Routledge, London.

Blonigen, B. and Slaughter, M., 1999. Foreign–affiliate activity and US skill upgrading. NBER Working Paper No:7040.

Bound, J. and Johnson, G., 1992. Changes in the structure of wages in the 1980s: An evaluation of alternative explanations. American Economic Review, 82, 371-92.

Cantwell, J.A., 1991. The international agglomeration of R&D. In M.C. Casson (Ed.), Global Research Strategy and International Competitiveness, Basil Blackwell, Oxford.

Conyon, M., Girma, S., Thompson, S. and Wright, P., 1999. The impact of foreign acquisition on wages and productivity in the UK. Centre for Research on Globalisation and Labour Markets, Research Paper 99/8.

Davies, S.W. and Lyons, B.R., 1991. Characterising relative performance: the productivity advantage of foreign owned firms in the UK. Oxford Economic Papers, 43, 584-95.

Desjonqueres, T., Machin, S. and Van Reenen, J., 1999. Another nail in the coffin? Or can the trade based explanation of changing skill structures be resurrected? Scandanavian Journal of Economics, 101, 533-54.

Driffield, N., 1996. Global Competition and the Labour Market, Harwood, Reading.

Driffield, N., 1999. Indirect employment effects of foreign direct investment into the UK. Bulletin of Economic Research, 51, 207-21.

Driffield, N., 2000. The impact on domestic productivity of inward investment in the UK. The Manchester School, forthcoming.

Dunning, J.H., 1988. Multinationals, Technology and Competitiveness. Allen & Unwin, London.

Feenstra, R. and Hanson, G., 1995. Foreign investment, outsourcing and relative wages. NBER Working Paper No:5121.

Feenstra, R. and Hanson, G., 1996. Globalisation, outsourcing and wage inequality. American Economic Review, 86, 240-45.

Feenstra, R. and Hanson, G., 1997. Foreign direct investment and relative wages: Evidence from Mexico's Maquiladoras. Journal of International Economics, 42, 371-93.

Figini, P. and Gorg, H., 1998. Multinational companies and wage inequality in the host country: The case of Ireland. Trinity Economic Paper No:98/16.

Girma, S., Greenaway, D. and Wakelin, K., 1999. Wages, productivity and foreign ownership in UK manufacturing. Centre for Research on Globalisation and Labour Markets, Research Paper 99/14.

Gottschalk, P. and Smeeding, T., 1997. Cross-national comparisons of earnings and income inequality. Journal of Economic Literature, 35, 633-87.

Green, F., Machin, S. and Manning, A., 1996. The employer size–wage effect: Can dynamic monopsony provide an explanation? Oxford Economic Papers, 48, 433-55.

Griffith, R., 1999. Using the ARD establishment level data to look at foreign ownership and productivity in the United Kingdom. Economic Journal, 109, 416-42.

Haddad, M. and Harrison, A., 1993. Are there positive spillovers from foreign investment? Evidence from panel data for Morocco. Journal of Development Economics, 42, 51-74.

Haskel, J., 1999. The trade and labour approaches to wage inequality. Queen Mary and Westfield College University of London, Working Paper No:405.

Haskel, J. and Heden, Y., 1999. Computers and the demand for skilled labour: Industry and establishment level panel evidence for the UK. Economic Journal, 109, C68-C79.

Hubert, F. and Pain, N., 1999. Inward investment and technical progress in the UK. Paper presented at the conference on "Inward investment, technological change and growth: the impact of MNCs on the UK economy." NIESR, September 1999.

Katz, L., Loveman, G. and Blanchflower, D., 1995. A comparison of changes in the structure of wages in four OECD countries. In R. Freeman, and L. Katz (Eds), Differences and changes in wage structure, Chicago University Press, Chicago.

Levy, F. and Murnane, R., 1992. US earnings levels and earnings inequality: A review of recent trend and proposed explanations. Journal of Economic Literature, 30, 1333-81.

Machin, S., 1996. Wage inequality in the UK. Oxford Review of Economic Policy, 12, 47-64.

Machin, S., 1998. Recent shifts in wage inequality and the wage returns to education in Britain. National Institute Economic Review, 166, 87-96.

Machin, S. and Van Reenen, J., 1998. Technology and changes in skill structure: Evidence from seven OECD countries. Quarterly Journal of Economics, 113, 1215-44.

Markusen, J., 1995. The boundaries of multinational enterprises and the theory of international trade. Journal of Economic Perspectives, 9, 169-89.

Markusen, J. and Venables, A., 1998. Multinational firms and the new trade theory. Journal of International Economics, 43, 183-204.

Murphy, K. and Welch, F., 1992. The structure of wages. Quarterly Journal of Economics, 107, 285-325.

Schmitt, J., 1995. The changing structure of male earnings in Britain 1974 to 1988. In R. Freeman and F. Katz (Eds), Differences and Changes in Wage Structure, Chicago University Press.

Slaughter, M., 1999 Globalisation and wages: A tale of two perspectives. World Economy, 22, 609-29.

Taylor, K., 1999a. Male earnings dispersion over the period 1973 to 1995 in four industries. Paper presented at the annual Education Employment and Economics Group, Swansea and the annual European Association of Labour Economics, Regensburg.

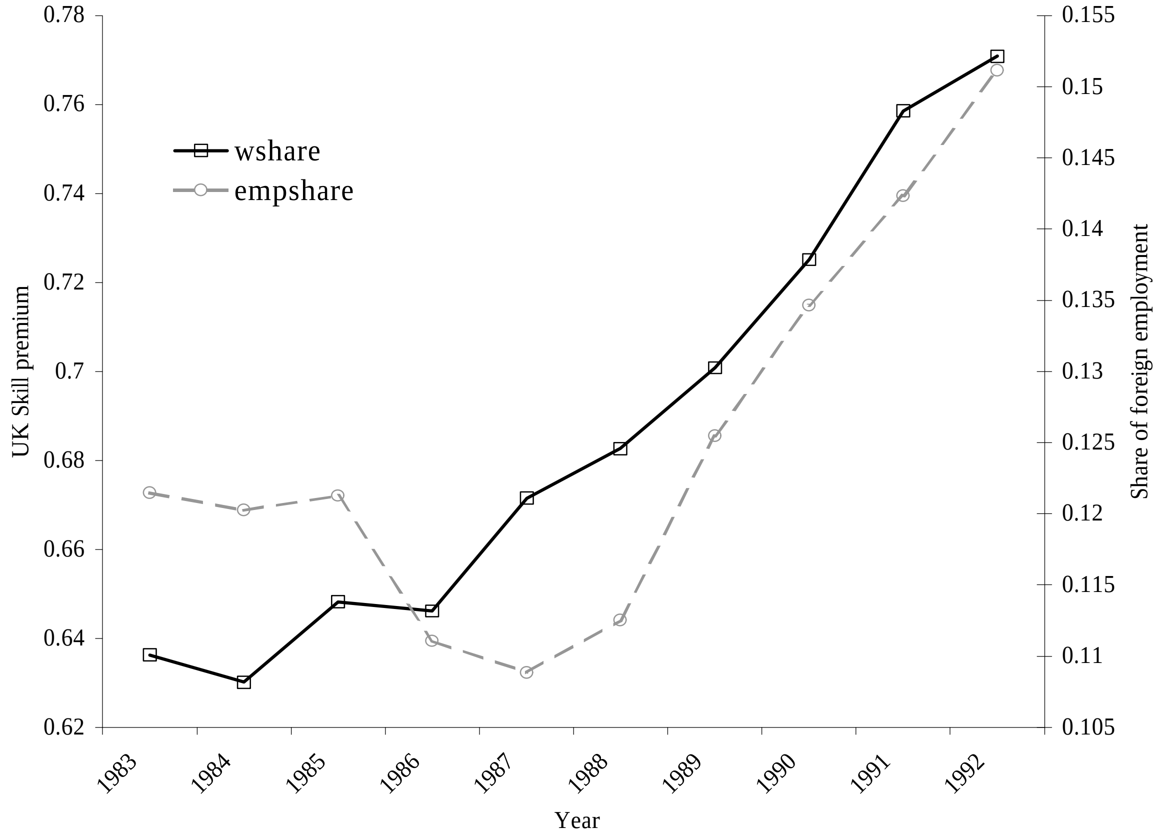
Taylor, K., 1999b. UK earnings dispersion: An industry and regional perspective. Discussion papers in Economics, Cardiff Business School, Cardiff University, No.99:114.

Vernon, R., 1966. International investment and international trade in the product cycle. Quarterly Journal of Economics, 80, 190-207.

Wood, A., 1994. North - South trade employment and inequality: Changing fortunes in a skill driven world. Clarendon Press, Oxford.

Wood, A., 1998. Globalisation and the rise in labour market inequalities. Economic Journal, 108, 1463-82.

Figure 1 Skill premium and foreign affiliate employment: UK manufacturing 1983 to 1992



Notes: Skill premium is measured as the ratio of average (across 3 digit industries) total annual wage bill of non-operatives to average total annual wage bill of operatives in UK manufacturing. Employment share is the proportion of total UK manufacturing employment accounted for by foreign owned multinationals.

Source: Census of Production, ONS.

Table 1 Variable definitions.

Variable	**Definition**
Y	Total industry sales by value.
R&D	Research and development expenditure at the 3-digit level.
Imports	The value of industry imports.
$\mathbf{W_{SKILLED}}$	The wages of non-operatives.
$\mathbf{W_{UNSKILLED}}$	The wages of operatives.
K	Capital stock estimated as the sum of net capital investment of the previous 7 years, depreciated by 10% per annum.
FDI(1)	Share of total UK manufacturing employment accounted for by foreign owned multinationals.
FDI(2)	Share of Net capital expenditure by foreign firms in the UK.
CR5	The industry five firm concentration ratio by sales.
Region	A coefficient of variation of the regional distribution of value added in the industry, based on the 11 standard UK regions.

Table 2 Random effects estimates of equation 5.

	1	2	3	4	5	6	7
Intercept	-0.4979 *(34.17)*	-0.4968 *(19.97)*	-0.4661 *(19.85)*	-0.4885 *(20.31)*	-0.4930 *(20.51)*	-0.4475 *(17.68)*	-0.5009 *(20.59)*
Capital	-0.0196 *(5.88)*	-0.2329 *(5.67)*	-0.0215 *(5.44)*	-0.0218 *(5.47)*	-0.0299 *(7.37)*	-0.0271 *(6.64)*	-0.0290 *(7.13)*
Sales	-0.0048 *(2.98)*	-0.0019 *(1.95)*	-0.0094 *(4.75)*	-0.0074 *(3.50)*	-0.0048 *(2.39)*	-0.0073 *(3.50)*	-0.0047 *(2.34)*
$(R\&D/Y)_{t-1}$	0.0068 *(4.32)*	0.0082 *(4.56)*	0.0047 *(2.61)*	0.0048 *(2.65)*	0.0055 *(3.04)*	0.0049 *(2.74)*	0.0059 *(3.35)*
(Imports / Y)	–	0.0096 *(2.66)*	–	0.0078 *(2.25)*	0.0041 *(1.16)*	0.0067 *(1.93)*	0.0056 *(1.58)*
FDI	–	–	0.0012 *(1.98)*	0.0008 *(1.76)*	0.0357 *(2.23)*	0.0155 *(4.89)*	0.0129 *(5.35)*
FDI^2	–	–	–	–	–	0.0007 *(4.07)*	-0.0752 *(2.60)*
FDI_{t-1}	–	–	0.0011 *(1.73)*	0.0008 *(1.64)*	0.0169 *(0.94)*	–	–
FDI_{t-2}	–	–	0.0013 *(2.37)*	0.0011 *(2.55)*	0.0487 *(2.82)*	–	–
Controls							
CR5	0.0101 *(2.53)*	0.0048 *(1.09)*	0.0136 *(3.09)*	0.0138 *(3.14)*	0.0066 *(1.55)*	0.0118 *(2.73)*	0.0087 *(1.99)*
Region	0.0092 *(2.49)*	0.0129 *(3.33)*	0.0117 *(3.12)*	0.0118 *(3.16)*	0.0127 *(3.41)*	0.0124 *(3.34)*	0.0121 *(3.23)*
Observations	909	909	808	808	808	909	909
Adjusted R^2	0.163	0.194	0.249	0.253	0.355	0.258	0.245
$y_0 = y_1 = y_2$	–	–	1.29 *(p=0.194)*	0.93 *(p=0.355)*	0.27 *(p=0.777)*	–	–
FE v RE $c^2(d)$	29.01*	26.35*	23.14*	25.52*	29.78*	28.39*	26.35*

Absolute White robust T– ratios are shown in parenthesis. *Significant at the 1% level.

Observations are less than 1010 due to time lags, each lag reduces the sample by 101.