Final Report

THE EFFECT OF FOREIGN MERGERS AND ACQUISITIONS ON UK PRODUCTIVITY AND EMPLOYMENT

Submitted to the UKTI by

Professor Richard Harris

October 2009

This work contains statistical data from ONS which is Crown copyright and reproduced with the permission of the controller of HMSO and Queen's Printer for Scotland. The use of the ONS statistical data in this work does not imply the endorsement of the ONS in relation to the interpretation or analysis of the statistical data. This work uses research datasets which may not exactly reproduce National Statistics aggregates

© Richard Harris

[this page is blank to allow double-sided printing Save Paper]

© Richard Harris

Contents

Executive summary *iv*

1. Overview 1

2. Literature review* 13

3. Overview of manufacturing data 45

4. Overview of service sector data 69

5. Characteristic of the panel level data 91

6. Impact of foreign acquisitions on productivity 105

7. Impact of foreign acquisitions on employment 153

8. Impact of foreign acquisitions on wages 181

9. Impact of foreign acquisitions on profitability 193

10. Impact of foreign acquisitions on plant closure 205

11. Impact of foreign acquisitions on Herfindahl index 221

12. Summary and conclusions 229

References *235*

* contributed by Dr. Cher Li

[this page is blank to allow double-sided printing Save Paper]

Executive summary

E.1 This project looks at the effect of foreign M&As on the micro-level performance of British industry in recent years, using detailed panel data drawn from the Annual Respondents Database (an ONS facility). Such data permit the identification of which plants were acquired, and the econometric analysis of the impact of such 'brownfield' investment on productivity, employment, profitability, wages, plant closures, and competition (as measured by industrial concentration).

E.2 In each area, there is a consideration of whether foreign-owned MNEs acquired the 'best' plants (i.e., most productive, profitable, largest, highest waged), and what was the impact on post-acquisition performance – did M&As result in improvements or not?

E.3 **Chapter 1** sets out the scope of the project, and also the steps taken to construct panel datasets for both manufacturing and certain service sector industries that contain the relevant information needed. The main sub-group of interest is those plants acquired by MNE's that were previously UK-owned, with UK-to-FO acquisitions in the manufacturing sector accounting for an annual average of some 89 thousand employees (in over 760 plants p.a.) throughout 1985-2005, although there were much larger annual changes in 1989-90, 1996, 1998-2001 and 2003. In total, UK-to-FO changes accounted for just under 2% of GB manufacturing employment in 1984-2005.

E.4 In the service sector industries covered, changes involving foreign-owned firms, accounted for only some 5-8% of total GB service sector employment during 1998-2005, with less than one-third of this small total being linked to UK-to-FO acquisitions (although 2000, 2001 and 2003 were important years for this sub-group). The average number of plants sold in the UK-to-FO sub-group was around 4,900 p.a.

E.5 A review of the literature in **Chapter 2** established the following key results based on a limited number of studies that have been conducted in this area:

E3.1 There is no overwhelming consensus on whether 'cherry-picking' (versus 'lemons buying') occurs with respect to the productivity levels of plants/firms pre-acquisition (this is likely to vary by sector, country, and time-period). However, foreign acquisition was generally found to exert more of a positive and significant impact on the acquired firm's post-takeover productivity.

E3.2 There is some evidence that foreign acquirers cherry-picked more profitable domestic targets, but there is mixed evidence on the post-acquisition impact.

E3.3 The empirical evidence on the probability of plant closure following acquisition by a foreign-owned company is almost universally that it increases significantly.

E3.4 Foreign-owned firms seem more likely to target firms that are already similar in size to existing (relatively large) foreign affiliates, while most studies have found foreign M&As have a negative effect on employment in acquired firm over time.

E3.5 Foreign subsidiaries are more likely to select domestic firms for takeover that also pay higher wages, and in a number of studies there is a further post-acquisition wage premium paid to workers. However, there were other studies that have found no significant impact of foreign acquisition on wages, while others note that any wage premiums appear to mirror the productivity advantage of the acquired firms.

E.6 **Chapters 3 and 4** take an aggregate overview, respectively, of the manufacturing and service sector datasets. Thus in anticipation of the econometric modelling that that follows, these chapters provide some important background information, considering such issues as the importance of the foreign-owned sector, and in particular whether employment and output has been (relatively) increasing in the subsidiaries of MNE's, and which sectors and regions have the highest input from foreign-owned plants. They then go on to compare brownfield and greenfield entry by MNE's, to show the relative important of these two types of investment, before considering differences in employment, capital-intensity, wage-rates, labour productivity, and price-cost margins for various sub-groups of plants.

Background information on manufacturing

E.7 Employment in UK-owned manufacturing has followed a fairly steady downward path since 1984 while employment in the foreign-owned sector has been mostly stable at around 750,000 employees (with a low of some 630,000 in 1987 and a high of 903,000 in 2002).

E.8 In terms of gross output, the foreign-owned sector grew by over 200% between 1984 and 2005 (the UK-owned sector was producing around 15% less in 2005 compared to 1984). Thus, by 2005 gross output levels in UK- and foreign-owned plants were almost the same. Thus it can be concluded that foreign-owned plants have assumed much greater importance and look set to dominate British manufacturing in the near future.

E.9 In terms of which sectors do FDI plants typically locate: in 2005 the industries with the greatest FO presence were motor vehicle & engines manufacturing, followed by office machinery and mechanical equipment, basic industrial chemicals, printing & publishing, telecommunications & electronic goods, and motor vehicles parts. Moreover, foreign-owned plants tended to concentrate in the same industries as UK-owned plants (although foreign-owned plants tend to locate more output in a smaller number of industries).

E.10 The regions with the highest levels of foreign-owned manufacturing output in 2005 were the East Midlands, the South East and West Midlands, while those with the lowest FDI presence were the North East, Wales and

London. All regions saw an increase in FDI production (while UK-owned production declined between 1990 and 2005). However, the region with the largest FDI presence in 1990 was the North West, but by 2005 it had fallen to 4th-5th place in the regional rankings (depending on whether gross output or GVA is used to measure output). Similarly, the Eastern region slipped from 2nd-3rd to 7th-8th, while London went from 4th to 9th-11th. In contrast, the East Midlands went from second last to top of the regional league table, while the South West also saw a significant increase from last to 4th-5th from the top.

E.11 During 1995-2000, investment by overseas MNE's in greenfield entry resulted in output that was over twice as large as gross output from previously UK-owned plants that were acquired. EU greenfield plants produced the most output on entry, followed closely by US-owned plants. Output in US brownfield acquisitions exceeded that of EU acquired plants, while SE Asian plants were the third major source of output. Brownfield and greenfield investment were particularly concentrated in electrical and electronic engineering (SIC34 under the SIC80 classification), chemicals (SIC25), and mechanical engineering (SIC32). In all, these three industries accounted for around 50% of gross output and GVA, for both brownfield and greenfield investments.

E.12 Lastly in Chapter 3, UK-owned plants that were acquired by foreign-owned companies are compared with 7 other sub-groups that together comprise almost the population of plants in the *ARD* that operated during 1995-2000. In terms of employment, there is some evidence that (in aggregate) employment in those plants sold by UK companies to the foreign-owned sector during 1995-2000 experienced substantial declines in size in the post-acquisition period. Foreign-owned greenfield plants also saw a decline in employment. This does not suggest that new foreign-owned acquisitions, nor brownfield new starts, experienced stable employment post-entry; only brownfield foreign-owned plants that were not subject to changes of ownership did well in employment terms.

E.13 As to the level of capital intensity, for most sub-groups capital-per-employee was increasing over time. The sub-groups with the lowest levels of capital intensity were (as expected) UK-owned single plant enterprises, and greenfield foreign-owned plants (which is unexpected). Since there is likely to be significant under-reporting of pre-production gross investment in the *ARD* this will bias down the true value of the plant & machinery capital stock, by an unknown amount.

E.14 As to differences in wage rates, generally foreign-owned plants paid higher average wages, and real wages were increasing from the mid-1990's onwards (especially in greenfield foreign-owned plants). With regard to labour productivity differences across the sub-groups, based on gross output, the other sub-groups linked to foreign-ownership tended to have higher productivity that was growing at a faster rate throughout. However, plants sold by UK companies to the foreign-owned sector during 1995-2000 tended to have productivity levels towards the bottom of the sub-groups comprising of foreign-owned plants.

E.15 In terms of profitability, and in comparison to productivity and wage rates, by the end of the period covered there is evidence that suggests foreign-owned plants had lower (and declining) profitability, while plants belonging to UK multi-plant enterprises and UK single plant enterprises had relatively high price-cost margins.

E.16 Lastly, in terms of the probability of closure, plants that changed owner more than once between 1985-2000, followed by plants sold by UK companies to the foreign-owned sector during 1985-1994 and 1995-2000, had the lowest hazard rates of closure. Greenfield foreign-owned plants had the highest initial rate of closure, but this is somewhat misleading as these plants are only observed for a much shorter period of time compared to other plants.

Background information on services

E.17 Employment in the service sector has increased throughout the period, in marked contrast to employment in manufacturing. Gains for UK-owned plants have been relatively modest (an overall increase of some 18% between 1997-2005), while employment in the foreign-owned sector has been rising rapidly with a net 1.25 million new employees (or a 130% increase on 1997).

E.18 While UK-owned service sector employment has been slowly rising, gross output has remained largely unchanged (a 2.3% increase overall between 1997-2005). Foreign-owned plants grew by around 56% overall; thus, by 2005 the gap in gross output levels in UK- and foreign-owned plants was closing.

E.19 FDI presence (in terms of gross output in 2005) was greatest in the wholesale of intermediate goods (such as petroleum, metals, wood products, and chemicals), followed by sale of motor vehicles, wholesale of machinery, office equipment and electronic goods, wholesale of textiles, clothing, ceramics and pharmaceuticals, computer & related activities, and legal, accounting and management consultancy services. Foreign-owned plants tended to concentrate in the same industries as UK-owned plants (although foreign-owned plants tend to locate significantly more output in a smaller number of 3-digit SIC's).

E.20 Basing FDI presence on GVA, the picture is different as wholesale industries (with high levels of intermediate inputs) have significantly lower levels of GVA. The industries having the highest levels of FDI presence are now computer & related activities, various business activities such as packaging, secretarial and call centre activities, architecture & technical consultancy, and legal, accounting and management consultancy services.

E.21 Depending on whether intermediate inputs are netted out of not, the regions with the highest levels of foreign-owned services output in 2005 were London, the South East and West Midlands or Scotland, while those with the lowest FDI presence were Wales, the North East, and East Midland

or Yorkshire-Humberside. Most regions saw an increase in FDI production, whichever measure of output is used, except the North West and Eastern England which experienced significant declines. Regional rankings between 1997 and 2005 did not change significantly (unlike with manufacturing).

E.22 During 1998-2002, investment by overseas MNE's in greenfield entry resulted in 21% higher gross output than what was produced in previously UK-owned plants that were acquired. EU greenfield plants produced the most output on entry, followed closely by EU-owned brownfield plants. Output in US greenfield plants exceeded that of US acquired plants, while SE Asian plants were the third major source of output.

E.23 Quite a different profile is obtained when output is measured by gross value-added; here US greenfield entry was much larger than for any other category. The main reason for this different pattern based on GVA is that EU plants were more heavily concentrated in the wholesale sectors.

E.24 As to which industries dominated, wholesale trade, computer & related activities, other business activities, and retailing accounted for around 70-79% of gross output and GVA, for both brownfield and greenfield investments.

E.25 Lastly using the aggregate data, UK-owned plants that were acquired by foreign-owned companies are compared with the other 6 sub-groups that together comprise almost the population of plants in the *ARD* that operated during 1998-2002. Firstly, there is evidence that employment in those plants sold by UK companies to the foreign-owned sector during 1998-2002 experienced a significant decline in employment in the post-acquisition period. In contrast, greenfield entry by foreign-owned plants showed the most exaggerated build-up in employment up to 2001, followed by stable employment levels.

E.26 As to the level of capital intensity, for most sub-groups capital-per-employee was stable or increasing over time. The sub-groups with the lowest levels of capital intensity were (as expected) UK-owned single plant enterprises, and greenfield foreign-owned plants (which is unexpected). The latter is most likely to be due to significant under-reporting of pre-production gross investment in the *ARD*; this will bias down the true value of the plant & machinery capital stock, by an unknown amount.

E.27 As to differences in wage rates, generally foreign-owned plants paid higher average wages, although there is evidence of a downward movement in most sectors post-2001 (especially in greenfield FO plants).

E.28 In terms of labour productivity differences across the sub-groups, based on gross output, foreign-ownership sub-groups tended to have higher labour productivity that was relatively stable throughout. The sub-group of particular interest here (plants sold by UK companies to the foreign-owned sector during 1998-2002) had productivity levels towards the top of the sub-groups comprising of foreign-owned plants until 2001, but during the post-acquisition period there was a substantial decline in relative productivity. Based on GVA, the productivity picture is similar; although

there is also evidence that GVA labour productivity also declined in foreign-owned greenfield plants.

E.29 In comparison to productivity and wage rates, and in line with the results presented for manufacturing, there is evidence that suggests foreign-owned plants had lower (and in some cases declining) profitability

E.30 Lastly, plants that changed owner more than once between 1998-2002, followed by plants sold by UK companies to the foreign-owned sector during 1998-2002, and the other foreign-owned brownfield plants, had the lowest hazard rates of closure. Greenfield foreign-owned plants also had a relatively low rate of closure.

Overview of the panel data and econometric methodology

E.31 **Chapter 5** sets out in detail the micro-level panel dataset used in this project. The variables used in the econometric analysis of productivity, employment, wages, profitability, and plant closures, are defined and explained.

E.32 As to the econometric methodology employed, various micro-based models are estimated using unbalanced panel data based on plants that existed in 1995-2000 (1998-2002 for services) but which operated during the full 1985-2005 (or 1997-2005) period [i.e. we do not include plants that closed before 1995 (1998 for services), nor plants that started post 2000 (2002)]. The dynamic modelling approach allows for endogeneity of the variables in the model, using a system GMM methodology which takes account of individual plant-level fixed effects as well as endogeneity (both of which are important and if ignored will lead to biased and potentially misleading results). The statistical approach taken also takes account of potential selectivity bias (due to acquired plants potentially having certain characteristics that affect outcomes – such as being more productive – whether they were acquired or not) and we do this using a matching estimator approach.

E.33 Using this approach, the rest of the report uses econometric methods to test whether foreign-owned MNEs acquired the 'best' plants (i.e., most productive, profitable, largest, highest waged), and what was the impact on post-acquisition performance – did M&As result in improvements or not?

E.34 To help put the results obtained into context, Table E.1 provides a summary of the literature (column 1) and a brief outline of the results obtained (column 2). The following paragraphs provide more detailed comments on the results from this study.

Table E.1 Summary of literature and results obtained

Literature review	Results from present study
(a) productivity	
• There is no overwhelming consensus on whether 'cherry-picking' (versus 'lemons buying') occurs with respect to the productivity levels of plants/firms pre-acquisition (this is likely to vary by sector, country, and time-period).	• Little evidence of 'cherry-picking' in manufacturing plants; this can be explained (at least in part) by the relatively higher levels of TFP of non-acquired plants at the top end of the TFP distribution; 'cherry-picking' occurs but not of the very best plants but rather those in the mid- to lower-end of the productivity spectrum • In services, mixed but overall more of a tendency for less productive plants to have been acquired
• Foreign acquisition was generally found to exert more of a positive and significant impact on the acquired firm's post-takeover productivity	• In manufacturing there was little change in TFP in US- and UK-acquired plants; while in EU- and other foreign-owned plants TFP was declining and this trend generally continued over time. • For services initially there were TFP gains for US- and EU-acquired plants, but improvements dissipated over time (although for EU-acquisitions they were not entirely lost); acquired by other foreign-owned firms saw very large initial gains in TFP just before and in the period of acquisition, but over time this fell back to around a 10% longer-term gain.
(b) profitability	
• There is some evidence that foreign acquirers cherry-picked more profitable domestic targets	• In manufacturing, little evidence of any 'cherry-picking' on the basis of the profitability of acquired plants • 'Cherry-picking' in the service sector, confined to a small number of industries and differed by ownership group
• There is mixed evidence on the post-acquisition impact	• Post-acquisition profitability was higher in US- and EU- acquired plants (some 25-29%). • In services, a longer term post-acquisition profits decline for US- and EU- acquired plants (11-25%); for the other foreign-owned ownership group the overall impact in the service sector was a 29% increase post-acquisition

(c) plant closure	
• The empirical evidence on the probability of plant closure following acquisition by a foreign-owned company is almost universally that it increases significantly	• Evidence here concurs; post-acquisition a (much) higher probability of plant closure in manufacturing and services
(d) employment	
• Foreign-owned firms seem more likely to target firms that are already similar in size to existing (relatively large) foreign affiliates	• Foreign-owned firms targeted larger UK manufacturing plants for acquisition • In the service sector, in aggregate there was little difference with non-acquired plants o however, this masks considerable differences at the industry level

• Most studies have found foreign M&As have a negative effect on employment in acquired firm over time	• Post-acquisition, manufacturing plants saw a general improvement
	  o especially in other foreign-owned plants, with some evidence of a step-change post-acquisition towards higher employment in US- and EU-acquired plants
	• In services, the overall picture shows there was little change (or slightly falling employment),
	  o except in US-acquired plants which saw significant employment size gains, before falling back after about the 4th year

(e) wages	

• Foreign subsidiaries are more likely to select domestic firms for takeover that also pay higher wages	• Manufacturing plants that were then acquired by foreign-owned multinationals were on balance likely to pay similar or lower wages except if the plant was acquired by a US multinational
	• In service sector:
	  o for US-acquisitions + 24% wage premium was paid.
	  o for EU-acquired plants, -7%;
	  o for the other foreign-owned group + 11% higher wages.

• In a number of studies there is a further post-acquisition wage premium paid to workers. o However, there were other studies that have found no significant impact of foreign acquisition on wages, while others note that any wage premiums appear to mirror the productivity advantage of the acquired firms	• Post-acquisition: o in manufacturing, wage rates were higher in all ownership sub-groups, but particularly in US-acquired plants where the longer-term wage premium was some 12%; o in services, the overall picture is longer term post-acquisition wage gains for US- and other FO- acquired plants, of around 5-8%. In EU-acquired plants the overall impact in the service sector was a 11% *decline* post-acquisition

Which plants were acquired?

E.35 With regard the results presented in **Chapter 6** on the 'cherry picking' hypothesis, manufacturing plants acquired during 1995-2000 were on balance likely to have lower productivity (even for plants acquired by US companies). When the TFP distributions (based on the predicted TFP of each plant obtained from model estimations) are considered, these show that compared to non-acquired plants, in most manufacturing industry groups acquired plants had *higher* TFP at lower- to middle-sections of the productivity distribution.

E.36 Thus, while econometric modeling shows that foreign-owned firms were not as involved in 'cherry-picking' manufacturing plants as might have a priori been predicted, this can be explained (at least in part) by the relatively higher levels of TFP of non-acquired plants at the top end of the TFP distribution; 'cherry-picking' occurs but not of the very best plants but rather those in the mid- to lower-end of the productivity spectrum.

E.37 As to whether foreign-owned firms 'cherry-picked' the best UK service sector plants, the econometric results showed that this was certainly true in a small number of industries, but the evidence is generally mixed, with overall more of a tendency for less productive plants to have been acquired.

E.38 In **Chapter 7** we tested the hypothesis that in terms of employment foreign-owned firms targeted larger UK manufacturing plants for acquisition, in general the results suggest that for the US- and EU-owned sub-groups, they tended to acquire larger plants to add to their stock of already above average-sized plants; while plants acquired by the other foreign-owned sector tended to be on average larger, although their existing stock generally comprised relatively smaller plants. Overall, these results are similar to those reported in the literature.

E.39 As to whether foreign-owned firms in the service sector acquired larger or smaller plants, in aggregate there was little difference with non-acquired plants. However, this masks considerable differences at the industry level; for example, US-acquired plants in retailing were significantly larger, but EU-acquired plants in the sale & maintenance of motors were some 55% smaller. In the other foreign-owned sub-group, acquired plants were smaller in sale & maintenance of motors, and renting equipment, computers and management-type services, but again much larger (about double the size) in retailing.

E.40 **Chapter 8** looks at whether foreign-owned firms targeted higher wage UK manufacturing plants for acquisition: in the US-owned sub-group the overall results suggest that plants acquired paid an additional 8% wage premium. For the EU-owned acquisition sub-group, the plants acquired were more likely to pay lower wages (on average some 3% lower). Finally, the picture for the other foreign-owned group of acquired plants was comparable wage rates paid in 4 of the 6 industries covered, and wages of between 11-15% lower in 2 sectors. In general, these results suggest that

manufacturing plants that were then acquired by foreign-owned multinationals were on balance likely to pay similar or lower wages except if the plant was acquired by a US multinational.

E.41 Turning to whether foreign-owned firms targeted higher wage UK service sector plants for acquisition, for US-acquisitions the overall results suggest an additional 24% wage premium was paid. For EU-acquired plants, there was an overall wage premium for acquired plants of around -7%; and for the other foreign-owned group of acquired plants results were more mixed, with an overall impact averaging out across all sectors of some 11% higher wages.

E.42 As to whether foreign-owned firms targeted more profitable UK manufacturing plants for acquisition, **Chapter 9** shows that in the US- and EU-owned sub-groups there is little evidence that this was the case. Overall, other foreign-owned acquired plants were some 9% less profitable. Thus there is little evidence of any 'cherry-picking' on the basis of the profitability of acquired plants.

E.43 Turning to whether foreign-owned firms targeted UK service sector plants with higher profits for acquisition, for US-acquisitions the overall results suggest an additional 44% profits premium. For the EU-owned acquisition sub-group, there was no difference in 6 of the 7 sectors included. The picture for the other foreign-owned group of acquired plants was no statistical difference in any sector. In those industries where it was not possible to disaggregate foreign-owned into sub-groups, the results show that retailing plants acquired by the foreign-owned achieved 55% higher profitability, while those in other business services had lower profits (of some 71%). 'Cherry-picking' associated with profitability, to the extent that it occurred in the service sector, was confined to a small number of industries and differed by ownership group.

E.44 In summary, this study finds limited evidence in favour of foreign M&As cherry-picking more productive plants, but they did generally acquire relatively larger plants (in employment terms), especially in manufacturing. However the wage rate in acquired plants tended to be similar, or lower, except mostly in US-acquisitions. There was little by way of strong evidence that the most profitable plants were 'cherry-picked', except in US-acquisitions in the service sector. In fact, as can be surmised, acquisitions by US multinationals tended to be the exception: such M&As tended to be of plants that paid higher wages, have higher profits, more employment, but – perhaps surprisingly - not exhibit higher productivity.

Post-acquisition effects

E.45 As to the productivity of acquired plants post-acquisition, in manufacturing there was little change in TFP in US- and UK-acquired plants; while in EU- and other foreign-owned plants TFP was declining and this trend generally continued over time. This suggests that when acquiring plants from the middle- and lower-end of the TFP distribution (albeit with relatively better

TFP than non-acquired plants), foreign-owned firms were not able (or did not attempt) to enhance their relative levels of TFP.

E.46 For services the overall picture is initially there were TFP gains for US- and EU-acquired plants, but these improvements dissipated over time (although for EU-acquisitions they were not entirely lost, as happened in the US-acquired plants). Service sector plants acquired by other foreign-owned firms saw very large initial gains in TFP just before and in the period of acquisition, but over time this fell back to around a 10% longer-term gain. Overall the situation in services was fairly immediate gains which then tapered-off, except in US-acquired plants which become worse over time. Furthermore, it is probable that these immediate TFP gains in services, at- and post-acquisition, reflect the lower relative productivity of such plants when acquired. However, it is perhaps of concern that such relative gains were not sustainable.

E.47 As to the time-profile of employment associated with manufacturing plants that were acquired, these plants saw a general improvement (especially in other foreign-owned plants, with some evidence of a step-change post-acquisition towards higher employment in US- and EU-acquired plants).

E.48 In services, the overall picture shows there was little change (or slightly falling employment), except in US-acquired plants which saw significant employment size gains, before falling back after about the 4th year.

E.49 As to the post-acquisition wage effect: in manufacturing, wage rates were higher in all ownership sub-groups, but particularly in US-acquired plants where the longer-term wage premium was some 12%; in services, the overall picture is longer term post-acquisition wage gains for US- and other FO- acquired plants, of around 5-8%. In EU-acquired plants the overall impact in the service sector was a 11% decline post-acquisition.

E.50 In manufacturing, post-acquisition profitability was higher in US- and EU-acquired plants, where the longer-term premium was some 25-29%. As to the post-acquisition profit effect in services, the overall picture is a longer term post-acquisition profits decline for US- and EU- acquired plants, of around 11-25%. In plants acquired by the other foreign-owned ownership group the overall impact in the service sector was a 29% increase post-acquisition.

E.51 Turning to the effect of acquisition on plant closure, **Chapter 10** shows that for US-acquired manufacturing plants the probability of closure was over 58%; for EU-acquired plants the comparable figure is nearly 80%. Being acquired by a firm that was other foreign-owned also increased the hazard rate (overall by 30%).

E.52 As to the post-acquisition impact on closure in services, being acquired by a foreign-owned firm had a significant and high impact on closure with overall, having controlled for other effects, a probability of closure at over 103% for US-acquired plants; for EU-acquired plants the comparable figure is nearly 29%; and for the other foreign-owned sector the comparable figure is 22.1%.

E.53 A detailed analysis of why being acquired by a foreign MNE has such a negative impact on a plant's survival rate is needed; but for a large number of cases examination of the 'raw' data in the ARD shows that foreign-owned firms tend to acquire other multi-plant businesses, and fairly quickly close down a number of the plants previously owned by the UK parent company. This may be the result of acquired plants being surplus to requirements; they are acquired to increase market power (and closing down capacity is one way of achieving an increase in the firms market share, given that this capacity was previously operated by competitors); or assimilation into the new organisation fails; or a combination of these and other factors.

E.54 In summary, there is little evidence of any post-acquisition productivity gains that generally lasted, although manufacturing (but generally not service sector) plants grew larger in employment terms after being acquired. In terms of wages, there were significant gains (except in EU service sector industries), and in manufacturing profits rose post-acquisition (but they declined overall in US and EU-service sector plants). In all sectors, there was a significant increase in the probability of plants closing after being acquired through a foreign M&A.

Competition effects

E.55 This report also considered the effect of foreign acquisitions/mergers on firm concentration (**Chapter 11**), as measured using a Herfindahl index. Using the index for 2005, the data shows that most industries have fairly low levels of concentration: for over 80% of the industries covered, there are more than 20 'equal-sized' firms producing in each the market, implying significant competition (for 50% of the industries there are more than 100 'equivalent-sized' firms in operation).

E.56 However, the relative contribution to the overall Herfindahl index of firms that were foreign-owned shows that certain sectors are dominated by overseas-owned MNEs. In Motor vehicle manufacturing, the foreign-owned contribution to the Herfindahl index is nearly 98% of the total figure. Foreign-owned firms also dominate the wholesale trade sector; the computer software & related industry; radio, TV and communications manufacturing; coke & petroleum products; pulp & paper manufacturing; instrumental engineering; machinery & equipment manufacture; electrical engineering; and the manufacture of wood products.

E.57 The basic Herfindahl index for each industry was decomposed into various sub-groups, so that changes in the index 1997-2005 that are attributable to foreign-ownership could be analysed. In about half of the industries considered, there was a fall in industry concentration. The largest fall (of some 7%) was in the other transport sector with most of this decline being due to a decline in the market shares of UK-owned firms operating in both 1997 and 2005. Other sub-groups in the other transport industry contributed relatively little to the fall in the index, although new foreign-owned greenfield firms (i.e. those opened after 1997) did contribute 0.76%

to the overall change in the index. Firms in operation in 1997 that were acquired by foreign-owned MNEs during the period only contributed less than one-fifth of the contribution of greenfield foreign-owned firms. Thus, there is little evidence that foreign M&As were impacting significantly on industry concentration levels in this period.

E.58 When foreign-owned firms did contribute a significant part to the overall change in industry concentration, this was either through a decline in the market shares of foreign-owned firms that operated in both years (cf. computer & related, and radio, TV and telecommunications manufacturing); or there was a decline in the market share of firms that were foreign-owned in 1997 but had been sold to UK-owned firms (or 'bought-out' by UK workers) by 2005 (cf. motor vehicle manufacturing). The other significant contribution comes from the opening of new foreign-owned greenfield firms (cf. motor vehicle manufacture and the R&D sector).

E.59 In summary, for the industries covered, changes in the Herfindahl index were generally small. And perhaps more importantly, there was little evidence that relative declines in the market shares of UK-owned firms was being matched by increases in the market shares of foreign-owned companies; where market shares did increase in the foreign-owned sector it was attributable to new greenfield investments.

Final comment

E.60 This study shows that our analysis of productivity, employment, wage, plant closure, and profitability, covering a number of different industries, generally results in an overall mixed (or heterogeneous) picture concerning the impact of foreign acquisition on British plants.

E.61 Therefore there are few straightforward or clear policy recommendations that arise from this report. The impact on a plant post-acquisition of being acquired by a foreign-owned enterprise differs across industries, such that no general policy approach would seem plausible.

1. Overview

1.1 UK Trade & Investment (UKTI) have commissioned this research to gain further understanding of the effects of foreign mergers and acquisitions on UK productivity, employment and competition. The project covers the following questions:

a. What are the characteristics of UK plants (in terms of financial performance, productivity and employment) that are acquired or merged with foreign-owned firms?

b. To what extent do acquiring/merging firms cherry-pick? To what extent has this behaviour persisted over time?

c. What is the effect of foreign acquisition on UK plant-level productivity (concentrating on total factor productivity) 1 year, 2 years, and 5 years after acquisition?

d. What is the effect of foreign acquisition on employment at plant level, 1 year, 2 years, and 5 years after acquisition? What is the effect of foreign acquisition effects on wages[1];

e. What is the effect of foreign acquisition on financial performance at plant level?

f. What is the effect of foreign acquisition on plant closures?

g. What is the effect of foreign acquisition/mergers on firm concentration at sectoral level?

1.2 Following and overview of the literature, the first part of this report covers data preparation and descriptive analysis. Setting up the data is a crucial part of the project; that is, obtaining the relevant panel (plant level) data covering 1984-2005[2] for manufacturing[3] and 1997-2005 for services, using the *ARD*:[4]

[1] Data on unskilled and skilled workers is unavailable in the ARD and therefore cannot be analysed.

[2] Currently 2005 is the latest year for which the ARD is available.

[3] Note, this study excludes agriculture, forestry and fishing and energy, water supply and construction. Data for agriculture (etc.) is mostly not covered in the *ARD*, and those energy industries that could be included (such as extraction of coal and oil and gas) would potentially face disclosure problems when foreign-owned firms are identified. It was also agreed with UKTI not to include construction.

[4] For a detailed description of the *ARD* see Oulton (1997), Griffith (1999), and Harris (2002, 2005a). Analysis using the database covers a range of areas; cf. Disney *et. al.* (2003a,b), Harris and Drinkwater (2000), Harris (2001, 2004), Collins and Harris (2002, 2005), Harris and

1. Obtaining a consistent enterprise (i.e. company) reference code so that changes in ownership can be analysed. The ONS moved to a new reference code in 1997 (when the Annual Business Inquiry – the source data for the *ARD* – went from covering just the production sector to most all market-based sectors). Thus there are discontinuities in the reference code that required the creation of a separate 'look-up' table to manufacturing match data across 1996/97.
2. Calculating the ownership status of plants in each year, and thus whether they were UK/foreign–owned[5], and whether there were changes in ownership year-to-year. This also allows the identification of 'greenfield' and 'brownfield' new start-ups, and whether the 'start-up' was by a UK- or foreign-owned firm.
3. Updating plant level estimates of the plant & machinery capital stock (using the approach in Harris, 2005b), and estimating for the first time the plant & machinery capital stock for the service sector. This is required in order to obtain estimates of total factor productivity (TFP).

Table 1.1: Service sector industries covered

SIC (1992)	DESCRIPTION
50	Sale/repair of motor vehicles
51	Wholesale agents
5211	Retail sale in non-specialist FDT stores
5231	Dispensing chemists
5244	Retail sale of furniture, lights and household articles
5248	Retail sale of goods in specialist stores
5261	Retail sale via mail order
5263	Other non-store retail sales
5274	Other repairs
62	Air transport
63	Support Transport; Travel Agencies
642	Telecommunications
71	Renting Equipment Without Operator
72	Computer hardware/software
73	R&D
74	Business services (legal, accounting, advertising, etc).
92	Recreational services (arts, sports)
93	Other personal services

1.3 This project does not cover all of the service sector. This is because of the large size of the ARD dataset, and the time it would take to undertake the

Robinson (2002, 2003, 2004a,b), Harris and Hassaszadeh (2002), Harris *et. al.* (2005), and Chapple *et. al.* (2005).

[5] Data on foreign ownership are available by country of origin which allows FDI plant to be disaggregated into sub-groups (such as US-, EU-, Commonwealth, South East Asia, and Other foreign owned).

tasks involved in par. 1.2.1 – 1.2.3 above. In addition, many service sector industries have very low levels of foreign ownership, and thus their inclusion would not significantly add to any study of the effects on the British economy of acquisitions and mergers by overseas-owned multinationals. Instead, it was agreed to include the sub-set service sector industries as set out in Table 1.1, since (based on *ARD* data for 2000) in the 2-digit industries included inward foreign direct investment (FDI) accounted for more than 10% of industry gross value-added (GVA) and more than 1% of all foreign-owned GVA.[6] Retail was further sub-divided into 4-digit industries and the same criteria applied to obtain a certain number of relevant retail industries for inclusion (in total the sub-groups listed accounted for over 85% of retail sector GVA in FDI in 2000). Finally, it was agreed with UKTI to also include SIC62 (air transport) and SIC642 (telecommunications); in total, the sub-groups listed in Table 1.1 account for over 90% of the GVA in foreign-owned companies that operated in the service sector (and 64.9% of GVA in all market-based service sectors).

1.4 The remainder of this Chapter explains how the panel data from the ARD was constructed (see par. 1.2 above), before providing an overview of the datasets that will be used when undertaking statistical analysis of the impact of acquisitions and mergers (i.e. brownfield FDI) on UK productivity and employment.

Creating a consistent database of plant ownership

1.5 Data on plants is available for 1984-2005 for manufacturing, but during this period the *ARD* went through various changes (in particular moving to the Inter-Departmental Business Register – or IDBR – in 1993 and the extension of the underlying Annual Business Inquiry in 1997 to cover more than just the production sector). The most important implication for the manufacturing data, from the perspective of the way ownership is measured, was that in 1996/1997 the ONS moved over from using a variable called EGRP_REF, to code the enterprise to which a plant belongs, to a new variable labelled WOWENT. Both of these IDBR variables allow the identification of the ultimate enterprise to which a plant belongs, but when the move was made in 1997 to WOWENT no 'look-up' table was created that allowed users of the *ARD* to link enterprise ownership over time. Additionally, a significant number of EGRP_REF's in 1996 were broken-down into more than one WOWENT in the 1997 data. To be able to measure whether there has been a change in plant ownership, it is necessary to have an IDBR enterprise code that can be linked through time.

1.6 However, in both 1996 and 1997 there remained a consistently classified lower-level enterprise code – labelled in the database as ENTREF. This variable emerged from the use of VAT codes to identify companies that could also belong to larger (holding) companies. Thus, EGRP_REF and WOWENT were consistently linked over 1996-97 using the lower-level

[6] Note, the *ARD* does not cover most of SIC's 65 – 67 (financial intermediation) and therefore these sectors have been omitted as well.

ENTREF code,[7] and when in 1997 there was more than one WOWENT associated with each EGRP_REF, the WOWENT with more than 50% of employment was chosen as the dominant WOWENT and it's matched EGRP_REF was used. Thus, a EGRP_REF code was obtained for every plant for 1997-2005, consistent with the EGRP_REF codes for 1984-1996, with new enterprises that came into existence post-1996 having their WOWENT code[8] used as a proxy for EGRP_REF.[9] For services, WOWENT is consistently defined from 1997, and thus this was used for these industries.

1.7 Having obtained a consistent enterprise-level code for each plant, new variables were created in the panel data set to measure a change in ownership and whether this was a change to/from UK/foreign ownership. Thus if the EGRP_REF (or for services the WOWENT) code changed between any adjacent two years, and there was also a change in the country of ownership, it was possible to distinguish four separate sub-groups of ownership change: (i) UK-to-UK ; (ii) foreign-owned (FO) to UK; (iii) UK to FO; and (iv) FO to FO.[10] In addition, if a plant was newly opened (based on the year it is first recorded in the IDBR[11]), it was possible to further distinguish two types of 'greenfield' new starts: UK-owned and foreign-owned.

1.8 Tables 1.2 and 1.3 (covering manufacturing) and Tables 1.4 and 1.5 (for the service sectors covered in Table 1.1) show the outcome of classifying plants to whether they changed ownership and the type of change incurred.[12] Figure 1.1 shows the percentage of total manufacturing employment that belonged to plants that changed their status (either through 'brownfield' acquisitions and mergers, or the 'greenfield' opening of new plants); in general greenfield UK starts were particularly important in 1993 and 1998 (representing nearly 22% of manufacturing employment in these years), but this reflects more the move in these years to a new business register (1993) and the economy-wide business inquiry (1997, impacting on manufacturing mostly in 1998). New foreign-owned greenfield sites accounted for a relatively small proportion of employment (1995, 1997-98

[7] In the 1996 and earlier manufacturing *ARD* data, ENTREF is called COMP_REF.
[8] A constant value of 99000000000 was added to each 'new' post-1996 WOWENT to ensure no values mistakenly matched a previously existing EGRP_REF.
[9] The EGRP_REF code also changed in 1993/94, for some but not all plants. For those that changed, the post-1993 code was matched back to pre-1994 codes using reporting unit and COMP_REF codes.
[10] Note, if there was a change in the country of ownership from one year to the next but no change in EGRP_REF, this was still classified as a change in ownership, since UK/FO enterprises often buy the whole company (and not just some of its plants).
[11] The 'opening' year (or birth) of a plant is based either on the first time it is observed (which for manufacturing extends back to 1970) or on information available in the Business Structure Database (BSD) – which is an annul cross-section of the IDBR starting in 1997. The BSD records the date when the plant (or enterprise) was first used in an ONS business survey (thus most of the dates that are recorded start in 1977), although for some plants other information has been used collected from other exercises (the earliest dates recorded are from the beginning of the 20th century).
[12] The first year from each panel dataset is 'lost' as this year is needed to establish the initial ownership status of each plant. Note also, the full ARD at local-unit level is used here (not a sample). The number of plants involved can be obtained by dividing Table 1.2 by Table 1.3.

Table 1.2: Employment associated with changes in ownership status in GB manufacturing plants, 1985-2005

Year	Brownfield acquisitions and mergers				Greenfield plants		No change in	
	UK-to-UK	FO-to-UK	UK-to-FO	FO-to-FO	new UK	new FO	status	Total
1985	493,776	39,385	25,221	52,624	197,483	10,289	4,689,912	5,508,690
1986	483,392	37,140	11,114	61,955	193,330	14,713	4,591,202	5,392,846
1987	452,148	26,701	39,960	71,813	211,425	19,198	4,528,414	5,349,659
1988	314,235	51,857	53,219	45,357	202,824	17,161	4,676,871	5,361,524
1989	307,759	30,341	111,861	39,758	227,984	14,859	4,646,850	5,379,412
1990	350,104	32,613	92,100	43,250	290,880	17,142	4,417,395	5,243,484
1991	325,495	37,230	65,498	65,348	138,993	21,931	4,298,706	4,953,201
1992	249,592	21,464	75,249	56,272	293,361	13,620	4,063,812	4,773,370
1993	245,046	52,778	64,133	53,452	1,160,460	28,328	3,746,164	5,350,361
1994	198,040	36,697	83,463	41,514	504,387	37,396	3,373,642	4,275,139
1995	338,810	63,258	39,697	78,082	764,388	77,801	3,250,923	4,612,959
1996	350,023	45,984	109,965	45,792	266,133	42,646	3,295,113	4,155,656
1997	211,797	78,279	31,620	46,683	495,983	90,034	3,643,993	4,598,389
1998	157,362	190,351	108,070	21,678	982,620	88,178	2,964,499	4,512,758
1999	391,178	73,176	193,212	79,092	187,133	33,816	3,001,365	3,958,972
2000	436,343	124,455	144,948	59,416	212,264	43,367	2,903,942	3,924,735
2001	550,083	59,003	273,361	118,927	244,493	74,415	2,494,450	3,814,732
2002	291,919	23,658	71,651	94,413	204,638	50,520	2,874,636	3,611,436
2003	270,480	70,799	122,840	144,111	157,299	25,565	2,616,641	3,407,735
2004	251,987	50,446	79,092	77,033	178,548	35,419	2,572,640	3,245,165
2005	271,019	194,896	75,654	40,019	146,697	17,509	2,393,052	3,138,846

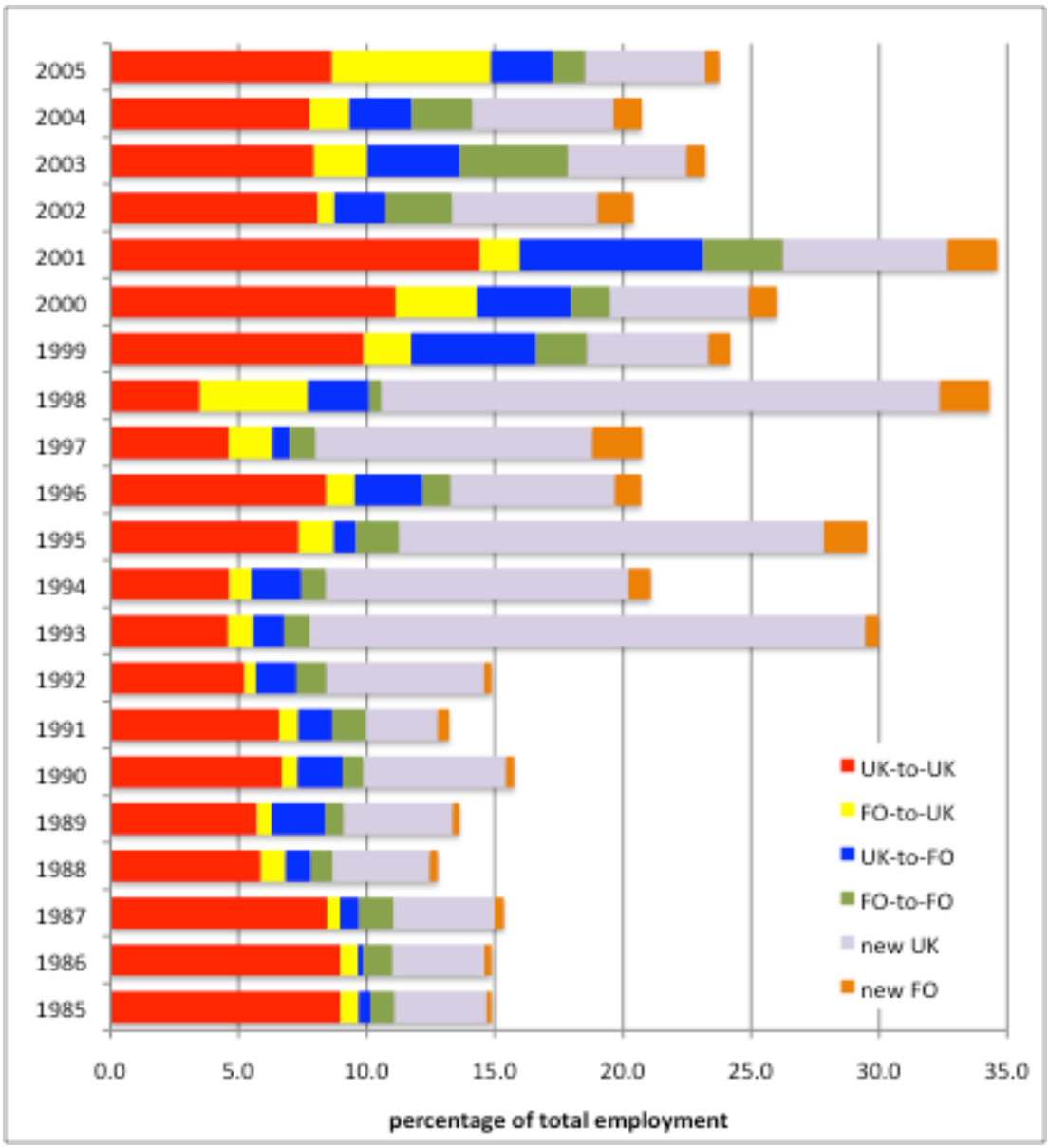
Source: own calculations based on ARD. Note all plants in ARD are used.

Table 1.3: Average size (in terms of employment) of GB manufacturing plants by changes in ownership status, 1985-2005

Year	Brownfield acquisitions and mergers				Greenfield plants		No change in	
	UK-to-UK	FO-to-UK	UK-to-FO	FO-to-FO	new UK	new FO	status	Total
1985	157	221	178	212	8	53	37	35
1986	148	154	192	161	8	72	35	33
1987	174	144	107	137	8	61	33	32
1988	98	143	115	167	7	61	34	31
1989	106	106	186	141	5	46	36	31
1990	102	153	210	166	13	46	31	31
1991	112	137	124	210	8	73	30	30
1992	118	154	186	219	5	46	38	28
1993	99	119	133	182	20	86	35	32
1994	111	149	209	255	11	19	25	23
1995	40	104	116	133	11	48	24	21
1996	38	136	98	106	10	48	22	22
1997	64	139	91	112	15	58	22	22
1998	57	94	124	142	17	90	22	22
1999	59	175	91	251	9	69	20	21
2000	59	115	121	103	9	109	19	21
2001	54	91	93	136	11	85	17	21
2002	36	81	150	106	9	72	20	20
2003	45	118	86	160	7	48	18	20
2004	46	89	109	158	8	59	19	19
2005	39	65	153	191	7	73	18	19

Source: own calculations based on ARD. Note all plants in ARD are used.

Figure 1.1: Changes in ownership status in GB manufacturing plants by year



Source: own calculations based on ARD. Note all plants in ARD are used.

and 2001 were particularly significant years for new FO sites, with between 74-90 thousand new jobs per annum being established), while mergers and acquisitions dominate changes in ownership.

1.9 The largest sub-group (aside from new UK greenfield employment covering particularly the mid- to late-1990s[13]) is UK-to-UK acquisitions, while employment changes from foreign-owned to UK-owned enterprises were particularly large in 1998, 2000, 2003 and 2005. The sub-group of particular

[13] The high level of new UK-owned start-ups in these years suggests that the IDBR was continually being improved pending the move to the economy-wide ABI in 1997 – which was the pilot year for extending beyond the production sector.

interest in this project (UK-to-FO) involved employment around an annual average of 89 thousand employees (in over 760 plants p.a.), although there were much larger annual changes in 1989-90, 1996, 1998-2001 and 2003. There was also a substantial market for foreign-owned firms selling plants to each other (e.g. in 2001 and 2003).

1.10 Table 1.3 shows the average size of the plants changing ownership or newly established. As was common in manufacturing in this period, there was overall a fall in the average size of plants (representing the outsourcing of non-core activities and the adoption of new technologies – such as CNC machinery and JIT – that allowed smaller batch production without associated higher costs); however acquisitions and greenfield starts involving foreign-owned enterprises continued to have above average employment levels. Greenfield plants set-up by multinational enterprises (MNE's) typically involved over 60 new jobs per new plant throughout the period covered, while MNE acquisitions of UK-owned plants were mostly twice as large. The largest foreign-owned plants tended to be sold to other MNE's.

1.11 Turning to the service sector industries covered (Table 1.4), on average around 25% of employment is in plants that change ownership each year. The largest sub-group in nearly every year is newly established UK-owned greenfield plants (around 9-13% p.a. over 1998-2005), followed closely by mergers and acquisitions involving UK-owned companies (Figure 1.2). Total employment associated with changes involving foreign-owned firms accounted for only some 5-8% of total GB service sector employment during 1998-2005, with less than one-third of this small total being linked to UK-to-FO acquisitions (although 2000, 2001 and 2003 were important years for this sub-group). The average number of plants sold in the UK-to-FO sub-group was around 4,900 p.a.

1.12 As to the average employment size of plants changing ownership, Table 1.5 shows that 'trade' involving foreign-owned plants was associated with larger plants (although on average much smaller than similar plants operating in manufacturing – cf. Table 1.3 – except for greenfield FO plants). There was little difference in the average size of such plants (in contrast to the data for manufacturing where brownfield plants were generally much larger than greenfield FO new starts).

Table 1.4: Employment associated with changes in ownership status in GB service sector plants, 1998-2005

Year	Brownfield acquisitions and mergers				Greenfield plants		No change in	
	UK-to-UK	FO-to-UK	UK-to-FO	FO-to-FO	new UK	new FO	status	Total
1998	689,010	109,286	113,605	87,393	668,129	78,305	5,397,673	7,143,401
1999	915,092	132,164	120,983	135,381	814,299	53,658	5,761,013	7,932,590
2000	639,580	107,798	181,030	61,044	1,113,340	71,024	6,073,553	8,247,369
2001	778,586	47,958	298,303	121,520	1,142,424	202,148	5,899,442	8,490,381
2002	762,834	28,057	57,895	133,817	964,861	190,318	6,553,180	8,690,962
2003	732,338	55,108	171,978	143,961	766,582	64,918	6,799,610	8,734,495
2004	629,474	67,370	122,344	226,192	768,953	95,517	7,040,507	8,950,357
2005	587,416	300,768	94,005	190,863	818,138	63,952	7,203,174	9,258,316

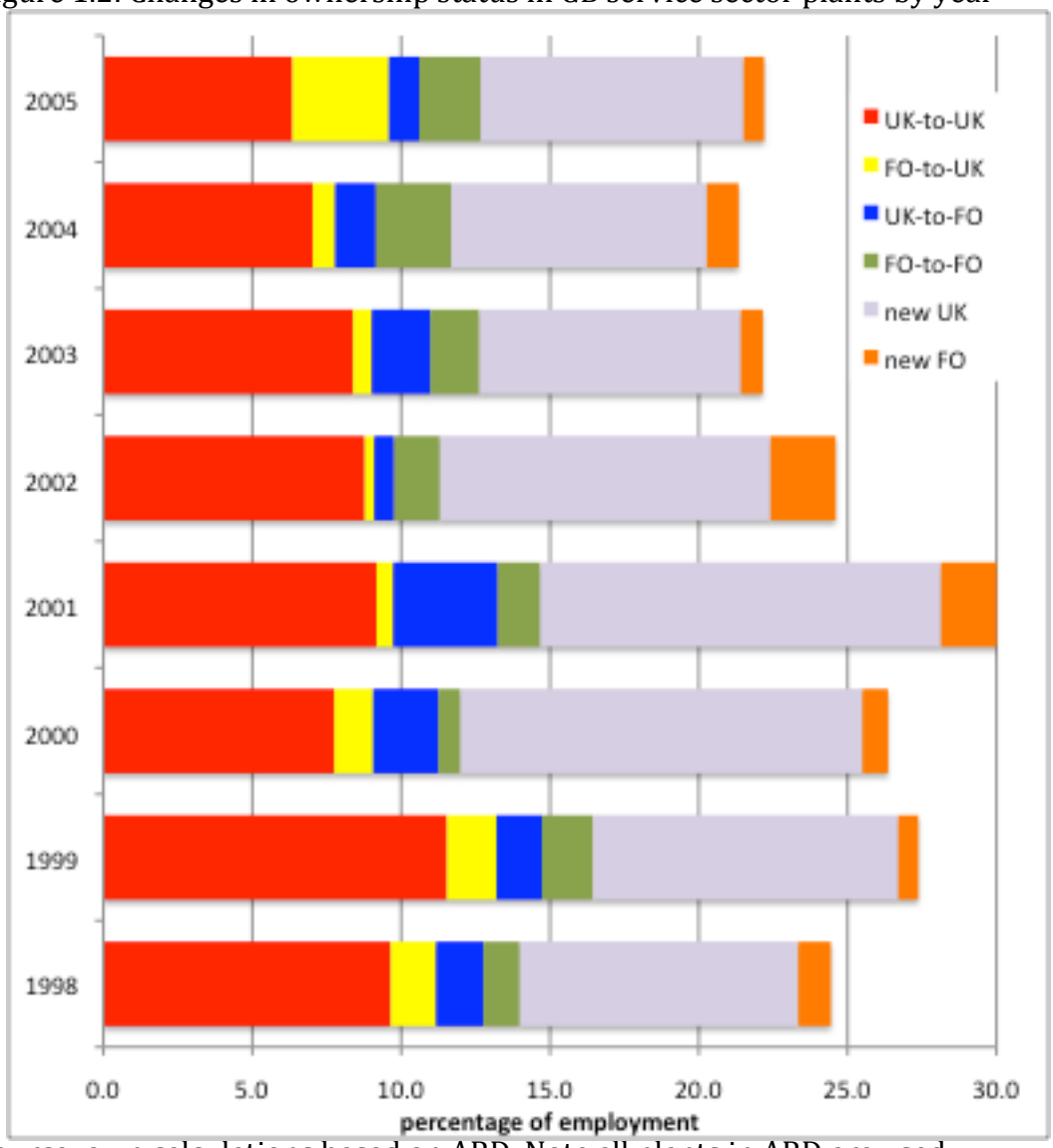
Source: own calculations based on *ARD*. See Table 1.1 for sectors covered. Note all plants in ARD are used.

Table 1.5: Average size (in terms o employment) of GB service sector plants by changes in ownership status, 1998-2005

Year	Brownfield acquisitions and mergers				Greenfield plants		No change in	
	UK-to-UK	FO-to-UK	UK-to-FO	FO-to-FO	new UK	new FO	status	Total
1998	26	36	29	41	5	33	8	8
1999	25	45	24	44	4	30	7	8
2000	22	24	45	28	6	27	7	8
2001	21	28	23	42	7	48	7	8
2002	21	23	36	34	6	58	7	8
2003	21	27	28	29	4	28	8	8
2004	27	24	33	74	5	26	8	8
2005	18	24	51	64	5	26	8	8

Source: own calculations based on ARD. Note all plants in ARD are used.

Figure 1.2: Changes in ownership status in GB service sector plants by year



Source: own calculations based on ARD. Note all plants in ARD are used.

Plant and machinery capital stock estimates

1.13 The underlying methodology used is set out in Harris (2005b). Updating estimates for manufacturing involved re-estimating the perpetual inventory model that included the extra years of real net investment in plant & machinery (including estimates of pre-production investment, where this is recorded in the *ARD*).

1.14 Estimates for services required gross investment data back as far as possible, given the length-of-life assumptions used by the ONS. Plant-level data is only available from 1997 (the first year of the economy-wide ABI), and thus it was decided to link such data to more aggregated information

kindly made available by Mary O'Mahony. This comprised UK gross investment data from 1948 constructed by the ONS (but at a fairly aggregated level, such as SIC50-52 covering wholesale and retail trades), and 3-digit UK data from the ABI (and associated surveys – see Harris et. al. 2005 for details) from 1994 onwards. The 1948-1996 UK investment data (in 1995 prices) was disaggregated to the 3-digit level based on the average shares of each 3-digit industry using 1994-96 data. The resultant 1948-1996 3-digit data was then used in the perpetual inventory method to obtain an end-1996 plant and machinery estimate of capital stock, which was then allowed to depreciate for the 1997-2005 period (with no further investment data being added for the post-1996 period). The length-of-life assumptions used were provided by the ONS capital stock branch, and the Denison approach was applied (comprising one-quarter straight-line depreciation net stock and three-quarters gross stock – see Harris, 2005b, for details).

1.15 Separate plant level capital stock estimates were then calculated using data from the *ARD* for 1997-2005 (and the same perpetual inventory approach as was used with the 3-digit UK data). In addition, each plant operating in 1997 received a (depreciated) share of the 1996 benchmark capital stock, based on their 1997-1999 shares of 3-digit industry gross investment and employment. Clearly for older, larger service sector plants their post-1996 capital stocks are dominated by the share received from the industry benchmark data, rather than post-1996 investments undertaken by the plant itself. This is an unavoidable problem, which becomes less important over time as plant level investment begins to dominate each plant's estimate of its total capital stock.

Summary and conclusions

1.16 The first task for this project has been to construct panel datasets for both manufacturing and certain service sector industries that contain the relevant information needed for especially the econometric estimation that is reported on in Chapter 6-10.

1.17 This Chapter describes how plants have been assigned on the basis of whether they experienced a change in ownership, and what type of change was involved. The main sub-group of interest is those plants acquired by MNE's that were previously UK-owned, although the data allows us to contrast the relative importance (in employment terms) of this sub-group vis-à-vis other sub-groups (such as greenfield new starts by MNE's). UK-to-FO acquisitions in the manufacturing sector accounted for an annual average of some 89 thousand employees (in over 760 plants p.a.) throughout 1985-2005, although there were much larger annual changes in 1989-90, 1996, 1998-2001 and 2003. In total, UK-to-FO changes accounted for just under 2% of GB manufacturing employment in 1984-2005.

1.18 Total employment in the service sector industries covered, associated with changes involving foreign-owned firms, accounted for only some 5-8% of

total GB service sector employment during 1998-2005, with less than one-third of this small total being linked to UK-to-FO acquisitions (although 2000, 2001 and 2003 were important years for this sub-group). The average number of plants sold in the UK-to-FO sub-group was around 4,900 p.a.

1.19 Lastly, estimates of plant-level plant & machinery capital stock have been obtained for both manufacturing and services, based on the perpetual inventory method (and the methods outlined in Harris, 2005b).

2. *Literature review*

2.1 This chapter provides an overview of the literature on inward foreign direct investment (FDI) specifically through mergers and acquisitions (M&A) i.e. 'brownfield' investment. It starts with a short discussion of the direct modes of internationalisation available to the firm, before narrowing down to a consideration of the direct modes available to FDI (i.e. 'brownfield' versus 'greenfield' FDI). After considering some recent trends in global FDI M&A activities, the theoretical background as to why multinational enterprises (MNE's) choose M&A's is considered. Following this the issue of whether acquired firms/plants have higher or lower productivity is considered – the so-called 'cherry-picking' versus 'lemon-buying' hypotheses. The remainder of the chapter then mainly considers the post-acquisition impact of FDI M&A activities, in terms of its impact on productivity, profitability, plant closures, employment, and wages – the main empirical issues considered in this report using panel data for Great Britain.

Mode of Internationalisation: Exporting vs. FDI

2.2 A firm can expand into international markets either by exporting from home or by replacing external contracts with direct ownership and internal hierarchies. The general explanations put forth in the literature for the firm's switching from one mode to the other include changes in trade costs, market sizes, relative production costs, and/or the importance of scale economies (Head and Ries, 2004).

2.3 The orthodox theory explaining the motive of FDI derives from Dunning (1988)'s "eclectic paradigm", which indicates that if a firm has some competitive advantages (or monopolistic advantages) over its rivals, and if protection licensing is not a safe option (due to property rights), the firm will choose to set up production subsidiaries in an overseas countries via FDI, and thereby these unique firm-specific resources can be exploited by venturing abroad. If there are specific advantages in the host country, FDI becomes a more attractive choice relative to exporting. Therefore FDI is frequently identified as the optimal channel for international penetration although establishing foreign operations may incur significant set-up and management costs (c.f. Dunning, 1981; Dunning and Rugman, 1985; and Hosseini, 2005). It follows that we could expect the motive for FDI to be at least in part explained by 'technology exploitation' or alternatively, 'market seeking', based on the MNE's specific advantages.

2.4 Other factors rendering exporting a less favourable strategy include the following. Above all, MNEs often enjoy technology advantage (consistent

with the ownership advantage argument) which confers the resources needed to overcome additional costs associated with establishing subsidiaries in remote markets. For instance, Castellani and Zanfei (2006, 2007) have empirically documented the superior technological knowledge possessed by MNEs which stimulate their expansion abroad. Alternatively, another motive for FDI is also argued to be 'technology sourcing' or 'technology seeking', as MNEs attempt to enhance their competitive advantages by acquiring and integrating complementary resources existing in firms in the host country. See Fosfuri and Motta (1999) for a theoretical framework of this technology-sourcing hypothesis, and Cantwell *et. al*. (2004) for an empirical treatment in the context of the transatlantic technological relationship (see also see Love, 2003; Driffield and Love, 2007).

2.5 Secondly, associated with the 'tariff-jumping' argument of FDI, barriers to trade provide another reason for FDI being preferred (e.g., locating in the UK brings with it access to EU markets). Given the existence of tariff and non-tariff barriers hindering the free flow of products cross borders, exporting to overseas markets is often not feasible. Thus FDI becomes an attractive strategy of internationalisation when the firm could efficiently exploit its monopolistic advantages of the intangible assets/resources it possesses by directly producing overseas (evidence in support of more efficient firms preferring to invest overseas is provided in Helpman et. al., 2004).

2.6 In addition, the existence of trade/transport costs means that while home-country comparative advantage (low input cost) and fixed costs could be conducive to exporting, high trade costs increase the propensity to use FDI but decrease export volumes. Under such circumstances, it is often more feasible for firms to invest in a foreign country so as to target buyers directly. Empirical evidence suggests that firms prefer FDI to exporting when trade costs are high and plant level scale economies are low (e.g. Head and Ries, 2003). Lastly, FDI is often superior to exporting in certain industries (especially in services sector) due to the low degree of tradability. In particular, many services industries are not internationally tradable, which are constrained by physical contact between service suppliers and customers.

Mode of FDI: Brownfield vs. Greenfield FDI

2.7 Depending on the entry mode into international markets, FDI can be categorised as being 'greenfield' or 'brownfield', with the former being the opening of a new production or service facility in an area and the latter resulting from a merger or acquisition (M&A) involving an existing facility. Greenfield investment and cross-border M&As can be similar in that they both initiate subsequent investment flows. Nevertheless, brownfield FDI merely leads to an ownership change without directly adding to employment or productive capacity in the host country; whilst greenfield

FDI immediately increases the capital stock. From the perspective of the MNE, brownfield investment is often the optimal choice when entry barriers to new markets are high, there is excess production capacity in the host industry, speedy establishment is required, or when the target firms have valuable proprietary assets to generate a competitive advantage immediately.

2.8 Harris and Robinson (2002) summarised various explanations in favour of brownfield acquisitions as the foreign firm's mode of entry into a new market, such as the 'internalisation' or assets-seeking approach (Buckley and Casson, 1998; Wesson, 1999). In particular, Buckley and Casson (1998) argued that establishing foreign affiliates through M&As was the optimal strategy when there were significant learning costs, and when there was a high level of competition, since greenfield investment increased local capacity and intensified competition. In contrast, costs associated with brownfield production are more likely to be incurred in the immediate post-acquisition phase as a result of issues related to integration and the establishment of internal trust. Also according to Caves (1996), brownfield entry reduces uncertainty associated with profitability in the newly established MNE through exploiting local knowledge embodied in the acquired firms. As also noted by Wesson (1999), "in order for asset-seeking FDI to be profitable, it must be the case that . . . local assets have greater value when combined with some assets already possessed by the investing firm than they do in the hands of local rivals. If not, local firms would be able to exploit the value of the local assets more efficiently than a foreign investor."

2.9 However, there is a concern that foreign operations established through M&As may have a less robust survival performance (vis-à-vis FDI subsidiaries established by greenfield investments), due to various reasons such as organisation compatibility, technology advancement, government support in the host country and the complexity in integrating and establishing managerial links with parent headquarters. More discussion on the survival prospects of the acquired firms is provided in subsequent sections.

2.10 The MNE's choice between greenfield production and brownfield mergers and acquisitions have also been shown to be dependent on firm-level heterogeneity, most importantly, capacities. Most notably, in a general equilibrium framework, Nocke and Yeaple (2007) developed a model of international trade and investment incorporating firm heterogeneity, to shed light on a FDI firm's choice of foreign-market entry. Their model generates the prediction that brownfield M&A involves either the most or the least efficient active firms, depending on the mobility of the firm; and this model further indicates that such firm heterogeneity also holds the key to the effects of country and industry characteristics on the distribution of firm efficiencies.

2.11 Empirically, using both country and industry level aggregate data for the US, Lipsey and Feliciano (2002) showed that greenfield FDIs were more likely to take place in years of high U.S. stock prices; whereas brownfield

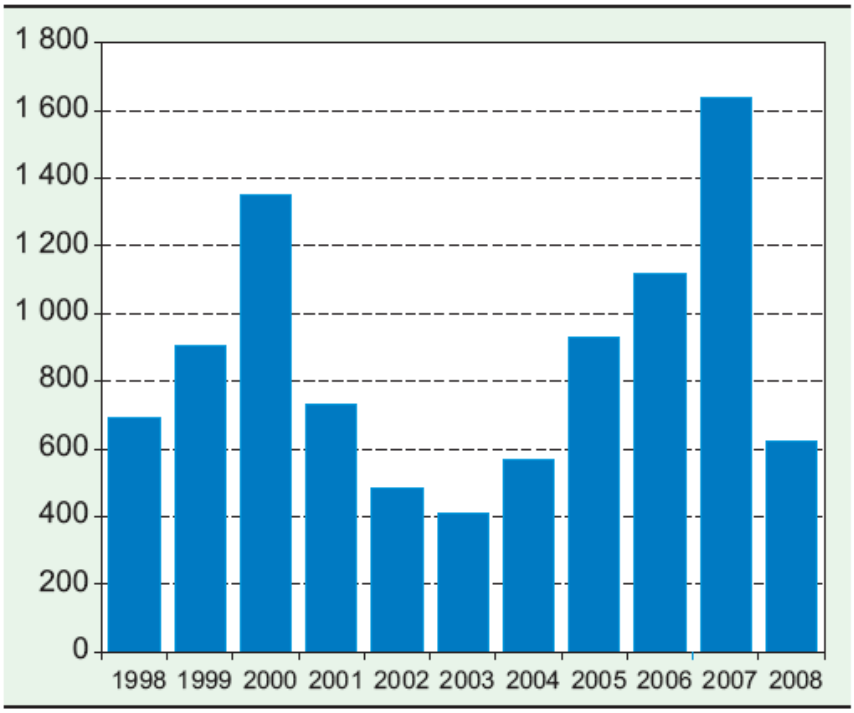
FDIs were discouraged by high values of the US dollar. They were also able to suggest that both M&As and the establishment of new plants were more likely to occur in times of relatively low US firm profitability and when interest rates were high. Furthermore, whilst both greenfield and brownfield FDIs mainly occurred in industries where the investing country enjoyed some comparative advantage, greenfield FDIs were relatively more likely in industries where the US had a comparative disadvantage.

Recent Trends

2.12 The value of cross border investments rose to $1,833 billion in 2007 (up by 30% following a four-year growth since 2003), with FDI inflows to developed countries growing by 33% to $1,248 billion (see Figure 2.1). The recent surge in FDI inflows at the global level has been particularly strong in manufacturing, and largely attributable to continued consolidation through cross-border M&As which contributed to nearly 90% of all FDI inflows across borders (UNCTAD, 2008, see Figure 2.1).

2.13 Cross-border M&As enjoyed a substantial growth in both quantity and quality, covering a broad range of manufacturing and services industries. According to UNCTAD (2008), the rapid and considerable increase in cross border M&A activity could be mostly explained by "sustained strong economic growth in most regions of the world, high corporate profits and competitive pressures", all of which helped motivate MNEs to strengthen their competitive position by acquiring foreign firms. In addition, financing conditions for debt-financed M&As were relatively favourable for an extended period.

Figure 2.1: Value of cross-border M&As, 1998-2008 ($ billion)



Source: UNCTAD (2008)

Note: Data for 2008 are for the 1st half of the year only

Table 2.1: Cross-border M&As in developed countries, by sector/industry, 2005-2007 (million $)

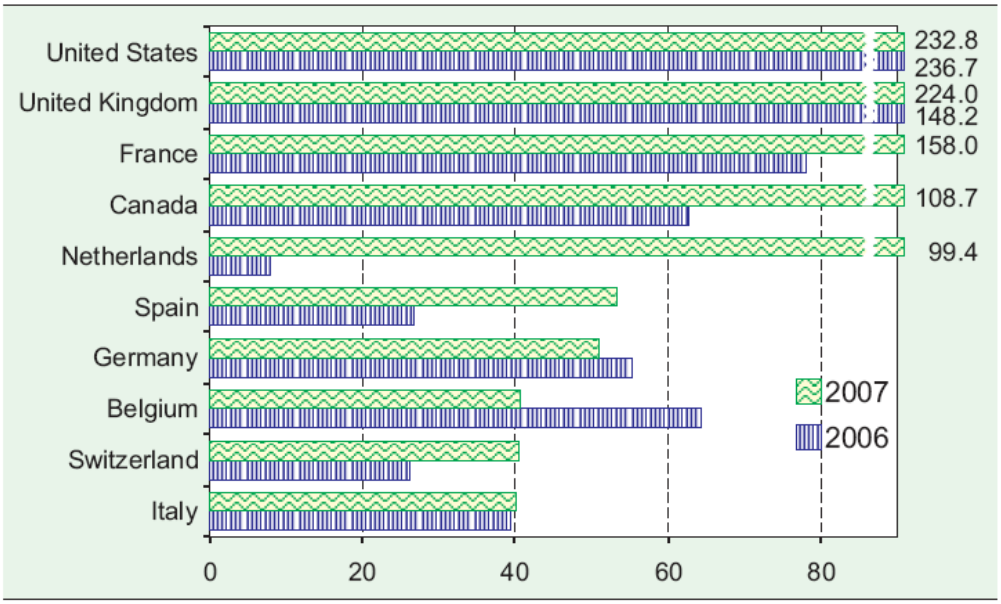
	Sales			Purchases		
Sector/industry	**2005**	**2006**	**2007**	**2005**	**2006**	**2007**
Total	820 358	969 116	1 454 084	777 609	930 101	1 410 802
Primary	150 945	97 769	85 404	107 896	62 696	114 767
Mining, quarrying and petroleum	143 026	95 112	84 287	106 573	59 682	114 150
Manufacturing	222 446	275 544	530 466	168 952	221 775	299 299
Food, beverages and tobacco	36 203	28 351	59 894	26 881	20 780	43 089
Wood and wood products	7 394	7 867	16 726	3 652	5 527	11 006
Publishing and printing	15 338	25 028	25 020	8 991	10 138	12 953
Chemicals and chemical products	60 643	55 634	127 943	32 949	38 568	101 182
Non-metallic mineral products	12 784	9 214	41 903	18 629	10 229	5 910
Metals and metal products	24 732	48 522	114 246	18 808	45 741	34 801
Machinery and equipment	7 308	16 207	22 575	8 988	20 223	7 145
Electrical and electronic equipment	17 257	39 274	25 251	14 286	36 540	37 608
Motor vehicles and other transport equipment	11 265	16 449	29 637	10 249	9 238	12 927
Precision instruments	16 164	11 341	39 487	8 970	12 879	19 827
Services	446 966	595 802	838 215	500 724	645 521	996 020
Electricity, gas and water	73 390	60 700	119 860	43 921	23 369	71 786
Construction	8 316	11 612	10 059	7 113	7 041	5 622
Hotels and restaurants	11 335	39 115	26 971	3 394	12 696	2 847
Trade	33 307	28 904	70 411	14 587	15 403	22 681
Transport, storage and communications	87 579	131 703	86 974	51 852	93 677	63 365
Finance	82 226	131 152	303 544	309 537	430 634	734 010
Business activities	114 262	141 630	163 271	53 496	45 837	72 813
Community, social and personal services	24 757	28 435	38 670	10 201	10 433	13 143

Source: UNCTAD (2008)

2.14 In terms of the sectoral trends of M&A FDI, cross-border M&As data from the UN shows that (c.f. Table 2.1) the most significant growth was in the manufacturing sector: cross-border M&A sales in developed countries increased by 93%; while cross-border purchases by MNEs in developed countries also rose by 35%. Nearly all industries in the sector benefited from increasing investments, with the highest cross-border M&A sales in chemicals, metals and food, beverages and tobacco, respectively. Services continued to be the sector with the largest FDI activity in developed countries, accounting for 58% of cross-border M&A sales in 2007. Activity was also very intense in financial services due to ongoing deregulation and restructuring and the financing needs of several banks following the developing crisis in financial markets.

2.15 Cross border M&As are particularly important as far as the UK economy is concerned, which has remained the largest FDI recipient in Europe with inflows increasing by 51% to $224 billion in 2007 (c.f. Figure 2.2). M&A FDIs were prevalent in a wide range of sectors, mostly concentrating in electricity, gas and water supply, consumer goods, trade and construction (UNCTAD, 2008).

Figure 2.2: Top ten recipients of FDI inflows in developed countries, 2006-2007 ($ billion)



Source: UNCTAD (2008)

Note: ranked by magnitude of 2007 FDI flows

Theoretical Background for FDI mergers and acquisitions

2.16 As originally put forward by Markusen (1995), when conceptualising the strategies of MNE's, two alternative motives for FDI have traditionally been studied. Firstly, a market-seeking motive is associated with reinforcing existing markets or promoting new ones, which directly relates to a horizontal model of FDI (i.e. the proximity-concentration model discussed below). A vertical FDI model (i.e. factor-proportion model) is based on the second type of motive of efficiency seeking whereby vertically expanding firms make initial overseas investments by relocating various stages of production so as to optimise their intra-division of labour. Two other additional motives were subsequently suggested by Dunning (2000): resource-seeking FDI, which aims at the exploitation of low labour cost and physical resources; and strategic asset-seeking FDI, which is more prevalent in brownfield M&As, since the acquiring firm can enhance it's existing set of specific (intangible) assets.

2.17 However, and in addition to the above, various other theoretical models have been developed in this well-established literature explaining the formation and determinants of FDI (see Markusen, 1995, 2002; Barba-Navaretti and Venables, 2004, and most recently, Faeth, 2009, for excellent surveys). In particular, Faeth (2009) provides an extensive survey of the literature to date, reviewing nine theoretical models: 1) early studies of the determinants of FDI; 2) determinants of FDI according to the neoclassical trade theory; 3) ownership advantages as determinants of FDI; 4) aggregate variables as determinants of FDI; 5) determinants of FDI in the ownership, location and internalization advantage (OLI) framework; 6) determinants of horizontal and vertical FDI; 7) determinants of FDI according to the knowledge-capital model; 8) determinants of FDI according to diversified FDI and risk diversification models and 9) policy variables as determinants of FDI. Here we discuss some of the most influential models below and highlight some issues where relevant.

The Proximity-Concentration/Horizontal Models

2.18 Under horizontal FDI, relocating production in foreign markets is demand-driven or to gain better access, and this gives rise to so-called 'proximity-concentration models'.[14] These models have mainly been proposed to explain the horizontal integration of MNEs, involving the linking of international activities in the firm across developed economies. This form of FDI emerges when the home market is relatively small and/or saturated; and when the host country has a secure and adequate demand surplus, coupled with significant barriers to exporting. Therefore foreign production becomes a more feasible choice than producing at home or exporting final products to a foreign market. It typically involves the duplication of home production facilities in overseas locations so as to better supply foreign buyers and evade trade costs, therefore improving the firm's competitive position abroad. In this horizontal case, foreign market size, trade barriers and transport costs jointly hold the key to the firm's decision to invest.

The Factor-Proportion/Vertical FDI Models

2.19 A second motive for cross-border investment relates to the supply side or to access lower-cost inputs; this leads to vertically integrated MNEs and is associated with the so-called 'factor-proportion model'.[15] In order to minimise the overall costs of production, MNEs choose to relocate certain stages of production in a lower-cost foreign market and produce goods/services that are often different to those produced at home. Firms find it profitable to fragment their production if relative factor endowments differ greatly between countries. According to traditional trade theory, these vertical FDI flows between dissimilar countries occur when the host country has a higher relative return on a relatively scarce

[14] See for instance, Krugman (1983), Markusen (2002) and Markusen and Venables (1998, 2000).
[15] These models were initially put forth by Helpman (1984), Helpman and Krugman (1985); and see Markusen and Markus (2002) for a recent contribution.

production factor – e.g., human capital. Traditionally it has been assumed that wage differentials across countries are a major determinant of vertical FDI: firms initially located in advanced high-cost countries have a tendency to engage in FDI vertically, establishing their labour-intensive operations in less developed lower-wage countries to reduce costs. This division of the firm vertically into labour-intensive production facilities in less developed economies, and capital-intensive knowledge capital in the most developed, is also consistent with the recent literature that sees FDI being motivated by the pursuit of new technologies and expertise that enhance the parent firm's future competitiveness.

2.20 Such theories further predict that such vertical movement of FDI is uni-directional: from countries that are relatively abundant with capital to countries relatively richly endowed with labour. Another major difference between vertical and horizontal FDI models is summarised by the well-known 'convergence hypothesis' put forward by Markusen and Venables (1998). Whilst proximity-concentration/horizontal models predict that internationalisation of production is increasing in the degree of similarity between the home and foreign country, the factor-proportion/vertical models postulate this to be increasing in differences in relative factor endowments.

2.21 In terms of the empirical evidence, the horizontal expansion view of FDI (or the market-seeking motive) has received more support in the literature. For instance, using data from Central and Eastern European Countries, Resmini (2000) found that FDI was driven by market considerations in general, although wage differentials were important in the scale-intensive and science-based sectors. Using aggregate data, Buch et al. (2005) also showed that for German subsidiaries abroad horizontal FDI was more important although cost-saving motives were again found to be significant for certain manufacturing industries. More recently, Roberts et al. (2008) employed Polish data to suggest that foreign MNEs were more likely to be attracted to consumer goods industries, which they present as evidence in favour of the market-seeking view that outward FDI allows firms to replicate their successes in overseas countries. Nevertheless, Bevan and Estrin (2004), using macro data to examine EU bilateral flows from source countries to the host countries, found that labour cost, host and source country size and proximity all turned out to be important and thus concluded that market-seeking and efficiency-seeking motives were both supported by empirical evidence.

The Knowledge-Capital FDI Models

2.22 More recently, in an effort to reconcile the differences between the proximity-concentration and factor-proportion models, Markusen and his associates have developed the so-called 'knowledge-capital model' to integrate the literature of both horizontal and vertical FDI (c.f. Markusen et al., 1996; Markusen, 2002). In this knowledge-capital framework, firms choose to serve international markets through exporting final products or direct investment (in either horizontal or vertical mode), and where

building multiple plants in a foreign market and having separate divisions for production and headquarter services become special cases of the general model. This KC model generates the prediction that horizontal FDI becomes increasingly important over time due to countries growing more similar (i.e. the convergence hypothesis); furthermore, vertical FDI tends to concentrated in small countries richly endowed with (human) capital, whilst certain stages of production get relocated into countries richly endowed with labour.

2.23 This KC model has consequently stimulated further empirical evaluation of the importance of various FDI models. In seeking to find the model that best characterises the overall pattern of FDI, Markusen and Maskus (2002) compared all of the three models (viz. the horizontal, vertical or knowledge-capital model) in a unified framework. Their findings show that the horizontal FDI and knowledge-capital models were generally better at describing actual outcomes (although they were largely indistinguishable); while the vertical FDI model failed to explain adequately aggregate world FDI, although they acknowledged that vertical models were important for particular sectors or in some host countries. Empirically, models of FDI have been tested using sector/country-level data, with the literature tending to provide most support for horizontally integrated MNEs (e.g. Brainard, 1997; Carr et al., 2001; and Blonigen et al., 2003). The supply-driven motive, and the relocation of production to countries richly endowed with 'cheap' labour, seem to be less important, and thus the validity of this vertical form of FDI remains disputed, despite limited evidence to substantiate these models (e.g. Hanson et al., 2001). Nevertheless, a caveat of this empirical literature lies in its heavy reliance on aggregated data; there is very limited microeconomic (modeling) evidence to explain how individual firms choose their FDI strategy.

2.24 For example, firm-specific factors that have been frequently documented in empirical studies to influence the firm's FDI decision include size, belonging to multi-plant enterprises, expenditure on R&D, innovation, technology or advertising, skills and human capital, all of which are consistent with the monopolistic advantage possessed by the MNE (e.g. Pradhan, 2004); although aggregate (macro-) factors have also been found to be significant, such as trade barriers, market size, policy influence (e.g. infrastructure quality, political regime, tax rates, tariffs, fiscal incentives, etc.), and lastly, risk factors (e.g. exchange rate, interest rate, market risk, etc.) (e.g. Ray, 1989; Wheeler and Mody, 1992).

Characteristics of the Acquired Firm: 'cherry-picking' vs. 'lemon-buying'

2.25 There are two competing theories predicting the characteristics of the firms that are more likely to become the target for foreign acquisitions. In general, the *'cherry-picking'* argument postulates that 'better' firms have a higher likelihood of being acquired, which is consistent with a *synergy hypothesis*, that 'cherry-picking' occurs when the combined value of the

new venture created by M&As exceeds the sum of the values of the individual firms. Therefore the existence of the synergy effect implies that only better performing firms tend to be acquired and the newly merged ventures are expected to benefit from a further improvement in performance post acquisition.

2.26 A the 'cherry-picking' view is also underpinned by various other theories in the international industrial organisation (IO) literature, particularly a *market structure hypothesis* and *operational efficiency theory*, where both claim that the market structure of the domestic target has a positive impact on the outcome of foreign acquisition, and that firms with high levels of productivity are more likely to change ownership, leading to productivity improvements post-acquisition. Drawing on these theories, Buckley and Casson (1998) in particular argue that acquisition of the domestic monopolist provides a foreign entrant with monopoly power; acquisitions tend to occur in highly concentrated industries so as to avoid the creation of new capacity and reduces the possibility of a price war between the foreign entrant and incumbents in the industry (Elango and Sambharya, 2004). In addition to these more traditionally known arguments, recent theoretical developments have also pointed to the importance of other concepts in facilitating brownfield acquisition entry, for instance, the complementarity in assets between the acquiring foreign MNE and the domestic target (c.f. Norback and Persson, 2008).

2.27 The view that foreign acquirers cherry-pick the best performing indigenous firms has also been supported by ample empirical evidence from various countries (e.g. McGuckin and Nguyen, 1995, 2001, for the US food industry; Goethals and Ooghe, 1997, for Belgium; Harris and Robinson, 2002, for the UK; Damijan and Knell, 2005, for Slovenia and Estonia; Fukao et al., 2005, for Japan; Sabirianova et al., 2005, for Czech Republic and Russia; Bellak et al., 2006, for Austria; Georgopoulos et al., 2008, for Greece; Roberts et al., 2008, for Poland; Salis, 2008, studied Slovenian manufacturing firms). For instance, Sabirianova et al. (2005) found that foreign investors in the Czech Republic and Russia acquired larger and more efficient firms. More recently, Roberts et al. (2008) used data covering the largest manufacturing firms in Poland to show that firms acquired by foreign investors were significantly larger and more profitable. Salis (2008) studied Slovenian manufacturing firms that were subject to takeover in 1997 and found that foreign investors cherry-picked domestic firms that were most productive, operating in the most concentrated industries and having the highest export propensity. And lastly, Georgopoulos et al. (2008), using Greek manufacturing data from 1989 to 1998, found that foreign targets were often 'national champions', with much larger business size, larger market shares, higher capital intensity, and operating in highly concentrated industries; thus they concluded that the acquisition activities of foreign MNEs might have contributed to the preservation of entrepreneurial gaps in Greek manufacturing. Nevertheless, in contrast, Karpaty (2007) also tested if foreign firms cherry-picked the best Swedish firms and found that neither profits nor productivity could explain which firm was acquired, thus rejecting the cherry-picking view.

2.28 Apart from the general support found for the 'cherry-picking' hypothesis, the majority of the empirical analysis fails to distinguish between foreign and domestic acquisition, with the following exceptions. Using Swedish data, Moden (1998) showed that high-productivity firms were more likely to be acquired by foreign-owned firms. In terms of evidence for the UK, Harris and Robinson (2002) analysed plant-level manufacturing data covering 1987-1992, and showed that foreign owned firms acquired the most productive UK plants (by 41% vis-à-vis non-acquired UK plants; by some 100% compared with plants that were acquired by UK firms). They further concluded that there was support for the operational efficiency theory for plant acquisitions in the UK manufacturing sector. Evidence presented in a cross-section of empirical studies of the relationship between productivity and foreign M&As is summarised in Table 2.2.

2.29 Countering this view, a rather more disparate literature tends to suggest that foreign firms are more likely to buy 'lemons' (i.e., under-performing/poorly-run firms) resulting in the replacement of poor management as inefficient plants are taken over. In accordance with this *managerial-discipline hypothesis*, this view argues that foreign M&As occur because managers desire to maximize their own achievements rather than company profits (there is a principle-agent problem), and thus inefficient firms are more likely to be taken over, poor management is replaced, and surviving firms will perform better (especially in terms of their rate of return on capital) post-acquisition (e.g. Jensen, 1988). Lichtenberg and Siegel (1990) take this approach further, arguing that changes in ownership are driven by plant-level lapses in efficiency, whereby plants look for a better 'match' with an enterprise to improve own performance,[16] implying that a low level of productivity increases the likelihood of a change in ownership and further productivity gains over time, with the most-efficient plants surviving in the long run. This proposition also echoes the internalisation view of multinational expansion (e.g. Dunning, 1988) in that there is an expectation of an inward transfer of inputs (e.g. technology, organisational assets, brand names, etc.) following a takeovers which would in turn increase the volume and/or value of outputs.

2.30 In terms of empirical studies that test this 'lemon-buying' view, this has generally found support in several studies for the US. In particular, Lichtenberg and Siegel (1987) using data for US companies between 1972 and 1981 found that the likelihood of ownership change was higher for less productive and smaller firms. Also Morck et al. (1989) estimated a probit model to show that in the case of hostile takeovers there was (weak) support for the management failure hypothesis. Lichtenberg and Siegel (1990) demonstrated that plants with lower productivity were more likely to change owners than those with higher productivity. Based on a sample of US firms, Chen (1997) also concluded that

[16] This approach is comparable to the theory of job turnover, whereby workers separate from their existing employers for a better job match.

Table 2.2: Evidence on pre-acquisition productivity and the post-acquisition impact in the literature

Study	Sample	Methodology	Pre-acquisition	Post-acquisition
McGuckin and Nguyen (1995)	US firms using the Longitudinal Research Database, 1977-1987	OLS regression	Cherry picking -ownership change is generally associated with plants with above average productivity	Transferred plants experience improvements in productivity
Conyon et al. (2002a)	UK manufacturing firms from OneSource database, 1989-1994 (331 domestic and 129 foreign acquisitions)	OLS estimation of growth rates (wage endogeneity controlled for)		An increase in labour productivity of 13%
Gioia and Thomsen (2002)	Danish firms, 1990-1997	Selection bias controlled for by including the inverse Mill's ratio as the correction term	Lemon-buying: foreign firms tend to acquire firms with lower return on assets, factor productivity and other measures	Selection-adjusted estimates indicate a negative effect of international takeovers on the performance of acquired firms
Harris and Robinson (2002)	UK manufacturing plants using the Annual Respondents Database, 1987–1992	Panel data using systems GMM	Cherry-picking of the most UK productive plants, conditioned by industrial characteristics	Overall productivity declines slightly (especially following domestic acquisition)
Arnold and Javorcik (2005)	Indonesian manufacturing plants, 1983-1996	difference-in-difference approach following use of propensity score matching		A large positive impact on productivity (e.g. 13.5% higher 3 years post-acquisition)
Fukao et al. (2005)	Japanese manufacturing firms, 1994–2000		Cherry-picking of firms with higher TFP levels	Large and quick improvement in TFP
Girma (2005)	UK manufacturing firms using OneSource database, 1989-1996	difference-in-difference approach following use of propensity score matching		US and EU acquisition saw TFP improvements
Girma et al. (2007)	UK manufacturing firms using *OneSource* database, 1988-1996	difference-in-difference approach following use of propensity score matching		A positive direct effect of FDI on the productivity of domestic exporters. Those with higher pre-acquisition productivity level experience larger efficiency gains, mostly concentrating in the years immediately after the acquisition
Piscitello and Rabbiosi (2005)	Italian manufacturing firms, 1994–1997	OLS regression based on various samples		Improvement in labour productivity in the medium-term post-acquisition

Bellak et al. (2006)	balance sheet data of a sample of Austrian manufacturing firms, 1985-2002	difference-in-difference approach with endogenous selection using the matching estimator technique	On average, evidence of cherry-picking	No significant growth; but lemons reduce their productivity gap (vis-à-vis cherries) e.g., after 4 years by 13%
Fukao et al. (2006)	Japanese firm-level data, 1994-2002	difference-in-difference approach following use of propensity score matching		Foreign acquisitions improve target firms' productivity significantly more and quicker than acquisitions by domestic firms
Karpaty (2007)	Swedish manufacturing firms, 1986–2002	difference-in-difference approach following use of propensity score matching	No evidence of cherry picking	Productivity increase by 3 - 11%, between 1–5 years post acquisition
Salis (2008)	Slovenian manufacturing firms, 1994-1999	difference-in-difference approach following use of propensity score matching	Cherry picking of the most productive firms (those with highest export propensity and operating in the most concentrated industries)	No evidence of higher TFP, both in the year of acquisition and in the subsequent two years

foreign M&As were more prevalent in industries with lower growth rates in value added, lower market concentration, lower import tariff rates and higher capital-labour ratios. Likewise, using a control sample of US firms for the period between 1981 and 1990, Gonzalez et. al. (1998) were able to show that foreign acquisitions were more likely to target US companies with lower returns on equity and lower sales growth.

2.31 As to the evidence from other countries, Köke (2000) tested the impact of inter alia ownership structure, size, performance (e.g. return on assets, return on equity, stock market returns) as determinants of potential takeovers in Germany; and this study indicated partial support for the 'lemon-buying' view in that complex-ownership decreased the likelihood of ownership change only for non-listed firms and size was negatively correlated to takeover probability for all firms. Castellani and Zanfei (2004) employed Italian data to show that firms acquired by foreign firms did not appear to be more productive/innovative. Gioia and Thomsen (2004) also showed that under-performing Danish firms (in terms of factor productivity and return on assets) were more likely to be targets of foreign acquisitions. In particular, Gioia and Thomsen (2002) also took these arguments further and highlighted the 'double-lemon' issue in that due to information asymmetries and adverse selection effects in acquisition markets, firms acquired by international investors tend to be poor performers vis-à-vis those acquired by domestic buyers, and therefore by extension they tend to perform worse than those indigenous firms that are not acquired.

Post-acquisition impact of FDI M&A in the acquired firm

M&A FDI and Productivity

2.32 Productivity gaps between foreign-owned firms/plants and domestic firms/plants have been widely observed and extensively investigated in the IO literature, and ample empirical evidence has been documented (see Bellak, 2004, for a thorough discussion of this issue).[17] A number of explanations have been put forward in the literature to account for such observed differentials in productivity levels associated with ownership: primarily advantage of multinationality (Davies and Lyons, 1991); more resources devoted to training and skills in foreign owned firms (Globerman et al., 1994); superior foreign technology (Oulton, 1998), higher levels of capital intensity in foreign subsidiaries (Oulton, 1998; Girma et al., 2001; and Harris, 2002), and so on. Nevertheless, in sharp contrast, any performance gap induced by foreign M&As (rather than foreign ownership in general) has received much less attention, since the majority of the existing empirical literature tends to ignore the dynamics of firm entry and

[17] Representative studies documenting such gaps include Davies and Lyons (1991), McGuckin and Nguyen (1995), Doms and Jensen (1998), Oulton (1998), Girma et al. (2001), Griffith and Simpson (2001), Conyon et al. (2002a), Harris (2002), Harris and Robinson (2003), Criscuolo and Martin (2009), to name just a few.

thus makes little distinction between greenfield and brownfield investments in foreign production.

2.33 Any investigation of the effect of foreign M&As necessitates the evaluation of both the pre-acquisition performance of the target firm and the post-acquisition performance of the merged/acquired firm.

2.34 With respect to the pre-acquisition productivity of the domestic target, as shown above the literature offers two alternative explanations for the foreign MNE's selection choice: acquiring firms intend to take advantage of over-performing domestic firms (i.e. cherry-picking) based on the operational efficiency view, or they select indigenous under-performers (i.e. lemon-buying) stemming from the managerial-discipline hypothesis. In either case, a selection bias usually arises when evaluating the post-acquisition impact of foreign M&As if we simply compare the time-profile of acquired and non-acquired firms. This is because studies suggest that the decisions of foreign M&As are found to be heavily influenced by the pre-acquisition performance of firms: such as productivity, return on assets/shares, managerial performance, growth potential and internationalisation orientation; as well as industry-specific characteristics; that is M&A activity is not a random process but depends on pre-acquisition characteristics that are likely to continue performance in the future.

2.35 This is because the pre-acquisition characteristics of the target firms are linked to explanations of possible gains for the acquired firm. As summarised in Bellak et al. (2006): i) managerial inefficiency arguments suggest that following the acquisition of under-performing firms, efficiency is expected to improve due to the disciplining effect of the takeover on the acquired firm's management;[18] ii) the synergy/restructuring effect that indicates the acquired firm could exploit the new parent's firm-specific assets and networks, which will result in additional efficiency gains (c.f. Bellak and Pfaffermayr, 2002); iii) the matching theory of ownership change that predicts that firms are constantly assessing the match between plant and parent and consequently efficiency becomes a 'side product' of growth (Morck et al., 1990); iv) the market power view which claims that profit maximisation is an important objective of acquisitions and thus the newly combined venture is able to increase their joint market power and to influence prices.

2.36 Irrespective of the links between pre- and post-acquisition performances by firms, based on either cherry-picking or management-discipline, there are other factors that can intervene to produce negative effects post-takeover. Above all, the extant literature suggests that foreign operations face higher costs relative to domestic firms stemming from information asymmetry (and potentially mislead takeover decisions), coordination over distance leading to resource shortage, lack of political influence and knowledge networks, difficulty in organisational integration and the like.

[18] Scherer (1998) argued that the takeover is stimulated by declining share prices.

2.37 As to the empirical evidence, foreign acquisition has mostly been found to exert a positive and significant impact on the acquired firm's post-takeover productivity, using data from both developed and developing countries. For example, in addition to the evidence of cherry-picking of more productive US target firms, McGuckin and Nguyen (1995, 2001) showed that the growth performance of acquired US firms tended to be better relative to those that have not experienced ownership change. Likewise, based on information for UK manufacturing firms from the OneSource database covering 1989-1994, Conyon et al. (2002a) found that those that were acquired by foreign companies exhibited an increase in labour productivity of 13%. For the Italian manufacturing sector between 1994 and 1997, Piscitello and Rabbiosi (2005) showed that there was evidence of improvements in labour productivity in the medium term post acquisition. Using Swedish data, Moden (1998)'s findings suggested that foreign acquisitions increased labour productivity despite a more uncertain effect on TFP, although such effects were largely dependent on firm size and on the initial level of productivity. Finally, in an analysis of foreign acquisition in a developing country, Arnold and Javorcik (2005) used data for Indonesian manufacturing plants to show that the improvements in productivity in acquired plants became visible in the acquisition year and continued in subsequent periods. They further concluded that the rise in productivity was a result of restructuring, as acquired plants increased investment outlays, employment and wages

2.38 The above studies tended to ignore any sample selection issues surrounding the link between the pre-acquisition characteristics of the firm that impact on post-acquisition performance. Thus, Karpaty (2007) again using data from the Swedish manufacturing sector for 1986–2002, employed a more sophisticated econometric approach to evaluating such productivity gains. Based on the propensity score-matching technique with a difference in-difference estimator, his findings showed that foreign acquisitions raised productivity in the acquired Swedish firms by between 3 and 11%, depending on the estimator chosen, although such productivity difference did not occur immediately but rather 1–5 years post acquisition.

2.39 Fukao et al. (2005) analysed data from Japanese manufacturing firms (1994–2000) and found that compared with in-in M&As, out-in M&As brought about a larger and quicker improvement in TFP. In a follow-up study, Fukao et al. (2006) adopted the difference-in-differences approach in conjunction with propensity score matching to take account of the selection problem that had not been controlled for in the previous study. Results from both unmatched samples and matched samples showed that acquisitions by foreign firms improved the target firms' productivity significantly more (and at a faster pace) than acquisitions by domestic firms.

2.40 In addition, and irrespective of whether sample selection techniques were used, the such positive productivity impact of foreign acquisition reported in many studies has been found to be moderated by various firm and/or industry-level factors such as pre-acquisition productivity level (Girma, 2005), size (Bellak et al., 2006), nationality of ownership (Bellak et al.,

2006), and domestic competition (Girma et al., 2006). In particular, taking the pre-acquisition level of productivity as a proxy for absorptive capacity for UK manufacturing firms, Girma (2005) found the higher the absorptive capacity of the target firm, the higher the rate of productivity change in the firm post acquisition; nevertheless, there also seemed to exist a threshold level of such absorptive capacity, beyond which the rate of technology transfer associated with foreign takeover begins to decline. Piscitello and Rabbiosi (2002) found that productivity gains were conditioned by firm size, i.e. productivity improvement was more pronounced in smaller firms; their findings also pointed to substantial difference in the productivity pattern between firms taken over by European and US investors.

2.41 Additionally, Girma et al. (2006) showed that the more competitive the industry where foreign takeovers occur, the higher the potential productivity gains (for those UK firms acquired by US and European MNEs). Restricting the analysis to the impact of foreign acquisition on the productivity level of domestic exporters, a recent study by Girma et al. (2007) also found productivity gains (associated with technology transfer) across domestic exporting firms over time. However, they also indicated that such productivity benefit appeared to differ depending on the exporter's pre-acquisition level of productivity (mirroring its absorptive capacity for appropriating the superior technology transferred from foreign MNEs); that is, those with higher pre-acquisition productivity level experienced larger efficiency gains, which mostly concentrated in the years immediately after the acquisition.

2.42 In a more disparate literature, foreign ownership is also found in some studies to exert very limited impact on the acquired firm (e.g. Salis, 2008, for Slovenian manufacturing sector; and Bellak et al., 2006, for a sample of Austrian firms). Meanwhile, various other studies have also documented negative effects of foreign ownership on the productivity of the acquired firm following acquisition. For instance, using plant-level data from the ARD for the period 1987-1992, Harris and Robinson (2002) found a rather mixed picture of the effect of foreign acquisitions in the UK manufacturing sector and concluded that there was an overall slight decline in the post-takeover productivity level (particularly in the metals and chemicals sector). In a similar vein, in a study of Danish firms, from 1990 to 1997, Gioia and Thomsen (2002) were able to show that based on the results from selection-adjusted estimates, overseas takeovers tended to have a negative impact on the performance of the acquired firms

M&A FDI and Profitability

2.43 The relationship between foreign acquisition and plant/firm-level productivity directly relates to other measures of performance such as profitability. This linkage has been documented by Driffield and Munday (1998), whose findings from UK manufacturing sector showed that if wages increased post-acquisition, alongside limited or no productivity growth, then this would lead to a decline in profitability. Despite their observations, and compared with the relatively well-established literature concerning

foreign M&As and productivity, the relationship between brownfield acquisition and post-takeover profits has been less extensively researched.

2.44 From a theoretical perspective, there are various reasons for expecting enhanced profits in acquired plants. Above all, the traditional international business/finance literature suggests that market power and risk diversification will result in a positive relationship between foreign takeovers and profitability. That is, the global diversification of business, and increased market power of the MNEs stemming from M&As, tend to reduce business operational risks and hence positively contribute to the acquired firm's leverage capacity (c.f. Eiteman et al., 2006). Likewise, the managerial discipline hypothesis also generates the prediction of enhanced profit prospects for acquired firms, given the assumption that M&As are motivated to reinforce managerial control over entrenched managers who are more interested in their own benefit. as Also, as Bellak (2004) argues, foreign MNEs often bring with them higher capital intensity, amongst other ownership advantages, which should translate into (labour) productivity growth, which further result in a rise in post-acquisitions profit margins.

2.45 However, there are even more explanations offered in the literature for expecting a negative relationship between foreign M&As and profitability. To start with, Bellak (2004) reviews a number of studies that acknowledge that a major objective of MNEs is to minimise their tax burden, and this often means that foreign owners are willing to accept lower profit margins in their overseas subsidiaries. The same is also true if the opportunity costs of internally generated funds are relatively low (vis-à-vis those of the funds generated outwith the business) and thus foreign affiliates are inclined to exploit re-invested profits, leading to a decline in their profitability.

2.46 In a recent development, Norback and Persson (2008) also deployed this market risk argument to explain why the profitability associated with foreign M&As was expected to be lower than that brought about by greenfield entry. They claimed that entry by M&As may be riskier than greenfield production. Their theoretical model demonstrates that a high level of complementarity in assets between the foreign acquirer and the domestic target has a positive impact on the acquisition decision, but. the acquirer's expected profits is decreasing in asset complementarity, and thus foreign MNEs may not necessarily benefit from increased ex post profits in markets with the most suitable takeover targets. This is because the complementarity between domestic and foreign assets results in upward pressure on the equilibrium acquisition price (measured as a non-acquiring MNE's willingness to pay); thus in equilibrium, the acquisition price increases more than the acquirer's product market profit, when domestic assets become more strategically valuable.

Table 2.3: Evidence on pre-acquisition profitability and the post-acquisition impact in the literature

Study	Sample	Methodology	Pre-acquisition	Post-acquisition
Fukao et al. (2005)	Japanese manufacturing firms, 1994–2000	OLS regression based on domestic/foreign samples	Cherry-picking of firms with higher profit rates	Large and quick improvement in profit rate
Bellak et al (2006)	Balance sheet data of a sample of Austrian manufacturing firms, 1985-2002	Difference-in-difference approach following use of propensity score matching		Profitability growth significantly higher for 'lemons' than for 'cherries'
Fukao et al. (2006)	Japanese firm-level data, 1994-2002	Difference-in-difference approach following use of propensity score matching		Foreign acquisitions improve target firms' profitability significantly more and quicker than acquisitions by domestic firms
Chari et al. (2009)	Transaction-specific M&A data and firm-level accounting data of U.S. firms acquired by firms from emerging markets, 1980-2007	Difference-in-difference approach following use of propensity score matching	Cherry-picking firms larger in size (measured as sales, total assets and employment)	The return on assets in target firms increases by 16%, on average, in the five years following acquisition

2.47 The empirical evidence on the linkage between profitability and foreign M&As is summarised in Table 2.3. There is some evidence of foreign acquirers cherry-picking more profitable domestic targets (Freund and Djankov, 2000; for Korea in the post-liberalization period; Lipsey and Feliciano, 2002, for US; Fukao et al., 2005, for Japanese manufacturing sector; and Chari et al., 2009, using data of US firms acquired by emerging markets investors). In particular, Freund and Djankov (2000) studied the differences between domestic and foreign takeovers in Korea for the post liberalisation period and showed that target firms were usually larger, more profitable, with lower debt, belonging to high value-added sectors. Similarly, Lipsey and Feliciano (2002) studied foreign acquisitions in the US during a ten-year period, and found that, inter alia, foreign acquisitions occurred at times of high firm profitability. Lastly, Fukao et al. (2005) also found that compared with in-in M&As, out-in M&As brought about a larger and quicker growth in post-acquisition profit rate.

2.48 In terms of the post-acquisition impact of foreign M&As on profitability, and given the evidence generally found on cherry-picking, the most recent studies have taken into account (potential) selectivity bias by adopting a difference-in-difference approach in conjunction with propensity score matching techniques. For instance, Fukao et al. (2006) found that for both unmatched and matched samples, foreign acquisitions improved the target firms' profitability significantly more (and faster) than acquisitions by domestic firms. Again controlling for the sample selection problem, Chari et al. (2009) analysed transaction-specific data on M&As over 30 years, for a sample of US firms acquired by investors from emerging markets for nearly 30 years, finding that on average the return on assets in target firms increased by 16% in the five years following the acquisition (which they interpreted as suggesting significant restructuring taking place).

2.49 More generally, Bellak et al. (2006) found that for a sample of Austrian manufacturing firms, the level of profitability post acquisition was dependent on its initial pre-acquisition level, i.e. 'lemons' enjoyed a significant higher growth than 'cherries'. Based on German data, Köke (2000) was able to suggest that there was little ex post improvement in financial performance in acquired firms. And lastly, Ravenscraft and Scherer (1987) even revealed a negative impact of takeovers on the profitability of target firms, nine years following ownership change.

M&A FDI and Closure

2.50 Given the a priori positive performance impact expected of foreign M&As, juxtaposed with welfare concerns that foreign MNEs are more footloose in the local economy, the impact of foreign acquisitions on closure rates is unknown. Drawing on the market power argument and the internalisation view of multinationalisation (c.f. Dunning, 1988), foreign ownership might enhance the acquired firm's competitiveness and thus its survival prospects, through the post-acquisition inward transfer of inputs stemming from the MNE's ownership advantage (e.g., technological and/or organisational assets, knowledge networks, brand names and so on).

2.51 However, more studies in the literature expect a negative impact of foreign acquisition on the acquired firm's propensity to survive. Foreign-owned plants may exhibit desirable characteristics in support of superior survivability; however, it is foreign ownership per se that overshadows the affiliate's survival prospects – MNEs frequently employ the extensive margin available to shut down plants with more ease compared to domestic firms (Bernard and Sjoholm, 2003). Brownfield acquisitions may be (at least in part) undertaken to gain market access and increase product market shares; and once such resources have been successfully integrated, the foreign parent firm may adjust operational capacities, particularly in industries where there are considerable scale economies and large surplus capacity. Also as argued by Girma and Görg (2004), firms that operate on a more competitive international stage, are inherently riskier vis-à-vis businesses solely serving the domestic market, and thus face a higher probability of closure.

2.52 These arguments are consistent with results by McCloughan and Stone (1998); for manufacturing plants in the Northern region of the UK they showed that the probability of closure confronting foreign plants was roughly an inverted U-shaped in that it first exhibited positive duration dependence, reached a peak, before having negative duration dependence thereafter. They were able to further demonstrate that the turning point from positive to negative duration dependence took place around 8 years following the establishment of foreign affiliates.

2.53 These arguments gain weight when brownfield acquisitions are juxtaposed with that of greenfield foreign production. McCloughan and Stone (1998), found that the survival time for acquisition entrants was some 60% less on average than that for greenfield entrants. Possible explanations for such discrepancies between different entry modes include the ease at which managerial links are established and business entities are integrated, technological considerations and the availability of host government grants, etc.

2.54 Other empirical evidence nearly universally points to foreign affiliates facing a higher probability of closure post-acquisition (e.g. Thomsen, 1999; Harris and Passaszadeh, 2002; Gioia and Thomsen, 2002; Bernard and Sjoholm, 2003; Girma and Görg, 2004) – see Table 2.4. In particular, Bernard and Sjoholm (2003) used information on foreign M&As in Indonesian manufacturing to show that foreign affiliates faced a much higher probability of closure, having controlled for other firm-level characteristics such as productivity and size. In a comparative analysis, they were also able to indicate that the hazard rates were highest for brownfield acquisitions, while the hazard ratio for greenfield establishments was also higher than that for domestically owned plants. They thus concluded that it was foreign ownership per se, rather than any other unobserved plant characteristics, that was contributing to higher closure rates.

Table 2.4: Evidence on post-acquisition impact on plant closure in the literature

Study	Sample	Methodology	Post-acquisition
McCloughan and Stone (1998)	UK manufacturing plants in the Northern region, 1970–1993	Weibull and lognormal hazard models	Acquired plants face higher closure rates than greenfield entrants
Harris and Passaszadeh (2002)	UK manufacturing plants using the ARD, 1974–1995	Semi-parametric Cox proportional hazard model	Some 36% higher closure rates, although diminishing with age
Bernard and Sjoholm (2003)	Indonesian manufacturing establishments, 1975-1989	Semi-parametric Cox proportional hazard model	Higher probability of closure and lower survival rates; the hazard ratio for acquired plants is higher than that for greenfield plants
Girma and Görg (2004)	UK plants in electronics and food industries, 1980-1993	Semi-parametric Cox proportional hazard model with IV estimation to control for endogeneity, based on a matched sample	Foreign takeover reduces the lifetime of the acquired plant

2.55 Harris and Passaszadeh (2002) were able to distinguish between foreign and domestic acquisitions using data for UK manufacturing plants based on the ARD, covering 1974–1995. Their findings suggested that in the 1974–1979 period, UK plants acquired by foreign MNEs were some 36% more likely to shut down (which was also shown to be conditioned by plant age); after 1979, this probability of closure decreased to between 26 and 30%. They interpreted this as suggesting that ownership change had a strong and deleterious impact on plant survival, implying significant problems with assimilating these plants. Likewise, Girma and Görg (2004) also deployed UK establishment-level data (for the electronics and food industries) and found that foreign acquisitions reduced survival probabilities for the acquired domestic plants.

M&A FDI and Employment

2.56 Cross-border M&As are generally encouraged by the host country government given their perceived positive impact on the labour market. From the market power perspective, foreign M&As are usually motivated to increase product market shares which then leads to larger plants. The opposing argument is that foreign owners may be more footloose and enjoy lower employment adjustment costs (relative to domestic owners). As Conyon et al. (2002b) argue, both horizontal and vertical M&As may be associated with losses in employment: horizontal FDI may lead to

reductions in the workforce especially in industries with surplus capacity or substantial scale economies; whereas in the vertical case, following a reduction in transactions costs, there is likely to be a corresponding loss in the workforce in the sales function of the upstream business and/or the procurement function of the downstream operations.

2.57 The impact of M&As on employment are also argued to be influenced by various other factors such as the nationality of the foreign ownership (e.g. Gugler and Yortoglu, 2004) and the distance between the target and acquiring firms (e.g. Lehto and Bockerman, 2006). In particular, in a comparative analysis between labour markets in the US and Europe, Gugler and Yortoglu (2004) presented evidence to show that the combined entities shed more (excess) labour after an M&A in Europe than in the US, due to 'sclerotic' labour markets in Europe implying higher adjustment costs, which consequently prevent firms from reaching the optimal employment level without reneging on contracts. To sum up, theoretical predictions are unclear as to the nature of the impact of foreign M&As on employment; and thus the testing of such effects remains very much an empirical issue.

2.58 With respect to the role of employment size in determining if a domestic firm becomes a target of foreign M&As, generally the evidence is positive (e.g. Almeida, 2007, for Portugal; and Chari et al., 2009, for a sample of US firms). For instance, Almeida (2007) demonstrated that during the pre-takeover period, Portuguese firms that were eventually targeted by foreign M&As were larger (and employed more educated workers than the average domestic firm). The author consequently concluded that the pre-acquisition size of target firms were already rather similar to those of the existing foreign affiliates, and thus foreign acquisition was not a random process.

2.59 From a policy perspective, distinguishing causation from correlation (and verifying the direction of causality) is crucial in the post-acquisition relationship between foreign ownership and employment. Most of the studies in this strand of the literature seem to have found foreign M&A's have a negative effect on employment in the acquired firm over time[19]. For instance, Conyon et al. (2002b) modelled labour demand using a specially constructed sample of acquiring and non-acquiring UK firms (between 1967-1996). Using panel technique with first differencing, they were able to show that (especially for related and hostile M&As) there was a reduction in labour demand post-acquisition and the reduction was proportionately more significant in smaller firms – this was interpreted as indicating efficiency gains in labour utilisation in these new entities. Table 2.5 provides a summary of empirical evidence on the relationship between foreign acquisitions and employment.

[19] Amongst the few exceptions, Fukao et al. (2005) showed that at least in the short run (i.e. two years following the acquisition), foreign M&As did not seem to have any impact on the workforce in the target firms. There are even fewer studies that suggest a positive impact, e.g. Almeida (2007) using data on Portuguese firms. Lastly, using Hungarian data, Cengödi et al. (2008) found that similar to the changes in productivity and wage premium, the employment level followed a U-shaped pattern post acquisition.

Table 2.5: Evidence on pre-acquisition employment and the post-acquisition impact in the literature

Study	Sample	Methodology	Pre-acquisition	Post-acquisition
Conyon et al. (2002b)	UK firms based on a specially constructed database, 1967-1996	Panel estimation-first differencing		Substantial reduction in employment; particularly, related to hostile mergers
Gugler and Yortoglu (2004)	Firms in US, UK and Continental Europe, using Thompson Financial Securities Data, 1981–1998	Panel approach- systems GMM		On average, no significant adverse effects on labour demand in the US, but 10% reduction in EU
Fukao et al. (2005)	Japanese manufacturing firms, 1994–2000	OLS regression based on domestic/foreign samples		No increase in target firms' employment two years after the acquisition
Lehto and Bockerman (2006)	Establishment-level data from Finland, 1989-2003	Difference-in-difference approach following use of propensity score matching		Downsizing in manufacturing employment, but much weaker effects in non-manufacturing
Almeida (2007)	Matched employer–employee data of Portuguese firms, 1991–1998	Using control group	Foreign-owned acquired larger firms	Firm size increases
Huttunen (2007)	Matched employer–employee panel data on Finnish plants, 1988–2001	Difference-in-difference approach following use of propensity score matching		Decreases the share of highly educated workers in employment
Chari et al. (2009)	Transaction-specific M&A data and firm-level accounting data of U.S. firms acquired by firms from emerging markets, 1980-2007	Difference-in-difference approach following use of propensity score matching	Cherry-picking firms larger in size (measured as sales, total assets and employment)	Employment, capital and sales decrease

2.60 More recent investigations have attempted to control for selectivity bias by deploying propensity score matching along with the difference-in-difference estimator; they nearly all point to a reduction in the workforce post-acquisition (e.g. Lehto and Bockerman, 2006; Huttunen, 2007; and most recently Chari et al., 2009). For example, in a study using 1989-2000 establishment-level data from Finland, Lehto and Bockerman (2006) found that foreign acquisition led to downsizing in manufacturing employment, but the effect was much less pronounced in the non-manufacturing sector. Huttunen (2007) also employed data on Finnish plants, covering a similar period (i.e. 1988–2001), to show that brownfield acquisitions decreased the share of highly educated workers in an acquired plant.

Finally, various comparative studies have highlighted distinct patterns across different ownership structures (i.e. domestic vs. foreign, US vs. EU) as well as substantial sectoral variation. For example, using data on M&As for the US, UK and continental Europe, Gugler and Yortoglu (2004) found that there was a significant fall in employment post-merger in the UK, as well as Continental Europe, despite little significant adverse effects on labour demand in the US. This study also highlighted the important role played by national institutions in moderating the effects of foreign M&As on domestic employment given the highly regulated nature of labour markets (particularly in Europe). And despite the overall conclusion that employment losses resulted from ownership change, Lehto and Bockerman(2006) indicated that there existed considerable sectoral variation and differences between foreign and domestic acquisitions in Finland. More specifically, foreign M&As had a consistently negative effect in manufacturing only, while domestic M&As were shown to exert a negative employment effects for all sectors.

M&A FDI and Wages

2.61 Cross-sectional evidence on whether there is a wage premium associated with foreign ownership tends to point to the consensus reached in the international IO literature; that foreign subsidiaries, inter alia, employ more educated workers and pay higher wages vis-à-vis domestically owned firms. Evidence from various countries covers the UK (e.g., Griffith, 1999; Girma et al. 2001; Conyon et al. 2002a; and Driffield and Girma, 2003); the US (e.g., Doms and Jensen, 1998; and Feliciano and Lipsey, 2006); Sweden, (Heyman et al. 2007); Portugal (Almeida, 2007); Indonesia (Lipsey and Sjoholm, 2004; and Sjöholm and Lipsey, 2006); Ghana, (Görg et al. 2007); and lastly, in a comparative study for Mexico, Venezuela and the US, Aitken et al. (1996). Almeida (2007) has summarised the empirical evidence on foreign wage premium, which is reproduced in Table 2.6 below. Various arguments have been advanced in the literature to explain the observed wage gaps between foreign and domestic firms. First of all is the existence of skill gaps that stem from the firm-specific ownership advantage of the foreign MNEs (Doms and Jensen, 1998). That is, the exploitation of often superior foreign technologies, as part of such firm-specific assets, may necessitate that foreign subsidiaries employ a more educated workforce with higher skill intensity. This also relates to the rent-sharing view which

posits that foreign subsidiaries pay higher wages as a consequence of the bargaining game, in which the workforce shares the extra rents generated by such superior technologies and market power. In the bargaining model developed by Görg et al. (2007), for example, firm-specific assets give rise to a productivity advantage; workers could accumulate more human capital by on-the-job training post acquisition (and higher wages are only paid to those involved in training), given that rents are shared with the workers.

2.62 Another frequently proposed argument is linked to potential spillovers of foreign technology. Since workers gain access to superior technologies in foreign affiliates, MNEs are often willing to pay a wage premium so as to prevent such technologies being leaked to domestic competitors (Fosfuri et al., 2001; Glass and Saggi, 2002; Csengodi and Urban, 2008). Extending this technology spillover theory as a justification for a foreign wage premium, Csengodi et al. (2008) incorporate a temporal dimension and argue that if it takes time to appropriate knowledge spillovers, the wages of highly educated workers may decline immediately post acquisition and start to grow at a later time. They further point out that workers with low/medium level of education may not face such a difference between short and long run.

2.63 Following brownfield acquisitions, higher wages may also be offered so as to compensate for any labour demand volatility associated with structural changes, or even the closure of divisions, as well as provide an incentive for workers to adapt to foreign management (Bernard and Sjöholm, 2003). Lastly, from an institutional perspective, the existence of labour unions means that foreign owners may pay a wage premium either in response to the pressure of high unionisation or to discourage such unionisation (Feliciano and Lipsey, 2006).

2.64 In terms of the empirical evidence on the pre-acquisition performance of target firms, recent analyses tend to suggest that there is evidence that foreign firms are more likely to select domestic firms that already pay higher wages (e.g. Almeida, 2007, for Portugal; Heyman et al., 2007, for Sweden). More detailed evidence on this relationship is presented in Table 2.7. For instance, Almeida (2007) utilised matched employer-employee data to show that prior to takeovers, Portuguese targets already employed more educated workers and paid higher hourly wages for a given worker quality (across workers with differing levels of education). However, Csengodi et al. (2008) failed to find any sign of pre-acquisition higher wages for domestic plants in the Hungarian manufacturing sector.

Table 2.6: A summary of the literature on foreign wage premium using firm level data

Country / period	Data / sample coverage	Dependent variable	Number of acquisitions	Independent variables		Foreign wage premium	
				Firm level	Worker level	Cross section	Panel data
Aitken, Harrison and Lipsey (1996) Venezuela, 1977–1989	Panel of firms Encusta Industrial. Manufacturing	Log average firm wage by skill group	N.A.	sector, region, assets, size, age	N.A.	25% skilled 17% unskilled	14% skilled 9.3% unskilled
Girma, Greenaway and Wakelin (1999) UK, 1991–1996	Panel of firms. OneSource. Manufacturing	Log average firm wage	N.A.	sector	N.A.	9.50%	0.40%
Conyon, Girma, Thompson and Wright (2002) UK, 1989–1994	Panel of firms. OneSource. manufacturing	Log average firm wage	129 foreign acquisitions and 331 domestic acquisitions	assets, sector average wages	N.A.	–	3.30%
Girma and Gorg (2003) U.K. 1980–1994	Panel of firms. ARD. Electronics and food	Log average firm wage by skill group	346 foreign acquisitions	average regional-sector wage, average wage in complement skill group, capital	N.A.	–	2%–4.9% skilled 2%–2.8% unskilled
Lipsey and Sjoholm (2004) Indonesia, 1996	Cross section of firms. Census Manufacturing	Log average firm wage by skill group	–	sector, region, energy per worker, inputs per worker, size, public ownership	Education, gender by skill group	12% blue collor, 22% white collar	–
Lipsey and Sjoholm (2002) Indonesia, 1975–1999	Panel of firms. Census Manufacturing	Log average firm wage by skill group	1045 foreign acquisitions 1243 domestic acquisitions	sector, region, energy per worker, inputs per worker, size, public ownership	N.A.	28% blue collar 41% white collar	17% blue collar 33% white collar
Almeida (2004) Portugal, 1991–1998	Panel of firms (MEED at firm level) Census Manufacturing and Non–manufacturing	Log average firm wage by education group	688 foreign acquisitions 505 domestic acquisitions	sector, size, age, public ownership.	Education, gender, age, tenure, hours worked by education group	31% low educated 46% high educated	0.1% low educated 0.8% high educated

Source: Almeida (2007) Table A1, p.94

Table 2.7: Evidence on pre-acquisition wages and the post-acquisition impact in the literature

Study	Sample	Methodology	Pre-acquisition	Post-acquisition
Conyon et al. (2002a)	UK manufacturing firms from OneSource database, 1989-1994 (331 domestic and 129 foreign acquisitions)	Instrumental variable estimation to control for the endogeneity of wages		3.4% higher than domestic firms, attributable to higher productivity levels
Almeida (2007)	matched employer–employee data of Portuguese firms, 1991–1998	Used control group	higher hourly wages paid for a given worker quality	Little effect on average wages (a slight increase in manufacturing firms)
Girma and Görg (2007)	UK establishments data from the Annual Respondents Database, 1980-1994	Difference-in-difference approach following use of propensity score matching		Sizable effects for +ive US acquisition; no impacts from EU acquisition; positive effects for unskilled workers from acquisitions by MNEs from the rest of the world
Heyman et al. (2007)	Matched employer–employee data on the entire Swedish private sector, 1996–2000	Difference-in-difference approach following use of propensity score matching	Foreign-owned acquired high-wage firms	Individual worker's wage level is 2–6% higher in acquired firms, but wage growth is lower than in non-acquired firms
Huttunen (2007)	Matched employer–employee panel data on Finnish plants, 1988–2001	Difference-in-difference approach following use of propensity score matching		Positive effect on wages, increasing with workers' schooling, occurring 1-3 years post acquisition
Csengodi et al. (2008)	Hungarian employee-employer matched data manufacturing firms, 1992-2001	Pre-programme technique with nearest-neighbour matching to construct control group	no evidence of higher wages	Significant increase in the wage premium during the takeover year, followed by a gradual increase thereafter
Csengodi and Urban (2008)	Hungarian employee-employer matched data manufacturing firms, 1992-2001	Pre-programme technique with nearest-neighbour matching to construct control group		Foreign-firm wage premium grows only for workers with low/medium levels of education and for blue-collar and white-collar low-skilled workers

2.65 In addressing causation, there are two major issues that are frequently highlighted in the literature concerning the empirical evaluation of the post-acquisition wage premium. Above all, when estimating models of labour demand, if data permit one would ideally use matched employer-employee datasets so as to take into account both firm- and individual-level characteristics. It is reasonable to expect foreign wage premium to be the outcome of firm-specific as well as employee-specific factors. These employee-specific characteristics, as a proxy for human capital, include gender, age, ethnicity, education, skills, disability and work experience etc., all of which have been traditionally found to influence wage premium/returns to education in the labour-economics oriented literature (Murphy and Welch, 1990; Harmon and Walker, 1995; Blundell et al., 2005). Therefore, the incorporation of information on human capital into firm-level data would allow the examination of whether there exists a wage premium for an employee (with a given level of human capital), rather than average observed higher wages in an acquired firm. However, such (matched) datasets are usually not readily available for analysis.

2.66 As in the evaluation of the productivity/profitability/employment effect, another frequently encountered issue is potential selection bias. In essence, firms acquired by foreign MNEs may pay higher wages simply because these firms paid higher wages prior to acquisition; unobserved firm-specific characteristics (such as technology, and absorptive capacity) as well as employee-level ability (i.e. education, skills) could well be contributing to a wage premium prior to acquisition (and thus determining foreign acquisition decisions) whilst exerting a further influence on the wage premium in the years following acquisition.

2.67 As to the empirical evidence on the wage premium paid in foreign subsidiaries post acquisition, a number of studies have provided support for this proposition (e.g. Conyon et al., 2002a and Girma and Görg, 2004, using UK data; Martins, 2004, using Portuguese data; Heyman et al., 2007, for Swedish private sector; Csengodi et al., 2008, for Hungarian manufacturing sector). Interestingly, despite confirming a wage premium paid by foreign affiliates, both Martins (2004) and Heyman et al. (2007) also found that foreign wage growth seemed to be lower (than in non-acquired firms). Csengodi et al. (2008) examined matched employee-employer data for a ten-year period and revealed a nonlinear wage premium profile pre- and post- foreign acquisition – that is, there was a hike in the wage premium during the takeover year, which was then followed by a more gradual increase thereafter. They argued this non-linear effect was in line with a rent-sharing view stemming from the productivity/efficiency gains from laying off workers; the wage premium only started to see a discernible rise in the long-run.

2.68 In contrast to Martins' findings, using Portuguese firm and individual level data, Almeida (2007) failed to find any significant impact of foreign acquisition on average wages. Likewise, Andrews et al. (2007) studied German employee-employer matched data, and based on difference-in-difference estimation results, they showed that foreign affiliates did not reward more highly-skilled occupations or better qualified individuals.

2.69 However, this wage effect of foreign acquisition should not be considered in isolation; rather it has been emphasised in the literature that this relationship is contingent on a number of other firm/individual-specific factors which might also have an influence over wages (e.g. analytical unit, productivity, human capital, nationality of ownership etc.). Above all, as discussed before, unit of analysis (i.e. firm vs. individual worker) has been recognised as important in affecting the wage-ownership nexus. For instance, it was revealed in Heyman et al. (2007) that there was a considerable discrepancy in the results obtained using firm-level and individual-level data. More specifically, firm-level results lead to an upward bias in the foreign wage premium estimates (due to the differing size distributions of foreign and domestically owned firms). Secondly, based on UK manufacturing data from the OneSource database (1989-1994), Conyon et al. (2002a) found that foreign subsidiaries paid on average 3.4% higher wages than in domestic firms; moreover, this wage premium appeared to be mirroring the productivity advantage of the foreign firms (i.e. when productivity was controlled for, wage gains post-acquisition disappeared). Similar results have also been shown by Girma and Görg (2004) in another study for the UK.

2.70 The foreign wage premium is also found to be dependent on the nationality of the owners. Conyon et al. (2002a), for example, used UK data to show that post acquisition wages rose in firms acquired by foreign owners; whereas wages fell in firms acquired by domestic owners, who were argued to exploit the opportunity to transfer surplus from the workforce. Similar results were found by Lipsey and Sjoholm (2004) for M&As taking place in the Indonesian manufacturing sector. Using UK establishment data from the ARD for the period 1980-1994, Girma and Gorg (2007) also found a considerable growth in the wage rate following takeovers by US firms; whereas there was no discernable effect found for acquisitions by EU firms (but there were positive effects for unskilled workers from acquisitions by MNEs from the rest of the world).

2.71 Last but not the least, human capital measures have also been stressed in a number of studies (utilising information on both the firm and its workforce) to condition the foreign wage premium following an acquisition. For instance, using panel data for Indonesian establishments, Lipsey and Sjoholm (2003) showed that foreign-owned establishments paid 10% more for blue-collar workers and 21% more for white-collar workers (vis-à-vis domestically owned establishments). In a study of the wage and skill effects of foreign acquisition in Portugal, Almeida (2007) showed post-acquisition wage growth was higher for highly educated workers (i.e. 4%), relative to a growth rate of 2% for those with a low-level of education. Görg and Girma (2007) showed for the UK that US subsidiaries paid a significant wage premium for highly skilled workers directly after takeover, but that wage premium emerged only two years after takeover for unskilled workers. Furthermore, Huttunen (2007) also found for Finnish plants that the size of the positive wage effects in foreign affiliates increased with the level of schooling of the workforce, which only started to increase within one to three years post-acquisition. Finally, for

Hungary, Csengodi and Urban (2008) were able to show that in post-acquisition years, the foreign wage premium only increased for workers with a low/medium level of education and for blue-collar and white-collar low-skilled workers but not for workers, with a high level of education or white-collar high-skilled workers.

Summary and conclusions

2.72 The key points that emerge from this review of the literature, that are particularly important for the rest of this report, are as follows. Firstly, there is no overwhelming consensus on whether 'cherry-picking' (versus 'lemons buying') occurs with respect to the productivity levels of plants/firms pre-acquisition. The latter is likely to vary by sector, country, and time-period. However, foreign acquisition was generally found to exert more of a positive and significant impact on the acquired firm's post-takeover productivity.

2.73 The literature generally expect to find a negative relationship between foreign M&A activity and profitability; there is some evidence that foreign acquirers cherry-picked more profitable domestic targets, but there is mixed evidence on the post-acquisition impact.

2.74 The empirical evidence on the probability of plant closure following acquisition by a foreign-owned company is almost universally that it increases significantly.

2.75 Foreign-owned firms seem more likely to target firms that are already similar in size to existing (relatively large) foreign affiliates, while most studies have found foreign M&As have a negative effect on employment in acquired firm over time.

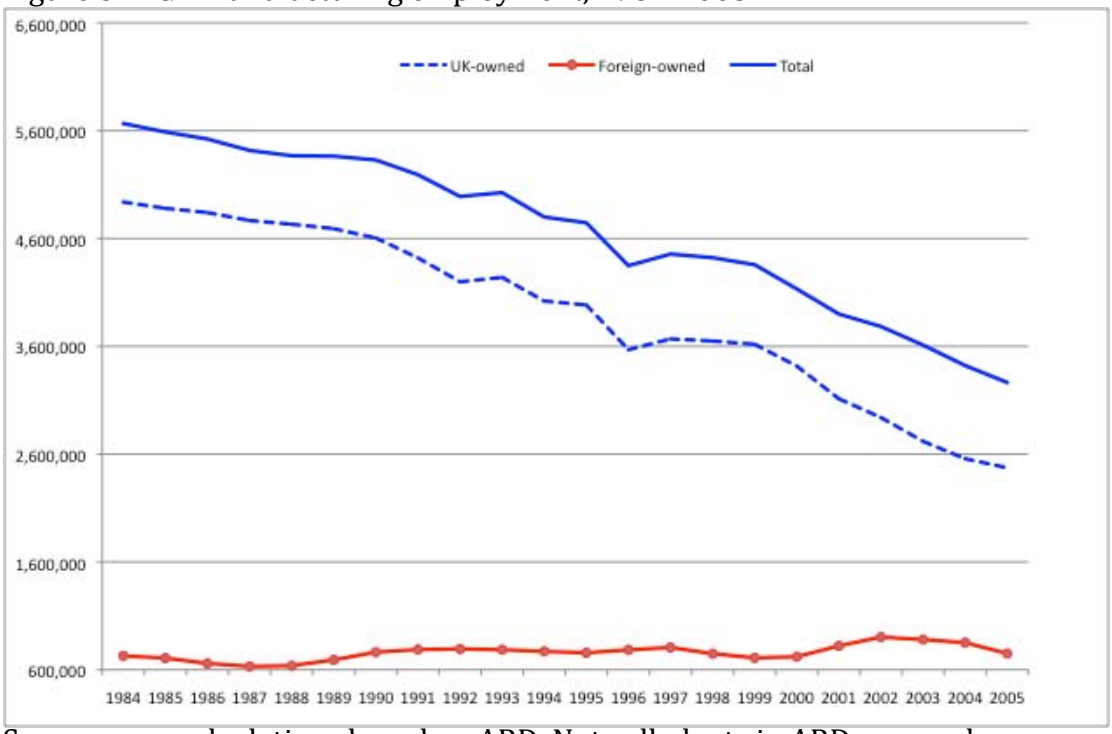
2.76 Foreign subsidiaries pay higher wages vis-à-vis domestically owned firms, they seem more likely to select domestic firms for takeover that also pay higher wages, and a number of studies show that post-acquisition there is a further wage premium paid to workers. However, there were other studies that have found no significant impact of foreign acquisition on wages, while others note that any wage premiums appear to mirror the productivity advantage of the acquired firms.

[this page is blank to allow double-sided printing  Save Paper]

3. Overview of manufacturing data

3.1 To provide some important background information, this Chapter starts by considering the importance of the foreign-owned sector, and in particular whether employment and output has been (relatively) increasing in the subsidiaries of MNE's, and which sectors and regions have the highest input from foreign-owned plants. We then go on to compare brownfield and greenfield entry by MNE's in 1995-2000, to show the relative importance of these two types of investment, before considering differences in employment, capital-intensity, wage-rates, labour productivity, and price-cost margins for various sub-groups of plants that were in existence during 1995-2000. The latter exercise is in anticipation of the econometric modelling which is based on plants that existed in 1995-2000 but which operated during the full 1985-2005 period (i.e. we do not include plants that closed before 1995, nor plants that started post 2000).

Figure 3.1: GB manufacturing employment, 1984-2005



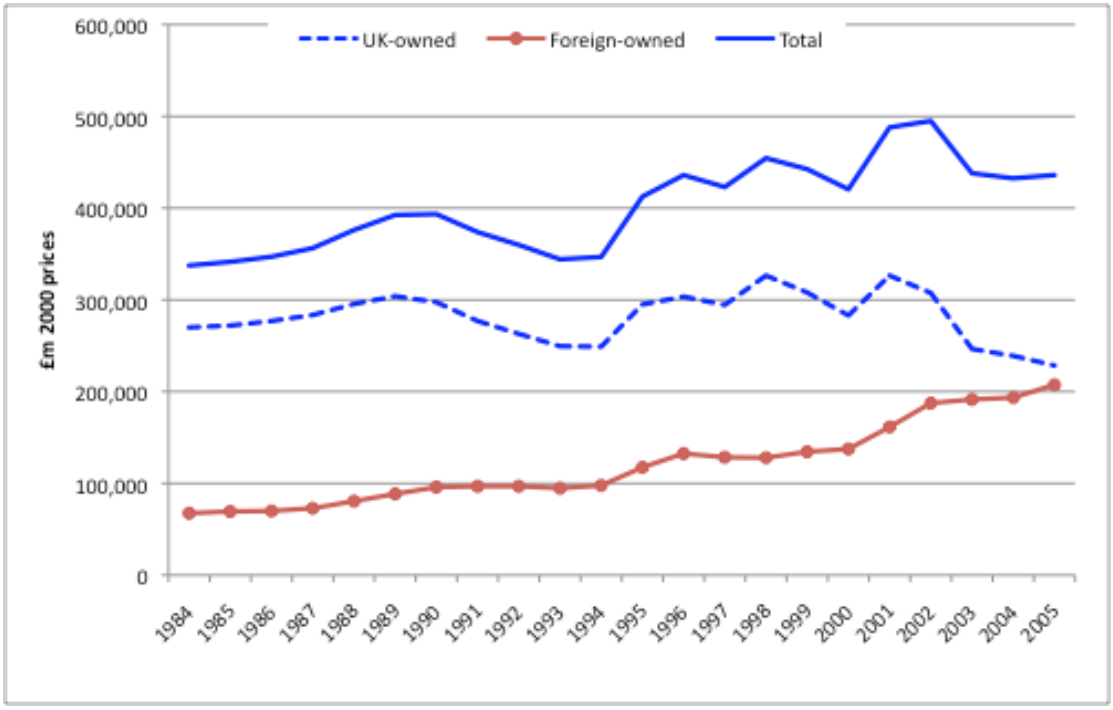
Source: own calculations based on ARD. Note all plants in ARD are used.

Importance of foreign-owned sector

3.2 In terms of employment, Figure 3.1 shows that employment in British manufacturing has followed a fairly steady downward path since 1984 (continuing a similar downward trend identified in Harris, 1999, Figure 3.1, for the 1973-1984 period). In contrast, employment in the foreign-owned

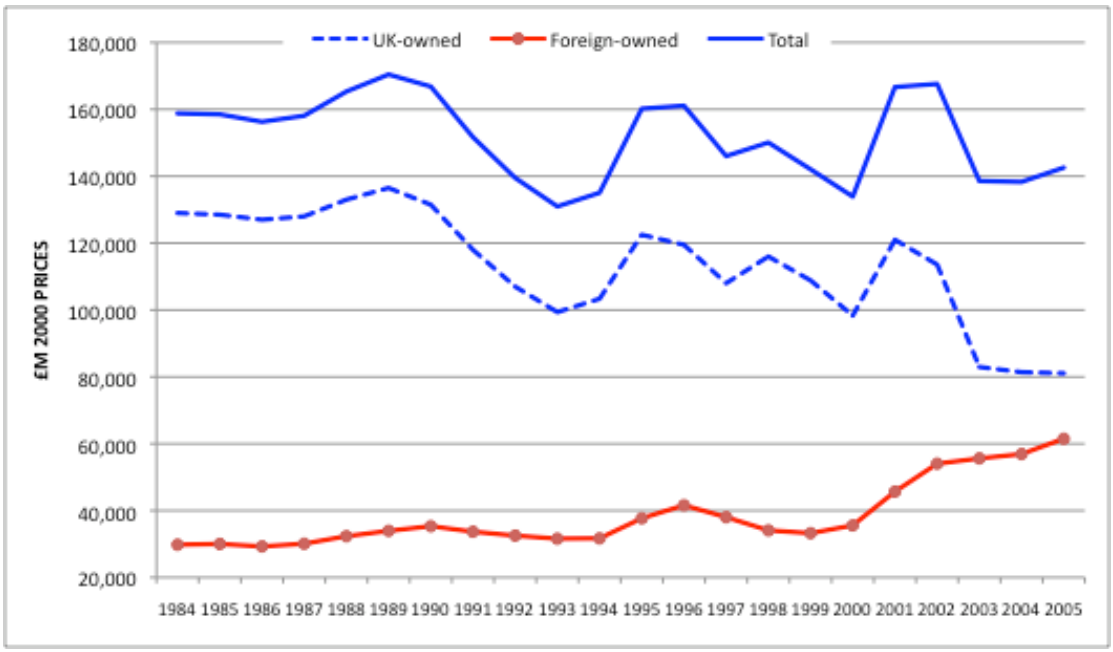
sector has been mostly stable around 750,000 employees (with a low of some 630,000 in 1987 and a high of 903,000 in 2002).

Figure 3.2: GB manufacturing gross output, 1984-2005



Source: own calculations based on (weighted) ARD

Figure 3.3: GB manufacturing gross value-added, 1984-2005

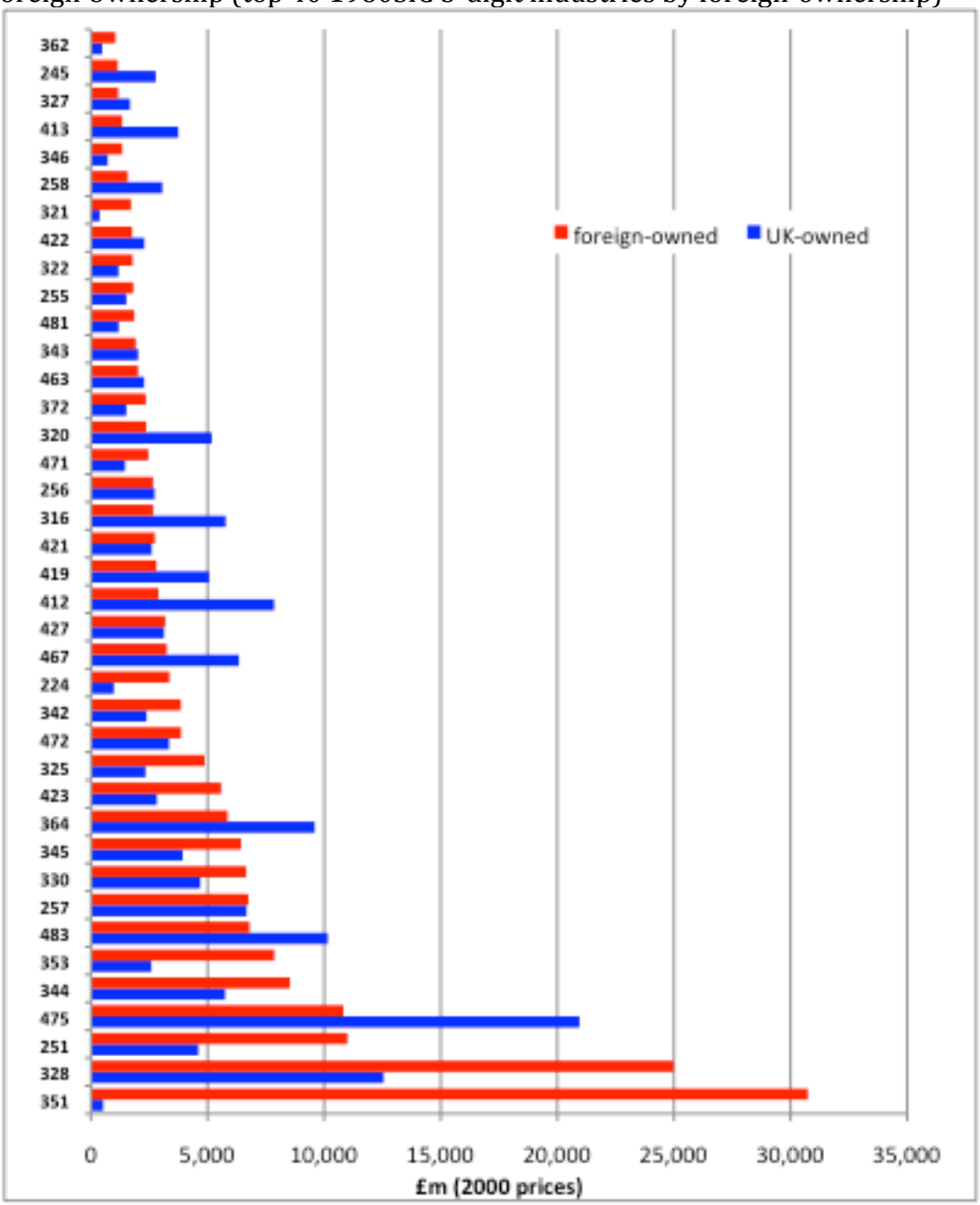


Source: own calculations based on (weighted) ARD

3.3 Analysis based on employment however hides the importance of inward FDI in terms of output. Figure 3.2 shows that while manufacturing

employment has been falling overall, the trend in gross output has been upwards.[20] This reflects increased capital- and intermediate-inputs intensity. This is especially true for the foreign-owned sector, which has grown by over 200% between 1984 and 2005 (the UK-owned sector was producing around 15% less in 2005 compared to 1984). Thus, by 2005 gross output levels in UK- and foreign-owned plants were almost the same.

Figure 3.4: Gross output in GB manufacturing, 2005: Ranked High to Low by Foreign Ownership (top 40 1980SIC 3-digit industries by foreign-ownership)

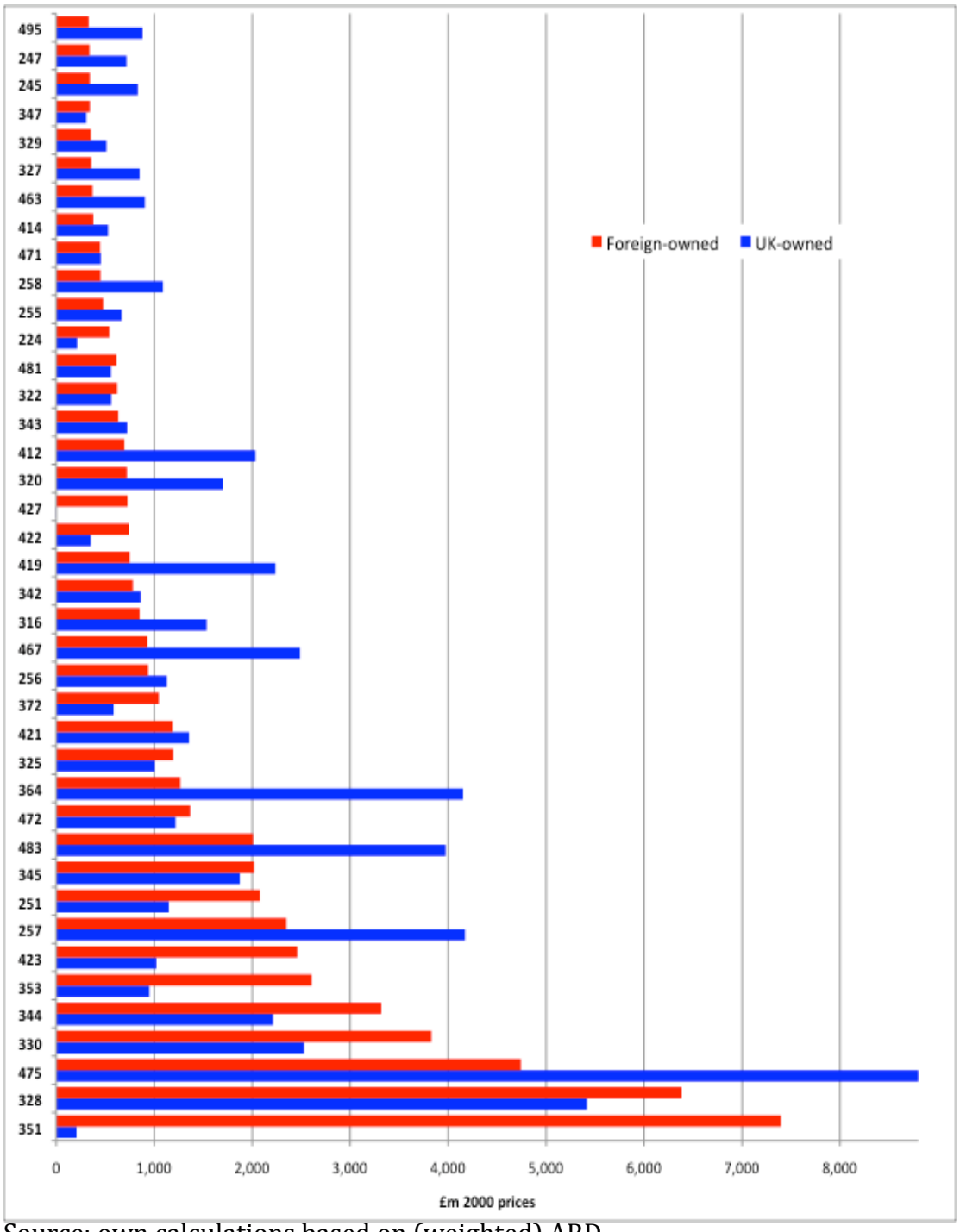


Source: own calculations based on (weighted) ARD

[20] Financial data in the ARD is based on a sample and therefore needs to weighted to reflect population totals (see Harris, 2005a, for details).

3.4 Based on gross valued-added statistics (where intermediate inputs are netted out), the conclusions reached are similar: UK-owned plants produced around 37% less GVA in 2005 compared to 1984, while GVA was over 100% higher in the foreign-owned sector. The greater difference in the foreign-owned sector between the results based on gross output and GVA is the greater use of intermediate inputs by the subsidiaries of MNE's.

Figure 3.5: Gross value-added in GB manufacturing, 2005: Ranked High to Low by Foreign Ownership (top 40 1980SIC 3-digit industries by foreign-ownership)



Source: own calculations based on (weighted) ARD

3.5 From the data produced in Figures 3.1 – 3.3, it can be concluded that foreign-owned plants have assumed much greater importance and look set to dominate British manufacturing in the near future. Thus, it is of interest to see in which sectors FDI plants typically locate. Figure 3.4 shows the sectors in which FDI presence (in terms of gross output in 2005) was greatest: motor vehicle & engines manufacturing had the highest level of FDI output (accounting for nearly £31b or 98% of total GB production), followed by office machinery and mechanical equipment (SIC328 under the 1980SIC), basic industrial chemicals (SIC251), printing & publishing (SIC475), telecommunications & electronic goods (SIC344), and motor vehicles parts (SIC353). In many of the top 40 sectors shown in Figure 3.1, foreign-owned plants produced more gross output than UK owned plants. However, the correlation between gross output in UK- and foreign-owned plants across all 80 3-digit manufacturing sectors was 0.48, suggesting that foreign-owned plants tended to concentrate in the same industries as UK-owned plants (although foreign-owned plants tend to locate more output in a smaller number of 3-digit SIC's[21]).

3.6 Figure 3.5 produces information on which industries had the highest levels of foreign-owned GVA; the picture is similar to that shown in Figure 3.4, with similar industries having the highest levels of FDI presence (e.g. motor vehicle & engines, office machinery and mechanical equipment, printing & publishing). The correlation between GVA in UK- and foreign-owned plants across all 80 3-digit manufacturing sectors was 0.61 (higher than the figure based on gross output), and both sub-sectors tended to concentrate similar relative levels of output in each 3-digit SIC.[22]

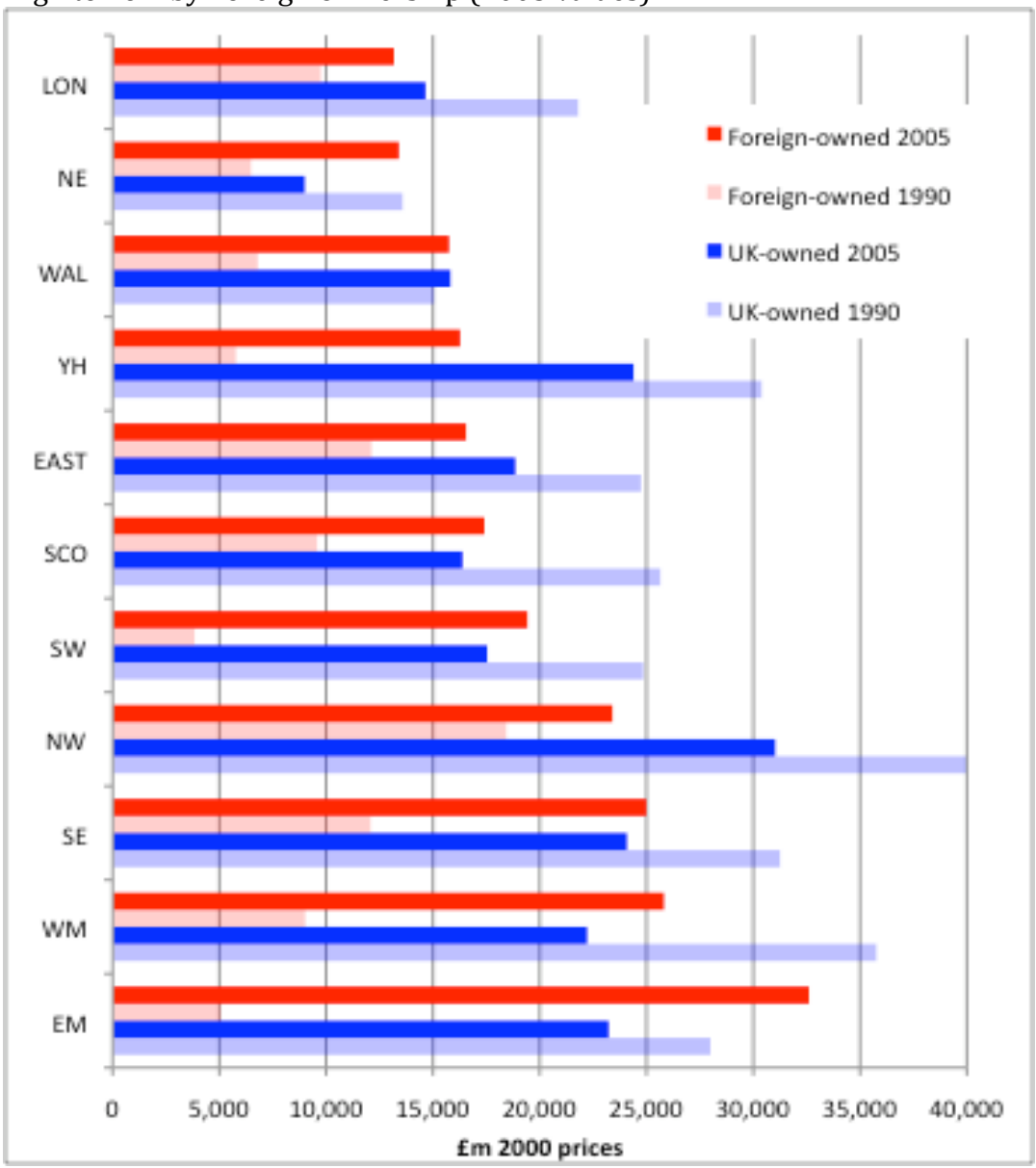
3.7 As to where FDI plants were located, Figures 3.6 and 3.7 rank gross output and GVA from lowest-to-highest across the government office regions of GB, for 1990 and 2005. Depending on whether intermediate inputs (which are relatively more important in the foreign-owned sector) are netted out of not, the regions with the highest levels of foreign-owned manufacturing output in 2005 were the East Midlands, the South East and West Midlands, while those with the lowest FDI presence were the North East, Wales and London. All regions saw an increase in FDI production (while UK-owned production declined between 1990 and 2005), but some saw relatively much larger gains which changed significantly the regional rankings between 1990 and 2005. For example, the region with the largest FDI presence in 1990 was the North West, but it only saw a modest increase in FDI output over the 15 years covered, so that by 2005 it had fallen to 4th-5th place in the regional rankings (depending on whether gross output or GVA is used to measure output). Similarly, the Eastern region slipped from 2nd-3rd to 7th-8th, while London went from 4th to 9th-11th. In contrast, the East Midlands went from second last to top of the regional league table, while

[21] A useful way to see this is to take the share of total manufacturing output for each 3-digit SIC, squaring each value and sum over all industries (and multiplying by 100) to obtain a Herfindahl-type index. The figure for foreign-owned plants is 4.2; the comparable figure for UK-owned plants is 2.8, indicating less concentration of output in a smaller number of industries.

[22] The Herfindahl-type indices were 3.7 and 4.6 respectively, for UK- and foreign-owned plants.

the South West also saw a significant increase from last to 4th-5th from the top.

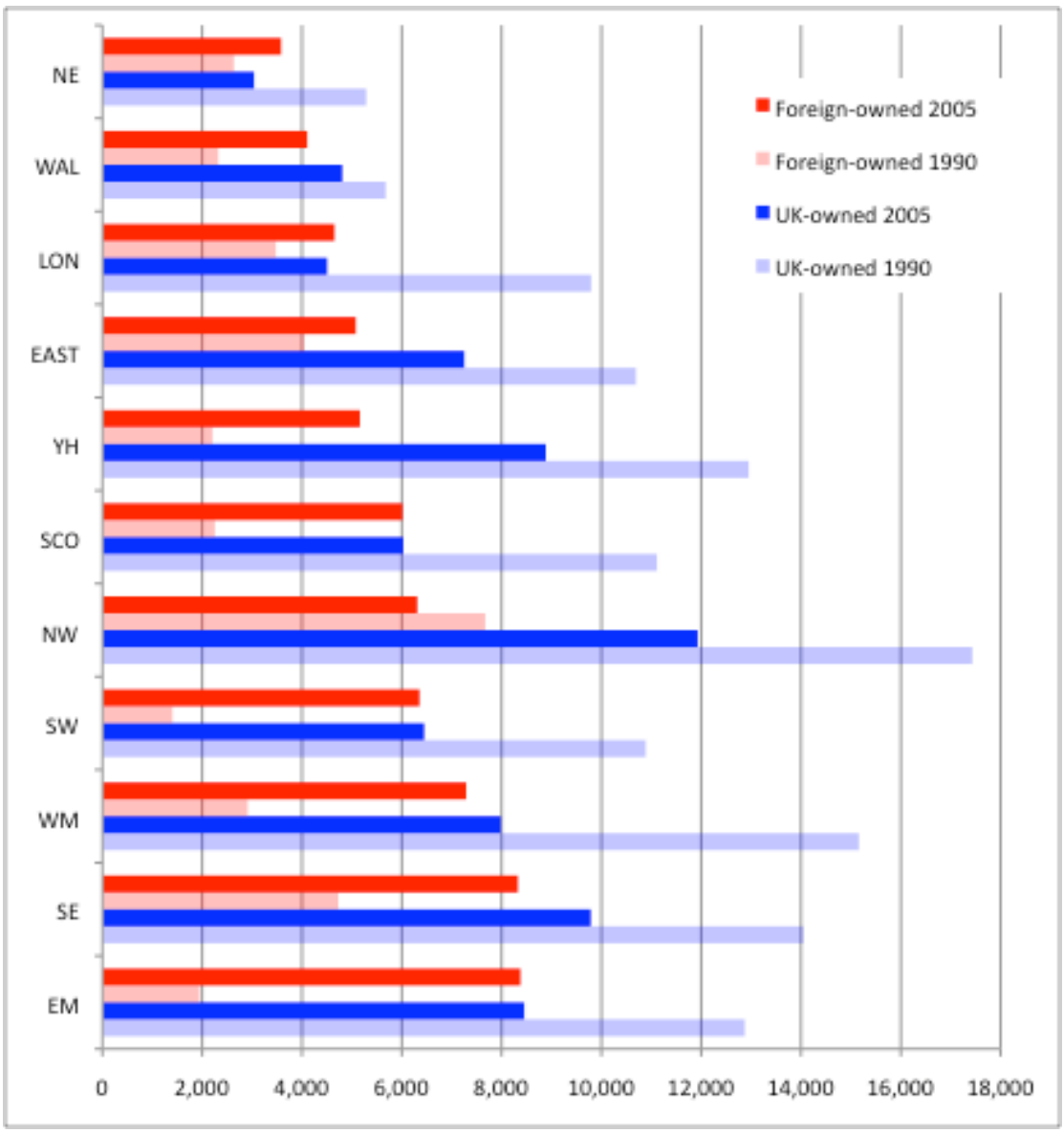
Figure 3.6 Gross output in GB manufacturing, 1990 and 2005, by region: Ranked High to Low by Foreign Ownership (2005 values)



Source: own calculations based on (weighted) ARD

3.8 In summary, the importance of inward FDI investment in manufacturing has increased significantly over 1984-2005, with foreign-owned plants overall accounting for almost as much gross output as UK-owned plants, and dominating output in certain industries and regions.

Figure 3.7 Gross value-added in GB manufacturing, 1990 and 2005, by region: Ranked High to Low by Foreign Ownership (2005 values)



Source: own calculations based on (weighted) ARD

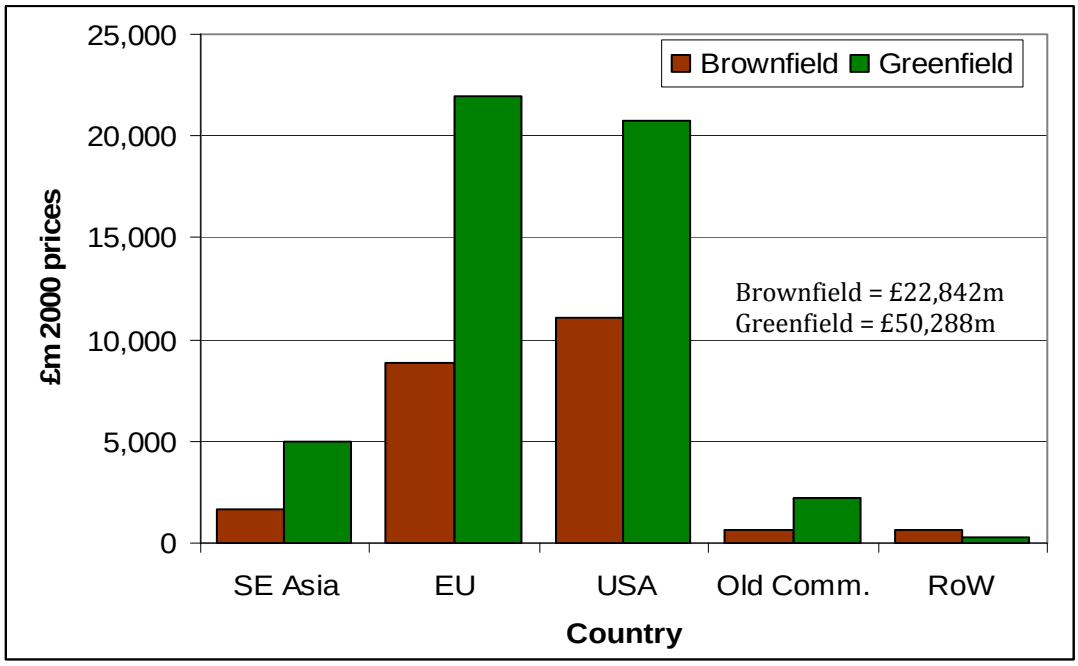
Entry by foreign-owned firms 1995-2000

3.9 In this sub-section, we shall look in more detail at the plants that were acquired by foreign-owned companies in 1995-2000. Firstly the manufacturing panel data was disaggregated into the following 8 sub-groups for analysis. Plants that were in operation between 1995-2000[23] were allocated to: (i) those that were sold by UK-owned companies to foreign-owned companies during 1995-2000; (ii) those that were sold by UK-owned companies to foreign-owned companies during 1985-1994 and

[23] Thus we omit plants that closed before 1995 and those that opened after 2000.

were operating in 1995-2000; (iii) plants that were foreign-owned brownfield plants during 1984-2000 (i.e. they were not acquired from UK-owned companies during this period); (iv) UK-owned plants that belonged to UK-owned companies that sold plants to the foreign-owned sector between 1995-2000; (v) UK-owned plants that belonged to UK-owned companies that did *not* sell plants to the foreign-owned sector between 1995-2000; (vi) those that were UK-owned single-plant enterprises between 1995-2000; (vii) plants that changed owner more than once during 1985-2000; and (viii) plants that were started during 1985-2000 as greenfield foreign-owned plants that did not change their ownership status between 1985-2000.[24] Note, including sub-group (vii) reallocated a number of plants that initially could have belonged to other sub-groups (e.g. (i) – (iii)); for example, this sub-group includes most of the plants that were in the FO-to-FO sub-group in Table 1.2.

Figure 3.8: Total real gross output by country (and type) of origin, 1995-2000, in GB manufacturing



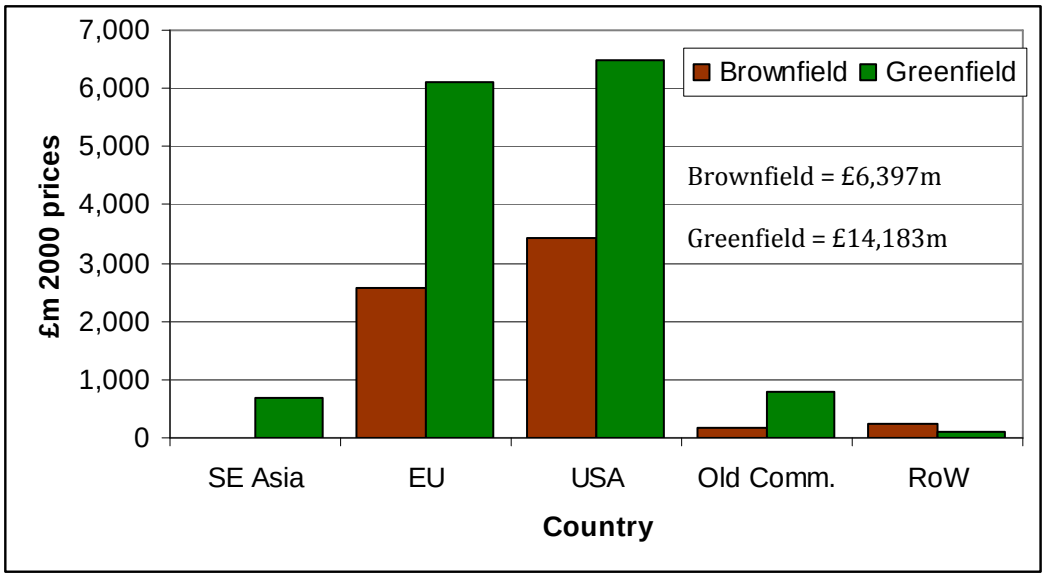
Note: Brownfield = existing UK plants sold to foreign-owned sector during 1995-2000
Greenfield = new plants set-up by foreign-owned firms 1995-2000 (no change of status 1995-2000)
Source: own calculations based on (weighted) ARD

3.10 Figure 3.8 shows the total gross output associated with sub-groups (i) and (viii) in the year in which acquisition or entry occurred, by the country of origin (SE Asia comprises Japan, Taiwan, Hong Kong, South Korea and Malaysia; the Old Commonwealth countries are Australia, Canada, New

[24] Note, there are a small number of other UK-owned plants that are not covered by any of the 8 sub-groups; these mostly comprise plants that were in the UK-to-UK acquired and FO-to-UK acquired categories outlined in section 1.

Zealand and South Africa). Firstly, investment by overseas MNE's in greenfield entry resulted in output that was over twice as large as gross output from previously UK-owned plants that were acquired. EU greenfield plants produced the most output on entry, followed closely by US-owned plants. Output in US brownfield acquisitions exceeded that of EU acquired plants, while SE Asian plants were the third major source of output.

Figure 3.9: Total real gross value-added by country (and type) of origin, 1995-2000, in GB manufacturing

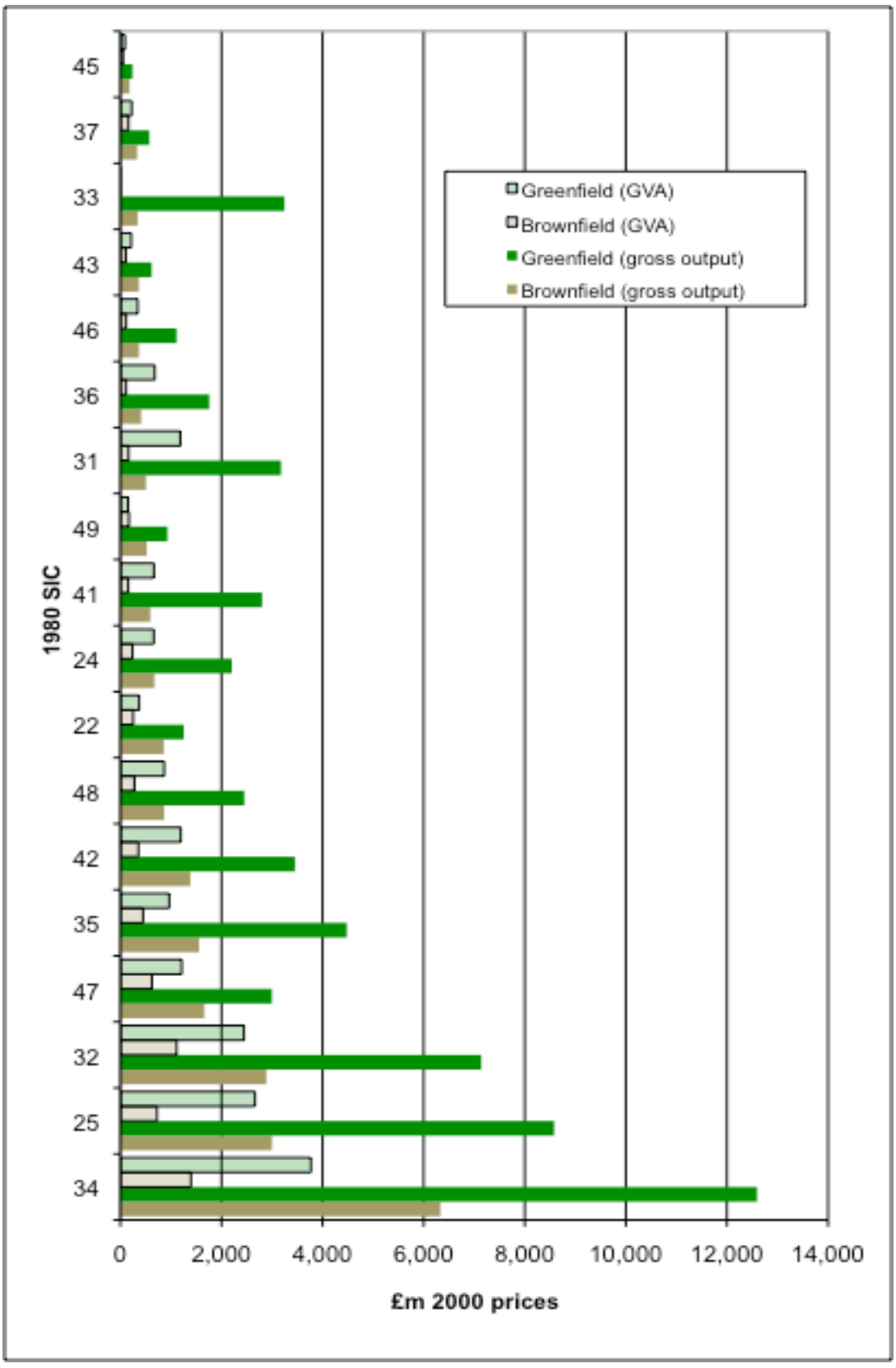


Note: see Figure 3.8

3.11 Figure 3.9 provides a similar profile for output measured by gross value-added, although GVA for SE Asian plants was relatively small after netting out intermediate inputs. This is especially the case for SE Asian brownfield plants.

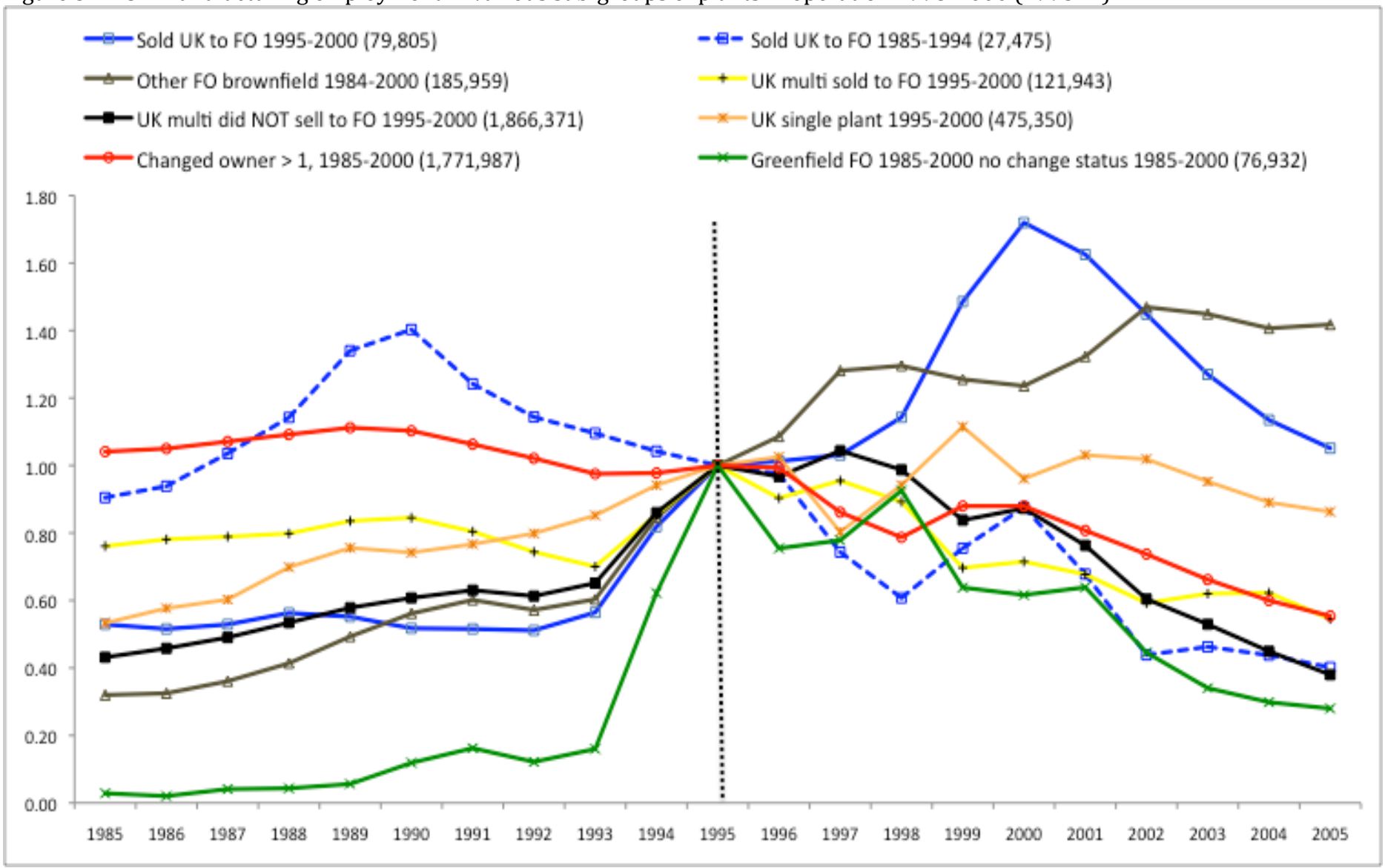
3.12 As to which industries dominated, Figure 3.10 shows that acquisitions and greenfield investment were particularly concentrated in electrical and electronic engineering (SIC34 under the SIC80 classification), chemicals (SIC25), and mechanical engineering (SIC32). In all, these three industries accounted for around 50% of gross output and GVA, for both brownfield and greenfield investments. In motor vehicles manufacturing (SIC35), food, drink & tobacco (SIC41), metals goods (SIC31) and office machinery (SIC33), greenfield plants produced considerably more output than did brownfield acquisitions.

Figure 3.10: Total real gross output and gross value-added by 1980 SIC 2-digit industry, 1995-2000, in GB manufacturing (ranked by brownfield gross output)



Note: see Figure 3.9.

Figure 3.11 UK manufacturing employment in various sub-groups of plants in operation 1995-2000 (1995=1)



Source: own calculations based on the *ARD*. Figures in parenthesis are 1995 employment values

Economic differences across various sub-groups

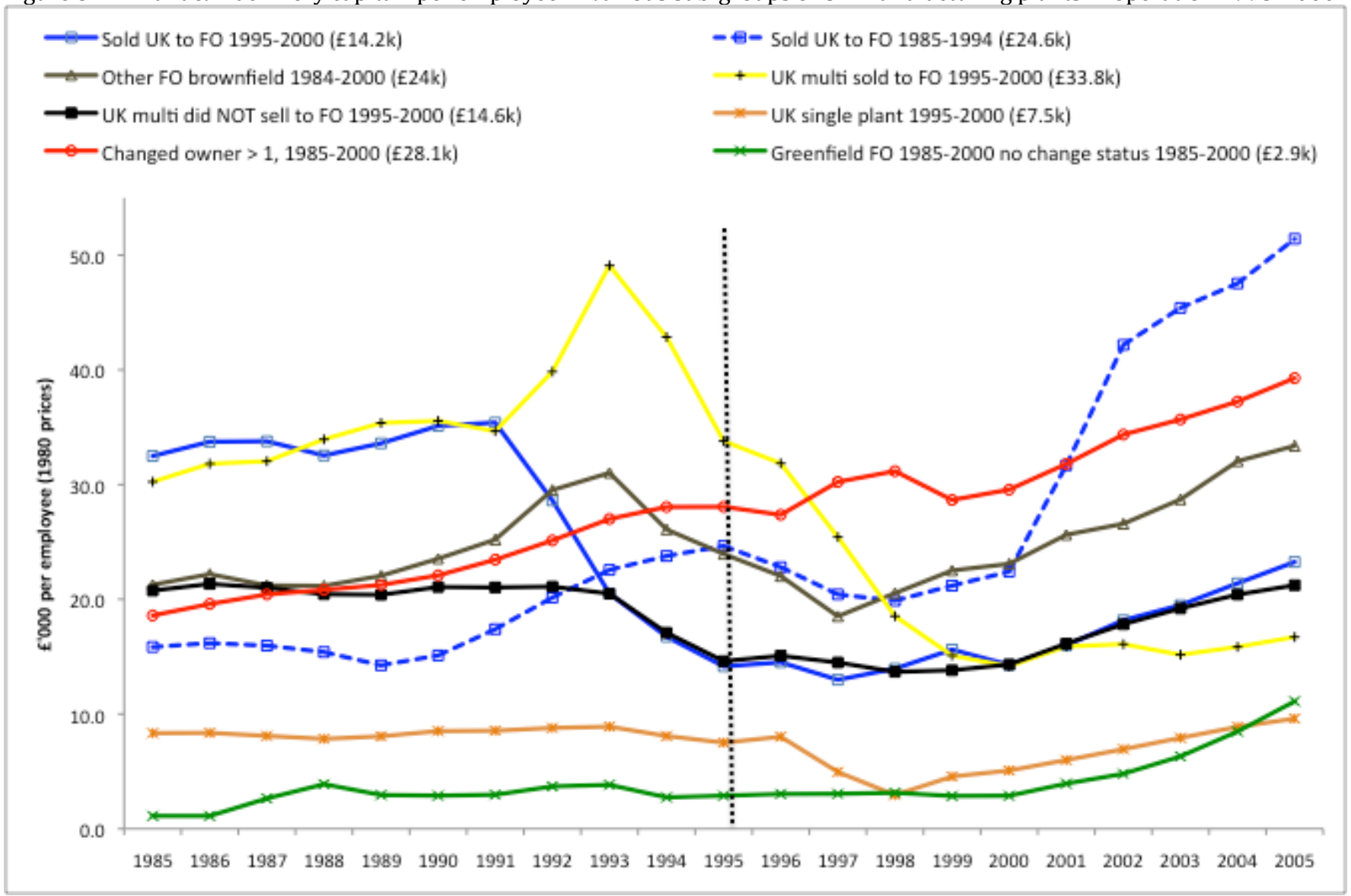
3.13 Lastly in this section UK-owned plants that were acquired by foreign-owned companies are compared with the other 7 sub-groups that together comprise almost the population of plants in the *ARD* that operated during 1995-2000. Comparisons will also include the 10 years before the first wave of acquisitions in 1995, as well as the post-acquisition period from 2001-2005.

3.14 Figure 3.11 plots relative employment for the 8 sub-groups (based on 1995 = 1). There is some evidence that employment in those plants sold by UK companies to the foreign-owned sector during 1995-2000 saw little growth until two years prior to acquisition, and then experienced rapid growth including in the acquisition period (as more plants were added to this sub-group), before substantially declining in size in the post-acquisition period. (Plants sold to the foreign-owned sector during 1985-1994 have a similar profile, but peaking 5 years earlier.) Similar patterns are found in several other sub-groups but without the rapid increase in employment 1995-2000 (since these other plants were not subject to acquisition – e.g. the UK single plant sub-group – or a significantly smaller level of acquisition – such as the two UK multi-plant sub-groups), with greenfield entry by foreign-owned plants showing the most exaggerated build-up in employment up to 1995. The exceptions were plants that experienced more than one change in ownership between 1985-2000, which had fairly stable employment up to 1995, but like most other sub-groups saw a decline in employment levels post-1995 (similar to the overall decline in manufacturing employment shown in Figure 3.1); and 'other FO brownfield' sub-group, which experienced positive growth for most of the 1985-2005 period.

3.15 Generally, Figure 3.11 does not suggest that new foreign-owned acquisitions, nor brownfield new starts, experienced stable employment post-entry; only brownfield foreign-owned plants that were not subject to changes of ownership did well in employment terms.

3.16 As to the level of capital intensity, Figure 3.12 shows that for most sub-groups capital-per-employee was increasing over time (with a temporary decline during 1993 to around 1996 for some). The exceptions are plants that belonged to UK multi-plant enterprises that sold plants to the foreign-owned sector between 1995-2000, where there was a significant decline in intensity post 1993 without any recovery; and plants sold by UK companies to the foreign-owned sector during 1995-2000, where capital intensity declines 4 years before acquisition but stabilises thereafter. For the latter sub-group, some of the fall in capital intensity may be associated with the build-up of employment prior to acquisition (cf. Figure 3.11), but this does not explain the large fall in intensity for the 1992-93 period.

Figure 3.12: Plant & machinery capital* per employee in various sub-groups of UK manufacturing plants in operation 1995-2000



* Plant & machinery capital stock plus hire of plant and machinery. Figures in parenthesis are 1995 average values.
Source: own calculations based on the (weighted) *ARD*.

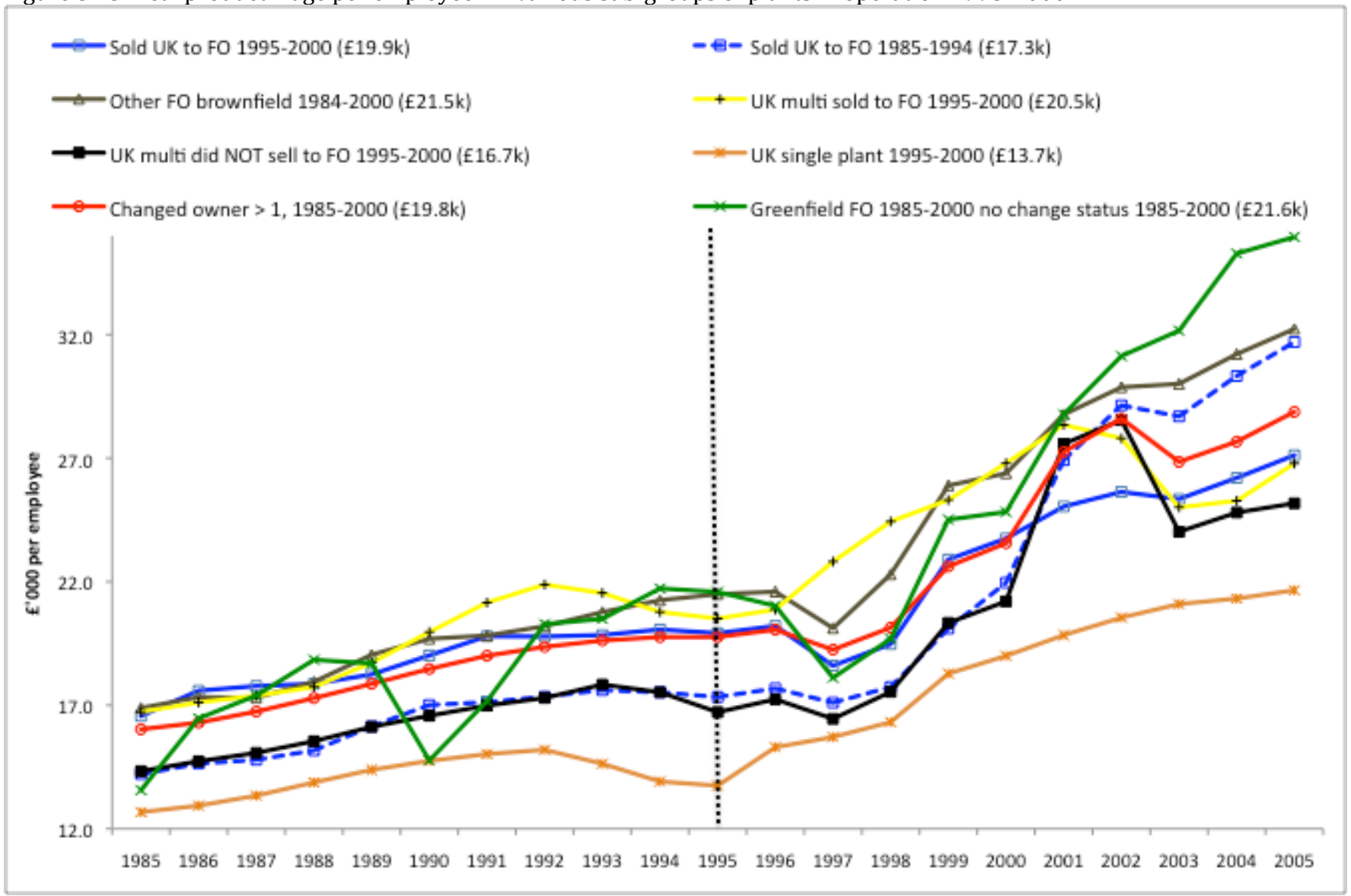
3.17 The sub-groups with the lowest levels of capital intensity were (as expected) UK-owned single plant enterprises, and greenfield foreign-owned plants (which is unexpected). Two points can be made about the latter sub-group: firstly, there is likely to be significant under-reporting of pre-production gross investment in the *ARD* (in most years the number of plants recording any pre-production investment are less than 130, while there were on average over 640 greenfield plants set-up by foreign-owned firms each year during the period covered). This will bias down the true value of the plant & machinery capital stock, by an unknown amount. The second point is that these greenfield plants did not change their status before 2000, and after this date there is a substantial increase in capital intensity (as shown in Figure 3.12) which coincides with some of these plants being acquired by other companies. In all, this suggests that while the absolute level of the capital stock may be under-estimated, the growth in capital is probably (much) more accurate.

3.18 As to differences in wage rates, Figure 3.13 shows that generally foreign-owned plants paid higher average wages (this is likely to be both because of a higher skill-mix but also because they want to attract the best workers and minimise employee turnover), and that real wages were increasing from the mid-1990's onwards (especially in greenfield foreign-owned plants). The lowest wage rates were in UK single plant enterprises, followed by plants belonging to UK multi-plant enterprises that did not sell to the foreign-owned sector during 1995-2000. UK enterprises that did sell to the foreign-owned sector paid significantly higher wages, although there was a substantial decline post-2002 leaving this sub-group in 2005 with lower wage rates than most other plants linked in various ways to foreign-ownership.

3.19 Figure 3.14 shows labour productivity differences across the sub-groups, based on gross output. There is a similar pattern to that seen in Figure 3.13, for wage rates, with the lowest levels of productivity in UK single plant firms and plants belonging to UK multi-plant enterprises that did not sell to the foreign-owned sector during 1995-2000. The other sub-groups are linked to foreign-ownership in various ways, and these plants tended to have higher productivity that was growing at a faster rate throughout. The sub-group of particular interest here (plants sold by UK companies to the foreign-owned sector during 1995-2000) tended to have productivity levels towards the bottom of the sub-groups comprising of foreign-owned plants.

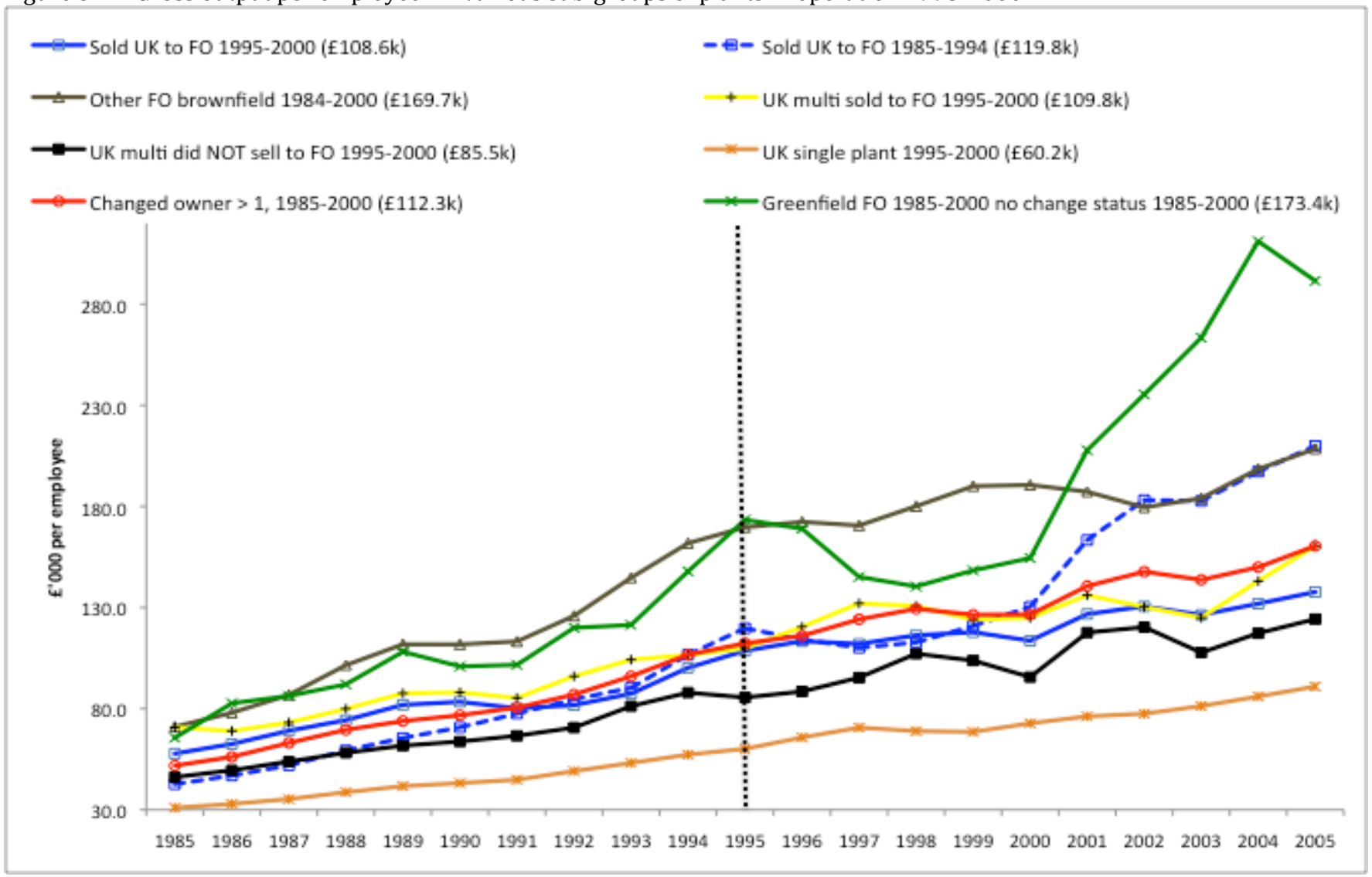
3.20 Figure 3.15 (based on GVA) provides a similar picture on productivity, although there is much more change in the average values over time. However, the overall rankings of the various sub-groups are similar, except that there is some evidence that those plants sold by UK companies to the foreign-owned sector during 1995-2000 experienced relatively weaker labour productivity post-acquisition.

Figure 3.13: Real product wage per employee* in various sub-groups of plants in operation 1995-2000



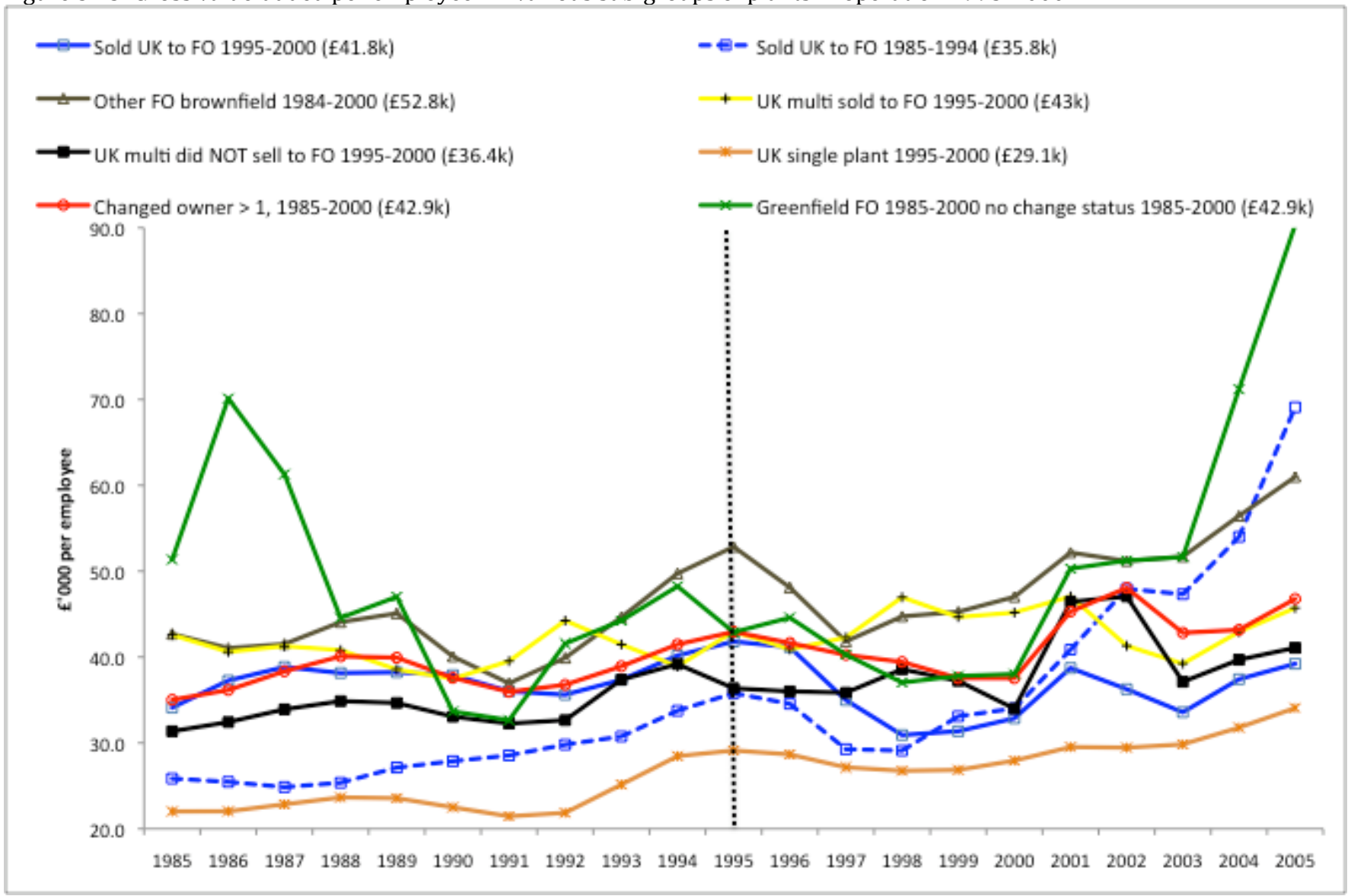
* Figures in parenthesis are 1995 average values.
Source: own calculations based on the (weighted) *ARD*.

Figure 3.14: Gross output per employee* in various sub-groups of plants in operation 1995-2000



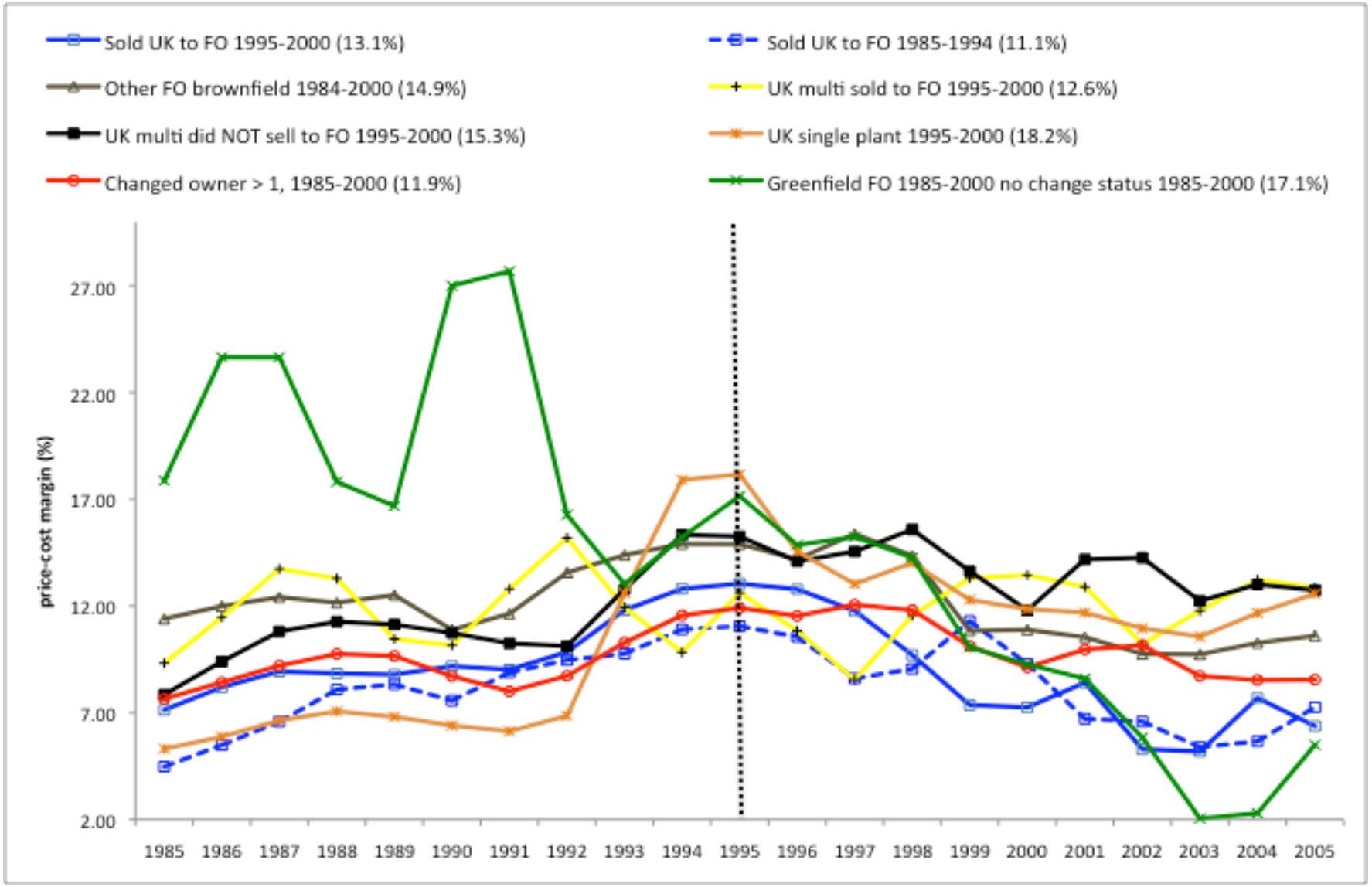
* Figures in parenthesis are 1995 average values.
Source: own calculations based on the (weighted) *ARD*.

Figure 3.15: Gross value-added per employee* in various sub-groups of plants in operation 1995-2000



* Figures in parenthesis are 1995 average values.
Source: own calculations based on the (weighted) *ARD*.

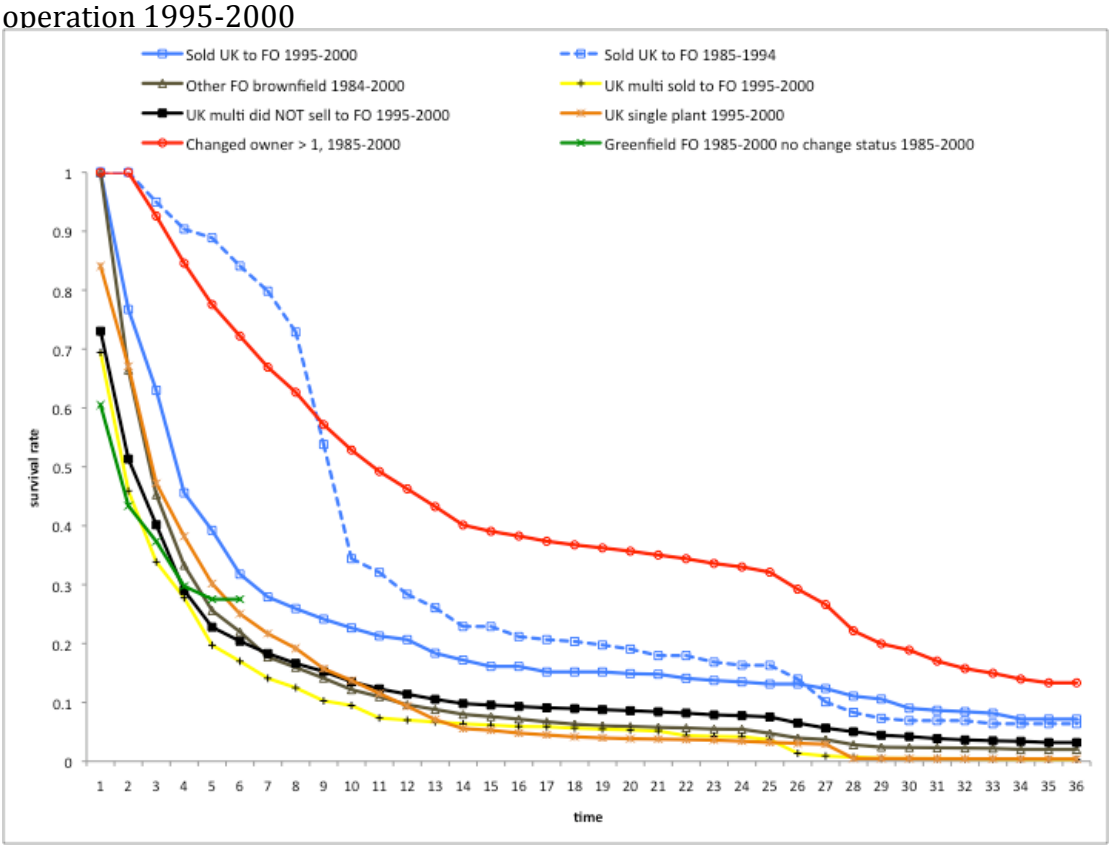
Figure 3.16: Price-cost margin* in various sub-groups of plants in operation 1995-2000



* Figures in parenthesis are 1995 average values.
Source: own calculations based on the (weighted) *ARD*.

3.21 Figure 3.16 provides information on price-cost margins,[25] i.e., the profitability of each sub-group. In comparison to productivity and wage rates, by the end of the period covered there is evidence that suggests foreign-owned plants had lower (and declining) profitability, while plants belonging to UK multi-plant enterprises and UK single plant enterprises had relatively high price-cost margins. However, this may not be an accurate indication of long-run profitability, but may be associated with higher short-run fixed costs of production following acquisitions and the establishment of new plants.

Figure 3.17: Kaplan-Meier Hazard rates in various sub-groups of plants in operation 1995-2000



Source: own calculations based on (weighted) *ARD*.

3.22 Lastly, Figure 3.17 shows the hazard rates of plant closures for the various sub-groups considered. Plants that changed owner more than once between 1985-2000, followed by plants sold by UK companies to the foreign-owned sector during 1985-1994 and 1995-2000, had the lowest hazard rates of closure. Initially plants belonging to UK multi-plant enterprises have higher probabilities of closure in the initial years following opening, than do UK-owned single plant enterprises, but by the

[25] Defined as gross operating surplus (gross value-added minus total labour costs) minus an estimate of the cost of capital services, all divided by gross-output [i.e. (pY-cY)/pY = (p – c)/p, where *c* is marginal costs].

9th year after opening single-plant firms have a greater likelihood of closing. Greenfield foreign-owned plants have the highest initial rate of closure, but this is somewhat misleading as these plants are only observed for a much shorter period of time compared to other plants (this also explains the reason why they only feature on the diagram for around 6 years after birth). However, it may well be that this sub-group is more prone to closure, and this will need to be tested using a Cox proportional hazard model which controls for covariates (which show how other effects shift plants away from the baseline hazard rate of closure).

Summary and conclusions for manufacturing

3.23 Employment in UK-owned manufacturing has followed a fairly steady downward path since 1984 while employment in the foreign-owned sector has been mostly stable around 750,000 employees (with a low of some 630,000 in 1987 and a high of 903,000 in 2002).

3.24 In terms of gross output, the foreign-owned sector grew by over 200% between 1984 and 2005 (the UK-owned sector was producing around 15% less in 2005 compared to 1984). Thus, by 2005 gross output levels in UK- and foreign-owned plants were almost the same. Based on gross valued-added statistics (where intermediate inputs are netted out), the conclusions reached are similar: UK-owned plants produced around 37% less GVA in 2005 compared 1984, while GVA was over 100% higher in the foreign-owned sector. Thus it can be concluded that foreign-owned plants have assumed much greater importance and look set to dominate British manufacturing in the near future.

3.25 In terms of which sectors do FDI plants typically locate. Based on gross output in 2005 the industries with the greatest FO presence were: motor vehicle & engines manufacturing, followed by office machinery and mechanical equipment, basic industrial chemicals, printing & publishing, telecommunications & electronic goods, and motor vehicles parts. Moreover, foreign-owned plants tended to concentrate in the same industries as UK-owned plants (although foreign-owned plants tend to locate more output in a smaller number of industries). Based on GVA, the picture is similar.

3.26 The regions with the highest levels of foreign-owned manufacturing output in 2005 were the East Midlands, the South East and West Midlands, while those with the lowest FDI presence were the North East, Wales and London. All regions saw an increase in FDI production (while UK-owned production declined between 1990 and 2005). However, the region with the largest FDI presence in 1990 was the North West, but by 2005 it had fallen to 4th-5th place in the regional rankings (depending on whether gross output or GVA is used to measure output). Similarly, the Eastern region slipped from 2nd-3rd to 7th-8th, while London went from 4th to 9th-11th. In contrast, the East Midlands went from second last to top of the regional

league table, while the South West also saw a significant increase from last to 4th-5th from the top.

3.27 During 1995-2000, investment by overseas MNE's in greenfield entry resulted in output that was over twice as large as gross output from previously UK-owned plants that were acquired. EU greenfield plants produced the most output on entry, followed closely by US-owned plants. Output in US brownfield acquisitions exceeded that of EU acquired plants, while SE Asian plants were the third major source of output. Brownfield and greenfield investment were particularly concentrated in electrical and electronic engineering (SIC34 under the SIC80 classification), chemicals (SIC25), and mechanical engineering (SIC32). In all, these three industries accounted for around 50% of gross output and GVA, for both brownfield and greenfield investments.

3.28 Lastly in this section UK-owned plants that were acquired by foreign-owned companies are compared with 7 other sub-groups that together comprise almost the population of plants in the *ARD* that operated during 1995-2000. In terms of employment, there is some evidence that employment in those plants sold by UK companies to the foreign-owned sector during 1995-2000 experienced substantial declines in size in the post-acquisition period. Foreign-owned greenfield plants also saw a decline in employment. This does not suggest that new foreign-owned acquisitions, nor brownfield new starts, experienced stable employment post-entry; only brownfield foreign-owned plants that were not subject to changes of ownership did well in employment terms.

3.29 As to the level of capital intensity, for most sub-groups capital-per-employee was increasing over time. The sub-groups with the lowest levels of capital intensity were (as expected) UK-owned single plant enterprises, and greenfield foreign-owned plants (which is unexpected). Since there is likely to be significant under-reporting of pre-production gross investment in the *ARD* this will bias down the true value of the plant & machinery capital stock, by an unknown amount.

3.30 As to differences in wage rates, generally foreign-owned plants paid higher average wages, and real wages were increasing from the mid-1990's onwards (especially in greenfield foreign-owned plants). With regard to labour productivity differences across the sub-groups, based on gross output, the other sub-groups linked to foreign-ownership tended to have higher productivity that was growing at a faster rate throughout. However, plants sold by UK companies to the foreign-owned sector during 1995-2000 tended to have productivity levels towards the bottom of the sub-groups comprising of foreign-owned plants.

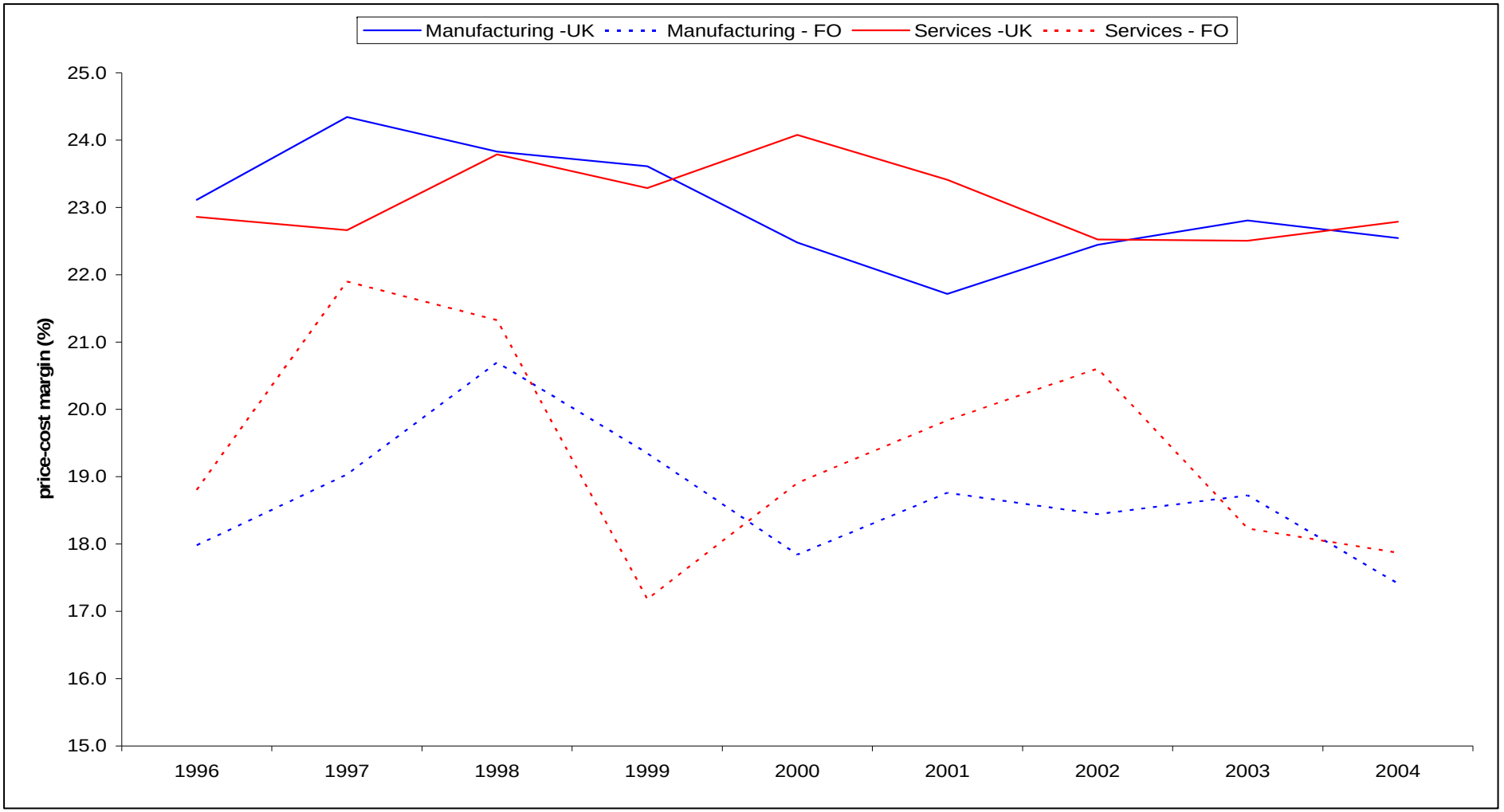
3.31 Based on GVA, there is some evidence that those plants sold by UK companies to the foreign-owned sector during 1995-2000 experienced relatively weaker labour productivity post-acquisition.

3.32 In terms of profitability, and in comparison to productivity and wage rates, by the end of the period covered there is evidence that suggests foreign-owned plants had lower (and declining) profitability, while plants

belonging to UK multi-plant enterprises and UK single plant enterprises had relatively high price-cost margins.

3.33 Lastly, in terms of the probability of closure, plants that changed owner more than once between 1985-2000, followed by plants sold by UK companies to the foreign-owned sector during 1985-1994 and 1995-2000, had the lowest hazard rates of closure. Greenfield foreign-owned plants had the highest initial rate of closure, but this is somewhat misleading as these plants are only observed for a much shorter period of time compared to other plants. However, it may well be that this sub-group is more prone to closure, and this will need to be tested using a Cox proportional hazard model which controls for covariates (which show how other effects shift plants away from the baseline hazard rate of closure).

Figure A3.1 Price-cost margin* in UK-and Foreign-owned firms 1996-2004[a]



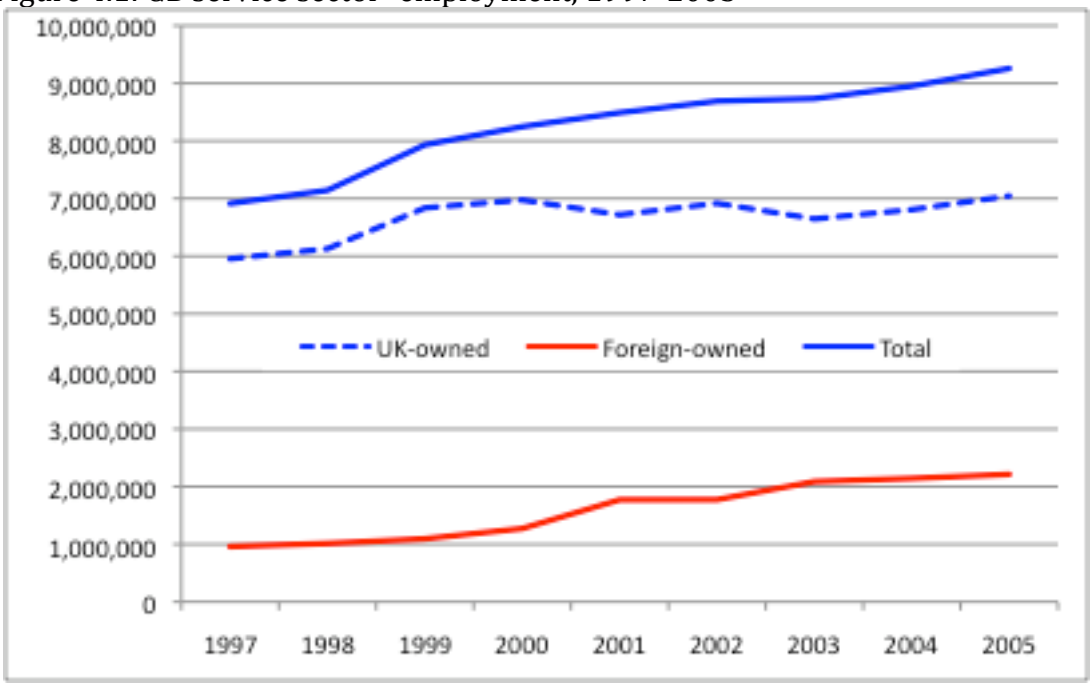
[a]Based on same industries used with ARD data. Weighted by ARD weights (see Harris and Li, 2007, for details). Source: FAME

[this page is blank to allow double-sided printing Save Paper]

4. Overview of service sector data

4.1 This section mirrors Chapter 3, except that it deals with those service sector industries covered in the project (Table 1.1). Thus we start by considering the importance of the foreign-owned sector, and in particular whether employment and output has been (relatively) increasing in the subsidiaries of MNE's, and which sectors and regions have the highest input from foreign-owned plants. We then go on to compare brownfield and greenfield entry by MNE's in 1998-2002, to show the relative important of these two types of investment, before considering differences in employment, capital-intensity, wage-rates, labour productivity, and price-cost margins for various sub-groups of plants that were in existence during 1998-2002. The latter exercise is in anticipation of the econometric modelling which is based on plants that existed in 1998-2002 but which operated during the full 1997-2005 period (i.e. we do not include plants that closed before 1998, nor plants that started post 2002).

Figure 4.1: GB service sector[a] employment, 1997-2005



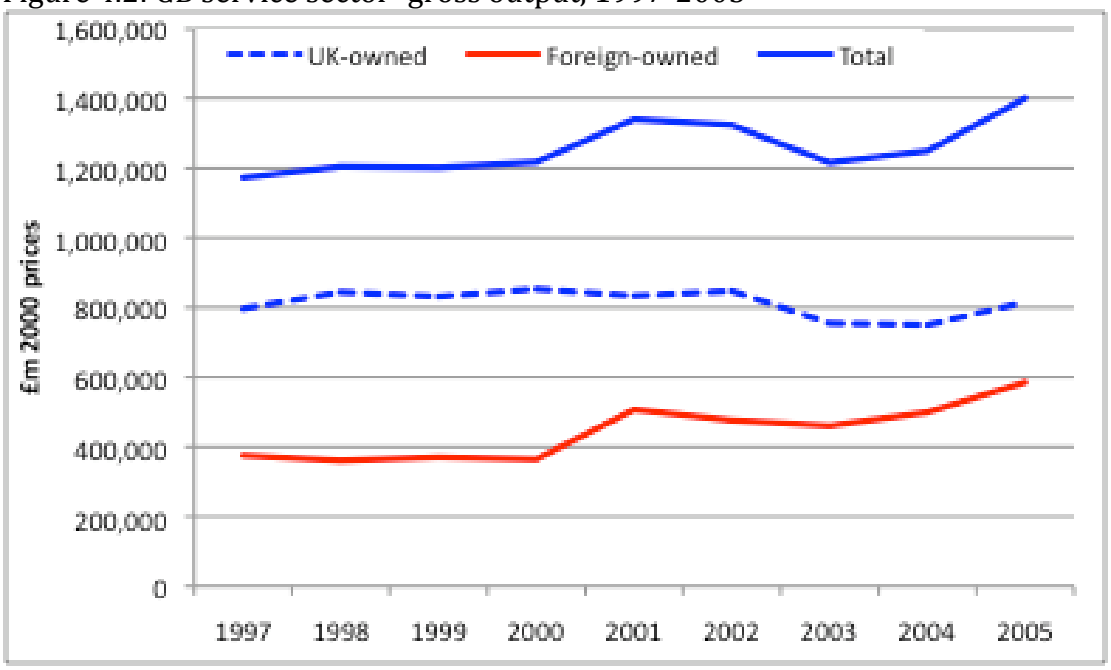
[a] Only includes certain sectors (see text for details)
Source: own calculations based on ARD

Importance of foreign-owned sector

4.2 In terms of employment, Figure 4.1 shows that employment in the service sector has increased throughout the period, in marked contrast to employment in manufacturing (Figure 3.1). Gains for UK-owned plants has

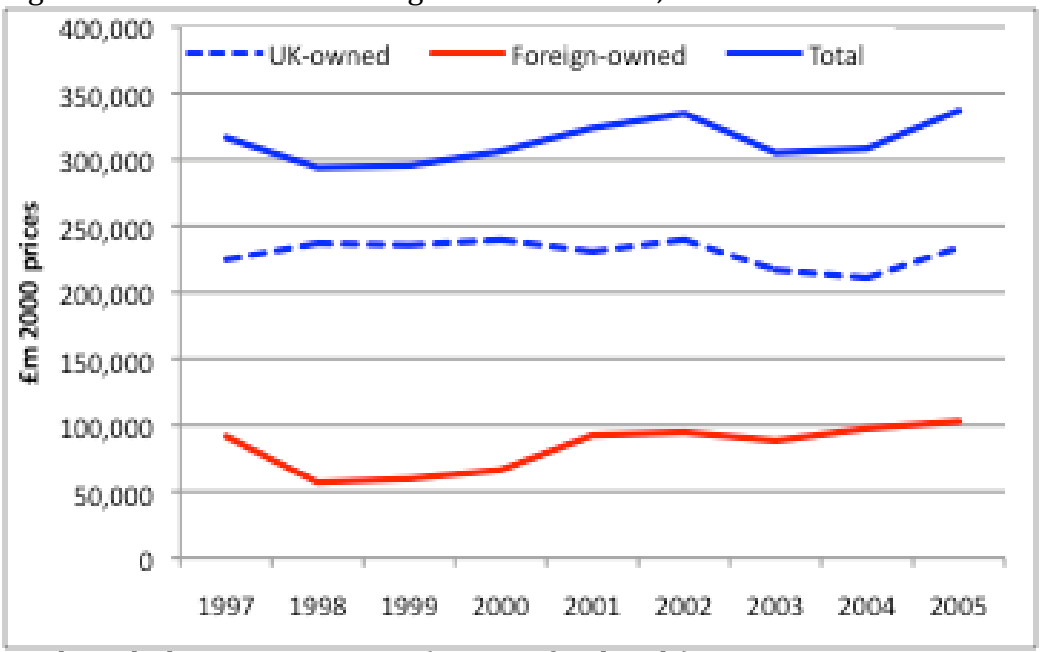
been relatively modest (an overall increase of some 18% between 1997-2005), while employment in the foreign-owned sector has been rising rapidly with a net 1.25 million new employees (or a 130% increase on 1997).

Figure 4.2: GB service sector[a] gross output, 1997-2005



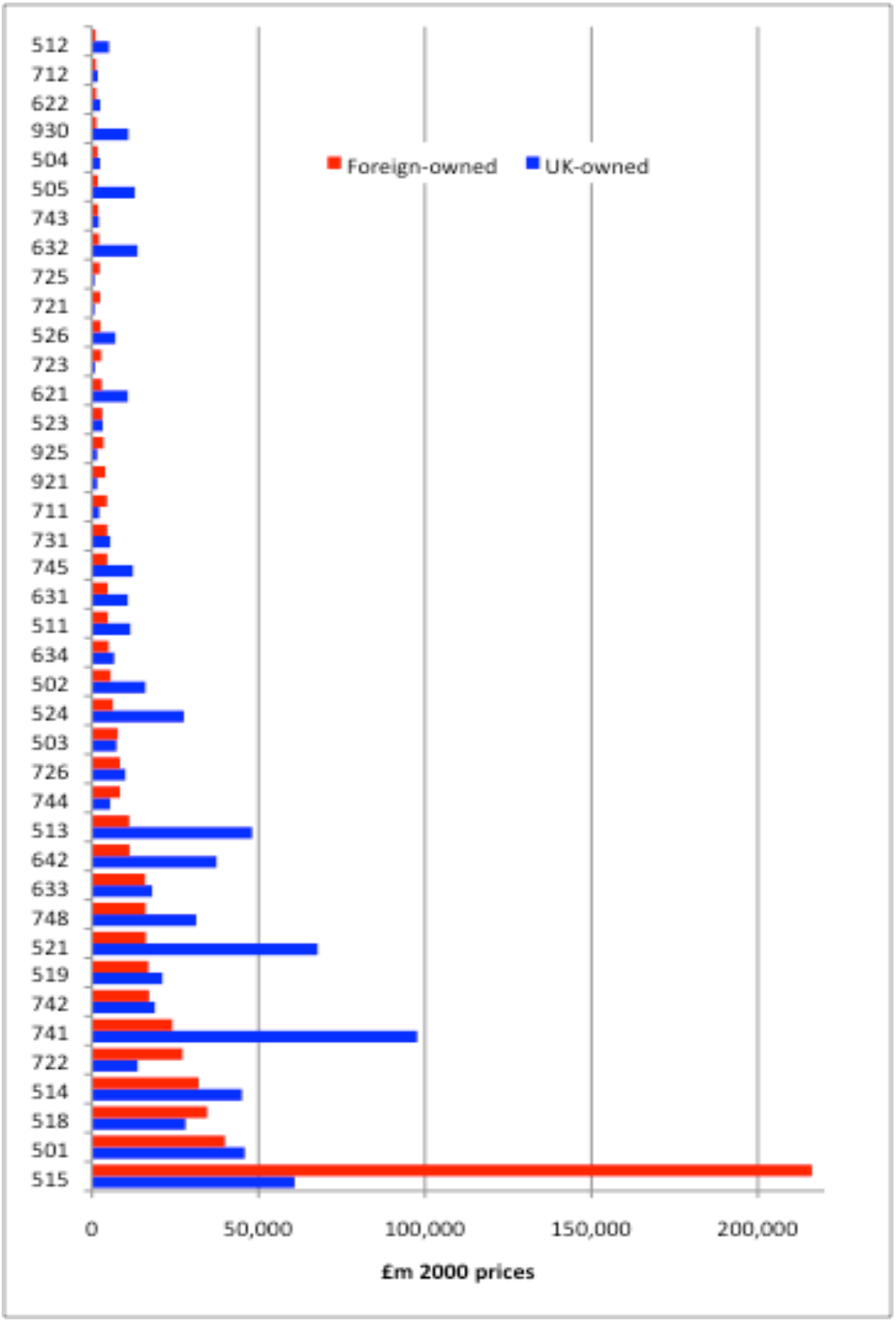
[a] Only includes certain sectors (see text for details)
Source: own calculations based on (weighted) ARD

Figure 4.3: GB service sector[a] gross value-added, 1997-2005



[a] Only includes certain sectors (see text for details)
Source: own calculations based on (weighted) ARD

Figure 4.4: Gross output in GB service sector[a], 2005: Ranked High to Low by Foreign Ownership (top 40 1992SIC 3-digit industries by foreign-ownership)



[a] Only includes certain sectors (see text for details)
Source: own calculations based on (weighted) ARD

4.3 Figure 4.2 shows that while UK-owned service sector employment has been slowly rising, gross output has remained largely unchanged (a 2.3%

increase overall between 1997-2005). This reflects the much greater labour-intensity of service sector industries. Foreign-owned plants grew by around 56% overall, which is significantly higher than for UK-owned plants (but much less than the increase in gross output of foreign-owned manufacturing). Thus, by 2005 the gap in gross output levels in UK- and foreign-owned plants was closing.

4.4 Based on gross valued-added statistics (where intermediate inputs are netted out), the conclusions reached are broadly similar: UK-owned plants produced around 4% more GVA in 2005 compared to 1997, while GVA was over 12% higher in the foreign-owned sector. Like manufacturing, the greatest difference in the foreign-owned sector between the results based on gross output and GVA is the greater use of intermediate inputs by the subsidiaries of MNE's.

4.5 From the data produced in Figures 4.1 – 4.3, it can be concluded that foreign-owned plants have assumed much greater importance but are still some way off from dominating the service sector industries covered (even though the latter were chosen for their relative dependence on inward FDI).

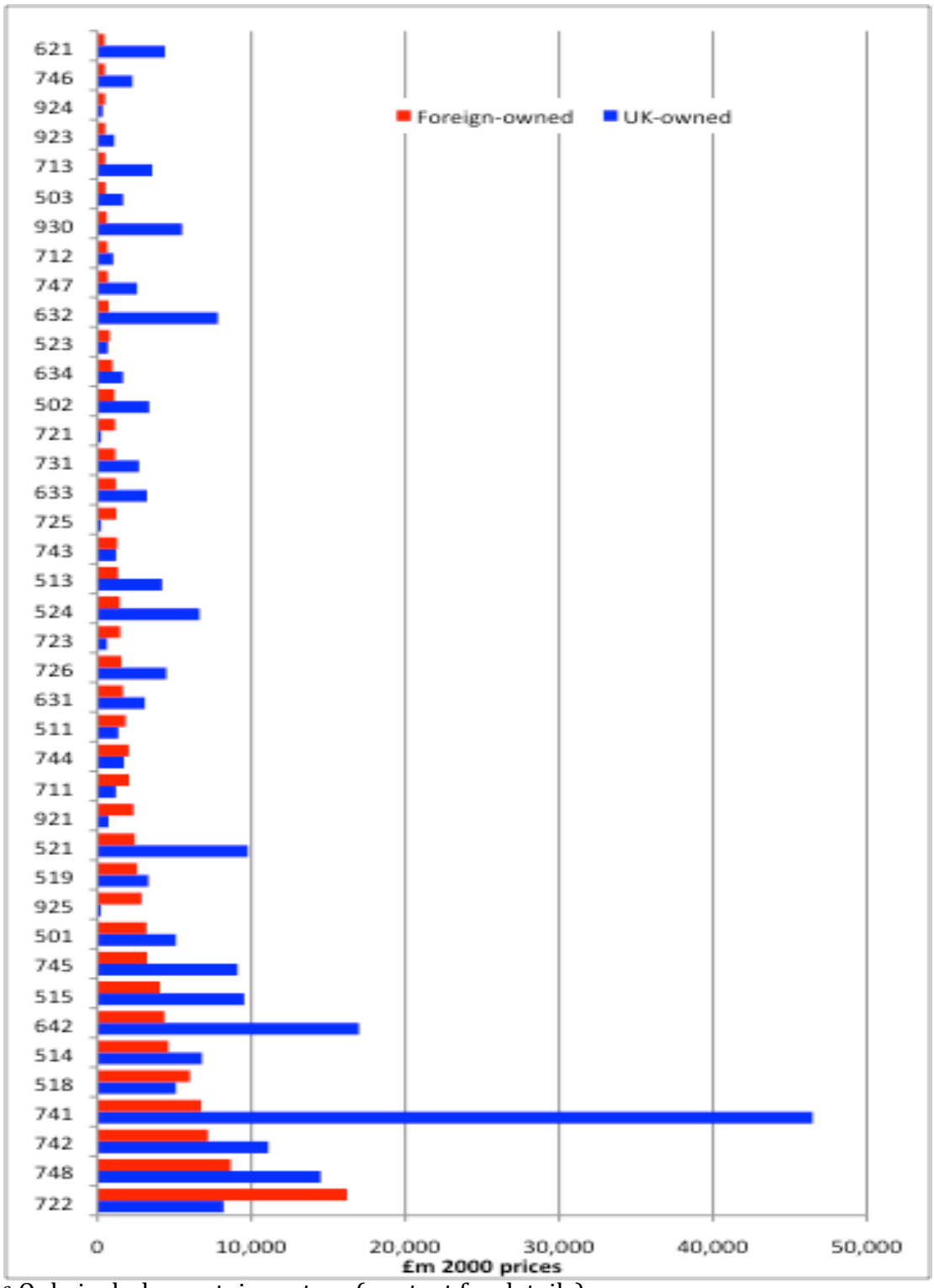
4.6 As to which sectors FDI plants typically locate in, Figure 4.4 shows the industries in which FDI presence (in terms of gross output in 2005) was greatest: the wholesale of intermediate goods (such as petroleum, metals, wood products, and chemicals) had the highest level of FDI output (accounting for nearly £216b or 78% of total GB production and 37% of gross output in the FDI sector), followed by sale of motor vehicles (SIC501 under the 1992SIC), wholesale of machinery, office equipment and electronic goods (SIC518), wholesale of textiles, clothing, ceramics and pharmaceuticals (SIC514), computer & related activities (SIC722), and legal, accounting and management consultancy services (SIC741). The correlation between gross output in UK- and foreign-owned plants across all 50 3-digit manufacturing sectors was 0.48, suggesting that foreign-owned plants tended to concentrate in the same industries as UK-owned plants (although foreign-owned plants tend to locate significantly more output in a smaller number of 3-digit SIC's[26]).

4.7 Figure 4.5 produces information on which industries had the highest levels of foreign-owned GVA; the picture is different to that shown in Figure 4.4, as wholesale industries (with high levels of intermediate inputs) have significantly lower levels of GVA. The industries having the highest levels of FDI presence are now computer & related activities (SIC722), various business activities such as packaging, secretarial and call centre activities (SIC748), architecture & technical consultancy (SIC742), and legal, accounting and management consultancy services (SIC741). The correlation between GVA in UK- and foreign-owned plants across all 50 3-digit manufacturing sectors was 0.50 (marginally higher than the figure

[26] Taking the share of total service sector output for each 3-digit SIC covered here, squaring each value and summing over all industries (and multiplying by 100) gives a Herfindahl-type index. The figure for foreign-owned plants is 15.8; the comparable figure for UK-owned plants is 5.1, indicating less concentration of output in a smaller number of industries in UK-owned plants.

based on gross output), and both sub-sectors tended to concentrate similar relative levels of output in each 3-digit SIC.[27]

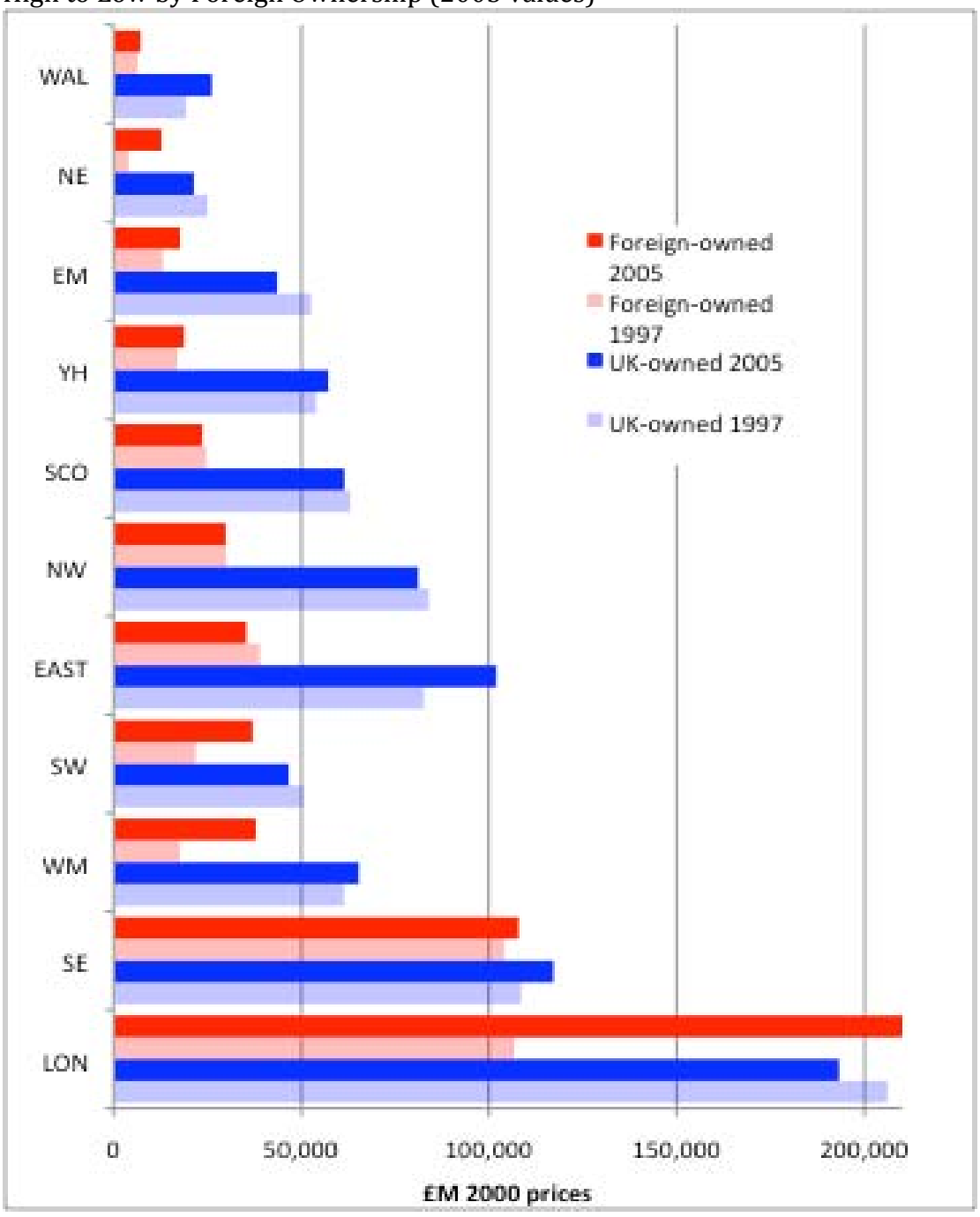
Figure 4.5: Gross value-added in GB service sector, 2005: Ranked High to Low by Foreign Ownership (top 40 1992SIC 3-digit industries by foreign-ownership)



[a] Only includes certain sectors (see text for details)
Source: own calculations based on (weighted) ARD

[27] The Herfindahl-type indices were 6.6 and 5.8 respectively, for UK- and foreign-owned plants.

Figure 4.6 Gross output in GB service sector[a], 1997 and 2005, by region: Ranked High to Low by Foreign Ownership (2005 values)

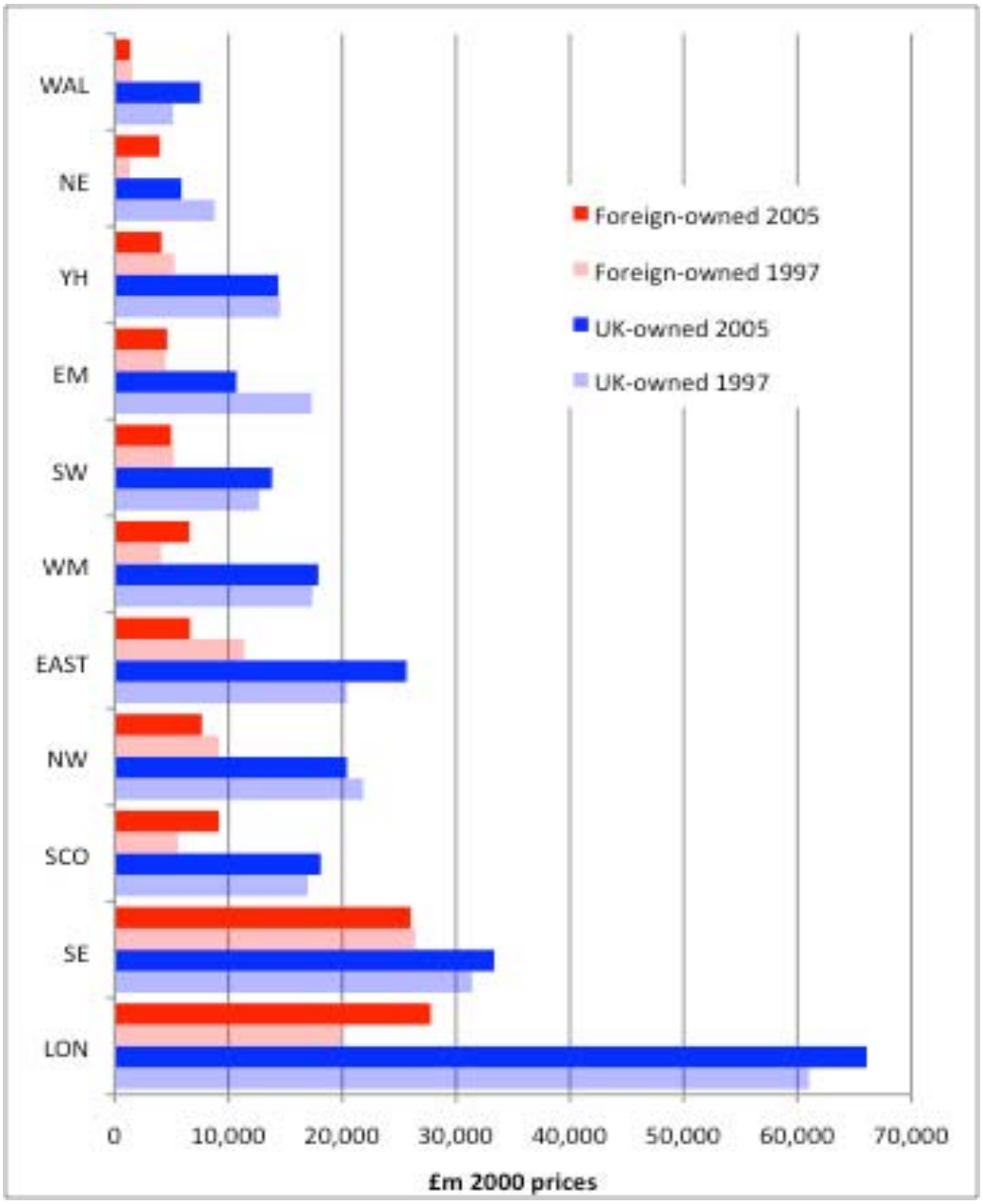


[a] Only includes certain sectors (see text for details)
Source: own calculations based on (weighted) ARD

4.8 As to where FDI plants were located, Figures 4.6 and 4.7 rank gross output and GVA from lowest-to-highest across the government office regions of GB, for 1997 and 2005. Depending on whether intermediate inputs (which are relatively more important in the foreign-owned sector) are netted out of not, the regions with the highest levels of foreign-owned services output

in 2005 were London, the South East and West Midlands or Scotland, while those with the lowest FDI presence were Wales, the North East, and East Midland or Yorkshire-Humberside.

Figure 4.7 Gross value-added in GB service sector[a], 1997 and 2005, by region: Ranked High to Low by Foreign Ownership (2005 values)



[a] Only includes certain sectors (see text for details)
Source: own calculations based on (weighted) ARD

4.9 Most regions saw an increase in FDI production, whichever measure of output is used, except the North West and Eastern England which experienced significant declines (Scotland saw a small decline based on gross output, while the South East, South West, Yorks-Humberside and

Wales saw small declines based on GVA). Regional rankings between 1997 and 2005 did not change significantly (unlike with manufacturing, which covered a longer time period than here), although the North West and Eastern England slipped down rankings and the West Midlands and Scotland have moved up.

4.10 In summary, the importance of inward FDI investment in services has increased significantly over 1997-2005, but not to the same extent as in manufacturing.

Entry by foreign-owned firms 1998-2002

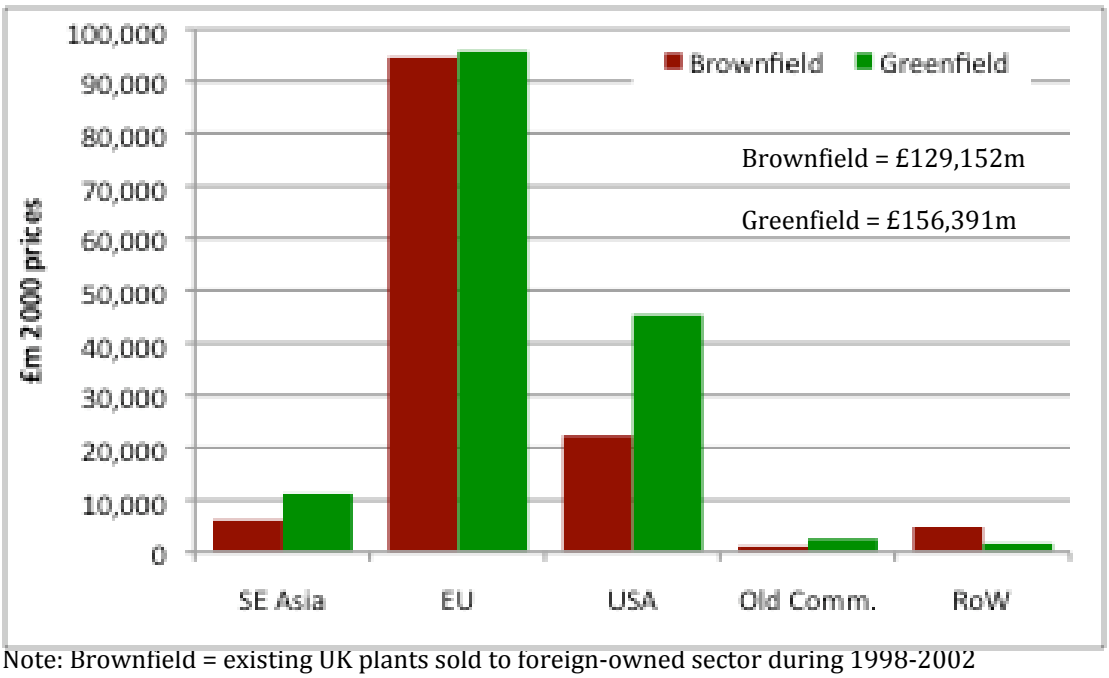
4.11 In this sub-section, we shall look in more detail at the plants that were acquired by foreign-owned companies in 1997-2002. Firstly the services panel data was disaggregated into the following 7 sub-groups for analysis. Plants that were in operation between 1998-2002[28] were allocated to: (i) those that were sold by UK-owned companies to foreign-owned companies during 1998-2002; (ii) plants that were foreign-owned brownfield plants during 1997-2000 (i.e. they were not acquired from UK-owned companies during this period); (iii) UK-owned plants that belonged to UK-owned companies that sold plants to the foreign-owned sector between 1998-2002; (iv) UK-owned plants that belonged to UK-owned companies that did *not* sell plants to the foreign-owned sector between 1998-2002; (v) those that were UK-owned single-plant enterprises between 1997-2002; (vi) plants that changed owner more than once during 1998-2002; and (vii) plants that were started during 1998-2002 as greenfield foreign-owned plants that did not change their ownership status between 1998-2002.[29] Note, including sub-group (vi) reallocated a number of plants that initially could have belonged to other sub-groups (e.g. (i) – (ii)); for example, this sub-group includes most of the plants that were in the FO-to-FO sub-group in Table 1.4.

4.12 Figure 4.8 shows the total gross output associated with sub-groups (i) and (vii) in the year in which acquisition or entry occurred, by the country of origin (SE Asia comprises Japan, Taiwan, Hong Kong, South Korea and Malaysia; the Old Commonwealth countries are Australia, Canada, New Zealand and South Africa). Firstly, investment by overseas MNE's in greenfield entry resulted in 21% higher gross output than that which was produced in previously UK-owned plants that were acquired (a much lower differential when compared to manufacturing). EU greenfield plants produced the most output on entry, followed closely by EU-owned brownfield plants. Output in US greenfield plants exceeded that of US acquired plants, while SE Asian plants were the third major source of output (but significantly behind the other two, unlike in manufacturing).

[28] Thus we omit plants that closed before 1998 and those that opened after 2002.

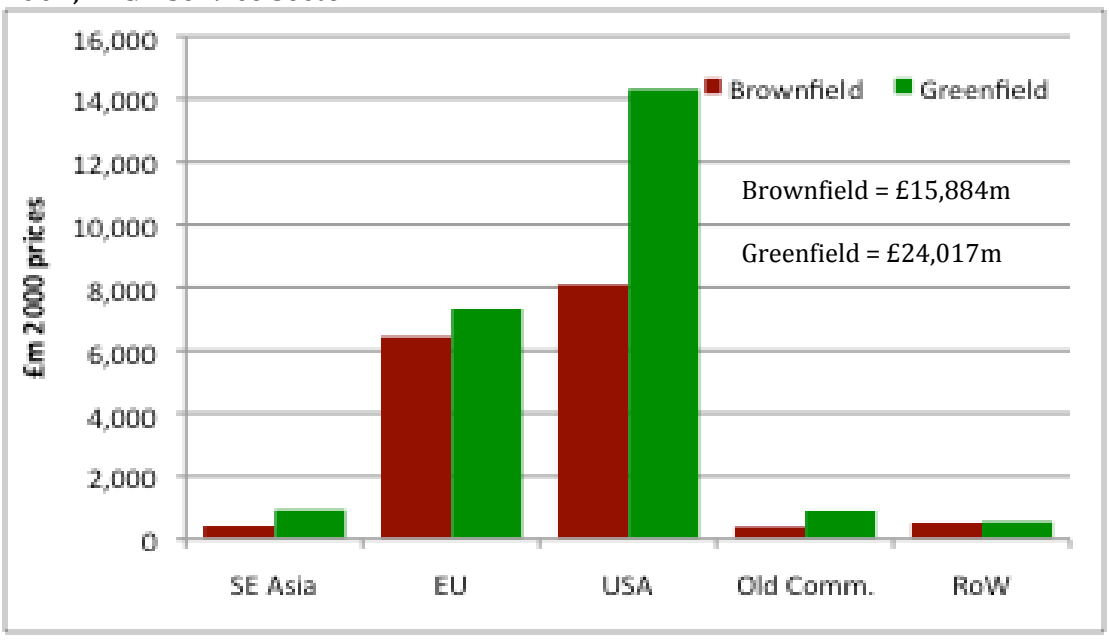
[29] Note, there are a small number of other UK-owned plants that are not covered by any of the 7 sub-groups; these mostly comprise plants that were in the UK-to-UK acquired and FO-to-UK acquired categories outlined in section 1.

Figure 4.8: Total real gross output by country (and type) of origin, 1998-2002, in GB service sector



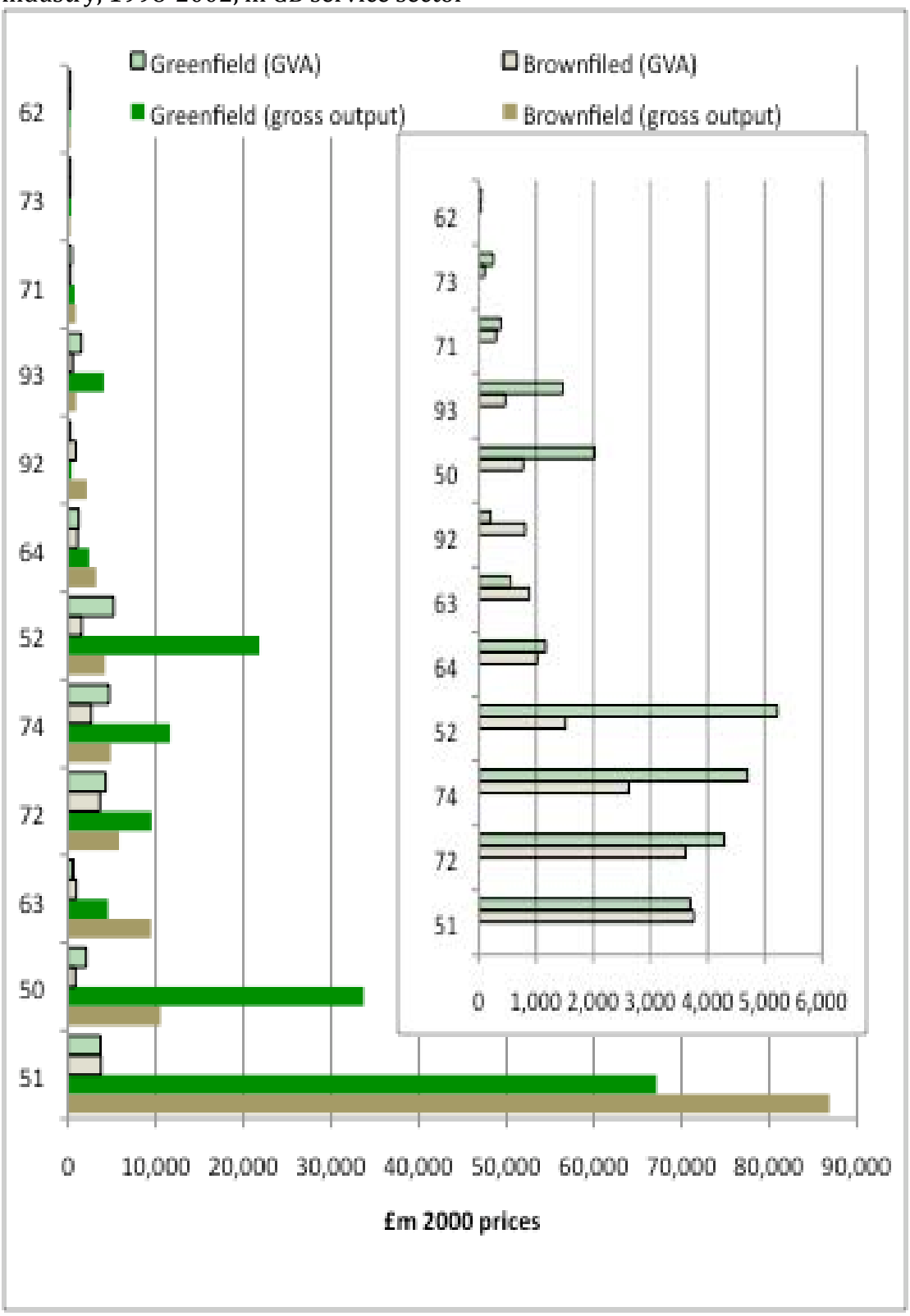
Note: Brownfield = existing UK plants sold to foreign-owned sector during 1998-2002
Greenfield = new plants set-up by foreign-owned firms 1998-2002 (no change of status 1998-2002)
Source: own calculations based on (weighted) ARD

Figure 4.9: Total real gross value-added by country (and type) of origin, 1998-2002, in GB service sector



Note: see Figure 4.8

Figure 4.10: Total real gross output and gross value-added by 1992 SIC 2-digit industry, 1998-2002, in GB service sector



Note: see Figure 4.8

4.13 Figure 4.9 provides quite a different profile for output measured by gross value-added; here US greenfield entry was much larger than for any other category. The main reason for this different pattern based on GVA is that

EU plants were more heavily concentrated in the wholesale sectors (where intermediate inputs is very high).

4.14 As to which industries dominated, Figure 4.10 shows that based on gross output acquisitions and greenfield investment were particularly concentrated in wholesale trade (SIC51 under the SIC92 classification), and the sale of motor vehicles & fuel (SIC50). Then in terms of brownfield gross output, support of transport (SIC63) and computer & related activities (SIC72) and other business activities (SIC74) rank next highest; for greenfield plants, retailing (SIC52), other business activities (SIC74), and computer & related activities (SIC72) rank next highest.

4.15 If GVA is considered (see the insert chart in Figure 4.10), then brownfield entry was highest in wholesale trades, followed by computer & related activities, other business activities, and retailing. In terms of greenfield entry, retailing ranks first, followed by other business activities, computer & related activities, and wholesale trades.

4.16 In all, wholesale trade, computer & related activities, other business activities, and retailing accounted for around 70-79% of gross output and GVA, for both brownfield and greenfield investments. In certain sectors (sales of motors, retailing, other business activities, and computer & related activities) greenfield plants produced considerably more output than did brownfield acquisitions.

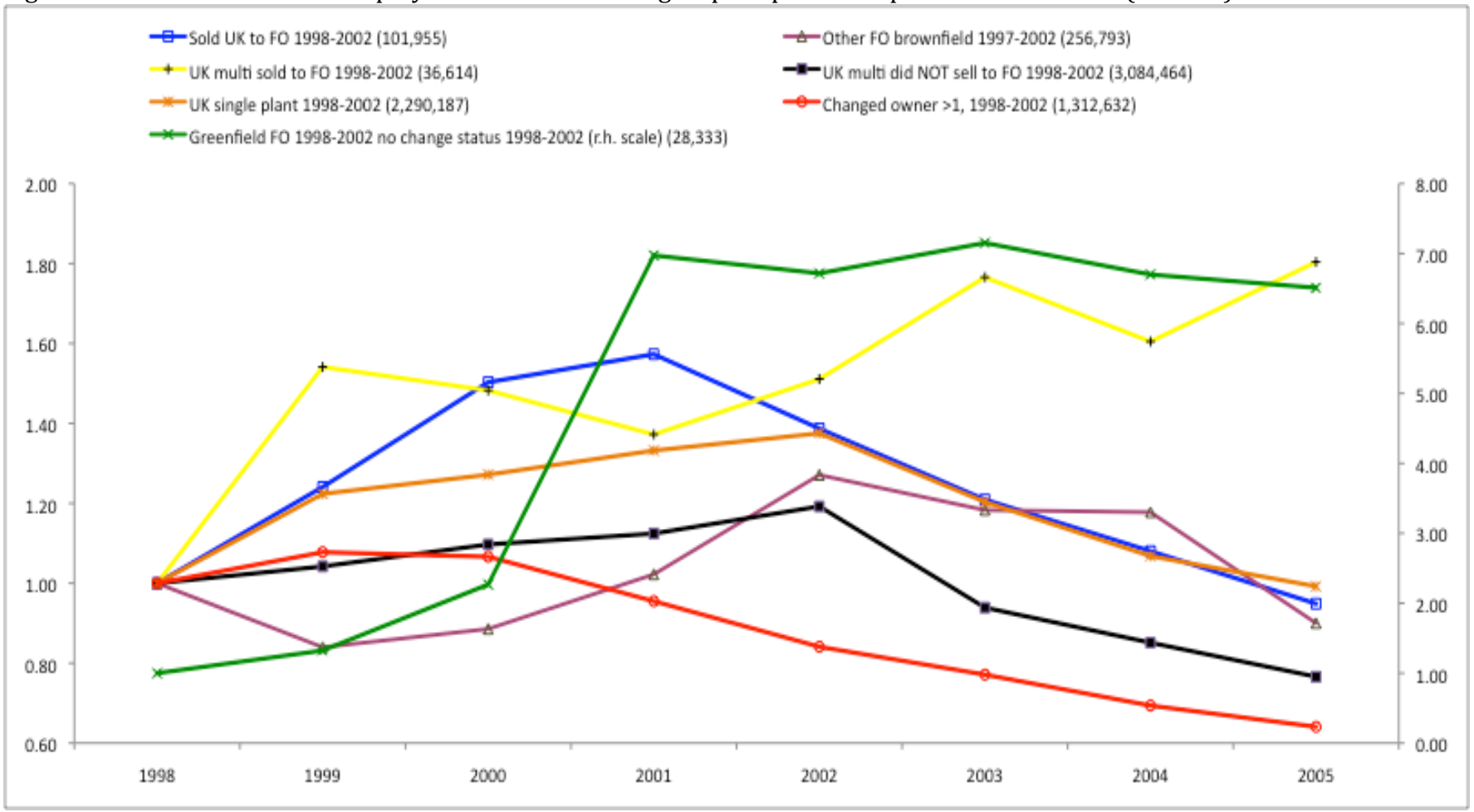
Economic differences across various sub-groups

4.17 Lastly in this section UK-owned plants that were acquired by foreign-owned companies are compared with the other 6 sub-groups that together comprise almost the population of plants in the *ARD* that operated during 1998-2002. Because of lack of data, comparisons will only include 1998-2002 and the post-acquisition period from 2003-2005.

4.18 Figure 4.11 plots relative employment for the 7 sub-groups (based on 1998 = 1). There is evidence that employment in those plants sold by UK companies to the foreign-owned sector during 1998-2002 experienced significant growth in the acquisition period (as more plants were added to this sub-group), before substantially declining in size in the post-acquisition period.[30] Similar patterns are found in four other sub-groups but with a slower increase in employment 1998-2002 (since these other plants were not subject to acquisition – e.g. the UK single plant sub-group – or presumably a significantly smaller level of acquisition – such as those plants that changed owner more than once). In contrast, greenfield entry by foreign-owned plants showed the most exaggerated build-up in employment up to 2001, followed by stable employment levels, while UK multi-plant enterprises that sold plants to the foreign-owned sector during 1998-2002 saw generally an upward trend in employment.

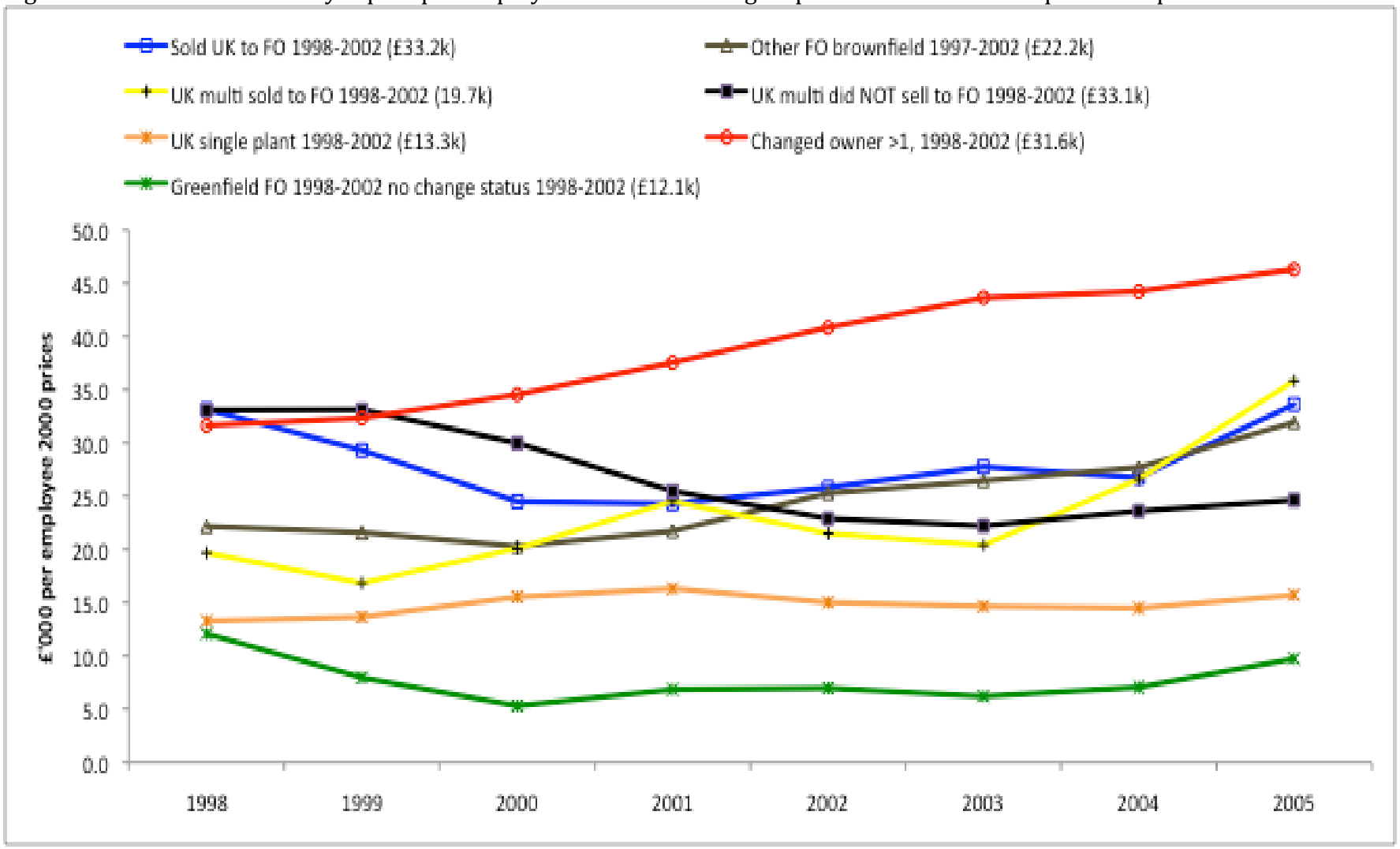
[30] Note, this decline in employment is set against the background of no new entry of plants post-2002 (unlike the data presented in Figure 4.1)

Figure 4.11 UK service sector employment in various sub-groups of plants in operation 1998-2002 (1998=1)



Source: own calculations based on (weighted) *ARD*. Figures in parenthesis are 1998 employment values

Figure 4.12: Plant & machinery capital per employee* in various sub-groups of UK service sector plants in operation 1998-2002



* Plant & machinery capital stock plus hire of plant and machinery. Figures in parenthesis are 1998 average values.
Source: own calculations based on (weighted) *ARD*.

4.19 As to the level of capital intensity, Figure 4.12 shows that for most sub-groups capital-per-employee was stable or increasing over time. The main exception was for UK multi-plant enterprises that did not sell plants to the foreign-owned sector between 1998-2002, where there was a significant decline in intensity until 2003.

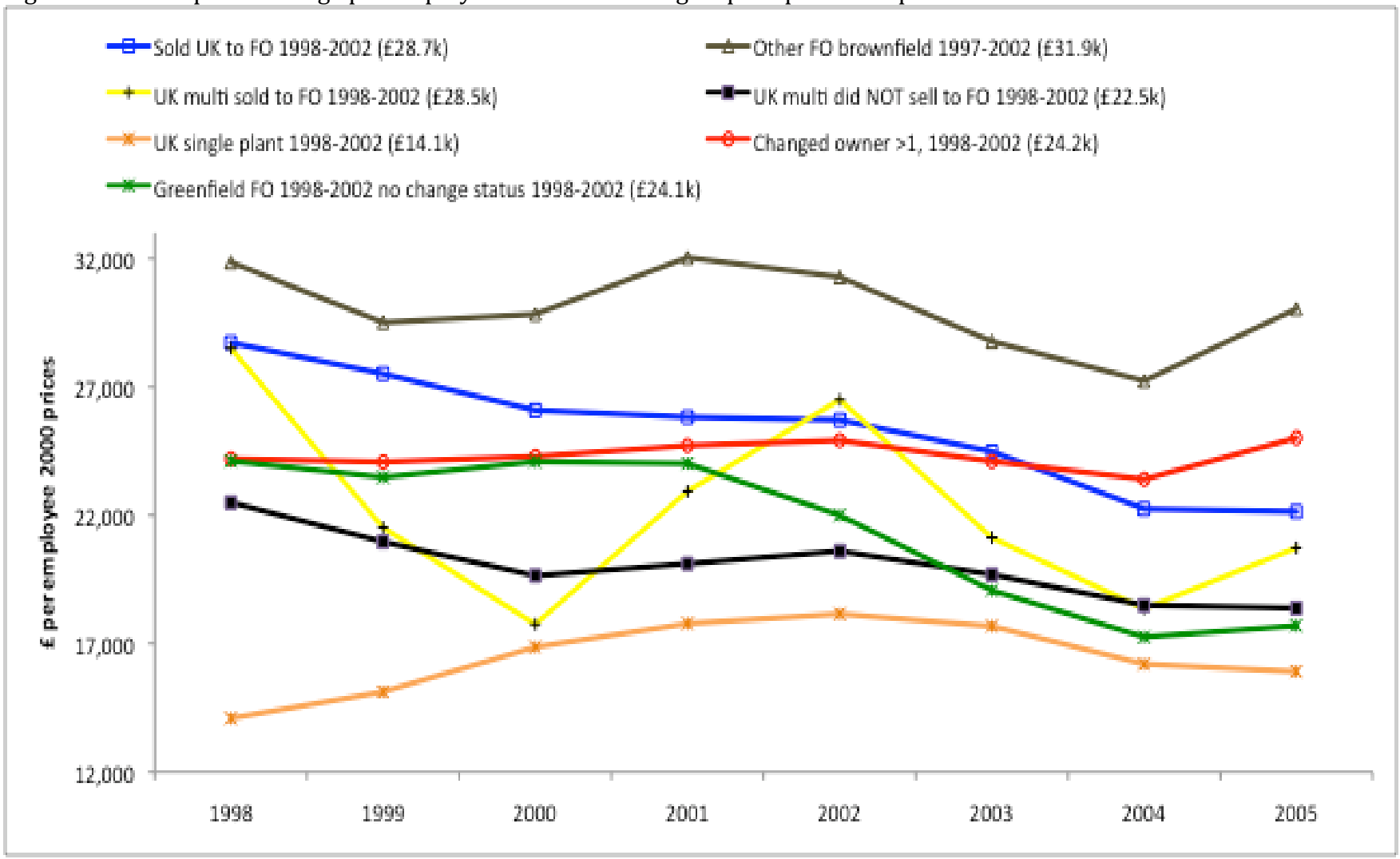
4.20 The sub-groups with the lowest levels of capital intensity were (as expected) UK-owned single plant enterprises, and greenfield foreign-owned plants (which is unexpected). The same point can be made about the latter sub-group as was made when discussing the data for manufacturing: there is likely to be significant under-reporting of pre-production gross investment in the *ARD*; this will bias down the true value of the plant & machinery capital stock, by an unknown amount.

4.21 As to differences in wage rates, Figure 4.13 shows that generally foreign-owned plants paid higher average wages (this is likely to be both because of a higher skill-mix but also because they want to attract the best workers and minimise employee turnover), although there is evidence of a downward movement in most sectors post-2001 (especially in greenfield FO plants). The lowest wage rates were in UK single plant enterprises, followed generally by plants belonging to UK multi-plant enterprises that did not sell to the foreign-owned sector during 1998-2002. The sub-group of plants comprising UK enterprises that did sell to the foreign-owned sector saw greater movement in real wage rates, compared to other sub-groups.

4.22 Figure 4.14 shows labour productivity differences across the sub-groups, based on gross output. The lowest levels of productivity were in UK single plant firms and plants belonging to UK multi-plant enterprises that did not sell to the foreign-owned sector during 1998-2002. The other sub-groups are linked to foreign-ownership in various ways, and these plants tended to have higher labour productivity that was relatively stable throughout. The sub-group of particular interest here (plants sold by UK companies to the foreign-owned sector during 1998-2002) had productivity levels towards the top of the sub-groups comprising of foreign-owned plants until 2001, but during the post-acquisition period there was a substantial decline in relative productivity.

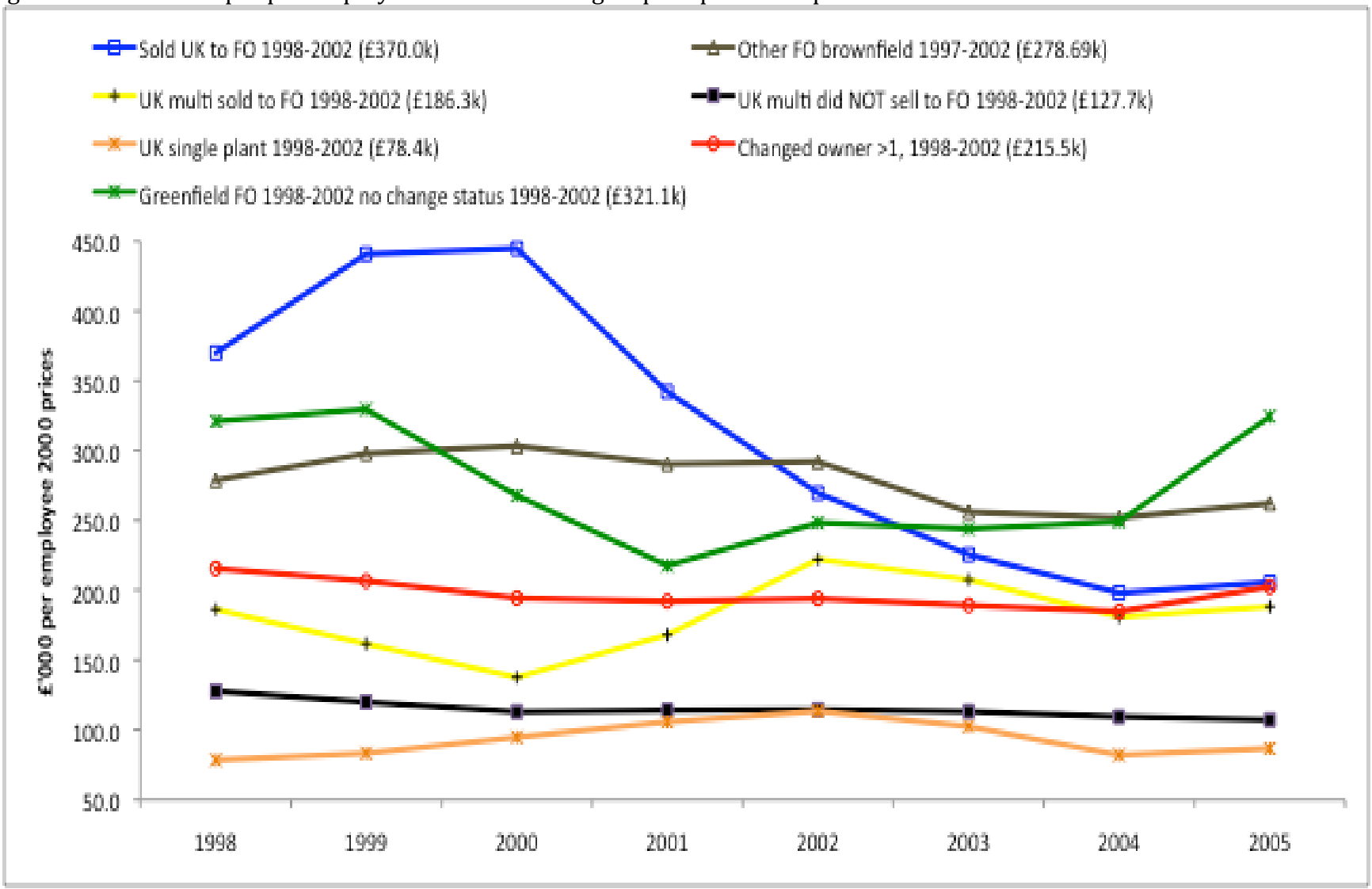
4.23 Figure 4.15 (based on GVA) provides a similar picture on productivity, again with a decline in post-acquisition productivity levels for plants sold by UK companies to the foreign-owned sector during 1998-2002. There is also evidence that GVA labour productivity also declined in foreign-owned greenfield plants. Nevertheless, the overall rankings of the various sub-groups are broadly similar.

Figure 4.13: Real product wage per employee* in various sub-groups of plants in operation 1998-2002



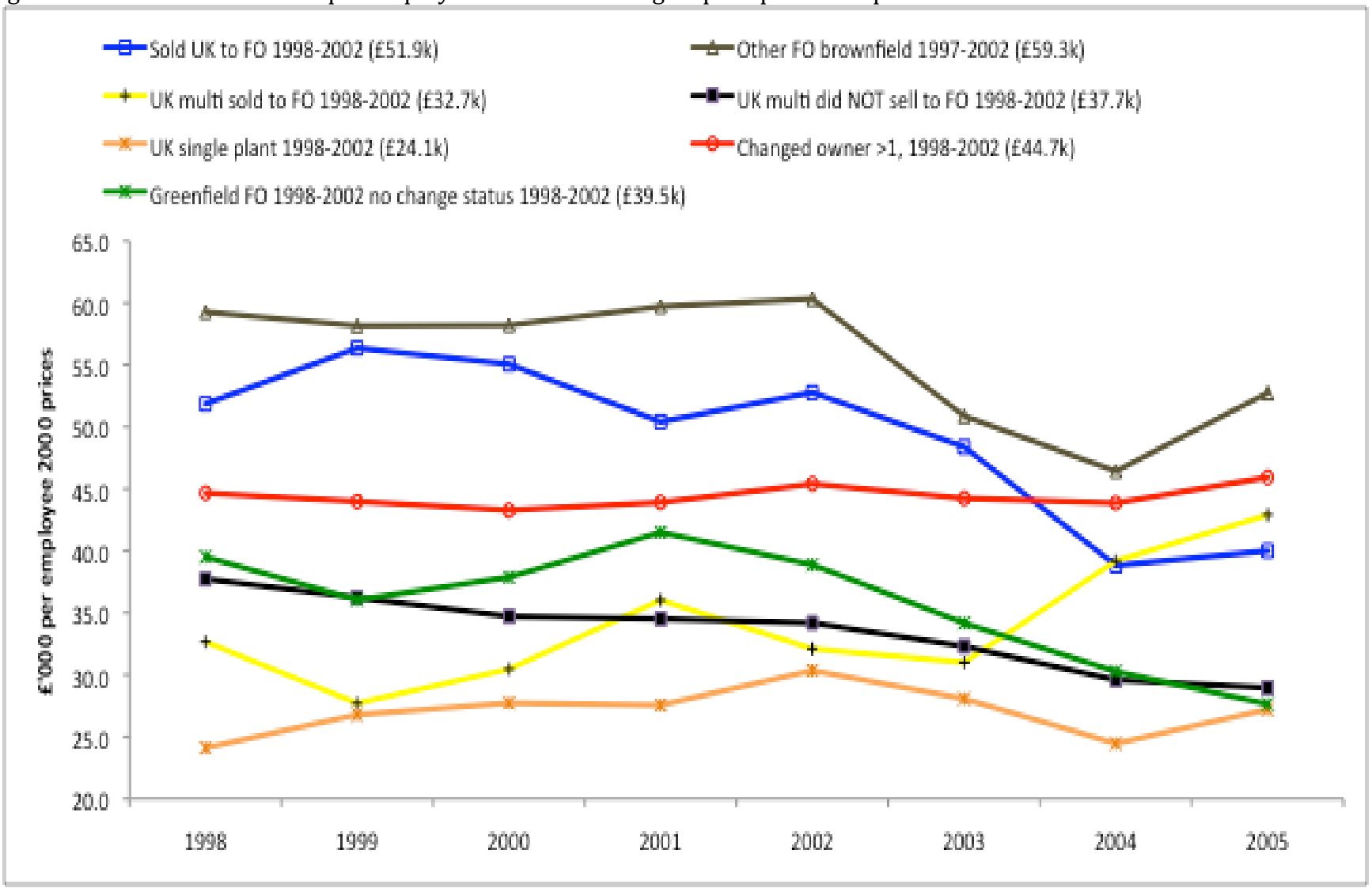
* Figures in parenthesis are 1998 average values.
Source: own calculations based on (weighted) *ARD*.

Figure 4.14: Gross output per employee* in various sub-groups of plants in operation 1998-2002



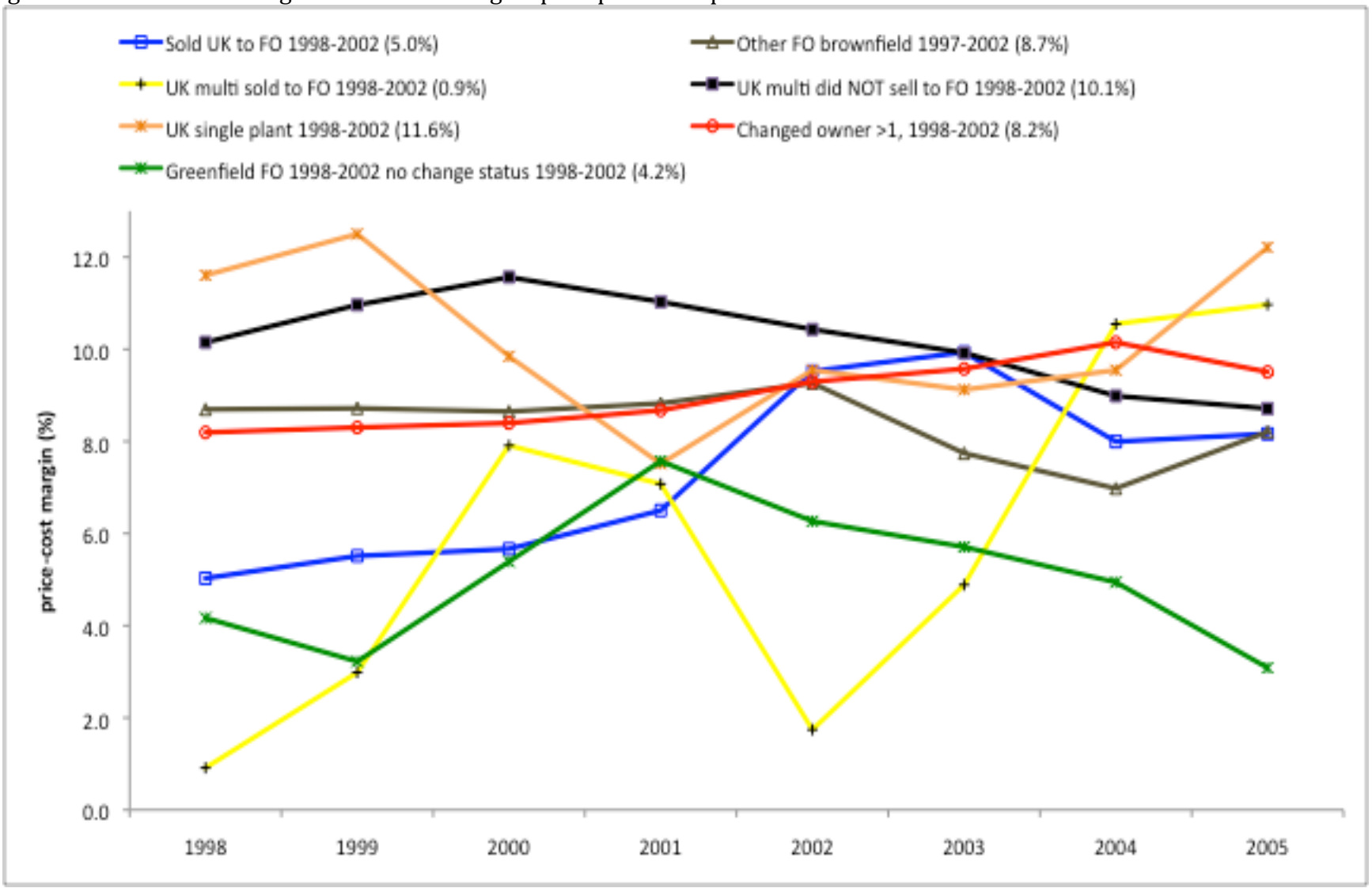
* Figures in parenthesis are 1998 average values.
Source: own calculations based on (weighted) *ARD*.

Figure 4.15: Gross value-added per employee* in various sub-groups of plants in operation 1998-2002



* Figures in parenthesis are 1998 average values.
Source: own calculations based on (weighted) *ARD*.

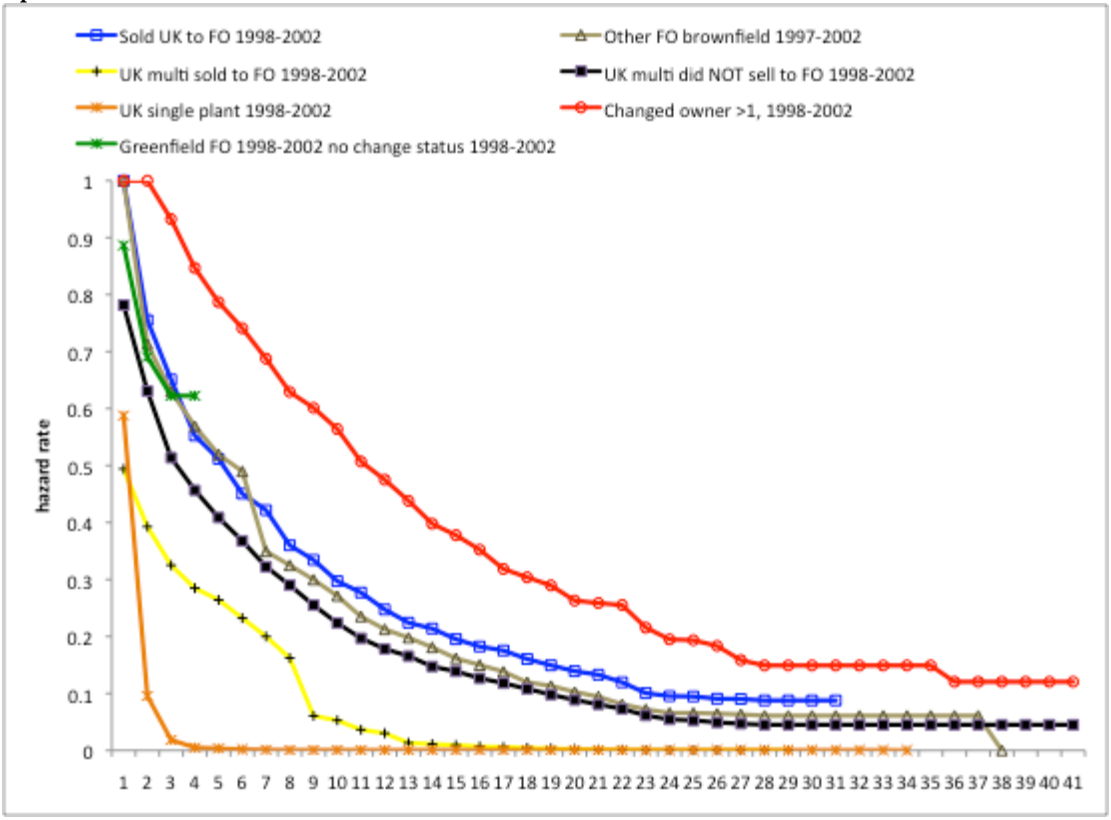
Figure 4.16: Price-cost margin* in various sub-groups of plants in operation 1998-2002



* Figures in parenthesis are 1998 average values.
Source: own calculations based on (weighted) *ARD*

4.24 Figure 4.16 provides information on price-cost margins,[31] i.e., the profitability of each sub-group. In comparison to productivity and wage rates, and in line with the results presented for manufacturing (Figure 3.16) there is evidence that suggests foreign-owned plants had lower (and in some cases declining) profitability, while plants belonging to UK multi-plant enterprises and UK single plant enterprises generally had relatively high price-cost margins. As with manufacturing, there is a possible caveat that this may not be an accurate indication of long-run profitability, but may be associated with higher short-run fixed costs of production following acquisitions and the establishment of new plants.

Figure 4.17: Kaplan-Meier hazard rates in various sub-groups of plants in operation 1998-2002



Source: own calculations based on (weighted) *ARD*.

4.25 Lastly, Figure 4.17 shows the hazard rates of plant closures for the various sub-groups considered. Plants that changed owner more than once between 1998-2002, followed by plants sold by UK companies to the foreign-owned sector during 1998-2002, and the other foreign-owned brownfield plants, had the lowest hazard rates of closure. Plants belonging to UK multi-plant enterprises have higher probabilities of closure and UK-

[31] Defined as gross operating surplus (gross value-added minus total labour costs) minus an estimate of the cost of capital services, all divided by gross-output [i.e. (pY-cY)/pY = (p – c)/p, where *c* is marginal costs].

owned single plant enterprises have the greatest likelihood of closing (a very rapid decline after initial opening). Greenfield foreign-owned plants have a relatively low rate of closure, but note these plants are only observed for a much shorter period of time compared to other plants (this explains the reason why they only feature on the diagram for around 6 years after birth). However, it may well be that this sub-group is more prone to closure, and this will need to be tested using a Cox proportional hazard model which controls for covariates (which show how other effects shift plants away from the baseline hazard rate of closure – see Chapter 10).

Summary and conclusions for services

4.26 Employment in the service sector has increased throughout the period, in marked contrast to employment in manufacturing. Gains for UK-owned plants has been relatively modest (an overall increase of some 18% between 1997-2005), while employment in the foreign-owned sector has been rising rapidly with a net 1.25 million new employees (or a 130% increase on 1997).

4.27 While UK-owned service sector employment has been slowly rising, gross output has remained largely unchanged (a 2.3% increase overall between 1997-2005). Foreign-owned plants grew by around 56% overall; thus, by 2005 the gap in gross output levels in UK- and foreign-owned plants was closing. Based on gross valued-added statistics, UK-owned plants produced around 4% more GVA in 2005 compared to 1997, while GVA was over 12% higher in the foreign-owned sector. Thus, it can be concluded that foreign-owned plants have assumed much greater importance but are still some way off from dominating the service sector industries covered.

4.28 FDI presence (in terms of gross output in 2005) was greatest in the wholesale of intermediate goods (such as petroleum, metals, wood products, and chemicals), followed by sale of motor vehicles, wholesale of machinery, office equipment and electronic goods, wholesale of textiles, clothing, ceramics and pharmaceuticals, computer & related activities, and legal, accounting and management consultancy services. Foreign-owned plants tended to concentrate in the same industries as UK-owned plants (although foreign-owned plants tend to locate significantly more output in a smaller number of 3-digit SIC's).

4.29 Basing FDI presence on GVA, the picture is different as wholesale industries (with high levels of intermediate inputs) have significantly lower levels of GVA. The industries having the highest levels of FDI presence are now computer & related activities, various business activities such as packaging, secretarial and call centre activities, architecture & technical consultancy, and legal, accounting and management consultancy services.

4.30 Depending on whether intermediate inputs are netted out of not, the regions with the highest levels of foreign-owned services output in 2005

were London, the South East and West Midlands or Scotland, while those with the lowest FDI presence were Wales, the North East, and East Midland or Yorkshire-Humberside. Most regions saw an increase in FDI production, whichever measure of output is used, except the North West and Eastern England which experienced significant declines. Regional rankings between 1997 and 2005 did not change significantly (unlike with manufacturing).

4.31 During 1998-2002, investment by overseas MNE's in greenfield entry resulted in 21% higher gross output than what was produced in previously UK-owned plants that were acquired. EU greenfield plants produced the most output on entry, followed closely by EU-owned brownfield plants. Output in US greenfield plants exceeded that of US acquired plants, while SE Asian plants were the third major source of output.

4.32 Quite a different profile is obtained when output is measured by gross value-added; here US greenfield entry was much larger than for any other category. The main reason for this different pattern based on GVA is that EU plants were more heavily concentrated in the wholesale sectors.

4.33 As to which industries dominated, wholesale trade, computer & related activities, other business activities, and retailing accounted for around 70-79% of gross output and GVA, for both brownfield and greenfield investments.

4.34 Lastly in this section UK-owned plants that were acquired by foreign-owned companies are compared with the other 6 sub-groups that together comprise almost the population of plants in the *ARD* that operated during 1998-2002. Firstly, there is evidence that employment in those plants sold by UK companies to the foreign-owned sector during 1998-2002 experienced a significant decline in employment in the post-acquisition period. In contrast, greenfield entry by foreign-owned plants showed the most exaggerated build-up in employment up to 2001, followed by stable employment levels.

4.35 As to the level of capital intensity, for most sub-groups capital-per-employee was stable or increasing over time. The sub-groups with the lowest levels of capital intensity were (as expected) UK-owned single plant enterprises, and greenfield foreign-owned plants (which is unexpected). The latter is most likely to be due to significant under-reporting of pre-production gross investment in the *ARD*; this will bias down the true value of the plant & machinery capital stock, by an unknown amount.

4.36 As to differences in wage rates, generally foreign-owned plants paid higher average wages, although there is evidence of a downward movement in most sectors post-2001 (especially in greenfield FO plants).

4.37 In terms of labour productivity differences across the sub-groups, based on gross output, foreign-ownership sub-groups tended to have higher labour productivity that was relatively stable throughout. The sub-group of particular interest here (plants sold by UK companies to the foreign-owned sector during 1998-2002) had productivity levels towards the top of the sub-groups comprising of foreign-owned plants until 2001, but during the post-acquisition period there was a substantial decline in relative

productivity. Based on GVA, the productivity picture is similar; although there is also evidence that GVA labour productivity also declined in foreign-owned greenfield plants.

4.38 In comparison to productivity and wage rates, and in line with the results presented for manufacturing, there is evidence that suggests foreign-owned plants had lower (and in some cases declining) profitability

4.39 Lastly, plants that changed owner more than once between 1998-2002, followed by plants sold by UK companies to the foreign-owned sector during 1998-2002, and the other foreign-owned brownfield plants, had the lowest hazard rates of closure. Greenfield foreign-owned plants also had a relatively low rate of closure.

5. Characteristic of the panel level data

5.1 All the (panel) data used in this study was drawn from the *ARD* (with data on R&D from the Business Enterprise R&D database merged into the *ARD*). Data for manufacturing plants was available covering 1984-2005; service sector data is only available from 1997. The panel data has been grouped into 9 sub-groups, as set out in Table 5.1; these are the same 8 sub-groups as set out in par. 3.9, although those plants that were sold to UK-owned companies during 1995-2000 (or 1998-2002 for services) have been allocated to a new sub-group in the following econometric analysis. The variables used are set out in Table 5.2.

5.2 Capital stocks were estimated at the plant level, linked to a benchmark estimate based on 1969 for manufacturing and 1996 for services. That is, annual 3-digit SIC real gross investment data (kindly made available by Mary O'Mahony) dating from 1948 was used to calculate a benchmark capital stock for each industry, and this was then apportioned to each plant existing in the year following the benchmark year. Details on the methods used for manufacturing are set out in Harris (2005b); a similar approach was used for services and based on the length-of-life of plant and machinery in each service sector as estimated by the ONS.

5.3 Age is obtained from whichever was oldest from either the year when the plant was first observed in the *ARD* or from information contained in the Business Structure Database (BSD) in the ONS. The latter is especially important for services, since the ARD only includes services from 1997; however, the BSD also uses information from various service sector surveys[32] conducted by the ONS (and its predecessor the CSO) from the 1970's and 1980's and information is available from these dating back to when plants were first included. Harris *et. al*. (2006) discuss these sources; for present purposes it is important to note that for most plants for which there is a data, the earliest observation is usually in 1977.

[32] E.g. the wholesale sector has been covered by the Business Monitor SDA26 which started in 1985 (but has data covering 1980-1997, while post 1993 it was replaced by the Report of the Review of the Annual Wholesale Inquiry). Before 1980, data for the wholesale sector was obtained from an annual survey carried out by the Business Statistics Office (BSO), with results published periodically in *British Business* (see *British Business* 10 August 1984 for details). Prior to 1997, the retail sector was covered by the Business Monitor SDA25/SDO25 which covered 1979-80, 1982 and 1984 and then annually from 1986 (during the 1980's there were 'full' annual inquiries every two years. Post 1993 the SDA25 was replaced by the Report of the Review of the Annual Retail Inquiry.). For missing years, the BSO conducted smaller-scale annual surveys with results often published periodically in *British Business*. Similarly, Business Monitor surveys were introduced in 1986 covering transport, communications, and most other market-based service sectors, with data for earlier years obtained on a more sporadic basis.

Table 5.1: Groups and industries used

Group	Definition[a]
1	plants that were sold by UK-owned companies to foreign-owned companies during 1995-2000 (1998-2002)
2[b]	plants that were sold by UK-owned companies to foreign-owned companies during 1985-1994 and were operating in 1995-2000
3	plants that were foreign-owned brownfield plants during 1984-2000 (1998-2002)
4	UK-owned plants that belonged to UK-owned companies that sold plants to the foreign-owned sector between 1995-2000 (1998-2002)
5	plants that were UK-owned single-plant enterprises between 1995-2000 (1998-2002)
6	plants that changed owner more than once during 1985-2000 (1998-2002)
7	plants that were started during 1985-2000 (1998-2002) as greenfield foreign-owned plants that did not change their ownership status between 1985-2000 (1998-2002)
8	plants that were sold to UK-owned companies during 1995-2000 (1998-2002)
9	plants that belonged to UK-owned companies that did not sell plants to the foreign-owned sector between 1995-2000 (1998-2002)
Industry	**Definition**
1	SIC 22-26 (1980 SIC): metals, extraction of minerals, chemicals
2	SIC 31-33 (1980 SIC): metal goods n.e.c., mechanical engineering, office & data processing equipment
3	SIC 34-37 (1980 SIC): electrical & electronic equipment, transport equipment, instrumental engineering
4	SIC41-45 (1980 SIC): food, drink, textiles, clothing, leather & footwear.
5	SIC 46-47 (1980 SIC): Timber, paper & printing.
6	SIC 48-49 (1980 SIC): rubber & plastics, other manufacturing
7	SIC 50 (1992 SIC): sale, maintenance & repair of motors
8	SIC 51 (1992 SIC): wholesale trade
9	SIC 521-524 (1992 SIC): retail sale in specialist and non-specialist stores
10	SIC 526-527; 55, 62-64 (1992 SIC): rest of retail trade covered in study, air transport, storage & telecommunication
11	SIC 71-73, 741 (1992 SIC): renting equipment, computers, R&D, law, accounting & management services
12	SIC 742-748 (1992 SIC): rest of other business activities
13	SIC 92-93 (1992 SIC): recreational services, other personal services

[a] Dates for manufacturing (service sector) plants are 1995-2000 (1998-2002)
[b] This sub-group was not available for service sector industries

5.4 Single-plant status is obtained from using the enterprise group reference codes contained in the *ARD* (EGRP_REF prior to 1997 for manufacturing, and WOWENT from 1997 onwards for all industries covered – see par. 16ff above). Foreign-ownership is obtained from the *ARD,* and is aggregated into 5 sub-groups. Attempts have been made to capture two types of spillover: agglomeration economies associated with localisation externalities (typically called MAR-externalties in the literature) and urbanisation economies (typically called Jacobian externalities). Box 5.1 provides more details.

5.5 The Herfindahl index of industrial concentration was also computed to take into account entry (and exit) barriers that can impact on various outcomes, with the expectation of a potentially negative influence of higher concentration on productivity and plant closures (positive on profitability).

Table 5.2: Variable definitions used in ARD panel dataset for 1985(1997)-2005

Variable	*Definitions*
Real gross output	Plant level gross output data deflated by 2-digit ONS producer price (output) indices. Data are in £'000 (2000 prices)
Real intermediate inputs	Plant level intermediate inputs (gross output minus GVA) deflated by 2-digit ONS producer price (input) indices (non-manufacturing only has a single PPI). Data are in £'000 (2000 prices)
Employment	Number of employees at plant. (Labour productivity measured as real gross output divided by employment)
Capital	Plant & machinery capital stock (£m 1980 prices for manufacturing; £m 1995 prices for non-manufacturing) plus real value of plant and machinery hires (deflated by producer price index) at plant. Source: Harris and Drinkwater (2000, updated) and Harris (2005b).
Wage bill	Plant level total labour costs divided by employment (deflated by PPI when real values used)
Age	Age of plant in years based on year of entry (source: IDBR)
Single-plant	Dummy coded 1 when plant belongs to a single-plant enterprise
US-owned	Dummy coded 1 if US-owned
EU-owned	Dummy coded 1 if EU-owned
SE-Asian-owned	Dummy coded 1 if owned by Malaysia, Taiwan, Japan, Singapore, HK
Old Commonwealth-owned	Dummy coded 1 if owned by Canada, Australia, NZ, South Africa
Other foreign-owned	Dummy coded 1 if other foreign-owned
Real R&D spending	Plant level BERD (intramural + extramural) deflated by PPI
Industry agglomeration	% of industry output (at 5-digit SIC level) located in local authority district in which plant is located – MAR-spillovers (see Box 6.1)
Diversification	% of 5-digit industries (from over 650) located in local authority district in which plant is located – Jacobian spillovers
Herfindahl	Herfindahl index of industry concentration (3-digit level).
Assisted Areas	Dummy variable = 1 if plant located in assisted area
Region	Dummy variable =1 if plant located in particular region (26 regions used including metropolitan regions)
Industry	1980 SIC or 1992 SIC of plant (used at 3-digit level in most analyses).
PCM	Plant level nominal price-cost margin defined as (GVA minus total labour costs minus capital costs[a]) ÷ gross output
Share	Plant's share in industry real gross output in t. Calculated at the 4-digit industry level
Opening employment	Plant level employment in start year
Displacement	Employment of new entrants ÷ employment of existing plants in time *t*
Growth	Growth in industry real gross output, *t*-1 to *t* (3-digit level)

[a] estimated as $P_K(r + \delta)$, where P_K is the price of investment goods for each industry (source: MM17 and ONS capital stocks branch), r is the rate of return to capital (see Harris and Andrew, 2000), and δ is depreciation (obtained when estimating the capital stock).

5.6 In addition, information is available on whether the plant was located in an Assisted Area, and which government office region and industry (4-digit SIC80 for manufacturing and 5-digit 199SIC for services) it belonged to.

Box 5.1: Spillovers and agglomeration economies

11.1 The first type of agglomeration economies is generally labelled localisation externalities and they are attributable to Marshall (1890), Arrow (1962), and Romer (1986) – hence the term MAR-spillovers. Such spillovers minimise transport and transaction costs for goods, people, or ideas, and thus to benefit from them suggests that firms within a specific industry locate near other firms along the supply chain (be they customers or suppliers); locate near other firms that use similar labour; and/or locate near other firms that might share knowledge (Ellison, *et. al*., 2007). MAR-spillovers are associated with industrial specialisation and are to a large extent an intra-industry phenomenon (where this covers firms belonging to a particular industry, or closely related industries).

11.2 Clearly firms locate in close proximity to reduce the costs of purchasing from suppliers, or shipping to downstream customers. Co-location is also likely if there is a large, common pool of labour. This maximises the 'fit' between productivity levels in firms and workers, since it allows (at lower cost) for labour sorting. It also facilitates workers acquiring industry-specific skills (human capital), since the risk of not being able to appropriate the returns from training are lower where there a large(r) number of potential employers. Again, reverse causality is a possibility because firms may be hiring the same type of workers, because they happen to already be located in the same geographical area. Lastly, firms may co-locate to obtain knowledge spillovers that occur when similar firms engage in, say, R&D to solve similar or related problems. Physical proximity (and density) speeds the flow of ideas, especially when a significant part of intangible knowledge is often tacit (and therefore difficult to codify), and (social) networks tend to be strong.

11.3 As well as MAR-spillovers leading to specialisation, spillovers can also result from urbanisation externalities due to the size and heterogeneity (or diversity) of an (urban) agglomeration. These are labelled Jacobian spillovers (Jacobs, 1970, 1986), and they result when different industries benefit from economies of scope (rather than scale). A greater range of activities (e.g. R&D, business services, cultural and lifestyle amenities, and the overall quality of the public infrastructure – cf Florida, 2002; Glaeser *et. al*., 2001) leads to inter-industry spillovers. (Larger) firms – and especially multinationals – tend to locate their head office management and R&D functions in urban agglomerations. Thus these agglomerations not only tend to generate more product innovations, but there is more likelihood of spin-offs and/or start-ups, which creates a thicker entrepreneurial culture.

5.7 Table 5.3 provides the average values (mean and median) of the variables in the manufacturing panel for the 8 sub-groups discussed in section 2. The 1984–2005 period is covered but only for those plants that were in operation in 1995-2000 (i.e. omitting plants that closed before 1995 and opened post-2000).

5.8 UK-owned plants that were sold to MNE's during 1985-1994, and those that changed ownership more than once during 1985-2000, were generally larger (in output, employment and capital terms), followed by 'Other FO brownfield 1984-2000' plants and UK-owned plants that were sold to MNE's during 1995-2000. Next are plants owned by UK multi-plant enterprises and greenfield FO 1985-2000 (although the latter have higher intermediate inputs and thus gross output levels, and lower capital).

5.9 R&D data is available from the BERD, and this only captures spending by those that contribute most to overall UK R&D; thus the population in the BERD database is small (typically some 12,000 observations per year). Consequently, the percentage of plants with positive R&D expenditure is low. Plants that were UK-owned and sold to the foreign-owned sector during 1995-2000 had the largest proportion undertaking R&D, followed by 'other FO brownfield plants', and then both those that changed owner more than once and plants that were UK-owned and sold to the foreign-owned sector during 1985-1994. However, this does not provide any indication of R&D intensity, which is presented in Table 5.4.[33] Here it can be seen that greenfield FO plants invested significantly higher levels of R&D per employee (although in a small number of plants – only some 2% had any R&D spending as shown in Table 5.3). Ranking second was 'other FO brownfield plants' (with around an average of £4,000 of R&D per employee), followed by plants that changed owner more than once.

5.10 Foreign-ownership is less than 100% (based on the mean statistic) for plants that were UK-owned and sold to the foreign-owned sector during 1985-1994 and 1995-2000, since these plants were UK-owned for at least some of the period covered. Some greenfield FO plants were sold to UK-owned companies post-200, and thus the '% foreign-owned' variable has a mean of 98.6%.

5.11 In terms of wage rates, foreign-owned sub-groups pay more, while UK-owned single-plants have the lowest rates (although the distribution across plants in each sub-group is skewed as seen by considering the median wage rate).

5.12 Differences across sub-groups with respect to the price-cost margin presents no clear picture; the data includes plants that had negative profitability and mean values are therefore based on significantly skewed distributions (hence the large negative mean for plants that were UK-owned and sold to the foreign-owned sector during 1995-2000).

5.13 In terms of the average age of plants, the oldest plants were in the 'changed owner more than once' sub-group (reflecting their lower hazard rates of

[33] Data in Table 5.4 is obtained by taking total R&D in each sub-group and dividing by total employment; the data are not averages across the panel dataset.

Table 5.3: Average values of variables (1984-2005) for each sub-group for GB manufacturing plants operating in 1995-2000

	Sold UK to FO 1995-2000		Sold UK to FO 1985-1994		Other FO brownfield 1984-2000		UK multi-plant firm sold to FO 1995-2000	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Gross output (£k 2000 prices)	8,208	1,302	11,185	2,571	11,531	1,348	4,531	493
GVA (£k 2000 prices)	2,633	465	3,592	922	3,353	436	1,687	173
Employment	67	13	109	32	64	11	39	6
Capital (£k 1980 prices)	1,514	66	2,407	295	1,767	79	1,122	68
% undertaking R&D	5.8	0.0	3.7	0.0	4.6	0.0	1.7	0.0
% Foreign-owned	52.1	100.0	59.3	100.0	99.6	100.0	3.1	0.0
Wage bill (£k 2000 prices)	1,574	296	2,066	500	1,730	252	866	109
% price-cost margin	-284.0	8.6	8.4	8.5	11.1	10.8	6.0	11.2
Age (years)	9.6	7.0	18.0	16.0	9.2	7.0	13.9	11.0
% located in assisted areas	40.3	0.0	41.6	0.0	39.4	0.0	39.3	0.0
% single-plant enterprises	15.4	0.0	19.2	0.0	8.7	0.0	0.5	0.0
Herfindahl index (%)	9.9	7.5	11.6	7.3	12.5	8.0	10.2	7.1
Industry agglomeration	0.6	0.3	0.7	0.3	0.7	0.3	0.5	0.2
Diversification	12.8	8.6	12.9	8.7	12.8	8.9	12.1	8.5

	UK multi-plant firm did NOT sell to FO 1995-2000		UK single plant 1995-2000		Changed owner > 1 during 1985-2000		Greenfield FO 1985-2000 (no change status 1985-2000)	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Gross output (£k 2000 prices)	3,563	557	2,269	1,015	11,284	1,500	6,004	899
GVA (£k 2000 prices)	1,409	225	948	479	4,119	606	1,587	286
Employment	36	8	35	20	102	18	31	7
Capital (£k 1980 prices)	684	39	260	74	2,745	233	137	15
% undertaking R&D	1.8	0.0	3.4	0.0	3.7	0.0	2.0	0.0
% Foreign-owned	0.3	0.0	0.7	0.0	25.5	0.0	98.6	100.0
Wage bill (£k 2000 prices)	725	129	596	318	2,147	333	816	162
% price-cost margin	8.0	11.0	7.4	11.5	6.6	9.6	14.3	13.2
Age (years)	12.6	9.0	14.6	11.0	22.0	23.0	3.4	2.0
% located in assisted areas	37.3	0.0	41.7	0.0	40.9	0.0	37.0	0.0
% single-plant enterprises	6.8	0.0	95.8	100.0	16.6	0.0	4.9	0.0
Herfindahl index (%)	11.9	8.1	7.6	4.4	10.0	6.3	11.9	7.6
Industry agglomeration	0.6	0.3	0.6	0.3	0.7	0.3	0.6	0.3
Diversification	12.1	8.5	13.0	8.7	12.6	8.7	12.9	8.9

Table 5.4: Total intra- and extra-mural spending on R&D per employee, for each sub-group for GB manufacturing plants operating in 1995-2000

	Sold UK to FO 1995-2000	Sold UK to FO 1985-1994	Other FO brownfield 1984-2000	UK multi-plant firm sold to FO 1995-2000	UK multi did NOT sell to FO 1995-2000	UK single plant 1995-2000	Changed owner > 1, 1985-2000	Greenfield FO 1985-2000 no change status 1985-2000
1996	692	1,614	2,883	2,027	1,407	208	2,163	5,968
1997	1,049	1,771	4,906	1,271	1,034	211	2,401	2,375
1998	1,637	496	4,185	4,138	886	192	2,313	2,102
1999	1,404	817	3,375	3,838	1,074	360	2,554	1,443
2000	1,996	939	4,010	1,566	1,877	438	2,723	12,415
2001	2,451	6,136	4,460	1,280	1,991	336	2,763	1,734
2002	2,466	2,020	5,778	1,487	2,534	733	3,252	758
2003	2,081	4,737	5,423	1,463	2,794	927	3,620	667
2004	2,629	1,532	4,206	1,918	2,186	598	3,299	19,895
2005	2,894	2,744	3,196	1,210	2,490	702	1,863	6,244

Source: weighted BERD-ARD

Table 5.5: Average values of variables (1997-2005) for each sub-group for GB service sector plants operating in 1998-2002

	Sold UK to FO 1998-2002		Other FO brownfield 1997-2002		UK multi-plant firm sold to FO 1998-2002		UK multi-plant firm did NOT sell to FO 1998-2002	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Gross output (£k 2000 prices)	9,210	851	7,994	481	5,308	1,666	3,598	681
GVA (£k 2000 prices)	1,303	161	1,593	116	928	226	1,045	173
Employment	27	9	30	7	28	9	32	8
Capital (£k 1980 prices)	749	69	770	33	715	34	769	65
% Foreign-owned	75.3	100.0	100.0	100.0	16.3	0.0	0.8	0.0
Wage bill (£k 2000 prices)	676	124	875	86	562	117	622	113
% price-cost margin	3.3	5.2	1.6	6.3	4.8	4.8	-309.9	7.8
Age (years)	7.8	5.0	6.7	5.0	5.5	4.0	8.1	5.0
% located in assisted areas	30.0	0.0	32.1	0.0	31.6	0.0	33.5	0.0
% single-plant enterprises	5.6	0.0	1.5	0.0	0.1	0.0	1.4	0.0
Herfindahl index (%)	8.1	4.1	11.8	3.6	6.6	2.7	7.1	2.9
Industry agglomeration	1.2	0.3	1.1	0.3	0.8	0.3	0.9	0.3
Diversification	61.2	60.5	61.8	61.3	61.2	60.6	60.4	60.0

	UK single plant 1997-2002		Changed owner > 1 during 1998-2002		Greenfield FO 1998-2002 (no change status 1998-2002)		Total	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Gross output (£k 2000 prices)	1,313	122	7,485	1,018	9,801	390	4,429	570
GVA (£k 2000 prices)	382	55	1,678	209	1,363	117	1,083	145
Employment	14	2	38	9	40	6	29	7
Capital (£k 1980 prices)	201	41	1,389	138	305	10	768	64
% Foreign-owned	0.3	0.0	31.5	0.0	98.8	100.0	16.4	0.0
Wage bill (£k 2000 prices)	229	19	917	145	783	74	619	96
% price-cost margin	-485.7	19.9	-12.8	5.5	10.0	11.0	-243.0	8.4
Age (years)	5.7	5.0	12.0	11.0	1.6	1.0	8.0	6.0
% located in assisted areas	29.4	0.0	31.2	0.0	30.2	0.0	32.0	0.0
% single-plant enterprises	98.7	100.0	4.0	0.0	1.0	0.0	22.7	0.0
Herfindahl index (%)	6.7	3.0	7.6	3.3	8.1	2.5	7.5	3.0
Industry agglomeration	1.0	0.1	1.1	0.3	1.0	0.3	1.0	0.3
Diversification	59.9	59.6	60.8	60.2	61.8	61.4	60.6	60.0

closure – see Figure 2.7); the youngest plants were greenfield foreign-own (since they are both by definition relative new and their hazard rate of closure is high).

5.14 Around 40% of plants across the sub-groups were located in assisted areas, and singe-plant status is mostly confined to UK-owned single plants (although a significant minority plants that changed owner more than once were at some time single plants[34]).

5.15 There is no strong evidence that concentration levels (as represented by the Herfindahl index) are different across the sub-groups, except perhaps for UK-owned single plant enterprises that tend to operate in industries with higher levels of competition.

5.16 Finally, agglomeration and diversity does not appear to differ across the various sub-groups, based on the information in Table 5.3.

5.17 As to the service sector panel data, Table 5.5 provides the average values (mean and median) of the variables for the 7 sub-groups discussed in section 3. The 1997–2005 period is covered but only for those plants that were in operation in 1998-2002 (i.e. omitting plants that closed before 1998 and opened post-2002).

5.18 Plants associated with the foreign-owned sector (that is those with relatively high foreign-ownership percentages in the table) were generally larger (in output, employment and capital terms), although greenfield FO plants had higher intermediate inputs and thus gross output levels, and lower capital inputs.

5.19 R&D data is available from the BERD, but to date the service sector data has not been fully integrated in the database (although levels are likely to be low as R&D in BERD is dominated by manufacturing).

5.20 In terms of wage rates, foreign-owned sub-groups pay more, while UK-owned single-plants unambiguously have the lowest rates. In general, profitability seems to be lower in service sector plants (compared to manufacturing), and there is evidence that shows that a significant proportion of UK-owned single plant enterprises have relatively high profitability.

5.21 Plants are on average younger in the service sectors covered, vis-à-vis manufacturing, with the oldest plants in the 'changed owner more than once' sub-group (reflecting their lower hazard rates of closure – see Figure 3.7); the youngest plants were greenfield foreign-own (since they are by definition relative new).

5.22 Around 30% of plants across the sub-groups were located in assisted areas (which is significantly lower than in manufacturing), and singe-plant status is mostly confined to UK-owned single plants (although some plants that changed owner more than once were also at some time single plants).

[34] Note, foreign-owned plants operating in the UK can also be single-plant enterprises if the MNE subsidiary only operates in one location.

5.23 There is no strong evidence that concentration levels (as represented by the Herfindahl index) are different across the sub-groups, although on average they are lower than in manufacturing.

5.24 Finally, agglomeration and diversity does not appear to differ across the various sub-groups, based on the information in Table 5.4, but both indices are higher than in manufacturing which suggests that services are more concentrated geographically (e.g. in cities).

Econometric issues when using panel micro-data

5.25 Harris (2002, 2005a) discusses the issues of weighting data prior to econometric estimation, and the preference for using plant (Local Unit) data from the ARD, rather than establishment (Reporting Unit) data. These issues are important, and have implications for any statistical analysis, and therefore the arguments presented in Harris (2005a) are repeated here for completeness.

Plant vs. establishment data

5.26 An important question when using the ARD is at what level should analyses take place: plant, establishment or enterprise level? For each year in the ARD there are two files that can be merged to produce plant (or local unit (LU)) level data; one file covers the sample of establishments (or RUs),[35] known as the 'selected' file, that were asked questions about financial matters (e.g. amounts spent on capital expenditure, including any pre-production expenditure), while the other contains information (such as employment and ownership structure) on 'non-selected' establishments (the remainder of the population). Establishment-level financial data can be 'spread back' to LUs using employment shares and the unique reference number allocated to each plant during the whole 1970– 2005 period (with single-unit establishments supplying their own LU – i.e. plant- level – information). Where necessary, sample data can be grossed up to provide population estimates (using employment estimates for all plants).[36]

5.27 Thus, plant-level (LU) estimates of financial data are to some extent derived from establishment-level (RU) information. In particular, large multiplant establishments combine a significant proportion of their plants into single financial returns to the Annual Business Inquiry (ABI). The extent to which such plant-level estimates of financial data are biased cannot be measured, and especially whether this biases any subsequent

[35] Establishments are either single plants or they make a return that covers several plants – details and definitions are provided in the introductory notes for each ABI.

[36] 'Weights' can be calculated at the 4-digit industry level and by RU size-band. Note, the 1980 Standard Industrial Classification (SIC) is typically used throughout for manufacturing data (requiring a 'look-up' table that reclassifies the 1992 SIC to the 1980 SIC), with plants from 1970 to 1979 reclassified from the 1968 SIC.

econometric analyses using plant- level data. Of course, 'spreading back' RU investment data to LUs based on employment shares is to assume, for example, a constant investment–labour ratio or labour productivity across the LUs of an establishment.[37] In addition, when using regression models the 'spreading back' of data is likely to lead to lower standard errors as the variance of the data at plant level is likely to be lower than it would be if information were available on each individual plant. But note, RUs also involve using data with lower variance as they comprise the average of what can be very different sized plants.

5.28 The most important argument for using plant-level data is that RUs are not an economic but an accounting unit[38] and consequently they are very often not 'stable' over time (an essential requirement for analysing opening and closure or when using the perpetual inventory approach to measuring the capital stock). That is, their composition (in terms of the number of plants they cover) can change as companies open and close plants, buy and sell plants, or simply change the way they report to the ONS (i.e. reallocate plants into different establishments for accounting purposes). Even those RUs that have the same number of plants in different years (typically the smallest establishments), the year of opening and closing for the different plants in each RU are a mix of different dates. The largest RUs, in employment terms, are more likely to have different numbers of plants in different years. The deviation in the opening and closing dates of the plants contained in these establishments is significant. In addition, the change in average employment in these establishments (and the standard deviation associated with the employment in the plants contained in each establishment) is very large.

5.29 To illustrate the consequences of using RU data rather than LU data, take the example of calculating the capital stock. If RU data are used, then when a plant(s) closes but the RU does not, the capital stock when calculated using the perpetual inventory method still remains in the RU measure. Similarly, if a plant is reassigned to another RU (perhaps because the RU was 'closed', or the plant was taken over by another enterprise), it will not bring its accumulated past net investment at the time of the transfer, and thus the RU that gains the plant does not also gain its capital stock.

5.30 Overall, the implications of using RU data rather than LU data when calculating the capital stock has been analysed by Harris (2005b). Using the perpetual inventory approach (involving length-of-life and depreciation information), the same procedures are used with real gross investment data based on LUs and RUs (the latter is referred to hereafter as the RU capital stock estimates). Table 4.1 in Harris (2005b) presents the results from aggregating plant-level capital stock data to the RU level and

[37] In the case of investment, since this is usually 'lumpy' then for some plants it is likely that investment–labour ratios are above and below the average for the RU. Over a number of years, however, this issue is unlikely to be too great a problem as there is a strong positive correlation between investment and employment levels across plants, reflecting the fact that large plants in employment terms on average tend to invest more (and vice versa).

[38] That is, an RU is just the multiplant return made by an enterprise, with the firm itself deciding how it wishes to combine plants into its RUs. So there can be a mix of large and small plants, covering several UK regions.

comparing the results with the RU capital stock estimates. Note, the extent to which the two series differ reflects the points noted above that RU's are often not stable over time (of course single-plant enterprises have de facto the same LU and RU reference codes, and therefore will have identical capital stock estimates[39]). The first difference noted by Harris (op. cit.) is that overall the total UK manufacturing capital stock is lower when RU data are used, because a number of RUs were 'closed' during the 1970–1993 period with (some or all) of the plants they accounted for reassigned to other RUs.

5.31 Next, the difference between the two capital stock estimates for each RU was calculated as the ratio of the estimate based on RU data to the estimate based on using LU data. During the 1980–1993 period, over 70% of RU's were 'stable' in that they contained the same plants throughout the post-1969 period (indeed, most were single-plant enterprises), but these 'stable' RUs only accounted for some 18–19% of the total real capital stock during 1980–1993. For a sub-group of other RUs, the capital stock based on using LU data was larger. This was usually the result of RUs that were closed having their plants reassigned but not the capital stocks of these reassigned plants. For a different sub-group of RUs, the capital stock based on using LU data is smaller. This typically resulted when some (but not all) of the plants within a RU were closed, which reduces the capital stock estimate based on using LU data but not the estimate obtained when using RU data (because the RU does not close and thus none of the capital stock of closing plants is removed).

5.32 In conclusion, while it is recognised that 'spreading' back RU data to plants imposes certain untested assumptions (e.g. the same labour productivity levels) and an unknown bias to econometric estimation, using establishment (or RU) data introduces significant problems as RUs are not economic units. As stated above, it is the contention here that either plant- or firm-level data should be used when analysing the ARD (with series like the capital stock based on plant- level estimates which if necessary can be aggregated to the firm level).

Weighting

5.33 Sample weights can be calculated in the ARD as information is available on the employment covered by each selected plant for which there is financial information as well as employment in non-selected plants (covering the rest of the population). The issue then arises as to whether the data that are used in econometric modelling should be weighted or not, to take account of the stratified sampling procedures used by the ONS when constructing the ARD.

5.34 If we have a correctly specified model determining y conditional on an exogenous variable x, then with simple random sampling (i.e. with everyone in the population having an equal, independent chance of getting into the sample) x would be exogenous in the sample as the error term in

[39] Although this changes if they are acquired by a multiplant firm.

the model has zero conditional mean – given that we impose E(x|u) = 0 – and constant conditional variance, Var(x|u)=c. Even if a stratified sample is drawn, with stratification based on *x*, then as long as E(x|u)=0 and Var(x|u)=c we have exogenous stratification, and weighting is unnecessary (as parameter estimates are consistent, unbiased and efficient). Put another way, there exists a 'true' underlying model that is based on what statisticians refer to as the existence of a 'super-population' where all observations come from the same population and thus they share common parameters. (The only reason for weighting in this case is to correct for such problems as heteroscedasticity, and not because the observations are based on a sample.) Indeed, weighting in such as situation (where E(x|u)=0 and Var(x|u)=c) is inefficient (although still consistent) because the weighting will upset the homoscedastic property of the model (as the weights can have a large variance).

5.35 But this model is a special case involving some fairly strong assumptions which ideally need to be tested and if there are problems, such as endogenous stratification or omitted variables (or, as some have argued, the belief that different strata may have different sub-parameters),[40] then weighted regression is necessary in order to identify population parameters.[41] For instance in the case of omitted variables, Wooldridge (1999) shows that even under such misspecification the weighted estimator converges to the population parameter, which is not true of the unweighted estimator. Moreover, he shows that under exogenous stratification, weighting results in consistent estimation if *x* is uncorrelated with the model's residuals (i.e. $E(x'u) \neq 0$) whereas the unweighted model requires the stronger property that E(x|u) = 0.

5.36 The major reason for using weighted regression is when *x* is exogenous in the population but endogenous in the sample because of the fact that sampling has produced selection bias. The latter occurs when the probability of getting in the sample (denoted by p) is correlated with *x* times *u.* If stratification is based on *x*, such that p is correlated with *x* and with *u*, then we will get $E(x|u) \neq 0$ in the sample and if unweighted regression is used the estimated parameters are inconsistent (Heckman, 1979; Hausman and Wise, 1981; Magee et al., 1998). Thus, when it is suspected that there is a possibility of endogenous sampling (given the way the sample is drawn from the population) and the goal is to obtain a

[40] Note, this point about different strata having different sub-parameters is not central to the arguments considered here that relate to weighting. In fact, if parameter estimates are unstable (across sub-groups of the sample or population, or over time) then it can be argued that imposing non-varying parameters would amount to model misspecification, which is a separate issue to whether data should be weighted or not.

[41] It has been suggested that unweighted and weighted models should be compared (and any differences used to formally tested for selection bias, using the Hausman test – see Magee et al. (1998); Wooldridge (1999) and Butler (2000), for a discussion). If selection bias is found, weighted regression should be used although there are those (e.g. DuMouchel and Duncan, 1983; Skinner et al., 1989) who take a very different approach and argue that if the two sets of estimates differ significantly then this is evidence that the model is misspecified and needs further elaboration and subsequent estimation using unweighted regression. However, this does not overcome the issue (discussed below) of endogenous sampling when the model is correctly specified.

consistent estimator, we should test the null of exogenous sampling (see Harris, 2002, Table A2) and if rejected use weighted regression as by construction (in the way sample weights are used) $E(x|u) = 0$.[42] As weighted regression may sometimes result in a larger error variance, alternative procedures involving the use of additional information can be useful (e.g. the two-stage procedure advocated by Magee et al., 1998). However, if the model is estimated using General Method of Moments (GMMs), Butler (2000) shows that the variance of the GMM estimator can be smaller when sampling weights are employed vis-a´-vis both unweighted GMM and weighted conditional maximum likelihood estimation (assuming disturbances are not homoscedastic, a reasonable assumption in non-linear models).

[42] It is assumed that weights are accurately measured; otherwise bias is introduced.

6. Impact of foreign acquisitions on productivity

6.1 The first two tasks are to consider (a) to what extent do acquiring/merging foreign-owned firms cherry-pick (i.e. acquire plants with above average productivity); and (b) what is the effect of foreign acquisition on UK firm productivity (looking at both total factor productivity (TFP) and labour productivity) 1 year, 2 years, and 5 years after acquisition.

6.2 In order to undertake this task, we have estimated production functions so as to model the determinants of TFP.[43,44] This is based on estimating a dynamic-form of the Cobb-Douglas production function using (unbalanced) panel-data:

$$\ln Y_{it} = \beta_0 + \sum_{j=1}^{4} \pi_{1j} x_{jit} + \sum_{j=1}^{3} \pi_{2j} x_{ji,t-1} + \sum_{l=1}^{8}\sum_{j=1}^{4} \pi_{3j} (D_l x_{jit}) + \pi_4 \ln Y_{i,t-1} + \phi_x X_{it}$$
$$+ \sum_{l=1}^{8} \lambda_l D_l + \sum_{k=1}^{4}\sum_{s=-6}^{6} \gamma_s ACQ_{k,t-s} + \eta_i + t_t + (1-\rho)e_{it} \qquad (6.1)$$

where the subscripts i and t represent the i-th plant and the t-th year of observation, respectively;
Y represents real gross output;
x_1 represents the logarithm of intermediate inputs;
x_2 represents the logarithm of capital (stock + hires);
x_3 represents the logarithm of total employment, e;
x_4 represents a time trend to take account of technical progress, t;
X is a vector of variables determining TFP (comprising most of the other variables in Table 5.2), and includes industry and region dummies;
D_l is a dummy variable taking on a value of 1 for each sub-group (l = 1, …, 8) with plants belonging to sub-group 9 forming the reference group;

[43] TFP is measured as the level of output that is *not* attributable to factor inputs (employment, intermediate inputs and capital). It measures the contribution to output of all other influences, capturing such determinants as technological progress and/or changes in efficiency (where the latter also captures the under-utilising of factor inputs unless this is taken into account when measuring these inputs). Thus, such a measure of TFP is equivalent to a combination of the residual ε_{it} from (6.1) and the time trend, t, which represents technological change. Harris (2005) provides a detailed explanation of how this approach is preferable to other estimators of productivity, and in particular why a one-step model is preferred rather than estimating a production function (or using a growth equation approach) involving just output and factor inputs in stage 1 to obtain (mis-specified) estimates of TFP for use in a stage 2 analysis of the determinants of TFP. Note also, we prefer not to use the Olley and Pakes (1996) approach, even though it has become very popular in the applied literature in this area. Our reasons are set out in the appendix to this chapter.

[44] Note, while the UKTI request was also to look at labour productivity, the results by definition should be the same as when estimating equation (6.1) having subtracted (log) labour from both sides of the equation. That is, labour productivity is determined by factor inputs and the determinants of TFP, and indeed it is this mixing of the influence of changes in factor inputs and TFP that make it a less useful measure of productivity.

ACQ are dummy variables taking on a value of 1 in the year when the plant was acquired, with k = 1, …, 4, representing US-owned, EU-owned, other country foreign-owned, and UK-owned, respectively;[45] and
the composite error term has three elements with the fixed-effect term η_i affecting all observations for the cross-section plant *i*; t_t affects all plants for time period *t*; and e_{it} affects only plant *i* during period *t*.[46]

6.3 As explained in Chapter 5, the unbalanced panel data used to estimate this model is based on plants that existed in 1995-2000 (1998-2002 for services) but which operated during the full 1985-2005 (or 1997-2005) period [i.e. we do not include plants that closed before 1995 (1998), nor plants that started post 2000 (2002)].

6.4 To allow for potential endogeneity of factor inputs and output, equation (6.1) was estimated using the Generalised Method of Moments (GMM) systems approach available in STATA 9.2 (Arellano and Bond, 1998). This is sufficiently flexible to allow for both endogenous regressors (through the use of appropriate instruments involving lagged values – in levels and first differences – of the potentially endogenous variables in the model[47]) and a first-order autoregressive error term.[48] Note, all data were also weighted to ensure that the samples are representative of the population of GB firms under consideration.[49]

6.5 There are three separate controls in equation (6.1) for the impact of foreign-ownership: firstly, there are dummy variables that take on a value of 1 during the period when the plant is either EU-, US-, or other country foreign-owned. These dummies allow us to determine whether there is some intrinsic productivity benefit from being foreign-owned (however and whenever this occurred). Secondly, we have included a dummy variable that take on a value of 1 for those plants that sometime during 1995-2000 (1998-2002) were acquired by foreign-owned firms (these comprise D_1 but in the model estimated we actually include 3 composite dummies comprising the foreign-ownership dummies, for EU-, US- and other county foreign-owned, multiplied by D_1). This allows us to determine whether those plants that were acquired by foreign-owned firms had higher productivity beyond any productivity advantage from belonging to a

[45] Note, ACQ_k enters contemporaneously and with leading and lagged terms, to consider the time profile of productivity for acquired firms leading up to and post being taken-over. The longest lead and lag are set to capture all other time periods covered in the dataset. Missing values for these terms are assigned a value of 0 (given the unbalanced nature of the panel dataset). Aggregating all those plants belonging to subgroups ACQ_1 to ACQ_3 is equal to the overall sub-group 1 (acquired by FO enterprise 1995-2000/1998-2002), whereas ACQ_4 is equivalent to D_8.
[46] Note, if e_{it} is serially correlated such that $e_{it} = \rho e_{it-1} + u_{it}$ then u_{it} is uncorrelated with any other part of the model, and $|\rho|<1$ ensures the model converges to a long-run equilibrium (i.e. the variables in the model are cointegrated).
[47] Output, intermediate inputs, labour and capital, are treated as endogenous.
[48] Using the GMM systems approach the model is estimated in both levels and first-differences. This is important, since Blundell and Bond (1999) argue that including both lagged levels and lagged first-differenced instruments leads to significant reductions in finite sample bias as a result of exploiting the additional moment conditions inherent from taking their system approach.
[49] A discussion of the importance of weighting the data is provided in Harris (2002, 2005).

foreign-owned multinational enterprise. This is a test of the 'cherry-picking' hypothesis. Thirdly, we include dummies (ACQ_k) that take on a value of 1 only for the year in which the previously UK-owned plant was acquired by a foreign-owned enterprise (for k = 1, ..., 3). This final set of dummies allows us to test if acquisition impacted on productivity, especially as we include the ACQ_k both contemporaneously and with leading and lagged terms, to consider the time profile of productivity for acquired firms leading up to and post being taken-over.

6.6 Including the second set of dummies, that test if the acquired plant has higher productivity throughout its existence in the dataset, to some extent is likely to help control for selectivity bias when estimating the impact of acquisition on productivity (i.e., where bias arises because the plant was always 'better' and would have performed better post-acquisition even if it had not changed ownership). This is because the parameter estimates, $\hat{\gamma}$, are estimated having controlled for the fact the plant belonged to sub-group D_1. However, while this may reduce any potential selectivity effect, it does not mitigate against the possibility that a potential bias will still remain, since the time-path of productivity post-acquisition is still (potentially) endogenous to the plant having certain characteristics that ensure its better performance whether it receives treatment (i.e., is acquired) or not.

6.7 Therefore, we need to take account of this potential selectivity bias and we do this using a matching estimator approach. The appendix to this chapter sets out and justifies the methods used.[50] Here we move to the results obtained when estimating equation (6.1) using the full-sample available (comprising both the treated and untreated data), and the matched-sample data (i.e., the treated and control group data).

6.8 Tables A6.1 and A6.2 in the appendix provides the results for manufacturing and service sector industries when equation (6.1) is estimated using the full-sample data.[51,52] The key results of interest are the dummy variables for each foreign ownership group, the dummies for each of the sub-groups identified (with specific interest regarding those plants that were acquired by foreign-owned firms during 1995-2000/1998-

[50] There is also a second potential source of selectivity bias – plants that close post-acquisition (see Chapter 10) drop out of the sample and therefore comparisons of post-acquisition productivity with pre-acquisition productivity may be biased (upwards) if it is assumed that the hazard rate of closure is higher for those plants that closed. This is little that can be done to mitigate against this impact of closure on estimates of post-acquisition productivity (except to note the possibility of likely upward bias), although it is worth noting that our preferred pre- and post-acquisition comparisons are based on the matched sample – i.e., plants with similar pre-acquisition characteristics. This is likely to mitigate substantially against bias caused by this second selectivity effect.

[51] Note, the model estimated passes diagnostic tests for autocorrelation and the Hansen test that the over-identifying restrictions are valid.

[52] Table A6.3 in the appendix shows the number of observations available for each of the models estimated below, for each sub-group of acquired plants. This information helps with the interpretation of the results obtained. That is, in some instances the number of observations for a relevant sub-group (e.g. plants acquired by Other Foreign-owned companies) may be small, relative to the overall number of plants acquired and not acquired.

2002), and the time profile of productivity associated with plants that were acquired at time *t*. The latter is tracked for the whole period before and after *t* (with the parameter estimate for ACQ_{t-6} covering the period 6+ years before being acquired, while ACQ_{t+6} covers the period 6+ years after being taken-over[53]). Tables 6.1 and 6.4 contain the results for manufacturing, while Tables 6.5 and 6.6 have results for services.

6.9 In addition to the results being presented in the tables, Figure 6.1 (for manufacturing) shows the cumulative distributions of TFP for each sub-group of acquired plants (along with the cumulative TFP of non-acquired plants); TFP was obtained from the results obtained when estimating equation (6.1).[54] A sub-group (e.g. US-acquired plants) with a productivity distribution always to the right of another sub-group (e.g. UK-acquired) is said to dominate the other sub-group. We can formally test if the rank ordering of productivity distribution of one sub-group of plants lies to the right of another sub-group using a two-sided Kolmogorov-Smirnov statistic (see Stevens, 1974); if so, there is shown to be first-order stochastic dominance between such (random) variables, which is a stricter test than simply comparing average productivity levels across sub-groups.

Manufacturing

6.10 Table 6.1 shows that manufacturing plants that were US-owned were overall some 6% more productive (than UK-owned plants, the benchmark group), although this varied from around 11% higher TFP in the other metals, extraction of minerals and chemicals sector, to no discernible advantage in the timber, paper & printer sector. In contrast, EU-owned plants were only statistically significantly more productive in the metal goods, mechanical engineering, and office & data processing equipment sector. The results for foreign-owned plants from elsewhere was more mixed; around 4% better in food, drink, textiles, clothing, leather & footwear, and timber, paper & printing; but over 5% less productive in the metal goods, mechanical engineering, and office & data processing equipment sector. Overall, therefore, belonging to this other FO-group brought no TFP advantage.

6.11 Turning to whether foreign-owned firms 'cherry-picked' the best UK plants for acquisition, in the US-owned sub-group the overall results suggest that plants acquired were some 14.3% less productive, although this masks considerable differences across industry sub-groups (over 23% more productive in the other metal goods, mechanical engineering, and office & data processing equipment sector, to over 46 less productive in the

[53] For service sector plants we do not have enough time periods before acquisition to go back to *t*-6. Rather ACQ_{t-4} is the end point covering the period 4+ years before being taken-over.

[54] Specifically, rearranging equation (6.1) gives:

$$TFP_{it} = \ln Y_{it} - \sum_{j=1}^{3} \hat{\pi}_{1j} x_{jit} - \sum_{j=1}^{3} \hat{\pi}_{2j} x_{ji,t-1} - \sum_{l=1}^{8} \sum_{j=1}^{3} \hat{\pi}_{3j} (D_l x_{jit}) - \hat{\pi}_4 \ln Y_{i,t-1} \qquad (6.2)$$

Table 6.1: Marginal TFP effects[a] associated with belonging to sub-group, manufacturing (source Table A6.1)

	IND1	z-value	IND2	z-value	IND3	z-value	IND4	z-value	IND5	z-value	IND6	z-value	Average[b]
US-owned	0.107	5.77	0.100	7.00	0.026	1.44	0.061	3.21	-0.007	-0.43	0.077	3.24	0.060
EU-owned	-0.012	-0.89	0.083	5.86	0.026	1.54	-0.011	-0.72	0.023	1.48	0.032	1.48	0.019
Other FO	-0.009	-0.71	-0.055	-4.24	-0.025	-1.45	0.037	2.17	0.045	4.11	-0.002	-0.09	-0.003
EU-owned x group 1	0.338	1.97	0.161	0.82	-0.517	-2.58	-0.415	-2.71	-0.174	-1.42	-0.125	-1.32	-0.150
US-owned x group 1	0.287	1.59	0.234	2.05	-0.462	-2.35	-0.437	-2.88	-0.170	-1.23	-0.184	-1.52	-0.143
Other FO x group 1	0.426	2.07	0.292	2.19	-0.479	-2.39	-0.391	-2.56	-0.149	-0.99	-0.235	-1.66	-0.100
group 2	-0.114	-0.30	0.098	1.41	-0.635	-1.96	-0.137	-0.44	0.655	1.10	-0.314	-0.84	-0.125
group 3	0.056	0.35	-0.238	-1.55	-0.682	-2.37	0.042	0.12	0.665	3.52	-0.410	-1.53	0.057
group 4	-0.280	-2.93	-0.149	-0.84	-0.487	-1.55	-0.404	-1.57	0.642	3.24	-0.432	-1.52	-0.088
group 5	-0.063	-0.38	0.194	1.17	-0.633	-2.19	-0.207	-0.67	0.287	1.62	-0.214	-0.76	-0.156
group 6	-0.204	-2.20	0.051	0.33	-0.549	-1.77	-0.174	-0.62	0.332	2.10	-0.302	-1.02	-0.179
group 7	-0.175	-0.66	0.026	0.04	0.668	0.43	-0.814	-2.62	1.359	2.12	0.242	0.17	0.148
group 8	-0.136	-1.39	-0.019	-0.12	-0.515	-1.62	-0.260	-1.01	0.116	0.74	-0.288	-0.97	-0.213

[a] Values from Table A6.1 have been converted to exp(β)-1.

[b] Obtained from weighting industry results using average total real gross output for the period covered.

electrical & electronic equipment, transport equipment, and instrumental engineering sector). For the EU-owned acquisition sub-group, the plants acquired were more likely to have lower TFP (on average 15% lower, but around 41-52% lower in the electrical & electronic equipment, transport equipment, and instrumental engineering, and food, drink, textiles, clothing, leather & footwear) although EU-acquired plants in the metals, extraction of minerals and chemicals sector were 34% more productive. For the other foreign-owned sub-group, plants had statistically significantly lower TFP in 3 of the 6 sectors covered, and higher TFP in the 2 others; the overall result was lower TFP of about 10%.

6.12 In general, these results suggest that during the 1995-2000 period, UK plants that were then acquired by foreign-owned multinationals were on balance likely to have lower productivity in 3 of the 6 industry sub-groups covered. This was true even for plants acquired by US companies, and even after taking account of the generally higher TFP levels associated with being US-owned.[55] Thus there is evidence of 'cherry-picking' in some industries (notably metals, extraction of minerals & chemicals, and other metal goods, mechanical engineering, and office & data processing equipment sectors) although in 2 - 3 industry sub-groups the evidence suggests that foreign-owned companies were more likely to acquire plants with lower levels of TFP.[56] This is in contrast to the results presented in Harris and Robinson (2002) covering acquisitions of manufacturing plants in the 1987-1992 period, which showed 'cherry-picking' in all three manufacturing sectors covered.[57]

6.13 As to the other sub-groups in Table 6.1, there is some evidence to suggest that greenfield foreign-owned plants had higher TFP, and but the results are generally insignificant (as they are for most other sub-groups).

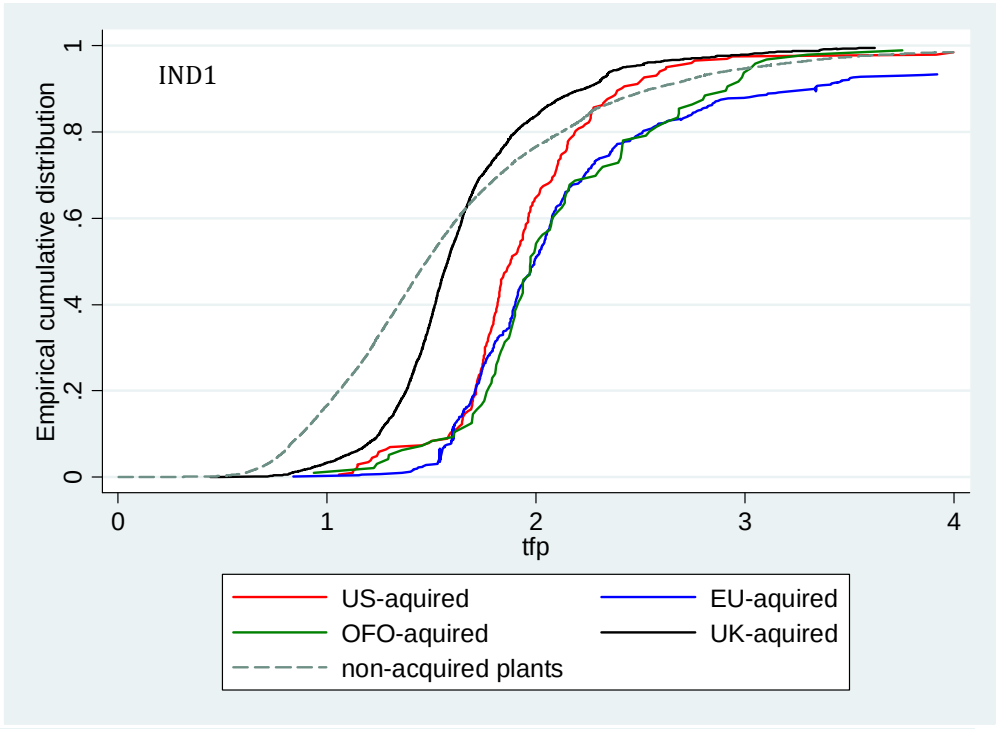
6.14 Turning to the results presented in Figure 6.1, these present a slightly different picture of whether acquired plants were 'cherry-picked'. The TFP distributions are based on the predicted TFP of each plant using the results obtained from estimating equation (6.1) – see footnote 54 – and therefore take into account all other determinants of output other than the impact of factor inputs (capital, labour and intermediate inputs). Thus, while Table 6.1 shows the impact of being foreign-owned, or the effect of being

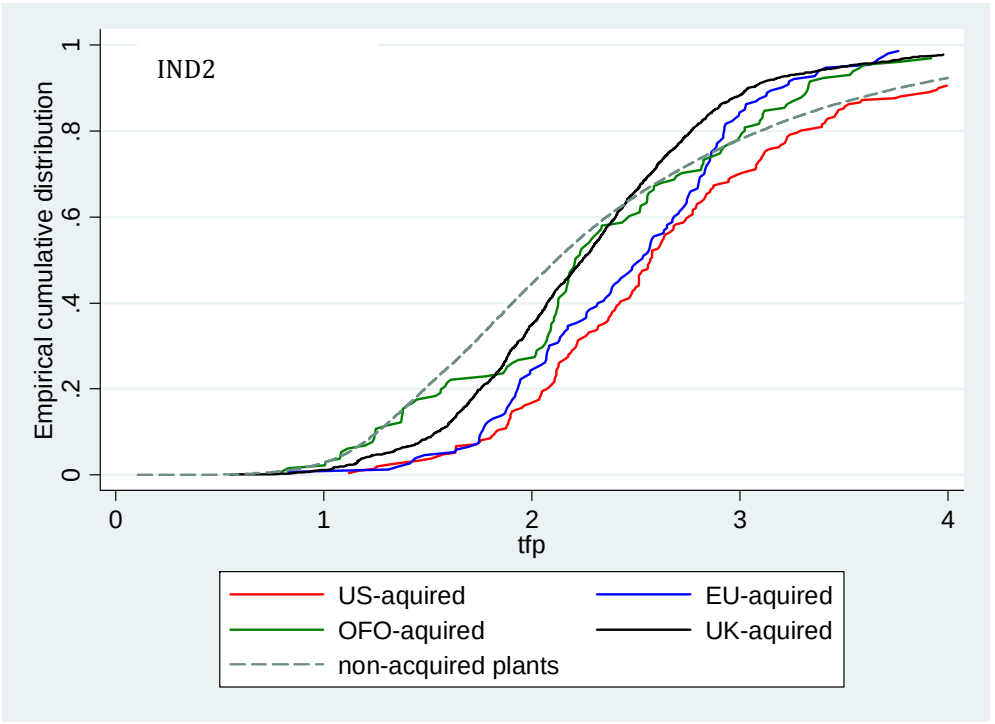
[55] That is, the effect of being US-owned *and* acquired means that all the parameter estimates attached to US-ownership in Table 6.1 must be added together.

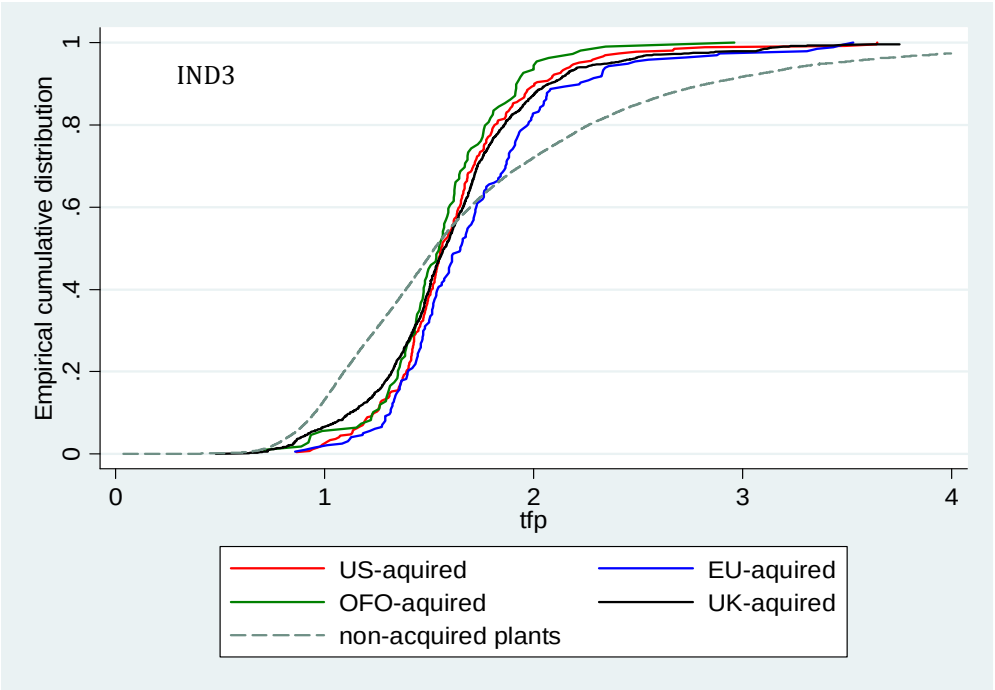
[56] Note, other industry groupings have been experimented with, compared to those set out in Table 5.1. For example, industries were reclassified based on their levels of R&D intensity throughout the 1995-2000 period (based on BERD data), but the results obtained were generally weaker (i.e., no clear patterns emerged to help explain the 'cherry picking' results based on R&D intensity across industries, and often the size and statistical significance of the results were poorer). Thus the industry groups set out in Table 5.1 are used throughout this and the following chapters.

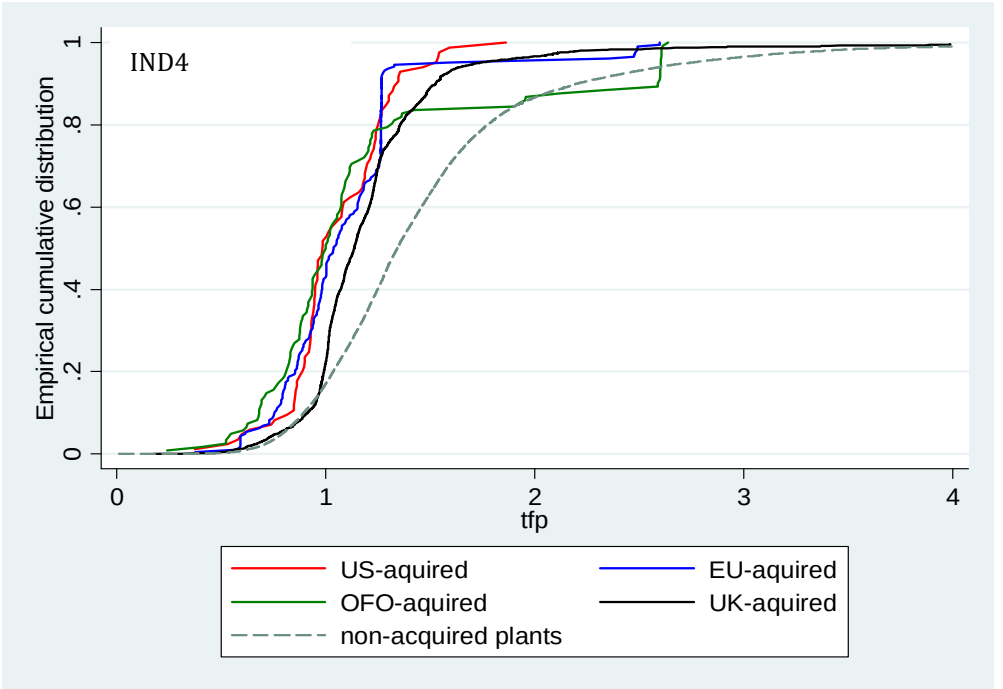
[57] There are some major differences (other than the time period covered) between this and the previous study. Probably the most important is that here other TFP effects (such as single-plant status, the age of the plant, market concentration, agglomeration factors, etc.) are controlled for, while Harris and Robinson (op. cit.) did not include any of these factors in their model, and given the significance of many of these variables this probably accounts for the difference in the results obtained (e.g., see Figure 2.1 and the discussion of the results obtained).

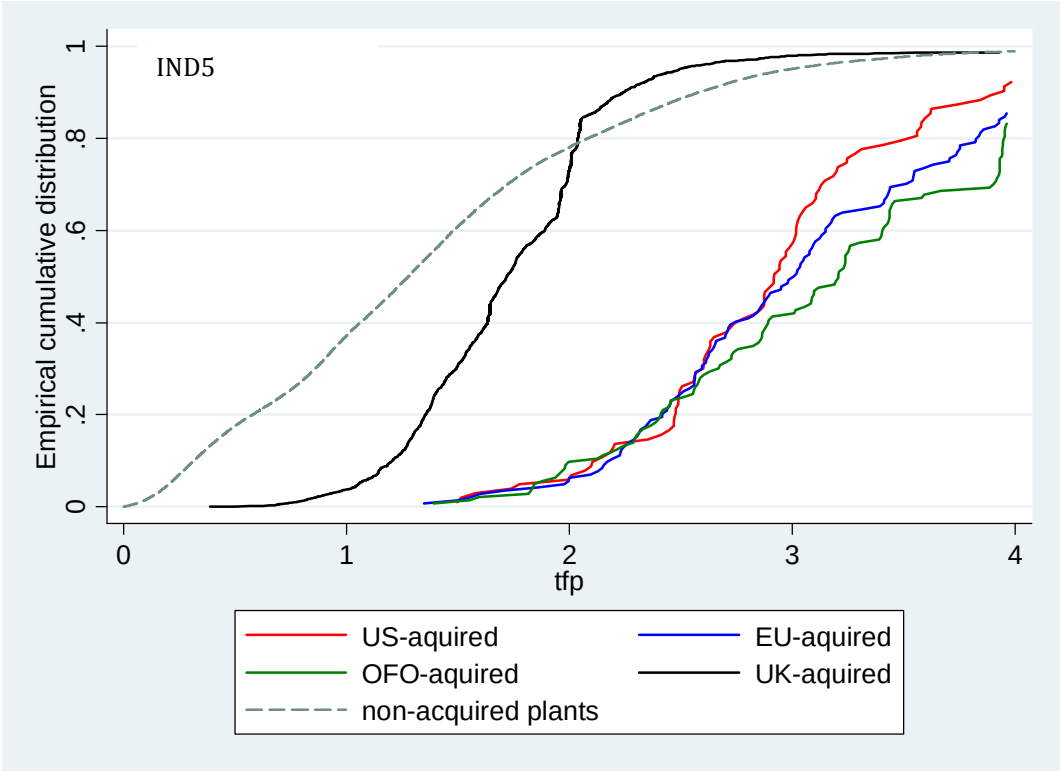
Figure 6.1: TFP distribution for acquired and non-acquired plants, manufacturing

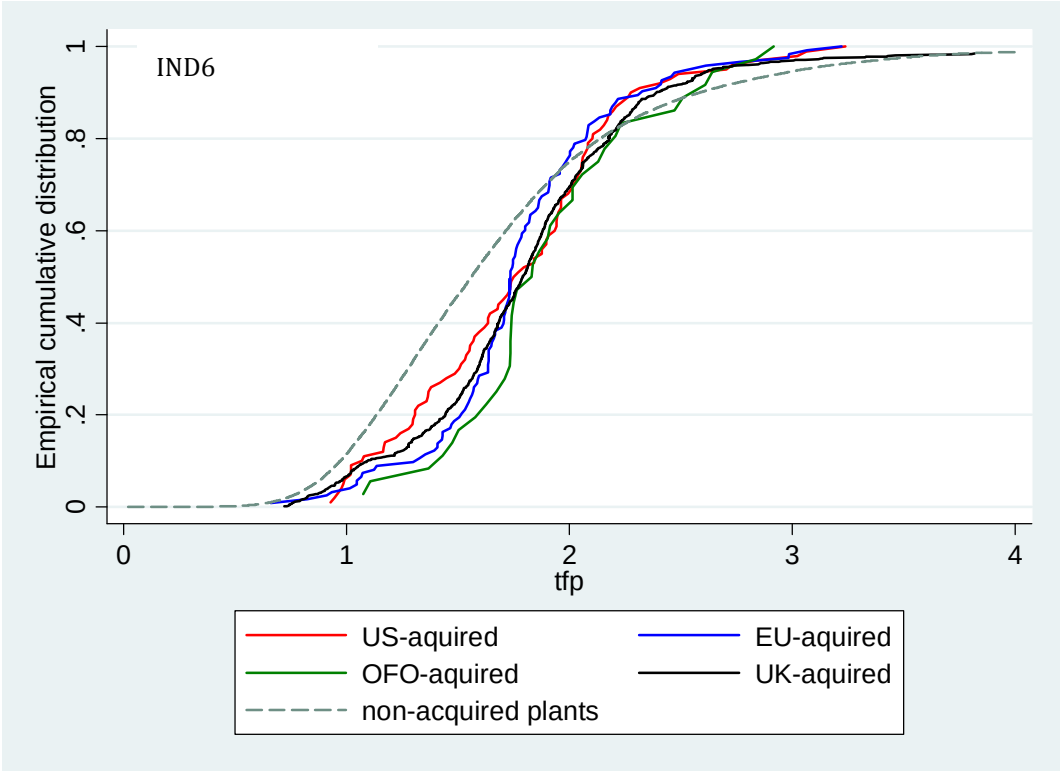












See Table 5.1 for industry codes used.

acquired, *holding all other determinants constant*, Figure 6.1 shows the actual TFP of the sub-groups of interest, which is the joint-outcome of factors such as ownership, belonging to an acquired sub-group (or not), and locational impacts.

6.15 The diagrams show that, compared to non-acquired plants, in most manufacturing industry groups acquired plants had *higher* TFP at lower- to middle-sections of the productivity distribution (the main exception is the food, drink, textiles, clothing, leather & footwear sub-group where non-acquired plants dominate throughout). In the timber, paper & printer sub-group (IND5), acquired plants were generally better than non-acquired plants at all levels of TFP (only the best UK-acquired plants had lower productivity compared to non-acquired plants at the top end of the distribution); in metals, extraction of minerals, and chemicals, EU- and Other Foreign-acquired plants were generally the best across the distribution; while in the other metal goods, mechanical engineering, and office & data processing equipment sector US-acquired plants had a TFP distribution to the right of non-acquired plants at all levels.

Table 6.2: Two-Sample Kolmogorov-Smirnov[a] Tests on the distribution of TFP by whether the plant was acquired, manufacturing, 1984-2005

Industry (1980 SIC)	Difference favourable to:	
	All acquired vs.	All non-acquired
1: SIC 22-26: metals, extraction of minerals, chemicals	-0.040**	0.264**
2: SIC 31-33: metal goods n.e.c., mechanical engineering, office & data processing equipment	-0.092**	0.146**
3: SIC 34-37: electrical & electronic equipment, transport equipment, instrumental engineering	-0.159**	0.173**
4: SIC41-45: food, drink, textiles, clothing, leather & footwear.	-0.325**	0.000
5: SIC 46-47: Timber, paper & printing.	-0.000	0.383**
6: SIC 48-49: rubber & plastics, other manufacturing	-0.043*	0.230**

Note: ** denotes null rejected at 1% level; * null rejected at 5% level.
[a] In each instance we are testing the two sub-groups listed against each other, with the null that the distribution of one sub-group dominates the other

6.16 Table 6.2 presents the results obtained when applying the Kolmogorov-Smirnov test to the data on TFP levels. Note, all acquired plants are aggregated into an 'acquired' sub-group, to test the null hypothesis that the difference between the two distributions is favourable to one sub-group over the other; being able to reject this null for one sub-group (e.g. non-acquired) would suggest that the other sub-group (e.g. acquired) has a distribution to the right of the rejected sub-group. Note, the values reported in Table 6.2 measure the greatest difference between the two sub-groups, and a positive value means that a sub-group lies to the *left* of the opposing sub-group (by definition of the way differences are calculated).

Table 6.3: Pre- and post-TFP effects[a] of acquisition by foreign-owned companies, manufacturing (source Table A6.1 and 'matched' estimates)

Based on full sample	IND1	z-value	IND2	z-value	IND3	z-value	IND4	z-value	IND5	z-value	IND6	z-value
EU(t-6)	0.058	1.27	0.167	3.27	0.056	0.67	0.053	0.93	0.553	2.52	0.001	0.01
EU(t-5)	0.018	0.20	0.104	1.76	0.120	1.26	0.056	0.74	0.261	2.16	0.572	4.61
EU(t-4)	-0.117	-1.83	0.121	1.02	-0.070	-0.59	-0.077	-0.79	0.181	1.85	-0.030	-0.59
EU(t-3)	-0.129	-2.81	0.232	1.83	0.601	2.60	0.160	2.23	0.214	1.30	0.102	1.05
EU(t-2)	-0.022	-1.02	0.144	1.51	0.011	0.16	0.184	1.62	0.140	1.20	-0.179	-1.67
EU(t-1)	-0.133	-6.61	0.231	2.69	0.125	1.47	-0.060	-1.22	0.205	1.99	-0.086	-1.14
EU(t)	-0.120	-3.16	0.060	1.20	0.132	1.59	-0.103	-1.64	-0.105	-1.10	-0.069	-0.74
EU(t+1)	-0.040	-1.21	0.033	0.53	0.039	0.39	-0.105	-2.24	-0.205	-2.62	-0.117	-1.29
EU(t+2)	-0.065	-1.75	0.031	0.46	0.083	1.11	-0.041	-0.88	-0.181	-2.62	-0.173	-1.32
EU(t+3)	-0.030	-0.70	-0.055	-0.91	0.150	1.82	0.050	0.59	-0.213	-2.39	0.004	0.04
EU(t+4)	-0.014	-0.32	0.014	0.25	0.155	1.60	0.008	0.15	-0.241	-3.15	0.051	0.34
EU(t+5)	-0.128	-2.47	-0.016	-0.30	0.123	1.22	-0.048	-0.89	-0.393	-2.97	0.042	0.22
EU(t+6)	-0.048	-0.99	-0.044	-0.76	0.228	2.68	0.065	1.26	0.866	2.37	-0.027	-0.24
US(t-6)	-0.102	-1.73	0.175	2.33	-0.077	-1.44	0.105	1.31	0.523	3.19	0.053	1.02
US(t-5)	-0.142	-1.46	0.024	0.79	-0.064	-1.23	0.171	1.31	0.043	0.37	-0.019	-0.41
US(t-4)	-0.194	-1.98	0.046	1.38	0.133	1.48	0.121	1.69	0.036	0.40	0.028	0.65
US(t-3)	-0.002	-0.03	0.074	0.84	-0.093	-1.88	0.152	2.14	-0.030	-0.54	0.019	0.44
US(t-2)	0.232	2.05	-0.027	-0.41	0.088	1.37	0.177	1.94	-0.046	-1.08	0.030	0.58
US(t-1)	0.054	0.95	0.055	0.95	-0.006	-0.13	0.069	0.75	-0.124	-2.67	0.035	0.76
US(t)	0.080	0.66	-0.007	-0.13	0.044	0.78	-0.026	-0.28	-0.113	-1.20	-0.021	-0.41
US(t+1)	0.009	0.13	-0.047	-0.63	0.007	0.16	-0.001	-0.02	-0.139	-1.70	-0.062	-1.40
US(t+2)	0.000	0.00	0.009	0.11	0.099	1.75	-0.077	-0.77	-0.258	-3.07	0.026	0.43
US(t+3)	0.003	0.04	-0.044	-0.45	0.091	1.32	-0.016	-0.19	-0.354	-2.90	-0.029	-0.51
US(t+4)	0.071	0.67	-0.027	-0.28	0.172	2.12	-0.014	-0.13	-0.271	-3.14	-0.059	-1.12
US(t+5)	0.167	1.54	-0.053	-0.53	0.091	1.28	0.029	0.19	-0.253	-1.52	0.023	0.33
US(t+6)	0.021	0.19	0.016	0.15	0.200	2.64	-0.092	-0.72	-0.393	-1.68	0.122	1.83
OFO(t-6)	0.031	0.24	-0.096	-0.72	0.037	0.34	0.047	0.91	0.838	4.18	0.244	1.77
OFO(t-5)	-0.048	-0.70	-0.029	-0.37	-0.035	-0.73	0.316	3.02	-	-	-	-

OFO(t-4)	-0.034	-0.52	-0.204	-1.31	0.053	0.77	0.399	3.90	-	-	-	-
OFO(t-3)	-0.111	-1.69	-0.016	-0.15	0.060	0.82	-0.040	-0.45	-0.094	-2.09	-	-
OFO(t-2)	-0.085	-1.06	0.166	0.70	0.020	0.43	-0.227	-3.30	0.122	1.54	0.103	0.95
OFO(t-1)	-0.151	-1.49	-0.113	-1.87	0.042	0.55	-0.073	-1.52	0.167	2.10	-0.032	-0.32
OFO(t)	-0.026	-0.29	-0.148	-1.23	0.038	0.51	-0.078	-1.39	-0.042	-0.56	0.049	0.40
OFO(t+1)	0.016	0.18	0.023	0.26	0.073	0.97	-0.120	-2.34	-0.197	-2.68	-0.034	-0.23
OFO(t+2)	-0.175	-1.61	0.066	0.72	0.067	0.66	-0.087	-1.53	-0.216	-2.91	-0.077	-0.53
OFO(t+3)	0.020	0.21	-0.058	-0.77	-0.018	-0.25	-0.116	-1.62	-0.411	-5.48	-0.131	-0.94
OFO(t+4)	0.072	0.56	-0.080	-0.85	-0.051	-0.42	-0.061	-1.27	-0.420	-5.56	-0.213	-1.49
OFO(t+5)	0.043	0.30	0.255	1.92	0.108	1.22	-0.202	-3.42	-0.505	-5.21	0.000	0.00
OFO(t+6)	-0.021	-0.17	-0.054	-0.68	0.155	1.17	-0.230	-2.71	-0.258	-2.91	0.382	2.91
UK(t-6)	0.054	2.74	-0.028	-1.64	0.006	0.26	0.046	2.33	0.031	1.59	0.060	2.41
UK(t-5)	0.031	1.65	-0.011	-0.61	-0.027	-1.16	0.212	4.48	0.043	2.01	0.009	0.34
UK(t-4)	0.013	0.55	0.011	0.45	-0.035	-0.94	-0.059	-3.33	-0.081	-3.79	0.070	1.69
UK(t-3)	0.034	1.71	-0.008	-0.70	0.038	1.20	-0.060	-3.72	0.206	7.82	0.033	0.99
UK(t-2)	0.057	3.02	0.011	0.82	0.039	1.07	0.022	1.02	-0.058	-3.81	-0.004	-0.11
UK(t-1)	0.007	0.41	0.008	0.59	0.020	0.68	-0.036	-1.99	-0.081	-6.10	0.013	0.54
UK(t)	0.016	0.90	-0.040	-2.18	0.022	0.75	-0.020	-0.88	-0.025	-1.73	0.023	0.94
UK(t+1)	-0.010	-0.71	-0.031	-1.73	-0.002	-0.08	0.013	0.70	-0.021	-1.41	0.022	0.93
UK(t+2)	-0.015	-0.93	-0.017	-0.78	-0.025	-0.97	0.006	0.33	-0.022	-1.48	0.030	1.22
UK(t+3)	-0.068	-3.95	-0.004	-0.12	0.028	1.13	-0.026	-1.57	0.007	0.33	0.016	0.57
UK(t+4)	-0.017	-0.92	-0.081	-3.20	0.046	1.44	0.010	0.51	0.000	0.01	-0.009	-0.33
UK(t+5)	-0.019	-0.76	-0.009	-0.34	0.047	1.32	-0.028	-1.06	0.004	0.17	0.022	0.58
UK(t+6)	-0.047	-1.32	-0.018	-0.84	0.034	0.58	0.002	0.08	-0.004	-0.13	-0.001	-0.04

Based on matched sample	IND1	z-value	IND2	z-value	IND3	z-value	IND4	z-value	IND5	z-value	IND6	z-value
EU(t-6)	0.077	1.33	0.102	1.34	-0.179	-2.62	0.115	1.62	0.008	1.07	0.180	2.98
EU(t-5)	-0.007	-0.11	0.068	1.30	-0.070	-0.52	0.105	1.81	0.021	1.13	0.612	6.53
EU(t-4)	0.000	0.01	-0.072	-1.32	-0.432	-2.69	-0.009	-1.09	-0.327	-3.42	0.295	2.55
EU(t-3)	-0.140	-6.75	0.176	1.79	-0.276	-2.19	-0.028	-1.35	-0.180	-2.08	0.311	3.39
EU(t-2)	-0.062	-2.58	0.349	2.17	-0.231	-2.43	-0.115	-2.97	-0.072	-1.76	-0.105	-1.85
EU(t-1)	-0.147	-5.74	0.287	2.01	-0.229	-2.61	0.038	1.44	-0.121	-1.98	-0.008	-1.07
EU(t)	-0.206	-5.46	0.240	1.86	-0.257	-2.86	-0.168	-2.62	-0.111	-1.82	0.055	1.44
EU(t+1)	-0.155	-4.40	0.271	1.89	-0.415	-2.73	-0.161	-2.49	-0.129	-1.95	-0.033	-1.22
EU(t+2)	-0.140	-3.29	0.246	1.86	-0.296	-2.36	0.019	1.15	-0.146	-2.12	-0.128	-1.64
EU(t+3)	-0.189	-4.19	0.192	1.63	-0.313	-2.77	0.002	1.02	-0.186	-2.65	0.119	1.50
EU(t+4)	-0.150	-2.89	0.227	1.79	-0.322	-2.38	-0.061	-1.53	-0.166	-2.47	0.076	1.35
EU(t+5)	-0.232	-4.22	0.276	1.89	-0.334	-2.20	-0.126	-1.98	-0.002	-1.01	0.184	1.72
EU(t+6)	-0.189	-3.04			-0.198	-1.29	-0.082	-1.59	0.603	2.31	-0.021	-1.13
US(t-6)	-0.072	-1.51	0.474	2.38	-0.156	-1.84	-0.085	-1.76	-0.146	-1.89	-0.089	-2.48
US(t-5)	-0.142	-2.46	0.200	2.24	-0.128	-1.56	-0.022	-1.17	-0.191	-3.37	-0.163	-3.55
US(t-4)	-0.122	-1.93	0.218	2.49	0.005	0.04	-0.060	-1.73	-0.175	-3.42	-0.088	-2.10
US(t-3)	-0.058	-0.71	0.220	2.09	-0.289	-2.52	0.020	1.22	-0.202	-3.59	-0.128	-2.49
US(t-2)	0.024	0.27	0.135	1.66	-0.078	-0.83	-0.011	-1.10	-0.120	-2.29	-0.085	-1.81
US(t-1)	-0.082	-1.74	0.267	2.08	-0.191	-2.25	0.002	1.02	-0.136	-2.73	-0.072	-1.79
US(t)	-0.088	-1.24	0.394	2.07	-0.146	-1.65	-0.076	-1.46	0.098	1.52	0.050	1.44
US(t+1)	-0.108	-2.01	0.257	1.84	-0.131	-1.25	-0.014	-1.07	-0.127	-1.87	0.030	1.23
US(t+2)	-0.129	-3.27	0.285	2.11	-0.116	-1.08	-0.102	-1.48	-0.202	-2.43	0.019	1.23
US(t+3)	-0.139	-1.95	0.161	1.53	-0.128	-1.11	-0.025	-1.12	-0.333	-3.24	-0.107	-1.55
US(t+4)	-0.003	-0.03	0.460	2.24	-0.145	-1.16	0.011	1.05	-0.137	-1.94	-	-
US(t+5)	-0.088	-0.92	0.386	2.00	-0.158	-1.21	0.021	1.09	-0.075	-1.22	-	-
US(t+6)	-0.094	-1.03	0.211	1.88	-0.057	-0.41	0.025	1.11	-0.354	-2.95	0.067	1.38
OFO(t-6)	-0.019	-0.23	-0.210	-1.60	-0.218	-2.73	0.157	2.49	-0.219	-2.03	-	-
OFO(t-5)	0.055	0.35	0.160	1.45	-0.175	-2.74	0.455	4.74	-	-	-	-
OFO(t-4)	0.097	1.04	-0.032	-1.08	-0.145	-1.26	0.591	5.45	-	-	-	-

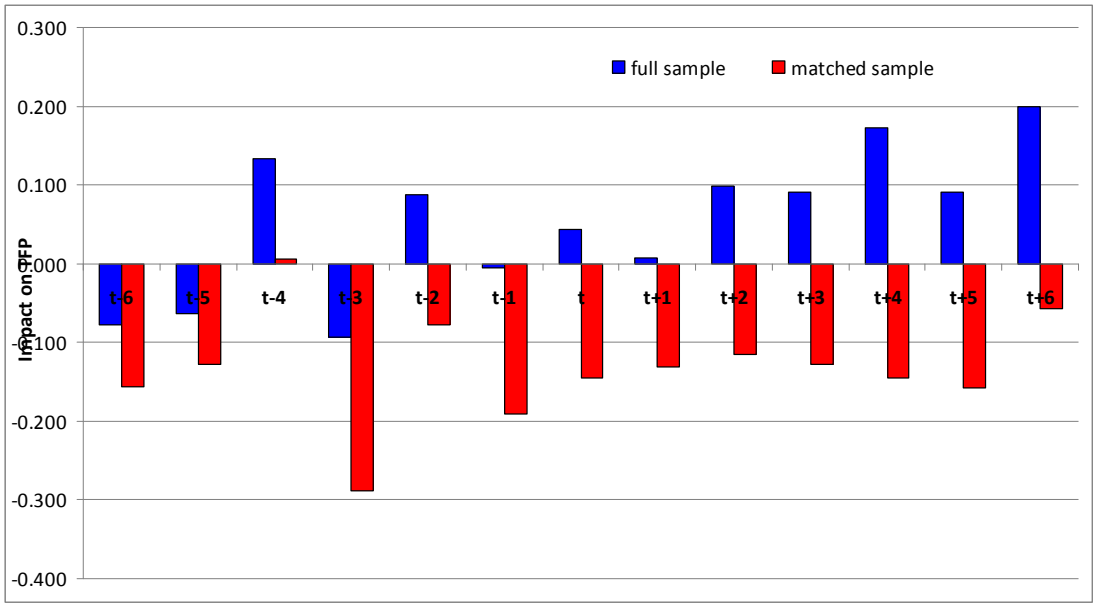
OFO(t-3)	-0.094	-1.61	0.106	1.23	-0.105	-0.98	0.208	2.95	-0.126	-2.02	-	-
OFO(t-2)	-0.090	-0.93	0.627	2.30	-0.149	-1.59	-0.137	-2.46	-0.052	-1.61	-	-
OFO(t-1)	-0.121	-1.86	0.136	1.64	-0.207	-1.87	-0.084	-1.89	-0.064	-1.60	-	-
OFO(t)	-0.157	-2.52	0.113	1.36	-0.225	-1.86	0.151	2.22	-0.154	-2.20	-0.123	-1.83
OFO(t+1)	-0.144	-2.50	0.154	1.54	-0.223	-1.65	0.065	1.55	-0.179	-2.18	-0.084	-1.43
OFO(t+2)	-0.168	-2.45	0.141	1.57	-0.268	-2.05	0.089	1.69	-0.184	-2.26	-0.192	-1.78
OFO(t+3)	-0.130	-1.81	0.012	1.05	-0.347	-2.57	-0.080	-1.80	-0.383	-3.72	-0.162	-1.61
OFO(t+4)	-0.090	-0.70	0.043	1.10	-0.388	-2.63	-0.033	-1.25	-0.401	-3.87	-0.250	-1.95
OFO(t+5)	-0.144	-1.20	0.362	1.60	-0.344	-2.43	-0.001	-1.01	-0.412	-3.34	-	-
OFO(t+6)	-0.198	-2.27	0.243	1.64	-0.236	-1.72	-0.137	-2.16	-0.257	-2.51	-	-
UK(t-6)	-0.121	-2.29	-0.038	-1.19	-	-	-0.091	-1.88	-	-	-0.066	-1.52
UK(t-5)	0.001	0.02	-0.014	-1.08	0.268	2.02	-0.135	-1.80	-	-	0.009	1.14
UK(t-4)	-0.092	-1.52	-0.092	-1.63	0.344	2.74	-0.140	-2.25	0.028	1.10	-0.220	-4.24
UK(t-3)	-0.031	-0.60	-0.061	-1.50	0.061	0.50	0.035	1.18	0.231	1.68	-0.052	-1.49
UK(t-2)	-0.101	-2.07	0.168	1.82	0.245	1.14	-0.043	-1.41	-0.201	-2.35	-0.076	-2.06
UK(t-1)	-0.072	-1.13	-0.051	-1.44	0.406	2.05	-0.112	-2.33	-0.136	-1.87	-0.139	-2.55
UK(t)	-0.018	-0.28	0.027	1.14	0.134	0.90	-0.056	-1.54	0.032	1.22	-0.080	-1.99
UK(t+1)	-0.038	-0.58	-0.079	-1.48	0.005	0.03	0.067	1.43	-0.020	-1.16	-0.096	-1.93
UK(t+2)	-0.021	-0.27	-0.140	-1.77	0.021	0.16	-0.070	-1.51	-0.051	-1.47	-	-
UK(t+3)	-0.121	-1.36	-0.093	-1.39	0.126	0.76	0.019	1.13	0.197	2.46	-	-
UK(t+4)	-0.015	-0.15	0.076	1.27	0.072	0.31	0.171	1.95	0.073	1.53	-0.141	-1.76
UK(t+5)	-0.033	-0.30	0.023	1.09	-0.051	-0.22	0.018	1.10	0.043	1.31	-0.122	-1.62
UK(t+6)	0.257	1.49	-	-	0.222	0.78	-0.140	-1.79	0.152	2.09	-0.056	-1.50

6.17 Firstly, we can confirm that in every industry examined (except IND4) plants that were acquired have a distribution that lies significantly to the right of non-acquired plants, and the largest difference between the two distributions is often above 0.2 (and always above 0.14).

However, for these same industries it is also possible to reject the null that the distribution for acquired plants is more favourable compared to the non-acquired (although the largest difference is usually much smaller than when testing if acquired plants dominate). This confirms what has been shown in Figure 6.1 that acquired plants dominate non-acquired plants for a large part of the distribution of TFP values, but usually at high levels of TFP there is a cross-over and non-acquired plants dominate those acquired.

6.18 In summary, the parameter estimates obtained from estimating equation (6.1) show that foreign-owned firms were not as involved in 'cherry-picking' manufacturing plants during 1995-2000 as might have a priori been predicted, based on previous studies for the UK. However, when productivity distributions are compared it can been seen that this can be explained, at least in part, by the relatively higher levels of TFP of non-acquired plants at the top end of the TFP distribution; 'cherry-picking' occurs but not of the very best plants but rather those in the mid- to lower-end of the productivity spectrum.

Figure 6.2: Impact on TFP for US-acquisitions (full- and matched-samples)

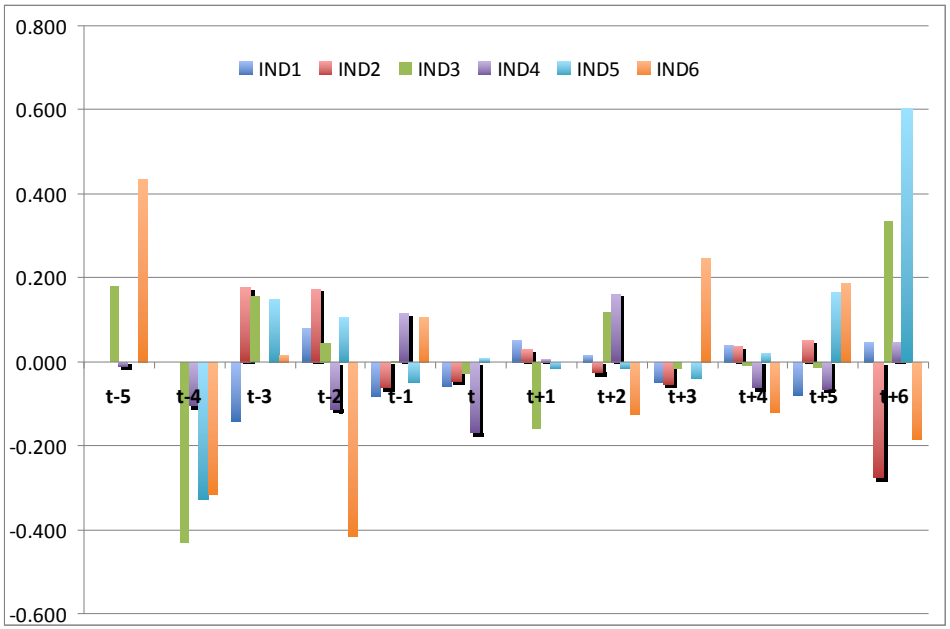


Source: Table 6.3

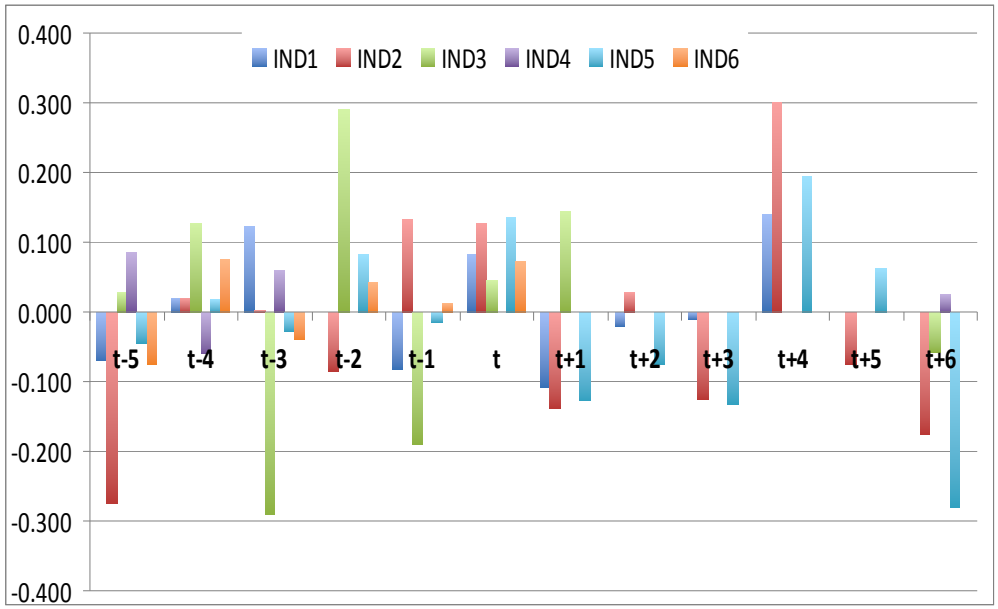
6.19 Table 6.3 presents the results for the time profile of productivity associated with plants that were acquired at time *t*. There are two sets of results: the top half of the table reports the parameter estimates obtained when estimation equation (6.1) with the full panel-data sample covering all plants in operation between 1995-2000. The lower half covers the results obtained from using the (much smaller) matched sample. Figure 6.2 summarises the two sets of results for US-acquisitions, to show that the

Figure 6.3: Year-on-year change in TFP in manufacturing industries for plants acquired, 1995-2000 (See Table 5.1 for industry codes used).

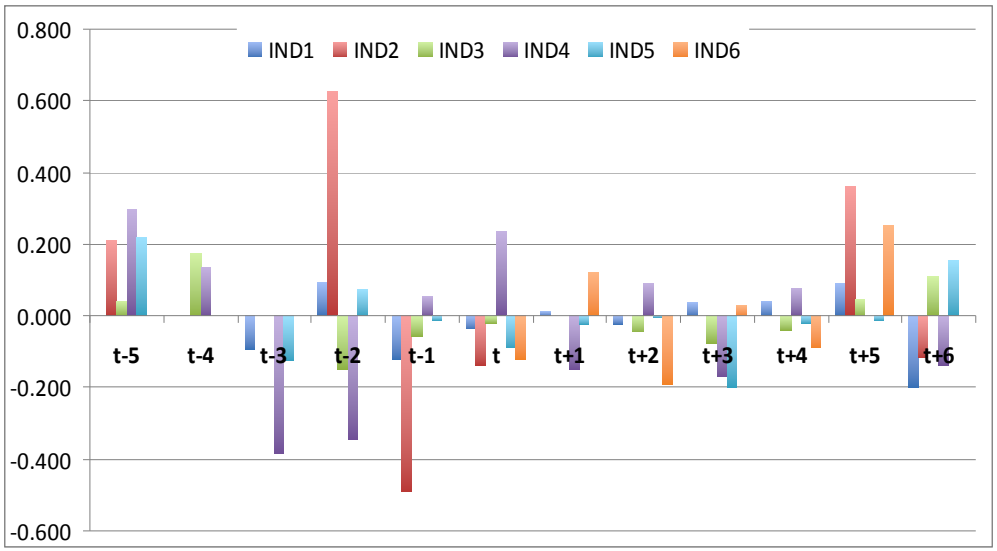
(a) EU-acquired



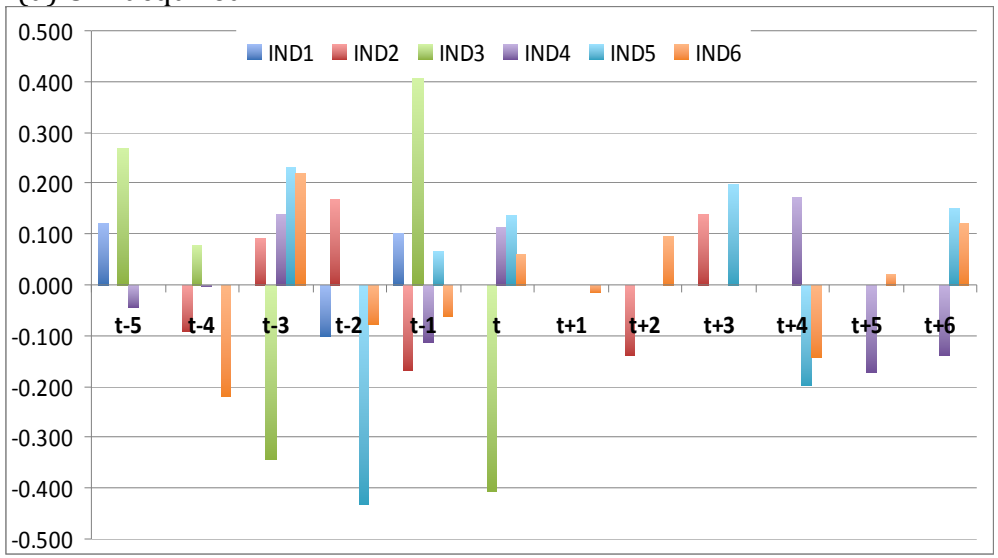
(b) US-acquired



(c) Other foreign-owned acquired



(d) UK -acquired



© Richard Harris

results are often quite different depending on whether the full of matched samples are used.

6.20 Given the possibility of sample selection bias, we concentrate on the matched-sample results. Figure 6.3 shows the *changes* in TFP for those estimates in Table 6.3 that were statistically significant. Generally the overall picture is that there is little sign of any sustained improvement in TFP post-acquisition.

6.21 However, there are some exceptions: TFP improved over time in plants acquired by the other foreign-owned sector for other metal goods, mechanical engineering, and office & data processing equipment; although this sector saw declines in TFO in timber, printing &paper, and rubber& plastics, and other manufacturing. EU-acquired plants improved in the long-run in timber, printing & paper; but UK-acquired plants in the electrical & electronic equipment, transport equipment, and rubber & plastics and other manufacturing sectors experienced declines in TFP.

Services

6.22 For two service-sector industries, it was not possible to estimate equation (6.1) and split sub-group D_1 into different foreign-owned sectors (due to too few takeovers for certain countries). Hence, the sub-group D_1 enters representing all UK-owned plants that were acquired by foreign-owned enterprises during 1998-2002.

6.23 Table 6.4 shows that in services plants that were US-owned were more productive (than UK-owned plants, the benchmark group) in only 2 industry groups (wholesale trade and retail trade in specialist and non-specialist stores, with higher TFP between 8-13%); TFP was 6% lower in other retail, air transport & telecoms; while in the other 2 industries covered there was no statistically significant TFP advantage from being US-owned. In contrast, EU-owned plants were more likely to have lower TFP of around 4-13% (in 4 of the 5 industry groups covered: sale & maintenance of motors; wholesale trade; other retail, air transport & telecoms; and computer software, R&D, accounting & management services). For the other foreign-owned sector, there was a productivity advantage of 4.3% in wholesales trade, and 25% higher TFP in retailing; while there was a small (but significant) negative effect in the sale & maintenance of motors industry. Lastly, in the rest of other business activities, foreign-owned plants overall were some 8% more productive. On average, foreign-owned plants were generally better in wholesale trade and retailing, and did less well in the sale & maintenance of motors and other retail, air transport & telecoms.

6.24 As to whether foreign-owned firms 'cherry-picked' the best UK service sector plants, this was certainly true in recreational & other personal services where there was a very large TFP advantage (of some 104%). US-owned firms appear to have acquired more productive plants in other

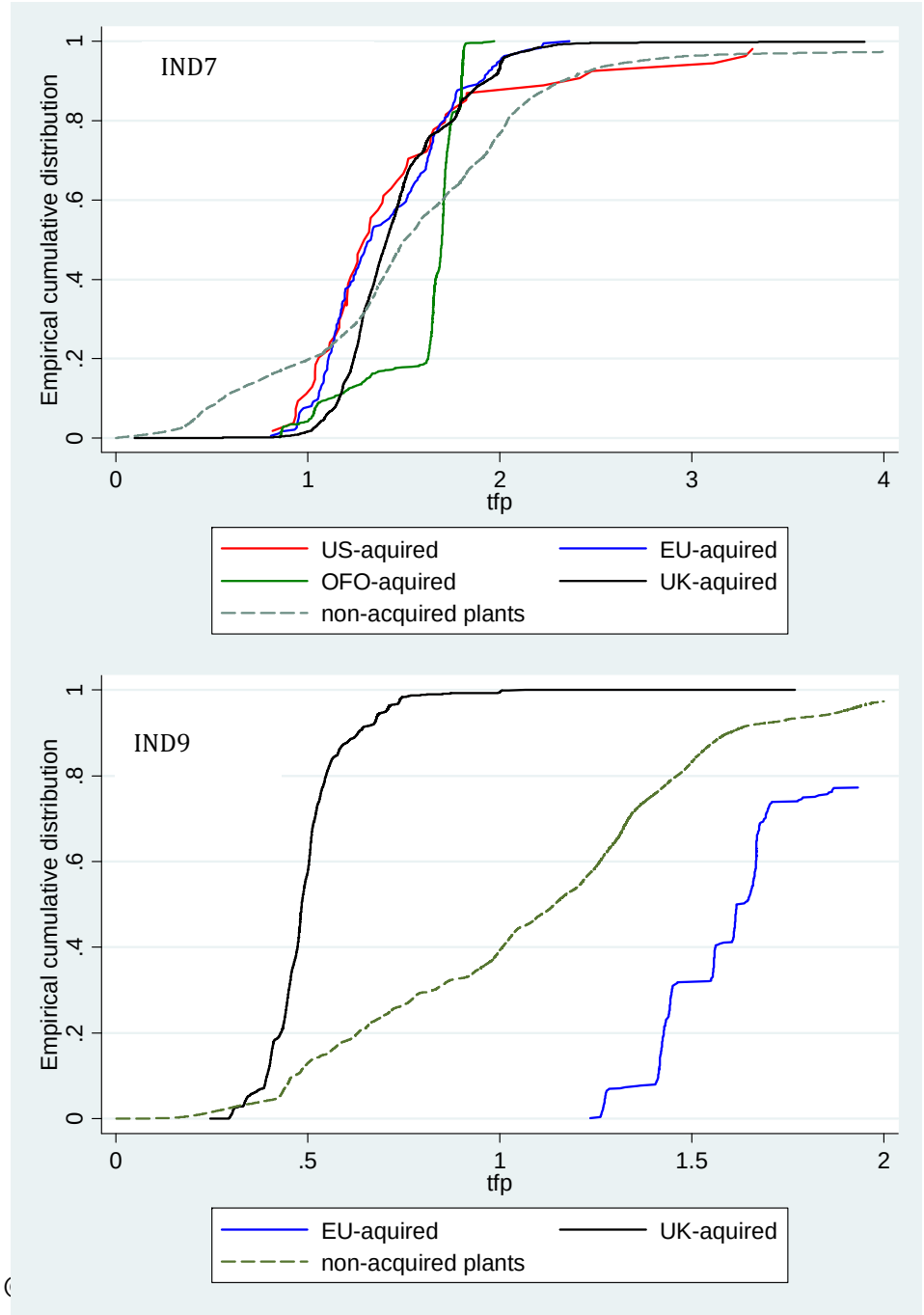
Table 6.4: Marginal TFP effects[a] associated with belonging to sub-group, services (source Table A6.2)

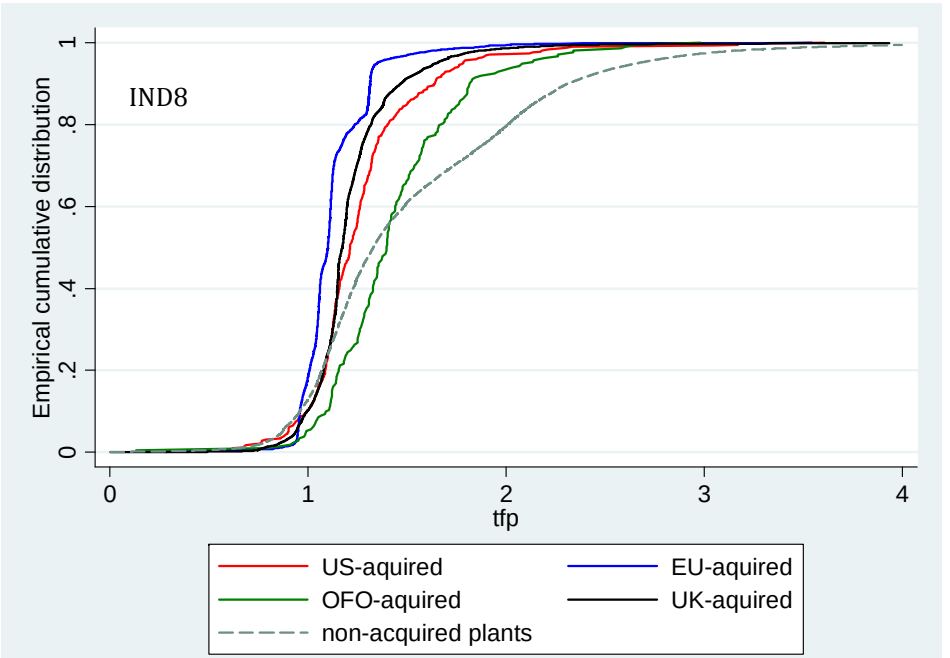
	IND7	z-value	IND8	z-value	IND9	z-value	IND10	z-value	IND11	z-value	IND12	z-value	IND13	z-value	Average[b]
US-owned	-0.002	-0.40	0.078	5.32	0.126	1.77	-0.057	-4.34	0.032	1.38	-	-	-	-	0.036
EU-owned	-0.039	-8.13	-0.036	-3.47	-0.028	-0.31	-0.035	-2.96	-0.129	-5.07	-	-	-	-	-0.047
Other FO	-0.015	-2.37	0.043	3.67	0.254	2.47	-0.011	-0.80	0.006	0.30	-	-	-	-	0.034
Foreign-owned	-	-	-	-	-	-	-	-	-	-	0.079	2.61	0.036	1.24	0.006
Foreign-owned x group 1	-	-	-	-	-	-	-	-	-	-			1.039	2.32	0.062
EU-owned x group 1	0.137	0.60	-0.617	-4.45	0.072	0.37	0.033	0.60	-0.003	-0.01	-	-	-	-	-0.201
US-owned x group 1	0.218	0.69	-0.526	-3.36	-	-	0.586	4.55	-0.172	-0.66	-	-	-	-	-0.113
Other FO-owned x group 1	0.261	1.10	-0.601	-4.28	-	-	-	-	0.111	0.39	-	-	-	-	-0.170
group 3	-0.093	-0.51	-0.500	-3.25	-0.676	-6.99	1.290	8.99	-0.119	-0.67	-0.616	-7.10	0.137	0.33	-0.115
group 4	1.045	2.29	-0.402	-1.87	-0.661	-2.59	0.746	3.66	-0.595	-3.43	1.008	5.12	1.145	0.90	0.063
group 5	0.706	2.24	-0.584	-3.83	-0.726	-6.83	1.033	5.27	-0.205	-1.17	-0.046	-0.12	-0.023	-0.06	-0.072
group 6	0.524	1.93	-0.562	-3.84	-0.602	-3.45	0.758	4.89	-0.104	-0.56	0.223	0.67	0.573	1.36	-0.053
group 7	1.063	5.63	-0.192	-0.79	-0.464	-2.85	1.222	6.05	-0.533	-1.68	0.989	0.86	1.181	0.54	0.237
group 8	0.298	1.18	-0.589	-4.11	-0.617	-4.92	1.188	6.43	-0.219	-1.38	-	-	0.787	1.77	-0.053

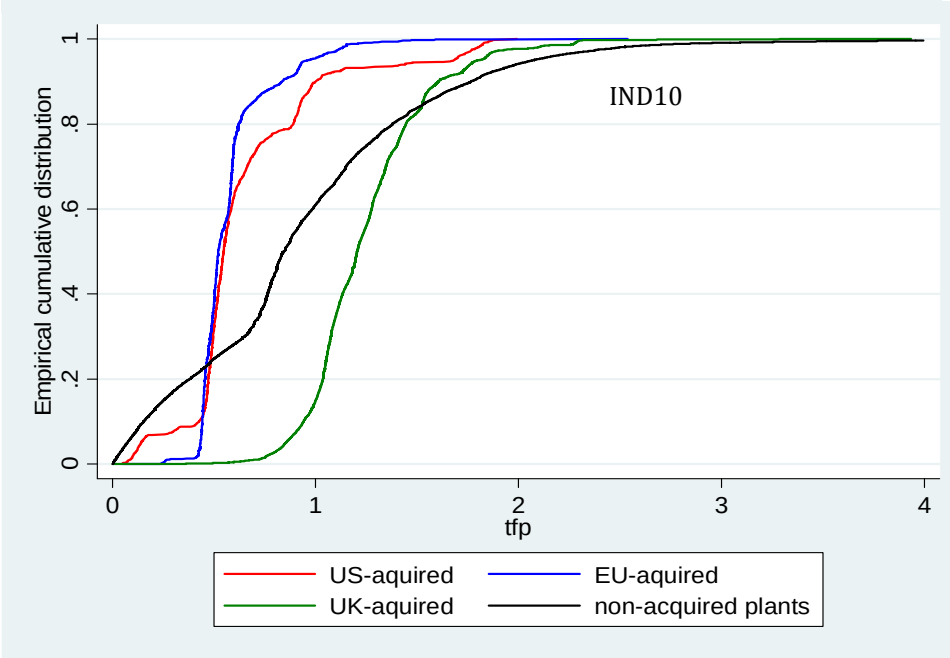
[a] Values from Table A6.2 have been converted to exp(β)-1.

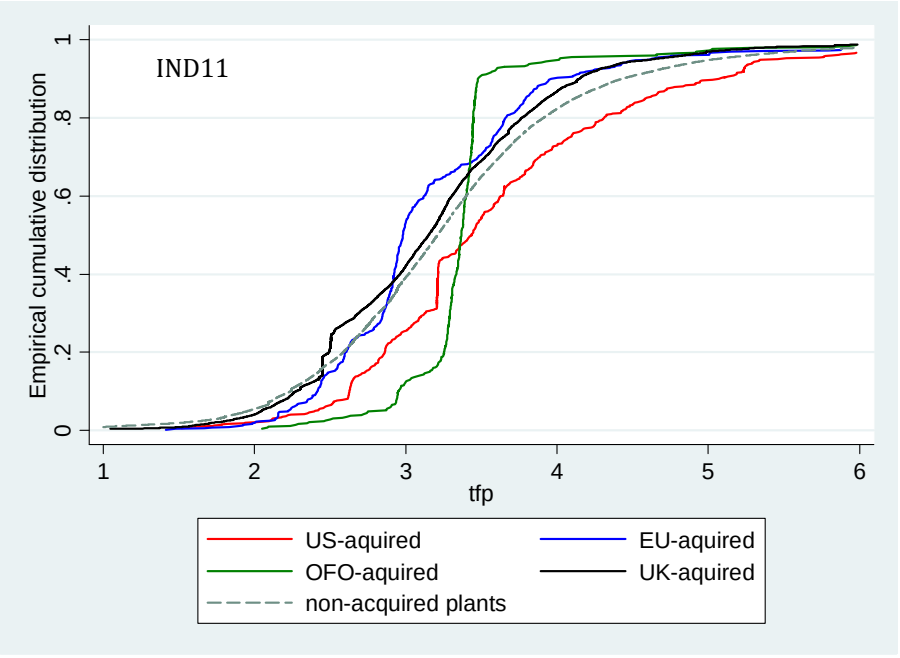
[b] Obtained from weighting industry results using average total real gross output for the period covered.

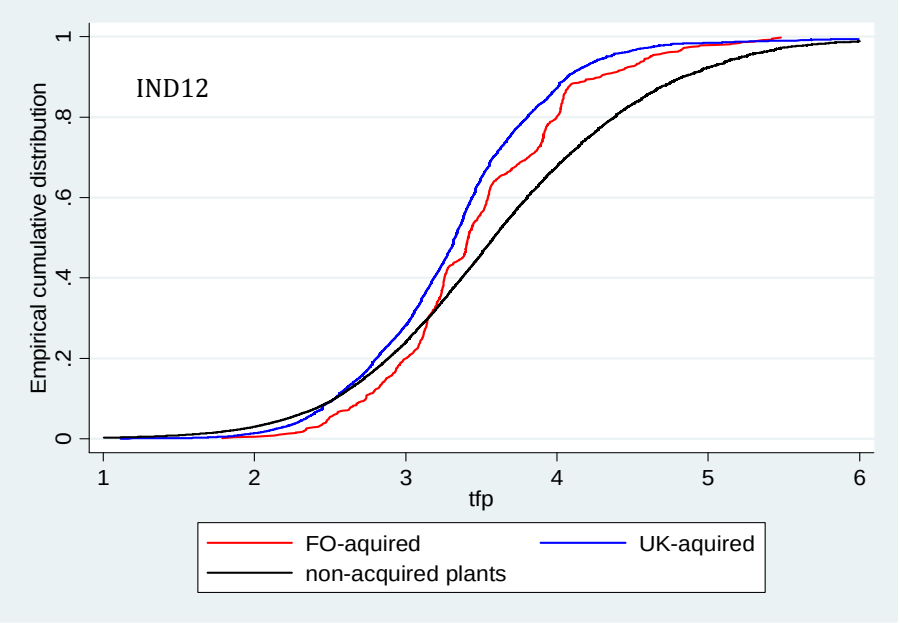
Figure 6.4: TFP distribution for acquired and non-acquired plants, services

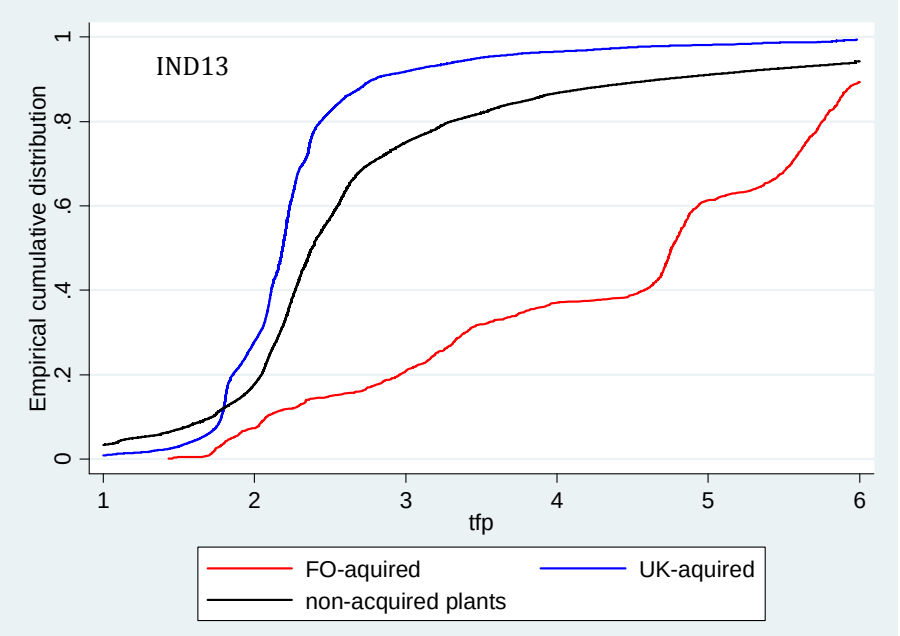












© Richard Harris

retail, air transport & telecoms (a 59% advantage), but less productive plants in wholesale trade (53% lower TFP). There is no evidence that EU-owned companies acquired better service sector plants; indeed, TFP was on average 62% lower in wholesale trade. The latter was also the case for other foreign-owned firms, with 60% lower TFP in the wholesale trade sector. So again the evidence from estimating equation (6.1) on 'cherry-picking' is mixed, with overall more of a tendency for less productive plants to have been acquired.

6.25 As to the other sub-groups in Table 6.3, they tended to be (much) more productive against the benchmark sub-group (plants that belonged to UK-owned companies that did not sell plants to the foreign-owned sector between 1998-2002) in the sale & maintenance of motors and other retail, air transport & telecoms sectors; but less productive in wholesale trade, retail trade, and to some extent in the renting of other business activities sector.

6.26 Turning to the TFP distributions presented in Figure 6.4, these show that there is much less evidence, when compared to manufacturing, that acquired plants had higher TFP at lower- to middle-sections of the productivity distribution, vis-à-vis non-acquired plants. In the sale and maintenance of motors (IND7) acquired plants are better in only the lower left-hand tail of the distribution (although plant acquired by the Other foreign-owned do better at such lower levels of TFP while the very best US-acquired plants seem to match the best non-acquired plants); in wholesale trade non-acquired plants have higher productivity for the upper 50% of the distribution, confirming the results in Table 6.4; in retail sales in specialist and non-specialist stores (IND9) the productivity distribution of EU-acquired plants is to the right of non-acquired plants (but there are few plants in this sub-group and the gap is relatively small,[58] hence the lack of statistical significance in Table 6.4); in other retail, air transport & telecoms (IND10) only plants acquired by UK-owned firms had higher productivity for some 80% of the distribution[59]; in computer software, R&D, accounting & management services (IND11) US-acquired plants have higher productivity than non-acquired plants (as do Other foreign-acquired plants up to the 50% level) – however, this was not large (see Table 6.5 below) and not statistically significant in Table 6.4; in the rest of business services (IND12) there is no evidence that plants acquired by foreign-owned firms had higher productivity (except at the lowest levels of the distribution); and in recreational and personal services (IND13) the evidence in Figure 6.4 confirms the results in Table 6.4 that foreign-owned firms 'cherry picked' the best UK service sector plants.

[58] Note the scale of the diagram, and also the results for this industry presented in Table 6.5, which show the maximum gap being only 0.024.

[59] Note, the results in Table 6.4 show that US-acquired plants had higher TFP; however, so did many other sub-groups that belong to the non-acquired group in Figure 6.4 (where non-acquisition only refers to the 1998-2002 period).

6.27 Table 6.5 presents the results obtained when applying the Kolmogorov-Smirnov test to the data on TFP levels in services. As with manufacturing, all acquired plants are aggregated into an 'acquired' sub-group, to test the null hypothesis that the difference between the two distributions is favourable to one sub-group over the other.

6.28 Firstly, the results obtained are significantly different from those reported in Table 6.2 for manufacturing; for the latter it was found that in nearly every industry examined plants that were acquired have a distribution that lies significantly to the right of non-acquired plants (at least for part of this distribution) and often the maximum difference was large. For services, in every industry sub-group acquired plants outperform non-acquired plants at some (usually the lower) part of the distribution, but the difference is generally much smaller (except for IND10 and to a lesser extent IND7). Moreover, this means (when compared to table 6.2) that acquired plants also had lower productivity (usually in the upper range of the distribution), involving larger differences, in 5 of the 7 industry sub-groups covered.

Table 6.5: Two-Sample Kolmogorov-Smirnov[a] Tests on the distribution of TFP by whether the plant was acquired, services, 1997-2005

Industry (1992 SIC)	Difference favourable to:	
	All acquired vs.	All non-acquired
7: SIC 50: sale, maintenance & repair of motors	-0.209**	0.180**
8: SIC 51: wholesale trade	-0.330**	0.042**
9: SIC 521-524: retail sale in specialist and non-specialist stores	-0.702**	0.024**
10: SIC 526-527; 55, 62-64: rest of retail trade covered in study, air transport, storage & telecommunication	-0.050**	0.371**
11: SIC 71-73, 741: renting equipment, computers, R&D, law, accounting & management services	-0.058**	0.027**
12 SIC 742-748: rest of other business activities	-0.200**	0.020**
13: SIC 92-93: recreational services, other personal services	-0.222**	0.044**

Note: ** denotes null rejected at 1% level; * null rejected at 5% level.
[a] In each instance we are testing the two sub-groups listed against each other, with the null that the distribution of one sub-group dominates the other

6.29 In summary, both the parameter estimates for service industries obtained from estimating equation (6.1) and comparisons of productivity distributions show that plants that were acquired by foreign-owned firms were not 'cherry picked'; the overall picture confirms that there was more of a tendency for less productive service sector plants to have been acquired.

6.30 As to the time-profile of productivity pre- and post-acquisition, Table 6.6 produces the full set of results. Again we concentrate on the matched-sample results (given the possibility of sample

Table 6.6: Pre- and post-TFP effects[a] of acquisition by foreign-owned companies, services (source Table A6.2 and 'matched' estimates)

Based on full sample	IND7	z-value	IND8	z-value	IND9	z-value	IND10	z-value	IND11	z-value	IND12	z-value	IND13	z-value
EU(t-3)	-	-	0.005	0.11	-	-	0.644	10.57	0.351	1.53	-	-	-	-
EU(t-2)	0.066	1.56	0.093	2.93	-	-	0.324	4.02	-0.050	-0.32	-	-	-	-
EU(t-1)	0.046	1.74	0.032	1.12	-	-	0.407	2.93	0.018	0.13	-	-	-	-
EU(t)	0.188	6.30	0.167	5.92	-0.243	-5.41	0.026	0.70	0.078	0.68	-	-	-	-
EU(t+1)	0.086	3.32	-0.041	-2.00	-0.124	-3.29	0.243	5.42	-0.006	-0.06	-	-	-	-
EU(t+2)	0.106	4.10	0.000	0.01	-0.056	-2.17	0.006	0.35	-0.142	-1.50	-	-	-	-
EU(t+3)	0.097	3.83	-0.091	-5.36	-0.045	-2.40	0.031	3.53	-0.115	-1.07	-	-	-	-
EU(t+4)	0.145	4.25	-0.073	-3.54	-0.009	-0.50	0.022	0.52	-0.159	-1.40	-	-	-	-
EU(t+5)	0.106	1.65	-0.019	-0.94	0.015	0.53	0.157	4.22	-0.217	-2.14	-	-	-	-
EU(t+6)	0.042	0.41	-0.057	-2.33	-0.020	-0.53	-0.042	-0.87	-0.229	-2.03	-	-	-	-
US(t-3)	-	-	-0.312	-4.94	-	-	-0.512	-7.96			-	-	-	-
US(t-2)	-	-	-0.107	-1.79	-	-	-0.501	-6.77	0.136	0.84	-	-	-	-
US(t-1)	-0.070	-0.34	-0.107	-1.54	-	-	-0.257	-1.18	0.368	2.23	-	-	-	-
US(t)	0.367	1.07	-0.186	-2.97	-	-	-0.102	-1.67	0.135	1.04	-	-	-	-
US(t+1)	0.033	0.17	-0.183	-2.82	-	-	-0.234	-4.26	0.134	0.89	-	-	-	-
US(t+2)	0.029	0.13	-0.232	-3.85	-	-	-0.262	-4.64	0.285	1.89	-	-	-	-
US(t+3)	-0.477	-1.98	-0.221	-3.70	-	-	-0.295	-4.59	0.098	0.79	-	-	-	-
US(t+4)	-0.169	-0.55	-0.246	-3.95	-	-	-0.428	-6.59	0.157	1.13	-	-	-	-
US(t+5)	-0.198	-0.66	-0.281	-3.89	-	-	-0.436	-6.32	0.093	0.67	-	-	-	-
US(t+6)	-0.005	-0.03	-0.320	-4.41	-	-	-0.253	-3.46	0.281	1.26	-	-	-	-
OFO(t-3)			0.118	2.60	-	-	-	-	0.424	2.76	-	-	-	-
OFO(t-2)	-0.101	-2.19	-0.065	-0.82	-	-	-	-	-0.023	-0.20	-	-	-	-
OFO(t-1)	-0.026	-0.66	0.149	1.75	-	-	-	-	-0.219	-1.17	-	-	-	-
OFO(t)	-0.048	-1.26	0.250	2.74	-	-	-	-	-0.174	-1.59	-	-	-	-
OFO(t+1)	-0.003	-0.08	0.073	1.56	-	-	-	-	-0.132	-1.28	-	-	-	-
OFO(t+2)	-0.053	-1.31	-0.073	-1.66	-	-	-	-	-0.218	-1.95	-	-	-	-
OFO(t+3)	-0.067	-1.68	-0.026	-0.67	-	-	-	-	-0.294	-2.43	-	-	-	-
OFO(t+4)	-0.066	-1.68	-0.010	-0.21	-	-	-	-	-0.185	-2.06	-	-	-	-
OFO(t+5)	-0.057	-1.40	-0.013	-0.32	-	-	-	-	-0.171	-2.01	-	-	-	-
OFO(t+6)	-0.079	-1.14	-0.038	-0.86	-	-	-	-	-	-	-	-	-	-
FO(t-3)	-	-	-	-	-	-	-	-	-	-	-0.600	-6.57	-	-
FO(t-2)	-	-	-	-	-	-	-	-	-	-	-0.488	-4.43	-0.287	-1.86
FO(t-1)	-	-	-	-	-	-	-	-	-	-	-0.361	-2.48	0.439	1.58
FO(t)	-	-	-	-	-	-	-	-	-	-	-0.328	-2.70	-0.211	-1.21
FO(t+1)	-	-	-	-	-	-	-	-	-	-	-0.271	-2.14	0.680	3.18
FO(t+2)	-	-	-	-	-	-	-	-	-	-	-0.240	-1.82	0.099	0.66
FO(t+3)	-	-	-	-	-	-	-	-	-	-	-0.162	-1.14	0.600	2.76

FO(t+4)	-	-	-	-	-	-	-	-	-	-	-0.271	-1.91	0.561	2.98
FO(t+5)	-	-	-	-	-	-	-	-	-	-	-0.068	-0.32	0.350	2.04
FO(t+6)	-	-	-	-	-	-	-	-	-	-	-0.357	-1.77	1.133	4.01
UK(t-4)	0.026	1.74	0.050	1.91	-0.084	-3.74	-0.101	-4.53	0.258	3.27	-0.405	-2.57	0.000	0.00
UK(t-3)	0.001	0.11	0.064	1.91	-0.078	-3.55	0.000	-0.01	0.169	3.59	-0.211	-3.20	-0.213	-2.52
UK(t-2)	0.054	3.39	0.016	0.75	-0.080	-3.95	0.002	0.07	0.251	8.07	-0.024	-0.31	-0.356	-8.02
UK(t-1)	0.063	4.58	0.085	3.73	-0.050	-3.60	0.081	3.93	0.127	3.03	-0.239	-3.51	-0.353	-5.68
UK(t)	0.067	6.08	0.045	3.91	-0.142	-11.64	-0.019	-1.46	0.176	6.62	-0.251	-3.52	-0.307	-8.26
UK(t+1)	0.022	2.43	0.018	1.83	-0.054	-4.80	0.024	1.73	0.097	4.26	0.000	0.00	-0.199	-6.82
UK(t+2)	0.047	5.92	-0.022	-2.48	-0.033	-3.88	0.013	1.12	0.155	6.05	-0.108	-1.99	-0.147	-4.96
UK(t+3)	0.000	0.00	-0.009	-1.03	-0.021	-2.57	0.032	2.38	0.095	3.65	-0.055	-1.18	-0.199	-7.67
UK(t+4)	-0.010	-0.79	-0.048	-5.15	-0.038	-5.35	0.054	4.27	0.058	2.41	0.004	0.11	-0.176	-9.02
UK(t+5)	-0.002	-0.19	-0.048	-4.98	-0.013	-1.84	0.081	5.96	0.000	-0.02	-0.142	-3.77	-0.175	-8.22
UK(t+6)	0.011	0.92	-0.046	-4.11	-0.018	-2.10	-0.014	-0.91	0.081	2.87	-0.103	-2.70	-0.222	-7.24

Based on matched sample	IND7	z-value	IND8	z-value	IND9	z-value	IND10	z-value	IND11	z-value	IND12	z-value	IND13	z-value
EU(t-3)	-	-	0.823	2.03	-	-	-	-	-	-	-	-	-	-
EU(t-2)	0.012	1.04	0.630	1.87	-	-	0.504	2.46	-0.445	-2.15	-	-	-	-
EU(t-1)	-0.219	-2.13	0.452	1.74	-	-	0.884	2.98	-0.285	-1.89	-	-	-	-
EU(t)	-0.143	-1.79	0.233	1.62	-0.399	-2.57	0.269	2.04	-0.320	-1.97	-	-	-	-
EU(t+1)	-0.171	-2.20	0.399	1.75	-0.404	-2.35	0.192	2.10	-0.166	-1.68	-	-	-	-
EU(t+2)	-0.162	-2.08	0.265	1.72	-0.207	-2.00	-0.100	-1.65	-0.291	-1.98	-	-	-	-
EU(t+3)	-0.180	-2.21	0.215	1.69	-0.080	-1.49	-0.204	-2.77	-0.158	-1.65	-	-	-	-
EU(t+4)	-0.058	-1.38	0.190	1.66	0.155	1.70	-0.116	-1.83	0.040	1.41	-	-	-	-
EU(t+5)	-0.193	-2.44	0.100	1.56	0.390	2.01	0.115	1.48	-0.007	-1.32	-	-	-	-
EU(t+6)	-0.108	-1.61	0.043	1.47	0.909	2.11	-0.479	-3.94	0.100	1.57	-	-	-	-
US(t-3)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
US(t-2)	-	-	-0.101	-1.71	-	-	-	-	-0.324	-2.06	-	-	-	-
US(t-1)	-	-	0.044	1.64	-	-	0.987	3.09	-0.274	-1.96	-	-	-	-
US(t)	-0.151	-1.49	0.424	1.89	-	-	0.491	2.05	-0.238	-1.92	-	-	-	-
US(t+1)	-0.058	-1.18	0.327	1.89	-	-	0.371	1.69	-0.153	-1.72	-	-	-	-
US(t+2)	-0.127	-1.79	0.140	1.75	-	-	0.107	1.22	-0.107	-1.66	-	-	-	-
US(t+3)	-0.533	-3.93	0.083	1.71	-	-	-0.179	-1.69	0.020	1.45	-	-	-	-
US(t+4)	-0.238	-1.60	-0.114	-1.77	-	-	-0.331	-2.66	0.022	1.46	-	-	-	-
US(t+5)	-0.253	-1.77	0.090	1.71	-	-	-0.318	-2.50	-0.052	-1.55	-	-	-	-
US(t+6)	-0.177	-2.08	-0.104	-1.75	-	-	0.064	0.64	-	-	-	-	-	-
OFO(t-3)			-	-	-	-	-	-	-	-	-	-	-	-

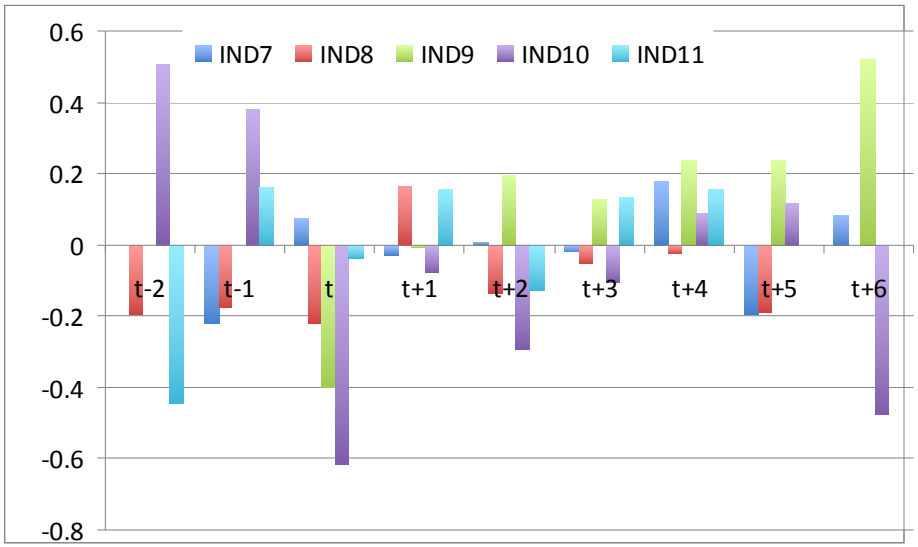
© Richard Harris

OFO(t-2)	-0.055	-1.36	-	-	-	-	-	-	-	-	-	-	-	-
OFO(t-1)	-0.232	-2.04	1.080	2.21	-	-	-	-	-0.439	-2.36	-	-	-	-
OFO(t)	-0.201	-2.18	1.186	2.11	-	-	-	-	-0.395	-2.16	-	-	-	-
OFO(t+1)	-0.170	-1.90	0.964	2.12	-	-	-	-	-0.169	-1.76	-	-	-	-
OFO(t+2)	-0.145	-1.84	0.266	1.77	-	-	-	-	-0.083	-1.60	-	-	-	-
OFO(t+3)	-0.203	-2.25	0.224	1.78	-	-	-	-	-0.079	-1.59	-	-	-	-
OFO(t+4)	-0.113	-1.62	0.329	1.86	-	-	-	-	0.078	1.59	-	-	-	-
OFO(t+5)	-0.118	-1.72	0.295	1.82	-	-	-	-	0.029	1.47	-	-	-	-
OFO(t+6)	-0.216	-2.14	0.245	1.78	-	-	-	-	-	-	-	-	-	-
FO(t-3)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FO(t-2)	-	-	-	-	-	-	-	-	-	-	-0.020	-1.06	-	-
FO(t-1)	-	-	-	-	-	-	-	-	-	-	0.141	1.37	-0.028	-1.08
FO(t)	-	-	-	-	-	-	-	-	-	-	0.139	1.34	-0.137	-1.44
FO(t+1)	-	-	-	-	-	-	-	-	-	-	0.269	1.63	-0.169	-1.56
FO(t+2)	-	-	-	-	-	-	-	-	-	-	0.369	1.88	-0.270	-1.94
FO(t+3)	-	-	-	-	-	-	-	-	-	-	0.501	2.21	-0.319	-2.15
FO(t+4)	-	-	-	-	-	-	-	-	-	-	0.472	2.17	-0.369	-2.38
FO(t+5)	-	-	-	-	-	-	-	-	-	-	0.901	2.79	-0.420	-2.63
FO(t+6)	-	-	-	-	-	-	-	-	-	-	0.973	2.73	-	-
UK(t-4)	-0.302	-1.71	-	-	-	-	-0.209	-1.85	-	-	-0.480	-3.90	-	-
UK(t-3)	0.045	1.13	-	-	-	-	-0.316	-2.48	-0.254	-2.01	-0.454	-3.18	-	-
UK(t-2)	0.085	1.32	0.098	1.67	-	-	-0.209	-1.92	-0.004	-1.31	-0.194	-1.70	-	-
UK(t-1)	-0.077	-1.28	0.289	2.10	-	-	-0.090	-1.53	-0.185	-1.91	-0.299	-2.40	0.565	2.97
UK(t)	-0.075	-1.36	0.212	1.85	-0.238	-2.00	-0.181	-2.20	0.070	1.52	-0.262	-2.27	0.695	3.36
UK(t+1)	-0.099	-1.82	0.248	2.02	0.051	1.62	-0.254	-2.74	0.125	1.69	-0.265	-2.30	0.514	3.41
UK(t+2)	-0.045	-1.57	0.211	2.00	0.105	1.87	-0.113	-1.94	-0.077	-1.60	-0.298	-2.36	0.312	3.09
UK(t+3)	-0.021	-1.36	0.120	1.87	0.098	1.89	-0.039	-1.41	-0.213	-2.30	-0.331	-2.49	0.137	2.48
UK(t+4)	-0.055	-2.12	0.222	2.14	0.102	1.89	-0.127	-2.16	-0.170	-1.96	-0.282	-2.36	0.253	2.97
UK(t+5)	-0.036	-1.70	0.198	2.06	0.220	2.11	0.098	1.91	-0.247	-2.45	-0.301	-2.35	0.092	1.98
UK(t+6)	0.009	1.10	0.261	2.03	0.193	1.89	0.087	1.65	-0.130	-1.94	-0.282	-2.01	0.150	2.00

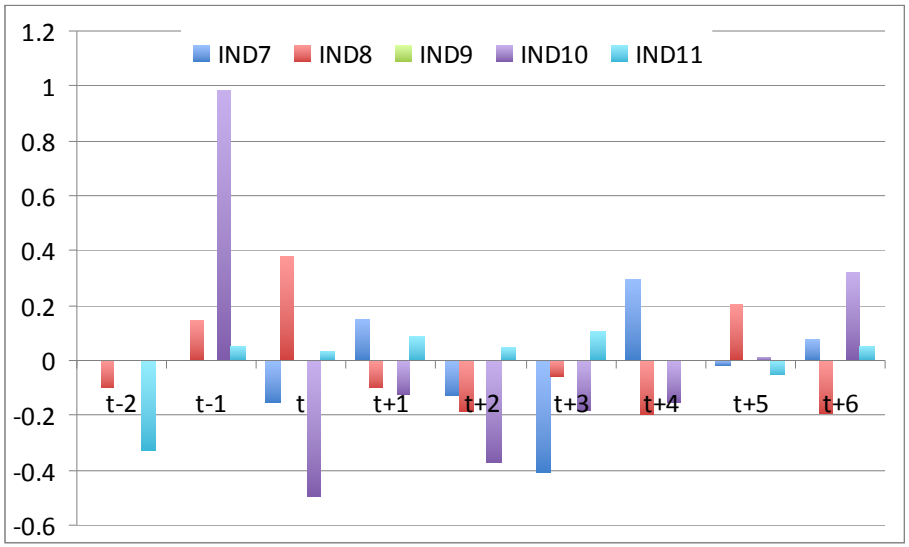
[a] Values from Table A2.1 have been converted to exp(β)-1.

Figure 6.5: Year-on-year change in TFP in service industries for plants acquired, 1998-2002

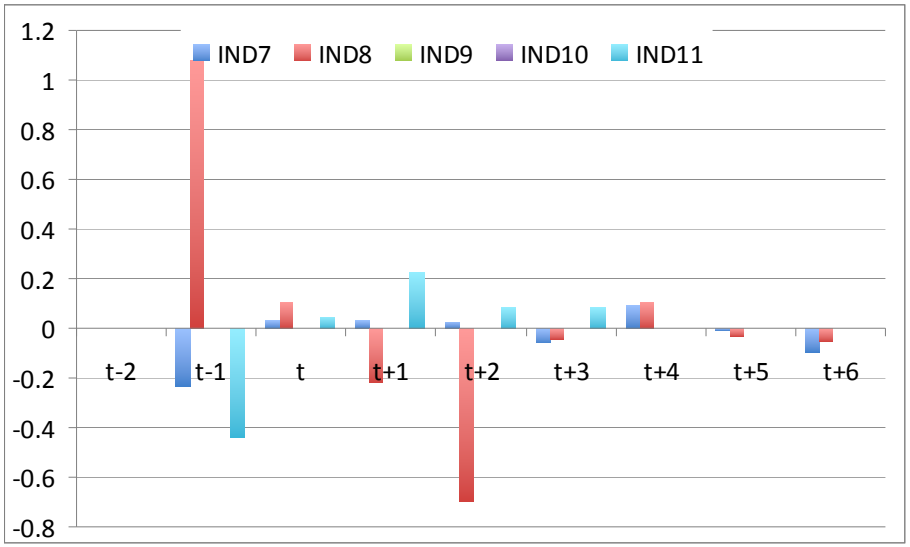
(a) EU-acquired



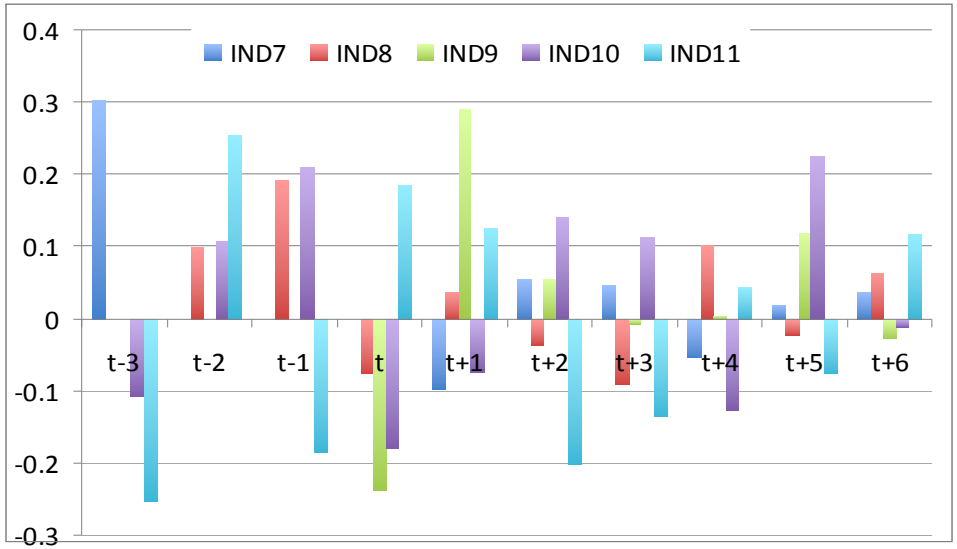
(b) US-acquired



(c) Other foreign-owned acquired

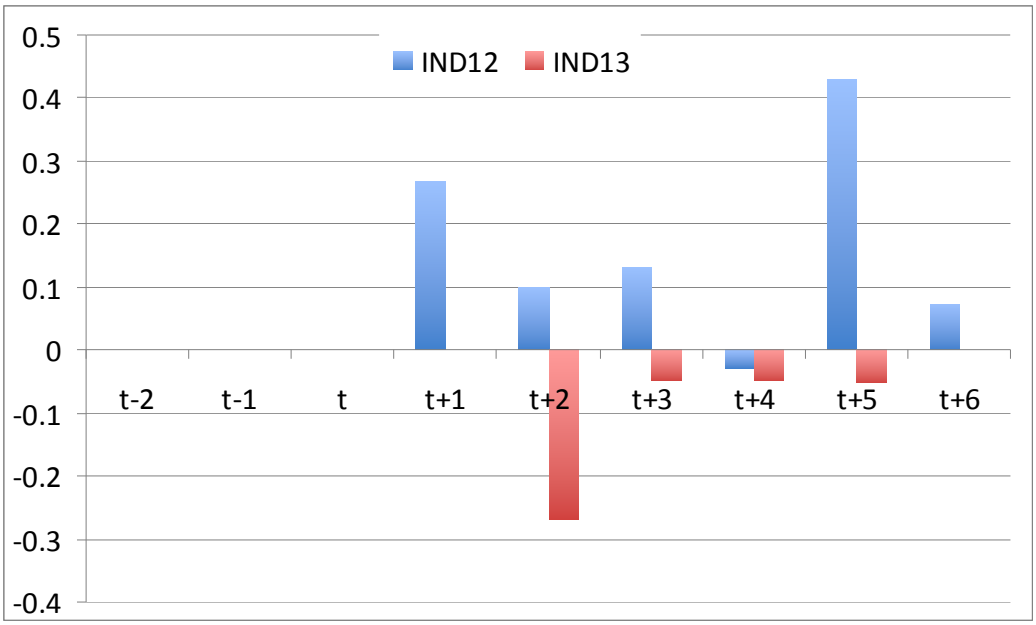


(d) UK-acquired

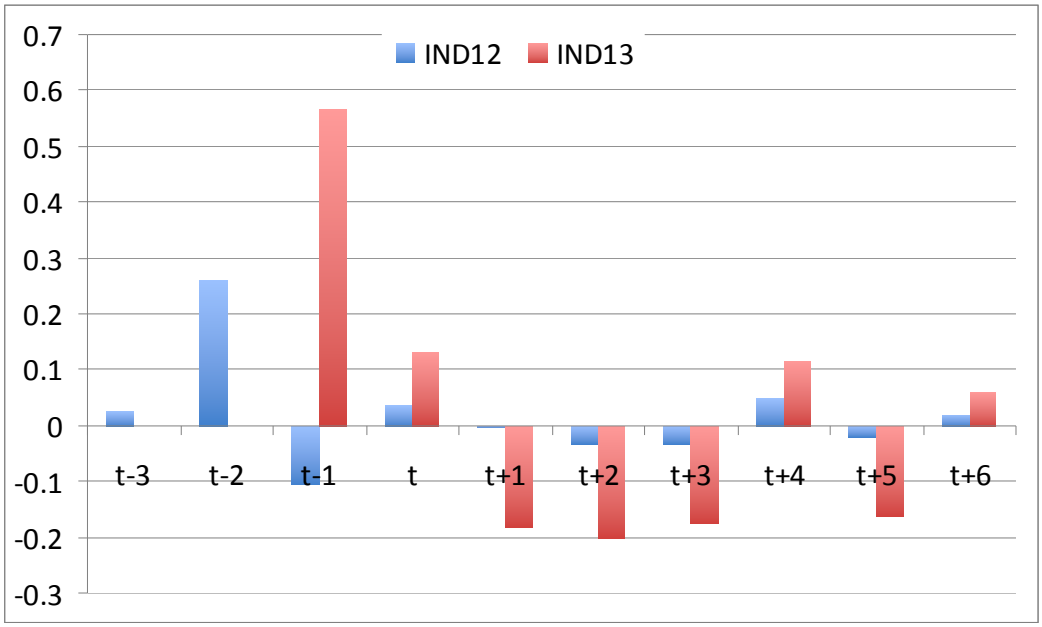


© Richard Harris

(e) Foreign-owned acquired



(f) UK-owned acquired



selection bias), with Figure 6.5 showing the *changes* in TFP for those estimates in Table 6.6 that were statistically significant. Generally, there is no clear overall pattern of any sustained improvement in TFP post-acquisition, although there is some evidence (Figure 6.5a) that specialist & non-specialist retail stores acquired by EU-firms did improve while other retail, air transport & telecoms plants declined over time for EU-acquired plants. US-acquired plants in both wholesale trade and other retail, air transport & telecoms saw declines in post-acquisition TFP; while other FO-acquired in wholesale trade also saw reduced TFP. Plants in other business services acquired by the foreign-owned sector (as a whole) have significantly improved over time (Figure 6.5e), while recreational &

other personal services plants have become much less productive. For UK-acquired firms in both these sectors (Figure 6.5f), there is some evidence that over time acquired plants have done worse post-acquisition; this was also the case in the computer software, R&D, accounting & management services sector after initial gains in TFP. However, UK-acquired plants did see gains post-acquisition in retail stores and other retail, air transport & telecoms.

6.31 Lastly, in an attempt to summarise the time profile of TFP for both manufacturing and services, across ownership groups, Table 6.7 weights the results presented above (using total gross output figures) to give industry totals. Firstly, it can be seen that the matched-sample estimates generally provide much larger impacts, and it is these we shall concentrate on.

6.32 In terms of the matched-sample estimates, for services the overall picture (Table 6.7 and Figure 6.6) is initially there were TFP gains for US-acquired plants, but these improvements turned to a decline in TFP over time (especially after $t + 3$). For EU-acquisitions there is a similar picture with large pre-acquisition gains that dissipated over time (but were not entirely lost as with the US-acquired plants). Service sector plants acquired by other foreign-owned firms saw very large initial gains in TFP just before and in the period of acquisition, but over time this falls back to around the 10% level. Lastly, in UK-acquired service sector plants, TFP improved post-acquisition and the small gains made have been sustained. Overall the situation in services was fairly immediate gains which then tapered-off, except in US-acquired plants which become worse over time.

6.33 In manufacturing, there was little change in TFP in US- and UK-acquired plants; while in EU- and other foreign-owned plants TFP was declining pre-acquisition and this trend generally continued over time.

Summary and conclusion

6.34 This chapter has considered to what extent do acquiring/merging foreign-owned firms acquire UK plants with above average productivity; and what is the effect of foreign acquisition on UK firm productivity post-acquisition.

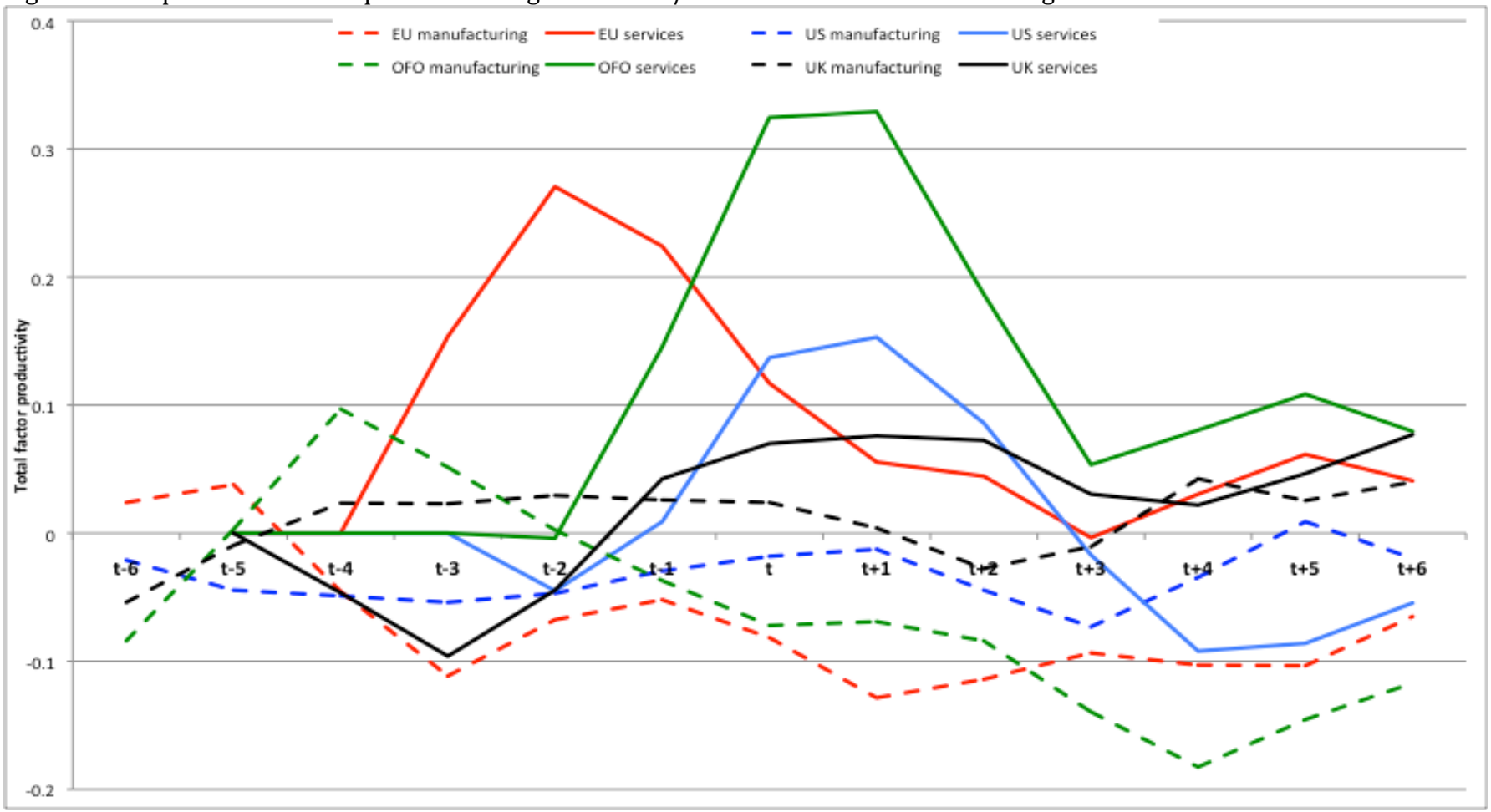
6.35 The evidence used is based on estimating econometric models of TFP using unbalanced panel data based on plants that existed in 1995-2000 (1998-2002 for services) but which operated during the full 1985-2005 (or 1997-2005) period [i.e. we do not include plants that closed before 1995 (1998 for services), nor plants that started post 2000 (2002)]. The dynamic modelling approach allows for endogeneity of factor inputs and output, using a system GMM methodology which takes account of fixed effects and endogeneity (both of which are important and if ignored will lead to biased and potentially misleading results). The statistical approach taken also takes account of potential selectivity bias (due to acquired plants potentially being more productive whether acquired or not) and we do this using a matching estimator approach.

Table 6.7: Pre- and post impact on TFP of foreign acquisitions (weighted totals of Tables 6.2 and 6.4)

	t-6	t-5	t-4	t-3	t-2	t-1	t	t+1	t+2	t+3	t+4	t+5	t+6
EU acquired													
Manufacturing(1)	0.134	0.128	-0.017	0.223	0.067	0.048	-0.022	-0.049	-0.030	0.005	0.010	-0.057	0.163
Manufacturing(2)	0.024	0.052	-0.143	-0.080	-0.055	-0.049	-0.114	-0.143	-0.085	-0.102	-0.104	-0.103	-0.027
Services (1)				0.147	0.081	0.077	0.085	0.019	-0.012	-0.038	-0.030	-0.004	-0.060
Services (2)				0.307	0.234	0.214	0.020	0.091	-0.002	-0.005	0.066	0.057	0.025
US-acquired													
Manufacturing(1)	0.080	0.000	0.032	0.018	0.098	0.019	0.005	-0.025	-0.023	-0.035	0.011	0.023	-0.008
Manufacturing(2)	-0.021	-0.068	-0.030	-0.078	-0.016	-0.043	0.007	-0.032	-0.057	-0.089	0.020	-0.002	-0.037
Services (1)				-0.187	-0.087	-0.026	-0.010	-0.074	-0.073	-0.175	-0.149	-0.178	-0.110
Services (2)				0.000	-0.090	0.108	0.166	0.140	0.032	-0.066	-0.118	-0.054	-0.055
Other FO acquired													
Manufacturing(1)	0.133	0.044	0.059	-0.031	-0.013	-0.034	-0.038	-0.028	-0.060	-0.094	-0.090	-0.033	-0.035
Manufacturing(2)	-0.084	0.090	0.104	-0.001	0.006	-0.080	-0.064	-0.074	-0.094	-0.185	-0.180	-0.111	-0.123
Services (1)				0.113	-0.042	0.017	0.058	0.005	-0.070	-0.067	-0.043	-0.041	-0.025
Services (2)				0.000	-0.008	0.299	0.350	0.308	0.065	0.042	0.119	0.098	0.061
UK-acquired													
Manufacturing(1)	0.025	0.049	-0.023	0.031	0.020	-0.010	-0.004	-0.006	-0.012	-0.011	-0.003	0.002	-0.004
Manufacturing(2)	-0.054	0.035	0.012	0.034	0.025	0.027	0.021	-0.013	-0.042	0.021	0.064	-0.013	0.093
Services (1)			0.025	0.023	0.026	0.036	0.011	0.012	0.009	0.000	-0.016	-0.025	-0.024
Services (2)			-0.093	-0.099	0.010	0.075	0.065	0.087	0.058	0.003	0.041	0.052	0.102

(1) full-sample; (2) matched-sample.

Figure 6.6: Impact on TFP of acquisition during 1995-2000/1998-2002 in GB manufacturing and services



Source: Table 2.7

6.36 With regard to the 'cherry picking' hypothesis, the results for manufacturing for plants acquired during 1995-2000 show that on balance they were likely to have lower productivity in 3 of the 6 industry sub-groups covered. This was true even for plants acquired by US companies. This is in contrast to previous results presented covering acquisitions of manufacturing plants in the 1987-1992 period, which showed 'cherry-picking' in all three manufacturing sectors covered.

6.37 When the TFP distributions (based on the predicted TFP of each plant using the results obtained from modelling) are considered, these show that compared to non-acquired plants, in most manufacturing industry groups acquired plants had *higher* TFP at lower- to middle-sections of the productivity distribution; that is, acquired plants dominate non-acquired plants for a large part of the distribution of TFP values, but usually at high levels of TFP there is a cross-over and non-acquired plants dominate those acquired.

6.38 Thus for manufacturing, while econometric modeling shows that foreign-owned firms were not as involved in 'cherry-picking' manufacturing plants during 1995-2000 as might have a priori been predicted, this can be explained (at least in part) by the relatively higher levels of TFP of non-acquired plants at the top end of the TFP distribution; 'cherry-picking' occurs but not of the very best plants but rather those in the mid- to lower-end of the productivity spectrum.

6.39 As to the time-profile of productivity of acquired plants pre- and post-acquisition, in manufacturing there was little change in TFP in US- and UK-acquired plants; while in EU- and other foreign-owned plants TFP was declining pre-acquisition and this trend generally continued over time. This suggests that when acquiring plants from the middle- and lower-end of the TFP distribution (albeit with relatively better TFP than non-acquired plants), foreign-owned firms were not able (or did not attempt) to enhance their relative levels of TFP.

6.40 As to whether foreign-owned firms 'cherry-picked' the best UK service sector plants, the econometric results showed that this was certainly true in a small number of industries, but the evidence is generally mixed, with overall more of a tendency for less productive plants to have been acquired.

6.41 Turning to the TFP distributions for service sector industries, these show that there is much less evidence, when compared to manufacturing, that acquired plants had higher TFP at lower- to middle-sections of the productivity distribution, vis-à-vis non-acquired plants (and they almost never had higher productivity at the upper end of the distribution). In manufacturing it was found that in nearly every industry examined plants that were acquired have a distribution that lies significantly to the right of non-acquired plants (at least for part of this distribution) and often the maximum difference was large. For services, in every industry sub-group acquired plants outperform non-acquired plants at invariably the lower part of the distribution, but the difference in favour of acquired plants is generally much smaller.

6.42 For services, both the econometric results and comparisons of productivity distributions show that plants that were acquired by foreign-owned firms were generally not 'cherry picked'; the overall picture confirms that there was more of a tendency for less productive service sector plants to have been acquired.

6.43 As to the time-profile of productivity of acquired plants pre- and post-acquisition, for services the overall picture is initially there were TFP gains for US- and EU-acquired plants, but these improvements dissipated over time (although for EU-acquisitions they were not entirely lost, as happened in the US-acquired plants). Service sector plants acquired by other foreign-owned firms saw very large initial gains in TFP just before and in the period of acquisition, but over time this fell back to around a 10% longer-term gain. Lastly, in UK-acquired service sector plants, TFP improved post-acquisition and the small gains made were sustained. Overall the situation in services was fairly immediate gains which then tapered-off, except in US-acquired plants which become worse over time.

6.44 It is probable that these immediate TFP gains in services, at- and post-acquisition, reflect the lower relative productivity of such plants when acquired. However, it is perhaps of concern that such relative gains were not sustainable.

Appendix

Sample selection issues and matching

A6.1 A particular issue when estimating models to determine the linkages between treatment status (here that the plant is acquired by a foreign-owned firm) and productivity using micro-level data has been that of sample selectivity (or matching).[60] A number of studies attempt to make comparisons between a 'treatment' group and the rest of the population when it is known or suspected that the treatment group are not a random sample drawn from the population of all firms. To illustrate, the standard evaluation problem presented in the literature will be briefly presented (cf. Heckman, 2000, and Heckman and Navarro-Lozano, 2004). The key issue is measuring without bias the outcome Y_i of the treatment effect on firms in terms of whether they receive the treatment D_i or not. That is:

$$E[Y_i|D_i = 1] - E[Y_i|D_i = 0] \qquad (A6.1)$$

To measure the impact using equation (A6.1), we only have the following information:

$$E[Y_i^1|D_i = 1] - E[Y_i^0|D_i = 0] \qquad (A6.2)$$

that is, the difference between what participants (D_i = 1) receiving the treatment experience in terms of outcome (Y_i^1) and what non-participants (D_i = 0) not receiving the treatment experience (Y_i^0). What is not observed is the outcome for participants had they not participated (i.e. $E[Y_i^0|D_i = 1]$). The latter counterfactual can be used to expand (A6.2) to give the following:

$$E[Y_i^1 - Y_i^0|D_i = 1] + \{E[Y_i^0|D_i = 1] - E[Y_i^0|D_i = 0]\} \qquad (A6.3)$$

Equation (A6.3) shows that a comparison between treated and untreated firms (in terms of what is observable – cf. equation A6.2) equals the effect of 'treatment on the treated' (the first term in equation A6.3) plus a bias term (the second major term after the addition sign). As pointed out by Angrist *et. al.* (1999), this bias would be zero if treated firms were randomly assigned (or at least assigned to ensure independence between D_i and Y_i^0).[61] So, for example, if plants are acquired independent of (say) the plant's potential productivity gain from being acquired, then the bias term would be zero. But this seems unrealistic because selection for acquisition

[60] See Moffitt (2004).

[61] Note if D_i is also independent of Y_i^1 (as would be expected in a 'laboratory-type' experiment where firms were randomly assigned) then $E[Y_i^1 - Y_i^0|D_i = 1] = E[Y_i^1 - Y_i^0]$ and the 'treatment on the treated effect equals the unconditional average treatment effect (that is, the impact on an acquired plant drawn randomly from the population of firms).

is likely to be made taking account of the potential productivity gains from takeover, and it might be expected that those most likely to achieve higher growth will have a higher probability of breaking-down the barriers to above average performance. Put another way, and referring to the second term in equation (A6.3), bias occurs because the characteristics of the acquired plants are such that they are likely to achieve better performance than non-assisted plants even when they are not taken over, and this 'better performance' is correlated with the decision to acquire. Thus, the essential problem at the core of the problem of evaluating the effect of takeovers is an attempt to estimate missing data, i.e. obtain an estimate of the unobserved counterfactual that is not biased because of any simultaneous relationship between the decision to acquire and the potential gains from such acquisition.

A6.2 There are several approaches that attempt to eliminate the bias that arises from self-selection (cf. Blundell *et. al*., 2005). The first considered here is matching. Essentially, this involves matching every acquired plant with another pant that has (very) similar characteristics but is not taken over. Thus, under the matching assumption acquired- and non-acquired plants have the same (observable) attributes that impact on productivity except that one sub-group receives the treatment (acquisition) and the other does not; put another way, the outcome that would result in the absence of acquisition is the same in both cases. Thus the non-acquired, matched sub-group constitutes the correct counterfactual for the missing information on the outcomes that acquired plants would have experienced, on average, if they had not received help.[62]

A6.3 Different approaches can be used to match plants, from using simple propensity score matching algorithms (Rosenbaum and Rubin, 1983), where such scores are obtained from a probit/logit regression approach, to covariate matching estimators (that use complicated algorithms to match plants who become foreign-owned with domestic plants). There are a number of issues with this matching process, including the need for a rich dataset set that includes all relevant variables (X_i) that impact on productivity and all variables that impact on whether the plant is acquired by a foreign firm or not (Z_i). Matching is done on the set of variables $W = (X, Z)$, so that any selection on unobservables is assumed to be trivial and does not affect outcomes in the absence of exporting. As Heckman and Navarro-Lozano (2004) point out, this requirement can lead to problems since "…if the analyst has too much information about the decision of who takes treatment, so that $P(W) = 1$ or 0, the method breaks down because people cannot be compared at a common W…(thus) methods for choosing W based on the fit of the model to data on D are potentially problematic".[63, 64]

---

[62] In terms of equation (A6.3), it is assumed: $E[Y_i^0 | D_i = 1] = E[Y_i^0 | D_i = 0]$. Thus matching assumes that Y_i^1 and Y_i^0 are independent of D_i.

[63] Typically plants that are acquired which are not 'supported' by plants from the domestic population are dropped, which can reduce significantly the size of the treatment sub-group included in any analysis. So where there is little common support between the treated and non-treated comparators, matching breaks down.

A6.4 In terms of the practical issues faced in any empirical design of matching plants Bryson *et. al.* (2002), Imbens (2004) and Zhao (2004) provide a detailed and useful discussion. The most commonly used propensity score matching approach involves estimating a model to identify the probability of being acquired/taken-over (i.e. the propensity score) using the following probit model:

$$P(\text{ACQ}_{it}=1) = \phi(ln\ \text{LP}_{it-1}, ln\ \text{AGE}_{it-1}, ln\ \text{KL}_{it-1}, ln\ \text{IL}_{it-1}, \text{size}_{it-1}, \text{single-plant}_{it}, ln\ \text{Diversification}_{it}, ln\ \text{agglomeration}_{it}, ln\ \text{Herfindahl}_{it}, \%\text{FO}_{nt-1}, \text{industry}_{it}, \text{region}_{it}) \quad \text{(A6.4)}$$

where *ACQ* is coded 1 if the plant *i* is acquired at time *t* during 1995-2000 (1998-2002); and other variables are explained in Table 1.2 except: *LP* is labour productivity; *KL* is capital-labour ratio; *IL* is the intermediate inputs-to-labour ratio; *size* represents 4 dummy variables that take on a value of 1 based on employment in the relevant quintile; and %FO is a measure of the importance of FDI (the value of industry output produced by foreign-owned plants was used here) in industry *n* to which the plant belongs. Following Girma *et. al.* (2004), if P_i if the propensity score of exporting for plant *i* at time *t*, we then use the propensity score matching procedure available in STATA 9.2 to find the closest match (using the "nearest-neighbour" approach) for each plant acquired through FDI in terms of the propensity scores from the sub-group of domestic plants, i.e.:

$$\left|P_i - P_j\right| = \min_{k \notin \{Acquired_k = 0\}} \{P_i - P_j\} \quad \text{(A6.5)}$$

A6.5 Note, acquired plants with propensity scores P_i that do not have 'common support' (i.e. the scores are higher than the maximum or less than the minimum propensity score for the non-export group) are dropped.

A6.6 The first major issue is which variables should enter equation (A6.4). The literature in this area show that omitting important variables can result in serious bias in the propensity scores used to obtain the control group; indeed it is argued that all the relevant variables in $W = (X, Z)$ should be included. Clearly, variables affected by treatment (such as productivity) should not be included contemporaneously, but only included (where justified) before acquisition (i.e. at $t - 1$ or earlier), and then only when its value at $t - 1$ has not been influenced by the anticipation of acquisition (Caliendo and Kopeinig, 2005). Variables in *W* that are not significant should be omitted (to reduce the risk of inefficient estimates of the propensity score), and it has been suggested by some (e.g. Heckman and Navarro-Lozano, 2004) that variables in *Z* that have only a weak impact on the outcome variable (e.g. productivity) should also be omitted to avoid inconsistency. Indeed Bhattacharya and Vogt (2007) provide evidence to show that indeed variables in *Z* that effectively act as instruments (i.e., they

[64] Another issue is that by definition, matching assumes that the effect for the average acquired plant is the same as the effect for the marginal plant (the 'treatment on the treated' effect equals the unconditional average treatment effect). Heckman and Navarro-Lozano (*op. cit.*) argue that this is an unattractive implication.

determine whether a plant is acquired or not, but are not correlated with the outcome variable – here TFP) should be omitted from the propensity score.

A6.7 A second major issue concerns the estimation of the propensity score model, equation (A6.4). The data available here is panel data, which involves an expectation that fixed effects are important, i.e. equation (A6.4) can be written as:

$$P_{it} = W_{it}\alpha + \mu_i + u_{it};\ u_t \sim N(0,1) \qquad \text{(A6.6)}$$

where fixed effects μ_i have been included. Such fixed effects are potentially correlated with the explanatory variables ($\mathbf{x}_{it}$, $\mathbf{z}_{it}$)[65] and this leads to what is termed the "incidental parameters problem" (Neyman and Scott (1948)[66], which has been shown to lead to biased estimates of the model parameters (α). This is especially problematic for the probit estimator which involves a non-linear approach.

A6.8 The problem essentially arises because in estimating equation (A6.6) using maximum likelihood methods the unobserved μ_i are replaced by inconsistent sample estimates [i.e. $\hat{\mu}_i(\alpha)$] which are conditional on the other parameters in the model (i.e., the α). As Fernandez-Val and Vella (2007) put it: "… since estimation of model parameters cannot be separated from the individual effects in these models, the estimation error of the individual effects contaminates the other parameter estimates" (p. 5). There have been several approaches suggested in the literature to overcome this problem and thus produce consistent (and thus unbiased) fixed effect probit estimators.[67] For example, Fernandez-Val and Vella (*op. cit.*) propose correcting the bias in the probit fixed effects estimator, but in practical terms the approach has not yet reached the stage that it is available in standard econometric packages such as STATA. An alternative is to use the simple approach suggested by Wooldridge (1995) which in practical terms means estimating (A6.6) as a cross-sectional probit model for each period *t*, and then calculating the propensity scores for each plant *i*, and stacking the results by *i* and *t* in order to obtain a control group.

---

[65] The alternative commonly used panel data estimator is to assume random effects (i.e. the terms μ_i are incorporated into the error terms in the model, and thus are assumed to vary independently of the explanatory variables). Random effects therefore by-passes the incidental parameters problem by integrating out the individual effects. The random effects approach is applicable if the panel data comprise *N* firms drawn randomly from a large population (e.g. the typical approach in household panel studies) such that the μ_i are randomly distributed across plants. The fixed effects approach is more appropriate here when focussing on a specific set of *N* plants which are not randomly selected from the population, and to which we would expect there to be a time invariant individual effect associated with each plant.

[66] See Lancaster (2000) and Fernandez-Val and Vella (2007), amongst others, for further discussion of this issue.

[67] Note the alternative of using a random effects probit estimator is not an option if fixed effects is the more appropriate model (see footnote 55) and if the regression model determining productivity is to estimated using a fixed effects approach. Clearly, using a random effects selection model (assuming individual effects are random) and a fixed effects regression model is not consistent. Similarly, it is not appropriate to use the fixed effects *logit* estimator because the regression approach assumes that the error terms in the model are normally distributed (and the logit estimator of course imposes a logistic distribution).

A6.9 Hence, in this study we have used the Wooldridge (1995) approach to obtain propensity scores, which are then used these year-by-year to match plants based on the nearest-neighbour, one-to-one common-support approach available in PSMATCH2 in STATA. Only variables that are significant in equation (A6.4) are used, and then only if they are also correlated with output (the dependent variable in equation 6.1).

A6.10 Having obtained a matched sample of foreign-owned acquired and non-acquired plants, there are generally two ways to proceed: firstly, the outcome variable (e.g. total factor productivity - TFP) can be compared for each matched pair and the average value obtained as a measure of the impact of acquisition on TFP. In common with most studies in this field, we do not take this approach but rather (re-)estimate equation (6.1) using the matched data to test hypotheses regarding the impact of plant acquisitions. This combination of matching and parametric estimation is argued (e.g. Blundell and Costa Dias, 2000) to improve the results obtained from this type of non-experimental evaluation study, as other impacts on the outcome variable are explicitly controlled for.

A6.11 Note, we test to ensure that the matched plants in the control group are an adequate sample, since if matching has worked then the $D_1 \times$ foreign-ownership dummy variables included in equation (6.1) should be statistically insignificant when it is estimated using only the matched treatment and control group sample; i.e., we will have removed the 'dissimilarity' between the acquired plants in our model and the non-acquired plants. In every instance we found these composite dummy variables to insignificant in when estimating (6.1) using only the control group sample of untreated plants. This is therefore confirmation of why estimating (6.1) using only matched data cannot be used to test the 'cherry-picking' hypothesis (matching effectively removes any evidence of its existence).

A6.12 Finally, for completeness we briefly review the alternative to matching as a means of controlling for sample selectivity effects. A second approach to dealing with self-selection bias is instrumental variable (IV) estimation. If a variable(s) can be found (belonging to Z_i) that affects whether a plant is acquired but does not affect outcomes (Y_i) directly (i.e. Z_i is not completely determined by X_i) then such a variable(s) can be used to instrument for the ACQ_k and overcome the problem of self-selection.[68] Put another way, such a variable(s) affects outcomes indirectly since it determines whether a plant is taken-over (which is presumed to be correlated with productivity), but it does not need to enter the outcome equation directly (i.e. does not belong to X_i) and is consequently a source of exogenous influence that can be used to identify the causal impact of ACQ_k in the model. The main issue with the approach is finding an appropriate instrument(s) that affects whetherthe plant is acquired but does not directly affect outcomes (other than through the plant being acquired). As Angrist and Krueger (2001) point out: "…good instruments often come from detailed knowledge of the economic mechanism and institutions determining the regressor of interest" (p. 73).

[68] Note, the fact that ACQ_k is dichotomous is not a problem according to Angrist (2001).

Blundell *et. al.* (2005) note that natural candidates as instruments are time constant factors and/or "pre-treatment characteristics". However, in this study we do not have access to any valid instruments; all the variables that determine whether a plant is acquired can validly enter the model determining productivity.

A6.13 The last approach considered here for eliminating the bias that arises from self-selection is the difference-in-difference estimator. If information is available for a pre- and post-treatment period (denoted t' and t, respectively), then measuring the impact of treatment can be achieved using an amended version of equation (A6.2):

$$\left\{E[Y_{it}^{1}|D_i=1]-E[Y_{it'}^{0}|D_i=1]\right\}-\left\{E[Y_{it}^{0}|D_i=0]-E[Y_{it'}^{0}|D_i=0]\right\} \qquad \text{(A6.7)}$$

where the first term represents the experience of firms who receive assistance between $(t-t')$ and the second term is the experience between $(t-t')$ of those not assisted. To justify this difference-in-difference estimator, it is assumed that (in terms of the counterfactual) what acquired plants would have experienced in the post-acquisition period, had they not been acquired, is the same as the experience of non-acquired plants, i.e.

$$\left\{E[Y_{it}^{0}|D_i=1]-E[Y_{it'}^{0}|D_i=1]\right\}=\left\{E[Y_{it}^{0}|D_i=0]-E[Y_{it'}^{0}|D_i=0]\right\} \qquad \text{(A6.8)}$$

The missing counterfactual is now known since rearranging (A6.7) gives:

$$E(Y_{it}^{0}|D_i=1)=E(Y_{it'}^{0}|D_i=1)+\left\{E[Y_{it}^{0}|D_i=0]-E[Y_{it'}^{0}|D_i=0]\right\} \qquad \text{(A6.9)}$$

that is, the outcome that acquired plants would have experienced post-acquisition, had they not been acquired, equals their outcome effect before any take-over takes place adjusted for what happens over the period to all non-acquired plants (the last major term in equation A6.9).

A6.14 A major issue with this approach is the assumption underlying equation (A6.8), which is needed to justify the difference-in-differences estimator. Essentially it is assumed that the outcome effect for acquired plants would have been the same as that experienced by non-acquired plants in the absence of take-over; but this seems unlikely if acquired plants are a (self-) selected sub-group exhibiting characteristics that make it more likely they will do better in terms of productivity if they are taken-over.

A6.15 In summary, and given the availability of the different approaches to the selectivity problem and the data available to us, we chose to test for the relationship between acquisition and productivity using a matching approach (based on the propensity scores obtained from the probability of being acquired as set out in equations A6.4 and A6.5). Estimates were obtained for all the industry sub-groups analysed.

Measuring productivity: the Olley and Pakes approach

A6.16 We discuss briefly why using the systems-GMM approach to estimating TFP is chosen instead of using the Olley and Pakes (1996) model (hereafter denoted OP), which has become relatively popular in recent years. The OP approach is an attempt to overcome endogeneity between output and inputs in the production function, while it also incorporates the impact of selectivity effects due to firms that close down. Basically, consider the following Cobb-Douglas value-added production function

$$y_{it} = \alpha_0 + \alpha_E e_{it} + \alpha_K k_{it} + \omega_{it} + \varepsilon_{it} \qquad \text{(A6.10)}$$

where *y* is now value added (rather than gross output), and ω represents productivity shocks that are assumed to be observed by the firm, but not by the econometrician. As it stands, there is endogeneity as $E(e_{it}|\omega_{it}) \neq 0$ and $E(k_{it}|\omega_{it}) \neq 0$, as the firm's optimal choice of factor inputs will generally be correlated with productivity shocks. OP assume that (i) ω evolves exogenously following a first-order Markov process, and in particular does not depend contemporaneously on any of the decision variables for the firm (such as investment and whether acquired); (ii) e_{it} is a non-dynamic input (i.e. it has no impact on future profits of the firm, thus ruling out training, hiring and firing costs); (iii) k_{it} is decided in period $t - 1$ (ruling out the use of hired capital assets, and/or incremental additions to capital, during *t*); and (iv) the firm's optimal investment, *i*, is a strictly increasing function of its current productivity, conditional on other state variables which includes whether the plant was acquired in the present context[i.e. $i_{it} = f_t(\omega_{it}, k_{it}, ACQ_{it-1})$]. Based on assumption (iv) the investment function can be inverted to obtain:

$$\omega_{it} = f_t^{-1}(i_{it}, k_{it}, ACQ_{it-1}) \qquad \text{(A6.11)}$$

and Equation (A.6.11) can be used to substitute into the production function to control for the unobserved ω_{it}:

$$y_{it} = \alpha_0 + \alpha_E e_{it} + \alpha_K k_{it} + f_t^{-1}(i_{it}, k_{it}, ACQ_{it-1}) + \varepsilon_{it} \qquad \text{(A6.12)}$$

A6.17 The OP approach then proceeds through three estimation steps, whereby in principle (given the above assumptions), the parameters from the production function can be identified and unbiased estimates obtained. However, this involves using semi-parametric techniques in stage 1 (whereby Equation (A6.12) is estimated with the composite term $\alpha_K k_{it} + f_t^{-1}(i_{it}, k_{it}, ACQ_{it-1})$ replaced by an unknown polynomial involving the three variables involved in this term), and more importantly it has been shown by Ackerberg et. al. (2005) that because of collinearity between $\alpha_K k_{it} + f_t^{-1}(i_{it}, k_{it}, ACQ_{it-1})$ and e_{it} it is not possible to identify the parameter α_K. When compared to using a dynamic panel estimator (DPD, such as systems-GMM), Ackerberg et. al. (op. cit.) point out a number of other drawbacks of the OP approach. Firstly, DPD methods can allow for fixed effects, and OP does not, which in our view is a significant drawback. Secondly, with respect to Equation (A6.11), it has to be assumed that there is strict monotonicity between investment and productivity, and that ω_{it} is the only unobservable input entering the investment function (prior to

inversion), ruling out measurement error in these variables. The DPD model does not require such assumptions, and it also allows for weaker assumptions with respect to the error term in the production function (ε_{it} uncorrelated with factor inputs prior to *t*, whereas OP requires ε_{it} to be uncorrelated at all *t*). In addition, DPD modelling does not invoke assumptions (ii) and (iii) above concerning the timing of investment and that labour be a non-dynamic input.

Table A6.1: Dynamic weighted systems GMM production function, manufacturing,1984-2005[a] (equation 6.1)

	IND1	z-value	IND2	z-value	IND3	z-value	IND4	z-value	IND5	z-value	IND6	z-value
ln real gross output$_{t-1}$	0.021	0.58	0.386	11.66	0.029	0.40	0.206	5.57	0.210	7.67	0.107	1.74
ln intermediate inputs$_t$	0.721	35.71	0.747	21.38	0.671	3.45	0.757	10.27	0.714	12.64	0.639	6.77
----"---- group 1	-0.056	-1.85	-0.034	-0.81	0.003	0.02	0.063	1.12	-0.305	-4.04	0.054	0.62
----"---- group 2	-0.098	-1.48	0.043	0.93	0.011	0.06	0.033	0.62	-0.106	-0.95	0.065	0.59
----"---- group 3	-0.007	-0.26	0.061	1.64	0.074	0.41	0.009	0.17	-0.180	-1.98	0.116	1.35
----"---- group 4	0.039	1.95	0.001	0.03	-0.063	-0.35	0.094	1.81	-0.321	-3.15	0.093	1.05
----"---- group 5	0.006	0.16	-0.061	-1.65	0.017	0.09	-0.010	-0.17	-0.086	-1.53	0.010	0.12
----"---- group 6	0.026	1.30	-0.014	-0.39	0.001	0.00	0.020	0.40	-0.041	-0.79	0.072	0.83
----"---- group 7	0.092	2.14	0.049	0.77	0.012	0.06	0.009	0.15	0.049	0.67	0.191	1.78
----"---- group 8	0.019	0.91	0.005	0.13	0.002	0.01	0.050	1.19	-0.036	-0.69	0.106	1.22
ln intermediate inputs$_{t-1}$	-0.006	-0.16	-0.357	-11.00	0.007	0.07	-0.200	-4.64	-0.164	-5.71	-0.079	-1.23
ln employment$_t$	0.278	14.47	0.274	5.96	0.164	0.68	0.193	2.90	0.355	5.66	0.337	3.56
----"---- group 1	0.037	1.27	-0.003	-0.06	0.145	0.62	0.012	0.30	0.306	3.12	-0.042	-0.52
----"---- group 2	0.169	3.63	-0.111	-1.96	0.154	0.64	-0.003	-0.08	0.049	0.46	-0.059	-0.56
----"---- group 3	-0.025	-1.09	-0.066	-1.53	0.087	0.40	0.016	0.42	0.101	1.17	-0.094	-1.15
----"---- group 4	-0.012	-0.74	0.026	0.51	0.222	0.99	-0.028	-0.67	0.301	2.68	-0.032	-0.38
----"---- group 5	-0.035	-0.88	0.046	1.03	0.150	0.65	0.072	1.72	0.062	0.95	-0.003	-0.03
----"---- group 6	-0.019	-1.23	0.005	0.13	0.163	0.73	0.024	0.73	0.006	0.10	-0.048	-0.62
----"---- group 7	-0.099	-2.26	-0.044	-0.72	0.007	0.03	0.072	1.35	-0.124	-1.10	-0.128	-0.88
----"---- group 8	-0.025	-1.50	-0.015	-0.35	0.151	0.67	-0.003	-0.09	0.016	0.26	-0.117	-1.47
ln employment$_{t-1}$	-0.032	-2.83	-0.082	-3.21	-0.061	-1.02	-0.016	-0.53	-0.113	-4.65	-0.059	-1.80
ln capital$_t$	0.106	7.53	0.093	5.19	0.131	2.26	0.118	2.26	0.056	4.21	0.094	3.07
----"---- group 1	-0.010	-0.93	0.012	0.55	-0.076	-1.51	-0.017	-0.59	-0.017	-0.69	-0.022	-0.77
----"---- group 2	0.003	0.24	-0.005	-0.26	-0.090	-1.80	0.020	0.64	0.073	3.00	-0.008	-0.38
----"---- group 3	0.003	0.24	-0.005	-0.26	-0.090	-1.80	0.020	0.64	0.073	3.00	-0.008	-0.38
----"---- group 4	-0.043	-4.81	-0.039	-1.77	-0.080	-1.76	-0.010	-0.35	0.050	2.95	-0.034	-1.24
----"---- group 5	-0.011	-0.62	-0.010	-0.54	-0.099	-2.02	-0.003	-0.08	0.030	2.64	-0.020	-1.00
----"---- group 6	-0.021	-2.58	-0.012	-0.65	-0.095	-1.98	0.009	0.31	0.030	2.88	-0.016	-0.77
----"---- group 7	-0.019	-0.96	0.027	0.59	0.003	0.03	-0.030	-0.62	0.065	1.80	-0.046	-1.28

----"---- group 8	-0.021	-2.23	-0.008	-0.41	-0.083	-1.71	-0.004	-0.13	0.013	1.13	0.015	0.67
ln capital$_{t-1}$	0.041	3.63	0.016	1.11	-0.012	-0.47	-0.012	-1.05	0.041	3.74	0.025	1.86
time	0.011	2.38	0.015	1.68	0.007	1.30	0.012	2.00	0.015	2.37	0.015	2.66
----"---- group 1	0.002	2.40	0.003	0.64	-0.006	-0.49	-0.001	-0.12	0.029	5.56	-0.004	-0.72
----"---- group 2	0.006	2.22	0.000	-0.09	0.007	0.65	-0.003	-1.24	0.005	1.39	0.000	-0.11
----"---- group 3	0.006	2.22	0.000	-0.09	0.007	0.65	-0.003	-1.24	0.005	1.39	0.000	-0.11
----"---- group 4	-0.002	-0.59	-0.001	-0.33	0.014	1.28	-0.005	-1.29	0.027	4.72	-0.004	-0.82
----"---- group 5	0.006	2.90	0.003	1.54	0.011	0.91	0.002	0.91	0.012	5.63	0.010	2.86
----"---- group 6	0.004	3.50	0.001	0.38	0.003	0.26	-0.002	-1.34	0.004	2.00	0.000	-0.09
----"---- group 7	-0.011	-1.08	-0.006	-0.37	-0.027	-0.77	0.068	4.81	-0.032	-3.15	-0.066	-1.29
----"---- group 8	0.003	1.65	0.002	0.79	0.000	-0.03	-0.003	-1.62	0.010	4.09	0.002	0.55
ln Industry agglomeration	0.014	5.31	0.006	2.04	0.009	1.48	0.021	5.13	0.016	3.29	0.013	1.75
ln Diversification	-0.013	-2.41	-0.009	-1.83	-0.012	-1.38	-0.023	-4.09	0.001	0.11	-0.007	-0.75
ln Herfindahl	0.006	1.36	0.005	1.68	0.008	0.49	0.015	1.15	0.024	8.08	0.012	1.73
Single plant enterprise	-0.005	-0.53	-0.002	-0.28	0.013	1.04	0.017	2.04	-0.005	-0.62	0.013	1.44
ln AGE	-0.050	-4.21	-0.048	-3.38	-0.036	-1.00	0.043	1.11	0.000	0.03	-0.033	-1.75
Assisted Area	-0.002	-0.41	-0.003	-0.64	-0.011	-1.25	-0.004	-0.84	-0.048	-3.47	0.004	0.50
US-owned	0.102	5.77	0.095	7.00	0.026	1.44	0.059	3.21	-0.007	-0.43	0.074	3.24
EU-owned	-0.012	-0.89	0.079	5.86	0.026	1.54	-0.011	-0.72	0.023	1.48	0.031	1.48
Other FO	-0.009	-0.71	-0.056	-4.24	-0.026	-1.45	0.036	2.17	0.044	4.11	-0.002	-0.09
EU-owned x group 1	0.291	1.97	0.150	0.82	-0.728	-2.58	-0.536	-2.71	-0.191	-1.42	-0.133	-1.32
US-owned x group 1	0.252	1.59	0.210	2.05	-0.619	-2.35	-0.575	-2.88	-0.187	-1.23	-0.203	-1.52
Other FO-owned x group 1	0.355	2.07	0.256	2.19	-0.652	-2.39	-0.496	-2.56	-0.161	-0.99	-0.268	-1.66
group 2	-0.121	-0.30	0.093	1.41	-1.009	-1.96	-0.147	-0.44	0.504	1.10	-0.377	-0.84
group 3	0.055	0.35	-0.272	-1.55	-1.145	-2.37	0.041	0.12	0.510	3.52	-0.527	-1.53
group 4	-0.329	-2.93	-0.161	-0.84	-0.668	-1.55	-0.517	-1.57	0.496	3.24	-0.566	-1.52
group 5	-0.065	-0.38	0.177	1.17	-1.002	-2.19	-0.232	-0.67	0.252	1.62	-0.241	-0.76
group 6	-0.228	-2.20	0.050	0.33	-0.796	-1.77	-0.191	-0.62	0.287	2.10	-0.360	-1.02
group 7	-0.193	-0.66	0.025	0.04	0.512	0.43	-1.684	-2.62	0.858	2.12	0.217	0.17
group 8	-0.146	-1.39	-0.019	-0.12	-0.723	-1.62	-0.301	-1.01	0.109	0.74	-0.340	-0.97
EU(t-6)	0.056	1.27	0.155	3.27	0.054	0.67	0.052	0.93	0.440	2.52	0.001	0.01

EU(t-5)	0.018	0.20	0.099	1.76	0.113	1.26	0.054	0.74	0.232	2.16	0.452	4.61
EU(t-4)	-0.124	-1.83	0.114	1.02	-0.072	-0.59	-0.080	-0.79	0.167	1.85	-0.030	-0.59
EU(t-3)	-0.138	-2.81	0.209	1.83	0.470	2.60	0.149	2.23	0.194	1.30	0.097	1.05
EU(t-2)	-0.022	-1.02	0.134	1.51	0.011	0.16	0.169	1.62	0.131	1.20	-0.197	-1.67
EU(t-1)	-0.142	-6.61	0.208	2.69	0.118	1.47	-0.062	-1.22	0.186	1.99	-0.090	-1.14
EU(t)	-0.128	-3.16	0.058	1.20	0.124	1.59	-0.109	-1.64	-0.111	-1.10	-0.071	-0.74
EU(t+1)	-0.041	-1.21	0.032	0.53	0.038	0.39	-0.111	-2.24	-0.229	-2.62	-0.125	-1.29
EU(t+2)	-0.067	-1.75	0.031	0.46	0.080	1.11	-0.042	-0.88	-0.200	-2.62	-0.190	-1.32
EU(t+3)	-0.031	-0.70	-0.056	-0.91	0.139	1.82	0.049	0.59	-0.240	-2.39	0.004	0.04
EU(t+4)	-0.015	-0.32	0.014	0.25	0.144	1.60	0.008	0.15	-0.276	-3.15	0.050	0.34
EU(t+5)	-0.137	-2.47	-0.017	-0.30	0.116	1.22	-0.049	-0.89	-0.500	-2.97	0.041	0.22
EU(t+6)	-0.049	-0.99	-0.045	-0.76	0.205	2.68	0.063	1.26	0.624	2.37	-0.028	-0.24
US(t-6)	-0.107	-1.73	0.161	2.33	-0.080	-1.44	0.100	1.31	0.420	3.19	0.051	1.02
US(t-5)	-0.153	-1.46	0.024	0.79	-0.066	-1.23	0.158	1.31	0.042	0.37	-0.019	-0.41
US(t-4)	-0.216	-1.98	0.045	1.38	0.125	1.48	0.115	1.69	0.035	0.40	0.028	0.65
US(t-3)	-0.002	-0.03	0.071	0.84	-0.097	-1.88	0.142	2.14	-0.031	-0.54	0.019	0.44
US(t-2)	0.208	2.05	-0.028	-0.41	0.084	1.37	0.163	1.94	-0.047	-1.08	0.030	0.58
US(t-1)	0.052	0.95	0.053	0.95	-0.006	-0.13	0.067	0.75	-0.133	-2.67	0.034	0.76
US(t)	0.077	0.66	-0.007	-0.13	0.043	0.78	-0.026	-0.28	-0.120	-1.20	-0.021	-0.41
US(t+1)	0.009	0.13	-0.048	-0.63	0.007	0.16	-0.001	-0.02	-0.149	-1.70	-0.064	-1.40
US(t+2)	0.000	0.00	0.009	0.11	0.094	1.75	-0.080	-0.77	-0.299	-3.07	0.026	0.43
US(t+3)	0.003	0.04	-0.044	-0.45	0.087	1.32	-0.016	-0.19	-0.437	-2.90	-0.030	-0.51
US(t+4)	0.069	0.67	-0.028	-0.28	0.159	2.12	-0.014	-0.13	-0.317	-3.14	-0.061	-1.12
US(t+5)	0.155	1.54	-0.054	-0.53	0.087	1.28	0.028	0.19	-0.292	-1.52	0.023	0.33
US(t+6)	0.021	0.19	0.016	0.15	0.182	2.64	-0.096	-0.72	-0.500	-1.68	0.115	1.83
OFO(t-6)	0.030	0.24	-0.101	-0.72	0.036	0.34	0.046	0.91	0.608	4.18	0.218	1.77
OFO(t-5)	-0.050	-0.70	-0.029	-0.37	-0.035	-0.73	0.275	3.02	-	-	-	-
OFO(t-4)	-0.034	-0.52	-0.228	-1.31	0.052	0.77	0.336	3.90	-	-	-	-
OFO(t-3)	-0.117	-1.69	-0.016	-0.15	0.058	0.82	-0.041	-0.45	-0.098	-2.09	-	-
OFO(t-2)	-0.089	-1.06	0.154	0.70	0.019	0.43	-0.258	-3.30	0.115	1.54	0.098	0.95
OFO(t-1)	-0.163	-1.49	-0.119	-1.87	0.041	0.55	-0.076	-1.52	0.154	2.10	-0.032	-0.32

OFO(t)	-0.027	-0.29	-0.161	-1.23	0.037	0.51	-0.082	-1.39	-0.042	-0.56	0.048	0.40
OFO(t+1)	0.015	0.18	0.023	0.26	0.070	0.97	-0.128	-2.34	-0.219	-2.68	-0.035	-0.23
OFO(t+2)	-0.193	-1.61	0.064	0.72	0.065	0.66	-0.091	-1.53	-0.243	-2.91	-0.080	-0.53
OFO(t+3)	0.020	0.21	-0.060	-0.77	-0.019	-0.25	-0.123	-1.62	-0.529	-5.48	-0.140	-0.94
OFO(t+4)	0.069	0.56	-0.084	-0.85	-0.053	-0.42	-0.063	-1.27	-0.546	-5.56	-0.240	-1.49
OFO(t+5)	0.042	0.30	0.227	1.92	0.103	1.22	-0.226	-3.42	-0.703	-5.21	-	-
OFO(t+6)	-0.022	-0.17	-0.055	-0.68	0.144	1.17	-0.261	-2.71	-0.299	-2.91	0.324	2.91
UK(t-6)	0.052	2.74	-0.029	-1.64	0.006	0.26	0.045	2.33	0.031	1.59	0.058	2.41
UK(t-5)	0.031	1.65	-0.011	-0.61	-0.028	-1.16	0.193	4.48	0.042	2.01	0.009	0.34
UK(t-4)	0.013	0.55	0.011	0.45	-0.036	-0.94	-0.061	-3.33	-0.084	-3.79	0.067	1.69
UK(t-3)	0.033	1.71	-0.008	-0.70	0.037	1.20	-0.061	-3.72	0.188	7.82	0.033	0.99
UK(t-2)	0.056	3.02	0.011	0.82	0.038	1.07	0.022	1.02	-0.060	-3.81	-0.004	-0.11
UK(t-1)	0.007	0.41	0.008	0.59	0.020	0.68	-0.037	-1.99	-0.084	-6.10	0.013	0.54
UK(t)	0.015	0.90	-0.041	-2.18	0.022	0.75	-0.020	-0.88	-0.025	-1.73	0.023	0.94
UK(t+1)	-0.010	-0.71	-0.032	-1.73	-0.002	-0.08	0.013	0.70	-0.021	-1.41	0.021	0.93
UK(t+2)	-0.015	-0.93	-0.017	-0.78	-0.025	-0.97	0.006	0.33	-0.023	-1.48	0.030	1.22
UK(t+3)	-0.070	-3.95	-0.004	-0.12	0.028	1.13	-0.027	-1.57	0.007	0.33	0.015	0.57
UK(t+4)	-0.018	-0.92	-0.085	-3.20	0.045	1.44	0.010	0.51	0.000	0.01	-0.009	-0.33
UK(t+5)	-0.019	-0.76	-0.009	-0.34	0.046	1.32	-0.029	-1.06	0.004	0.17	0.022	0.58
UK(t+6)	-0.048	-1.32	-0.018	-0.84	0.033	0.58	0.002	0.08	-0.004	-0.13	-0.001	-0.04
Constant	2.032	16.17	1.475	7.04	2.684	4.71	1.648	3.04	1.453	6.83	2.168	5.23
AR(1) z-statistic	-14.98**		-12.61**		-3.96**		-11.06**		-4.31**		-4.73**	
AR(2) z-statistic	1.95		1.79		-1.65		0.69		0.30		-0.87	
Hansen test χ^2(df)	500.51		374.88		55.01		39.61		402.76		390.33	
No. of Obs.	51,824		41,445		33,519		54,864		38,759		16,434	
No. of groups	11,245		11,664		7,750		11,283		9,281		4,871	

[a] 3-digit industry and 26 regional dummies were included but results are not reported

Table A6.2: Dynamic weighted systems GMM production function, services,1997-2005[a] (equation 6.1)

	IND7	z-value	IND8	z-value	IND9	z-value	IND10	z-value	IND11	z-value	IND12	z-value	IND13	z-value
ln real gross output$_{t-1}$	0.478	6.56	0.113	1.51	0.185	6.73	0.215	5.16	0.181	3.13	0.114	5.30	0.210	3.00
ln intermediate inputs$_t$	0.706	11.42	0.536	7.82	0.739	23.17	0.759	18.67	0.487	6.90	1.396	11.45	0.695	17.42
----"---- group 1	0.208	3.34	0.321	5.20	-0.019	-0.53	0.070	2.28	0.093	1.38	-0.663	-6.77	0.040	0.90
----"---- group 3	0.254	4.22	0.297	4.77	0.136	5.32	-0.080	-2.31	0.108	1.66	-0.555	-5.98	-0.213	-2.53
----"---- group 4	-0.050	-0.41	0.299	4.31	0.288	6.72	0.041	1.08	0.130	2.04	-1.118	-9.77	-0.029	-0.16
----"---- group 5	0.125	1.97	0.306	4.85	0.212	6.27	-0.083	-1.96	0.037	0.59	-0.710	-6.54	-0.082	-1.60
----"---- group 6	0.181	2.99	0.310	4.98	0.157	2.99	0.038	1.05	0.042	0.67	-0.727	-7.79	-0.002	-0.08
----"---- group 7	0.048	0.89	0.216	3.46	0.089	3.23	0.006	0.17	-0.097	-1.02	-0.645	-5.27	-0.322	-2.28
----"---- group 8	0.181	3.04	0.291	4.76	0.185	5.16	0.005	0.13	0.015	0.24	-0.698	-7.91	-0.020	-0.78
ln intermediate inputs$_{t-1}$	-0.482	-7.10	-0.111	-1.58	-0.184	-6.12	-0.140	-2.90	-0.099	-1.73	-0.071	-1.96	-0.193	-2.77
ln employment$_t$	0.604	5.73	0.467	5.36	0.384	11.02	0.517	8.37	0.623	6.39	0.160	6.21	0.133	3.25
----"---- group 1	-0.455	-4.10	-0.377	-4.52	-0.001	-0.02	-0.268	-4.17	-0.188	-2.08	0.738	6.54	0.050	0.53
----"---- group 3	-0.484	-4.61	-0.346	-4.15	-0.166	-7.92	-0.140	-2.35	-0.180	-1.94	0.852	7.29	0.694	5.26
----"---- group 4	-0.088	-0.47	-0.391	-4.35	-0.336	-9.74	-0.276	-4.49	-0.175	-1.91	0.892	7.39	0.068	0.52
----"---- group 5	-0.350	-3.15	-0.364	-4.33	-0.203	-5.75	-0.174	-2.59	-0.054	-0.59	0.722	6.58	0.350	3.41
----"---- group 6	-0.432	-4.02	-0.354	-4.31	-0.183	-4.43	-0.251	-4.13	-0.061	-0.70	0.747	6.81	0.163	1.90
----"---- group 7	-0.413	-4.42	-0.288	-3.33	-0.167	-5.20	-0.248	-3.59	0.052	0.52	0.615	5.20	0.491	2.83
----"---- group 8	-0.423	-3.99	-0.324	-4.02	-0.180	-5.75	-0.231	-3.94	-0.031	-0.36	0.769	6.94	0.218	2.48
ln employment$_{t-1}$	-0.076	-2.69	0.015	0.44	-0.029	-4.21	-0.125	-2.91	-0.246	-4.14	-0.077	-2.47	-0.061	-1.25
ln capital$_t$	0.045	1.80	0.062	2.74	0.068	12.84	0.086	6.34	0.016	1.39	0.089	1.74	0.390	7.83
----"---- group 1	0.176	4.54	0.157	5.99	-0.040	-2.36	0.133	5.01	0.049	1.99	-0.015	-0.35	0.097	1.19
----"---- group 3	0.149	4.23	0.157	6.13	-0.035	-3.82	0.138	5.45	0.031	1.99	-0.170	-3.91	-0.247	-4.24
----"---- group 4	0.180	4.05	0.148	5.08	-0.018	-1.58	0.118	4.36	-0.024	-0.92	0.304	4.10	0.049	0.35
----"---- group 5	0.175	4.23	0.134	5.29	-0.076	-3.40	0.156	4.87	-0.056	-2.37	-0.117	-1.64	-0.075	-1.27
----"---- group 6	0.181	4.60	0.147	5.94	-0.039	-4.85	0.129	5.05	-0.036	-1.64	0.031	0.59	0.048	0.85
----"---- group 7	0.296	6.78	0.186	5.50	-0.022	-1.91	0.137	3.56	0.015	0.52	0.098	1.29	-0.079	-1.02
----"---- group 8	0.166	4.10	0.136	5.53	-0.055	-6.00	0.124	4.99	-0.026	-1.45	0.012	0.46	0.023	0.39
ln capital$_{t-1}$	0.000	0.04	0.020	2.14	0.034	3.07	0.022	2.52	0.113	3.09	0.112	2.14	-0.129	-5.64
time	0.001	0.28	0.012	2.75	0.009	7.80	0.009	4.22	0.003	0.97	0.009	0.87	0.035	10.02

----"---- group 1	0.016	3.22	0.008	1.40	-0.008	-0.71	0.058	5.01	0.021	1.33	0.068	1.45	-0.014	-4.88
----"---- group 3	0.005	1.75	-0.012	-2.72	0.054	40.71	-0.003	-0.55	0.004	0.72	0.091	4.41	-0.029	-8.67
----"---- group 4	0.045	1.68	-0.015	-1.55	-0.017	-0.58	0.023	5.10	0.067	7.71	-0.053	-1.94	-0.012	-2.22
----"---- group 5	-0.005	-1.28	-0.005	-1.13	0.030	5.78	0.024	3.80	0.011	1.42	0.066	3.20	-0.006	-1.08
----"---- group 6	-0.003	-1.03	-0.018	-4.09	0.030	23.41	0.013	2.57	0.007	1.48	0.054	2.95	-0.027	-8.38
----"---- group 7	0.008	0.95	0.006	0.38	0.033	11.86	-0.033	-1.47	0.161	7.01	-0.011	-0.30	-0.024	-2.45
----"---- group 8	0.006	2.10	0.008	1.81	0.017	5.38	0.003	0.49	0.023	3.95	0.057	2.42	-0.029	-5.97
ln Industry agglomeration	0.012	4.80	0.026	7.58	0.014	9.02	0.001	0.17	0.038	5.47	-0.019	-1.89	0.067	5.32
ln Diversification	-0.052	-2.94	-0.073	-4.33	-0.043	-5.65	0.030	1.53	-0.129	-4.10	-0.115	-1.30	-0.060	-1.17
ln Herfindahl	0.031	5.05	0.022	4.30	0.038	3.89	0.028	3.57	0.032	5.21	0.052	8.02	0.099	14.88
Single plant enterprise	0.036	2.38	0.077	5.41	0.023	0.90	0.126	4.49	0.007	0.31	0.149	3.09	0.090	1.61
ln AGE	0.020	2.40	0.009	1.26	-0.046	-6.40	0.038	2.73	-0.107	-6.13	-0.196	-4.02	-0.132	-5.08
Assisted Area	0.001	0.12	-0.004	-0.90	0.004	2.17	0.012	2.71	-0.020	-2.24	-0.046	-1.75	0.070	5.01
US-owned	-0.002	-0.40	0.075	5.32	0.119	1.77	-0.059	-4.34	0.031	1.38	-	-	-	-
EU-owned	-0.041	-8.13	-0.037	-3.47	-0.028	-0.31	-0.036	-2.96	-0.138	-5.07	-	-	-	-
Other FO	-0.015	-2.37	0.042	3.67	0.226	2.47	-0.011	-0.80	0.006	0.30	-	-	-	-
Foreign-owned	-	-	-	-	-	-	-	-	-	-	0.076	2.61	0.035	1.24
Foreign-owned x group 1	-	-	-	-	-	-	-	-	-	-			0.713	2.32
EU-owned x group 1	0.128	0.60	-0.959	-4.45	0.069	0.37	0.033	0.60	-0.003	-0.01	-	-	-	-
US-owned x group 1	0.197	0.69	-0.746	-3.36	-	-	0.461	4.55	-0.189	-0.66	-	-	-	-
Other FO-owned x group 1	0.232	1.10	-0.920	-4.28	-	-	-	-	0.106	0.39	-	-	-	-
group 3	-0.098	-0.51	-0.692	-3.25	-1.127	-6.99	0.829	8.99	-0.126	-0.67	-0.957	-7.10	0.129	0.33
group 4	0.716	2.29	-0.515	-1.87	-1.080	-2.59	0.557	3.66	-0.905	-3.43	0.697	5.12	0.763	0.90
group 5	0.534	2.24	-0.877	-3.83	-1.294	-6.83	0.710	5.27	-0.230	-1.17	-0.047	-0.12	-0.023	-0.06
group 6	0.422	1.93	-0.826	-3.84	-0.921	-3.45	0.564	4.89	-0.109	-0.56	0.202	0.67	0.453	1.36
group 7	0.724	5.63	-0.213	-0.79	-0.624	-2.85	0.798	6.05	-0.762	-1.68	0.687	0.86	0.780	0.54
group 8	0.261	1.18	-0.889	-4.11	-0.960	-4.92	0.783	6.43	-0.247	-1.38		-	0.581	1.77
EU(t-3)	-	-	0.005	0.11	-	-	0.497	10.57	0.301	1.53	-	-	-	-
EU(t-2)	0.064	1.56	0.089	2.93	-	-	0.280	4.02	-0.051	-0.32	-	-	-	-
EU(t-1)	0.045	1.74	0.031	1.12	-	-	0.342	2.93	0.018	0.13	-	-	-	-
EU(t)	0.173	6.30	0.155	5.92	-0.279	-5.41	0.026	0.70	0.075	0.68	-	-	-	-

EU(t+1)	0.082	3.32	-0.042	-2.00	-0.132	-3.29	0.217	5.42	-0.006	-0.06	-	-	-	-
EU(t+2)	0.101	4.10	0.000	0.01	-0.058	-2.17	0.006	0.35	-0.153	-1.50	-	-	-	-
EU(t+3)	0.092	3.83	-0.095	-5.36	-0.046	-2.40	0.031	3.53	-0.122	-1.07	-	-	-	-
EU(t+4)	0.135	4.25	-0.076	-3.54	-0.009	-0.50	0.022	0.52	-0.173	-1.40	-	-	-	-
EU(t+5)	0.100	1.65	-0.019	-0.94	0.015	0.53	0.146	4.22	-0.244	-2.14	-	-	-	-
EU(t+6)	0.041	0.41	-0.059	-2.33	-0.020	-0.53	-0.043	-0.87	-0.260	-2.03	-	-	-	-
US(t-3)	-	-	-0.374	-4.94	-	-	-0.718	-7.96			-	-	-	-
US(t-2)	-	-	-0.113	-1.79	-	-	-0.696	-6.77	0.128	0.84	-	-	-	-
US(t-1)	-0.073	-0.34	-0.113	-1.54	-	-	-0.297	-1.18	0.313	2.23	-	-	-	-
US(t)	0.313	1.07	-0.205	-2.97	-	-	-0.108	-1.67	0.126	1.04	-	-	-	-
US(t+1)	0.033	0.17	-0.202	-2.82	-	-	-0.267	-4.26	0.126	0.89	-	-	-	-
US(t+2)	0.029	0.13	-0.264	-3.85	-	-	-0.304	-4.64	0.250	1.89	-	-	-	-
US(t+3)	-0.648	-1.98	-0.250	-3.70	-	-	-0.350	-4.59	0.093	0.79	-	-	-	-
US(t+4)	-0.185	-0.55	-0.283	-3.95	-	-	-0.559	-6.59	0.146	1.13	-	-	-	-
US(t+5)	-0.220	-0.66	-0.329	-3.89	-	-	-0.573	-6.32	0.089	0.67	-	-	-	-
US(t+6)	-0.005	-0.03	-0.385	-4.41	-	-	-0.292	-3.46	0.248	1.26	-	-	-	-
OFO(t-3)			0.112	2.60	-	-	-	-	0.353	2.76	-	-	-	-
OFO(t-2)	-0.107	-2.19	-0.067	-0.82	-	-	-	-	-0.023	-0.20	-	-	-	-
OFO(t-1)	-0.026	-0.66	0.139	1.75	-	-	-	-	-0.247	-1.17	-	-	-	-
OFO(t)	-0.049	-1.26	0.223	2.74	-	-	-	-	-0.192	-1.59	-	-	-	-
OFO(t+1)	-0.003	-0.08	0.070	1.56	-	-	-	-	-0.142	-1.28	-	-	-	-
OFO(t+2)	-0.054	-1.31	-0.076	-1.66	-	-	-	-	-0.246	-1.95	-	-	-	-
OFO(t+3)	-0.069	-1.68	-0.026	-0.67	-	-	-	-	-0.349	-2.43	-	-	-	-
OFO(t+4)	-0.068	-1.68	-0.010	-0.21	-	-	-	-	-0.204	-2.06	-	-	-	-
OFO(t+5)	-0.058	-1.40	-0.013	-0.32	-	-	-	-	-0.187	-2.01	-	-	-	-
OFO(t+6)	-0.083	-1.14	-0.039	-0.86	-	-	-	-	-	-	-	-	-	-
FO(t-3)	-	-	-	-	-	-	-	-	-	-	-0.917	-6.57	-	-
FO(t-2)	-	-	-	-	-	-	-	-	-	-	-0.670	-4.43	-0.338	-1.86
FO(t-1)	-	-	-	-	-	-	-	-	-	-	-0.447	-2.48	0.364	1.58
FO(t)	-	-	-	-	-	-	-	-	-	-	-0.397	-2.70	-0.237	-1.21
FO(t+1)	-	-	-	-	-	-	-	-	-	-	-0.316	-2.14	0.519	3.18

FO(t+2)	-	-	-	-	-	-	-	-	-	-	-0.274	-1.82	0.094	0.66
FO(t+3)	-	-	-	-	-	-	-	-	-	-	-0.176	-1.14	0.470	2.76
FO(t+4)	-	-	-	-	-	-	-	-	-	-	-0.316	-1.91	0.445	2.98
FO(t+5)	-	-	-	-	-	-	-	-	-	-	-0.071	-0.32	0.300	2.04
FO(t+6)	-	-	-	-	-	-	-	-	-	-	-0.442	-1.77	0.757	4.01
UK(t-4)	0.025	1.74	0.049	1.91	-0.088	-3.74	-0.106	-4.53	0.258	3.27	-0.520	-2.57	0.000	0.00
UK(t-3)	0.001	0.11	0.062	1.91	-0.082	-3.55	0.000	-0.01	0.169	3.59	-0.237	-3.20	-0.239	-2.52
UK(t-2)	0.053	3.39	0.016	0.75	-0.084	-3.95	0.002	0.07	0.251	8.07	-0.024	-0.31	-0.440	-8.02
UK(t-1)	0.061	4.58	0.082	3.73	-0.051	-3.60	0.078	3.93	0.127	3.03	-0.273	-3.51	-0.435	-5.68
UK(t)	0.065	6.08	0.044	3.91	-0.153	-11.64	-0.020	-1.46	0.176	6.62	-0.289	-3.52	-0.367	-8.26
UK(t+1)	0.022	2.43	0.018	1.83	-0.055	-4.80	0.024	1.73	0.097	4.26	0.000	0.00	-0.222	-6.82
UK(t+2)	0.046	5.92	-0.022	-2.48	-0.034	-3.88	0.013	1.12	0.155	6.05	-0.115	-1.99	-0.159	-4.96
UK(t+3)	0.000	0.00	-0.009	-1.03	-0.021	-2.57	0.031	2.38	0.095	3.65	-0.057	-1.18	-0.222	-7.67
UK(t+4)	-0.010	-0.79	-0.049	-5.15	-0.039	-5.35	0.053	4.27	0.058	2.41	0.004	0.11	-0.193	-9.02
UK(t+5)	-0.002	-0.19	-0.049	-4.98	-0.013	-1.84	0.078	5.96	0.000	-0.02	-0.153	-3.77	-0.193	-8.22
UK(t+6)	0.011	0.92	-0.047	-4.11	-0.018	-2.10	-0.014	-0.91	0.081	2.87	-0.108	-2.70	-0.250	-7.24
Constant	0.473	2.02	1.970	7.37	1.773	8.71	0.267	1.47	2.857	10.39	4.066	11.55	2.209	5.97
AR(1) z-statistic	-9.01**		-4.82**		-12.67**		-8.85**		-6.45**		-11.43**		-2.58**	
AR(2) z-statistic	1.22		1.37		1.40		1.88		1.38		1.90		1.31	
Hansen test χ^2(df)	35.09		27.12		37.44		9.01		22.76		24.99		21.02	
No. of Obs.	39,557		74,255		80,697		94,172		50,389		53,799		60,587	
No. of groups	14,748		25,351		22,907		37,466		21,760		21,871		21,296	

[a] 2-digit industry and 26 regional dummies were included but results are not reported

Table A6.3: Number of observations of plants[a] acquired in the ARD panel dataset[b]

Industry	US-acquired	EU-acquired	OFO-acquired	UK-acquired	Non-acquired
1	203	548	96	3,128	74,131
2	211	153	131	2,035	74,242
3	271	198	109	1,620	52,126
4	85	207	122	3,020	81,300
5	103	144	146	2,965	63,299
6	100	123	36	991	29,631
7	54	186	937	10,647	67,146
8	424	3,928	213	24,620	115,968
9	*	502	*	29,019	94,423
10	1,188	3,506	178	31,660	121,433
11	653	554	432	14,409	102,191
12		739		14,523	90,891
13		1,490		17,587	91,378

[a] This is the number of plants in the sample, not the number of plant years. Hence, depending on the number of years each plant was present in the sample, plant years would be a much larger number.

[b] Note, the number of observations available in the 'matched' dataset (as opposed to the full dataset used in Table A6.1) comprises acquired plants (columns 2-5 above) and approximately an equal number of one-to-one matched non-acquired plants (column 6).

7. Impact of foreign acquisitions on employment

7.1 The third task is to consider the effect of foreign acquisition on employment at plant level, 1 year, 2 years, and 5 years after acquisition.

7.2 In order to undertake this task, employment functions have been estimated based on the firm's decision to maximise profits subject to its production function.[69] Thus we estimate a dynamic-form of the employment function using (unbalanced) panel-data:

$$\begin{aligned}\ln L_{it} = \beta_0 &+ \sum_{j=1}^{3}\pi_{1j}x_{jit} + \sum_{j=1}^{2}\pi_{2j}x_{ji,t-1} + \sum_{l=1}^{8}\sum_{j=1}^{3}\pi_{3j}(D_l x_{jit}) + \pi_4 \ln L_{i,t-1} \\ &+ \pi_5 \ln K_{i,t-1} + \pi_6 \ln M_{i,t-1} + \phi_x X_{it} \\ &+ \sum_{l=1}^{8}\lambda_l D_l + \sum_{k=1}^{4}\sum_{s=-6}^{6}\gamma_s ACQ_{k,t-s} + \eta_i + t_t + (1-\rho)e_{it} \qquad (7.1)\end{aligned}$$

where the subscripts *i* and *t* represent the *i*-th plant and the *t*-th year of observation, respectively;
L represents employment;
x_1 represents the logarithm of real gross output;
x_2 represents the logarithm of real wages;
x_3 represents a time trend to take account of technical progress, *t*;
K and *M* are capital and intermediate inputs[70];
X is a vector of variables determining TFP (comprising most of the other variables in Table 5.2), and includes industry and region dummies;
D_l is a dummy variable taking on a value of 1 for each sub-group (l = 1, …, 8) with plants belonging to sub-group 9 forming the reference group;
ACQ are dummy variables taking on a value of 1 in the year when the plant was acquired, with k = 1, …, 4, representing US-owned, EU-owned, other country foreign-owned, and UK-owned, respectively;[71] and
the composite error term has three elements with the fixed-effect term η_i affecting all observations for the cross-section plant *i*; t_t affects all plants for time period *t*; and e_{it} affects only plant *i* during period *t*.

7.3 As with the production function in the last chapter, the unbalanced panel data used to estimate this model is based on plants that existed in 1995-2000 (1998-2002 for services) but which operated during the full 1985-2005 (or 1997-2005) period [i.e. we do not include plants that closed before 1995 (1998), nor plants that started post 2000 (2002)].

7.4 To allow for potential endogeneity of factor inputs and output, equation (7.1) was estimated using the Generalised Method of Moments (GMM)

[69] See, for example, Harris (1985) or Felipe and McCombie (2008).
[70] These are included because in the short-run dynamic model, all factors of production can adjust (with different speeds of adjustment) to change in the state variables in the model (cf. Nadiri and Rosen, 1969; Harris, 1985)
[71] Note, see equation (6.1) for details.

systems approach available in STATA 9.2 (Arellano and Bond, 1998). This is sufficiently flexible to allow for both endogenous regressors (through the use of appropriate instruments involving lagged values – in levels and first differences – of the potentially endogenous variables in the model[72]) and a first-order autoregressive error term. Note, all data were also weighted to ensure that the samples are representative of the population of GB firms under consideration.

7.5 As in Chapter 6, there are three separate controls in equation (7.1) for the impact of foreign-ownership: firstly, for when the plant is either EU-, US-, or other country foreign-owned; secondly, for those plants that sometime during 1995-2000 (1998-2002) were acquired by foreign-owned firms; and thirdly, we include dummies (ACQ_k) that take on a value of 1 only for the year in which the previously UK-owned plant was acquired by a foreign-owned enterprise (for k = 1, …, 3).

7.6 Given the need to take account of potential selectivity bias we do this using the same matching estimator approach as used in the last chapter (the same model is used). Here we move to the results obtained when estimating equation (7.1) using the full-sample available (comprising both the treated and untreated data), and the matched-sample data (i.e., the treated and control group data).

7.7 Tables A7.1 and A7.2 in the appendix provides the results for manufacturing and service sector industries when equation (7.1) is estimated using the full-sample data.[73] The key results of interest are the dummy variables for each foreign ownership group, the dummies for each of the sub-groups identified (with specific interest regarding those plants that were acquired by foreign-owned firms during 1995-2000/1998-2002), and the time profile of employment associated with plants that were acquired at time *t*. The latter is tracked for the whole period before and after *t* (with the parameter estimate for ACQ_{t-6} covering the period 6+ years before being acquired, while ACQ_{t+6} covers the period 6+ years after being taken-over[74]). Tables 7.1 and 7.2 contain the results for manufacturing, while Tables 7.3 and 7.4 have results for services.

Manufacturing

7.8 For manufacturing plants, Table 7.1 shows that US-owned plants had overall some 3% more employment (than UK-owned plants, the benchmark group), although this varied from around 12% higher in the metals, extraction of minerals and chemicals sector, to around 7% lower employment in timber, paper & printing and rubber & plastics and other manufacturing. The pattern across industries was similar for EU-owned

[72] Employment, output, real wages, intermediate inputs, and capital, are treated as endogenous.
[73] Note, the model estimated passes diagnostic tests for autocorrelation and the Hansen test that the over-identifying restrictions are valid.
[74] For service sector plants we do not have enough time periods before acquisition to go back to *t*-6. Rather ACQ_{t-4} is the end point covering the period 4+ years before being taken-over.

Table 7.1: Marginal employment effects[a] associated with belonging to sub-group, manufacturing (source Table A7.1)

	IND1	z-value	IND2	z-value	IND3	z-value	IND4	z-value	IND5	z-value	IND6	z-value	Average[b]
US-owned	0.118	3.50	0.082	4.20	0.038	1.70	-0.008	-0.22	-0.073	-4.83	-0.066	-2.19	0.031
EU-owned	0.217	7.62	0.044	2.19	-0.011	-0.52	0.061	1.84	-0.045	-2.95	-0.041	-1.60	0.053
Other FO-owned	-0.226	-8.02	-0.102	-5.58	-0.082	-3.93	-0.100	-3.18	0.001	0.11	-0.002	-0.10	-0.103
EU-owned x group 1	0.307	1.32	-0.437	-2.32	0.832	2.46	0.693	2.73	0.884	2.82	0.477	1.22	0.486
US-owned x group 1	0.478	1.78	-0.502	-2.80	0.799	2.38	0.802	2.75	1.030	3.12	0.505	1.31	0.546
Other FO-owned x group 1	0.170	0.65	-0.455	-2.35	0.700	2.00	0.650	2.70	1.009	2.95	0.282	0.80	0.419
group 2	0.658	1.16	0.008	0.03	0.920	2.77	0.910	3.04	-0.271	-0.76	-0.615	-1.84	0.481
group 3	-0.120	-0.58	-0.512	-4.06	0.778	2.16	0.847	1.73	0.673	2.18	0.032	0.14	0.354
group 4	-0.422	-2.43	-0.069	-0.24	0.375	1.36	0.911	3.28	1.067	3.31	-0.063	-0.15	0.321
group 5	0.893	5.27	0.074	0.48	0.940	4.29	0.925	4.33	1.029	4.16	0.824	3.07	0.799
group 6	0.467	2.73	-0.069	-0.50	0.779	2.79	0.983	4.75	0.894	3.42	0.423	1.93	0.622
group 7	0.959	2.18	0.592	1.42	0.064	0.09	-0.506	-0.99	0.917	1.81	-0.429	-0.84	0.289
group 8	0.638	3.12	-0.116	-0.74	0.745	2.51	0.670	3.75	0.529	2.01	0.267	1.25	0.519

[a] Values from Table A7.1 have been converted to exp(β)-1.

[b] Obtained from weighting industry results using average total real gross output for the period covered.

plants; although employment was 22% higher in the metals, extraction of minerals and chemicals sector, and 4% lower in timber, paper & printing and rubber & plastics and other manufacturing. Thus, overall the better performance meant employment in EU-owned plants was some 5% above the benchmark. In contrast, employment in plants belonging to other foreign-owned companies in manufacturing were significantly lower in most industries covered (and overall some 10% lower); from 23% lower in the metals, extraction of minerals and chemicals sector, to 8% lower in the electrical & electronic equipment, transport equipment, and instrumental engineering sector.

7.9 Turning to whether foreign-owned firms targeted larger UK plants for acquisition, in the US-owned sub-group the overall results suggest that plants acquired were some 55% larger in employment terms, and only in the other metal goods, mechanical engineering, and office & data processing equipment sector were acquired plants on average smaller. For the EU-owned acquisition sub-group, again the plants acquired were more likely to be larger but not quite to the same extent as for the US-acquired sub-group (on average 49% larger, and again smaller in the other metal goods, mechanical engineering, and office & data processing equipment sector). Finally, the picture for the other foreign-owned group of acquired plants was very similar (although once more slightly smaller with on average 42% higher employment levels in plants that were acquired).

7.10 In general, these results suggest that during 1995-2000, UK manufacturing plants that were then acquired by foreign-owned multinationals were on balance larger (except the other metal goods, mechanical engineering, and office & data processing equipment sector). Thus, for the US- and EU-owned sub-groups, they tended to acquire larger plants to add to their stock of already above average-sized plants. While plants acquired by the other foreign-owned sector tended to be on average larger, their existing stock generally comprised of relatively smaller plants.

7.11 As to the other sub-groups in Table 7.1, there is some evidence to suggest that most sub-groups owned plants that were larger than the benchmark group (even single-plant enterprises), once we control for other factors (such as output and real wages). In particular, the UK-acquired sub-group had larger plants .

7.12 Table 7.2 presents the results for the time profile of employment associated with plants that were acquired at time *t*. There are two sets of results: the top half of the table reports the parameter estimates obtained when estimation equation (7.1) with the full panel-data sample covering all plants in operation between 1995-2000; the lower half covers the results obtained from using the (much smaller) matched sample.

7.13 Given the possibility of sample selection bias, we concentrate on the matched-sample results. Figure 7.2 shows the *changes* in employment for those estimates in Table 7.2 that were statistically significant. Generally the overall picture is that there is little sign of any sustained improvement in employment post-acquisition, although trends are apparent for certain ownership sub-groups in some industries.

Table 7.2: Pre- and post-employment effects[a] of acquisition by foreign-owned companies, manufacturing (source Table A7.1 and 'matched' estimates)

Based on full sample	IND1	z-value	IND2	z-value	IND3	z-value	IND4	z-value	IND5	z-value	IND6	z-value
EU(t-6)	-0.071	-0.88	-0.135	-1.85	-0.067	-1.11	0.144	0.94	0.017	0.13	-0.135	-1.97
EU(t-5)	0.052	0.67	-0.029	-0.19	-0.452	-1.54	0.279	1.52	0.123	0.99	-0.387	-5.13
EU(t-4)	-0.076	-0.78	-0.177	-2.33	-0.292	-2.04	0.705	2.76	0.296	2.66	-0.064	-0.93
EU(t-3)	-0.120	-1.81	-0.071	-0.60	-0.109	-1.30	-0.221	-0.81	0.131	1.50	-0.161	-1.31
EU(t-2)	-0.019	-0.74	-0.030	-0.55	-0.115	-2.40	0.149	1.16	-0.117	-1.30	-0.059	-0.81
EU(t-1)	-0.016	-0.56	-0.001	-0.01	-0.099	-1.74	0.231	2.53	0.037	0.40	-0.005	-0.07
EU(t)	-0.192	-4.11	0.011	0.26	0.000	-0.01	0.077	1.02	0.136	1.93	-0.045	-0.64
EU(t+1)	0.102	1.67	-0.077	-1.09	0.056	0.75	0.015	0.13	0.133	2.15	0.074	0.94
EU(t+2)	0.029	0.48	-0.023	-0.29	-0.019	-0.32	-0.029	-0.28	0.145	2.09	-0.040	-0.29
EU(t+3)	0.089	1.30	-0.042	-0.99	-0.122	-1.70	-0.059	-0.60	0.091	1.28	0.389	2.47
EU(t+4)	0.089	1.13	-0.083	-1.30	-0.079	-0.92	0.013	0.14	0.048	0.71	0.051	0.52
EU(t+5)	0.131	1.49	-0.050	-0.80	0.020	0.14	-0.195	-1.53	0.155	1.52	0.244	1.34
EU(t+6)	-0.003	-0.03	0.090	1.91	-0.063	-0.94	-0.367	-1.71	0.093	0.91	-0.025	-0.21
US(t-6)	-0.105	-1.31	-0.017	-0.35	-0.053	-1.06	-0.047	-0.25	-0.107	-1.58	-0.043	-0.68
US(t-5)	-0.079	-0.65	0.039	1.28	0.058	1.76	-0.012	-0.05	-0.005	-0.08	-0.049	-0.71
US(t-4)	-0.242	-1.64	0.014	0.32	-0.186	-2.36	-0.118	-0.57	-0.007	-0.20	0.005	0.10
US(t-3)	-0.272	-3.12	-0.034	-0.41	0.189	2.09	-0.063	-0.49	0.015	0.46	0.016	0.25
US(t-2)	-0.389	-2.79	0.116	1.61	-0.131	-2.04	-0.030	-0.15	0.019	0.58	-0.048	-0.76
US(t-1)	-0.112	-1.52	0.109	1.64	-0.005	-0.11	0.000	0.00	-0.025	-0.80	-0.078	-0.99
US(t)	-0.031	-0.30	-0.051	-0.68	-0.003	-0.06	0.008	0.04	-0.159	-1.77	0.027	0.38
US(t+1)	-0.162	-1.46	0.048	0.70	-0.085	-1.69	-0.037	-0.23	0.034	0.43	-0.018	-0.26
US(t+2)	-0.082	-1.32	0.017	0.19	-0.019	-0.40	0.165	0.63	0.177	2.03	0.032	0.52
US(t+3)	-0.173	-2.06	0.065	0.85	-0.001	-0.02	0.119	0.59	0.195	1.81	0.045	0.76
US(t+4)	-0.141	-1.25	0.042	0.63	-0.035	-0.69	0.120	0.54	0.153	1.90	0.084	1.30
US(t+5)	-0.250	-2.58	0.091	0.79	0.040	0.59	0.255	1.41	0.148	1.43	0.379	3.50
US(t+6)	-0.134	-1.39	0.074	1.32	-0.010	-0.15	0.319	1.31	0.220	2.28	0.314	3.28
OFO(t-6)	-0.008	-0.06	-0.006	-0.05	-0.034	-0.31	-0.008	-0.06	-0.040	-0.58	-0.111	-1.61
OFO(t-5)	-0.054	-0.51	0.036	0.44	0.048	0.47	-0.598	-4.58	-	-	-	-
OFO(t-4)	-0.138	-1.32	0.157	1.22	-0.114	-1.14	-0.430	-3.21	-	-	-	-
OFO(t-3)	-0.032	-0.23	0.029	0.22	-0.058	-0.50	-0.177	-1.08	0.199	4.84	0.000	
OFO(t-2)	0.038	0.23	-0.063	-0.55	0.066	0.85	0.641	4.13	-0.240	-4.32	-0.178	-2.63
OFO(t-1)	0.312	0.98	-0.200	-3.92	-0.076	-0.63	0.199	1.17	-0.078	-1.25	0.032	0.44
OFO(t)	0.076	0.49	0.041	0.47	0.087	0.72	0.219	1.30	0.093	1.50	0.321	3.22
OFO(t+1)	-0.003	-0.02	0.151	1.34	-0.069	-0.59	-0.077	-0.72	0.070	1.04	0.116	1.31
OFO(t+2)	0.026	0.15	-0.019	-0.21	0.195	1.12	0.028	0.21	0.137	2.00	0.225	1.92

© Richard Harris

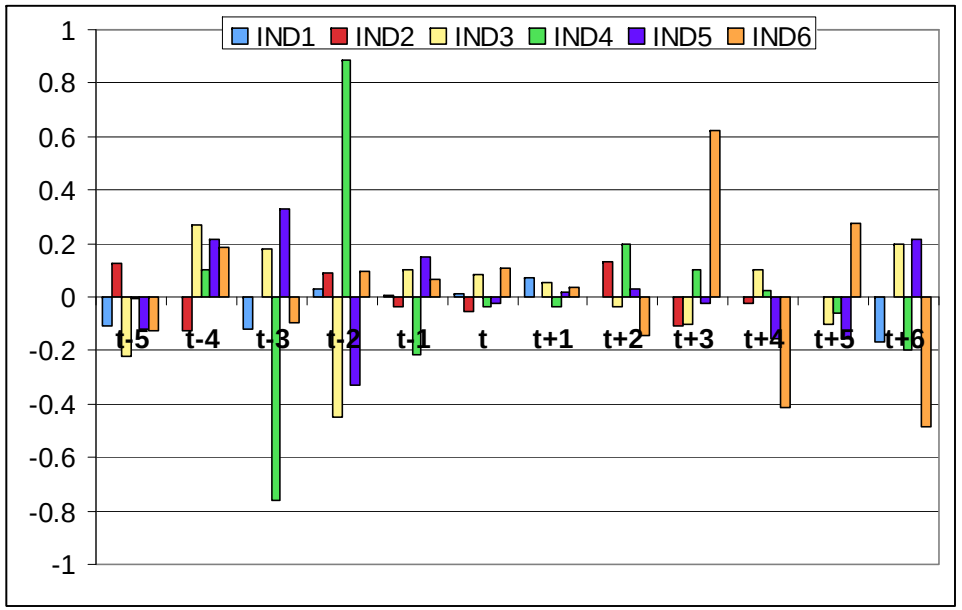
OFO(t+3)	0.132	0.77	-0.046	-0.30	0.123	1.09	-0.011	-0.08	0.152	2.04	0.875	5.89
OFO(t+4)	-0.038	-0.19	0.072	0.53	0.151	0.93	-0.101	-0.63	0.169	2.44	0.801	5.10
OFO(t+5)	0.289	1.03	-0.264	-2.12	-0.014	-0.10	-0.025	-0.19	0.212	2.42	-	-
OFO(t+6)	0.248	1.10	-0.051	-0.47	-0.293	-1.82	0.241	0.86	-0.005	-0.07	-0.198	-1.97
UK(t-6)	-0.019	-0.59	-0.005	-0.24	0.026	1.36	-0.058	-1.95	0.024	0.91	-0.014	-0.40
UK(t-5)	-0.042	-1.20	-0.001	-0.03	0.018	0.59	-0.222	-4.54	0.045	2.07	0.048	1.99
UK(t-4)	0.040	1.43	0.005	0.17	0.030	0.89	0.009	0.21	0.029	1.23	0.018	0.52
UK(t-3)	-0.010	-0.36	-0.015	-0.93	-0.115	-3.33	-0.020	-0.78	-0.046	-2.76	0.062	1.23
UK(t-2)	0.006	0.19	0.007	0.33	0.098	2.60	-0.048	-1.69	0.040	2.23	0.093	2.28
UK(t-1)	0.095	3.72	0.030	1.91	0.036	1.24	-0.094	-3.02	0.036	1.96	0.059	1.97
UK(t)	-0.051	-1.86	0.041	1.11	-0.042	-1.29	-0.116	-3.41	-0.012	-0.58	0.083	2.44
UK(t+1)	0.071	3.04	0.008	0.39	0.003	0.11	-0.082	-2.30	-0.016	-0.93	0.104	2.91
UK(t+2)	0.069	2.78	0.060	2.44	0.067	2.61	-0.078	-2.23	-0.001	-0.08	-0.070	-2.03
UK(t+3)	0.158	5.06	0.076	2.75	-0.019	-0.57	-0.085	-2.51	0.061	2.70	0.205	4.35
UK(t+4)	0.162	4.51	0.009	0.31	0.077	2.41	-0.130	-3.55	0.049	2.30	0.060	1.38
UK(t+5)	0.195	4.25	-0.011	-0.33	0.041	0.92	-0.111	-2.52	0.053	2.28	0.070	1.31
UK(t+6)	0.298	5.50	0.050	1.52	0.023	0.38	-0.185	-4.72	0.051	1.55	0.133	2.98
Constant	-2.625	-15.93	-1.371	-7.79	-1.772	-7.51	-3.927	-8.64	-2.055	-9.05	-1.702	-8.27

Based on matched sample	IND1	z-value	IND2	z-value	IND3	z-value	IND4	z-value	IND5	z-value	IND6	z-value
EU(t-6)	0.107	1.69	0.053	1.34	0.116	3.20	0.668	2.94	-0.093	-1.76	-0.123	-2.14
EU(t-5)	0.079	1.55	0.128	1.64	-0.106	-2.26	0.660	3.64	-0.215	-2.20	-0.247	-2.45
EU(t-4)	0.067	1.39	-0.004	-1.03	0.164	2.20	0.763	3.93	0.038	1.27	-0.062	-1.62
EU(t-3)	-0.117	-1.73	0.010	1.08	0.345	2.59	0.064	1.12	0.331	2.74	-0.160	-2.16
EU(t-2)	-0.086	-1.86	0.092	1.74	-0.102	-2.15	0.889	2.70	-0.015	-1.17	-0.067	-1.59
EU(t-1)	-0.082	-1.68	0.056	1.55	-0.005	-1.06	0.674	3.35	0.148	2.17	0.005	1.04
EU(t)	-0.070	-1.62	0.034	1.30	0.081	1.95	0.638	3.86	0.127	1.68	0.108	1.86
EU(t+1)	0.024	1.18	-0.008	-1.07	0.136	2.23	0.600	3.53	0.146	1.82	0.145	2.07
EU(t+2)	-0.035	-1.29	0.130	1.99	0.099	1.83	0.798	2.85	0.178	1.95	-0.037	-1.19
EU(t+3)	-0.019	-1.12	0.023	1.17	-0.022	-1.22	0.901	3.07	0.155	1.91	0.624	2.97
EU(t+4)	0.001	0.78	0.054	1.42	0.100	1.80	0.922	3.13	0.071	1.39	0.211	2.19
EU(t+5)	0.063	1.33	0.019	1.14	0.074	1.46	0.860	2.68	-0.155	-1.80	0.487	3.03
EU(t+6)	-0.168	-1.96	-	-	0.199	2.27	0.660	2.35	0.059	1.24	-0.057	-1.36
US(t-6)	0.086	1.66	0.033	1.27	0.087	2.37	0.238	1.57	0.242	2.89	0.162	1.96
US(t-5)	0.009	1.04	0.020	1.36	0.077	2.28	0.258	1.55	0.187	3.13	0.068	1.54

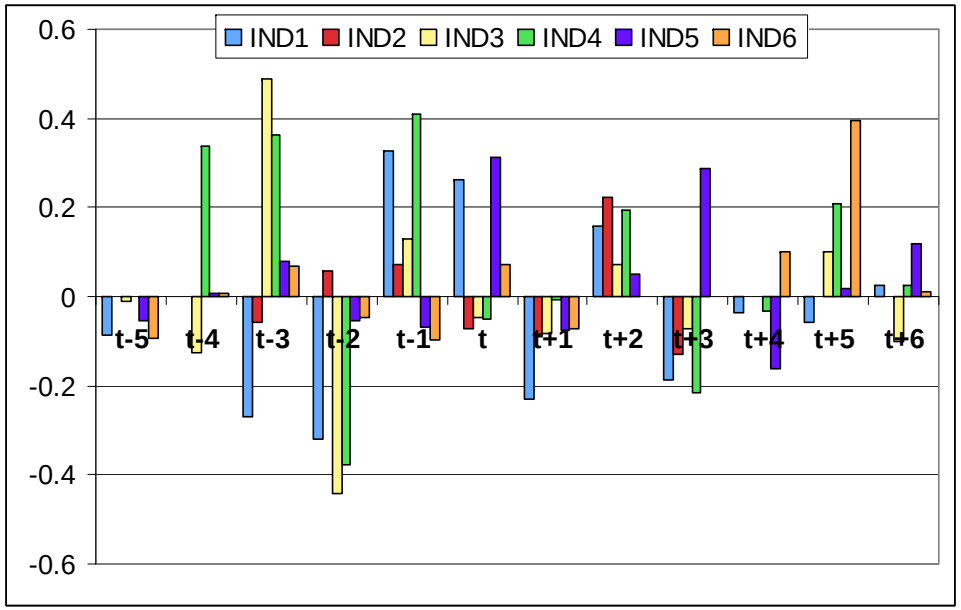
US(t-4)	-0.027	-1.14	0.024	1.36	-0.048	-1.66	0.338	2.21	0.194	3.51	0.075	1.77
US(t-3)	-0.270	-2.79	-0.057	-1.63	0.442	4.03	0.700	3.26	0.273	3.66	0.142	2.32
US(t-2)	-0.591	-4.00	0.002	1.02	-0.004	-1.07	0.324	2.34	0.218	3.63	0.097	1.88
US(t-1)	-0.264	-3.27	0.071	1.74	0.128	2.94	0.735	3.50	0.151	3.25	-0.033	-1.33
US(t)	-0.011	-1.08	0.052	1.48	0.082	2.06	0.685	2.43	0.464	3.09	0.071	1.77
US(t+1)	-0.231	-2.56	-0.090	-1.79	-0.019	-1.25	0.678	2.15	0.388	2.69	-0.023	-1.23
US(t+2)	-0.072	-1.73	0.131	2.13	0.072	1.77	0.873	3.07	0.440	2.93	0.007	1.07
US(t+3)	-0.259	-2.96	-0.051	-1.37	0.033	1.36	0.657	2.89	0.728	3.16	-0.006	-1.07
US(t+4)	-0.294	-2.84	-0.075	-1.51	0.038	1.42	0.624	3.48	0.567	3.07	0.102	2.03
US(t+5)	-0.351	-3.04	0.025	1.13	0.102	1.98	0.832	3.13	0.585	3.06	0.497	3.48
US(t+6)	-0.326	-3.04	0.081	1.55	0.021	1.20	0.856	3.52	0.702	4.38	0.508	4.25
OFO(t-6)	0.071	1.37	-0.098	-1.41	0.059	1.63	-0.319	-2.75	0.119	1.60	-0.195	-2.45
OFO(t-5)	-0.192	-2.17	-0.044	-1.25	0.012	1.14	-0.644	-3.88	-	-	-	-
OFO(t-4)	-0.327	-3.02	0.089	1.44	-0.085	-2.20	-0.288	-2.01	-	-	-	-
OFO(t-3)	-0.248	-2.37	-0.208	-2.11	-0.053	-1.60	0.234	1.89	0.367	4.21	-	-
OFO(t-2)	0.141	1.46	-0.178	-2.17	-0.028	-1.41	0.816	3.81	-0.008	-1.08	-0.395	-6.11
OFO(t-1)	0.005	1.02	-0.230	-4.51	-0.036	-1.39	0.462	2.51	0.077	1.79	-0.257	-3.47
OFO(t)	-0.145	-2.02	-0.185	-2.59	0.313	3.39	0.811	3.27	0.123	1.79	0.177	2.23
OFO(t+1)	-0.224	-2.52	-0.078	-1.58	0.260	2.93	0.785	3.15	0.136	1.77	-0.123	-1.75
OFO(t+2)	-0.111	-1.63	-0.316	-2.97	0.710	4.34	0.758	3.02	0.198	2.15	-0.196	-2.64
OFO(t+3)	-0.179	-1.97	-0.206	-2.34	0.460	3.91	0.807	3.67	0.219	2.14	0.234	2.35
OFO(t+4)	-0.362	-2.51	-0.260	-2.53	0.567	3.13	0.902	3.09	0.457	3.41	0.305	2.62
OFO(t+5)	-0.300	-2.14	-0.225	-2.01	0.159	2.01	0.734	4.04	0.632	3.61	-	-
OFO(t+6)	-0.051	-1.24	-0.319	-3.17	0.118	2.00	0.866	4.51	0.191	1.95	-0.429	-3.90
UK(t-6)	0.138	1.57	0.088	1.64	-	-	-0.205	-1.76	-	-	-0.023	-1.33
UK(t-5)	0.249	4.23	0.043	1.35	-0.015	-1.19	-0.390	-2.37	-	-	0.098	2.80
UK(t-4)	0.397	4.13	-0.039	-1.33	0.234	3.96	-0.424	-2.62	-0.014	-1.08	0.068	2.07
UK(t-3)	0.050	1.62	0.069	1.42	0.297	4.24	-0.591	-4.22	-0.080	-1.45	0.055	1.79
UK(t-2)	0.585	4.82	-0.025	-1.17	-0.078	-1.75	-0.096	-1.20	0.079	1.76	0.121	2.56
UK(t-1)	0.635	3.51	0.119	1.94	-0.115	-1.84	-0.188	-1.94	0.195	0.31	0.074	2.42
UK(t)	0.537	4.25	0.060	1.41	0.052	1.37	-0.583	-4.09	-0.047	-1.35	0.075	2.46
UK(t+1)	0.580	4.19	0.007	1.05	-0.139	-2.44	-0.454	-2.51	0.004	1.03	0.125	3.32
UK(t+2)	0.606	3.93	-0.079	-1.53	-0.055	-1.64	-0.537	-3.16	-0.055	-1.43	-0.033	-1.54
UK(t+3)	0.704	4.29	-0.164	-1.85	-0.103	-2.02	-0.508	-2.81	-0.074	-1.60	0.134	2.82
UK(t+4)	0.817	3.80	-0.064	-1.29	-0.117	-1.98	-0.621	-3.28	-0.115	-1.93	0.078	1.90
UK(t+5)	0.859	3.64	-0.236	-2.23	-0.038	-1.26	-0.610	-2.94	-0.123	-1.84	0.134	2.36
UK(t+6)	0.911	5.64	-	-	-0.212	-2.30	-0.612	-2.80	-0.185	-2.32	0.222	3.54

Figure 7.2: Year-on-year change in employment in manufacturing industries for plants acquired, 1995-2000

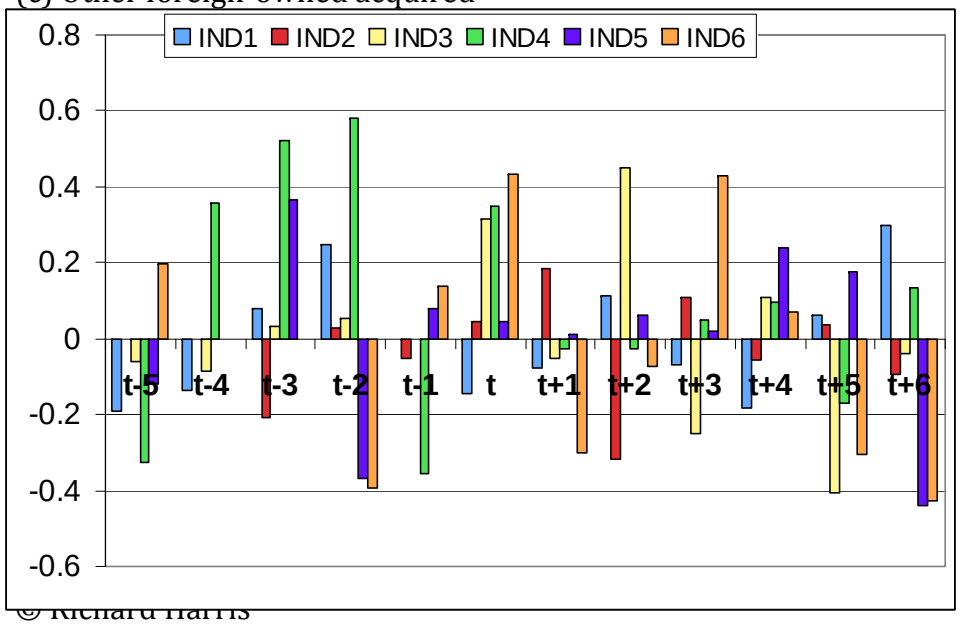
(a) EU-acquired



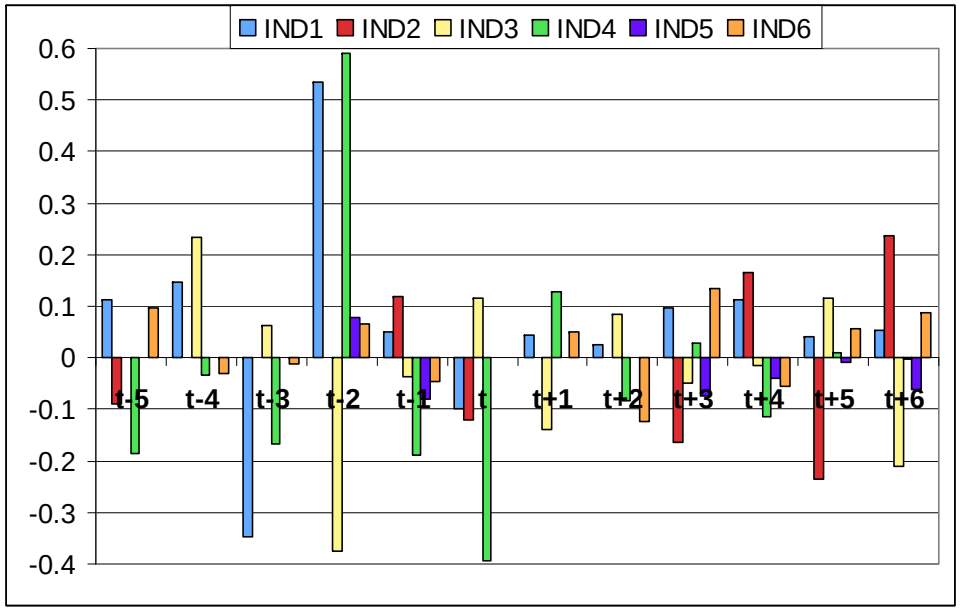
(b) US-acquired



(c) Other foreign-owned acquired



(d) UK-acquired



© Richard Harris

7.14 However, there are some exceptions: employment increased over time in plants acquired by US-owned firms in timber, paper & printing, and rubber & plastics and other manufacturing. However, (cet. par.) employment in US-acquired plants declined in the metals, extraction of minerals and chemicals sector. For other foreign-owned acquisitions, there was an increase in average employment size over time in food, drink, textiles and clothing, but falls in the metals, extraction of minerals and chemicals sector, and the other metal goods, mechanical engineering, and office & data processing equipment sector. For UK-acquired plants, employment size increased over time in the metals, extraction of minerals and chemicals sector, and rubber& plastics, and other manufacturing; but declined in the electrical & electronic equipment, transport equipment sector.

Services

7.15 For two service-sector industries, it was not possible to estimate equation (7.1) and split sub-group D_1 into different foreign-owned sectors (due to too few takeovers for certain countries). Hence, the sub-group D_1 enters representing all UK-owned plants that were acquired by foreign-owned enterprises during 1998-2002.

7.16 Table 7.3 shows that service sector plants that were US-owned were around 16% larger in employment terms in the sale & maintenance of motors; 6% larger in other retail, air transport & telecoms; 3% larger in wholesale trade; but 14% smaller in specialist & non-specialist retails stores. The patter was similar for EU-owned plants, although plants in the sale & maintenance of motors were only 5% larger on average. Generally, as with manufacturing, plants belonging to the other foreign-owned sector were smaller, while foreign-owned plants that could not be separated into countries were slightly larger in other business services, but over 15% smaller in the recreational & personal services sector. Overall, across all service industries, foreign ownership was not associated with any significant differences in employment size.

7.17 As to whether foreign-owned firms in the service sector acquired larger or smaller plants, US-acquired plants in retailing were significantly larger, but EU-acquired plants in the sale & maintenance of motors were some 55% smaller. In the other foreign-owned sub-group, acquired plants were smaller in sale & maintenance of motors, and renting equipment, computers and management-type services, but again much larger (about double the size) in retailing.

7.18 As to the other sub-groups in Table 7.3, they tended to be smaller if they were foreign-owned greenfield plants, while plants acquired by UK-owned companies also tended to be smaller in a number of service sectors.

Table 7.3: Marginal employment effects[a] associated with belonging to sub-group, services (source Table A7.2)

	IND7	z-value	IND8	z-value	IND9	z-value	IND10	z-value	IND11	z-value	IND12	z-value	IND13	z-value	average
US-owned	0.164	14.82	0.030	1.98	-0.139	-2.08	0.057	3.56	0.011	0.74	-	-	-	-	0.021
EU-owned	0.051	6.70	0.035	2.75	-0.191	-8.03	0.053	4.57	0.013	0.73	-	-	-	-	0.001
Other FO	-0.065	-7.40	-0.043	-3.31	-0.064	-2.34	-0.040	-2.92	0.011	0.76	-	-	-	-	-0.018
Foreign-owned	-	-	-	-	-	-	-	-	-	-	0.036	3.27	-0.153	-8.11	-0.008
Foreign-owned x group 1	-	-	-	-	-	-	-	-	-	-	0.015	0.74	0.264	0.60	0.016
EU-owned x group 1	-0.549	-2.15	-0.269	-1.90	-0.380	-1.33	0.077	0.39	-0.220	-1.55	-	-	0.000	-	-0.133
US-owned x group 1	-0.656	-1.28	-0.323	-2.24	0.943	17.39	0.031	0.15	-0.080	-0.51	-	-	0.000	-	-0.024
Other FO-owned x group 1	-0.515	-1.90	-0.344	-2.14	1.005	5.51	0.182	0.73	-0.384	-2.42	-	-	0.000	-	-0.028
group 3	-0.129	-0.64	-0.118	-0.81	0.728	4.09	-0.395	-2.56	0.075	0.72	-0.131	-3.31	-0.820	-11.69	-0.056
group 4	-0.729	-2.01	0.290	1.02	0.654	15.05	-0.408	-2.12	-0.112	-0.82	-0.768	-8.65	-0.057	-0.11	-0.161
group 5	-0.370	-1.97	0.550	2.44	0.922	2.78	-0.225	-1.03	0.094	0.59	0.360	2.32	-0.448	-2.73	-0.003
group 6	-0.391	-2.43	0.110	0.73	1.388	12.77	-0.364	-2.56	0.004	0.03	-0.158	-4.19	-0.621	-8.22	-0.036
group 7	-0.776	-5.47	0.022	0.11	-	-	-0.478	-1.92	-0.192	-1.24	0.232	2.06	-0.316	-0.23	-0.215
group 8	-0.407	-2.63	0.067	0.45	-	-	-0.364	-2.47	-0.022	-0.19	-0.048	-1.04	-0.546	-7.00	-0.146

[a] Values from Table A7.2 have been converted to exp(β)-1.

[b] Obtained from weighting industry results using average total real gross output for the period covered.

Table 7.4: Pre- and post-employment effects[a] of acquisition by foreign-owned companies, services (source Table A7.2 and 'matched' estimates)

Based on full sample	IND7	z-value	IND8	z-value	IND9	z-value	IND10	z-value	IND11	z-value	IND12	z-value	IND13	z-value
EU(t-3)	-	-	-0.269	1.96	-	-	-0.348	-9.46	-0.036	-0.35	-	-	-	-
EU(t-2)	0.323	2.52	-0.323	1.73	-	-	-0.060	-0.44	0.194	1.46	-	-	-	-
EU(t-1)	-0.089	-1.18	-0.344	2.31	-	-	0.266	2.20	0.049	0.66	-	-	-	-
EU(t)	-0.039	-0.61	-0.118	2.40	0.326	6.50	-0.362	-11.25	0.002	0.03	-	-	-	-
EU(t+1)	-0.081	-1.49	0.290	-1.15	0.400	8.60	-0.215	-7.68	0.027	0.44	-	-	-	-
EU(t+2)	-0.112	-1.63	0.550	4.07	0.109	3.93	0.005	0.27	0.066	0.68	-	-	-	-
EU(t+3)	-0.172	-2.31	0.110	1.74	0.074	3.35	0.045	3.41	0.131	2.46	-	-	-	-
EU(t+4)	-0.048	-0.42	0.022	4.78	-0.065	-3.73	0.078	1.07	0.054	0.77	-	-	-	-
EU(t+5)	-0.208	-1.28	0.067	0.38	-0.191	-8.95	0.034	0.48	0.151	2.66	-	-	-	-
EU(t+6)	0.064	0.77	0.079	-3.20	-0.161	-5.56	0.065	0.77	0.134	2.09	-	-	-	-
US(t-3)	-	-	0.126	0.36	-	-	0.073	0.89			-	-	-	-
US(t-2)	-	-	0.090	5.71	-	-	0.004	0.05	0.008	0.09	-	-	-	-
US(t-1)	0.434	0.44	0.068	0.81	-	-	-0.254	-2.11	-0.061	-0.84	-	-	-	-
US(t)	0.046	0.06	-0.026	2.02	-	-	-0.098	-1.17	-0.117	-1.89	-	-	-	-
US(t+1)	0.304	0.35	0.087	1.10	-	-	-0.182	-2.42	-0.054	-0.71	-	-	-	-
US(t+2)	-0.205	-0.28	0.036	2.91	-	-	-0.176	-2.28	-0.182	-1.61	-	-	-	-
US(t+3)	0.527	0.34	0.110	1.66	-	-	-0.003	-0.03	-0.084	-1.35	-	-	-	-
US(t+4)	1.100	0.57	0.010	0.88	-	-	0.006	0.07	-0.137	-1.65	-	-	-	-
US(t+5)	1.079	0.57	-0.099	1.26	-	-	0.052	0.53	-0.092	-1.28	-	-	-	-
US(t+6)	-0.179	-0.26	0.025	3.24	-	-	0.874	6.61	-0.201	-2.27	-	-	-	-
OFO(t-3)			0.484	0.21	-	-			0.726	3.97	-	-	-	-
OFO(t-2)	0.019	0.24	0.064	3.17	-	-	-0.117	-0.89	0.701	4.03	-	-	-	-
OFO(t-1)	-0.205	-4.12	0.161	0.49	-	-	-0.387	-3.50	0.486	3.28	-	-	-	-
OFO(t)	-0.110	-2.10	0.081	1.02	-0.425	-1.41	-0.112	-0.82	0.238	1.77	-	-	-	-
OFO(t+1)	-0.162	-3.53	0.242	0.16	-	-	-0.139	-1.08	0.233	1.79	-	-	-	-
OFO(t+2)	-0.252	-5.54	0.122	0.74	-	-	-0.072	-0.49	0.273	1.85	-	-	-	-
OFO(t+3)	-0.081	-1.58	0.074	0.71	-	-	-0.122	-0.82	0.382	2.75	-	-	-	-
OFO(t+4)	-0.107	-2.21	0.101	-0.51	-	-	-0.019	-0.11	0.303	2.17	-	-	-	-
OFO(t+5)	-0.210	-4.62	0.328	0.17	-	-	0.253	1.96	0.032	0.37	-	-	-	-
OFO(t+6)	-0.384	-3.54	0.037	-0.32	-	-	-	-	-	-	-	-	-	-
FO(t-1)	-	-		-	-	-	-	-	-	-	-0.069	-1.04	-0.719	-5.20
FO(t-2)	-	-		-	-	-	-	-	-	-	0.014	0.20	-0.383	-4.12
FO(t-3)	-	-		-	-	-	-	-	-	-	-0.084	-1.21	0.256	4.91

FO(t)	-	-		-	-	-	-	-	-	-	0.025	0.43	-0.231	-1.90
FO(t+1)	-	-		-	-	-	-	-	-	-	-0.050	-0.98	-0.313	-3.30
FO(t+2)	-	-		-	-	-	-	-	-	-	-0.053	-1.03	-0.338	-3.31
FO(t+3)	-	-		-	-	-	-	-	-	-	-0.067	-1.32	-0.392	-2.53
FO(t+4)	-	-		-	-	-	-	-	-	-	0.004	0.08	-0.437	-3.93
FO(t+5)	-	-		-	-	-	-	-	-	-	-0.091	-1.05	-0.467	-4.20
FO(t+6)	-	-		-	-	-	-	-	-	-	-0.385	-4.51	-0.628	-4.67
UK(t-4)	0.066	1.83	0.130	3.92	0.046	1.73	0.134	5.21	-0.160	-4.24	0.165	1.55	0.205	3.41
UK(t-3)	0.073	2.05	0.031	0.78	0.030	0.99	0.047	1.60	-0.158	-4.12	0.057	1.28	-0.167	-2.16
UK(t-2)	0.127	3.94	0.023	0.66	0.057	3.13	0.040	1.76	-0.070	-2.74	-0.048	-1.50	0.400	4.35
UK(t-1)	0.098	2.77	0.014	0.56	0.044	3.47	0.030	2.11	-0.053	-2.46	-0.018	-0.58	-0.167	-2.16
UK(t)	0.018	0.88	-0.009	-0.42	-0.012	-0.92	0.075	6.20	-0.110	-6.69	0.017	0.71	0.050	2.48
UK(t+1)	0.100	5.22	0.019	1.08	-0.009	-0.82	-0.037	-3.01	-0.031	-2.10	-0.119	-5.26	0.008	0.52
UK(t+2)	0.051	2.87	-0.002	-0.14	-0.040	-4.06	-0.006	-0.60	-0.091	-6.04	0.004	0.18	-0.082	-6.27
UK(t+3)	0.094	5.40	0.031	1.96	-0.060	-6.37	0.024	1.99	-0.076	-5.33	-0.009	-0.41	-0.048	-3.54
UK(t+4)	0.113	5.45	0.026	1.69	-0.055	-6.18	0.020	1.56	-0.029	-1.96	-0.008	-0.36	-0.064	-5.37
UK(t+5)	0.047	2.64	0.018	1.21	-0.064	-6.73	0.042	2.89	0.020	1.36	-0.063	-2.82	-0.064	-3.35
UK(t+6)	0.048	2.66	0.018	1.28	-0.037	-3.35	0.145	5.89	-0.026	-1.74	-0.054	-2.75	-0.104	-3.15

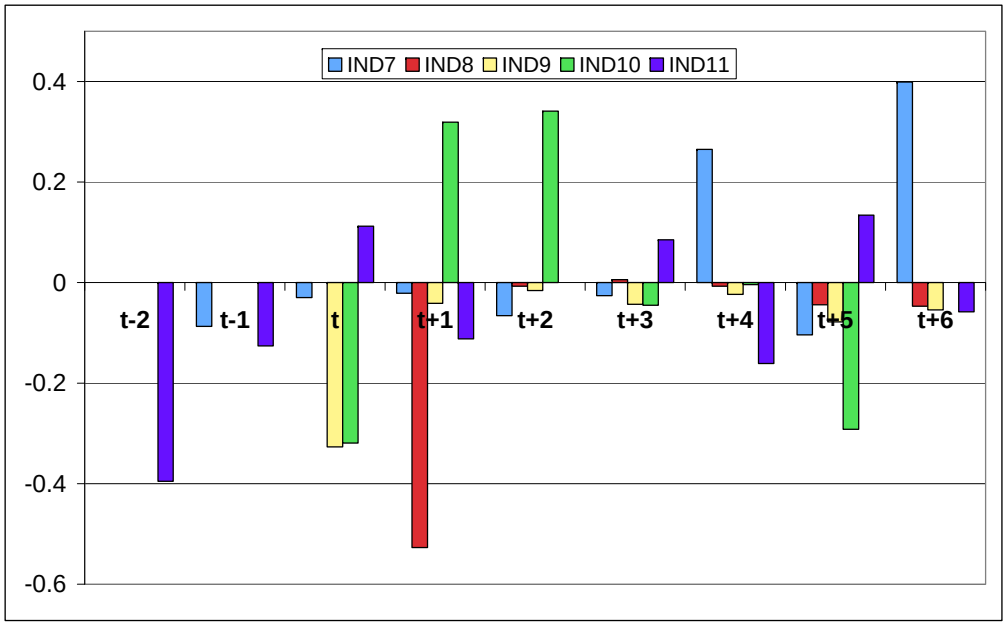
Based on matched sample	IND7	z-value	IND8	z-value	IND9	z-value	IND10	z-value	IND11	z-value	IND12	z-value	IND13	z-value
EU(t-3)	-	-	-0.430	-1.23	-	-	-	-	0.521	3.47	-	-	-	-
EU(t-2)	0.406	2.39	-0.453	-1.20	-	-	-0.127	-1.26	0.126	1.84	-	-	-	-
EU(t-1)	0.319	2.20	-0.508	-1.39	-	-	0.036	1.07	0.030	1.36	-	-	-	-
EU(t)	0.289	2.04	-0.538	-1.52	-0.327	-2.69	-0.319	-1.98	0.112	2.26	-	-	-	-
EU(t+1)	0.268	1.90	-0.527	-1.66	-0.368	-3.64	-0.016	-1.04	0.005	1.08	-	-	-	-
EU(t+2)	0.202	1.73	-0.534	-1.66	-0.384	-4.64	0.341	1.84	0.033	1.38	-	-	-	-
EU(t+3)	0.176	1.68	-0.528	-1.67	-0.427	-5.42	0.296	1.93	0.085	2.63	-	-	-	-
EU(t+4)	0.441	2.39	-0.535	-1.64	-0.451	-5.72	0.292	1.85	-0.076	-2.24	-	-	-	-
EU(t+5)	0.337	2.05	-0.579	-1.74	-0.529	-6.17	-0.033	-0.84	0.058	2.05	-	-	-	-
EU(t+6)	0.736	3.06	-0.626	-1.84	-0.583	-5.81	0.223	1.47	-0.006	-0.56	-	-	-	-
US(t-2)			-0.326	-0.86	-	-			-0.014	-1.13	-	-	-	-
US(t-1)			-0.545	-1.66	-	-	-0.232	-1.47	0.045	1.57	-	-	-	-
US(t)	0.005	1.01	-0.397	-1.19	-	-	-0.047	-1.13	0.125	2.27	-	-	-	-
US(t+1)	0.049	1.17	-0.422	-1.33	-	-	0.155	1.43	0.224	2.84	-	-	-	-
US(t+2)	-0.078	-1.31	-0.479	-1.44	-	-	0.067	1.19	0.065	1.75	-	-	-	-
US(t+3)	0.421	1.85	-0.587	-1.87	-	-	0.433	2.24	0.084	2.27	-	-	-	-

US(t+4)	0.675	2.99	-0.518	-1.70	-	-	0.623	2.63	0.102	2.18	-	-	-	-
US(t+5)	0.935	3.35	-0.537	-2.06	-	-	0.441	2.61	0.124	2.69	-	-	-	-
US(t+6)	0.286	2.04	-0.482	-1.51	-	-	0.502	2.77	0.156	2.19	-	-	-	-
OFO(t-3)	-	-	-	-	-	-	-	-	0.412	3.32	-	-	-	-
OFO(t-2)	0.550	2.28	-	-	-	-	-	-	0.126	1.91	-	-	-	-
OFO(t-1)	0.351	1.99	-0.449	-1.14	-	-	-0.389	-2.02	0.093	1.68	-	-	-	-
OFO(t)	0.281	2.01	-0.420	-1.08	-	-	-0.057	-1.13	0.254	2.94	-	-	-	-
OFO(t+1)	0.200	1.74	-0.534	-1.46	-	-	-0.138	-1.35	0.140	2.64	-	-	-	-
OFO(t+2)	0.056	1.22	-0.624	-1.70	-	-	0.278	1.59	-0.023	-1.29	-	-	-	-
OFO(t+3)	0.351	2.27	-0.567	-1.73	-	-	0.063	1.20	0.093	1.63	-	-	-	-
OFO(t+4)	0.292	2.06	-0.618	-1.70	-	-	-0.130	-1.43	-0.013	-1.12	-	-	-	-
OFO(t+5)	0.202	1.78	-0.694	-1.78	-	-	-0.289	-2.29	-0.125	-2.12	-	-	-	-
OFO(t+6)	0.370	2.25	-0.666	-1.67	-	-	-	-	-	-	-	-	-	-
FO(t-2)	-	-	-	-	-	-	-	-	-	-	0.682	2.14	-	-
FO(t-1)	-	-	-	-	-	-	-	-	-	-	0.598	2.02	-0.851	-2.23
FO(t)	-	-	-	-	-	-	-	-	-	-	0.504	1.76	-0.097	-1.18
FO(t+1)	-	-	-	-	-	-	-	-	-	-	0.476	1.74	-0.221	-1.43
FO(t+2)	-	-	-	-	-	-	-	-	-	-	0.484	1.78	0.029	1.06
FO(t+3)	-	-	-	-	-	-	-	-	-	-	0.439	1.79	0.042	1.09
FO(t+4)	-	-	-	-	-	-	-	-	-	-	0.434	1.84	0.070	1.15
FO(t+5)	-	-	-	-	-	-	-	-	-	-	0.260	1.49	0.010	1.02
FO(t+6)	-	-	-	-	-	-	-	-	-	-	0.405	1.76	-	-
UK(t-4)	-	-	-	-	-	-	-0.025	-1.09	0.164	2.77	0.415	1.66	-	-
UK(t-3)	-0.333	-3.37	-	-	-	-	-0.270	-1.99	0.216	3.12	0.567	2.50	-	-
UK(t-2)	0.147	2.19	-0.104	-0.77	-	-	-0.154	-1.63	0.174	3.50	0.258	1.84	-	-
UK(t-1)	0.140	2.32	0.003	0.03	-	-	-0.087	-1.43	0.209	4.33	0.289	1.96	0.232	1.96
UK(t)	0.199	2.77	0.001	0.01	-0.222	-1.25	-0.136	-1.73	0.134	3.15	0.311	2.37	0.144	2.11
UK(t+1)	0.183	2.81	0.033	0.32	-0.119	-0.88	-0.230	-2.59	0.132	3.29	0.227	1.97	0.141	2.42
UK(t+2)	0.092	1.85	-0.032	-0.36	-0.045	-0.46	-0.196	-2.64	0.017	1.48	0.162	1.73	0.017	2.85
UK(t+3)	0.063	1.56	-0.001	-0.01	0.053	0.55	-0.104	-2.11	0.077	2.98	0.115	1.43	0.080	2.68
UK(t+4)	0.017	1.12	-0.008	-0.12	0.149	1.43	-0.118	-2.33	0.077	3.85	-0.013	-1.07	0.080	2.94
UK(t+5)	0.136	1.89	-0.055	-0.69	0.379	2.13	-0.079	-2.02	0.007	0.90	-0.066	-1.34	0.007	2.64
UK(t+6)	0.078	1.61	-0.048	-0.53	0.682	2.57	0.024	1.21	-0.005	0.65	-0.148	-1.69	-0.005	2.20

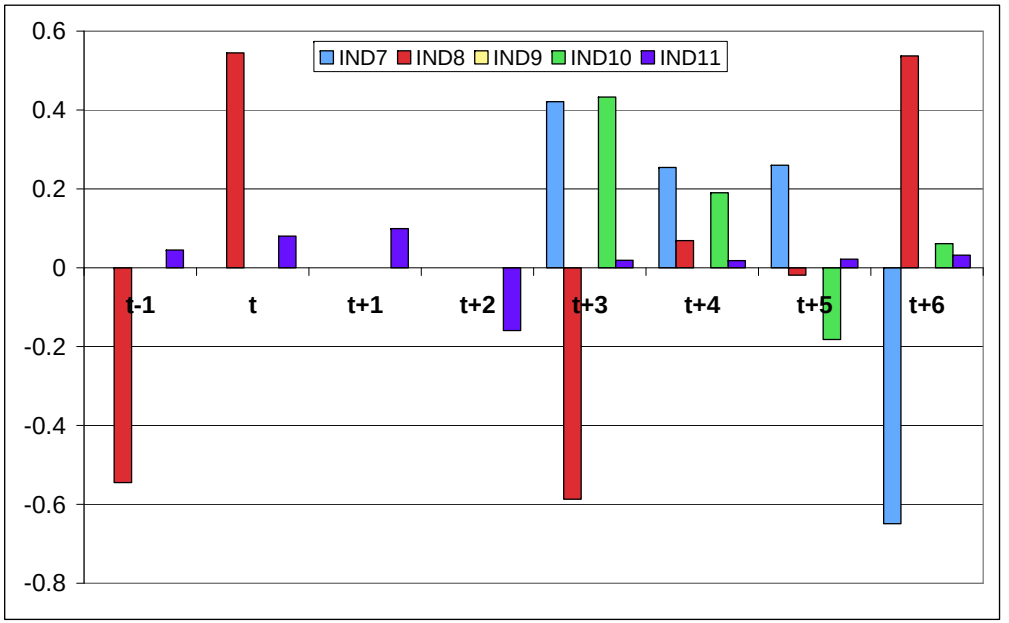
[a] Values from Table A7.1 have been converted to exp(β)-1.

Figure 7.3: Year-on-year change in employment in service industries for plants acquired, 1998-2002

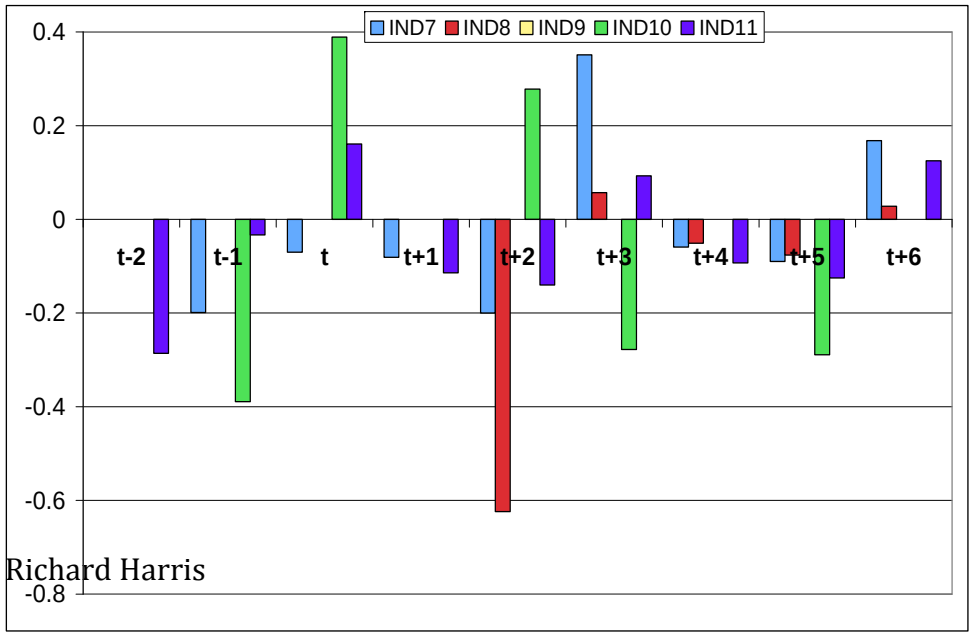
(a) EU-acquired



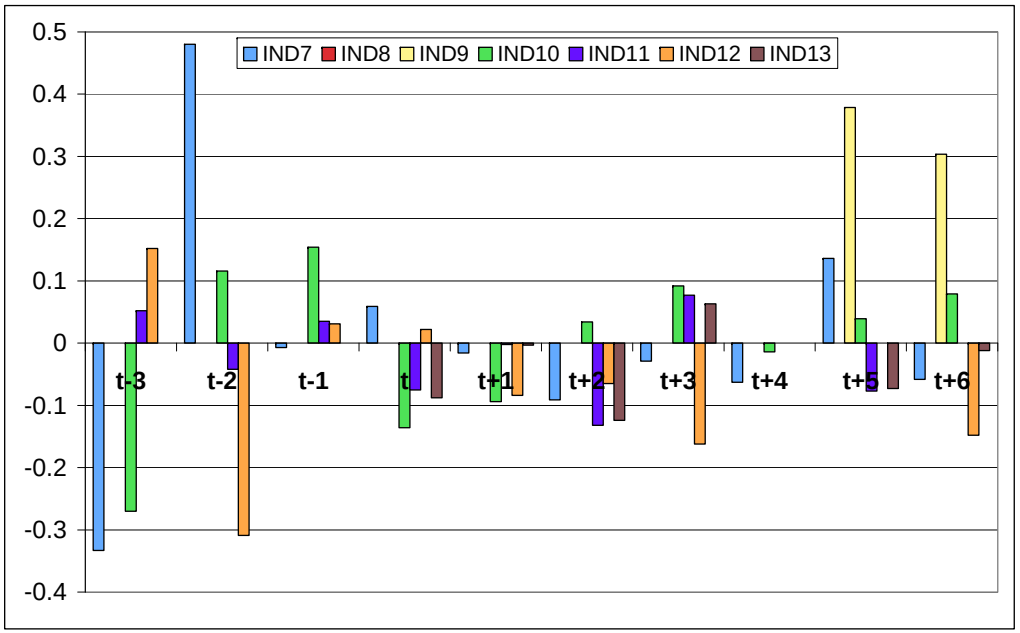
(b) US-acquired



(c) Other foreign-owned acquired

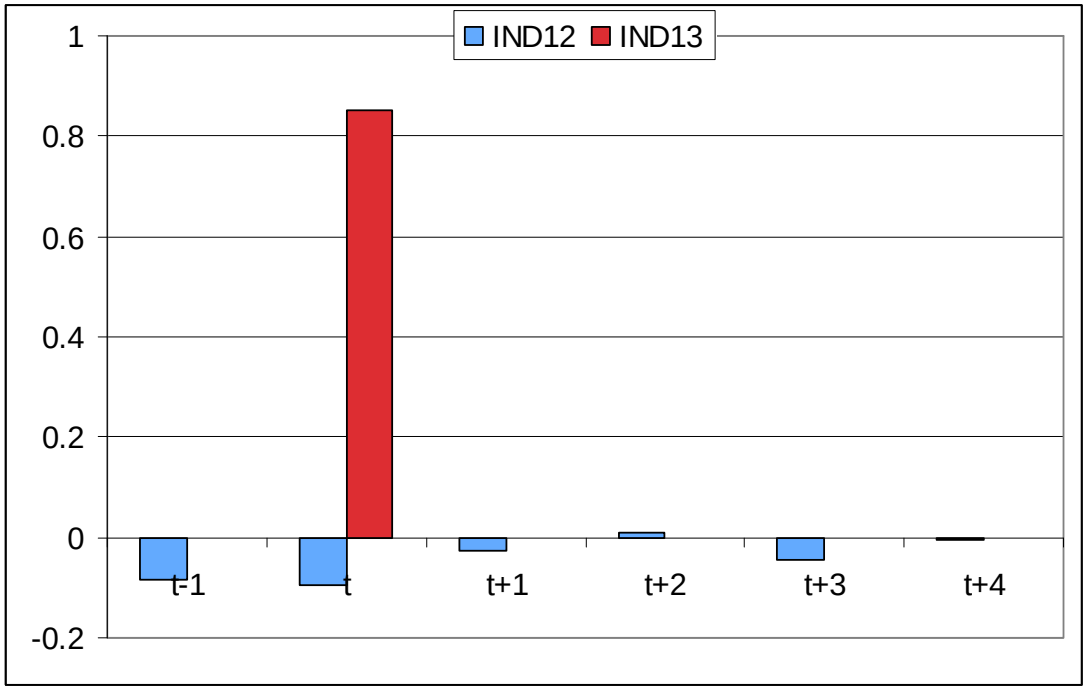


(d) UK-acquired



© Richard Harris

(e) Foreign-owned acquired



7.19 As to the time-profile of employment pre- and post-acquisition, Table 7.4 produces the full set of results. Again we concentrate on the matched-sample results (given the possibility of sample selection bias), with Figure 7.3 showing the *changes* in employment for those estimates in Table 7.4 that were statistically significant. Generally, there is evidence of a sustained increase in post-acquisition employment in EU-acquired plants belonging to the sale & maintenance of motors sector, while US-acquired plants in air transport, storage & telecoms also saw a rise. In contrast, US-acquired plants in the sale & maintenance of motors sector saw declining employment in the longer run. For foreign-owned plants where separate country ownership could not be included, there was a one-off boost to employment size upon being acquired in the recreational & personal services sector. UK-acquired plants saw increases in retail, and declines in their employment in other business activities and in the recreational & personal services sector.

7.20 Lastly, to summarise the time profile of employment for both manufacturing and services, across ownership groups, Table 7.5 weights the results presented above (using total gross output figures) to give industry totals. Firstly, it can be seen that the matched-sample estimates generally provide much larger impacts, and it is these we shall concentrate upon.

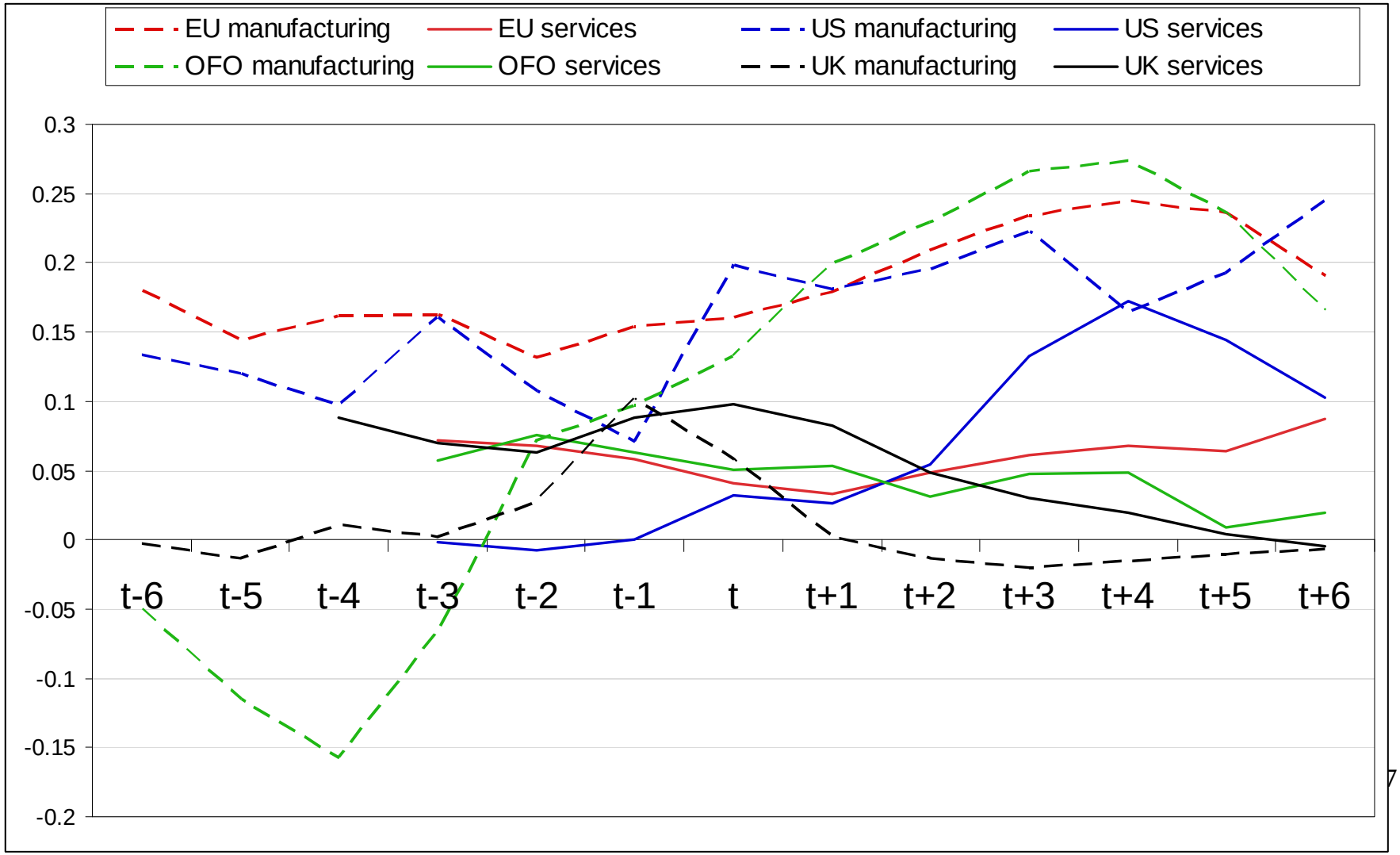
7.21 In terms of the matched-sample estimates, for services the overall picture is initially there were employment gains for US-acquired plants, but these improvements turned to a slight decline by the end of the period (mirroring to some extent the results for TFP presented in the last chapter). For EU-acquisitions there was mostly no significant change over

Table 7.5: Pre and post impact on employment of foreign acquisitions (weighted totals of Tables 7.2 and 7.4)

	t-6	t-5	t-4	t-3	t-2	t-1	t	t+1	t+2	t+3	t+4	t+5	t+6
EU acquired													
Manufacturing(1)	-0.027	-0.051	0.070	-0.101	-0.024	0.026	-0.006	0.047	0.008	0.004	-0.002	0.017	-0.069
Manufacturing(2)	0.180	0.108	0.216	0.109	0.154	0.153	0.168	0.191	0.227	0.241	0.249	0.224	0.158
Services(1)				-0.033	0.067	0.016	0.087	0.124	0.034	0.025	-0.017	-0.077	-0.027
Services(2)				0.072	0.064	0.052	0.030	0.037	0.061	0.061	0.075	0.053	0.121
US-acquired													
Manufacturing(1)	-0.063	-0.002	-0.118	-0.025	-0.100	-0.015	-0.032	-0.051	0.041	0.027	0.019	0.068	0.096
Manufacturing(2)	0.134	0.106	0.087	0.235	-0.019	0.161	0.235	0.127	0.265	0.180	0.149	0.237	0.252
Services(1)				0.006	0.001	0.032	-0.018	0.021	-0.068	0.063	0.137	0.144	0.018
Services(2)				-0.002	-0.013	0.014	0.050	0.003	0.106	0.160	0.185	0.103	
Other FO acquired													
Manufacturing(1)	-0.024	-0.120	-0.123	-0.028	0.108	0.048	0.120	0.005	0.086	0.117	0.087	0.037	0.010
Manufacturing(2)	-0.050	-0.179	-0.135	0.001	0.143	0.050	0.216	0.182	0.276	0.256	0.292	0.180	0.152
Services(1)				0.100	0.090	0.007	-0.150	-0.002	-0.004	0.031	0.025	-0.005	-0.054
Services(2)				0.057	0.095	0.031	0.070	0.036	0.027	0.068	0.029	-0.012	0.052
UK-acquired													
Manufacturing(1)	-0.008	-0.043	0.023	-0.039	0.026	0.021	-0.036	0.003	0.019	0.041	0.036	0.036	0.049
Manufacturing(2)	-0.003	-0.023	0.044	-0.039	0.093	0.110	0.007	-0.002	-0.025	-0.016	-0.014	-0.007	-0.006
Services(1)			0.054	0.003	0.049	0.012	-0.005	-0.015	-0.025	-0.022	-0.012	-0.025	-0.014
Services(2)			0.088	0.052	0.074	0.102	0.094	0.070	0.027	0.034	0.006	0.003	-0.012

(1) full-sample; (2) matched-sample.

Figure 7.4: Impact on employment of acquisition during 1995-2000/1998-2002 in GB manufacturing and services



time, while service sector plants acquired by other foreign-owned firms saw over time a small decline in relative employment size. Lastly, in UK-acquired service sector plants, initial improvements post-acquisition have declined to zero. Overall the situation in services was little change (or slightly falling employment), except in US-acquired plants which saw significant employment size gains, before falling back after about the 4th year.

7.22 In manufacturing, plants acquired by foreign-owned companies saw general improvements in employment (especially in other foreign-owned plants, with some evidence of a step-change post-acquisition towards higher employment in US- and EU-acquired plants). There was little evidence of any sustained change in UK-acquired plants.

Summary and conclusions

7.23 This chapter has considered the effect of foreign acquisition on employment at the plant level, 1 year, 2 years, and 5 years after acquisition.

7.24 The evidence used is based on estimating employment functions using unbalanced panel data based on plants that existed in 1995-2000 (1998-2002 for services) but which operated during the full 1985-2005 (or 1997-2005) period [i.e. we do not include plants that closed before 1995 (1998 for services), nor plants that started post 2000 (2002)]. The dynamic modelling approach allows for endogeneity of factor inputs and output, using a system GMM methodology which takes account of fixed effects and endogeneity (both of which are important and if ignored will lead to biased and potentially misleading results). The statistical approach taken also takes account of potential selectivity bias (due to acquired plants potentially being more productive and thus having better employment outcomes, whether acquired or not) and we do this using a matching estimator approach.

7.25 As to whether foreign-owned firms targeted larger UK manufacturing plants for acquisition, in general the results suggest that during 1995-2000 this was the case in most sectors. Thus, for the US- and EU-owned sub-groups, they tended to acquire larger plants to add to their stock of already above average-sized plants; while plants acquired by the other foreign-owned sector tended to be on average larger, although their existing stock generally comprised relatively smaller plants.

7.26 As to the time-profile of employment associated with manufacturing plants that were acquired, these plants saw a general improvement (especially in other foreign-owned plants, with some evidence of a step-change post-acquisition towards higher employment in US- and EU-acquired plants). There was little evidence of any sustained change in UK-acquired plants.

7.27 As to whether foreign-owned firms in the service sector acquired larger or smaller plants, in aggregate there was little difference with non-acquired

plants. However, this masks considerable differences at the industry level; for example, US-acquired plants in retailing were significantly larger, but EU-acquired plants in the sale & maintenance of motors were some 55% smaller. In the other foreign-owned sub-group, acquired plants were smaller in sale & maintenance of motors, and renting equipment, computers and management-type services, but again much larger (about double the size) in retailing.

7.28 As to the time-profile of employment pre- and post-acquisition in services, the overall picture shows there was little change (or slightly falling employment), except in US-acquired plants which saw significant employment size gains, before falling back after about the 4th year.

Appendix

Table A7.1: Dynamic weighted systems GMM employment function, manufacturing,1984-2005[a] (equation 7.1)

	IND1	z-value	IND2	z-value	IND3	z-value	IND4	z-value	IND5	z-value	IND6	z-value
ln employment$_{t-1}$	0.323	18.46	0.747	27.28	0.506	15.66	0.239	3.71	0.534	20.95	0.479	12.03
ln intermediate inputs$_{t-1}$	-0.550	-16.33	0.014	0.45	-0.051	-2.04	-0.310	-2.33	-0.116	-4.43	-0.025	-0.57
ln capital$_{t-1}$	-0.031	-3.84	-0.062	-7.25	-0.021	-2.54	-0.029	-2.31	-0.030	-4.19	-0.027	-3.08
ln real gross output$_t$	0.890	61.13	0.906	72.82	0.960	58.87	0.836	26.14	0.928	82.72	0.874	47.35
----"---- group 1	0.028	1.80	-0.002	-0.13	-0.045	-2.88	-0.012	-0.45	-0.041	-3.01	-0.029	-1.48
----"---- group 2	-0.036	-1.25	-0.038	-2.50	-0.058	-1.44	0.034	1.11	0.084	1.71	0.078	2.05
----"---- group 3	-0.024	-1.23	-0.020	-1.65	-0.067	-4.51	-0.027	-1.00	-0.044	-3.52	-0.011	-0.52
----"---- group 4	-0.041	-2.58	-0.019	-1.39	-0.038	-2.51	-0.061	-1.76	-0.038	-3.40	-0.016	-0.93
----"---- group 5	-0.075	-4.10	-0.065	-5.23	-0.113	-7.25	-0.076	-2.53	-0.086	-5.15	-0.061	-3.12
----"---- group 6	0.005	0.43	-0.011	-1.08	-0.047	-3.56	-0.021	-0.83	-0.028	-3.35	-0.001	-0.10
----"---- group 7	-0.040	-1.38	-0.067	-1.89	-0.077	-3.26	0.203	4.30	-0.112	-4.18	-0.109	-2.31
----"---- group 8	0.001	0.06	-0.029	-2.56	-0.044	-3.13	0.005	0.21	-0.026	-2.78	0.007	0.45
ln real gross output$_{t-1}$	0.322	8.83	-0.619	-11.31	-0.380	-9.87	0.227	1.64	-0.309	-8.86	-0.335	-6.35
ln real wage$_t$	-0.619	-14.05	-0.901	-14.37	-0.754	-9.04	-0.032	-0.22	-0.644	-7.58	-0.716	-9.70
----"---- group 1	-0.164	-2.49	0.221	2.52	-0.126	-1.39	-0.464	-3.42	-0.135	-1.51	-0.003	-0.03
----"---- group 2	-0.004	-0.02	0.120	1.72	-0.148	-1.03	-0.677	-3.87	-0.180	-1.09	0.209	1.10
----"---- group 3	0.105	1.39	0.283	4.23	-0.108	-1.07	-0.286	-1.92	-0.154	-1.63	-0.034	-0.38
----"---- group 4	0.358	4.38	0.071	0.76	-0.041	-0.43	-0.398	-2.37	-0.222	-2.18	0.094	0.57
----"---- group 5	-0.087	-1.34	0.163	2.71	-0.032	-0.37	-0.350	-2.51	-0.079	-0.97	-0.009	-0.12
----"---- group 6	-0.116	-2.43	0.053	0.95	-0.107	-1.32	-0.567	-4.90	-0.201	-2.52	-0.131	-1.85
----"---- group 7	-0.048	-0.40	0.039	0.51	-0.244	-1.56	0.503	1.27	-0.376	-2.22	-0.151	-0.71
----"---- group 8	-0.101	-1.93	0.116	1.76	-0.109	-1.29	-0.460	-3.84	-0.115	-1.37	-0.096	-1.37
ln real wage$_{t-1}$	0.160	5.35	0.640	11.24	0.494	11.70	-0.180	-1.86	0.413	11.96	0.349	6.95
time	0.020	14.27	0.005	3.09	-0.008	-2.65	0.003	0.99	-0.001	-0.43	0.005	2.26
----"---- group 1	0.000	0.02	-0.001	-0.21	0.009	2.15	0.020	3.28	-0.008	-1.37	-0.009	-2.22
----"---- group 2	-0.016	-1.59	-0.004	-1.13	0.000	0.01	0.004	0.33	-0.001	-0.12	-0.018	-1.33
----"---- group 3	-0.005	-0.84	-0.001	-0.38	0.015	3.10	0.015	2.62	0.013	4.32	0.005	1.22

----"---- group 4	-0.012	-2.74	0.001	0.28	0.005	1.43	0.017	1.56	0.004	1.37	-0.004	-0.90
----"---- group 5	-0.010	-3.48	-0.002	-1.37	0.004	1.36	0.005	1.48	-0.001	-0.55	-0.004	-1.62
----"---- group 6	-0.007	-4.08	-0.002	-1.17	0.005	1.68	0.012	4.40	0.004	2.26	0.000	0.17
----"---- group 7	-0.026	-1.21	0.002	0.19	0.065	2.03	-0.083	-1.65	0.039	3.18	0.092	2.70
----"---- group 8	-0.016	-6.10	-0.001	-0.50	0.006	1.77	0.011	2.96	0.001	0.59	-0.004	-1.13
ln Industry agglomeration	-0.008	-1.96	0.001	0.19	-0.013	-4.18	-0.027	-3.26	-0.016	-3.10	-0.020	-2.93
ln Diversification	0.019	2.31	-0.007	-1.11	0.007	0.99	0.008	0.82	0.001	0.13	0.005	0.38
ln Herfindahl	-0.103	-15.70	-0.051	-10.97	-0.061	-8.51	-0.118	-13.71	-0.021	-6.12	-0.083	-11.06
Single plant enterprise	0.088	6.41	0.032	5.59	0.001	0.14	0.049	3.46	0.027	3.45	0.024	2.02
US-owned	0.118	3.50	0.082	4.20	0.038	1.70	-0.008	-0.22	-0.073	-4.83	-0.066	-2.19
EU-owned	0.217	7.62	0.044	2.19	-0.011	-0.52	0.061	1.84	-0.045	-2.95	-0.041	-1.60
Other FO	-0.226	-8.02	-0.102	-5.58	-0.082	-3.93	-0.100	-3.18	0.001	0.11	-0.002	-0.10
ln AGE	0.098	7.71	0.141	11.97	0.063	5.30	0.120	4.02	0.070	4.98	0.104	7.34
Assisted Area	0.009	1.00	0.007	0.88	0.003	0.34	0.011	1.11	0.058	4.05	0.000	-0.03
EU-owned x group 1	0.267	1.32	-0.575	-2.32	0.605	2.46	0.527	2.73	0.633	2.82	0.390	1.22
US-owned x group 1	0.391	1.78	-0.697	-2.80	0.587	2.38	0.589	2.75	0.708	3.12	0.409	1.31
Other FO-owned x group 1	0.157	0.65	-0.607	-2.35	0.531	2.00	0.501	2.70	0.698	2.95	0.248	0.80
group 2	0.505	1.16	0.007	0.03	0.652	2.77	0.647	3.04	-0.316	-0.76	-0.955	-1.84
group 3	-0.128	-0.58	-0.717	-4.06	0.575	2.16	0.614	1.73	0.515	2.18	0.031	0.14
group 4	-0.548	-2.43	-0.072	-0.24	0.318	1.36	0.647	3.28	0.726	3.31	-0.065	-0.15
group 5	0.638	5.27	0.071	0.48	0.663	4.29	0.655	4.33	0.707	4.16	0.601	3.07
group 6	0.383	2.73	-0.071	-0.50	0.576	2.79	0.685	4.75	0.639	3.42	0.353	1.93
group 7	0.673	2.18	0.465	1.42	0.062	0.09	-0.705	-0.99	0.651	1.81	-0.561	-0.84
group 8	0.494	3.12	-0.123	-0.74	0.557	2.51	0.513	3.75	0.425	2.01	0.237	1.25
EU(t-6)	-0.074	-0.88	-0.145	-1.85	-0.069	-1.11	0.134	0.94	0.017	0.13	-0.144	-1.97
EU(t-5)	0.050	0.67	-0.030	-0.19	-0.601	-1.54	0.246	1.52	0.116	0.99	-0.490	-5.13
EU(t-4)	-0.079	-0.78	-0.195	-2.33	-0.345	-2.04	0.534	2.76	0.260	2.66	-0.066	-0.93
EU(t-3)	-0.128	-1.81	-0.073	-0.60	-0.115	-1.30	-0.250	-0.81	0.123	1.50	-0.175	-1.31
EU(t-2)	-0.019	-0.74	-0.031	-0.55	-0.122	-2.40	0.139	1.16	-0.125	-1.30	-0.061	-0.81
EU(t-1)	-0.016	-0.56	-0.001	-0.01	-0.104	-1.74	0.208	2.53	0.036	0.40	-0.005	-0.07
EU(t)	-0.214	-4.11	0.011	0.26	0.000	-0.01	0.074	1.02	0.128	1.93	-0.047	-0.64

EU(t+1)	0.097	1.67	-0.080	-1.09	0.054	0.75	0.015	0.13	0.125	2.15	0.072	0.94
EU(t+2)	0.028	0.48	-0.024	-0.29	-0.020	-0.32	-0.030	-0.28	0.135	2.09	-0.041	-0.29
EU(t+3)	0.085	1.30	-0.043	-0.99	-0.130	-1.70	-0.060	-0.60	0.087	1.28	0.329	2.47
EU(t+4)	0.085	1.13	-0.087	-1.30	-0.082	-0.92	0.013	0.14	0.047	0.71	0.050	0.52
EU(t+5)	0.123	1.49	-0.051	-0.80	0.020	0.14	-0.217	-1.53	0.144	1.52	0.218	1.34
EU(t+6)	-0.003	-0.03	0.086	1.91	-0.065	-0.94	-0.457	-1.71	0.089	0.91	-0.025	-0.21
US(t-6)	-0.111	-1.31	-0.017	-0.35	-0.055	-1.06	-0.049	-0.25	-0.113	-1.58	-0.044	-0.68
US(t-5)	-0.082	-0.65	0.038	1.28	0.056	1.76	-0.012	-0.05	-0.005	-0.08	-0.050	-0.71
US(t-4)	-0.277	-1.64	0.014	0.32	-0.206	-2.36	-0.125	-0.57	-0.007	-0.20	0.005	0.10
US(t-3)	-0.317	-3.12	-0.035	-0.41	0.173	2.09	-0.065	-0.49	0.015	0.46	0.016	0.25
US(t-2)	-0.492	-2.79	0.110	1.61	-0.140	-2.04	-0.030	-0.15	0.019	0.58	-0.050	-0.76
US(t-1)	-0.118	-1.52	0.103	1.64	-0.005	-0.11	0.000	0.00	-0.026	-0.80	-0.081	-0.99
US(t)	-0.032	-0.30	-0.053	-0.68	-0.003	-0.06	0.008	0.04	-0.173	-1.77	0.026	0.38
US(t+1)	-0.177	-1.46	0.047	0.70	-0.088	-1.69	-0.038	-0.23	0.033	0.43	-0.018	-0.26
US(t+2)	-0.086	-1.32	0.017	0.19	-0.019	-0.40	0.152	0.63	0.163	2.03	0.031	0.52
US(t+3)	-0.189	-2.06	0.063	0.85	-0.001	-0.02	0.112	0.59	0.178	1.81	0.044	0.76
US(t+4)	-0.152	-1.25	0.041	0.63	-0.035	-0.69	0.113	0.54	0.143	1.90	0.081	1.30
US(t+5)	-0.288	-2.58	0.087	0.79	0.039	0.59	0.227	1.41	0.138	1.43	0.321	3.50
US(t+6)	-0.144	-1.39	0.071	1.32	-0.010	-0.15	0.277	1.31	0.199	2.28	0.273	3.28
OFO(t-6)	-0.008	-0.06	-0.006	-0.05	-0.034	-0.31	-0.008	-0.06	-0.041	-0.58	-0.118	-1.61
OFO(t-5)	-0.055	-0.51	0.035	0.44	0.047	0.47	-0.911	-4.58	-	-	-	-
OFO(t-4)	-0.149	-1.32	0.145	1.22	-0.121	-1.14	-0.562	-3.21	-	-	-	-
OFO(t-3)	-0.032	-0.23	0.028	0.22	-0.060	-0.50	-0.195	-1.08	0.182	4.84	-	-
OFO(t-2)	0.037	0.23	-0.065	-0.55	0.064	0.85	0.495	4.13	-0.274	-4.32	-0.196	-2.63
OFO(t-1)	0.272	0.98	-0.224	-3.92	-0.079	-0.63	0.181	1.17	-0.081	-1.25	0.032	0.44
OFO(t)	0.073	0.49	0.040	0.47	0.083	0.72	0.198	1.30	0.089	1.50	0.278	3.22
OFO(t+1)	-0.003	-0.02	0.141	1.34	-0.071	-0.59	-0.080	-0.72	0.068	1.04	0.109	1.31
OFO(t+2)	0.026	0.15	-0.019	-0.21	0.178	1.12	0.028	0.21	0.128	2.00	0.203	1.92
OFO(t+3)	0.124	0.77	-0.048	-0.30	0.116	1.09	-0.011	-0.08	0.141	2.04	0.629	5.89
OFO(t+4)	-0.038	-0.19	0.069	0.53	0.141	0.93	-0.107	-0.63	0.156	2.44	0.588	5.10
OFO(t+5)	0.254	1.03	-0.307	-2.12	-0.014	-0.10	-0.025	-0.19	0.193	2.42	-	-

OFO(t+6)	0.221	1.10	-0.053	-0.47	-0.347	-1.82	0.216	0.86	-0.005	-0.07	-0.221	-1.97
UK(t-6)	-0.019	-0.59	-0.005	-0.24	0.026	1.36	-0.059	-1.95	0.023	0.91	-0.014	-0.40
UK(t-5)	-0.043	-1.20	-0.001	-0.03	0.018	0.59	-0.251	-4.54	0.044	2.07	0.046	1.99
UK(t-4)	0.039	1.43	0.005	0.17	0.029	0.89	0.009	0.21	0.028	1.23	0.018	0.52
UK(t-3)	-0.010	-0.36	-0.016	-0.93	-0.122	-3.33	-0.021	-0.78	-0.047	-2.76	0.060	1.23
UK(t-2)	0.005	0.19	0.007	0.33	0.093	2.60	-0.050	-1.69	0.039	2.23	0.089	2.28
UK(t-1)	0.090	3.72	0.030	1.91	0.036	1.24	-0.099	-3.02	0.035	1.96	0.057	1.97
UK(t)	-0.052	-1.86	0.040	1.11	-0.043	-1.29	-0.124	-3.41	-0.012	-0.58	0.080	2.44
UK(t+1)	0.068	3.04	0.008	0.39	0.003	0.11	-0.086	-2.30	-0.016	-0.93	0.099	2.91
UK(t+2)	0.067	2.78	0.058	2.44	0.064	2.61	-0.081	-2.23	-0.001	-0.08	-0.073	-2.03
UK(t+3)	0.147	5.06	0.073	2.75	-0.019	-0.57	-0.089	-2.51	0.059	2.70	0.186	4.35
UK(t+4)	0.150	4.51	0.009	0.31	0.075	2.41	-0.140	-3.55	0.048	2.30	0.058	1.38
UK(t+5)	0.178	4.25	-0.011	-0.33	0.041	0.92	-0.117	-2.52	0.052	2.28	0.068	1.31
UK(t+6)	0.261	5.50	0.048	1.52	0.023	0.38	-0.205	-4.72	0.050	1.55	0.125	2.98
Constant	-2.625	-15.93	-1.371	-7.79	-1.772	-7.51	-3.927	-8.64	-2.055	-9.05	-1.702	-8.27
AR(1) z-statistic	-19.51**		-16.38**		-14.92**		-10.73**		-6.85**		-11.81**	
AR(2) z-statistic	-0.55		1.88		1.44		1.69		1.05		-0.54	
Hansen test χ^2(df)	331.11		431.61		34.45		298.54		170.55		302.69	
No. of Obs.	51,824		41,445		33,519		54,864		38,759		16,434	
No. of groups	11,245		11,664		7,750		11,283		9,281		4,871	

[a] 3-digit industry and 26 regional dummies were included but results are not reported

Table A7.2: Dynamic weighted systems GMM employment function, services,1997-2005 (equation 7.1)

	IND7	z-value	IND8	z-value	IND9	z-value	IND10	z-value	IND11	z-value	IND12	z-value	IND13	z-value
ln employment$_{t-1}$	0.579	17.36	0.730	29.13	0.577	50.75	0.609	16.40	0.719	20.07	0.772	30.31	0.722	51.29
ln intermediate inputs$_{t-1}$	-0.151	-2.47	-0.315	-7.54	-0.697	-29.23	0.163	2.96	-0.113	-4.02	0.061	3.80	-0.094	-5.95
ln capital$_{t-1}$	0.076	6.33	-0.007	-1.23	-0.125	-43.05	-0.010	-0.89	-0.027	-3.57	-0.047	-8.34	0.185	20.84
ln real gross output$_{t}$	0.532	23.34	0.635	24.89	0.864	160.44	0.709	22.25	0.904	28.34	0.955	48.59	0.255	19.01
"" group 1	0.008	0.35	-0.019	-0.83	0.068	3.09	-0.053	-1.84	-0.164	-5.71	-0.077	-3.64	0.206	9.19
"" group 3	-0.027	-1.82	-0.038	-1.71	-0.049	-7.55	-0.040	-1.32	-0.162	-6.25	-0.061	-3.76	0.137	6.96
"" group 4	0.040	0.68	-0.011	-0.35	0.020	0.61	-0.024	-0.69	-0.108	-3.53	0.011	0.63	0.109	1.94
"" group 5	-0.063	-3.11	-0.085	-2.70	-0.024	-0.63	-0.101	-2.78	-0.239	-7.33	-0.106	-4.50	0.062	1.78
"" group 6	-0.024	-1.48	-0.024	-1.12	0.013	1.65	-0.025	-0.86	-0.186	-7.17	-0.064	-4.15	0.110	8.03
"" group 7	-0.008	-0.30	0.015	0.67	0.003	0.19	-0.040	-1.24	-0.148	-5.56	-0.079	-4.22	0.308	5.35
"" group 8	-0.026	-1.58	-0.011	-0.51	0.035	6.59	-0.027	-0.88	-0.179	-6.92	-0.072	-4.48	0.095	7.63
ln real gross output$_{t-1}$	-0.083	-1.12	-0.079	-1.57	0.339	14.02	-0.516	-9.77	-0.325	-7.32	-0.689	-20.86	-0.170	-9.46
ln real wage$_{t}$	-0.764	-11.74	-0.585	-8.54	-0.376	-16.40	-0.887	-18.50	-1.026	-15.93	-0.983	-23.07	-0.287	-5.01
"" group 1	0.311	2.31	0.121	1.77	-0.129	-1.34	0.226	4.17	0.401	5.62	0.117	2.53	-0.412	-2.98
"" group 3	0.147	2.02	0.126	1.92	-0.298	-9.67	0.203	4.72	0.317	5.92	0.161	3.57	0.350	5.39
"" group 4	0.230	2.00	-0.075	-1.08	-0.885	-7.17	0.278	5.25	0.233	3.72	0.446	8.66	-0.195	-2.34
"" group 5	0.398	4.65	0.094	1.26	-0.296	-5.98	0.323	6.08	0.513	7.32	0.170	3.61	0.057	0.73
"" group 6	0.274	4.18	0.016	0.26	-0.374	-16.00	0.207	4.84	0.419	7.00	0.179	4.01	0.022	0.37
"" group 7	0.643	9.75	-0.007	-0.10	-0.345	-2.11	0.206	3.76	0.438	6.40	0.184	3.78	-0.018	-0.06
"" group 8	0.266	4.03	-0.005	-0.08	-0.400	-15.17	0.225	5.11	0.433	7.22	0.185	4.08	-0.007	-0.12
ln real wage$_{t-1}$	0.225	9.89	0.377	10.25	0.259	22.00	0.377	9.50	0.361	9.30	0.643	20.91	0.139	5.15
time	0.016	3.89	-0.002	-1.08	0.028	19.65	0.007	1.89	-0.011	-4.05	-0.006	-2.21	-0.020	-4.34
"" group 1	-0.011	-1.48	0.010	1.64	0.048	6.19	-0.052	-4.89	0.004	0.36	0.029	2.60	-0.001	-0.05
"" group 3	-0.022	-4.03	0.000	0.11	-0.024	-14.90	0.049	11.28	0.017	3.15	0.005	1.31	0.085	6.85
"" group 4	0.011	0.36	0.002	0.28	-0.253	-3.26	-0.030	-5.16	0.008	0.60	0.071	4.03	-0.001	-0.04
"" group 5	-0.021	-4.05	-0.002	-0.74	-0.026	-2.26	0.023	3.02	0.002	0.50	-0.002	-0.21	0.009	0.69
"" group 6	-0.018	-4.46	0.003	1.23	-0.027	-17.97	0.002	0.55	-0.001	-0.20	0.018	5.64	0.004	0.90
"" group 7	-0.023	-0.94	-0.014	-1.28	-0.034	-5.85	0.054	2.69	-0.015	-1.11	-0.032	-2.43	-0.168	-1.34
"" group 8	-0.017	-3.31	0.001	0.45	-0.020	-9.15	-0.001	-0.13	-0.003	-0.83	0.006	2.25	0.013	2.16

ln Industry agglomeration	-0.004	-1.76	0.003	1.47	-0.021	-8.73	0.000	-0.02	-0.020	-5.01	-0.013	-5.78	0.011	3.56
ln Diversification	0.057	3.32	0.009	0.76	0.102	7.94	0.014	0.86	0.087	3.87	0.088	4.25	0.013	0.48
ln Herfindahl	0.001	0.15	0.003	0.71	-0.048	-7.72	-0.025	-3.08	-0.025	-6.11	-0.003	-1.28	-0.010	-2.13
Single plant enterprise	0.017	0.84	0.027	2.48	-0.086	-1.55	0.163	4.89	0.034	2.13	0.045	2.31	-0.009	-0.27
ln AGE	-0.060	-7.39	0.010	1.98	0.130	39.63	0.035	4.04	-0.005	-0.50	0.040	5.52	-0.091	-11.16
Assisted Area	0.004	0.96	0.002	0.61	-0.007	-2.02	-0.010	-2.36	0.004	0.62	-0.007	-1.23	-0.004	-0.46
US-owned	0.152	14.82	0.030	1.98	-0.150	-2.08	0.056	3.56	0.011	0.74	-	-	-	-
EU-owned	0.049	6.70	0.034	2.75	-0.211	-8.03	0.052	4.57	0.013	0.73	-	-	-	-
Other FO	-0.067	-7.40	-0.044	-3.31	-0.066	-2.34	-0.041	-2.92	0.011	0.76	-	-	-	-
Foreign-owned	-	-	-	-	-	-	-	-	-	-	0.035	3.27	-0.166	-8.11
Foreign-owned x group 1	-	-	-	-	-	-	-	-	-	-	0.015	0.74	0.234	0.60
EU-owned x group 1	-0.797	-2.15	-0.313	-1.90	-0.478	-1.33	0.074	0.39	-0.249	-1.55	-	-	-	-
US-owned x group 1	-1.068	-1.28	-0.390	-2.24	0.664	17.39	0.030	0.15	-0.084	-0.51	-	-	-	-
Other FO-owned x group 1	-0.724	-1.90	-0.421	-2.14	0.696	5.51	0.167	0.73	-0.485	-2.42	-	-	-	-
group 3	-0.139	-0.64	-0.126	-0.81	0.547	4.09	-0.503	-2.56	0.072	0.72	-0.141	-3.31	-1.715	-11.69
group 4	-1.306	-2.01	0.255	1.02	0.503	15.05	-0.524	-2.12	-0.119	-0.82	-1.460	-8.65	-0.058	-0.11
group 5	-0.462	-1.97	0.438	2.44	0.653	2.78	-0.255	-1.03	0.089	0.59	0.307	2.32	-0.594	-2.73
group 6	-0.496	-2.43	0.104	0.73	0.870	12.77	-0.452	-2.56	0.004	0.03	-0.172	-4.19	-0.971	-8.22
group 7	-1.498	-5.47	0.022	0.11	-	-	-0.649	-1.92	-0.214	-1.24	0.208	2.06	-0.380	-0.23
group 8	-0.522	-2.63	0.065	0.45	-	-	-0.452	-2.47	-0.022	-0.19	-0.049	-1.04	-0.789	-7.00
EU(t-3)	-	-	0.076	1.96	-	-	-0.427	-9.46	-0.037	-0.35	-	-	-	-
EU(t-2)	0.280	2.52	0.119	1.73	-	-	-0.062	-0.44	0.177	1.46	-	-	-	-
EU(t-1)	-0.093	-1.18	0.086	2.31	-	-	0.236	2.20	0.048	0.66	-	-	-	-
EU(t)	-0.039	-0.61	0.066	2.40	0.282	6.50	-0.449	-11.25	0.002	0.03	-	-	-	-
EU(t+1)	-0.085	-1.49	-0.026	-1.15	0.336	8.60	-0.242	-7.68	0.026	0.44	-	-	-	-
EU(t+2)	-0.119	-1.63	0.083	4.07	0.103	3.93	0.005	0.27	0.064	0.68	-	-	-	-
EU(t+3)	-0.188	-2.31	0.035	1.74	0.071	3.35	0.044	3.41	0.123	2.46	-	-	-	-
EU(t+4)	-0.049	-0.42	0.104	4.78	-0.067	-3.73	0.075	1.07	0.053	0.77	-	-	-	-
EU(t+5)	-0.233	-1.28	0.010	0.38	-0.212	-8.95	0.033	0.48	0.140	2.66	-	-	-	-
EU(t+6)	0.062	0.77	-0.104	-3.20	-0.175	-5.56	0.063	0.77	0.126	2.09	-	-	-	-
US(t-3)	-	-	0.025	0.36	-	-	0.070	0.89			-	-	-	-

US(t-2)	-	-	0.395	5.71	-	-	0.004	0.05	0.008	0.09	-	-	-	-
US(t-1)	0.361	0.44	0.062	0.81	-	-	-0.293	-2.11	-0.063	-0.84	-	-	-	-
US(t)	0.045	0.06	0.149	2.02	-	-	-0.104	-1.17	-0.125	-1.89	-	-	-	-
US(t+1)	0.265	0.35	0.078	1.10	-	-	-0.201	-2.42	-0.056	-0.71	-	-	-	-
US(t+2)	-0.229	-0.28	0.217	2.91	-	-	-0.194	-2.28	-0.201	-1.61	-	-	-	-
US(t+3)	0.423	0.34	0.115	1.66	-	-	-0.003	-0.03	-0.087	-1.35	-	-	-	-
US(t+4)	0.742	0.57	0.071	0.88	-	-	0.006	0.07	-0.148	-1.65	-	-	-	-
US(t+5)	0.732	0.57	0.096	1.26	-	-	0.051	0.53	-0.096	-1.28	-	-	-	-
US(t+6)	-0.198	-0.26	0.284	3.24	-	-	0.628	6.61	-0.225	-2.27	-	-	-	-
OFO(t-3)	-	-	0.036	0.21	-	-			0.546	3.97	-	-	-	-
OFO(t-2)	0.019	0.24	0.355	3.17	-	-	-0.124	-0.89	0.531	4.03	-	-	-	-
OFO(t-1)	-0.230	-4.12	0.098	0.49	-	-	-0.489	-3.50	0.396	3.28	-	-	-	-
OFO(t)	-0.116	-2.10	0.135	1.02	-0.554	-1.41	-0.119	-0.82	0.214	1.77	-	-	-	-
OFO(t+1)	-0.176	-3.53	0.017	0.16	-	-	-0.150	-1.08	0.209	1.79	-	-	-	-
OFO(t+2)	-0.290	-5.54	0.113	0.74	-	-	-0.075	-0.49	0.241	1.85	-	-	-	-
OFO(t+3)	-0.084	-1.58	0.081	0.71	-	-	-0.130	-0.82	0.323	2.75	-	-	-	-
OFO(t+4)	-0.113	-2.21	-0.069	-0.51	-	-	-0.019	-0.11	0.265	2.17	-	-	-	-
OFO(t+5)	-0.236	-4.62	0.029	0.17	-	-	0.226	1.96	0.032	0.37	-	-	-	-
OFO(t+6)	-0.484	-3.54	-0.075	-0.32	-	-	-	-	-	-	-	-	-	-
FO(t-1)	-	-	-	-	-	-	-	-	-	-	-0.072	-1.04	-1.271	-5.20
FO(t-2)	-	-	-	-	-	-	-	-	-	-	0.014	0.20	-0.484	-4.12
FO(t-3)	-	-	-	-	-	-	-	-	-	-	-0.088	-1.21	0.228	4.91
FO(t)	-	-	-	-	-	-	-	-	-	-	0.024	0.43	-0.262	-1.90
FO(t+1)	-	-	-	-	-	-	-	-	-	-	-0.052	-0.98	-0.376	-3.30
FO(t+2)	-	-	-	-	-	-	-	-	-	-	-0.055	-1.03	-0.413	-3.31
FO(t+3)	-	-	-	-	-	-	-	-	-	-	-0.069	-1.32	-0.498	-2.53
FO(t+4)	-	-	-	-	-	-	-	-	-	-	0.004	0.08	-0.575	-3.93
FO(t+5)	-	-	-	-	-	-	-	-	-	-	-0.096	-1.05	-0.629	-4.20
FO(t+6)	-	-	-	-	-	-	-	-	-	-	-0.486	-4.51	-0.989	-4.67
UK(t-4)	0.064	1.83	0.122	3.92	0.045	1.73	0.125	5.21	-0.175	-4.24	0.153	1.55	0.186	3.41
UK(t-3)	0.071	2.05	0.031	0.78	0.030	0.99	0.046	1.60	-0.172	-4.12	0.056	1.28	-0.182	-2.16

UK(t-2)	0.120	3.94	0.023	0.66	0.055	3.13	0.040	1.76	-0.072	-2.74	-0.049	-1.50	0.337	4.35
UK(t-1)	0.094	2.77	0.014	0.56	0.043	3.47	0.029	2.11	-0.054	-2.46	-0.018	-0.58	-0.182	-2.16
UK(t)	0.018	0.88	-0.009	-0.42	-0.012	-0.92	0.072	6.20	-0.117	-6.69	0.017	0.71	0.048	2.48
UK(t+1)	0.095	5.22	0.019	1.08	-0.009	-0.82	-0.037	-3.01	-0.032	-2.10	-0.127	-5.26	0.008	0.52
UK(t+2)	0.050	2.87	-0.002	-0.14	-0.040	-4.06	-0.006	-0.60	-0.095	-6.04	0.004	0.18	-0.086	-6.27
UK(t+3)	0.090	5.40	0.031	1.96	-0.062	-6.37	0.024	1.99	-0.080	-5.33	-0.009	-0.41	-0.049	-3.54
UK(t+4)	0.107	5.45	0.026	1.69	-0.056	-6.18	0.019	1.56	-0.029	-1.96	-0.008	-0.36	-0.066	-5.37
UK(t+5)	0.046	2.64	0.018	1.21	-0.066	-6.73	0.041	2.89	0.019	1.36	-0.065	-2.82	-0.066	-3.35
UK(t+6)	0.047	2.66	0.018	1.28	-0.038	-3.35	0.135	5.89	-0.027	-1.74	-0.055	-2.75	-0.110	-3.15
Constant	0.559	2.22	-0.524	-3.16	-3.159	-45.77	-0.289	-1.45	-0.691	-3.81	-0.480	-6.01	1.830	12.86
AR(1) z-statistic	-17.46**		-18.55**		-18.09**		-13.91**		-6.45**		-16.70**		-21.63**	
AR(2) z-statistic	1.75		1.86		-1.79		1.63		1.38		1.92		1.69	
Hansen test χ^2(df)	71.05		70.42		62.91		41.98		51.76		36.2		68.09	
No. of Obs.	39,557		74,106		80,697		94,172		50,389		53,799		60,587	
No. of groups	14,748		25,261		22,907		37,466		21,760		21,871		21,296	

[a] 2-digit industry and 26 regional dummies were included but results are not reported

[this page is blank to allow double-sided printing  Save Paper]

8. Impact of foreign acquisitions on real wages

8.1 The fourth task is to consider the effect of foreign acquisition on real wages. In order to undertake this task, we have estimated real wage functions typically used in firm level studies of this kind.[75] Thus we estimate a dynamic-form of the real wage function using (unbalanced) panel-data:

$$\ln w_{it} = \beta_0 + \pi_1 \ln pcm_{it} + \pi_2 \ln LP_{it} + \pi_3 t + \pi_4 \ln w_{i,t-1} + \phi_x X_{it} + \sum_{l=1}^{8} \lambda_l D_l + \sum_{k=1}^{4} \gamma_k \sum_{t=1}^{n} ACQ_{kt} + \eta_i + t_t + (1-\rho) e_{it} \qquad (8.1)$$

where the subscripts *i* and *t* represent the *i*-th plant and the *t*-th year of observation, respectively;
w represents real (product) wages;
pcm represents the price-cost margin;
LP represents labour productivity;
t represents a time trend to take account of technical progress;
X is a vector of variables determining TFP (comprising most of the other variables in Table 5.2), and includes industry and region dummies;
D_l is a dummy variable taking on a value of 1 for each sub-group (l = 1, …, 8) with plants belonging to sub-group 9 forming the reference group;
ACQ are dummy variables taking on a value of 1 in the year when the plant was acquired, with k = 1, …, 4, representing US-owned, EU-owned, other country foreign-owned, and UK-owned, respectively;[76] and
the composite error term has three elements with the fixed-effect term η_i affecting all observations for the cross-section plant *i*; t_t affects all plants for time period *t*; and e_{it} affects only plant *i* during period *t*.

8.2 As with the production function in the Chapter 5, the unbalanced panel data used to estimate this model is based on plants that existed in 1995-2000 (1998-2002 for services) but which operated during the full 1985-2005 (or 1997-2005) period [i.e. we do not include plants that closed before 1995 (1998), nor plants that started post 2000 (2002)].

8.3 To allow for potential endogeneity of factor inputs and output, equation (8.1) was estimated using the Generalised Method of Moments (GMM) systems approach available in STATA 9.2 (Arellano and Bond, 1998). This is sufficiently flexible to allow for both endogenous regressors (through the use of appropriate instruments involving lagged values – in levels and first differences – of the potentially endogenous variables in the model[77]) and a first-order autoregressive error term. Note, all data were also weighted to

[75] See, for example.: Conyon et. al. (2004); Amess and Wright (2007); Huttunen (2007); Pianta and Tancioni (2008);
[76] Note, here we do not consider the time-profile of wages pre- and post-entry but rather set the dummy variable *ACQ* to take on the value 1 for the whole period until *n* (the last observation for the plant) from the year of acquisition.
[77] The price-cost margin and labour productivity are both treated as endogenous.

ensure that the samples are representative of the population of GB firms under consideration.

8.4 Again as in Chapter 6, there are three separate controls in equation (8.1) for the impact of foreign-ownership: firstly, for when the plant is either EU-, US-, or other country foreign-owned; secondly, for those plants that sometime during 1995-2000 (1998-2002) were acquired by foreign-owned firms; and thirdly, we include dummies (ACQ_k) that take on a value of 1 from the year in which the previously UK-owned plant was acquired by a foreign-owned enterprise (for k = 1, …, 3).

8.5 Given the need to take account of potential selectivity bias we do this using the same matching estimator approach as used previously (the same model is used). Here we move to the results obtained when estimating equation (8.1) using the full-sample available (comprising both the treated and untreated data), and the matched-sample data (i.e., the treated and control group data).

8.6 Tables A8.1 and A8.2 in the appendix provides the results for manufacturing and service sector industries when equation (8.1) is estimated using the full-sample data.[78] The key results of interest are the dummy variables for each foreign ownership group, the dummies for each of the sub-groups identified (with specific interest regarding those plants that were acquired by foreign-owned firms during 1995-2000/1998-2002), and the post-acquisition dummies associated with plants that were acquired at time *t*. Tables 8.1 and 8.2 contain the results for manufacturing, while Tables 8.3 and 8.4 have results for services.

Manufacturing

8.7 For manufacturing plants, Table 8.1 shows that US-owned plants paid overall higher wages of around 21% (than UK-owned plants, the benchmark group), although this varied from around 50% higher in the other metal goods, mechanical engineering, and office & data processing equipment sector, no significant difference in rubber& plastics & other manufacturing; to around 17% lower in timber, paper & printing. The pattern across industries was similar for EU-owned plants; although wages were 17% higher overall. In contrast, wage rates in plants belonging to other foreign-owned companies in manufacturing were no different, or significantly lower in 3 of the 6 industries covered (and overall some 13% lower); from 29% lower in the other metal goods, mechanical engineering, and office & data processing equipment sector, to 13% lower in the electrical & electronic equipment, transport equipment, and instrumental engineering sector. Overall wage patterns across foreign-owned firms matched the employment patterns reported in the last chapter.

[78] Note, the model estimated passes diagnostic tests for autocorrelation and the Hansen test that the over-identifying restrictions are valid.

8.8 Turning to whether foreign-owned firms targeted higher wage UK plants for acquisition, in the US-owned sub-group the overall results suggest that plants acquired paid an additional 8% wage premium, although there was no significant difference in electrical & electronic equipment, transport equipment, and instrumental engineering, or in rubber& plastics & other manufacturing.

8.9 For the EU-owned acquisition sub-group, and unlike the US-acquired sub-group, the plants acquired were more likely to pay lower wages (on average some 3% lower, although there was no statistical difference in 3 or the 6 industries covered, and food, drink textiles, clothing, leather & footwear actually paid a 9% premium). Finally, the picture for the other foreign-owned group of acquired plants was comparable wage rates paid to the benchmark sub-group in 4 of the 6 industries, and lower wages in electrical & electronic equipment, transport equipment, and instrumental engineering (15% lower), and timber, paper & printing (-11%).

8.10 In general, these results suggest that during 1995-2000, UK manufacturing plants that were then acquired by foreign-owned multinationals were on balance likely to pay similar or lower wages – although for EU plants this has to be set against the overall higher wages paid when a plant was EU-owned – except if the plant was acquired by a US multinational. For plants acquired by firms from the other foreign-owned sub-group, the net effect was significantly lower wage rates overall.

8.11 As to the other sub-groups in Table 8.1, the picture is a mixed one although overall there is some evidence to suggest that most sub-groups owned plants that paid slightly lower wages rates than the benchmark group (the main exception being greenfield foreign-owned plants started before 2000), once we control for other factors (such as profitability and productivity).

8.12 Table 8.2 presents the results for the post-acquisition wage effect associated with plants that were acquired at time *t*. There are two sets of results: the top half of the table reports the parameter estimates obtained when estimation equation (8.1) with the full panel-data sample covering all plants in operation between 1995-2000; the lower half covers the results obtained from using the (much smaller) matched sample.

8.13 Given the possibility of sample selection bias, we concentrate on the matched-sample results. In EU-acquired plants wage rates post-acquisition were significantly higher in 3 of the 6 industries covered (e.g., 21% higher in food, drink textiles, clothing, leather & footwear; some 13% higher in metals, extraction of minerals& chemicals); in US-acquired plants the situation was even better with post-acquisition wage gains in 4 of the 6 industry sub-groups (ranging from 32% to early 13% higher, with no effect in other metal goods, mechanical engineering, and office & data processing equipment, and the electrical & electronic equipment, transport equipment, and instrumental engineering sector); for plants acquired by other foreign-owned firms there were gains (of between 12-21%) in 3 sectors and a lower wage rate (of around 25%) in the other metal goods, mechanical

Table 8.1: Marginal wage effects[a] associated with belonging to sub-group, manufacturing (source Table A8.1)

	IND1	z-value	IND2	z-value	IND3	z-value	IND4	z-value	IND5	z-value	IND6	z-value	Average[b]
US-owned	0.455	10.94	0.501	10.73	0.098	3.16	0.167	6.38	-0.168	-6.89	-0.005	-0.14	0.207
EU-owned	0.379	10.28	0.469	7.75	0.086	2.96	0.071	3.27	-0.128	-3.54	0.003	0.08	0.169
Other FO	-0.272	-8.70	-0.290	-9.13	-0.132	-3.94	0.011	0.39	0.020	0.98	-0.017	-0.54	-0.128
EU-owned x group 1	-0.053	-1.75	0.015	0.27	-0.129	-2.15	0.093	1.88	-0.055	-0.72	-0.060	-0.93	-0.031
US-owned x group 1	0.088	2.02	0.094	1.64	-0.020	-0.48	0.179	3.46	0.077	1.98	0.054	1.16	0.078
Other FO-owned x group 1	0.024	0.22	0.180	0.88	-0.152	-2.26	-0.021	-0.54	-0.113	-2.30	0.184	0.81	-0.013
group 2	0.107	1.35	0.014	0.19	-0.101	-2.62	0.094	1.98	-0.188	-1.51	-0.056	-1.09	-0.008
group 3	-0.009	-0.37	-0.078	-3.00	-0.101	-3.82	0.082	3.38	-0.077	-2.04	-0.018	-0.36	-0.032
group 4	0.008	0.50	0.098	3.22	-0.008	-0.52	0.014	0.46	0.023	0.78	0.035	1.11	0.023
group 5	-0.036	-1.82	-0.022	-0.93	0.002	0.09	-0.041	-2.97	0.070	3.36	0.050	2.02	-0.007
group 6	-0.011	-1.20	-0.004	-0.21	-0.047	-3.28	0.011	1.06	-0.021	-1.59	-0.021	-1.14	-0.016
group 7	0.221	4.36	0.231	3.18	0.004	0.08	0.233	2.57	0.335	4.61	-0.123	-0.66	0.167
group 8	0.035	2.86	-0.002	-0.17	-0.012	-0.64	0.021	1.70	-0.037	-2.07	0.015	0.65	0.004

[a] Values from Table A8.1 have been converted to exp(β)-1.

[b] Obtained from weighting industry results using average total real gross output for the period covered.

Table 8.2 Marginal wage effect post-acquisition (full and matched samples), manufacturing (source Table A8.1 and matched sample)

	IND1	z-value	IND2	z-value	IND3	z-value	IND4	z-value	IND5	z-value	IND6	z-value
Full sample												
EU post-acquisition effect	0.038	1.17	-0.025	-0.37	0.071	0.93	0.015	0.27	0.150	1.37	0.093	1.09
US post-acquisition effect	0.022	0.49	-0.076	-1.05	0.027	0.53	-0.088	-1.18	-0.005	-0.06	-0.034	-0.53
Other FO post-acquisition effect	0.236	1.77	-0.001	0.00	0.149	1.47	0.047	0.91	0.217	3.30	-0.162	-0.80
UK post-acquisition effect	-0.017	-0.98	0.006	0.24	-0.015	-0.58	-0.045	-2.74	-0.022	-1.04	0.030	0.98
Matched sample												
EU post-acquisition effect	0.135	1.96	0.118	1.75	-0.066	-0.86	0.208	2.01	-0.108	-1.07	-0.020	-0.14
US post-acquisition effect	0.200	2.26	0.015	0.18	0.004	0.07	0.202	2.35	0.126	1.86	0.322	1.91
Other FO post-acquisition effect	0.123	1.86	-0.245	-1.61	0.209	2.24	0.031	0.30	0.013	0.19	0.210	1.78
UK post-acquisition effect	0.194	2.08	-0.146	-1.94	0.154	2.49	0.005	0.03	-0.069	-0.90	-0.111	-1.01

Table 8.3: Marginal wage effects[a] associated with belonging to sub-group, services (source Table A8.2)

	IND7	z-value	IND8	z-value	IND9	z-value	IND10	z-value	IND11	z-value	IND12	z-value	IND13	z-value	Average[b]
US-owned	0.105	4.12	-0.054	-1.01	-0.038	-1.09	-0.083	-3.61	0.188	1.74	0.354	5.11	0.004	0.05	0.027
EU-owned	0.152	5.37	-0.143	-2.13	0.326	7.81	-0.185	-5.41	-0.035	-0.38	0.241	3.35	-0.340	-5.52	-0.046
Other FO	-0.065	-3.38	0.260	2.83	0.302	20.22	0.028	1.31	-0.160	-1.53	-0.180	-3.27	0.315	4.07	0.101
Foreign-owned x group 1	-	-	-	-	-	-	-	-	-	-	-0.050	-0.79	-0.100	-0.56	-0.008
EU-owned x group 1	0.227	5.60	-0.045	-0.99	-0.354	-5.10	0.071	0.55	-0.387	-2.85	-	-	-	-	-0.067
US-owned x group 1	0.227	3.13	0.201	1.79	-	-	0.914	3.18	0.057	0.52	-	-	-	-	0.242
Other FO-owned x group 1	0.180	4.69	0.550	4.96	-	-	-0.214	-2.50	-0.538	-1.94	-	-	-	-	0.114
group 3	0.216	6.92	0.180	10.74	-0.277	-8.83	0.359	9.53	-0.171	-1.35	-0.048	-1.85	-0.313	-7.47	0.076
group 4	-0.390	-4.17	-0.191	-3.55	-0.489	-6.90	-0.207	-9.00	-0.168	-2.40	-0.349	-9.62	0.338	1.53	-0.217
group 5	-0.153	-3.61	-0.089	-2.20	-0.105	-1.23	-0.113	-2.04	-0.043	-0.72	0.037	0.90	-0.023	-0.30	-0.086
group 6	0.189	8.57	0.097	4.18	-0.186	13.77	-0.266	13.63	-0.151	-1.60	-0.015	-1.25	0.207	3.84	-0.002
group 7	-0.745	19.35	0.080	1.70	-0.151	-4.61	0.195	3.97	0.048	0.66	-0.128	-3.37	0.225	1.46	-0.045
group 8	-0.071	-2.59	0.166	6.04	0.028	1.35	-0.156	-5.84	-0.123	-1.80	-0.098	-4.70	0.363	2.57	0.030

[a] Values from Table A8.2 have been converted to exp(β)-1.

[b] Obtained from weighting industry results using average total real gross output for the period covered.

engineering, and office & data processing equipment sector. UK-acquired plants had equipment sector. UK-acquired plants had a similar post-acquisition profile to the other foreign-owned sub-group.

Services

8.14 For two service-sector industries, it was not possible to estimate equation (8.1) and split sub-group D_1 into different foreign-owned sectors (due to too few takeovers for certain countries). Hence, the sub-group D_1 enters representing all UK-owned plants that were acquired by foreign-owned enterprises during 1998-2002.

8.15 Table 8.3 shows that US-owned plants paid overall higher wages in 3 of the 6 industry groups covered, with some 35% higher wage rates in other business services to some 10% higher in the sale & maintenance of motors sector. US-owned plants paid lower wages in other retailing, air transport, storage & telecoms (some 8% lower). In 3 industry groups (e.g. wholesale and most of retail trade) there was no significance difference.

8.16 EU-owned plants had a similar pattern to the US-owned plants for those industries that had a statistically significant US effect; but in other industries the pattern is mixed. Wage rates were (some 33%) higher in retail sales in EU-owned specialist and non-specialist plants, but significantly lower in wholesale trade and recreational & personal services (14.3% and 34% lower, respectively). Overall, wage rates were some 5% lower in EU-owned plants.

8.17 In contrast, wage rates in plants belonging to other foreign-owned companies in services were overall some 10% higher; due mostly to the significant wage premiums (of between 26% to 32%) in wholesale, most of retail, and recreational & personal services. However wage rates were lower in 3 of the 6 industries covered (some 6% lower in the sale & maintenance of motors sector; 16% lower in renting equipment, computers and management-type services; and 18% lower in other business services).

8.18 Turning to whether foreign-owned firms targeted higher wage UK plants for acquisition, in the US-owned sub-group the overall results suggest that plants acquired paid an additional 24% wage premium, although this is based on significantly higher wage rates in only 3 of the 7 industries covered. For the EU-owned acquisition sub-group, a higher wage rate (of around 23%) was paid in the sale and maintenance of motors sector (as was the situation for the US-acquired sub-group in this sector); but significantly lower wages (of between 35% to 39%) were paid to EU-acquired plants operating in most of retailing and renting equipment, computers and management-type services. In 4 of the 7 sectors, there was no difference for EU-acquired plants, giving an overall wage premium for acquired plants of around -7%.

8.19 Finally, the picture for the other foreign-owned group of acquired plants was more mixed, with higher wages paid in 2 industries, lower wages in a

further 2, and no statistical difference in the remaining 3 industries. The overall impact averages out with a wage premium across all sectors of some 11%.

8.20 In general, these results suggest that during 1995-2000, UK manufacturing plants that were then acquired by foreign-owned multinationals were on balance likely to pay similar or higher wages, except if the plant was acquired by a EU multinational. However, the picture is not clear-cut and in some sectors (e.g. renting equipment, computers and management-type services) plants acquired paid lower wage rates (vis-à-vis the benchmark group).

8.21 As to the other sub-groups in Table 8.3, the picture is a mixed one although overall there is some evidence to suggest that most sub-groups owned plants that paid slightly lower wages rates than the benchmark group (the main exception being brownfield foreign-owned plants between 1998-2002), once we control for other factors (such as profitability and productivity).

8.22 Table 8.4 presents the results for the post-acquisition wage effect associated with plants that were acquired at time *t*. There are two sets of results: the top half of the table reports the parameter estimates obtained when estimation equation (8.1) with the full panel-data sample covering all plants in operation between 1998-2002; the lower half covers the results obtained from using the (much smaller) matched sample.

8.23 Given the possibility of sample selection bias, we concentrate on the matched-sample results. In EU-acquired plants wage rates post-acquisition were significantly lower in 5[79] of the 7 industries covered (e.g., 9% lower in other retailing, air transport, storage & telecoms, to 27% lower in most of retailing). Post-acquisition US-acquired plants experienced a more mixed outcome, with negative impacts in 2 out of 7 sectors (some 6% lower in sale & maintenance of motors, and 14% lower in renting equipment, computers and management-type services); and positive wage premiums in 2 (12% in other retailing, air transport, storage & telecoms; 17% in wholesale trade). Lastly, the in plants acquired by the other foreign-owned sector show higher post-acquisition wages in 3 of the 7 sectors covered (ranging from a 3% premium in the sale & maintenance of motors, to a 30% premium in most of retail trade) and lower wages (of some 11%) in renting equipment, computers and management-type services.

8.24 Lastly, to summarise the post-acquisition wage effect for both manufacturing and services, across ownership groups, Table 8.5 weights the results presented above (using total gross output figures) to give industry totals. Since the matched-sample estimates attempt to control for sample selection bias, it is these we shall concentrate upon.

[79] That is, 5 industries if we include the results for the aggregated foreign-owned sub-group for IND11 as indicative of the EU results for this sector.

Table 8.4: Marginal wage effect post-acquisition (full and matched samples), services (source Table A8.2 and matched sample)

	IND7	z-value	IND8	z-value	IND9	z-value	IND10	z-value	IND11	z-value	IND12	z-value	IND13	z-value
Full sample														
FO post-acquisition effect	-	-	-	-	-	-	-	-	-	-	-0.041	-0.52	0.193	0.98
EU post-acquisition effect	0.005	0.05	0.009	0.19	-0.173	-2.38	-0.659	-7.50	0.188	1.17	-	-	-	-
US post-acquisition effect	0.075	0.92	-0.014	-0.13	0.000		-0.462	-2.95	-0.190	-2.17	-	-	-	-
Other FO post-acquisition effect	0.239	7.85	-0.164	-2.04	0.174	1.53	0.170	1.16	0.655	1.89	-	-	-	-
UK post-acquisition effect	-0.173	-7.76	-0.066	-4.46	-0.010	-0.50	0.048	2.79	-0.036	-1.06	0.084	3.63	-0.156	-2.71
Matched sample														
FO post-acquisition effect	-	-	-	-	-	-	-	-	-	-	-0.105	-2.41	-0.002	-0.01
EU post-acquisition effect	-0.111	-2.09	-0.162	-5.28	-0.272	-5.24	-0.085	-2.23	-0.018	-0.18	-	-	-	-
US post-acquisition effect	-0.057	-1.82	0.172	1.85	0.000		0.125	2.95	-0.141	-2.11	-	-	-	-
Other FO post-acquisition effect	0.033	1.71	0.192	1.96	0.300	2.51	-0.025	-0.98	-0.114	-1.91	-	-	-	-
UK post-acquisition effect	-0.266	-4.03	0.044	1.75	0.192	2.25	0.044	1.89	-0.054	-1.62	-0.183	-2.01	-0.005	-0.07

[a] Values from Table A8.2 have been converted to exp(β)-1.

[b] The results for this industry are not yet available

Table 8.5: Post acquisition impact on wages for UK-to-foreign plants (weighted totals of Tables 8.2 and 8.4)

	EU	US	OFO	UK
Manufacturing(1)	0.049	-0.022	0.113	-0.017
Manufacturing(2)	0.058	0.122	0.058	0.040
Services(1)	-0.071	-0.089	0.116	-0.055
Services(2)	-0.113	0.051	0.079	-0.017

(1) full-sample; (2) matched-sample

8.25 In terms of the matched-sample estimates in Table 8.5, for services the overall picture is longer term post-acquisition wage gains for US- and other FO- acquired plants, of around 5-8%. In EU-acquired plants the overall impact in the service sector was a 11% decline post-acquisition.

8.26 In manufacturing, post-acquisition wages were higher in all ownership sub-groups, but particularly in US-acquired plants where the longer-term wage premium was some 12%.

Summary and conclusions

8.27 This chapter has considered the effect of foreign acquisition on real wages at the plant level. The evidence used is based on estimating real wage functions using unbalanced panel data based on plants that existed in 1995-2000 (1998-2002 for services) but which operated during the full 1985-2005 (or 1997-2005) period [i.e. we do not include plants that closed before 1995 (1998 for services), nor plants that started post 2000 (2002)]. The dynamic modelling approach allows for endogeneity of factor inputs and output, using a system GMM methodology which takes account of fixed effects and endogeneity (both of which are important and if ignored will lead to biased and potentially misleading results). The statistical approach taken also takes account of potential selectivity bias (due to acquired plants potentially being more productive and thus having better wage outcomes, whether acquired or not) and we do this using a matching estimator approach.

8.28 As to whether foreign-owned firms targeted higher wage UK manufacturing plants for acquisition, in the US-owned sub-group the overall results across all the 6 industry sectors covered suggest that plants acquired paid an additional 8% wage premium. For the EU-owned acquisition sub-group, the plants acquired were more likely to pay lower wages (on average some 3% lower). Finally, the picture for the other foreign-owned group of acquired plants was comparable wage rates paid to the benchmark sub-group in 4 of the 6 industries, and wages of between 11-15% lower in 2 sectors. In general, these results suggest that during 1995-2000, UK manufacturing plants that were then acquired by foreign-owned multinationals were on balance likely to pay similar or lower wages except if the plant was acquired by a US multinational.

8.29 As to the post-acquisition wage effect in manufacturing, wage rates were higher in all ownership sub-groups, but particularly in US-acquired plants where the longer-term wage premium was some 12%.

8.30 Turning to whether foreign-owned firms targeted higher wage UK service sector plants for acquisition, for US-acquisitions the overall results suggest an additional 24% wage premium was paid, although this is based on significantly higher wage rates in only 3 of the 7 industries covered. For EU-acquired plants, there was an overall wage premium for acquired plants of around -7%; and for the other foreign-owned group of acquired plants results were more mixed, with an overall impact averaging out across all sectors of some 11% higher wages.

8.31 As to the post-acquisition wage effect in services, the overall picture is longer term post-acquisition wage gains for US- and other FO- acquired plants, of around 5-8%. In EU-acquired plants the overall impact in the service sector was a 11% decline post-acquisition.

Table A8.1: Dynamic weighted systems GMM real wage function, manufacturing,1984-2005 (Equation 8.1)[a]

	IND1	z-value	IND2	z-value	IND3	z-value	IND4	z-value	IND5	z-value	IND6	z-value
ln real wage$_{t-1}$	-0.003	-0.27	0.090	5.53	-0.030	-3.84	-0.010	-1.25	0.009	0.59	-0.032	-2.64
ln price-cost margin	-0.056	-2.88	-0.119	-4.66	-0.057	-2.52	-0.093	-3.59	-0.104	-2.95	0.017	0.53
ln labour productivity	0.338	5.83	0.210	1.45	0.582	6.66	0.240	3.64	0.944	10.69	0.639	5.23
time	0.019	20.56	0.017	4.75	0.011	3.17	0.020	13.21	0.002	0.97	0.011	3.66
ln Industry agglomeration	0.021	4.55	0.009	0.94	-0.011	-1.74	0.019	3.48	-0.040	-3.98	-0.021	-1.72
ln Diversification	-0.022	-2.58	0.000	-0.02	0.018	1.94	-0.007	-0.78	0.019	1.51	0.012	0.80
Single plant enterprise	-0.006	-0.42	-0.005	-0.24	-0.036	-3.90	-0.025	-2.54	0.020	1.57	-0.006	-0.41
ln AGE	0.041	5.99	0.044	3.42	0.021	3.21	0.055	10.20	0.072	7.07	0.067	6.96
US-owned	0.375	10.94	0.406	10.73	0.094	3.16	0.154	6.38	-0.184	-6.89	-0.005	-0.14
EU-owned	0.321	10.28	0.385	7.75	0.082	2.96	0.068	3.27	-0.137	-3.54	0.003	0.08
Other FO	-0.317	-8.70	-0.343	-9.13	-0.141	-3.94	0.011	0.39	0.020	0.98	-0.017	-0.54
Assisted Area	-0.001	-0.11	-0.004	-0.36	-0.011	-0.89	-0.007	-0.88	0.018	1.43	0.010	0.67
EU-owned x group 1	-0.055	-1.75	0.015	0.27	-0.138	-2.15	0.089	1.88	-0.056	-0.72	-0.062	-0.93
US-owned x group 1	0.084	2.02	0.090	1.64	-0.020	-0.48	0.165	3.46	0.074	1.98	0.052	1.16
Other FO-owned x group 1	0.024	0.22	0.166	0.88	-0.165	-2.26	-0.022	-0.54	-0.120	-2.30	0.169	0.81
group 2	0.102	1.35	0.014	0.19	-0.107	-2.62	0.090	1.98	-0.209	-1.51	-0.057	-1.09
group 3	-0.009	-0.37	-0.081	-3.00	-0.106	-3.82	0.078	3.38	-0.080	-2.04	-0.018	-0.36
group 4	0.008	0.50	0.093	3.22	-0.008	-0.52	0.014	0.46	0.023	0.78	0.034	1.11
group 5	-0.037	-1.82	-0.022	-0.93	0.002	0.09	-0.042	-2.97	0.067	3.36	0.049	2.02
group 6	-0.012	-1.20	-0.004	-0.21	-0.048	-3.28	0.011	1.06	-0.021	-1.59	-0.021	-1.14
group 7	0.199	4.36	0.207	3.18	0.004	0.08	0.210	2.57	0.289	4.61	-0.131	-0.66
group 8	0.034	2.86	-0.002	-0.17	-0.012	-0.64	0.020	1.70	-0.038	-2.07	0.015	0.65
EU post-acquisition effect	0.037	1.17	-0.026	-0.37	0.069	0.93	0.015	0.27	0.140	1.37	0.089	1.09
US post-acquisition effect	0.022	0.49	-0.080	-1.05	0.026	0.53	-0.092	-1.18	-0.005	-0.06	-0.034	-0.53
Other FO post-acquisition effect	0.212	1.77	-0.001	0.00	0.139	1.47	0.046	0.91	0.197	3.30	-0.176	-0.80
UK post-acquisition effect	-0.018	-0.98	0.006	0.24	-0.015	-0.58	-0.046	-2.74	-0.022	-1.04	0.030	0.98
Constant	-1.327	-1.99	-0.312	-0.19	-3.885	-3.98	-0.359	-0.42	-8.467	-8.18	-4.448	-3.25
AR(1) z-statistic	-10.57**		-6.97		-9.38		-9.84		-8.41		-7.40	
AR(2) z-statistic	-1.72		-1.22		-1.16		-1.12		-1.54		-1.41	
Hansen test χ^2(df)	22.32		17.64		10.30		27.45		33.43		17.83	
No. of Obs.	40,864		32,986		26,389		45,905		33,074		13,768	
No. of groups	9,435		10,328		6,868		10,392		8,471		4,397	

[a] 2-digit industry and 26 regional dummies were included but results are not reported

Table A8.2: Dynamic weighted systems GMM real wage function, services,1997-2005[a]

	IND7	z-value	IND8	z-value	IND9	z-value	IND10	z-value	IND11	z-value	IND12	z-value	IND13	z-value
ln real wage$_{t-1}$	-0.184	-7.28	0.012	1.06	-0.041	-7.74	0.061	4.61	-0.115	-2.47	0.033	1.76	0.620	9.60
ln price-cost margin	-0.036	-2.26	-0.008	-0.91	0.015	4.60	-0.287	13.07	-0.308	-2.26	-0.249	-10.79	-0.076	-1.48
ln labour productivity	0.194	4.32	0.296	2.26	0.209	5.29	1.058	11.94	1.392	4.63	0.999	33.17	0.168	1.96
time	0.017	7.63	0.010	7.67	0.004	3.57	-0.012	-6.68	-0.009	-1.93	-0.004	-2.58	-0.007	-0.89
ln Industry agglomeration	-0.011	-1.40	0.034	2.40	0.050	12.29	-0.051	-7.45	-0.055	-1.98	-0.026	-8.04	0.004	0.76
ln Diversification	0.210	3.59	-0.038	-0.75	-0.134	-6.32	0.110	3.34	0.288	2.44	0.094	2.92	-0.096	-2.55
Single plant enterprise	0.001	0.03	0.153	3.72	-0.294	-3.27	0.261	4.65	0.072	1.15	0.079	2.10	0.044	0.63
ln AGE	0.078	10.89	-0.022	-4.19	0.035	13.00	0.076	9.60	0.086	2.08	-0.020	-3.72	-0.155	-6.56
US-owned	0.100	4.12	-0.055	-1.01	-0.038	-1.09	-0.086	-3.61	0.172	1.74	0.303	5.11	0.004	0.05
EU-owned	0.141	5.37	-0.154	-2.13	0.282	7.81	-0.204	-5.41	-0.036	-0.38	0.216	3.35	-0.416	-5.52
Other FO	-0.067	-3.38	0.231	2.83	0.264	20.22	0.027	1.31	-0.174	-1.53	-0.198	-3.27	0.274	4.07
Assisted Area	0.014	1.02	-0.012	-1.80	0.015	3.14	-0.019	-2.20	-0.006	-0.40	-0.020	-2.16	-0.019	-2.31
Foreign-owned x group 1	-	-	-	-	-	-	-	-	-	-	-0.052	-0.79	-0.105	-0.56
EU-owned x group 1	0.204	5.60	-0.046	-0.99	-0.437	-5.10	0.068	0.55	-0.489	-2.85	-	-	-	-
US-owned x group 1	0.204	3.13	0.183	1.79	-	-	0.649	3.18	0.055	0.52	-	-	-	-
Other FO-owned x group 1	0.165	4.69	0.438	4.96	-	-	-0.241	-2.50	-0.773	-1.94	-	-	-	-
group 3	0.195	6.92	0.166	10.74	-0.324	-8.83	0.307	9.53	-0.188	-1.35	-0.049	-1.85	-0.376	-7.47
group 4	-0.494	-4.17	-0.212	-3.55	-0.671	-6.90	-0.232	-9.00	-0.184	-2.40	-0.429	-9.62	0.291	1.53
group 5	-0.166	-3.61	-0.093	-2.20	-0.111	-1.23	-0.120	-2.04	-0.044	-0.72	0.036	0.90	-0.023	-0.30
group 6	0.173	8.57	0.093	4.18	-0.206	13.77	-0.309	13.63	-0.164	-1.60	-0.016	-1.25	0.188	3.84
group 7	-1.368	19.35	0.077	1.70	-0.163	-4.61	0.178	3.97	0.046	0.66	-0.137	-3.37	0.203	1.46
group 8	-0.074	-2.59	0.154	6.04	0.028	1.35	-0.170	-5.84	-0.132	-1.80	-0.103	-4.70	0.310	2.57
FO post-acquisition effect	-	-	-	-	-	-	-	-	-	-	-0.042	-0.52	0.176	0.98
EU post-acquisition effect	0.005	0.05	0.009	0.19	-0.190	-2.38	-1.077	-7.50	0.173	1.17	-	-	-	-
US post-acquisition effect	0.072	0.92	-0.014	-0.13	-	-	-0.620	-2.95	-0.211	-2.17	-	-	-	-
Other FO post-acquisition effect	0.214	7.85	-0.179	-2.04	0.160	1.53	0.157	1.16	0.504	1.89	-	-	-	-
UK post-acquisition effect	-0.190	-7.76	-0.068	-4.46	-0.010	-0.50	0.047	2.79	-0.036	-1.06	0.080	3.63	-0.170	-2.71
Constant	0.727	1.31	2.606	2.02	-0.144	-0.32	-10.131	-9.89	-13.029	-3.58	-7.964	25.78	2.808	1.97
AR(1) z-statistic	-13.77**		-8.96**		-16.35**		-13.67**		-3.66**		-11.25**		-11.10**	
AR(2) z-statistic	1.53		-1.77		-1.51		-1.99*		-1.05		1.28		1.36	
Hansen test χ^2(df)	9.20		7.18		7.37		9.71		9.85		3.86		8.38	
No. of Obs.	28,273		54,942		67,020		79,803		42,272		48,088		52,195	
No. of groups	12,083		21,826		22,361		34,401		19,264		20,515		18,789	

[a] 2-digit industry and 26 regional dummies were included but results are not reported

© Richard Harris

9. Impact of foreign acquisitions on profitability

9.1 The fifth task is to consider the effect of foreign acquisition on profitability (represented here by the price-cost margin[80]). In order to undertake this task, we have estimated price-cost margin functions typically used in firm level studies of this kind.[81] Thus we estimate a dynamic-form of the function using (unbalanced) panel-data:

$$\ln pcm_{it} = \beta_0 + \pi_1 \ln ms_{it} + \pi_2 \ln HERF_{it} + \pi_3 IG_{jt} + \pi_4 t + \pi_5 \ln pcm_{i,t-1} + \phi_x X_{it} + \sum_{l=1}^{8} \lambda_l D_l + \sum_{k=1}^{4} \gamma_k \sum_{t=1}^{n} ACQ_{kt} + \eta_i + t_t + (1-\rho)e_{it} \qquad (9.1)$$

where the subscripts *i* and *t* represent the *i*-th plant and the *t*-th year of observation, respectively;
pcm represents the price-cost margin;
ms is the plant's share in industry *j*'s gross output;
HERF is industry *j*'s Herfindahl index of market concentration;
IG represents the year-to-year growth of industry *j*'s total gross output;
t represents a time trend to take account of technical progress;
X is a vector of variables determining TFP (comprising most of the other variables in Table 5.2), and includes industry and region dummies;
D_l is a dummy variable taking on a value of 1 for each sub-group (l = 1, …, 8) with plants belonging to sub-group 9 forming the reference group;
ACQ are dummy variables taking on a value of 1 in the year when the plant was acquired, with k = 1, …, 4, representing US-owned, EU-owned, other country foreign-owned, and UK-owned, respectively;[82] and
the composite error term has three elements with the fixed-effect term η_i affecting all observations for the cross-section plant *i*; t_t affects all plants for time period *t*; and e_{it} affects only plant *i* during period *t*.

9.2 As with the production function in Chapter 5, the unbalanced panel data used to estimate this model is based on plants that existed in 1995-2000 (1998-2002 for services) but which operated during the full 1985-2005 (or

[80] Defined as gross operating surplus (gross value-added minus total labour costs) minus an estimate of the cost of capital services, all divided by gross-output [i.e. (pY-cY)/pY = (p – c)/p, where *c* is marginal costs]. Note, we exclude from the subsequent analysis those plants with negative price-cost margins; this was to reduce the impact of outliers (often those with negative profits had very large values) and also because the resultant model estimates were better (i.e., more in line with theory and easier to interpret) when negative vaues were excluded. Leaving out negative values reduced the sample size by some 20% (depending on year and sector).
[81] *Herf* and *ms* (plant market share) are included based on the standard structure-performance relationship as set out in Cowling and Waterson (1976); we expect a positive effect of market concentration and market share as determinants of profitability (see Bennenbroek and Harris, 1995; Slade, 2004).
[82] Note, here we do not consider the time-profile of profitability pre- and post-entry but rather set the dummy variable *ACQ* to take on the value 1 for the whole period until *n* (the last observation for the plant) from the year of acquisition.

1997-2005) period [i.e. we do not include plants that closed before 1995 (1998), nor plants that started post 2000 (2002)].[83]

9.3 To allow for potential endogeneity of factor inputs and output, equation (9.1) was estimated using the Generalised Method of Moments (GMM) systems approach available in STATA 9.2 (Arellano and Bond, 1998). This is sufficiently flexible to allow for both endogenous regressors (through the use of appropriate instruments involving lagged values – in levels and first differences – of the potentially endogenous variables in the model[84]) and a first-order autoregressive error term. Note, all data were also weighted to ensure that the samples are representative of the population of GB firms under consideration.

9.4 As in Chapter 6, there are three separate controls in equation (9.1) for the impact of foreign-ownership: firstly, for when the plant is either EU-, US-, or other country foreign-owned; secondly, for those plants that sometime during 1995-2000 (1998-2002) were acquired by foreign-owned firms; and thirdly, we include dummies (ACQ_k) that take on a value of 1 from the year in which the previously UK-owned plant was acquired by a foreign-owned enterprise (for k = 1, …, 3).

9.5 Given the need to take account of potential selectivity bias we do this using the same matching estimator approach as used previously (the same model is used). Here we move to the results obtained when estimating equation (9.1) using the full-sample available (comprising both the treated and untreated data), and the matched-sample data (i.e., the treated and control group data).

9.6 Tables A9.1 and A9.2 in the appendix provides the results for manufacturing and service sector industries when equation (9.1) is estimated using the full-sample data.[85] The key results of interest are the dummy variables for each foreign ownership group, the dummies for each of the sub-groups identified (with specific interest regarding those plants that were acquired by foreign-owned firms during 1995-2000/1998-2002), and the post-acquisition dummies associated with plants that were acquired at time *t*. Tables 9.1 and 9.2 contain the results for manufacturing, while Tables 9.3 and 9.4 have results for services.

Manufacturing

9.7 For manufacturing plants, Table 9.1 shows that US-owned plants overall had higher profitability of around 24% (than UK-owned plants, the benchmark group), although this varied from around 24% higher in the

[83] Note, we exclude observations for those plants where the price-cost margin was zero (around 20% of our sample, depending on year and sector). We have experimented with using *pcm* unlogged, but the results often suffer from significant outlier values and are both less easy to interpret and more imprecise.

[84] The plant's market share and the Herfindahl index are both treated as endogenous.

[85] Note, the model estimated passes diagnostic tests for autocorrelation and the Hansen test that the over-identifying restrictions are valid.

Table 9.1: Marginal price-cost margin effects[a] associated with belonging to sub-group, manufacturing (source Table A9.1)

	IND1	z-value	IND2	z-value	IND3	z-value	IND4	z-value	IND5	z-value	IND6	z-value	average
US-owned	0.664	7.96	-0.046	-0.45	0.237	2.63	0.113	0.62	0.006	0.09	0.434	2.59	0.236
EU-owned	0.036	0.60	-0.224	-2.25	0.113	1.15	-0.071	-0.45	-0.201	-3.74	-0.081	-0.68	-0.045
Other FO	-0.134	-2.00	-0.006	-0.06	-0.276	-3.76	-0.233	-1.85	0.022	0.45	-0.128	-1.64	-0.149
EU-owned x group 1	-0.261	-2.05	-0.106	-0.57	0.007	0.04	-0.289	-1.42	0.107	0.51	0.427	1.21	-0.091
US-owned x group 1	0.130	0.94	-0.130	-0.53	-0.148	-1.06	0.046	0.12	0.016	0.10	-0.191	-1.09	-0.029
Other FO-owned x group 1	0.473	1.97	-0.489	-2.02	-0.437	-2.15	0.204	1.01	-0.349	-2.05	-0.065	-0.27	-0.091
group 3	-0.088	-1.44	0.003	0.03	-0.101	-1.23	0.305	2.15	-0.045	-0.61	-0.343	-3.26	-0.003
group 4	-0.116	-2.72	0.095	0.89	0.595	5.67	-0.054	-0.23	-0.068	-1.27	-0.236	-1.74	0.102
group 5	-0.107	-1.42	0.230	3.58	0.079	1.43	0.151	2.35	0.193	3.93	0.076	1.04	0.094
group 6	-0.033	-0.76	-0.073	-1.54	-0.147	-2.98	-0.170	-2.94	0.105	3.46	-0.080	-1.37	-0.081
group 7	0.071	1.00	-0.429	-2.71	-0.019	-0.06	0.196	0.28	-0.165	-1.92	-0.667	-2.48	-0.075
group 8	-0.067	-1.82	0.008	0.16	0.050	0.76	0.068	1.01	0.074	2.03	-0.074	-1.00	0.019

[a] Values from Table A9.1 have been converted to exp(β)-1.

[b] Obtained from weighting industry results using average total real gross output for the period covered.

electrical & electronic equipment, transport equipment, and instrumental engineering sector, to 66% higher in metals, extraction of minerals& chemicals, while in 3 of the 6 sectors covered there was no significant effect. For EU-owned plants, here was no significant difference in 4 out of 6 industries, while in two sectors profitability was significantly lower (around 20-22% lower in the other metal goods, mechanical engineering, and office & data processing equipment sector, and in timber, paper & printing); overall, profitability was 4.5% lower in EU-owned plants.

9.8 Profitability was generally lower in plants belonging to other foreign-owned companies in manufacturing, with values ranging between -13% (in metals, extraction of minerals& chemicals, and in rubber & plastics and other manufacturing) to -28% (in the electrical & electronic equipment, transport equipment, and instrumental engineering sector); overall profitability was some 15% lower in this ownership sub-group.

9.9 Turning to whether foreign-owned firms targeted more profitable UK plants for acquisition, in the US- and EU-owned sub-groups there is little evidence that this was the case. Only for EU-acquired plants in the metals, extraction of minerals& chemicals sector was there a statistical difference (with lower profitability of some -26%). For plants acquired by the other foreign-owned sub-group, profitability was lower in 3 of the 6 sectors covered (ranging from 35% lower in timber, paper & printing, to 49% lower in other metal goods, mechanical engineering, and office & data processing equipment), although profitability was (47%) higher in metals, extraction of minerals& chemicals. Overall, other foreign-owned acquired plants were some 9% less profitable.

9.10 In general, these results suggest that during 1995-2000, UK manufacturing plants that were then acquired by foreign-owned multinationals were on balance likely to have similar or lower levels of profitability; there is little evidence of any 'cherry-picking' on the basis of the profitability of acquired plants.

9.11 As to the other sub-groups in Table 9.1, the picture is mixed although overall there is some evidence to suggest that single-plant enterprises had overall higher profitability, while greenfield foreign-owned plants had lower profitability.

9.12 Table 9.2 presents the results for the post-acquisition profit effect associated with plants that were acquired at time *t*. There are two sets of results: the top half of the table reports the parameter estimates obtained when estimation equation (9.1) with the full panel-data sample covering all plants in operation between 1995-2000; the lower half covers the results obtained from using the (much smaller) matched sample. As can be seen, the results when used the matched sample are often significantly different to those obtained using the full dataset.

9.13 Given the possibility of sample selection bias, we concentrate on the matched-sample results. In EU-acquired plants post-acquisition profitability was significantly higher in 2 of the 6 industries covered (47% higher the metals, extraction of minerals& chemicals sector, and some 21% higher in food, drink, textiles, clothing & footwear); but lower in 3 other

Table 9.2: Post-effects[a] on price-cost margin of acquisition by foreign-owned companies, manufacturing (source Table A9.1 and 'matched' estimates)

	IND1	z-value	IND2	z-value	IND3	z-value	IND4	z-value	IND5	z-value	IND6	z-value
Full sample												
EU post-acquisition effect	-0.064	-1.03	0.045	0.18	-0.248	-1.32	-0.144	-0.40	0.105	0.35	-0.392	-1.50
US post-acquisition effect	-0.267	-1.84	0.167	0.58	-0.126	-0.71	-0.422	-1.74	-0.036	-0.17	-0.184	-0.65
Other FO post-acquisition effect	-0.160	-0.74	0.631	1.33	0.935	2.09	-0.475	-2.55	0.156	0.61	-0.564	-1.70
UK post-acquisition effect	-0.029	-0.43	-0.155	-2.25	-0.336	-4.42	-0.167	-2.33	0.141	3.05	-0.272	-2.64
Matched sample												
EU post-acquisition effect	0.479	2.55	-0.153	-1.26	-0.240	-1.67	0.214	1.61	-0.582	-2.90	0.225	1.52
US post-acquisition effect	-0.145	-1.65	0.922	2.23	0.054	1.21	0.749	2.07	0.737	3.30	0.255	1.64
Other FO post-acquisition effect	-0.411	-2.34	-0.608	-1.99	0.056	1.14	-0.238	-1.45	-0.640	-2.07	-0.012	-0.81
UK post-acquisition effect	-0.315	-2.58	-0.468	-1.85	-0.097	-1.26	0.485	1.89	0.862	2.86	0.018	1.06

[a] Values from Table A9.1 have been converted to exp(β)-1.

Table 9.3: Marginal price-cost margin effects[a] associated with belonging to sub-group, services (source Table A9.2)

	IND7	z-value	IND8	z-value	IND9	z-value	IND10	z-value	IND11	z-value	IND12	z-value	IND13	z-value	average
Foreign-owned	-	-	-	-	0.104	2.84	-	-	-	-	-0.106	-3.33	0.026	0.73	0.005
US-owned	-0.192	-5.13	0.658	4.62	-	-	-0.381	-4.26	0.140	1.97	-	-	-	-	0.188
EU-owned	-0.006	-0.14	1.054	6.09	-	-	-0.201	-2.73	0.099	0.98	-	-	-	-	0.381
Other FO	0.003	0.10	-0.691	-6.10	-	-	-0.495	-6.53	-0.218	-4.88	-	-	-	-	-0.361
Foreign-owned x group 1	-	-	-	-	0.552	7.65	-	-	-	-	-0.706	-9.70	0.119	0.59	0.021
EU-owned x group 1	0.006	0.03	-0.243	-0.91	-	-	0.170	0.52	0.377	1.91	-	-	-	-	-0.006
US-owned x group 1	0.878	8.67	0.886	1.80	-	-	-0.199	-0.54	0.089	0.64	-	-	-	-	0.441
Other FO-owned x group 1	-0.103	-1.34	0.024	0.03	-	-	0.008	0.01	-0.300	-0.59	-	-	-	-	-0.053
group 3	0.343	7.98	1.171	5.73	-0.478	-33.41	1.090	7.43	-0.079	-1.05	-0.449	-8.28	0.282	5.54	0.581
group 4	-0.063	-0.35	0.722	2.26	0.255	2.66	0.389	6.98	-0.266	-3.28	-0.597	-11.51	-0.829	-4.11	0.215
group 5	0.367	2.46	0.683	3.18	0.371	4.30	0.484	1.83	0.094	1.33	0.604	5.06	0.422	3.54	0.471
group 6	0.358	8.97	-0.465	-3.81	0.203	7.54	-0.310	-5.59	-0.115	-1.26	-0.383	-12.54	0.101	1.52	-0.179
group 7	1.051	10.02	6.471	5.85	-0.076	-3.22	1.370	6.04	0.051	0.93	-0.537	-9.00	0.068	0.99	2.734
group 8	-0.195	-3.82	-0.517	-3.44	0.243	16.27	-0.513	-10.30	-0.093	-1.62	-0.306	-12.32	-0.042	-0.77	-0.303

[a] Values from Table A9.2 have been converted to exp(β)-1.

[b] Obtained from weighting industry results using average total real gross output for the period covered.

sectors (especially timber, paper & printing). In US-acquired plants the situation was significantly better with post-acquisition profitability gains in 4 of the 6 industry sub-groups (ranging from 26% to nearly 92% higher, with no significant difference in the electrical & electronic equipment, transport equipment, and instrumental engineering sector); for plants acquired by other foreign-owned firms post-acquisition profits were negative in 3 of the 6 sectors (of between 41-64% lower).

Services

9.14 For two service-sector industries, it was not possible to estimate equation (9.1) and split sub-group D_1 into different foreign-owned sectors (due to too few takeovers for certain countries). Hence, the sub-group D_1 enters representing all UK-owned plants that were acquired by foreign-owned enterprises during 1998-2002.

9.15 Table 9.3 shows that US-owned plants had overall higher profits in 2 of the 7 industry groups covered, with some 67% higher profitability in wholesale trade and 14% higher profits in renting equipment, computers and management-type services. US-owned plants experienced lower profits in the sale & maintenance of motors sector, and in other retailing, air transport, storage & telecoms (some 19-38% lower). In 3 industry groups (e.g. most of retail trade) there was no significance difference. Overall, plants belonging to this ownership sub-group had around a 19% higher level of profits.

9.16 EU-owned plants experienced profit levels similar to the benchmark group in 5 of the 7 industries covered; however in wholesale trade profits were some 105% higher, while in other retailing, air transport, storage & telecoms profitability was 20% lower. Across all industries, profitability in EU-owned plants was around 38% higher.

9.17 In contrast, profits in plants belonging to other foreign-owned companies in services were overall some 36% lower; due mostly to significantly lower profitability (of between 22% to 69%) in wholesale, other retailing, air transport, storage & telecoms, and renting equipment, computers and management-type services.

9.18 Turning to whether foreign-owned firms targeted UK plants with higher profits for acquisition, in the US-owned sub-group the overall results suggest that plants acquired achieved an additional 44% profit premium, although this is based on significantly higher profits in only 2 of the 7 industries covered (there was significant effect in the other 5 sectors). For the EU-owned acquisition sub-group, higher profits (of around 38%) were made in renting equipment, computers and management-type services; but there was no difference for EU-acquired plants in the other 6 sectors included. The picture for the other foreign-owned group of acquired plants was no statistical difference in any sector. Finally, in retailing plants acquired by the foreign-owned sector (where no disaggregation by country

Table 9.4: Post-effects[a] on price-cost margin of acquisition by foreign-owned companies, services (source Table A9.2 and 'matched' estimates)

	IND7	z-value	IND8	z-value	IND9	z-value	IND10	z-value	IND11	z-value	IND12	z-value	IND13	z-value
Full sample														
FO post-acquisition effect	-	-	-	-	-0.310	-5.75	-	-	-	-	0.314	2.33	-0.389	-2.60
EU post-acquisition effect	0.127	0.60	-0.707	-3.64	-	-	-0.558	-2.52	-0.403	-3.05	-	-	-	-
US post-acquisition effect	-0.408	-2.31	-0.709	-2.91	-	-	1.467	1.97	-0.027	-0.20	-	-	-	-
Other FO post-acquisition effect	0.724	6.86	0.405	2.33	-	-	0.952	1.13	0.564	0.75	-	-	-	-
UK post-acquisition effect	0.109	1.94	0.540	2.99	-	-	0.404	6.02	-0.101	-3.00	-	-	-	-
Matched sample														
FO post-acquisition effect	-	-	-	-	-0.139	-0.94	-	-	-	-	0.545	2.22	0.686	2.04
EU post-acquisition effect	0.309	1.76	-0.510	-3.10	-	-	-0.355	-2.22	-0.303	-1.73	-	-	-	-
US post-acquisition effect	0.675	2.48	-0.454	-2.72	-	-	-0.153	-1.74	-0.128	-1.30	-	-	-	-
Other FO post-acquisition effect	0.554	4.01	0.520	2.33	-	-	-0.471	-1.93	0.500	1.95	-	-	-	-
UK post-acquisition effect	0.247	1.69	0.312	2.09	-	-	-0.041	-1.16	0.036	0.82	-	-	-	-

[a] Values from Table A9.2 have been converted to exp(β)-1.

was possible) achieved 55% higher profitability, while those in other business services had lower profits (of some 71%).

9.19 In general, these results suggest that during 1997-2002, UK service plants that were then acquired by foreign-owned multinationals were on balance

likely to achieve lower levels of profits, except perhaps if the plant was acquired by a US multinational (and then in only two sectors). 'Cherry-picking' associated with profitability, to the extent that it occurred, was confined to a small number of industries and differed by ownership group.

9.20 As to the other sub-groups in Table 9.3, there is some evidence to suggest that most sub-groups owned plants that had higher profit levels than the benchmark group (especially greenfield foreign-owned plants, foreign-owned brownfield plants, and single-plant enterprises), once we control for other factors (such as market share and industry concentration).

9.21 Table 9.4 presents the results for the post-acquisition profitability associated with plants that were acquired at time *t*. There are two sets of results: the top half of the table reports the parameter estimates obtained when estimation equation (9.1) with the full panel-data sample covering all plants in operation between 1998-2002; the lower half covers the results obtained from using the (much smaller) matched sample.

9.22 Given the possibility of sample selection bias, we concentrate on the matched-sample results. In EU-acquired plants post-acquisition profits were significantly lower in 3 of the 7 industries covered (e.g., 30% lower in renting equipment, computers and management-type services, to 51% lower in wholesale trade); and higher (around 31%) in sales & maintenance of motors. Post-acquisition US-acquired plants also experienced higher profits in the sales & maintenance of motors sector (around 68% higher), but lower profits in wholesale trade (-45%) and other retailing, air transport, storage & telecoms (-15%). Post-acquisition, plants acquired by the other foreign-owned group did better in 3 of the 7 industries (around 50-55% higher profits in sales & maintenance of motors, wholesale trade, and renting equipment, computers and management-type services), and worse (-47%) in other retailing, air transport, storage & telecoms. In the rest of business services and personal & recreational services, foreign-owned plants saw significant post-acquisition increases in profits (of some 55-69%).

Table 9.5: Post acquisition impact on price-cost margin for UK-to-foreign plants (see Tables 9.2 and 9.4)

	EU	US	OFO	UK
Manufacturing(1)	-0.106	-0.164	0.179	-0.144
Manufacturing(2)	0.252	0.290	-0.012	0.019
Services(1)	-0.388	-0.124	0.476	0.256
Services(2)	-0.245	-0.116	0.288	0.152

(1) full-sample; (2) matched-sample

9.23 Lastly, to summarise post-acquisition profitability impacts for both manufacturing and services, across ownership groups, Table 9.5 weights the results presented above (using total gross output figures) to give industry totals. Since the matched-sample estimates attempt to control for sample selection bias, it is these we shall concentrate upon.

9.24 In terms of the matched-sample estimates in Table 9.5, for services the overall picture is a longer term post-acquisition profits decline for US- and EU- acquired plants, of around 11-25%. In plants acquired by the other foreign-owned ownership group the overall impact in the service sector was a 29% increase post-acquisition.

9.25 In manufacturing, post-acquisition profitability was higher in US- and EU-acquired plants, where the longer-term premium was some 25-29%.

Summary and conclusions

9.26 This chapter has considered the effect of foreign acquisition on profitability at the plant level. The evidence used is based on estimating price-cost margin functions using unbalanced panel data based on plants that existed in 1995-2000 (1998-2002 for services) but which operated during the full 1985-2005 (or 1997-2005) period [i.e. we do not include plants that closed before 1995 (1998 for services), nor plants that started post 2000 (2002)]. The dynamic modelling approach allows for endogeneity of factor inputs and output, using a system GMM methodology which takes account of fixed effects and endogeneity (both of which are important and if ignored will lead to biased and potentially misleading results). The statistical approach taken also takes account of potential selectivity bias (due to acquired plants potentially being more productive and thus having better wage outcomes, whether acquired or not) and we do this using a matching estimator approach.

9.27 As to whether foreign-owned firms targeted more profitable UK manufacturing plants for acquisition, in the US- and EU-owned sub-groups there is little evidence that this was the case. Overall, other foreign-owned acquired plants were some 9% less profitable. Thus there is little evidence of any 'cherry-picking' on the basis of the profitability of acquired plants.

9.28 Lastly, in manufacturing, post-acquisition profitability was higher in US- and EU- acquired plants, where the longer-term premium was some 25-29%.

9.29 Turning to whether foreign-owned firms targeted UK service sector plants with higher profits for acquisition, for US-acquisitions the overall results suggest an additional 44% profits premium, although this is based on significantly higher profits in only 2 of the 7 industries covered. For the EU-owned acquisition sub-group, there was no difference for EU-acquired plants in the 6 of the 7 sectors included. The picture for the other foreign-owned group of acquired plants was no statistical difference in any sector. In those industries where it was not possible to disaggregate foreign-

owned into sub-groups, the results show that retailing plants acquired by the foreign-owned achieved 55% higher profitability, while those in other business services had lower profits (of some 71%). 'Cherry-picking' associated with profitability, to the extent that it occurred in the service sector, was confined to a small number of industries and differed by ownership group.

9.30 As to the post-acquisition profit effect in services, the overall picture is a longer term post-acquisition profits decline for US- and EU- acquired plants, of around 11-25%. In plants acquired by the other foreign-owned ownership group the overall impact in the service sector was a 29% increase post-acquisition.

Table A9.1: Dynamic weighted systems GMM price-cost function, manufacturing,1984-2005[a] (equation 9.1)

IND1	IND1	z-value	IND2	z-value	IND3	z-value	IND4	z-value	IND5	z-value	IND6	z-value
ln price-cost margin$_{t-1}$	0.113	1.45	0.163	2.86	0.106	1.30	-0.196	-4.21	0.309	4.77	-0.154	-2.43
ln plant market share	0.247	2.27	0.244	2.16	0.363	4.83	0.566	6.17	0.183	2.12	0.270	2.36
ln Herfindahl	0.321	3.88	0.384	3.99	0.694	4.69	0.479	7.27	0.300	5.56	0.287	2.71
Industry growth	-0.055	-2.25	-0.103	-1.50	-0.125	-2.87	-0.205	-3.90	0.025	0.87	-0.140	-1.71
time	-0.003	-0.54	-0.035	-3.91	-0.027	-4.35	-0.051	-6.67	-0.016	-3.31	-0.029	-3.03
ln Industry agglomeration	0.096	3.07	-0.084	-1.76	-0.123	-4.01	-0.165	-5.16	-0.122	-2.58	-0.137	-2.24
ln Diversification	-0.116	-3.37	0.060	1.00	0.080	1.83	0.102	2.31	0.107	2.77	0.171	1.93
Single plant enterprise	0.257	3.61	0.058	1.06	-0.214	-3.51	-0.222	-3.43	-0.234	-3.03	-0.162	-1.74
US-owned	0.509	7.96	-0.047	-0.45	0.213	2.63	0.107	0.62	0.005	0.09	0.360	2.59
EU-owned	0.036	0.60	-0.254	-2.25	0.107	1.15	-0.073	-0.45	-0.225	-3.74	-0.085	-0.68
Other FO	-0.144	-2.00	-0.006	-0.06	-0.323	-3.76	-0.266	-1.85	0.022	0.45	-0.137	-1.64
ln AGE	0.034	0.42	-0.107	-1.16	-0.388	-5.23	-0.588	-5.84	-0.209	-3.34	-0.408	-3.03
Assisted Area	0.009	0.41	0.040	1.03	-0.038	-1.06	-0.039	-0.99	-0.030	-1.19	-0.003	-0.06
EU-owned x group 1	-0.303	-2.05	-0.112	-0.57	0.007	0.04	-0.341	-1.42	0.102	0.51	0.356	1.21
US-owned x group 1	0.122	0.94	-0.139	-0.53	-0.160	-1.06	0.045	0.12	0.016	0.10	-0.212	-1.09
Other FO-owned x group 1	0.387	1.97	-0.671	-2.02	-0.575	-2.15	0.186	1.01	-0.429	-2.05	-0.067	-0.27
group 3	-0.092	-1.44	0.003	0.03	-0.106	-1.23	0.266	2.15	-0.046	-0.61	-0.420	-3.26
group 4	-0.123	-2.72	0.091	0.89	0.467	5.67	-0.056	-0.23	-0.071	-1.27	-0.269	-1.74
group 5	-0.114	-1.42	0.207	3.58	0.076	1.43	0.141	2.35	0.177	3.93	0.073	1.04
group 6	-0.034	-0.76	-0.075	-1.54	-0.159	-2.98	-0.186	-2.94	0.100	3.46	-0.084	-1.37
group 7	0.069	1.00	-0.560	-2.71	-0.019	-0.06	0.179	0.28	-0.180	-1.92	-1.100	-2.48
group 8	-0.070	-1.82	0.008	0.16	0.049	0.76	0.066	1.01	0.071	2.03	-0.077	-1.00
EU post-acquisition effect	-0.067	-1.03	0.044	0.18	-0.285	-1.32	-0.155	-0.40	0.100	0.35	-0.497	-1.50
US post-acquisition effect	-0.311	-1.84	0.154	0.58	-0.135	-0.71	-0.548	-1.74	-0.036	-0.17	-0.203	-0.65
Other FO post-acquisition effect	-0.175	-0.74	0.489	1.33	0.660	2.09	-0.645	-2.55	0.145	0.61	-0.831	-1.70
UK post-acquisition effect	-0.029	-0.43	-0.169	-2.25	-0.409	-4.42	-0.183	-2.33	0.132	3.05	-0.317	-2.64
Constant	-2.789	-4.91	0.158	0.29	-0.154	-0.50	-0.676	-1.86	-1.151	-3.76	-1.628	-2.55
AR(1) z-statistic	-8.33**		-7.47**		-5.63**		-6.61**		-7.28**		-2.01*	
AR(2) z-statistic	-1.17		-0.73		0.15		-1.11		1.89		-1.87	
Hansen test χ^2(df)	25.88		32.15		44.10		17.30		12.98		36.90	
No. of Obs.	60,471		29,063		23,076		41,705		30,537		12,672	
No. of groups	16,319		9,407		6,297		9,788		7,966		4,115	

[a] 2-digit industry and 26 regional dummies were included but results are not reported

Table A9.2: Dynamic weighted systems GMM price-cost function, services, 1997-2005[a] (equation 9.1)

	IND7	z-value	IND8	z-value	IND9	z-value	IND10	z-value	IND11	z-value	IND12	z-value	IND13	z-value
ln price-cost margin$_{t-1}$	0.495	11.14	0.031	0.35	0.052	0.81	0.999	14.61	0.757	15.00	0.112	1.42	0.099	1.01
ln plant market share	0.235	2.56	0.769	5.88	0.056	3.19	0.608	8.14	0.233	2.24	0.382	16.62	-0.010	-0.11
ln Herfindahl	0.008	0.10	0.756	9.76	0.690	18.67	0.644	3.74	0.275	3.42	0.503	5.33	0.072	4.47
Industry growth	-0.089	-1.99	0.451	2.39	0.046	2.91	0.449	16.62	0.244	4.57	-0.020	-0.94	-0.023	-1.55
time	-0.028	-4.61	-0.028	-2.71	0.045	17.58	-0.114	-11.38	-0.017	-1.64	-0.075	-16.19	-0.016	-2.28
ln Industry agglomeration	-0.112	-3.21	-0.712	-5.95	-0.037	-3.61	-0.422	-8.03	-0.105	-1.20	-0.177	-15.67	-0.046	-1.53
ln Diversification	0.503	4.37	2.012	4.80	0.098	2.20	0.777	5.14	0.227	0.97	0.670	8.75	0.136	1.45
Single plant enterprise	-0.124	-0.85	-1.548	-4.93	0.385	5.28	-1.354	-4.93	-0.162	-1.37	-0.195	-2.08	0.280	3.28
ln AGE	-0.016	-0.89	-0.359	-5.54	-0.033	-6.81	0.014	0.93	0.037	0.94	-0.082	-6.65	-0.089	-9.63
Assisted Area	0.029	1.45	-0.042	-0.68	0.021	2.21	-0.024	-0.94	0.013	0.77	-0.056	-2.50	0.011	0.53
Foreign-owned	-	-	-	-	0.099	2.84	-	-	-	-	-0.112	-3.33	0.026	0.73
US-owned	-0.214	-5.13	0.506	4.62	-	-	-0.480	-4.26	0.131	1.97	-	-	-	-
EU-owned	-0.006	-0.14	0.720	6.09	-	-	-0.224	-2.73	0.094	0.98	-	-	-	-
Other FO	0.003	0.10	-1.175	-6.10	-	-	-0.684	-6.53	-0.246	-4.88	-	-	-	-
Foreign-owned x group 1	-	-	-	-	0.439	7.65	-	-	-	-	-1.225	-9.70	0.113	0.59
EU-owned x group 1	0.006	0.03	-0.279	-0.91	-	-	0.157	0.52	0.320	1.91	-	-	-	-
US-owned x group 1	0.630	8.67	0.634	1.80	-	-	-0.221	-0.54	0.085	0.64	-	-	-	-
Other FO-owned x group 1	-0.109	-1.34	0.024	0.03	-	-	0.008	0.01	-0.356	-0.59	-	-	-	-
group 3	0.295	7.98	0.775	5.73	-0.650	-33.41	0.737	7.43	-0.082	-1.05	-0.596	-8.28	0.248	5.54
group 4	-0.066	-0.35	0.543	2.26	0.227	2.66	0.329	6.98	-0.310	-3.28	-0.909	-11.51	-1.765	-4.11
group 5	0.313	2.46	0.520	3.18	0.315	4.30	0.395	1.83	0.090	1.33	0.472	5.06	0.352	3.54
group 6	0.306	8.97	-0.625	-3.81	0.185	7.54	-0.371	-5.59	-0.122	-1.26	-0.483	-12.54	0.097	1.52
group 7	0.718	10.02	2.011	5.85	-0.079	-3.22	0.863	6.04	0.049	0.93	-0.771	-9.00	0.066	0.99
group 8	-0.217	-3.82	-0.729	-3.44	0.217	16.27	-0.720	-10.30	-0.097	-1.62	-0.365	-12.32	-0.043	-0.77
FO post-acquisition effect	-	-	-	-	-0.372	-5.75	-	-	-	-	0.273	2.33	-0.493	-2.60
EU post-acquisition effect	0.120	0.60	-1.229	-3.64	-	-	-0.816	-2.52	-0.515	-3.05	-	-	-	-
US post-acquisition effect	-0.525	-2.31	-1.233	-2.91	-	-	0.903	1.97	-0.027	-0.20	-	-	-	-
Other FO post-acquisition effect	0.545	6.86	0.340	2.33	-	-	0.669	1.13	0.447	0.75	-	-	-	-
UK post-acquisition effect	0.103	1.94	0.432	2.99	-	-	0.339	6.02	-0.106	-3.00	-	-	-	-
Constant	-0.400	-1.56	8.650	5.88	-5.849	-30.38	9.339	7.53	1.289	1.38	-1.494	-4.31	-1.760	-5.14
AR(1) z-statistic	9.54**		-8.36**		-16.37**		-14.32**		-11.72**		-13.40**		-13.06**	
AR(2) z-statistic	-0.75		-1.60		1.95		0.87		1.22		-1.97		-1.42	
Hansen test χ^2(df)	9.55		12.05		13.13		9.01		6.02		8.03		10.99	
No. of Obs.	24,582		45,367		93,784		74,702		39,018		85,470		87,036	
No. of groups	10,759		18,856		32,926		31,912		18,067		38,947		34,769	

[a] 2-digit industry and 26 regional dummies were included but results are not reported

10. Impact of foreign acquisitions on plant closure

10.1 Given the UKTI's interest in the impact of foreign acquisitions on competition, this chapter consider the evidence on whether acquired plants experienced a higher probability (hazard) of closure post-acquisition.

10.2 In order to model the determinants of plant closure, and defining the hazard rate of plant *i* as the probability that it shuts down in time *t* having survived until *t*, the hazard function h( ) is given by:

$$h(t; \mathbf{X}(t)) = P[\text{firm at } t \mid \text{survival to } t; \mathbf{X}(t)] = P[T = t \mid T \geq t, \mathbf{X}(t)] \qquad (10.1)$$

where $\mathbf{X}(t)$ is the covariate path of $\boldsymbol{x}$ up to t. We choose to estimate a Cox proportional hazard model (Cox 1972, 1975):

$$h(t) = h_0(t) \exp(\mathbf{x}(t)\, \boldsymbol{\beta}) \qquad (10.2)$$

which comprises a parameterised function of firm characteristics, $\exp(\mathbf{x}(t)\boldsymbol{\beta})$; and a non-parametric base-line hazard, $h_0(t)$, as this is preferable to specifying a functional form such as the Weibull distribution, which may lead to misspecification of the baseline hazard function. Such a semi-parametric model is more flexible than other alternative specifications, and in our empirical work we found the results to be more plausible when compared to parametric modelling of the baseline hazard. Given the need to meet the proportional hazard assumption, we allowed the baseline hazard to differ for 5 sub-groups based on allocating plants in time *t* to different age-bands.

10.3 Unbalanced panel data was used, for plants that existed in 1995-2000 (1998-2002 for services) but which operated during the full 1985-2005 (or 1997-2005) period [i.e. we do not include plants that closed before 1995 (1998 for services), nor plants that started post 2000 (2002)]. The (weighted) Cox proportional hazards model in STATA (version 9.2) was estimated, and the actual modelling strategy used was to start with a simple model (involving only the key variables, including the four *ACQ* dummy variables that take on a value of 1 in the year when the plant was acquired by US-owned, EU-owned, other country foreign-owned, and UK-owned companies), before entering variables multiplied by 'age',[86] and excluding insignificant cross-product variables involving the age variable.[87] Thus, for those variables that also enter with age, it is possible to consider if there is a differential impact on older plants (these are important, and

[86] As Disney *et. al.* (2003a) point out: "… with the Cox specification, we cannot enter age directly since it is collinear with the baseline hazard. We could enter age directly if we adopted a parametric specification for the baseline, but we would then be relying on identification of the age effect from the assumed functional form" (p.105).

[87] The 'restricted model' approach was checked against the 'full model' by testing whether the omitted parameter estimates were jointly zero.

ensure the correct specification of the model, although these results will not be discussed here).

10.4 There is also an issue as to whether estimating the hazard model will result in any potential selectivity bias. If the time-path of certain attributes (such as productivity) post-acquisition are contemporaneously correlated with the plant's likelihood of surviving, then there is a (potentially) endogenous relationship between being acquired and plant closure. To overcome this potential problem, we could instrument the acquisition variables (assuming instruments are available) or use a matching estimator approach. As pointed out by Bijwaard (2008), duration models are inherently non-linear and the usual IV approach is therefore not valid. Thus, matching is preferable. However, this approach (using the same matching estimator approach as used in the earlier chapters) did not result in plausible results when estimating the hazard model; many variables that are likely to determine closure (based on previous research using the ARD data – see Harris and Hassaszadeh, 2002) dropped out and many of the remaining parameter estimates were large and insignificant. Thus we could proceed by assuming that any selectivity bias is likely small;[88] and then to test to see if our results are robust to estimating the model while restricting the dataset to just those plants that were acquired. Clearly, only including the acquired plants means there can be no selectivity bias associated with whether a plant receives treatment (i.e., is acquired) or not. Hence, this is the approach taken below.

10.5 Tables A10.1 and A10.2 in the appendix provides the results for manufacturing and the service sector industries when equation (10.1) is estimated using the full-sample data with a proportional Cox model.[89] The key results of interest are the dummy variables for each foreign ownership group, and the post-acquisition dummies associated with plants that were acquired at time *t*. Table 10.1 contains the results for manufacturing, while Tables 10.2 has the results for services.

10.6 For manufacturing plants, Table 10.1 shows that US-owned plants overall had a higher probability of closure of around 2.6% (when compared to UK-owned plants, the benchmark group), although there was only a significantly higher hazard rate (of 16.5%) in the metal goods, mechanical engineering, and office & data processing equipment sector. EU-owned plants also had a higher hazard rate overall (6.5%), but significant impacts were confined to only the metals, extraction of minerals & chemicals sector (with a higher probability of closure of 17.8%). Lastly, plants owned by the other foreign-owned sub-group had a lower rate of closure (-17.8% overall, and significant in 4 of the 6 industries covered, ranging from nearly -14% to -32%).

[88] Harris and Li (2009) have taken this approach with respect to the relationship between plant closure and whether the plant exports; they find that matching produced similar results (albeit with less precise estimators given the data loss that occurs when using the matching approach).
[89] The additional variables included in the model (compared to those used in previous chapters) are a measure of displacement resulting from the entry of new plants, and the starting employment for each plant (with the expectation that plants that are initially larger will have higher productivity and thus a greater likelihood, *cet. par*., of survival).

Table 10.1: Parameter estimates ($e^{\beta}-1$) of the weighted hazard model, manufacturing,1984-2005 (source: Table A10.1)

	IND1	z-value	IND2	z-value	IND3	z-value	IND4	z-value	IND5	z-value	IND6	z-value	Average[a]
US-owned	0.028	0.31	0.165	2.24	-0.057	-0.63	0.057	0.52	-0.088	-0.77	0.130	0.79	0.026
EU-owned	0.178	2.46	0.111	1.58	-0.017	-0.18	0.055	0.50	0.033	0.29	-0.014	-0.09	0.065
Other FO	-0.322	-3.86	-0.138	-1.67	-0.028	-0.29	-0.257	-2.07	-0.267	-2.52	0.079	0.50	-0.178
US post-acquisition effect	0.462	3.01	0.441	3.43	0.377	2.19	0.740	2.97	1.208	7.48	0.289	1.47	0.583
EU post-acquisition effect	0.715	7.87	0.655	3.53	0.657	4.54	1.267	9.95	0.582	2.83	0.510	2.15	0.779
Other FO post-acquisition effect	0.160	0.70	0.412	1.75	0.187	0.91	0.781	3.32	-0.072	-0.27	0.046	0.09	0.300
UK post-acquisition effect	0.272	5.53	0.454	10.37	0.422	7.83	0.372	9.74	0.457	13.33	0.298	5.14	0.383
group 2	1.039	3.90	0.314	1.22	0.302	0.88	0.897	3.47	1.088	3.20	1.197	5.25	0.733
group 3	0.498	6.76	0.318	4.56	0.330	4.06	0.364	3.52	0.560	5.42	0.172	1.43	0.390
group 4	0.167	4.36	0.000	0.00	0.347	6.50	0.179	1.74	0.265	4.64	0.489	5.55	0.219
group 6	0.604	8.87	0.477	10.14	0.358	6.28	0.467	7.88	0.670	11.37	0.626	7.82	0.505
group 7	0.195	4.07	0.276	5.05	0.251	4.27	0.224	4.39	0.273	4.89	0.351	4.39	0.246
group 8	-0.216	-2.53	-0.414	-4.82	-0.258	-2.78	-0.090	-0.75	0.169	1.36	-0.437	-2.65	-0.193

[a] Obtained from weighting industry results using average total real gross output for the period covered

Table 10.2: Parameter estimates ($e^{\beta}-1$) of the weighted hazard model, services, 1997-2005 (source Table A10.2)

	IND7	z-value	IND8	z-value	IND9	z-value	IND10	z-value	IND11	z-value	IND12	z-value	IND13	z-value	Average[a]
US-owned	-2.453	-30.91	-0.531	-6.39	2.009	3.38	0.094	1.23	0.285	3.36	0.339	1.82	-0.497	-1.62	-0.335
EU-owned	-1.369	-25.91	-0.233	-2.91	-0.699	-1.17	-0.401	-5.24	0.519	5.98	1.294	7.41	0.692	2.26	-0.209
Other FO	1.395	27.20	0.309	3.86	0.927	1.56	-1.022	-13.21	-0.194	-2.31	-0.521	-2.87	-0.056	-0.18	0.189
FO post-acquisition effect	–	–	–	–	–	–	–	–	–	–	0.133	1.35	0.424	2.93	0.031
US post-acquisition effect	1.863	6.55	1.202	9.37	–	–	1.170	12.22	0.969	10.40	–	–	–	–	1.029
EU post-acquisition effect	1.222	7.14	-0.109	-1.34	-0.033	-0.23	1.082	14.12	0.072	0.50	–	–	–	–	0.290
Other FO post-acquisition effect	0.318	4.24	0.428	2.23	–	–	–	–	0.103	0.61	–	–	–	–	0.221
UK post-acquisition effect	0.761	19.06	0.446	14.73	0.577	25.11	0.649	37.65	0.704	27.52	0.087	3.50	-0.020	-0.52	0.527
group 3	0.242	3.55	-0.120	-1.70	-2.228	-21.38	0.997	14.62	0.120	2.05	0.038	0.55	0.795	7.05	0.014
group 4	0.890	3.63	1.237	16.35	-0.606	-1.21	0.656	19.55	0.738	10.24	0.274	3.74	0.563	2.41	0.794
group 6	1.060	9.65	0.740	11.87	0.831	5.70	1.023	10.62	0.907	14.57	0.604	4.71	0.814	6.46	0.857
group 7	-0.320	-7.06	-0.052	-1.49	-0.253	-7.83	-0.139	-5.20	0.103	3.34	-0.261	-7.25	0.355	10.32	-0.078
group 8	0.548	6.66	0.668	9.74	-2.375	-28.34	1.403	22.55	-0.015	-0.19	-0.985	-8.90	-1.611	-6.72	0.183

[a] Obtained from weighting industry results using average total real gross output for the period covered

10.7 As to the post-acquisition impact on closure, being acquired by a US- or EU-owned firm had a significant and high impact on closure in every industry group considered. Overall for US-acquired plants, the probability of closure (having controlled for all other effects) was over 58%; for EU-acquired plants the comparable figure is nearly 80%. Being acquired by a firm that was other foreign-owned also increased the hazard rate (overall by 30%) but the effects was only significant in 2 out of the 6 industries covered.

10.8 Figure 10.1 presents confirmation of these results, showing the survival functions resulting from estimating the hazard model, for each acquired sub-group (compared against the non-acquired sub-group).[90]

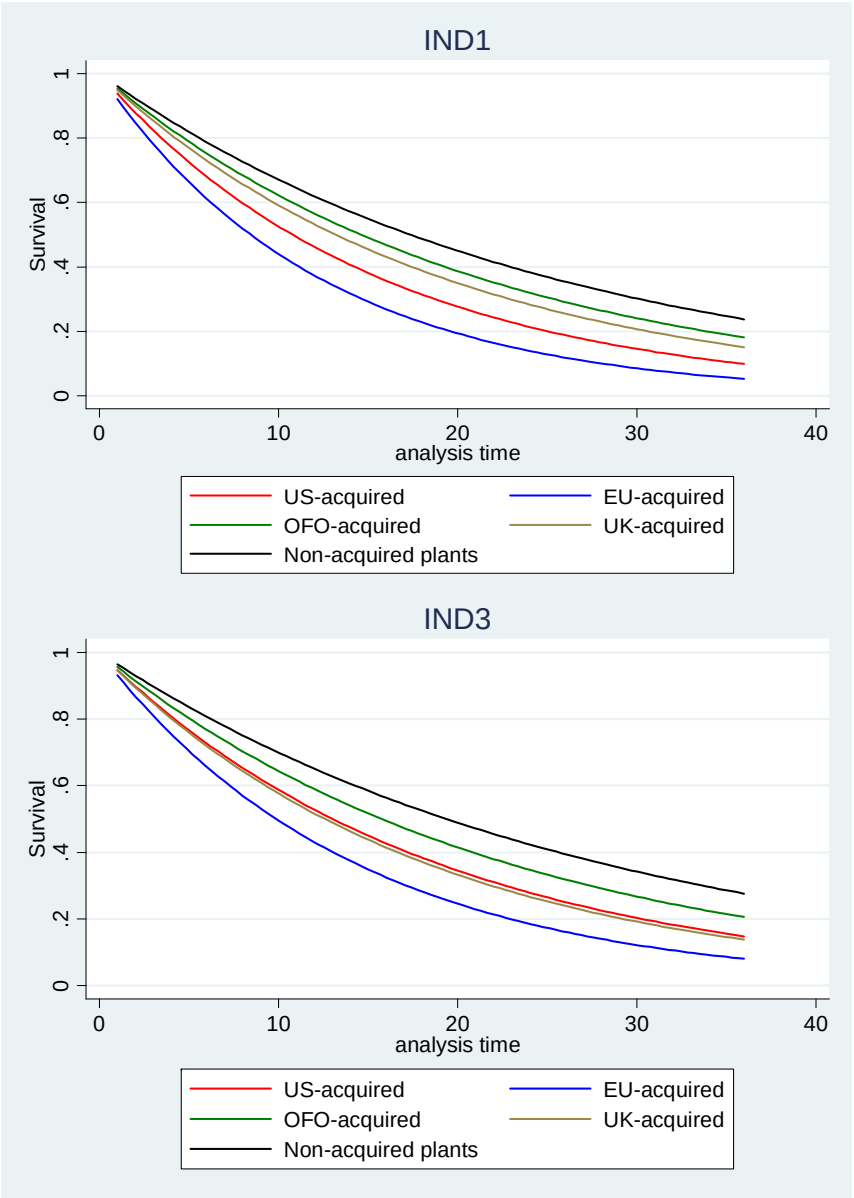
10.9 For plants belonging to the service sector, Table 10.2 shows the impact of ownership on plant survival is very different when compared to manufacturing. US-owned plants overall had a lower probability of closure of around -33.5% (when compared to UK-owned plants, the benchmark group), although this overall effect was heavily influenced by (very) large negative effects in the sale & maintenance of motors, wholesale trade, and recreational & other personal services; while there were countervailing positive hazard effects in 3 other industries. EU-owned plants had a similar profile across the industries covered (with overall a lower hazard rate of closure from being EU-owned of some 21%), although there were some major differences (e.g., in retailing, other retail, air transport & telecoms, and recreational & other personal services). Lastly, the overall hazard rate of closure for plants that were owned by other foreign-owned firms was higher (nearly 19% higher), although this hides major differences across industry sub-groups (e.g. significantly higher hazard in the sale & maintenance of motors and a significantly lower rate in other retail, air transport & telecoms).

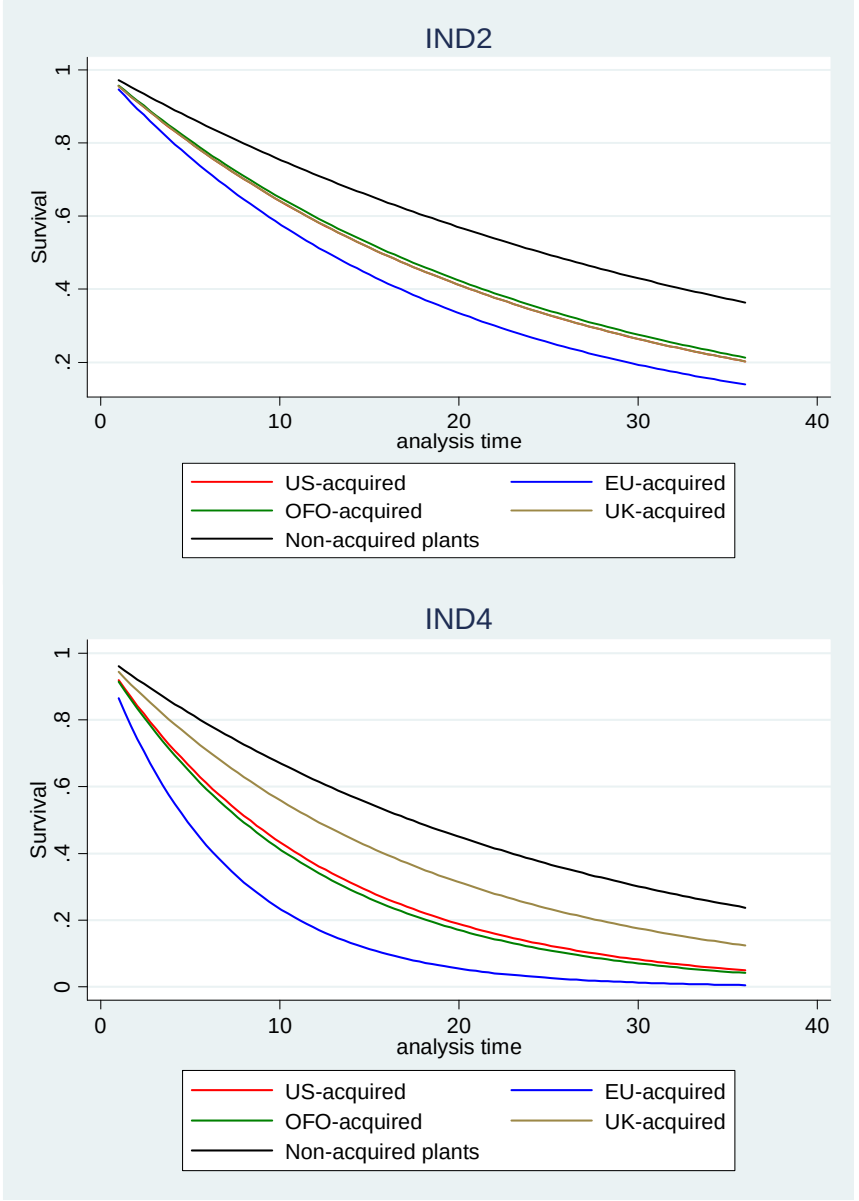
10.10 As to the post-acquisition impact on closure in services, being acquired by a foreign-owned firm had a significant and high impact on closure in most industry groups considered. Overall for US-acquired plants, the probability of closure was over 103%; for EU-acquired plants the comparable figure is nearly 29%; and for the other foreign-owned sector the comparable figure is 22.1%. Again Figure 10.1 presents visual confirmation of the results, showing the survival functions from the estimated hazard models.

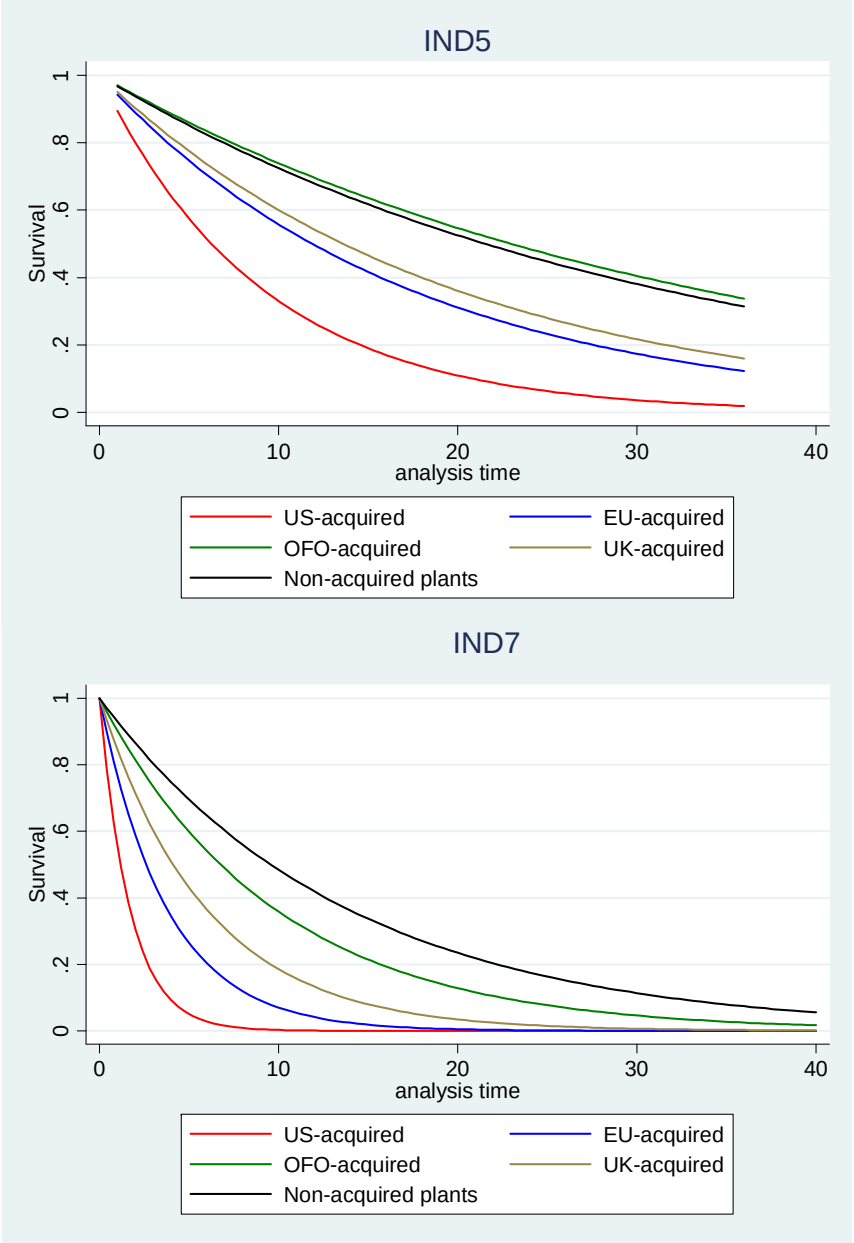
10.11 Finally, Figure 10.2 summaries the overall post-acquisition effects for manufacturing and services, for the ownership sub-groups covered. As set out above, the impact of being acquired by a US-owned firm is to significantly lower a plant's prospect of survival in the post-acquisition period. A detailed analysis of why this is the case deserves more in-depth analysis; but for a large number of cases examination of the 'raw' data in the ARD shows that foreign-owned firms tend to acquire other multi-plant businesses, and fairly quickly close down a number of the plants previously owned by the UK parent company. That is, the foreign-owned acquirer is not interested in all the plants that it buys, preferring to keep some in operation and close down the others (rather than sell them on, presumably

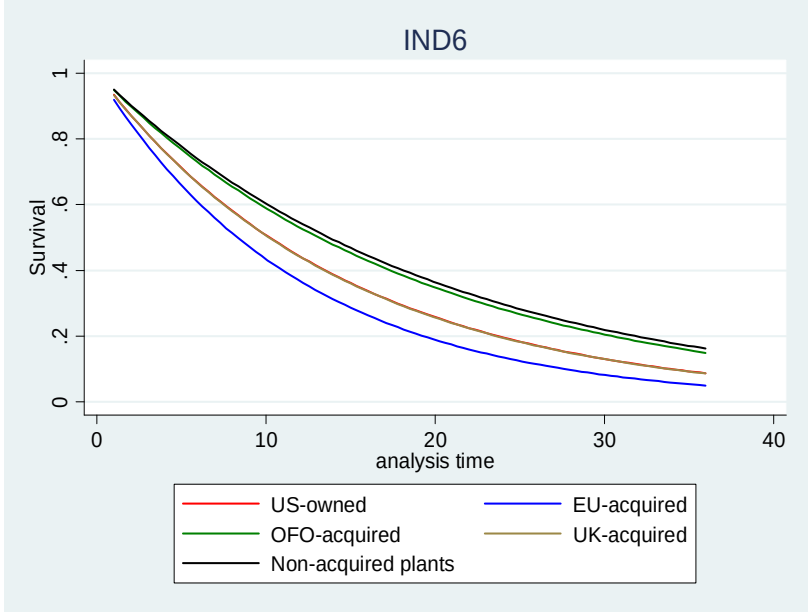
[90] These graphs were produced using the STCURVE command in STATA9.2.

Figure 10.1: Survival functions for acquired and non-acquired plants (based on model results in Table A10.1 and A10.2)

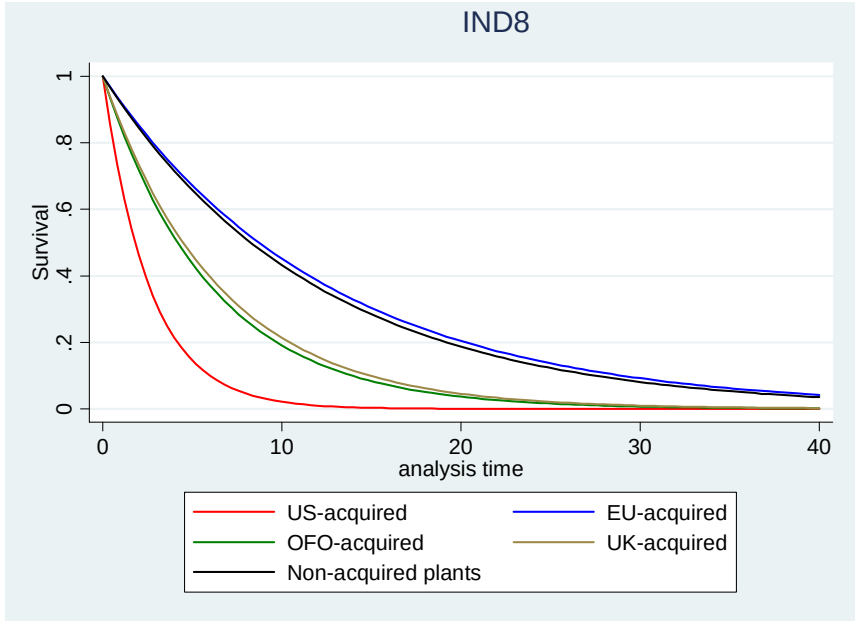


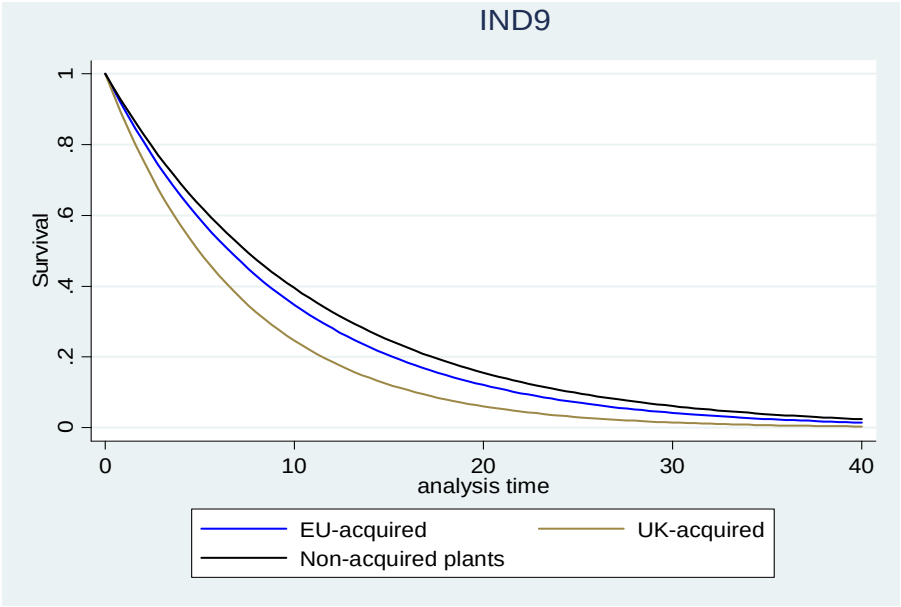


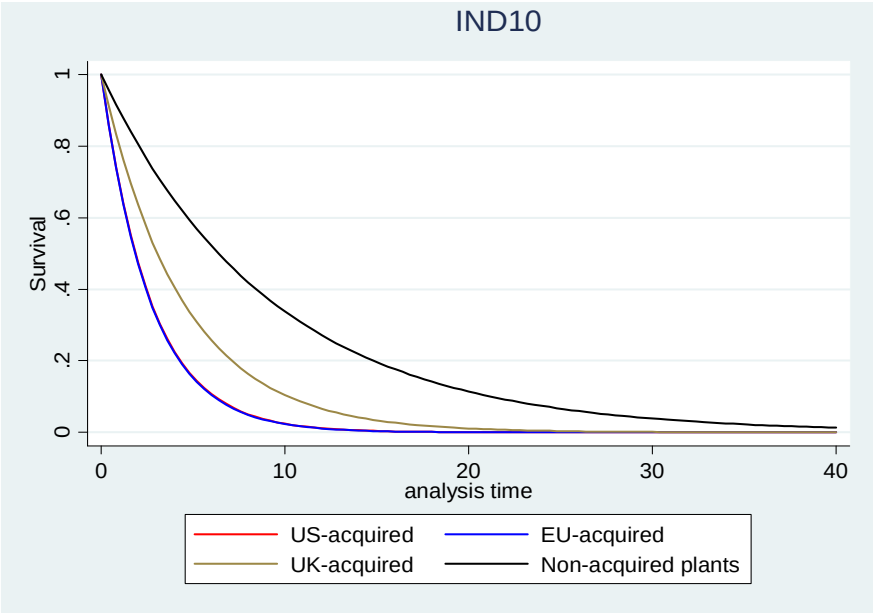

IND5
Survival
0
.2
.4
.6
.8
1
0
10
20
30
40
analysis time
US-acquired
EU-acquired
OFO-acquired
UK-acquired
Non-acquired plants

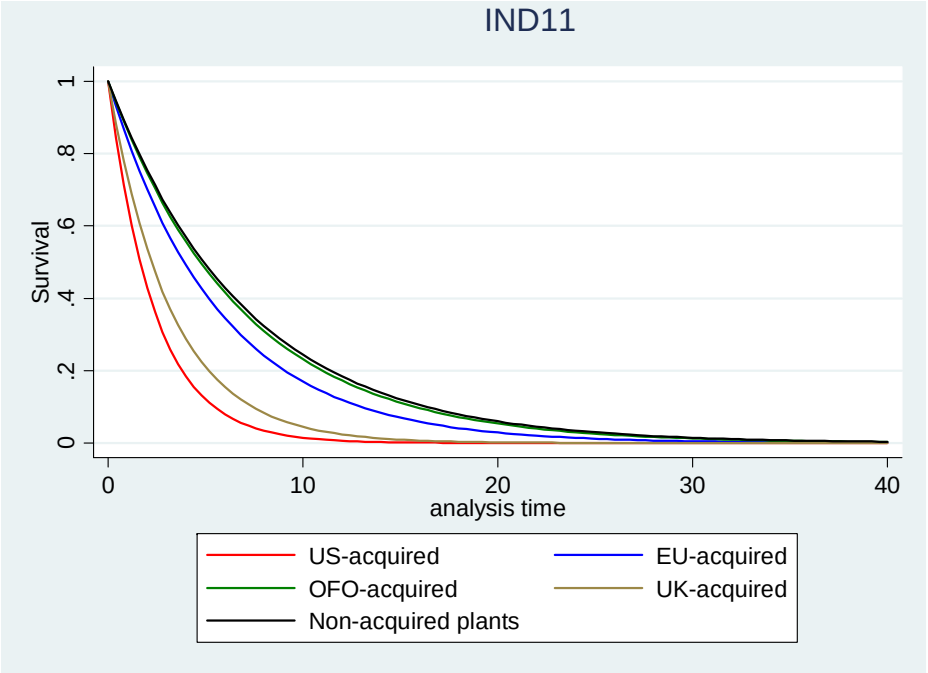

IND6
Survival
0
.2
.4
.6
.8
1
0
10
20
30
40
analysis time
US-owned
EU-acquired
OFO-acquired
UK-acquired
Non-acquired plants

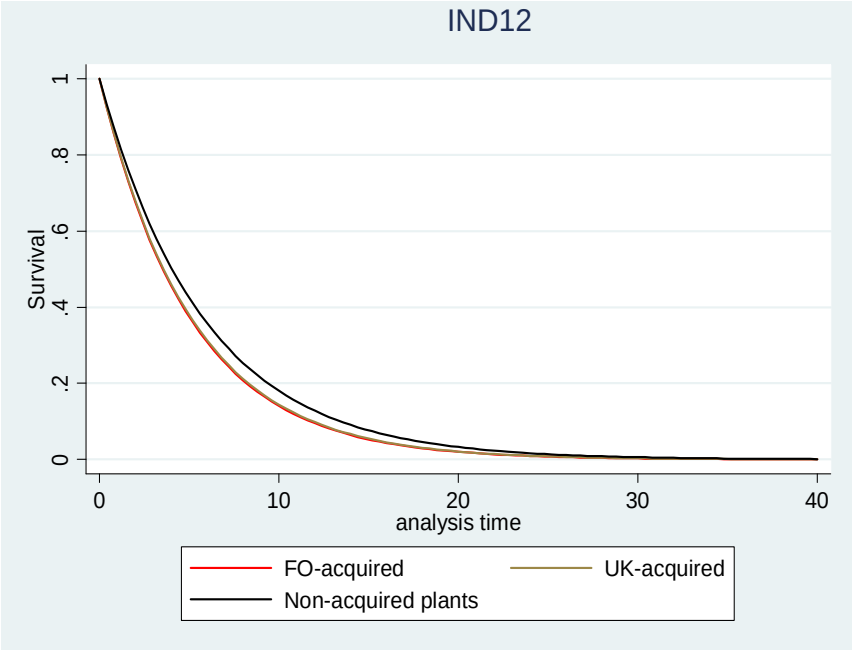
IND7
Survival
0
.2
.4
.6
.8
1
0
10
20
30
40
analysis time
US-acquired
EU-acquired
OFO-acquired
UK-acquired
Non-acquired plants


IND8
Survival
0
.2
.4
.6
.8
1
0
10
20
30
40
analysis time
US-acquired
EU-acquired
OFO-acquired
UK-acquired
Non-acquired plants


IND9
Survival
0
.2
.4
.6
.8
1
0
10
20
30
40
analysis time
EU-acquired
UK-acquired
Non-acquired plants


IND10
Survival
0
.2
.4
.6
.8
1
0
10
20
30
40
analysis time
US-acquired
EU-acquired
UK-acquired
Non-acquired plants


IND11
Survival
0
.2
.4
.6
.8
1
0
10
20
30
40
analysis time
US-acquired
EU-acquired
OFO-acquired
UK-acquired
Non-acquired plants


IND12
Survival
0
.2
.4
.6
.8
1
0
10
20
30
40
analysis time
FO-acquired
UK-acquired
Non-acquired plants

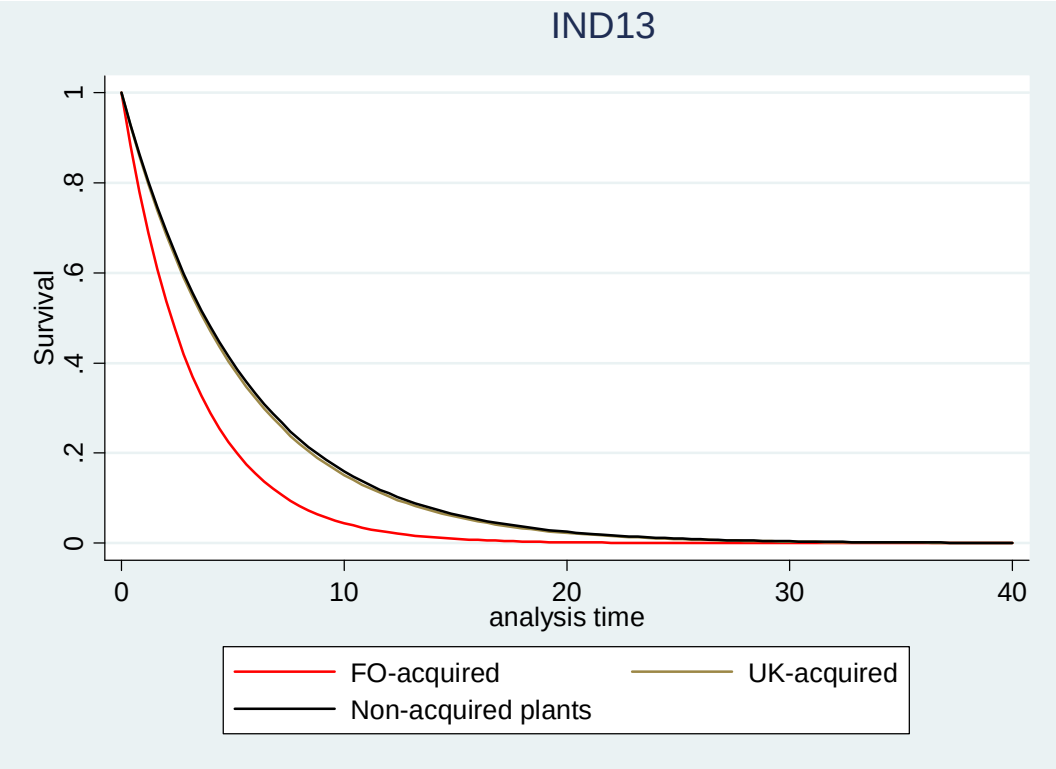
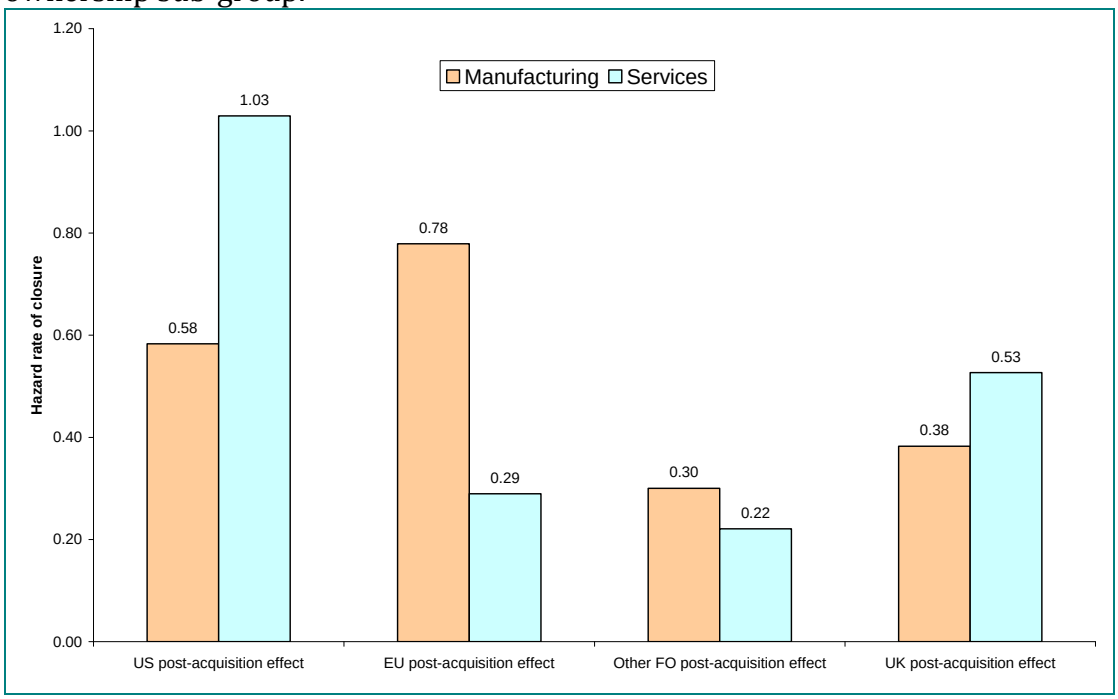


Figure 10.2: Average increase in probability of closure post-acquisition, by ownership sub-group.



Source: Tables 10.1 and 10.2

Table 10.3: Parameter estimates ($e^{\beta}-1$) of the weighted hazard model, 1995/8-2005 – foreign- and UK-owned acquired plants only (source Table A10.3)

	Manufacturing	z-value	Services	z-value
US-owned	-0.314	-1.70	-1.442	-11.67
EU-owned	-0.247	-1.42	-0.889	-7.16
Other FO	0.310	1.91	1.247	14.24
US post-acquisition effect	1.449	12.86	0.865	6.09
EU post-acquisition effect	1.692	17.26	0.487	4.25
Other FO post-acquisition effect	0.812	4.61	0.202	2.07
UK post-acquisition effect	1.445	24.33	0.986	39.72

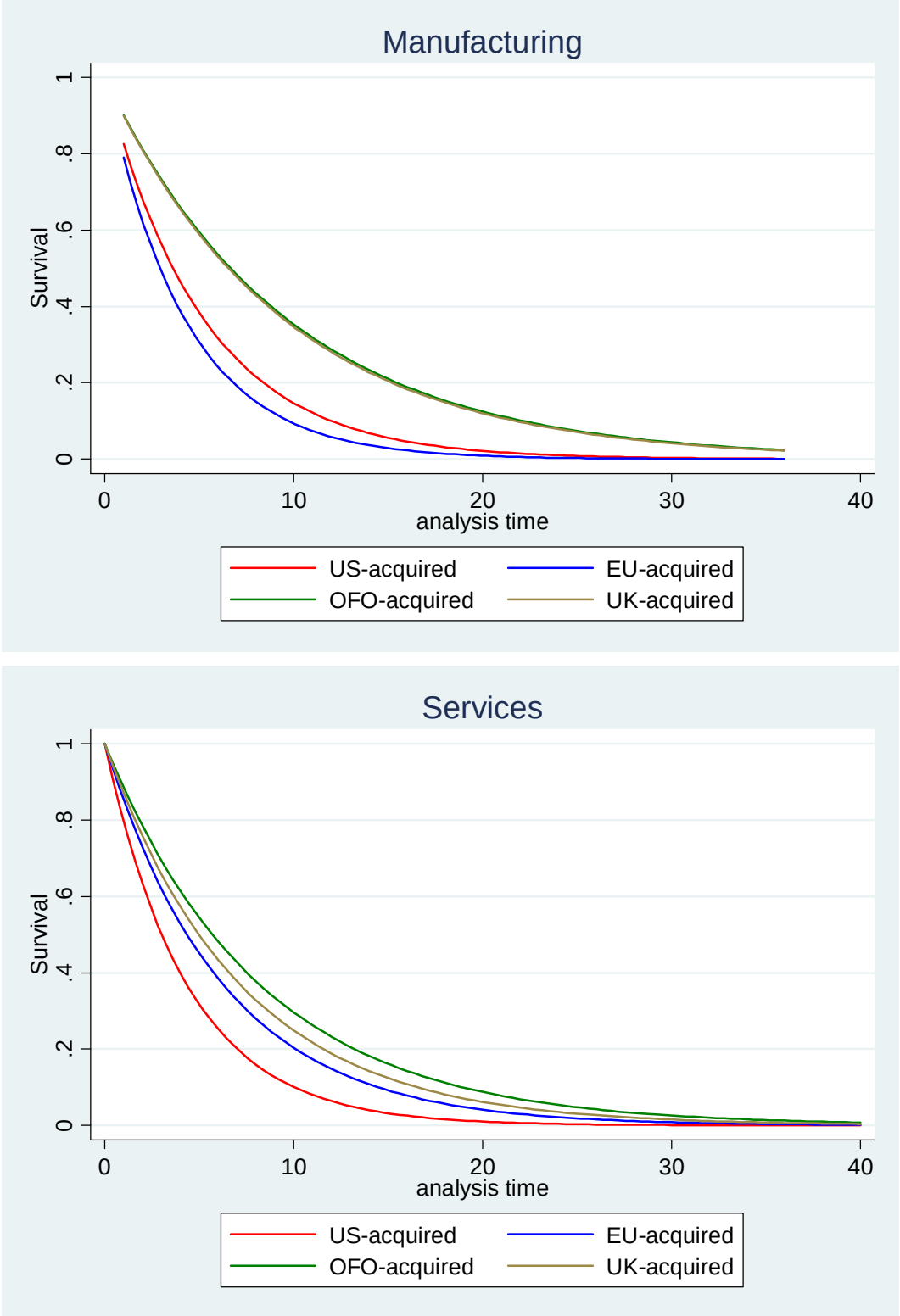
because this is too expensive vis-à-vis the likely price that would be obtained for such residual local units).

10.12 Finally, in an attempt to see if sample selection potentially changes the results obtained, the hazard model was re-estimated, using data for all manufacturing and all services industries and only those plants that were acquired during 1995-2000 (or 1998-2002 for services). Table A10.3 presents the full results, while Table 10.3 reproduces the estimates of most interest (and the survival functions for each acquired sub-group are shown in Figure 10.3).

10.13 For both sectors, plants that were US- or EU-owned were significantly less likely to close, while for those plants belonging to the other foreign-owned sector had a much higher probability of closure. For manufacturing, the results are different when compared to those presented in Table 10.1, where being US- or EU-owned had little overall impact, and there was evidence that other foreign-owned plants had a lower hazard rate.

10.14 As to post-acquisition effects, the hazard rate increased significantly after plants were taken over, in both sectors and all ownership groups. While there are differences in magnitude to those reported in Tables 10.1 and 10.2, the overall patterns are similar. This confirms that foreign ownership per se tends to confer benefits on plants, presumably as the (intangible) assets of the parent become available to the subsidiaries of MNEs; however, being acquired by another (foreign-owned) firm brings significant risks of closure, such as the acquired plant may be surplus to requirements, acquired to increase market power (and closing down capacity is one way of achieving an increase in the firms market share, given that this capacity was previously operated by competitors), or assimilation into the new organisation fails.

Figure 10.3: Survival functions for acquired plants (excluding non-acquired)



Summary and conclusions

10.15 This chapter has considered the evidence on whether plants that are acquired by foreign-owned MNEs experienced a higher probability (hazard) of closure post-acquisition. Given that the literature reviewed in Chapter 2 suggests that the probability of closure increase significantly when firm/plants are taken-over, there is an important potential link between 'brownfield' FDI the impact of foreign acquisitions on competition.

10.16 In order to model the determinants of plant closure, a Cox proportional hazard model was estimated using (weighted) unbalanced panel data for plants that existed in 1995-2000 (1998-2002 for services) but which operated during the full 1985-2005 (or 1997-2005) period [i.e. we do not include plants that closed before 1995 (1998 for services), nor plants that started post 2000 (2002)].

10.17 US-owned manufacturing plants overall had a higher probability of closure of around 2.6% (when compared to UK-owned plants, the benchmark group); EU-owned plants also had a higher hazard rate overall (6.5%); and plants owned by the other foreign-owned sub-group had a lower rate of closure (-17.8% overall).

10.18 As to the post-acquisition impact on closure in manufacturing, for US-acquired plants the probability of closure was over 58%; for EU-acquired plants the comparable figure is nearly 80%. Being acquired by a firm that was other foreign-owned also increased the hazard rate (overall by 30%).

10.19 For plants belonging to the service sector, the impact of ownership on plant survival is very different when compared to manufacturing. US-owned plants overall had a lower probability of closure of around -33.5%; EU-owned plants overall had a lower hazard rate of closure of some 21%; and the overall hazard rate of closure for plants that were owned by other foreign-owned firms was nearly 19% higher.

10.20 As to the post-acquisition impact on closure in services, being acquired by a foreign-owned firm had a significant and high impact on closure with overall a probability of closure at over 103% for US-acquired plants; for EU-acquired plants the comparable figure is nearly 29%; and for the other foreign-owned sector the comparable figure is 22.1%.

10.21 A detailed analysis of why being acquired by a foreign MNE has such a negative impact on a plant's survival rate deserves more in-depth analysis; but for a large number of cases examination of the 'raw' data in the ARD shows that foreign-owned firms tend to acquire other multi-plant businesses, and fairly quickly close down a number of the plants previously owned by the UK parent company. This may be the result of acquired plants being surplus to requirements; acquired to increase market power (and closing down capacity is one way of achieving an increase in the firms market share, given that this capacity was previously operated by competitors); or assimilation into the new organisation fails; or a combination of these and other factors.

10.22 Finally, in an attempt to see if sample selection potentially changes the results obtained, the hazard model was re-estimated, using data for all manufacturing and all services industries and only those plants that were acquired during 1995-2000 (or 1998-2002 for services). For both sectors, plants that were US- or EU-owned were significantly less likely to close, while for those plants belonging to the other foreign-owned sector had a much higher probability of closure.

10.23 As to post-acquisition effects, when only acquired plants are allowed to enter the hazard model, the probability of closure increased significantly after plants were taken over, in both manufacturing and services and all ownership sub-groups.

Table A10.1: Parameter estimates ($e^{\beta}-1$) of the weighted hazard model, manufacturing,1984-2005[a] (equation 10.1)

	IND1	z-value	IND2	z-value	IND3	z-value	IND4	z-value	IND5	z-value	IND6	z-value
US-owned	0.028	0.31	0.165	2.24	-0.057	-0.63	0.057	0.52	-0.088	-0.77	0.130	0.79
EU-owned	0.178	2.46	0.111	1.58	-0.017	-0.18	0.055	0.50	0.033	0.29	-0.014	-0.09
Other FO	-0.322	-3.86	-0.138	-1.67	-0.028	-0.29	-0.257	-2.07	-0.267	-2.52	0.079	0.50
US post-acquisition effect	0.462	3.01	0.441	3.43	0.377	2.19	0.740	2.97	1.208	7.48	0.289	1.47
EU post-acquisition effect	0.715	7.87	0.655	3.53	0.657	4.54	1.267	9.95	0.582	2.83	0.510	2.15
Other FO post-acquisition effect	0.160	0.70	0.412	1.75	0.187	0.91	0.781	3.32	-0.072	-0.27	0.046	0.09
UK post-acquisition effect	0.272	5.53	0.454	10.37	0.422	7.83	0.372	9.74	0.457	13.33	0.298	5.14
group 2	1.039	3.90	0.314	1.22	0.302	0.88	0.897	3.47	1.088	3.20	1.197	5.25
group 3	0.498	6.76	0.318	4.56	0.330	4.06	0.364	3.52	0.560	5.42	0.172	1.43
group 4	0.167	4.36	0.000	0.00	0.347	6.50	0.179	1.74	0.265	4.64	0.489	5.55
group 6	0.604	8.87	0.477	10.14	0.358	6.28	0.467	7.88	0.670	11.37	0.626	7.82
group 7	0.195	4.07	0.276	5.05	0.251	4.27	0.224	4.39	0.273	4.89	0.351	4.39
group 8	-0.216	-2.53	-0.414	-4.82	-0.258	-2.78	-0.090	-0.75	0.169	1.36	-0.437	-2.65
ln Growth	-0.121	-3.68	0.100	2.03	0.336	8.83	-0.682	-15.89	0.015	0.41	0.133	5.46
----"---- x AGE	0.016	3.53	0.064	8.97	0.007	1.51	0.055	9.83	0.031	7.66	-0.008	-2.25
ln Industry agglomeration	-0.003	-0.28	-0.041	-2.96	-0.015	-1.26	-0.033	-3.36	-0.021	-1.34	0.030	1.33
----"---- x AGE	-0.002	-1.32	0.006	3.17	0.001	0.37	0.004	3.20	0.006	3.11	-0.005	-1.29
ln Diversification	-0.047	-2.04	0.010	0.32	0.043	1.39	0.041	1.71	-0.017	-0.55	0.003	0.07
----"---- x AGE	0.003	1.25	-0.012	-3.37	-0.005	-1.67	-0.012	-3.99	-0.006	-1.74	0.002	0.41
ln employment	0.043	1.63	0.154	5.10	0.052	1.14	0.063	2.12	0.097	2.78	0.109	2.28
----"---- x AGE	-0.005	-1.83	-0.031	-11.06	-0.023	-6.90	-0.013	-5.30	-0.027	-7.75	-0.019	-4.15
ln Herfindahl	-0.164	-7.37	0.119	6.90	0.174	6.40	0.348	17.06	0.084	5.67	0.173	6.21
----"---- x AGE	0.017	5.89	0.020	10.53	0.001	0.29	0.027	11.00	0.022	10.33	0.025	8.29
ln Capital-labour ratio	0.267	18.60	0.147	12.31	0.068	4.57	0.180	14.05	0.130	10.81	0.155	8.05
----"---- x AGE	0.005	2.31	-0.009	-8.05	-0.003	-1.38	0.001	0.51	-0.004	-2.24	0.000	-0.16
ln opening employment	-0.107	-4.18	-0.255	-8.60	-0.144	-3.20	-0.138	-4.71	-0.195	-5.67	-0.190	-3.93
----"---- x AGE	0.006	2.46	0.018	6.33	0.012	3.62	0.012	5.02	0.018	5.32	0.007	1.52
ln TFP	0.087	5.06	-0.071	-4.50	0.054	2.60	-0.061	-3.72	-0.030	-2.11	-0.108	-4.16
----"---- x AGE	-0.019	-21.27	-0.013	-10.42	-0.011	-7.65	-0.014	-15.53	-0.015	-10.87	-0.012	-6.30
ln Displacement	-0.058	-3.98	0.116	8.12	0.103	6.71	0.145	10.69	0.195	14.98	0.109	6.91
----"---- x AGE	0.023	20.02	0.015	13.31	0.019	14.09	0.006	6.59	0.007	5.60	0.005	2.99
Single plant enterprise	-0.228	-3.02	-0.112	-2.11	0.010	0.16	-0.268	-4.22	-0.218	-3.35	-0.553	-5.69
----"---- x AGE	0.012	2.54	0.004	1.06	-0.009	-2.05	0.014	3.96	0.028	5.73	0.041	5.74

Constant	0.389	1.53	2.186	9.52	-0.184	-0.54	2.859	11.38	1.764	8.42	2.634	7.78
No. of Obs.	75,573		73,568		52,381		81,781		64,405		29,968	
No. of groups	17,579		29,051		13,525		20,027		21,935		12,152	
No. of closures	8,451		8,507		5,102		8,915		7,596		4,661	
Log pseudolikelihood	-8307.8		-7373.0		-4785.4		-8440.7		-6392.9		-2826.4	

[a] 3-digit industry and 26 regional dummies were included but results are not reported

Table A10.2: Parameter estimates ($e^{\beta}-1$) of the weighted hazard model, services, 1997-2005[a] (equation 10.1)

	IND7	z-value	IND8	z-value	IND9	z-value	IND10	z-value	IND11	z-value	IND12	z-value	IND13	z-value
US-owned	-2.453	-30.91	-0.531	-6.39	2.009	3.38	0.094	1.23	0.285	3.36	0.339	1.82	-0.497	-1.62
EU-owned	-1.369	-25.91	-0.233	-2.91	-0.699	-1.17	-0.401	-5.24	0.519	5.98	1.294	7.41	0.692	2.26
Other FO	1.395	27.20	0.309	3.86	0.927	1.56	-1.022	-13.21	-0.194	-2.31	-0.521	-2.87	-0.056	-0.18
FO post-acquisition effect	–	–	–	–	–	–	–	–	–	–	0.133	1.35	0.424	2.93
US post-acquisition effect	1.863	6.55	1.202	9.37	–	–	1.170	12.22	0.969	10.40	–	–	–	–
EU post-acquisition effect	1.222	7.14	-0.109	-1.34	-0.033	-0.23	1.082	14.12	0.072	0.50	–	–	–	–
Other FO post-acquisition effect	0.318	4.24	0.428	2.23	–	–	–	–	0.103	0.61	–	–	–	–
UK post-acquisition effect	0.761	19.06	0.446	14.73	0.577	25.11	0.649	37.65	0.704	27.52	0.087	3.50	-0.020	-0.52
group 3	0.242	3.55	-0.120	-1.70	-2.228	-21.38	0.997	14.62	0.120	2.05	0.038	0.55	0.795	7.05
group 4	0.890	3.63	1.237	16.35	-0.606	-1.21	0.656	19.55	0.738	10.24	0.274	3.74	0.563	2.41
group 6	1.060	9.65	0.740	11.87	0.831	5.70	1.023	10.62	0.907	14.57	0.604	4.71	0.814	6.46
group 7	-0.320	-7.06	-0.052	-1.49	-0.253	-7.83	-0.139	-5.20	0.103	3.34	-0.261	-7.25	0.355	10.32
group 8	0.548	6.66	0.668	9.74	-2.375	-28.34	1.403	22.55	-0.015	-0.19	-0.985	-8.90	-1.611	-6.72
ln Growth	-0.166	-4.18	-0.210	-6.09	-0.162	-2.74	0.169	10.20	0.118	8.07	0.029	0.73	0.518	16.69
----"---- x AGE	-0.008	-1.70	0.056	11.00	0.069	9.44	0.035	7.60	-0.034	-10.28	0.107	13.29	-0.030	-13.14
ln Industry agglomeration	-0.007	-0.65	-0.002	-0.45	0.043	2.18	0.019	3.68	-0.008	-2.33	0.009	1.56	-0.009	-1.73
----"---- x AGE	0.006	4.14	0.001	0.68	0.004	1.52	-0.001	-1.36	0.004	5.31	-0.001	-1.10	0.001	0.69
ln Diversification	0.219	1.88	0.120	1.43	-0.299	-3.07	-0.341	-5.92	-0.040	-0.79	0.250	3.00	-0.127	-1.94
----"---- x AGE	-0.019	-1.47	-0.001	-0.05	-0.025	-2.53	0.024	3.68	-0.017	-1.89	-0.031	-2.12	0.029	3.19
ln employment	-0.424	-8.10	-0.339	-8.19	-0.489	-11.97	-0.288	-14.80	-0.221	-8.88	-0.183	-8.50	-0.159	-4.10
----"---- x AGE	-0.027	-5.90	-0.007	-1.71	0.026	6.04	-0.004	-1.96	-0.021	-7.84	-0.004	-1.40	0.003	0.92
ln Herfindahl	0.697	16.54	-0.209	-11.26	0.546	9.41	0.615	29.73	-0.280	-19.84	0.131	10.63	-0.079	-8.70

----"---- x AGE	0.006	3.16	0.021	12.31	-0.156	-18.51	-0.009	-6.22	0.012	8.11	-0.013	-4.95	0.010	7.57
ln Capital-labour ratio	0.058	7.43	0.060	10.03	-0.044	-7.08	-0.001	-0.19	0.072	17.38	0.085	15.55	0.065	9.96
----"---- x AGE	-0.011	-8.86	0.003	2.21	0.014	10.18	-0.002	-2.61	-0.004	-3.96	0.002	1.15	0.009	7.22
ln opening employment	0.016	3.59	0.004	1.12	-0.018	-4.18	-0.004	-1.71	0.008	3.20	0.001	0.39	-0.013	-4.24
----"---- x AGE	0.177	3.35	0.100	2.42	0.266	6.40	0.131	6.76	0.072	2.92	-0.017	-0.77	0.067	1.72
ln TFP	-0.067	-6.04	-0.109	-15.70	0.149	10.01	0.049	6.88	-0.072	-12.74	-0.058	-7.38	-0.034	-5.34
----"---- x AGE	-0.004	-4.02	0.001	0.87	-0.040	-21.97	-0.009	-15.32	0.001	1.85	-0.009	-7.47	0.001	2.83
ln Displacement	0.059	3.69	0.029	2.57	0.047	4.39	-0.037	-4.01	0.009	1.06	-0.180	-10.42	-0.097	-6.68
----"---- x AGE	-0.008	-4.69	-0.012	-10.00	-0.018	-14.93	-0.028	-22.12	0.002	1.46	-0.008	-2.93	-0.009	-5.80
Single plant enterprise	1.130	10.12	1.192	18.21	0.385	2.59	0.678	6.94	0.837	12.92	0.915	6.89	0.831	6.52
----"---- x AGE	-0.214	-34.00	-0.176	-39.35	-0.078	-12.91	-0.136	-33.25	-0.140	-35.65	-0.121	-21.48	-0.103	-20.49
Constant	2.420	11.27	-0.147	-1.41	-1.468	-6.82	0.103	0.90	-1.149	-13.29	0.425	3.85	-1.180	-11.89
No. of Obs.	69,518		127,259		111,597		170,191		109,143		96,404		102,492	
No. of groups	36,780		63,847		23,843		71,648		77,402		40,830		88,621	
No. of closures	12,122		20,725		11,535		30,719		35,639		20,792		48,843	
Log pseudolikelihood	-10948.2		-18645.2		-14381.9		-34975.0		-23719.5		-20222.3		-25647.3	

[a] 3-digit industry and 26 regional dummies were included but results are not reported

Table A10.3: Parameter estimates ($e^{\beta}-1$) of the weighted hazard model, 1995/8-2005[a] (equation 10.1) – foreign- and UK-owned acquired plants only

	Manufacturing	z-value	Services	z-value
US-owned	-0.314	-1.70	-1.442	-11.67
EU-owned	-0.247	-1.42	-0.889	-7.16
Other FO	0.310	1.91	1.247	14.24
US post-acquisition effect	1.449	12.86	0.865	6.09
EU post-acquisition effect	1.692	17.26	0.487	4.25
Other FO post-acquisition effect	0.812	4.61	0.202	2.07
UK post-acquisition effect	1.445	24.33	0.986	39.72
ln Growth	-0.082	-1.96	0.323	17.09
----"---- x AGE	0.016	3.25	-0.018	-8.09
ln Industry agglomeration	-0.024	-1.20	0.012	1.30
----"---- x AGE	0.002	0.56	0.001	0.99
ln Diversification	-0.024	-0.54	-0.080	-0.90
----"---- x AGE	0.004	0.71	-0.002	-0.25
ln employment	0.099	3.03	-0.258	-14.12
----"---- x AGE	-0.009	-3.46	-0.007	-4.82
ln Herfindahl	0.148	4.83	0.036	1.78
----"---- x AGE	-0.004	-1.03	0.001	1.31
ln Capital-labour ratio	0.010	2.92	0.107	13.65
----"---- x AGE	-0.007	-5.93	-0.007	-10.30
ln opening employment	-0.123	-3.85	0.117	6.47
----"---- x AGE	-0.011	-2.41	-0.001	-0.50
ln TFP	-0.139	-4.81	-0.055	-4.59
----"---- x AGE	-0.021	-10.60	-0.002	-4.17
ln Displacement	0.230	12.26	-0.313	-20.24
----"---- x AGE	-0.008	-3.30	-0.006	-67.19
Single plant enterprise	-0.199	-1.96	1.130	10.35
----"---- x AGE	-0.000	-0.00	-0.158	-59.66
Constant	3.344	7.99	-1.650	-9.44
No. of Obs.	31,561		206,978	
No. of groups	9,201		67,066	
No. of closures	3,921		27,705	
Log pseudolikelihood	-2620.1		-21662.6	

[a] 3-digit industry and 26 regional dummies were included but results are not reported. Note manufacturing covers 1995-2005.

11. Impact of foreign acquisitions on Herfindahl index

11.1 The final task is to consider the effect of foreign acquisitions/mergers on firm concentration.[91] The latter is measured here using a Herfindahl index (i.e. the sum of the squared market shares of each firm in an industry)[92] and here we decompose this index to show the contributions of various sub-groups (including foreign-owned firms that opened, closed or continued throughout) using real gross output data from the ARD covering 1997-2005.

11.2 Given that inward FDI is more concentrated in certain industries, and given the results from the last chapter that confirm that post-acquisition there is a significant increase in the hazard rate of closure, it should be possible to see if closures have had an important impact on reducing market competition in UK industries.

11.3 We start by presenting the Herfindahl index for 2005 (multiplied by 100), covering 32 (non-disclosive) 1992 SIC 2-digit industries, broken-down into UK- and foreign-owned plants (Figure 7.1). The sum of these two ownership sub-groups gives the overall Herfindahl index (i.e., the first figure presented in Figure 7.1). As can be seen, most industries have fairly low levels of concentration, as the reciprocal of the index indicates the "equivalent" number of firms in the industry (e.g., in air transport there are just over 5 “equivalent” firms of equal-size). For over 80% of the industries covered, there are more than 20 ‘equal-sized’ firms producing in each market, implying significant competition (for 50% of the industries there are more than 100 ‘equivalent-sized’ firms in operation).[93]

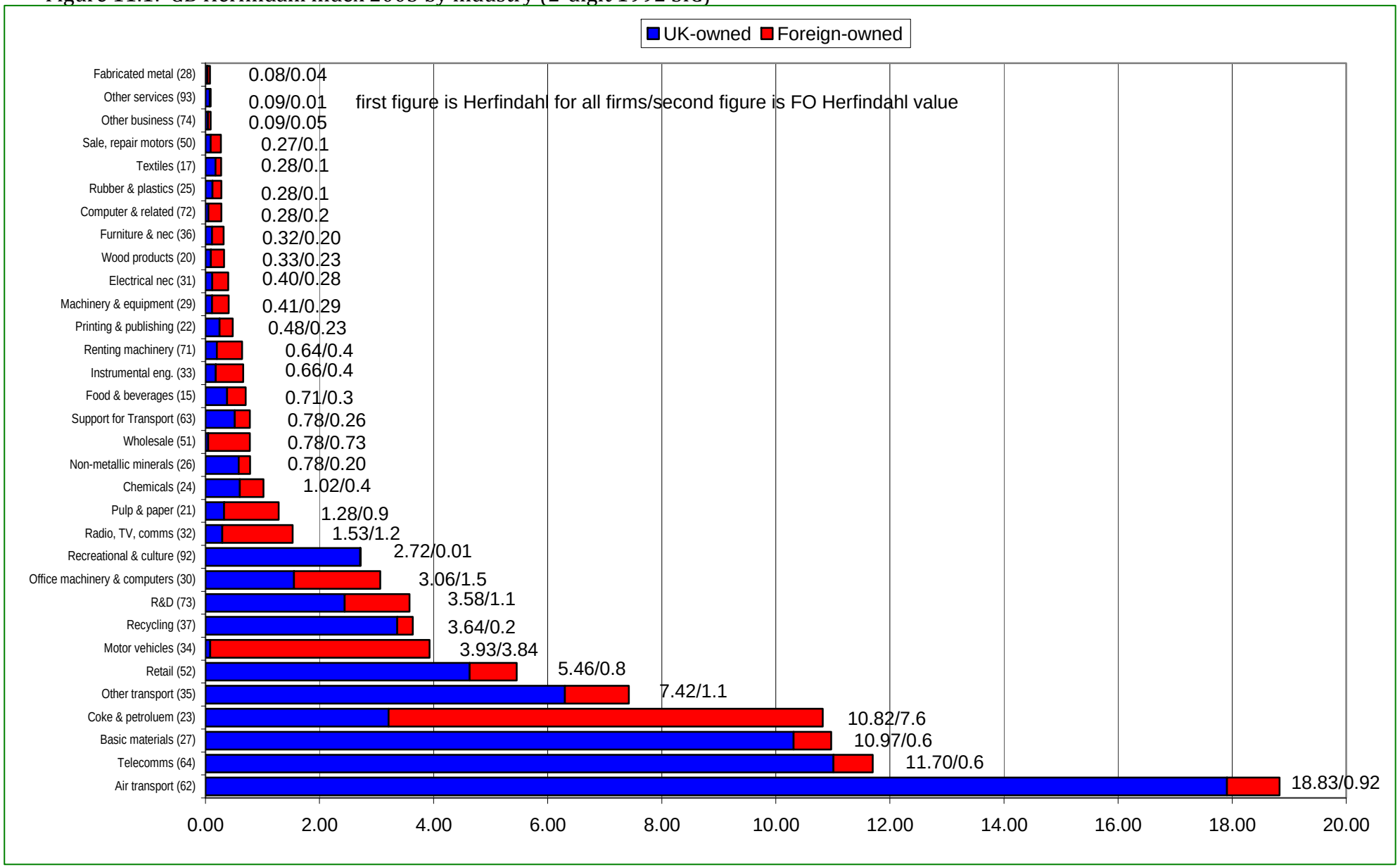
11.4 Figure 11.1 also shows the relative contribution to the overall Herfindahl index of firms that were foreign-owned. In Motor vehicle manufacturing (SIC34), the foreign-owned contribution to the Herfindahl index is nearly 98% of the total figure. Foreign-owned firms also dominate wholesale trade (94%); computer software & related, and radio, TV and communications manufacturing (both 81%); and several industries have around 70-75% of their total

[91] The original requirement was to look at sectoral impacts, and disaggregate these to see if there were differences by country of origin and/or across UK regions. However, because of the way the Herfindahl index is calculated, and the relatively small numbers of observations involved when the data is disaggregated, considering the country or origin and/or region would not pass the ONS disclosure test for the ARD data. Thus results are not available.

[92] There are different measures of concentration that can be used, such as the industry share of the *n* largest firms (referred to as an *n*-firm Concentration ratio), but the most popular measure is the Herfindahl index (which has been shown by Hannah and Kay, 1977, to have more desirable properties than other indices, and it is also consistent with the Cowling and Waterson, 1976, model of oligopoly).

[93] Note, in the US a Herfindahl index above 18% is considered to be high, indicating a market where competition is significantly curtailed. In the EU the focus is on the level of change; for instance that concern is raised if there's a "2.5%" change when the index already shows a concentration of "10%".

Figure 11.1: GB Herfindahl index 2005 by industry (2-digit 1992 SIC)



index attributable to foreign-owned companies (e.g., coke & petroleum, pulp & paper manufacturing, instrumental engineering, machinery & equipment manufacture, electrical engineering, and the manufacture of wood products).

11.5 The basic Herfindahl index can be decomposed into 8 sub-groups, covering 1997 and 2005; these are set out in Table 11.1.[94] The index in each year is composed of firms in operation in that year, but it is possible to distinguish between ownership sub-groups (including whether a firm changed ownership). Then for separate years, those firms in operation in only a particular year are added; when changes in the Herfindahl index are considered 1997-2005, those firms that only operated in 1997 will have closed by 2005, and similarly, those firms only operating in 2005 will have opened by 2005 (hence the labels used in the table for these sub-groups).

Table 11.1: Herfindahl sub-groups

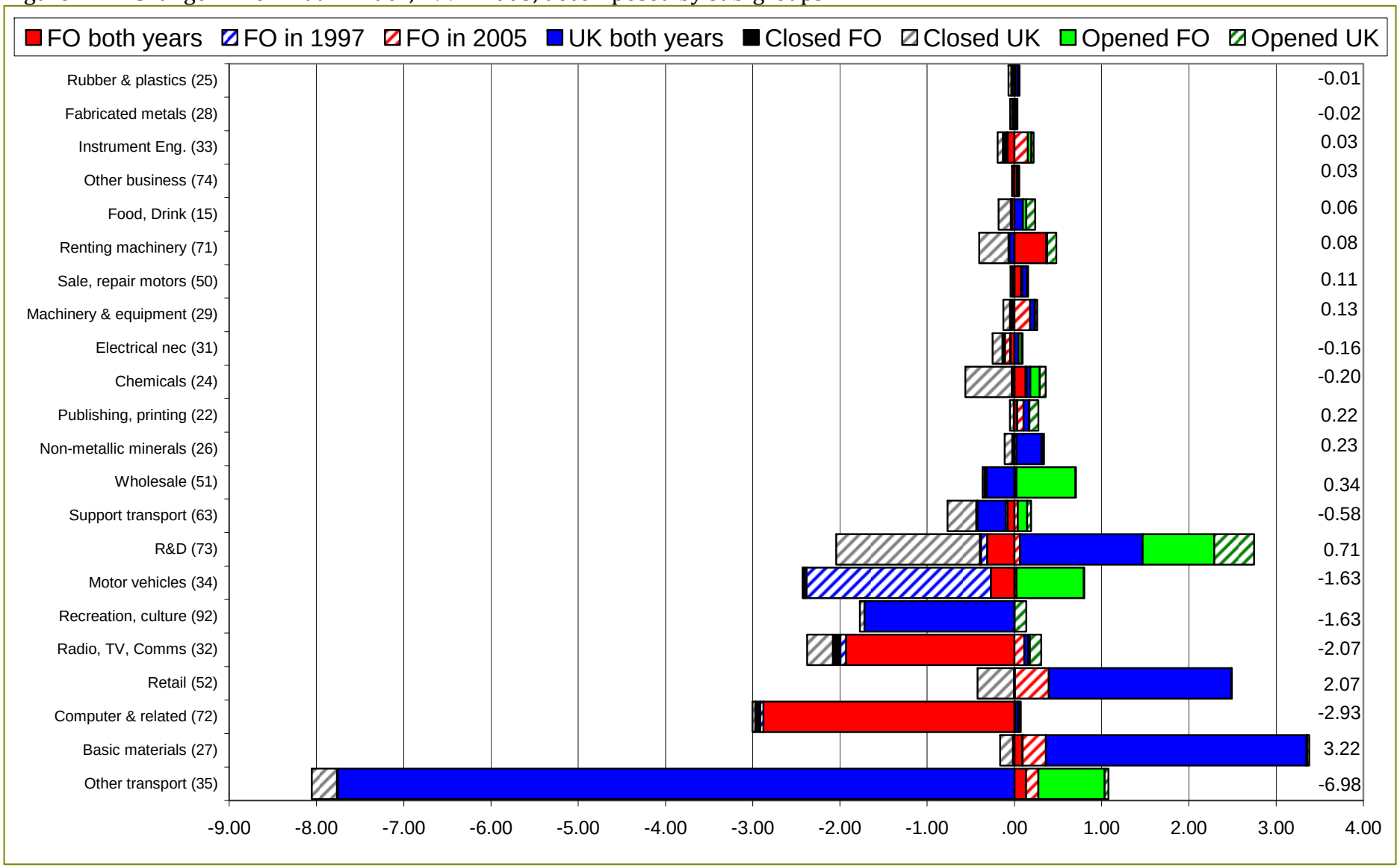
Herfindahl index for 2005	Herfindahl index for 1997
Firms in operation in 1997 and 2005: foreign-owned both years	
Firms in operation in 1997 and 2005: foreign-owned in 2005 (not 1997)	
Firms in operation in 1997 and 2005: foreign-owned in 1997 (not 2005)	
Firms in operation in 1997 and 2005: UK-owned both years	
Firms in operation in 2005 (not 1997): foreign-owned ("opened FO")	Firms in operation in 1997 (not 2005): foreign-owned ("closed FO")
Firms in operation in 2005 (not 1997): UK-owned ("opened UK-owned")	Firms in operation in 1997 (not 2005): UK-owned ("closed UK-owned")

11.6 Using the sub-groups in Table 11.1, it is possible to consider changes in the Herfindahl index over time and consider the contributions of each sub-group to this change. Figure 11.2 shows that in about half of the industries considered,[95] there was a fall in industry concentration. The largest fall (of some 7%) was in the other transport (SIC35) sector, which includes aircraft manufacturing; as can be seen, most of this decline was due to a fall

[94] Because the ARD only samples some 10-15% of all reporting units each year (rather than all of them), comparing output levels (and hence market shares) across time is problematic. A firm can be in operation (as shown in the ARD), but only output is reported for only some of the time span covered. When this happens (as it did here), one solution is to interpolate the share of output of the non-selected reporting units. This is done by using the population-weighted total output for the industry, and the total output of selected reporting units (since by definition, the output to be interpolated to non-selected RU's is simply total population output less selected RU output). Interpolation was achieved by predicting (using a regression model) the share of each non-selected RU based on its employment size, whether foreign-owned, year, and 2-digit SIC group (since these factors are known to be significantly related to output shares); the total output predicted for an industry was then constrained to equal the total of the non-selected output that initially needed to be allocated.

[95] Note, the results for only 22 of the 32 industries included in Figure 11.1 can be reported; the other 10 industries do not pass ONS 'disclosure tests'.

Figure 11.2: Change in Herfindahl index, 1997-2005, decomposed by sub-groups



(of nearly 7.8%) in the Herfindahl index (and hence market shares squared) of firms that were open in both years and which were UK-owned.[96] Other sub-groups in the other transport industry contributed relatively little to the fall in the index, although new foreign-owned greenfield firms (i.e. those opened after 1997) did contribute 0.76% to the overall change in the index. However, firms in operation in 1997 that were acquired by foreign-owned MNEs during the period only contributed 0.14%, which was less than one-fifth of the contribution of greenfield foreign-owned firms.

11.7 When foreign-owned firms did contribute a significant part to the overall change in industry concentration, this was either through a decline in the market shares of those firms open in both years (cf. computer & related, and radio, TV and telecommunications manufacturing); or there was a decline in market share of firms that were foreign-owned in 1997 but had been sold to UK-owned firms (or 'bought-out' by UK workers) by 2005 (cf. motor vehicle manufacturing). The other significant contribution comes from the opening of new foreign-owned greenfield firms (cf. motor vehicle manufacture and R&D sector).

11.8 The closure of foreign-owned firms played no significant role in any of the industries covered. However, it is more likely (given the results reported in the last chapter) that the closure of *plants* previous owned by UK companies are likely to be more important – if at all – leading to possible increases in concentration levels if they reduce industry capacity. Such changes at the plant level would mostly show up in Figure 11.2 as some part of the decline in the index attributable to firms that were either UK-owned throughout (i.e. covering those plants that were sold to foreign-owned firms *within* the period, which were then closed), or UK-owned firms in 1997 that were closed by 2005 (i.e. they were acquired by foreign-owned firms and most or all of their production capacity was shut-down). To disentangle the impact of changes in plant ownership between firms, and the subsequent impact of this on concentration levels, would require the tracking of every change in plant ownership on a year-by-year basis, and linking these plants back to their 1997 and 2005 output levels. Besides this being a very large task, it is also likely that there would be problems undertaking such a task using the ARD. Firstly, gross output data is only available for a sample of selected reporting units each year (however see footnote 94 for a way of overcoming this problem); secondly, there are likely to be disclosure problems since the ONS require any statistic that is reported to be based on at least ten respondents. Nevertheless, measuring the impact of *plant* closures on firm market shares is worthy of more work (or at least an investigation into the feasibility of this type of work).

11.9 Whether the task should be undertaken also depends on whether there is any a priori expectation that the output shares of foreign-owned firms are increasing, and that this is (at least in part) due to closing previously UK-owned plants. Figure 11.2 shows that for the industries covered, changes in

[96] Note the fall of nearly 7.8% in the Herfindalh index for this group suggests that actual market share (based on real gross output) declined by over 60%.

the Herfindahl index were generally small. And perhaps more importantly, there is little evidence that relative declines in the market shares of UK-owned firms was being matched by increases in the market shares of foreign-owned companies; where market shares did increase in the foreign-owned sector it was attributable to new greenfield investments.

Summary and conclusions

11.10 The final task is to consider the effect of foreign acquisitions/mergers on firm concentration, as measured using a Herfindahl index that can be decomposed to show the contributions of various sub-groups (especially foreign-owned firms that opened, closed or continued throughout).

11.11 Using the Herfindahl index for 2005, covering 1992 SIC 2-digit industries, the data shows that most industries have fairly low levels of concentration: for over 80% of the industries covered, there are more than 20 'equal-sized' firms producing in each the market, implying significant competition (for 50% of the industries there are more than 100 'equivalent-sized' firms in operation).

11.12 The relative contribution to the overall Herfindahl index of firms that were foreign-owned was also considered. In Motor vehicle manufacturing, the foreign-owned contribution to the Herfindahl index is nearly 98% of the total figure. Foreign-owned firms also dominate the wholesale trade sector; the computer software & related industry; radio, TV and communications manufacturing; coke & petroleum products; pulp & paper manufacturing; instrumental engineering; machinery & equipment manufacture; electrical engineering; and the manufacture of wood products.

11.13 The basic Herfindahl index for each industry was decomposed into various sub-groups, so that changes in the index 1997-2005 that are attributable to foreign-ownership could be analysed. In about half of the industries considered, there was a fall in industry concentration. The largest fall (of some 7%) was in the other transport sector with most of this decline being due to a decline in the market shares of UK-owned firms that were open in both 1997 and 2005. Other sub-groups in the other transport industry contributed relatively little to the fall in the index, although new foreign-owned greenfield firms (i.e. those opened after 1997) did contribute 0.76% to the overall change in the index. Firms in operation in 1997 that were acquired by foreign-owned MNEs during the period only contributed less than one-fifth of the contribution of greenfield foreign-owned firms.

11.14 When foreign-owned firms did contribute a significant part to the overall change in industry concentration, this was either through a decline in the market shares of foreign-owned firms open in both years (cf. computer & related, and radio, TV and telecommunications manufacturing); or there was a decline in market share of firms that were foreign-owned in 1997 but had been sold to UK-owned firms (or 'bought-out' by UK workers) by 2005 (cf. motor vehicle manufacturing). The other significant contribution comes

from the opening of new foreign-owned greenfield firms (cf. motor vehicle manufacture and R&D sector).

11.15 In summary, for the industries covered, changes in the Herfindahl index were generally small. And perhaps more importantly, there was little evidence that relative declines in the market shares of UK-owned firms was being matched by increases in the market shares of foreign-owned companies; where market shares did increase in the foreign-owned sector it was attributable to new greenfield investments.

[this page is blank to allow double-sided printing Save Paper]

12. Summary and conclusions

12.1 This project has looked at the effect of foreign M&As on the micro-level performance of British industry in recent years, using detailed panel data drawn from the ARD. Such data have permitted the identification of which plants were acquired, and the econometric analysis of the impact of such 'brownfield' investment on productivity, employment, profitability, wages, plant closures, and competition (as measured by industrial concentration).

12.2 In each area, there is a consideration of whether foreign-owned MNEs acquired the 'best' plants (i.e., most productive, profitable, largest, highest waged), and what was the impact on post-acquisition performance – did M&As result in improvements or not?

12.3 A review of the literature established the following key results based on a limited number of studies that have been conducted in this area:

12.3.1 There is no overwhelming consensus on whether 'cherry-picking' (versus 'lemons buying') occurs with respect to the productivity levels of plants/firms pre-acquisition (this is likely to vary by sector, country, and time-period). However, foreign acquisition was generally found to exert more of a positive and significant impact on the acquired firm's post-takeover productivity.

12.3.2 There is some evidence that foreign acquirers cherry-picked more profitable domestic targets, but there is mixed evidence on the post-acquisition impact.

12.3.3 The empirical evidence on the probability of plant closure following acquisition by a foreign-owned company is almost universally that it increases significantly.

12.3.4 Foreign-owned firms seem more likely to target firms that are already similar in size to existing (relatively large) foreign affiliates, while most studies have found foreign M&As have a negative effect on employment in acquired firm over time.

12.3.5 Foreign subsidiaries are more likely to select domestic firms for takeover that also pay higher wages, and in a number of studies there is a further post-acquisition wage premium paid to workers. However, there were other studies that have found no significant impact of foreign acquisition on wages, while others note that any wage premiums appear to mirror the productivity advantage of the acquired firms.

Which plants were acquired?

12.4 With regard the results presented in **Chapter 6** on the 'cherry picking' hypothesis, manufacturing plants acquired during 1995-2000 were on balance likely to have lower productivity (even for plants acquired by US

companies). When the TFP distributions (based on the predicted TFP of each plant obtained from model estimations) are considered, these show that compared to non-acquired plants, in most manufacturing industry groups acquired plants had *higher* TFP at lower- to middle-sections of the productivity distribution.

12.5 Thus, while econometric modeling shows that foreign-owned firms were not as involved in 'cherry-picking' manufacturing plants as might have a priori been predicted, this can be explained (at least in part) by the relatively higher levels of TFP of non-acquired plants at the top end of the TFP distribution; 'cherry-picking' occurs but not of the very best plants but rather those in the mid- to lower-end of the productivity spectrum.

12.6 As to whether foreign-owned firms 'cherry-picked' the best UK service sector plants, the econometric results showed that this was certainly true in a small number of industries, but the evidence is generally mixed, with overall more of a tendency for less productive plants to have been acquired.

12.7 In **Chapter 7** we tested the hypothesis that in terms of employment foreign-owned firms targeted larger UK manufacturing plants for acquisition, in general the results suggest that for the US- and EU-owned sub-groups, they tended to acquire larger plants to add to their stock of already above average-sized plants; while plants acquired by the other foreign-owned sector tended to be on average larger, although their existing stock generally comprised relatively smaller plants. Overall, these results are similar to those reported in the literature.

12.8 As to whether foreign-owned firms in the service sector acquired larger or smaller plants, in aggregate there was little difference with non-acquired plants. However, this masks considerable differences at the industry level; for example, US-acquired plants in retailing were significantly larger, but EU-acquired plants in the sale & maintenance of motors were some 55% smaller. In the other foreign-owned sub-group, acquired plants were smaller in sale & maintenance of motors, and renting equipment, computers and management-type services, but again much larger (about double the size) in retailing.

12.9 **Chapter 8** looks at whether foreign-owned firms targeted higher wage UK manufacturing plants for acquisition: in the US-owned sub-group the overall results suggest that plants acquired paid an additional 8% wage premium. For the EU-owned acquisition sub-group, the plants acquired were more likely to pay lower wages (on average some 3% lower). Finally, the picture for the other foreign-owned group of acquired plants was comparable wage rates paid in 4 of the 6 industries covered, and wages of between 11-15% lower in 2 sectors. In general, these results suggest that manufacturing plants that were then acquired by foreign-owned multinationals were on balance likely to pay similar or lower wages except if the plant was acquired by a US multinational.

12.10 Turning to whether foreign-owned firms targeted higher wage UK service sector plants for acquisition, for US-acquisitions the overall results suggest an additional 24% wage premium was paid. For EU-acquired plants, there

was an overall wage premium for acquired plants of around -7%; and for the other foreign-owned group of acquired plants results were more mixed, with an overall impact averaging out across all sectors of some 11% higher wages.

12.11 As to whether foreign-owned firms targeted more profitable UK manufacturing plants for acquisition, **Chapter 9** shows that in the US- and EU-owned sub-groups there is little evidence that this was the case. Overall, other foreign-owned acquired plants were some 9% less profitable. Thus there is little evidence of any 'cherry-picking' on the basis of the profitability of acquired plants.

12.12 Turning to whether foreign-owned firms targeted UK service sector plants with higher profits for acquisition, for US-acquisitions the overall results suggest an additional 44% profits premium. For the EU-owned acquisition sub-group, there was no difference in 6 of the 7 sectors included. The picture for the other foreign-owned group of acquired plants was no statistical difference in any sector. In those industries where it was not possible to disaggregate foreign-owned into sub-groups, the results show that retailing plants acquired by the foreign-owned achieved 55% higher profitability, while those in other business services had lower profits (of some 71%). 'Cherry-picking' associated with profitability, to the extent that it occurred in the service sector, was confined to a small number of industries and differed by ownership group.

12.13 In summary, this study finds limited evidence in favour of foreign M&As cherry-picking more productive plants, but they did generally acquire relatively larger plants (in employment terms), especially in manufacturing. However the wage rate in acquired plants tended to be similar, or lower, except mostly in US-acquisitions. There was little by way of strong evidence that the most profitable plants were 'cherry-picked', except in US-acquisitions in the service sector. In fact, as can be surmised, acquisitions by US multinationals tended to be the exception: such M&As tended to be of plants that paid higher wages, have higher profits, more employment, but – perhaps surprisingly - not exhibit higher productivity.

Post-acquisition effects

12.14 As to the productivity of acquired plants post-acquisition, in manufacturing there was little change in TFP in US- and UK-acquired plants; while in EU- and other foreign-owned plants TFP was declining and this trend generally continued over time. This suggests that when acquiring plants from the middle- and lower-end of the TFP distribution (albeit with relatively better TFP than non-acquired plants), foreign-owned firms were not able (or did not attempt) to enhance their relative levels of TFP.

12.15 For services the overall picture is initially there were TFP gains for US- and EU-acquired plants, but these improvements dissipated over time (although for EU-acquisitions they were not entirely lost, as happened in the US-acquired plants). Service sector plants acquired by other foreign-

owned firms saw very large initial gains in TFP just before and in the period of acquisition, but over time this fell back to around a 10% longer-term gain. Overall the situation in services was fairly immediate gains which then tapered-off, except in US-acquired plants which become worse over time. Furthermore, it is probable that these immediate TFP gains in services, at- and post-acquisition, reflect the lower relative productivity of such plants when acquired. However, it is perhaps of concern that such relative gains were not sustainable.

12.16 As to the time-profile of employment associated with manufacturing plants that were acquired, these plants saw a general improvement (especially in other foreign-owned plants, with some evidence of a step-change post-acquisition towards higher employment in US- and EU-acquired plants).

12.17 In services, the overall picture shows there was little change (or slightly falling employment), except in US-acquired plants which saw significant employment size gains, before falling back after about the 4th year.

12.18 As to the post-acquisition wage effect: in manufacturing, wage rates were higher in all ownership sub-groups, but particularly in US-acquired plants where the longer-term wage premium was some 12%; in services, the overall picture is longer term post-acquisition wage gains for US- and other FO- acquired plants, of around 5-8%. In EU-acquired plants the overall impact in the service sector was a 11% decline post-acquisition.

12.19 In manufacturing, post-acquisition profitability was higher in US- and EU-acquired plants, where the longer-term premium was some 25-29%. As to the post-acquisition profit effect in services, the overall picture is a longer term post-acquisition profits decline for US- and EU- acquired plants, of around 11-25%. In plants acquired by the other foreign-owned ownership group the overall impact in the service sector was a 29% increase post-acquisition.

12.20 Turning to the effect of acquisition on plant closure, **Chapter 10** shows that for US-acquired manufacturing plants the probability of closure was over 58%; for EU-acquired plants the comparable figure is nearly 80%. Being acquired by a firm that was other foreign-owned also increased the hazard rate (overall by 30%).

12.21 As to the post-acquisition impact on closure in services, being acquired by a foreign-owned firm had a significant and high impact on closure with overall, having controlled for other effects, a probability of closure at over 103% for US-acquired plants; for EU-acquired plants the comparable figure is nearly 29%; and for the other foreign-owned sector the comparable figure is 22.1%.

12.22 A detailed analysis of why being acquired by a foreign MNE has such a negative impact on a plant's survival rate is needed; but for a large number of cases examination of the 'raw' data in the ARD shows that foreign-owned firms tend to acquire other multi-plant businesses, and fairly quickly close down a number of the plants previously owned by the UK parent company. This may be the result of acquired plants being surplus to requirements; they are acquired to increase market power (and closing down capacity is

one way of achieving an increase in the firms market share, given that this capacity was previously operated by competitors); or assimilation into the new organisation fails; or a combination of these and other factors.

12.23 In summary, there is little evidence of any post-acquisition productivity gains that generally lasted, although manufacturing (but generally not service sector) plants grew larger in employment terms after being acquired. In terms of wages, there were significant gains (except in EU service sector industries), and in manufacturing profits rose post-acquisition (but they declined overall in US and EU-service sector plants). In all sectors, there was a significant increase in the probability of plants closing after being acquired through a foreign M&A.

Competition effects

12.24 This report also considered the effect of foreign acquisitions/mergers on firm concentration (**Chapter 11**), as measured using a Herfindahl index. Using the index for 2005, the data shows that most industries have fairly low levels of concentration: for over 80% of the industries covered, there are more than 20 'equal-sized' firms producing in each the market, implying significant competition (for 50% of the industries there are more than 100 'equivalent-sized' firms in operation).

12.25 However, the relative contribution to the overall Herfindahl index of firms that were foreign-owned shows that certain sectors are dominated by overseas-owned MNEs. In Motor vehicle manufacturing, the foreign-owned contribution to the Herfindahl index is nearly 98% of the total figure. Foreign-owned firms also dominate the wholesale trade sector; the computer software & related industry; radio, TV and communications manufacturing; coke & petroleum products; pulp & paper manufacturing; instrumental engineering; machinery & equipment manufacture; electrical engineering; and the manufacture of wood products.

12.26 The basic Herfindahl index for each industry was decomposed into various sub-groups, so that changes in the index 1997-2005 that are attributable to foreign-ownership could be analysed. In about half of the industries considered, there was a fall in industry concentration. The largest fall (of some 7%) was in the other transport sector with most of this decline being due to a decline in the market shares of UK-owned firms operating in both 1997 and 2005. Other sub-groups in the other transport industry contributed relatively little to the fall in the index, although new foreign-owned greenfield firms (i.e. those opened after 1997) did contribute 0.76% to the overall change in the index. Firms in operation in 1997 that were acquired by foreign-owned MNEs during the period only contributed less than one-fifth of the contribution of greenfield foreign-owned firms. Thus, there is little evidence that foreign M&As were impacting significantly on industry concentration levels in this period.

12.27 When foreign-owned firms did contribute a significant part to the overall change in industry concentration, this was either through a decline in the

market shares of foreign-owned firms that operated in both years (cf. computer & related, and radio, TV and telecommunications manufacturing); or there was a decline in the market share of firms that were foreign-owned in 1997 but had been sold to UK-owned firms (or 'bought-out' by UK workers) by 2005 (cf. motor vehicle manufacturing). The other significant contribution comes from the opening of new foreign-owned greenfield firms (cf. motor vehicle manufacture and the R&D sector).

12.28 In summary, for the industries covered, changes in the Herfindahl index were generally small. And perhaps more importantly, there was little evidence that relative declines in the market shares of UK-owned firms was being matched by increases in the market shares of foreign-owned companies; where market shares did increase in the foreign-owned sector it was attributable to new greenfield investments.

References

Ackerberg, D.A., Caves, K. and Frazer, G. (2005). 'Structural identification of production functions', mimeo: University of California at Los Angeles.

Aitken, B., Harrison, A. and Lipsey, R.E. (1996) Wages and Foreign Ownership: a Comparative Study of Mexico, Venezuela, and the United States, *Journal of International Economics*, 40, 345–371.

Almeida, R. (2007) The Labour Market Effects of Foreign Owned Firms. *Journal of International Economics*, 72, 75–96.

Amess, K. and M. Wright (2007) The wage and employment effects of leveraged buyouts in the UK, *International Journal of Economics and Business*, 14, 179-195.

Andrews, M., Bellmann, L., Schank, T. and Upward, R. (2007) The Takeover and Selection Effects of Foreign Ownership in Germany: an Analysis Using Linked Worker-Firm Data. GEP Research Paper 2007/08, University of Nottingham.

Antkiewicz, A. and Whalley, J. (2006) Recent Chinese Buyout Activity and the Implications for Global Architecture. *NBER Working Paper* No. W12072.

Arnold, J.M. and Javorcik, B.S. (2005) Gifted Kids or Pushy Parents? Foreign Acquisitions and Plant Performance in Indonesia, CEPR Discussion Papers No. 5065.

Arrow, K.J. (1962) The economic implications of learning by doing, *Review of Economic Studies*, 29, 155-173

Barba-Navaretti, G. and Venables, A.J. (2004) *Multinational Firms in the World Economy,* Princeton: Princeton University Press.

Bellak, C. (2004) How Domestic and Foreign Firms Differ and Why Does it Matter? *Journal of Economic Surveys*, 18, 483-514.

Bellak, C. and M. Pfaffermayr (2002) Why Foreign-Owned Firms are Different: A Conceptual Framework and Empirical Evidence for Austria. Hamburg Institute of International Economics Discussion Paper No. 26372.

Bellak, C., Pfaffermayr, M. and Wild, M. (2006) Firm Performance after Ownership Change: A Matching Estimator Approach. *Applied Economics Quarterly*, 52, 29-54.

Bernard, A.B. and Sjoholm, F. (2003) Foreign Owners and Plant Survival. NBER Working Paper No. 10039.

Bevan, A. and Estrin, S. (2004) The Determinants of Foreign Direct Investment into European Transition Economies. *Journal of Comparative Economics*, 32, 775–787.

Blonigen, B.A., Davies, R.B., and Head, K. (2003) Estimating the Knowledge-Capital Model of the Multinational Enterprise: Comment. *American Economic Review*, 93, 980-994.

Blundell, R., Dearden, L. and Sianesi, B. (2005) Evaluating the Effect of Education on Earnings: Models, Methods and Results from the National Child

Development Survey. *Journal of the Royal Statistical Society: Series A*, 168, 473-512.

Brainard, S. and Riker, D. (1997) Are US Multinational s Exporting Jobs? NBER Working Paper No. 5958.

Buch, C.M., Kleinert, J., Lipponer, A., and Toubal, F. (2005) Determinants and Effects of Foreign Direct Investment: Evidence from German Firm-Level Data. *Economic Policy*, 20, 52-110.

Buckley, P. J. and Casson, M. C. (1998) Analyzing Foreign Market Entry Strategies: Extending the Internalization Approach. *Journal of International Business Studies*, 29, 539–562.

Butler, J. S. (2000). Efficiency results of MLE and GMM estimation with sampling weights. *Journal of Econometrics*, 96, pp. 25–37.

Cantwell, J.A., Dunning, J.H., and Janne, O.E. (2004) Towards a Technology-seeking Explanation of US Direct Investment in the United Kingdom. *Journal of International Management*, 10(1), 5-20.

Capron, L. and Mitchell, W. (1998) The Role of Acquisitions in Reshaping Business Capabilities in the International Telecommunications Industry. *Industrial and Corporate Change*, 7, 715–730.

Carr, D.L., Markusen, J.R., and Maskus, K.E. (2001) Estimating the Knowledge Capital Model of the Multinational Enterprise. *American Economic Review*, 91, 693-708.

Castellani, D. and Zanfei, A. (2004) "Cherry-picking" and Self-selection Empirical Evidence on Ex-ante Advantages of Multinational Firms in Italy. *Applied Economics Quarterly*, 50, 5–20.

Castellani, D. and Zanfei, A. (2006) *Multinational Firms, Innovation and Productivity,* Cheltenham: Edward Elgar.

Castellani, D. and Zanfei, A. (2007) Internationalisation, Innovation and Productivity: How Do Firms Differ in Italy? *World Economy*, 30, 156-176.

Caves, R. E. (1996) *Multinational Enterprise and Economic Analysis*, 2nd edition, Cambridge, MA: Cambridge University Press.

Chapple, W., Morrison Paul, C.J. and Harris, R. (2005) Manufacturing and Corporate Environmental Responsibility: Cost Implications of Voluntary Waste Minimisation. *Structural Change & Economic Dynamics*, 16: 347-373.

Chari, A., Chen, W. and Dominguez, K. (2009) Foreign Ownership and Firm Performance: Emerging-Market Acquisitions in the United States. NBER Working Paper No. 14786.

Chen, C. H. (1997) The Determinants of Foreign and Domestic Merger Activities in US Manufacturing Industries. Ph.D. Dissertation, the University of Wisconsin.

Collins, A. and Harris, R.I.D (2005) The Impact of Foreign Ownership and Efficiency on Pollution Abatement Expenditure by Chemical Plants: Some UK Evidence, *Scottish Journal of Political Economy*, 52: 747-768Disney *et. al.* (2003a,b),

Collins, A. and Harris, R.I.D. (2002) Does Plant Ownership Affect the Level of Pollution Abatement Expenditure?, *Land Economics*, 78:171-189.

Conyon, M. et. al. (2004) Do wages rise or fall following a merger? *Oxford Bulletin of Economics and Statistics*, 66, 847-62.

Conyon, M. J., Girma, S., Thompson, S., and Wright, P. W. (2002a) The Productivity and Wage Effects of Foreign Acquisition in the United Kingdom. *Journal of Industrial Economics*, 50, 85–102.

Conyon, M.J., Girma, S., Thompson, S. and Wright, P.W. (2002b) The Impact of Mergers and Acquisitions on Company Employment in the United Kingdom. *European Economic Review,* 46, 31-49.

Cowling, K., Waterson, M. (1976), Price Cost Margins and Market Structure, *Economica*, 43, 267-74.

Criscuolo, C. and Martin, R. (2009) Multinationals and US Productivity Leadership: Evidence from Great Britain. *Review of Economics and Statistics*, 91, 263-281.

Csengödi, S., Urban, D.M. and Jungnickel, R. (2008) Foreign Takeovers and Wages in Hungary. *Review of World Economics,* 144, 55-82.

Damijan, J. and Knell, M. (2005). How Important Is Trade and Foreign Ownership in Closing the Technology Gap? Evidence from Estonia and Slovenia. *Review of World Economics*, 141, 271–295.

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, 584–595.

Disney, R., Haskel, J. and Heden, Y. (2003a) Entry, Exit and Establishment Survival in UK Manufacturing, *Journal of Industrial Economics*, 51: 93-115.

Disney, R., Haskel, J. and Heden, Y. (2003b) Restructuring and Productivity Growth in UK Manufacturing, *Economic Journal,* 113: 666-694.

Doms, M. E. and Jensen, J.B. (1998) Comparing Wages, Skills, and Productivity between Domestically and Foreign Owned Manufacturing Establishments in the United States. NBER Working Papers No. 6822.

Driffield, N. and Munday, M. (1998) The Impact of Foreign Direct Investment on UK Manufacturing: is There a Profit Squeeze in Domestic Firms? *Applied Economics*, 30, 705–709.

Driffield, N. and Girma, S. (2003) Regional Foreign Direct Investment and Wage Spillovers: Plant Level Evidence from the UK Electronics Industry. *Oxford Bulletin of Economics and Statistics*, 65, 453-474.

Driffield, N. and J. Love (2007) Linking FDI motivation and host economy productivity effects: conceptual and empirical analysis, *Journal of International Business Studies*, 38(3), 460-473

Dumouchel, W. H. and Duncan, G. J. (1983) Using sample survey weights in multiple regression analyses of stratified samples. *Journal of the American Statistical Association*,78, pp. 535–43.

Dunning, J.H. (1981) *International Production and the Multinational Enterprise,* London: Allen & Unwin.

Dunning, J.H. (1988) The Eclectic Paradigm of International Production: A Restatement and Some Possible Extensions. *Journal of International Business Studies*, 19(1), 1-31.

Dunning, J.H. (2000) The Eclectic Paradigm as an Envelope for Economic and Business Theories of MNE Activity, *International Business Review*, 9, 163–190.

Dunning, J.H. and Rugman, A.M. (1985) The Influence of Hymer's Dissertation on the Theory of Foreign Direct Investment. *The American Economic Review*, 75, 228-232.

Eiteman, D.K., Stonehill, A.I. and Moffett, M.H. (2006) *Multinational Business Finance*, 11th ed., Addison-Wesley, Reading, MA,

Elango, B. and Sambharya, R.B. (2004) The Influence of Industry Structure on the Entry Mode Choice of Overseas Entrants in Manufacturing Industries. *Journal of International Management*, 10, 107–124.

Ellison, G. *et. al*. (2007) What Causes Industry Agglomeration? Evidence from Coagglomeration Patterns, *NBER Working Paper Series*, Working Paper 13068.

Faeth, I. (2009) Determinants of Foreign Direct Investment a Tale of Nine Theoretical Models. *Journal of Economic Surveys*, 23, 165-196.

Feliciano, Z. and Lipsey, R.E. (1999) Foreign Ownership, Wages, and Wage Changes in U.S. Industries, 1987-92. *Contemporary Economic Policy*, 24, 74-91.

Feliciano, Z. and Lipsey, R. E. (2002) Foreign Entry into U.S. Manufacturing by Takeovers and the Creation of New Firms. NBER Working Paper No. 9122.

Florida, R. (2002) *The rise of the creative class and how its transforming work, leisure community and everyday life.* Basic Books, New York.

Fosfuri, A., Massimo, M. and Ronde, T. (2001) Foreign Direct Investments and Spillovers through Workers Mobility. *Journal of International Economics,* 53, 205–222.

Fosfuri, A. and Motta, M. (1999) Multinationals Without Advantages. *Scandinavian Journal of Economics*, 101, 617-630.

Freund, C.L. and Djankov, S. (2000) Which Firms Do Foreigners Buy? Evidence from the Republic of Korea. World Bank Policy Research Working Paper No. 2450.

Fukao, K., Ito, K., Kwon, H. (2005) Do Out-in M&As Bring Higher TFP to Japan? An Empirical Analysis Based on Micro-data on Japanese Manufacturing Firms. *Journal of the Japanese and International Economies*, 19, 272-301.

Fukao, K., Ito, K., Kwon, H.U. and Takizawa, M. (2006) Cross-Border Acquisitions and Target Firms' Performance: Evidence From Japanese Firm-Level Data. NBER Working Paper No. 12422.

Georgopoulos, A., Argyros, G. and Boura, G. (2008) Which Targets Stimulate Cross-border Acquisitions? An Empirical Investigation of Industrial Organization and Trade Factors within a Competition Framework of International and Domestic Acquisition Targets, *Journal of Industry, Competition and Trade*, 8, 55-72.

Gioia, C. and Thomsen, S. (2002) International Mergers and Acquisitions and the Market for Lemons. International Acquisitions and Firm Performance in Denmark 1990-1997. Paper proposed for presentation at the 28th European International Business Academy Conference, Athens, Greece.

Gioia, C. and Thomsen, S. (2004) International Acquisitions in Denmark 1990–1997: Selection and Performance. *Applied Economics Quarterly*, 50, 61–88.

Girma, S. (2005). Technology Transfer from Acquisition FDI and the Absorptive Capacity of Domestic Firms: An Empirical Investigation. *Open Economics Review*, 14, 165-178.

Girma, S. and Gorg, H. (2004) Blessing or Curse? Domestic Plants Employment and Survival Prospects After Foreign Acquisition. *Applied Economics Quarterly*, 50, 89-110.

Girma, S. et. al. (2007), Do Exporters Have Anything to Learn from Foreign Multinationals, *European Economic Review*, 51, 981-998.

Girma, S., Greenaway, D. and Wakelin, K. (2001) Who Benefits from Foreign Direct Investment in the UK? *Scottish Journal of Political Economy*, 48, 119–133.

Girma, S., Thompson, S. and Wright, P. (2006) International Acquisitions, Domestic Competition and Firm Performance. *International Journal of the Economics of Business*, 13, 335-349.

Girma, S., Kneller, R. and Pisu, M. (2007) Do Exporters Have Anything to Learn from Foreign Multinationals? *European Economic Review*, 51, 993-1010.

Glaeser, E. *et. al*. (2001) Consumer City, *Journal of Economic Geography*, 1, pp. 27-50.

Glass, A. J. and Saggi, K. (2002) Multinational Firms and Technology Transfer. *Scandinavian Journal of Economics,* 104, 495–513.

Globerman, S. Ries, J. C. and Vertinsky, I. (1994) The Economic Performance of Foreign Affiliates in Canada. *Canadian Journal of Economics*, 27, 143–156.

Goethals, J. and Ooghe, H. (1997) The Performance of Foreign and National Take-overs in Belgium. *European Business Review*, 97, 24–37.

Gonzalez, P., Vasconcellos, G. M. and Kish, R. J. (1998) Cross-Border Mergers and Acquisitions: The Under valuation Hypothesis. *The Quarterly Review of Economics and Finance*, 38, 25-45.

Görg, H. Strobl, E. and Walsh, F. (2007) Why Do Foreign-Owned Firms Pay More? The Role of On-the-Job Training. *Review of World Economics,* 143, 464-482.

Griffith, R. (1999) Using the ARD Establishment Level Data to Look at Foreign Ownership and Productivity in the United Kingdom, the *Economic Journal*, 109, F416-F442.

Griffith, R. and Simpson, H. (2001) Characteristics of Foreign-Owned Firms in British Manufacturing. IFS Working Papers (W01/10). The Institute for Fiscal Studies, London, UK.

Gugler, K.P. and Yurtoglu, B.B. (2004) The Effects of Mergers on Company Employment in the USA and Europe. *International Journal of Industrial Organization,* 22, 481-502.

Hannah, L. and Kay, J. A. (1977): *Concentration in modern industry. Theory, measurement and the UK experience*, Macmillan, London.

Hanson, G.H., Mataloni Jr., R.J., and Slaughter, M.J. (2001) Expansion Strategies of U.S. Multinational Firms. NBER Working Paper No. 8433.

Harmon, C. and Walker, I. (1995) Estimates of the Economic Return to Schooling for the United Kingdom. *American Economic Review*, 85, 1278-1286.

Harris, R.I.D. (2001) Comparing Regional Technical Efficiency in UK Manufacturing Plants: The Case of Northern Ireland 1974-1995, *Regional Studies*, 35: 519-554.

Harris, R.I.D. (2002) Foreign Ownership and Productivity in the United Kingdom – Some Issues When Using the ARD Establishment Level Data. *Scottish Journal f Political Economy*, 49, 318–335.

Harris, R.I.D. (2004) DTI Industrial Support Policies: Key Findings from New Micro-data Analysis, in *Raising UK productivity – Developing the Evidence Base for Policy*, DTI Economics Paper No. 8, London.

Harris, R.I.D. (2005a) Economics of the Workplace: Special Issue Editorial. *Scottish Journal of Political Economy,* 52(3): 323-343.

Harris, R.I.D. (2005b) Deriving Measures of Plant-level Capital Stock in UK Manufacturing, 1973-2001. Report to the DTI, London.

Harris, R.I.D. and B. Andrew (2000) Rates of Return on Plant and Machinery in the Regions of the UK, 1968-1991, *Scottish Journal of Political Economy*, vol. 47, pp. 304-324

Harris, R.I.D. and Drinkwater, S. (2000) UK Plant and Machinery Capital Stocks and Plant Closures, *Oxford Bulletin of Economics and Statistics*, 62, 239-261.

Harris, R. and C. Robinson (2002) The Impact of Foreign Acquisitions on Total Factor Productivity: Plant-level Evidence from UK Manufacturing, 1987-1992, *Review of Economics and Statistics*, 84, 562-568

Harris, R.I.D. and Hassaszadeh, P. (2002) The Impact of Ownership Changes and Age Effects on Plant Exits in UK Manufacturing, 1974–1995. *Economics Letters*, 75, 309-317.

Harris, R.I.D and Robinson, C. (2003) Foreign Ownership and Productivity in the United Kingdom: Estimates for UK Manufacturing Using the *ARD*, *Review of Industrial Organisation*, 22, 207-223

Harris, R.I.D and Robinson, C. (2004a) Industrial Policy and its Effect on Total Factor Productivity in UK Manufacturing Plants, 1990-1998, *Scottish Journal of Political Economy*, 51(4), 528-543.

Harris, R.I.D and Robinson, C. (2004b) Productivity Impacts and Spillovers from Foreign Ownership in the United Kingdom, *National Institute Economic Review*, 187, 70-87.

Harris, R.I.D., Siegel, D.S. and Wright, M. (2005) Assessing the Impact of Management Buyouts on Economic Efficiency: Plant-Level Evidence from the United Kingdom, *Review of Economics and Statistics* 87(1), 148-153.

Harris, R.I.D., O'Mahony, M., and C. Robinson (2006) Research on Scottish productivity. Reported submitted to the Scottish Executive Office of the Chief Economic Advisor.

Harris, R.I.D. and Q.C. Li (2009) Export-market Dynamics and the Probability of Firm Closure: Evidence for the UK, forthcoming in *Scottish Journal of Political Economy*.

Hausman, J. A. and Wise, D. A. (1981). Stratification on endogenous variables and estimation: the Gary Income Maintenance Experiment. In F. Manski and D. McFadden (eds.), *Structural Analysis of Discrete Data with Econometric Applications.* Cambridge,MA: MIT Press, pp. 365–91.

Head, K. and Ries, J. (2003) Heterogeneity and the FDI versus Export Decision of Japanese Manufactures. *Journal of the Japanese and International Economies*, 17, 448-467.

Head, K. and Ries, J. (2004) Exporting and FDI as Alternative Strategies. *Oxford Review of Economic Policy*, 20, 409-423.

Heckman, J. (1979). Sample selection bias as a specification error. *Econometrica*, 47,pp. 153–61.

Helpman, E. (1984) A Simple Theory of International Trade with Multinational Corporations. *Journal of Political Economy*, 92, 451-471.

Helpman, E. and Krugman, P. (1985) *Market Structure and Foreign Trade,* MIT Press.

Helpman, E., M.J. Melitz and Yeaple, S.R. (2004) Export Versus FDI with Heterogeneous Firm, *American Economic Review*, 94, 300-316.

Heyman, F., Sjoholm, F. and Tingvall, P. (2007) Is There Really a Foreign Ownership Wage Premium? Evidence from Matched Employer-Employee Data. *Journal of International Economics*, 73, 355-376.

Hosseini, H. (2005) An Economic Theory of FDI: A Behavioral Economics and Historical Approach. *Journal of Socio-Economics*, 34, 528-541.

Huttunen, K. (2007) The Effect of Foreign Acquisition on Employment and Wages: Evidence from Finnish Establishments. *The Review of Economics and Statistics*, 89, 497-509.

Jacobs, J. (1970) *The Economy of Cities*, Vintage, New York, NY.

Jacobs, J. (1986) *Cities and the Wealth of Nations.* Vintage, New York, NY.

Jensen, M. (1988) Takeovers: Their Causes and Consequences. *Journal of Economic Perspectives*, 2, 21-48.

Karpaty, P. (2007) Productivity Effects of Foreign Acquisitions in Swedish Manufacturing: The FDI Productivity Issue Revisited, *International Journal of the Economics of Business*, 14, 241-260.

Köke, J. (2000) Control Transfers in Corporate Germany: Their Frequency, Causes and Consequences. ZEW Discussion Paper No. 00-67, Mannheim.

Krugman, P. (1983) The New Theories of International Trade and the Multinational Enterprise. In: Audretsch, D. and Kindleberger, C. (eds.) *The Multinational Corporation in the 1980s*, Cambridge, MA: MIT Press.

Lehto, E. and Bockerman, P. (2006) Enemy of Labour? Analysing the Employment Effects of Mergers and Acquisitions. Labour Institute for Economic Research Discussion Paper No. 221.

Lichtenberg, F.R. and Siegel, D. (1987) Productivity and Changes in Ownership of Manufacturing Plants, *Brookings Papers on Economic Activity,* 3, 643–673.

Lichtenberg, F.R. and Siegel, D. (1990) The Effects of Leveraged Buyouts on Productivity and Related Aspects of Firm Behaviour. *Journal of Financial Economics*, 27, 165–194.

Lipsey. R.E. and Sjoholm, F. (2004) Foreign Direct Investment, Education, and Wages in Indonesian Manufacturing. *Journal of Development Economics*, 73, 415-422.

Love, J.H. (2003) Technology sourcing versus technology exploitation: an analysis of US foreign direct investment flows, *Applied Economics*, 35, 1667-1678.

Magee, L., Robb, A. L. and Burbridge, J. B. (1998). On the use of sampling weights when estimating regression models with survey data. *Journal of Econometrics,* 84, pp. 251–71.

Markusen, J.R. (1995) The Boundary of Multinational Enterprises and the Theories of International Trade. *Journal of Economic Perspectives*, 9, 169-189.

Markusen, J.R. (2002) *Multinational Firms and the Theory of International Trade,* Cambridge, MA: MIT Press.

Markusen, J.R. and Maskus, K.E. (2002) Discriminating among Alternative Theories of the Multinational Enterprise. *Review of International Economics*, 10, 694-707.

Markusen, J.R. and Venables, A.J. (1998) Multinational Firms and the New Trade Theory. *Journalof International Economics*, 46, 183-203.

Markusen, J.R. and Venables, A.J. (2000) The Theory of Endowment, Intra-Industry, and Multinational Trade. *Journal of International Economics*, 52, 209-234.

Markusen, J.R., Venables, A.J., Konan, D.E., and Zhang, K.H. (1996) A Unified Treatment of Horizontal Direct Investment, Vertical Direct Investment, and the Pattern of Trade in Goods and Services. NBER Working Paper 5696.

Marshall, A. (1890) *Principles of Economics*, Macmillan, London.

Martins, P. S. (2004) Do Foreign Firms Really Pay Higher Wages? Evidence From Different Estimators, IZA discussion paper 1388.

McCloughan, P. and Stone, I. (1998) Life Duration of Foreign Multinational Subsidiaries: Evidence from UK Northern Manufacturing Industry. *International Journal of Industrial Organization*, 16, 719-747.

McGuckin, R.H. and Nguyen, S.V. (1995) On Productivity and Plant Ownership Change: New Evidence from the Longitudinal Research Database. *RAND Journal of Economics*, 26, 57–76.

McGuckin, R.H. and Nguyen, S.V. (2001) The Impact of Ownership Changes: a View from Labour Markets. *International Journal of Industrial Organization*, 19, 739-762.

Moden, K. M. (1998) Foreign Acquisitions of Swedish Companies: Effects on R&D and Productivity, IUI, Stockholm, mimeograph.

Morck, R., Shleifer, A. and Vishny, R.W. (1989) Characteristics of Hostile and Friendly Takeover Targets, NBER Working Paper No. 2295.

Morck, R., Shleifer, A. and Vishny, R.W. (1990) Do Managerial Objectives Drive Bad Acquisitions? *Journal of Finance*, 45, 31–48.

Murphy, K. and Welch, F. (1990) Empirical Age-Earnings Profiles. *Journal of Labour Economics,* 8, 202-229.

Nocke, V. and Yeaple, S. (2007) Cross-border Mergers and Acquisitions vs. Greenfield Foreign Direct Investment: the Role of Firm Heterogeneity, *Journal of International Economics*, 72, 336-365.

Norbäck, P.J. and Persson, L. (2008) Globalization and Profitability of Cross-Border Mergers and Acquisitions. *Economic Theory*, 35, 241-266.

Olley, G.S. and Pakes, A. (1996). The dynamics of productivity in the telecommunications equipment industry, *Econometrica*, Vol. 64(6), pp. 1263-1297.

Oulton, N. (1997). 'The ABI respondents database: a new resource for industrial economics research', *Economic Trends*, Vol. 528, pp. 46-57.

Oulton, N. (1998) Investment, Capital and Foreign Ownership in UK Manufacturing. NIESR Discussion Paper 141.

Pianta, M. and M. Tancioni (2008) Innovations, wages, and profits, *Journal of Post Keynesian Economics*, 31, 101-123.

Piscitello, L. and Rabbiosi, L. (2002) Foreign Entry Through Acquisition - the Impact on Labour Productivity and Employment. Unpublished, Politecnico de Milano.

Piscitello, L. and Rabbiosi, L. (2005) The Impact of FDI on Local Companies' Labour Productivity: Evidence from the Italian Case. *International Journal of the Economics of Business*, 12, 35–51.

Pradhan, J.P. (2004) The Determinants of Outward Foreign DirectInvestment: A Firm-level Analysis of Indian Manufacturing. *Oxford Development Studies*, 32, 619-639.

Ravenscraft, D.J. and Scherer, F.M. (1987) Life after Takeover, *Journal of Industrial Economics,* 36, 147–156.

Ray, E.J. (1989) The Determinants of Foreign Direct Investment in the United States: 1979-85. In: Feenstra, R.(eds.) *Trade Policies for International Competitiveness*, Chicago,IL: University of Chicago Press.

Resmini, L. (2000) The Determinants of Foreign Direct Investment in the CEECs. *Economics of Transition*, 8, 665–689.

Roberts, B.M., Thompson, S. and Mikolajczyk, K. (2008) Privatization, Foreign Acquisition and the Motives for FDI in Eastern Europe, *Journal Review of World Economics*, 144, 408-427.

Romer, P.M. (1986) Increasing returns and long-run growth, *Journal of Political Economy*, 94(5) pp.1002-1037.

Sabirianova, K., Svejnar, J. and Terrell, K. (2005). Foreign Investment, Corporate Ownership, and Development: Are Firms in Emerging Markets Catching up to the World Standard? IZA Discussion Paper No. 1457.

Salis, S. (2008) Foreign Acquisition and Firm Productivity: Evidence from Slovenia, *World Economy*, 31, 1030-1048.

Scherer, F.M. (1988) Corporate Takeovers: The Efficiency Arguments. *Journal of Economic Perspectives*, 2, 69–82.

Sjöholm, F. and Lipsey, R. E. (2006) Foreign Firms and Indonesian Manufacturing Wages: An Analysis with Panel Data. *Economic Development and Cultural Change,* 55, 201–221.

Skinner, C. S., Holt, D. and Smith, T. M. (1989). *Analysis of Complex Surveys*. Chichester: John Wiley.

Stephens, M. A. (1974). "EDF Statistics for Goodness of Fit and Some Comparisons". *Journal of the American Statistical Association* **69**: 730–737.

UNCTAD (2008) World Investment Report - Transnational Corporations and the Infrastructure Challenge.

Wesson, T. (1999) A Model of Asset-Seeking Foreign Direct Investment Driven by Demand Conditions. *Canadian Journal of Administrative Sciences*, 16, 1–10.

Wheeler, D. and Mody, A. (1992) International Investment Location Decisions: the Case of US Firms. *Journal of International Economics*, 33, 57-76.

Wooldridge, J. M. (1999). Asymptotic properties of weighted m-estimators for variable probability samples. *Econometrica*, 67, pp. 1385–406.