

How does overseas investment affect activity at home?

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Abstract: I investigate the behaviour of multinational firms in UK manufacturing and business service sectors. I differentiate between UK multinationals that make *outward* investments in relatively low-wage economies versus those that do not, and between their activities in high-skill versus low-skill industries in the UK. UK multinationals that invest in low-wage economies typically also invest in a large number of high-wage economies. I find some evidence that these firms display lower employment growth than other types of firm, in particular in low-skill UK industries, consistent with labour in relatively low-wage economies being a substitute for labour in relatively low-skill industries in the UK. But in high-skill manufacturing industries establishments owned by UK multinationals that invest in low-wage economies are among the largest and most productive. However, my findings suggest that this is not a result of overseas investment, but rather that only the most productive firms can bear the costs of investing in numerous locations abroad.

Keywords: multinational enterprises; skills; globalisation

JEL classification: F2

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1 Introduction

This paper provides evidence on the effects of overseas foreign direct investment (FDI) on multinational firms' home-country operations. Understanding the adjustment mechanisms of multinational firms is important in the context of the relaxation of barriers to inward investment in low-wage economies, such as China's accession to the WTO in 2001. The OECD (2006) now highlights China as a major destination for FDI outside the OECD area, with estimated inflows of \$72 billion in 2005. How multinational firms structure their operations globally is also of considerable interest because they make up a substantial proportion of employment in OECD economies. Bernard and Jensen (2005) report that US multinationals account for 26% of manufacturing employment in the US; below I show that in the UK in 2003 UK multinationals accounted for 16% of manufacturing employment and 9% of employment in the business services sector, with foreign-owned multinationals comprising a further 26% and 15% in the two sectors respectively.¹ International restructuring can potentially affect large numbers, and particular groups of workers, and is of considerable interest to governments.

The paper focuses on the behaviour of different types of multinational firms differentiating between those that make outward investments in relatively low-wage economies, and hence might be engaged in vertical FDI, and those that only invest in relatively high-wage economies. It turns out that multinationals that invest in low-wage economies also invest in a large number of high-wage economies, that is, they engage in complex FDI strategies (Yeaple, 2003a). However, I do find some evidence to suggest that for these firms, labour in relatively low-wage countries might be a substitute for labour in the UK in relatively low-skill industries, in line with activity being located globally according to countries' comparative advantage. These findings imply that low-skill workers are those most likely to be affected by their employers investing overseas in low-wage economies.

Overseas investment may also bring benefits; indeed firms may make such investments in order to survive. Relocating activity to a relatively low-wage economy may allow a firm to reduce costs and expand output. Investment, employment and output may therefore potentially increase (or at least not decrease) in complementary (high-skill) activities at home. I find evidence that in high-skill manufacturing industries UK multinationals that invest in low-wage economies are larger and more productive than other UK multinationals and domestic firms. However, my

¹ See also Griffith, Redding and Simpson (2004) for evidence covering a wider range of sectors.

results suggest that this is not a direct result of overseas investment, but rather that these advantages are attributable to other firm-specific assets. My findings support the proposition that only the most productive firms become multinationals (Melitz, 2003). I find that those firms that are investing in low-wage economies and in a large number of countries overseas typically have higher productivity than those that only make investments in a smaller number of high-wage economies, consistent with their being able to overcome large fixed costs of investment abroad. Finally, my findings provide some of the first evidence on these issues for activity outside the manufacturing sector.

The paper is structured as follows. The next section presents some theoretical and empirical background, and section 3 describes the data and presents some descriptive statistics. Section 4 details my empirical approach and presents the findings, and section 5 concludes.

2 Outward FDI and firm adjustment

The theoretical literature on multinational enterprises (MNEs) differentiates between horizontal FDI, the replication of home country activity abroad in proximity to customers as a substitute for exporting, and vertical FDI, locating different stages of the production chain, or for multi-product firms locating the production of different goods, geographically according to countries' comparative advantage.² In practice MNEs undertake both types of overseas investment simultaneously (Yeaple, 2003a), however horizontal and vertical FDI have different implications for the skill-intensity of an MNE's home-country operations.

The key difference is that while horizontal FDI, the replication of either all stages of production activity or of downstream production abroad to serve a particular market, could imply an increase in the skill-intensity of production at home (either through the manufacture of low skill-intensity products abroad that would otherwise have been produced at home and exported, or through the expansion of headquarter or R&D services at home), this would be expected to occur irrespective of the economic characteristics of the host economy. Whereas, if firms are engaging in vertical FDI, locating stages of production or the production of different goods in different economies according to comparative advantage, effects on home country operations would be expected to be systematically related to the economic characteristics of host economies relative to those of the home country.

² Examples of models of horizontal multinationals are Markusen (1984) and Brainard (1997) and of vertical multinationals, Helpman (1984, 1985); Venables (1999) contains elements of both types of activity.

Under vertical FDI firms would be expected to locate (low) skill-intensive activities in (low) skill-abundant countries. Hence the relocation of activity to a relatively low skill-abundant, low-wage country would be expected to be associated with an increase in the skill-intensity of production at home. If the good is subsequently used as an intermediate input in production in the home country, then there may also be an increase in the use of imported inputs. Empirical evidence exists in support of this. Head and Ries (2002), using data on outward investment by Japanese firms, find that an increase in investment in relatively low per-capita GDP economies was associated with an increase in the skill-intensity of firms' employment in Japan, and with increased purchases of imported goods.

Brainard and Riker (1997) and Riker and Brainard (1997) also find evidence consistent with MNEs engaging in vertical FDI. They find that labour in affiliates in high-income countries is a substitute for labour in affiliates in other high-income countries (i.e. countries with similar skill levels) and a complement for labour in low-wage economies. They also find evidence that labour in low-wage economies competes to carry out those activities most sensitive to labour costs. Braconier and Ekholm (2000) find some evidence that home country employment in Swedish multinationals is a substitute for employment in affiliates in high-income host countries.³

Firms invest overseas for a reason, to increase profits or even to survive, hence outward investment may lead to higher investment, employment and output compared to if the firm had not chosen to produce abroad. If the firm is engaging in vertical FDI and re-locating low-skill activities abroad, then any increase in activity at home might be most likely to occur in relatively high-skill activities. Using data on US multinationals in manufacturing and their overseas affiliates Desai et al. (2005) observe that firms whose operations grow overseas also exhibit growth in their domestic (US) activities, and conclude that rather than crowding out domestic activity by the same firms, overseas activity increases domestic activity. Harrison and McMillan (2007) use similar data but distinguish between affiliates located in low-income versus high-income countries. They find evidence that labour in low-income countries substitutes for labour at home, and that labour in high-income countries is a complement to that

³ Further research includes Hanson, Mataloni and Slaughter (2003) who do not find strong evidence that parent and affiliate employment within U.S. multinationals are substitutes, and Konings and Murphy (2001). See also Chapter 9 of Barba-Navaretti and Venables (2004) for a summary of research on home-country effects of outward FDI. Yeaple (2003) provides an industry-level analysis which finds a role for comparative advantage in explaining the pattern of U.S. outward FDI. Hanson, Mataloni and Slaughter (2005) analyse within-firm trade and vertical production networks, by exploiting variation across affiliates operating in the same industry in different locations owned by the same firm

in the US, suggesting that the finding of Desai et al. (2005) is driven by the latter effect. Barba Navaretti et al. (2007) compare the behaviour of firms that become multinationals in France and Italy to that of firms that remain purely domestic. They also differentiate between outward investment in low-wage versus developed economies. They find no evidence of negative effects and some evidence of positive scale effects on domestic activity. These studies do not differentiate between employment effects for workers with different skill-levels in the home economy.⁴

Finally, it is clear that not all firms make outward investments. Theory suggests that only the most productive firms will invest overseas due to the high fixed costs of establishing operations abroad. (Melitz, 2003). Criscuolo and Martin (2005) provide recent evidence on the productivity advantage of MNEs for the UK. If, as is likely, fixed costs are increasing the number of overseas affiliates established, then we might also expect a positive correlation between productivity and the global scale of a firm's operations.

One issue raised by this discussion is that in order to isolate any effect of outward investment it is necessary to be able to proxy how the firm would have behaved had it chosen not to invest overseas. Rather than use matching estimators to isolate a specific control group to use as a proxy, in this paper I make more general comparisons between plants and establishments owned by four types of firms: UK multinationals (UK-MNEs) that make investments in low-wage economies; UK-MNEs that only invest in high-wage economies; foreign-MNEs; and domestic, non-MNE firms. I also exploit information before and after firms begin to invest abroad to try and pick up any changes in behaviour associated with overseas investment. The next section describes the data I use to do this.

3 Data and descriptive statistics

3.1 Overseas investment

I use information on overseas investment from the UK Office for National Statistics (ONS) Annual Inquiry into Foreign Direct Investment (AFDI) to identify UK multinational firms and to derive indicators of whether or not they are investing in low-wage economies. The AFDI register contains annual information on the population of firms undertaking outward investment

⁴ See Fabbri et al. (2003) for evidence on multinational ownership and the elasticity of labour demand for less-skilled workers.

from the UK and on the country of location of their overseas subsidiaries, associates and branches.⁵ I use the register data over the period 1998 to 2004.

I define a UK-MNE as a firm that makes at least one outward investment from the UK, and which is not itself classified as owned by a foreign multinational, (i.e. I exclude affiliates of e.g. US multinationals making outward investments to other European countries from the UK). I combine the AFDI data with data on countries' GDP per capita relative to that in the UK to create a firm-level indicator for investment in low-wage economies. The indicator I use is a dummy variable equal to one if a firm has overseas operations in any country with per capita GDP of less than 10% of that in the UK in a particular year. However in doing this I exclude overseas operations in countries designated as tax havens. This is because the register is used for the purpose of collecting FDI data which relate to all financial flows to overseas affiliates, rather than just those relating to investment in fixed capital assets. These, along with the countries with per capita GDP less than 10% of the UK where I observe overseas affiliates, are listed in table A1 in the Appendix.

Table 1 provides information on the number of UK-MNEs engaged in outward investment, and on the average number of countries in which they have affiliates overseas. The table splits UK-MNEs into three types: those that are investing in both low-wage, (based on the definition above), and high-wage economies⁶; those that are only investing in low-wage economies; and those that are only investing in high-wage economies. The vast majority of UK-MNEs are in the final group.

What is distinctive in the table is that those UK-MNEs that do invest in both types of country, and which might be thought of as engaging in both vertical and horizontal FDI simultaneously, typically invest in a much larger number of countries. Overall, the number of low-wage countries and high-wage countries that firms invest in is highly positively correlated (0.80). This is in line with the evidence of Mayer et al. (2007) on the outward investment strategies of

⁵ No information on the size of the affiliate is provided. A subsidiary is an overseas company where the UK parent holds the majority of the voting rights and can exercise a dominant influence, an overseas associate company is one where the UK parent holds at least 10% of the voting rights and can exercise a significant influence, and a branch is a permanent overseas establishment defined for the purpose of UK tax and double taxation agreements. This is a fixed place of business abroad through which the UK company operates but which is not a subsidiary or associate company. The population of firms in the register increases over the period and then decreases. Part of the increase may be due to the inclusion of outward investors that were previously missing from the register. This may mean I mis-classify some UK-MNEs as domestic firms in 1998.

⁶ For ease of exposition I will refer to all countries with per-capita GDP greater than 10% of the UK as high-wage economies, although there is clearly a great deal of heterogeneity among this group of countries.

French multinational firms. Given this, and if investment abroad is associated with significant fixed costs, we might expect these multinationals to be among the most productive firms. However it also implies that I will not be able to cleanly differentiate between behaviour associated with investment in low-wage economies versus investment in a large number of countries. For the remainder of the paper I will differentiate between two types of UK-MNEs: those which invest in low-wage economies (columns (2) and (3) of Table 1) which I will denote UK-MNE_L and those which only invest in high-wage economies (column (4) of Table 1) which I will denote UK-MNE_H.

3.2 UK plants and establishments

My second data source is the plant and establishment-level data from the British Annual Respondents Database (ARD).⁷ The AFDI information can be linked to the ARD data at the firm level.⁸

To analyse employment and employment growth I use data on the *population* of plants in manufacturing and business services sectors over the period 1998 to 2003. This contains very basic information on employment, age, 5-digit industry, ownership (including whether a plant is owned by a foreign-multinational) and firm structure, and allows me to incorporate entry and exit into the analysis.

More detailed characteristics, such as productivity and capital intensity, can only be examined using the ARD establishment-level sample, where an establishment can comprise more than one plant in the same line of business under common ownership. I also use these data over the period 1998 to 2003.⁹ I account for the sample stratification by using inverse sampling probabilities as weights in all regressions, however the way the sample is structured means that the probability of being sampled increases with establishment size, and hence the sample may be biased towards growing, surviving plants. For the data for manufacturing industries I use 4-digit

⁷ See Barnes and Martin (2002) and Griffith (1999) for a full description. It is a legal requirement for firms to respond to the ARD survey. The ARD contains indicators of whether a UK-based plant is owned by a foreign multinational. This information is collected alongside the outward AFDI investment data. The definition of foreign direct investment used for statistical purposes in collecting the inward and outward FDI data is, “*investment that adds to, deducts from or acquires a lasting interest in an enterprise operating in an economy other than that of the investor, the investor’s purpose being to have an “effective voice” in the management of the enterprise. (For the purposes of the statistical inquiry, an effective voice is taken as equivalent to a holding of 10% or more in the foreign enterprise.)*” Office for National Statistics (2000).

⁸ See Criscuolo and Martin (2005) and Griffith et al. (2004) for analyses using these linked data.

⁹ See Martin (2002) for more information on the construction of the capital stock data.

industry level deflators to construct real values of output, value-added etc. Due to a lack of detailed industry-level deflators for business services sectors I use 4-digit industry-year dummies in the regression analysis instead. I provide some descriptive statistics on these data in Table 6, section 4.2 below.

I also use the plant population data to construct further firm characteristics. I construct three indicators of multi-plant firms: whether a plant is part of a firm with other plants in the same 5-digit industry; for the analysis of manufacturing, whether the plant is part of a firm with plants in other 5-digit manufacturing industries; and for the analysis of business services, whether the plant is part of a firm with plants in other 5-digit business services industries. All refer only to activity in the UK. I construct similar variables using the establishment population data for use in conjunction with the establishment-level sample.

3.3 Industry characteristics

I derive my main measure of industry skill intensity from the UK Labour Force Survey (LFS). I use a measure of the proportion of employees in an industry who report having no qualifications. I create a time-invariant average at the 4-digit industry level using data from 1995 to 2003.¹⁰ The average share of employees with no qualifications is shown for 2-digit manufacturing industries and 3-digit business services industries in Table A2 in the Appendix. The sectors with the lowest skill-intensities in manufacturing include clothing, leather, textiles and rubber and plastics, and in business services they include industrial cleaning, investigation and security services, and letting of own property. One problem is that many of these business services activities will not be geographically mobile or tradeable. However some, that are relatively low-skill such as data processing will be. Ideally the analysis could be improved by conditioning on those business-services that are tradeable.

¹⁰ I average over the LFS spring quarters for these years to increase the sample sizes on which the measure is based. Although it is an industry-level measure there is a concern that it will be affected by firm behaviour (exit) during this period. In my robustness checks I use other measures constructed using data which pre-date the analysis period.

Table 1. Outward investment: number of countries invested in by firm-type and year

	All UK-MNEs		Investing in low-wage and high-wage countries			Only investing in low-wage countries		Only investing in high-wage countries	
	(1)		(2)			(3)		(4)	
Year	Mean number countries	Number firms	Mean number low-wage countries	Mean number high-wage countries	Number firms	Mean number low-wage countries	Number firms	Mean number high-wage countries	Number firms
1998	4.11	2,269	3.88	18.38	217	1.27	11	2.19	2,041
1999	3.67	2,817	3.88	17.69	227	1.12	25	2.11	2,565
2000	3.31	3,117	3.61	16.50	235	1.06	81	1.96	2,801
2001	3.31	3,222	3.70	16.09	246	1.06	85	1.97	2,891
2002	3.30	3,021	2.45	15.41	240	1.01	80	1.98	2,701
2003	3.73	2,599	3.72	16.86	238	1.03	86	2.07	2,275
2004	3.88	2,267	3.72	16.97	239	1.00	87	1.94	1,941

Source: author's calculations using AFDI data (Source: ONS).

4 Evidence on the behaviour of outward investors at home

In this section I analyse the characteristics of the UK activities of UK-MNEs in a number of dimensions. In doing so I make comparisons across two types of UK-MNE, those that invest in low-wage economies (UK-MNE_L) and those that only invest in high-wage economies (UK-MNE_H), and also make comparisons with plants owned by foreign-MNEs and with purely domestic firms. I also distinguish between firms' behaviour in high-skill versus low-skill industries in the UK, as it is in low-skill (tradeable) industries where we might expect the effects of vertical FDI to be felt.

I first look at employment, entry, exit and employment growth, before turning to analysing a wider range of firm characteristics including productivity and investment. Finally, I make within-firm comparisons of behaviour before and after outward investments are made in order to assess whether any of the advantages of multinational firms might be attributed to outward investment as opposed to being driven by pre-existing attributes of these firms.

4.1 Employment and employment growth

To examine employment and employment growth among different types of firm I use the plant-level population data described in section 3.2. Table 2a shows how employment in manufacturing plants in 1998 and 2003 was split between plants owned by different types of firm, and how it was split between plants that were either continuers (present in the population in 1998 and 2003), exitors (present in the population in 1998 but not in 2003) and entrants (present in the population in 2003 but not 1998). Overall the table shows a decrease in manufacturing employment of around 700,000 employees, with the majority of this decrease being driven by net exit, rather than substantial reductions in employment by continuing plants.

Looking across the different ownership categories, column (1) of the table shows that in 1998 UK-MNEs investing in low-wage economies accounted for around 12% of manufacturing employment (9% + 3%) and UK-MNEs only investing in high-wage economies around 13%. Affiliates of foreign-owned multinationals located in the UK accounted for a further 17%. By 2003, the respective proportions were 6%, 10% and 26% respectively. The final two columns (3) and (4) show the number of plants in each category in each year. This illustrates that part of the substantial increase in employment in continuing foreign-owned establishments appears to have been driven by changes in ownership. Finally, the table illustrates the dramatic difference in the average size of plants of different ownership types. In 2003, the average domestic owned

plant had 12 employees (1,920,000 employees in 157,200 plants) whereas the figures for plants owned by UK-MNE_Ls, UK-MNE_Hs and foreign-MNEs were 127, 109 and 121 respectively.

Table 2a. Change in employment 1998 to 2003 by firm-ownership type, all manufacturing industries

	Employment 1998		Employment 2003		Plants 1998	Plants 2003
	(1)	(2)	(3)	(4)	(5)	(6)
Continuers	2.77m	68%	2.68m	80%	100,700	100,700
UK-MNE_L	0.38m	9%	0.16m	5%	1,500	1,100
UK-MNE_H	0.38m	9%	0.30m	9%	2,800	2,100
Foreign-MNE	0.49m	12%	0.74m	22%	2,200	5,000
Domestic	1.53m	38%	1.48m	44%	94,100	92,500
Exitors	1.29m	32%			81,800	
UK-MNE_L	0.14m	3%			1,400	
UK-MNE_H	0.15m	4%			2,200	
Foreign-MNE	0.19m	5%			1,800	
Domestic	0.81m	20%			76,400	
Entrants			0.66m	20%		68,500
UK-MNE_L			0.03m	1%		400
UK-MNE_H			0.05m	1%		1,100
Foreign-MNE			0.14m	4%		2,300
Domestic			0.44m	13%		64,700
All	4.07m	100%	3.35m	100%	182,500	169,200

Note: figures may not sum due to rounding.

Source: author's calculations using AFDI and ARD data (Source: ONS) and LFS data.

To examine where within the manufacturing sector the different types of firm concentrate their activities over time, in Table 2b I distinguish between high-skill and low-skill manufacturing industries. To do this I rank 4-digit manufacturing industries by the industry-level skill intensity measure (see section 3.3) and split them into thirds. The table reports information on employment in the high-skill third (the third of industries with the lowest shares of employees with no qualifications), and the low-skill third (those with the highest shares of employees with no qualifications).

Employment in low-skill manufacturing industries fell by more than employment in high-skill manufacturing industries. In 1998, in a pattern consistent vertical FDI behaviour UK-MNEs investing in low-wage economies accounted for a much higher share of total employment in high-skill industries (19%, 280,000 employees) compared to low-skill industries (8%, 110,000 employees). This pattern of orientation of employment towards high-skill industries is also observed among plants owned by foreign-MNEs, whereas UK-MNEs that only invest in high-wage countries accounted for a higher share of employment in low-skill industries (15%, 210,000 employees in low-skill, 12%, 170,000 employees in high-skill industries).

By 2003 UK-MNEs investing in low-wage economies had reduced their share of employment in high-skill industries to 10%, and to only 2% in low-skill industries, whereas there was much less of a change in the shares of UK-MNEs only investing in high-wage economies (they still accounted for 11% of employment in low-skill industries and 12% of employment in high-skill industries). Later in this section I explore differences in employment growth in more detail.

Table 2b. Change in employment 1998 to 2003 by firm-ownership type, high-skill and low-skill manufacturing industries

	Employment 1998		Employment 2003		Plants 1998	Plants 2003
	(1)	(2)	(3)	(4)	(5)	(6)
High-skill industries						
Continuers	1.01m	70%	0.98m	79%	36,600	36,800
UK-MNE_L	0.22m	15%	0.10m	8%	800	700
UK-MNE_H	0.13m	9%	0.13m	10%	1,300	1,000
Foreign-MNE	0.18m	13%	0.29m	23%	1,000	2,400
Domestic	0.48m	33%	0.46m	37%	33,400	32,700
Exiters	0.42m	29%			28,500	
UK-MNE_L	0.06m	4%			700	
UK-MNE_H	0.04m	3%			900	
Foreign-MNE	0.08m	6%			900	
Domestic	0.24m	17%			26,000	
Entrants			0.26m	21%		26,700
UK-MNE_L			0.02m	2%		300
UK-MNE_H			0.03m	2%		500
Foreign-MNE			0.07m	6%		1,200
Domestic			0.15m	12%		24,700
All	1.44m	100%	1.24m	100%	65,100	63,500
Low-skill industries						
Continuers	0.87m	64%	0.85m	81%	27,000	27,400
UK-MNE_L	0.07m	5%	0.02m	2%	300	200
UK-MNE_H	0.14m	10%	0.09m	9%	800	500
Foreign-MNE	0.10m	7%	0.19m	18%	500	1,200
Domestic	0.56m	41%	0.55m	52%	25,300	25,400
Exiters	0.49m	36%			24,300	
UK-MNE_L	0.04m	3%			400	
UK-MNE_H	0.07m	5%			700	
Foreign-MNE	0.04m	3%			400	
Domestic	0.34m	25%			22,900	
Entrants			0.20m	19%		17,100
UK-MNE_L			0.003m	0.3%		50
UK-MNE_H			0.02m	2%		300
Foreign-MNE			0.04m	4%		500
Domestic			0.14m	13%		16,200
All	1.36m	100%	1.05m	100%	51,300	44,400

Note: figures may not sum due to rounding. The total number of continuing plants can differ between 1998 and 2003 as plants can change industries.

Source: author's calculations using AFDI and ARD data (Source: ONS) and LFS data.

Tables 3a and 3b show the same information for business services sectors, with Table 3a indicating that the sector saw employment growth of around 640,000 thousand employees over

the period. Table 3b shows that the increase in employment in relatively high-skill business services (around 720,000 employees) was greater than in low-skill (around 40,000). In 1998 UK-MNEs investing in low-wage economies accounted for 6% of employment in high-skill business services sectors, falling slightly to 4% in 2003, in low-skill business services sectors they accounted for 10% of employment in 1998, falling to 5% by 2003. UK-MNEs that were only investing in high-wage economies kept a fairly stable share of employment in both high-skill (5% in 1998, 6% in 2003), and low-skill (9% in 1998, 8% in 2003) business services sectors.

Table 3a. Change in employment 1998 to 2003 by firm-ownership type, all business services industries

	Employment 1998		Employment 2003		Plants 1998	Plants 2003
	(1)		(2)		(3)	(4)
Continuers	1.65m	55%	1.89m	52%	206,100	206,100
UK-MNE_L	0.07m	2%	0.05m	1%	800	600
UK-MNE_H	0.13m	4%	0.12m	3%	2,000	2,200
Foreign-MNE	0.10m	3%	0.25m	7%	1,300	4,200
Domestic	1.35m	45%	1.46m	40%	202,000	199,100
Exitors	1.37m	45%			223,800	
UK-MNE_L	0.11m	4%			1,900	
UK-MNE_H	0.13m	4%			4,400	
Foreign-MNE	0.08m	3%			1,800	
Domestic	1.05m	35%			215,800	
Entrants			1.78m	49%		310,300
UK-MNE_L			0.06m	2%		700
UK-MNE_H			0.12m	3%		3,400
Foreign-MNE			0.28m	8%		6,100
Domestic			1.31m	36%		300,000
All	3.02m	100%	3.66m	100%	430,000	516,500

Note: figures may not sum due to rounding.

Source: author's calculations using AFDI and ARD data (Source: ONS) and LFS data.

The tables also provide information on the propensities of different types of plant to enter and exit over the period. Column (3) of Tables 2b and 3b can be used to look at the propensity of plants owned by different types of firm to exit the population between 1998 and 2003 in high and low-skill industries. Figure 1 shows these exit propensities, measured as the proportion of plants present in 1998 to have exited by 2003. Figure 2 shows a corresponding measure of entry propensity, the proportion of plants present in 2003 that entered between 1999 and 2003.

Table 3b. Change in employment 1998 to 2003 by firm-ownership type, high-skill and low-skill business services industries

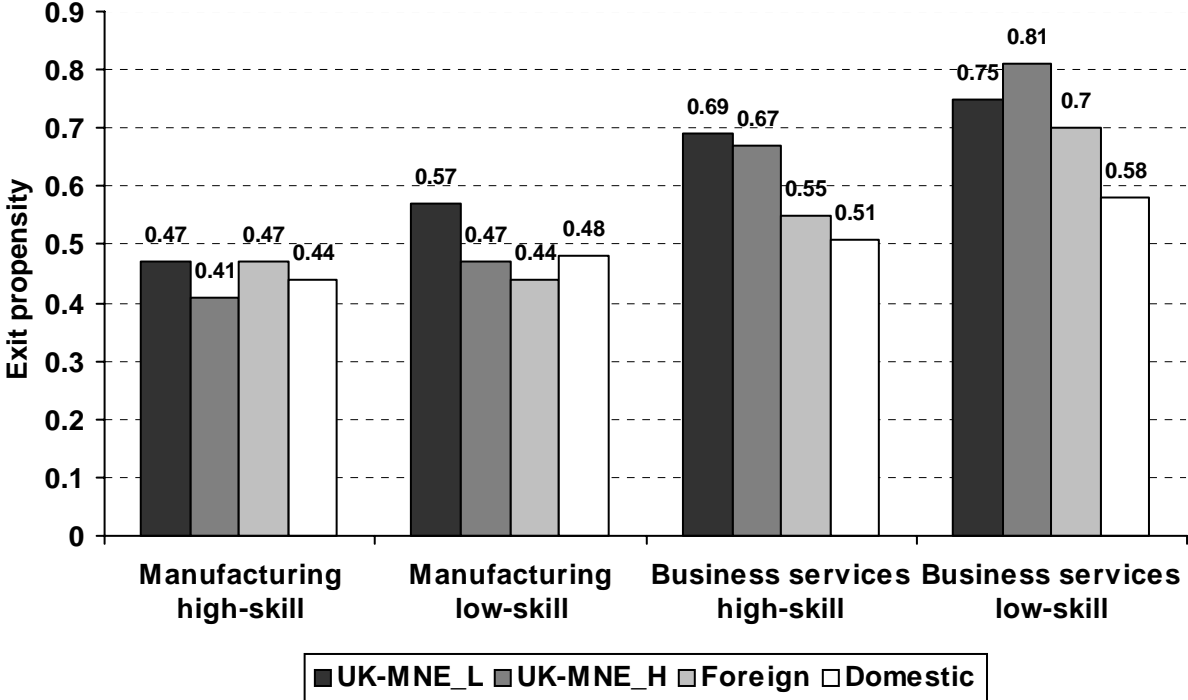
	Employment 1998		Employment 2003		Plants 1998	Plants 2003
High-skill industries	(1)		(2)		(3)	(4)
Continuers	0.59m	57%	0.86m	49%	116,800	145,100
UK-MNE_L	0.03m	3%	0.03m	2%	400	400
UK-MNE_H	0.03m	3%	0.05m	3%	800	1,200
Foreign-MNE	0.04m	4%	0.10m	6%	500	2,300
Domestic	0.49m	48%	0.67m	38%	115,200	141,200
Exitors	0.44m	43%			124,200	
UK-MNE_L	0.03m	3%			900	
UK-MNE_H	0.02m	2%			1,600	
Foreign-MNE	0.02m	2%			600	
Domestic	0.36m	35%			121,100	
Entrants			0.89m	51%		231,700
UK-MNE_L			0.03m	2%		400
UK-MNE_H			0.05m	3%		1,300
Foreign-MNE			0.13m	7%		3,200
Domestic			0.67m	38%		226,800
All	1.03m	100%	1.75m	100%	241,000	376,800
Low-skill industries						
Continuers	0.36m	49%	0.39m	51%	23,800	24,200
UK-MNE_L	0.02m	3%	0.01m	1%	200	100
UK-MNE_H	0.03m	4%	0.03m	4%	400	400
Foreign-MNE	0.02m	3%	0.06m	8%	300	900
Domestic	0.29m	40%	0.29m	38%	23,000	22,800
Exitors	0.37m	51%			34,500	
UK-MNE_L	0.05m	7%			600	
UK-MNE_H	0.04m	5%			1,700	
Foreign-MNE	0.03m	4%			700	
Domestic	0.25m	34%			31,500	
Entrants			0.38m	49%		38,100
UK-MNE_L			0.03m	4%		200
UK-MNE_H			0.03m	4%		1,600
Foreign-MNE			0.07m	9%		1,700
Domestic			0.26m	34%		34,600
All	0.73m	100%	0.77m	100%	58,400	62,300

Note: figures may not sum due to rounding. The total number of continuing plants can differ between 1998 and 2003 as plants can change industries.

Source: author's calculations using AFDI and ARD data (Source: ONS) and LFS data.

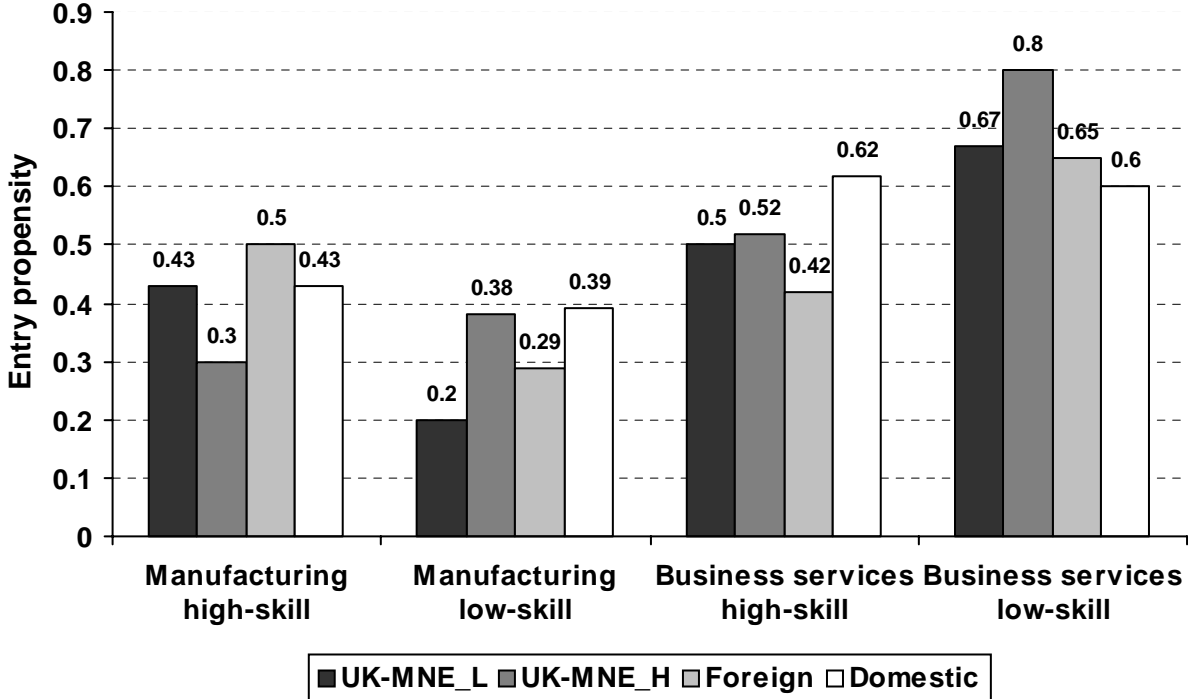
The figures show that among manufacturing plants the highest exit rates and the lowest entry rates on these measures are among plants in low-skill industries owned by UK-MNEs investing in low-wage economies, which is consistent with this type of firm re-locating relatively low-skill activities from the UK abroad. This pattern is not replicated in the business services sector, where exit and entry rates are in general higher.

Figure 1: plant exit propensities 1998 to 2002 by firm-ownership type and industry skill intensity, manufacturing and business services



Source: author’s calculations using AFDI and ARD data (Source: ONS) and LFS data.

Figure 2: plant entry propensities 1999 to 2003 by firm-ownership type and industry skill intensity, manufacturing and business services



Source: author’s calculations using AFDI and ARD data (Source: ONS) and LFS data.

To examine differences in employment growth across plants in more detail I run the following regression,

$$Empgrow_{it,t-2} = \alpha + \beta_1 UKMNE_L_{it-2} + \beta_2 UKMNE_H_{it-2} + \beta_3 FOR_{it-2} + \chi'_{it-2} \gamma + t_t + ind_j + \varepsilon_{it} \quad (1)$$

Where employment growth is measured between $t-2$ and t defined as

$$Empgrow_{it,t-2} = \frac{E_{it} - E_{it-2}}{(E_{it} + E_{it-2})/2} \quad (2)$$

following Biscourp and Kramarz (2007), where E_{it} is employment in plant i at time t . This varies between -2 (for exitors) and 2 (for entrants). $UKMNE_L$, $UKMNE_H$ and FOR are dummy variables indicating that the plant is owned by a UK-MNE investing in a low-wage economy, a UK-MNE that only invests in high-wage economies, and a foreign-MNE respectively, (hence the omitted category is purely domestic owned plants), and χ is a vector of plant characteristics. For manufacturing plants these include age, an indicator for a small or medium-sized plant (less than 250 employees), a dummy variable to indicate that the plant is part of a firm with other plants in the same 5-digit industry, and a dummy variable to indicate that the plant is part of a firm with other plants in the manufacturing sector. For plants in business services I do not have data on age and I replace the final dummy with one to indicate that the plant is part of a firm with other plants within the business services sector.¹¹ Dunne et al. (1988, 1999) and Bernard and Jensen (2005) show that these characteristics are related to exit propensities, for example younger, smaller plants and plants that are part of multi-plant firms are more likely to exit. t are time-dummies and ind_j are 4-digit industry dummies. I estimate this specification using data on employment growth over two, three-year periods 1998-2000 and 2001-2003.

Tables 4 and 5 show the results of this exercise for plants in manufacturing and business services separately. The first three columns in each case present results for continuing plants only, whereas the final three columns present results for the full set of plants (continuers, exitors and entrants). The top half of each table presents un-weighted regressions and the bottom half employment-weighted regressions. The tables only report the estimated coefficients on the firm ownership dummies. The table also reports the results of tests of whether the estimated coefficients on the three ownership dummies are statistically significantly different from each other.

¹¹ For entrants the characteristics variables are dated t rather than $t-2$.

For manufacturing (Table 4), looking at continuing plants only, I find no significant differences in employment growth across the firm ownership types. However once exitors and entrants are included, I find evidence that plants owned by UK-MNEs investing in low-wage economies typically exhibit lower employment growth than those owned by the other three types of firms, and that this appears to be primarily driven by lower employment growth in low-skill industries. There is also some evidence that plants owned by foreign-owned MNEs and by UK-MNEs that only invest in high-wage economies have higher employment growth than purely domestic plants. Hence UK-MNEs investing in low-wage economies display a different pattern of employment growth compared to other types of firms in manufacturing.

The results for business services for continuing plants (columns (1)-(3), Table 5) suggest that in low-skill industries plants owned by UK-MNEs investing in low-wage economies exhibit lower employment growth than domestic plants and plants owned by other UK-MNEs, although the estimated coefficient is not statistically significantly different from that for foreign-owned plants. Once entrants and exitors are also included (columns (4)-(6)) the pattern of results is similar, although there is also evidence that plants owned by foreign-owned multinationals display higher overall employment growth compared to domestic-owned plants. While the results for business services point towards UK-MNEs investing in low-wage economies having lower employment growth in low-skill industries in the UK, there is also some evidence that they also exhibit lower employment growth in high-skill business services. It is worth remembering that these MNEs are investing in a large number of countries around the globe, and it is possible that they may also be locating high-skill business services activities such as R&D in countries such as the US.

In conclusion then it appears that plants in the UK owned by UK-MNEs investing in low-wage economies show lower employment growth, in particular in low-skill industries, a finding consistent with labour in low-wage economies being a substitute for labour in low-skill industries in the UK. This ties in with the findings of Harrison and McMillan (2007) for the US, and with the theory of vertical FDI.

This examination of employment growth rates has abstracted from differences in firm performance which will be an important determinant of employment growth and plant survival. In the next section I examine a wider range of characteristics.

Table 4. Employment growth regressions: manufacturing plant population

Dep. var.: $Empgrow_{t,t-2}$	Survivors only			Survivors, exitors and entrants		
	All industries (1)	High-skill industries (2)	Low-skill industries (3)	All industries (4)	High-skill industries (5)	Low-skill industries (6)
<i>Without employment weights</i>						
(1) UK-MNE_L _{t-2}	-0.034 (0.019)	-0.043 (0.029)	-0.034 (0.018)	-0.087* (0.041)	-0.077 (0.059)	-0.164* (0.068)
(2) UK-MNE_H _{t-2}	-0.004 (0.008)	-0.019 (0.011)	0.007 (0.016)	0.044 (0.024)	0.051 (0.039)	0.032 (0.040)
(3) Foreign-MNE _{t-2}	-0.010 (0.005)	-0.015 (0.009)	-0.005 (0.009)	0.055* (0.023)	0.023 (0.037)	0.049 (0.036)
R-squared	0.02	0.02	0.02	0.05	0.05	0.05
Accept (1) = (2) at 5% level?	Yes	Yes	Yes	No	Yes	No
Accept (1) = (3) at 5% level?	Yes	Yes	Yes	No	Yes	No
Accept (2) = (3) at 5% level?	Yes	Yes	Yes	Yes	Yes	Yes
<i>With employment weights</i>						
(1) UK-MNE_L _{t-2}	-0.026 (0.017)	-0.028 (0.028)	-0.015 (0.016)	-0.076* (0.033)	-0.041 (0.055)	-0.098 (0.055)
(2) UK-MNE_H _{t-2}	-0.014 (0.011)	-0.024 (0.021)	-0.016 (0.015)	0.028 (0.021)	0.090** (0.033)	-0.018 (0.032)
(3) Foreign-MNE _{t-2}	-0.007 (0.009)	-0.004 (0.016)	0.016 (0.013)	0.023 (0.020)	0.025 (0.034)	0.019 (0.029)
R-squared	0.05	0.06	0.05	0.04	0.04	0.05
Accept (1) = (2) at 5% level?	Yes	Yes	Yes	No	No	Yes
Accept (1) = (3) at 5% level?	Yes	Yes	Yes	No	Yes	No
Accept (2) = (3) at 5% level?	Yes	Yes	Yes	Yes	Yes	Yes
Plant characteristics	Yes	Yes	Yes	Yes	Yes	Yes
4-digit industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	268,789	98,537	71,368	433,330	159,795	116,751

Note: plant characteristics included are: age, sme dummy, firm owns multi plants in 5-digit industry dummy; firm owns multi plants in manufacturing dummy. Standard errors clustered at the firm-level in parentheses.* significant at 5%, ** significant at 1% level.

Source: author's calculations using AFDI and ARD data (Source: ONS) and LFS data.

Table 5. Employment growth regressions: business services plant population

Dep. var.: $Empgrow_{t,t-2}$	Survivors only			Survivors, exitors and entrants		
	All industries (1)	High-skill industries (2)	Low-skill industries (3)	All industries (1)	High-skill industries (2)	Low-skill industries (3)
<i>Without employment weights</i>						
(1) UK-MNE $_L_{t-2}$	-0.026 (0.023)	0.005 (0.025)	-0.069** (0.021)	-0.112 (0.077)	-0.146 (0.078)	-0.215 (0.155)
(2) UK-MNE $_H_{t-2}$	-0.005 (0.013)	-0.002 (0.011)	0.002 (0.017)	0.020 (0.097)	-0.020 (0.037)	0.041 (0.262)
(3) Foreign-MNE $_{t-2}$	-0.009 (0.013)	-0.003 (0.011)	-0.047 (0.029)	0.136 (0.060)*	0.043 (0.033)	0.072 (0.169)
R-squared	0.00	0.00	0.01	0.12	0.17	0.01
Accept (1) = (2) at 5% level?	Yes	Yes	No	Yes	Yes	Yes
Accept (1) = (3) at 5% level?	Yes	Yes	Yes	No	No	Yes
Accept (2) = (3) at 5% level?	Yes	Yes	Yes	Yes	Yes	Yes
<i>With employment weights</i>						
(1) UK-MNE $_L_{t-2}$	-0.132 (0.103)	-0.087* (0.044)	-0.120** (0.046)	-0.155* (0.074)	-0.172 (0.090)	-0.224** (0.084)
(2) UK-MNE $_H_{t-2}$	-0.010 (0.044)	-0.021 (0.019)	0.003 (0.053)	-0.011 (0.082)	0.017 (0.090)	-0.087 (0.206)
(3) Foreign-MNE $_{t-2}$	0.049 (0.030)	-0.027 (0.019)	-0.065 (0.071)	0.156* (0.064)	0.094 (0.061)	-0.058 (0.139)
R-squared	0.06	0.01	0.03	0.08	0.17	0.01
Accept (1) = (2) at 5% level?	Yes	Yes	No	Yes	Yes	Yes
Accept (1) = (3) at 5% level?	Yes	Yes	Yes	No	No	Yes
Accept (2) = (3) at 5% level?	Yes	Yes	Yes	Yes	Yes	Yes
Plant characteristics	Yes	Yes	Yes	Yes	Yes	Yes
4-digit industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	654,344	376,660	78,121	1,271,915	752,492	165,118

Note: plant characteristics included are: sme dummy; firm owns multi plants in 5-digit industry dummy; firm owns multi plants in business services dummy. Standard errors clustered at the firm-level in parentheses. * significant at 5%, ** significant at 1% level.

Source: author's calculations using AFDI and ARD data (Source: ONS) and LFS data.

4.2 Establishment characteristics and productivity

In this section I use the establishment-level sample described in section 3.2 to examine further differences in performance characteristics for establishments owned by the four types of firm. Table 6 provides some descriptive statistics for one year of the estimation sample, 2003. It shows that in both the manufacturing and business services sector, establishments owned by multinationals are much larger in terms of output, value-added and employment than purely domestic establishments, that they exhibit higher labour productivity as measured by output per employee or value-added per employee and pay higher wages, that they are more investment and capital intensive and that they use more intermediate inputs per employee. This pattern is well established (for UK evidence see Criscuolo and Martin (2005) and Griffith et al. (2004)). Establishments owned by multinational firms are also more likely to be older and to be part of larger multi-establishment firms.

Table 6. Descriptive statistics: manufacturing and business services, establishments 2003

Mean characteristics, 2003	UK-MNE_L	UK-MNE_H	Foreign-MNE	Domestic
Manufacturing				
<i>No. establishments</i>	234	514	1,295	3,323
Gross output ^a	128.0	45.0	100.4	19.4
Value-added ^a	51.1	16.5	32.0	6.7
Employment	539.8	407.8	464.9	169.3
Gross output per employee ^b	177.9	111.0	173.9	99.5
Value-added per employee ^b	60.3	41.9	53.4	35.7
Investment per employee ^c	6.1	4.6	5.8	4.5
Capital stock per employee ^c	170.4	104.5	174.6	101.7
Intermediate inputs per employee ^b	117.5	69.2	120.8	64.2
Average wage ^b	28.8	25.4	27.6	22.3
Age (truncated at 31)	17.5	18.9	16.6	14.5
Multi estabs in industry dummy	0.59	0.39	0.29	0.11
Multi estabs in manuf dummy	0.35	0.35	0.25	0.11
Business services				
<i>No. establishments</i>	46	125	324	3,536
Gross output ^a	42.5	28.3	34.7	7.0
Value-added ^a	24.0	18.1	19.2	4.7
Employment	839.8	474.3	475.2	149.3
Gross output per employee ^b	123.6	110.7	130.8	70.6
Value-added per employee ^b	70.2	58.3	65.0	40.6
Investment per employee ^c	5.3	6.0	6.0	5.0
Capital stock per employee ^c	170.6	129.5	176.5	72.4
Intermediate inputs per employee ^b	51.6	51.8	66.2	29.5
Average wage ^b	50.2	41.1	43.4	23.3
Age (truncated at 9)	7.9	8.0	7.5	6.4
Multi estabs in industry dummy	0.49	0.31	0.23	0.05
Multi estabs in bus. services dummy	0.93	0.70	0.49	0.11

^a £ million. ^b £ thousand. ^c £ thousand 1995. Note: all figures are from the 2003 estimation sample data. Source: author's calculations using AFDI and ARD data (Source: ONS).

To examine these differences in characteristics in more detail I run the following regression for each characteristic:

$$\log(\text{characteristic})_{it} = \alpha + \beta_1 UKMNE_L_{it} + \beta_2 UKMNE_H_{it} + \beta_3 FOR_{it} + \chi'_{it} \gamma + t_t + ind_j + \varepsilon_{it} \quad (3)$$

where $UKMNE_L$, $UKMNE_H$ and FOR are dummy variables indicating that the establishment is owned by a UK-MNE investing in a low-wage economy, a UK-MNE that only invests in high-wage economies, and a foreign-owned MNE respectively, (hence the omitted category is purely domestic establishments), χ is a vector of establishment characteristics which includes: age; a dummy variable to indicate that the establishment is part of a firm with other establishments in the same 5-digit industry; and a dummy variable to indicate that the establishment is part of a firm with other establishments in the manufacturing or business services sector respectively. t is a set of time dummies, and ind_j a set of 4-digit industry dummies. In the business services specifications I replace these two sets of dummies with a single set of 4-digit industry-year dummies due to a lack of deflators for the characteristics variables at the level of narrowly defined industries. I cluster the standard errors at the firm level, and all regressions are weighted using inverse sampling probabilities.

I use data over six years 1998-2003, and I run separate regressions for establishments in manufacturing and in business services, and within each of these separate regressions for establishments in high-skill and low-skill industries. For ease of exposition Tables 7a-7c report the estimated coefficients for each characteristic as percentage differences from the omitted category (domestic establishments), calculated as $\exp(\beta) - 1$ for each of β_1 , β_2 and β_3 , along with indicators of statistical significance, and the results of t-tests of whether the estimated coefficients are statistically significantly different from each other. The table reports on three sets of characteristics: size; labour productivity and wages; and input intensity.

Size

The findings in Table 7a confirm the impression given in the descriptive statistics in Table 6, that establishments owned by MNEs are substantially larger than domestic establishments. For manufacturing the size characteristics (gross output, value-added and employment) point to a ranking of foreign-owned establishments being the largest followed by UK-MNEs investing in low-wage economies, followed by UK-MNEs that do not, although in some cases the estimated coefficients are not statistically significantly different from each other. The two types of UK-MNEs are more similar in terms of size in low-skill industries than in high-skill industries,

where UK-MNEs investing in low-wage economies are significantly larger in terms of output and value-added.

Table 7a: Size: % difference relative to domestic establishments, manufacturing and business services

Size	Manufacturing			Business Services		
	All industries	High-skill industries	Low-skill industries	All industries	High-skill industries	Low-skill industries
Gross output						
(1) UK-MNE_L	142% **	183% **	113% **	270% **	267% **	341% **
(2) UK-MNE_H	94% **	97% **	83% **	265% **	385% **	172% **
(3) Foreign-MNE	239% **	264% **	196% **	540% **	695% **	601% **
(1) = (2) (5% level)	No	No	Yes	Yes	Yes	Yes
(1) = (3) (5% level)	No	No	No	No	No	Yes
(2) = (3) (5% level)	No	No	No	No	No	No
Value-added						
(1) UK-MNE_L	131% **	162% **	97% **	242% **	228% **	371% **
(2) UK-MNE_H	89% **	92% **	78% **	245% **	329% **	161% **
(3) Foreign-MNE	171% **	184% **	145% **	440% **	552% **	500% **
(1) = (2) (5% level)	No	No	Yes	Yes	Yes	Yes
(1) = (3) (5% level)	No	Yes	Yes	No	No	Yes
(2) = (3) (5% level)	No	No	No	No	No	No
Employment						
(1) UK-MNE_L	92% **	111% **	76% **	165% **	175% **	253% *
(2) UK-MNE_H	71% **	71% **	63% **	189% **	265% **	132% **
(3) Foreign-MNE	130% **	137% **	113% **	283% **	368% **	353% **
(1) = (2) (5% level)	Yes	Yes	Yes	Yes	Yes	Yes
(1) = (3) (5% level)	No	Yes	Yes	No	No	Yes
(2) = (3) (5% level)	No	No	No	No	No	No
Observations	39,396	13,538	13,678	24,693	11,150	3,877

Note: Figures reported are $\exp(\beta) - 1$ from equation (3). Establishment characteristics included in each regression: age; firm owns multi establishments in 5-digit industry dummy; firm owns multi establishments in manufacturing / business services dummy. Manufacturing regressions include 4-digit industry dummies and time dummies. Business services regressions include 4-digit industry-year dummies. Standard errors in parentheses clustered at the firm level. * significant at 5%; ** significant at 1% level.

Source: author's calculations using AFDI and ARD data (Source: ONS), and LFS data.

For the business services sector, foreign-owned establishments are again significantly larger than the other three types of establishment, and the differences between MNEs and purely domestic establishments are greater than in manufacturing. Compared to the findings for manufacturing, establishments in businesses services owned by the two types of UK-MNEs are more similar to each other in terms of size.

Labour productivity and wages

Table 7b indicates that for manufacturing, foreign-owned establishments have significantly higher output per employee than the other three types of firm. Establishments that are owned by UK-MNEs investing in low-wage economies have significantly higher output per employee than other UK-MNEs in high-skill industries, but not in low-skill industries. The value-added per employee measure also shows that across all industries foreign-owned establishments and those owned by UK-MNEs investing in low wage economies typically have higher labour productivity than other UK-MNEs. Foreign-owned establishments also typically pay the highest wages.

Table 7b: Labour productivity and wages: % difference relative to domestic establishments, manufacturing and business services

Labour productivity and wages	Manufacturing			Business Services		
	All industries	High-skill industries	Low-skill industries	All industries	High-skill industries	Low-skill industries
Gross output per employee						
(1) UK-MNE_L	26% **	34% **	21% **	39% **	33% **	25%
(2) UK-MNE_H	13% **	16% **	12% **	26% **	33% **	18%
(3) Foreign-MNE	47% **	54% **	39% **	67% **	70% **	55% **
(1) = (2) (5% level)	No	No	Yes	Yes	Yes	Yes
(1) = (3) (5% level)	No	No	No	No	No	Yes
(2) = (3) (5% level)	No	No	No	No	No	No
Value-added per employee						
(1) UK-MNE_L	20% **	24% **	12% **	29% **	19%	34%
(2) UK-MNE_H	11% **	12% **	9% **	19% **	17% **	13%
(3) Foreign-MNE	18% **	20% **	15% **	41% **	39% **	32% *
(1) = (2) (5% level)	No	Yes	Yes	Yes	Yes	Yes
(1) = (3) (5% level)	Yes	Yes	Yes	Yes	Yes	Yes
(2) = (3) (5% level)	No	No	Yes	No	No	Yes
Average wage						
(1) UK-MNE_L	14% **	14% **	15% **	45% **	34% **	30%
(2) UK-MNE_H	11% **	13% **	9% **	43% **	52% **	18% *
(3) Foreign-MNE	19% **	20% **	18% **	80% **	93% **	47% **
(1) = (2) (5% level)	Yes	Yes	Yes	Yes	Yes	Yes
(1) = (3) (5% level)	No	Yes	Yes	No	No	Yes
(2) = (3) (5% level)	No	No	No	No	No	No
Observations	39,396	13,538	13,678	24,693	11,150	3,877

Note: see note to Table 7a. * significant at 5%; ** significant at 1% level.

Source: author's calculations using AFDI and ARD data (Source: ONS), and LFS data.

The pattern is similar for business services although as for the size measures the ranking of the two types of UK-MNEs is less clear. For the two measures of labour productivity the estimated differences between UK-MNEs and domestic establishments are not significant at the 5% level for low-skill industries.

Input intensity

Table 7c suggests that for high-skill but not low-skill manufacturing industries, establishments owned by UK-MNEs investing in low-wage economies have higher capital stock per employee, and use more intermediate inputs per employee compared to other UK-MNEs, although the figures are still lower than those for foreign-owned MNEs. In general the differences across MNEs in investment intensity (investment per employee) are not statistically significant.

Table 7c: Input intensity: % difference relative to domestic establishments, manufacturing and business services

Input intensity	Manufacturing			Business Services		
	All industries	High-skill industries	Low-skill industries	All industries	High-skill industries	Low-skill industries
Investment per employee						
(1) UK-MNE_L	27% **	31% **	16%	22% *	17%	37%
(2) UK-MNE_H	23% **	28% **	22% **	19% **	3%	5%
(3) Foreign-MNE	36% **	33% **	30% **	27% **	14% *	54% *
(1) = (2) (5% level)	Yes	Yes	Yes	Yes	Yes	Yes
(1) = (3) (5% level)	Yes	Yes	Yes	Yes	Yes	Yes
(2) = (3) (5% level)	No	Yes	Yes	Yes	Yes	Yes
Capital stock per employee						
(1) UK-MNE_L	34% **	38% **	33% **	54% **	59% **	10%
(2) UK-MNE_H	16% **	17% **	17% **	44% **	60% **	25%
(3) Foreign-MNE	60% **	59% **	52% **	100% **	103% **	89% **
(1) = (2) (5% level)	No	No	Yes	Yes	Yes	Yes
(1) = (3) (5% level)	No	No	No	No	No	Yes
(2) = (3) (5% level)	No	No	No	No	No	Yes
Intermediate inputs per employee						
(1) UK-MNE_L	31% **	41% **	28% **	65% **	67% **	28%
(2) UK-MNE_H	18% **	20% **	16% **	47% **	66% **	20%
(3) Foreign-MNE	68% **	77% **	56% **	118% **	140% **	87% **
(1) = (2) (5% level)	No	No	Yes	Yes	Yes	Yes
(1) = (3) (5% level)	No	No	No	No	No	Yes
(2) = (3) (5% level)	No	No	No	No	No	No
Observations	39,396	13,538	13,678	24,693	11,150	3,877

Note: see note to Table 7a. * significant at 5%; ** significant at 1% level.

Source: author's calculations using AFDI and ARD data (Source: ONS), and LFS data.

Foreign-owned establishments are again the most capital intensive in business services, and use intermediate inputs the most intensively. As before the two types of UK-MNEs display more similar behaviour in business services sectors than they do in manufacturing.

In addition to making labour productivity comparisons across the four groups of establishments I also estimate production functions to investigate differences in total factor productivity (TFP). I include the same three dummy variables for the three MNE ownership types in the regressions, as well as establishment characteristics, 4-digit industry dummies and time dummies (interacted for business services). Table 8 shows the results of this exercise.

For manufacturing the results indicate that overall, UK-MNEs investing in low-wage economies have significantly higher TFP than establishments owned by other UK-MNEs (around 3% higher) and purely domestic establishments (around 5% higher). Moreover, this advantage over UK-MNEs that only invest in high-wage economies looks to be driven by significantly higher TFP in high-skill industries. Indeed the results point towards this group of establishments as having even higher TFP than foreign-owned establishments although the estimated coefficients are not statistically significantly different from each other. The results for business services have a different pattern with the estimated coefficients suggesting that UK-MNEs investing in low-wage economies exhibit higher TFP than the other groups of firms in low-skill industries, and that foreign-owned establishments have the highest TFP overall.

In summary, the findings for manufacturing point towards UK-MNEs investing in low-wage economies as having a lead over other UK-MNEs in terms of efficiency and scale in high-skill, but not low-skill industries. This pattern, of advantages being clustered in high-skill sectors, is consistent with vertical FDI leading to home-country benefits in industries where the home country has a comparative advantage. But the results are not definitive as to whether these differences in performance are a direct result of overseas investment, or whether they can be explained by other firm attributes. In the final section of the paper I attempt to address this question by focussing on establishments that are part of firms that begin to invest abroad over the period.

Table 8. Total factor productivity: manufacturing and business services

Dep. var.: Ln(gross output)	Manufacturing			Business services		
	All industries	High-skill industries	Low-skill industries	All industries	High-skill industries	Low-skill industries
Ln(employment)	0.245** (0.006)	0.252** (0.012)	0.257** (0.009)	0.406** (0.005)	0.478** (0.008)	0.344** (0.011)
Ln(intermediates)	0.597** (0.007)	0.585** (0.013)	0.596** (0.013)	0.291** (0.009)	0.279** (0.012)	0.270** (0.019)
Ln(capital stock)	0.133** (0.005)	0.142** (0.010)	0.124** (0.009)	0.257** (0.009)	0.203** (0.013)	0.354** (0.022)
(1) UK-MNE_L	0.049** (0.010)	0.061** (0.016)	0.020 (0.012)	0.122** (0.043)	0.093 (0.054)	0.164* (0.072)
(2) UK-MNE_H	0.022** (0.007)	0.026* (0.011)	0.018* (0.009)	0.078** (0.024)	0.100** (0.034)	0.062 (0.056)
(3) Foreign-MNE	0.036** (0.005)	0.045** (0.010)	0.028** (0.009)	0.172** (0.018)	0.204** (0.022)	0.091 (0.050)
Age	-0.000* (0.000)	-0.001** (0.000)	-0.000 (0.000)	0.009** (0.002)	0.005 (0.003)	0.010* (0.004)
Multi manuf / bus. serv. dummy	0.010* (0.005)	0.000 (0.008)	0.013 (0.008)	0.101** (0.017)	0.057** (0.022)	0.144** (0.046)
Multi industry dummy	0.020** (0.005)	0.024* (0.010)	0.015 (0.008)	0.024 (0.021)	0.004 (0.028)	0.002 (0.051)
4-digit industry dummies	Yes	Yes	Yes	No	No	No
Time dummies	Yes	Yes	Yes	No	No	No
4-digit industry-year dummies	No	No	No	Yes	Yes	Yes
Observations	39,396	13,538	13,678	24,693	11,150	3,877
R-squared	0.98	0.98	0.98	0.94	0.94	0.95
Accept (1) = (2) at 5% level?	No	No	Yes			
Accept (1) = (3) at 5% level?	Yes	Yes	Yes			
Accept (2) = (3) at 5% level?	Yes	Yes	Yes			

Note: standard errors clustered at the firm-level in parentheses. * significant at 5%; ** significant at 1% level.

Source: author's calculations using AFDI and ARD data (Source: ONS), and LFS data.

4.3 Are differences in characteristics a result of outward investment?

In this section I compare the characteristics of establishments that start to make outward investments over the period 1999 to 2003 with establishments that remain purely domestic. Moreover, I make before/after comparisons within firms, hence the specification takes the form of a difference-in-differences analysis. Therefore to identify any effect of outward investment this analysis relies on the assumption that conditional on observables, those establishments that start to make outward investments would have exhibited similar trends in characteristics to those that do not, had they chosen not to invest abroad. The estimation equation is as follows:

$$\log(\text{characteristic})_{it} = \alpha + \beta_1 A_UKMNE_L_{it} + \beta_2 A_UKMNE_H_{it} + \chi'_{it} \gamma + t_i + ind_j + \mu_f + \varepsilon_{it} \quad (4)$$

Where A_UKMNE_L is a dummy variable which takes the value of one in all years after the firm which owns the establishment has begun to invest in a country or group of countries that includes at least one low-wage economy, and A_UKMNE_H is a dummy variable which takes the value of one in all years after the firm which owns the establishment has begun to invest in a country or group of countries that are high-wage only. The dummies are mutually exclusive, hence a firm may begin by investing only in high-wage economies, but if it subsequently starts investing in a low-wage economy A_UKMNE_L will switch to being coded as one A_UKMNE_H will switch to zero. μ_f is a firm dummy and all other variables are defined as before.

I estimate this regression on all establishments that are identified in the establishment-level population as being purely domestic in 1998 (i.e. not part of an MNE), and which never become part of a foreign-owned establishment. Hence the estimation sample contains the set of establishments that either remain purely domestic, or are part of firms that begin to invest abroad (become UK-MNEs) in any year from 1999 onwards, or are taken over by UK-MNEs in any year from 1999 onwards.

In Table 9 I first estimate separate regressions for manufacturing and business services without firm-fixed effects (columns (1) and (3)) and then including firm-fixed effects (columns (2) and (4)). Looking first at the estimates without firm-fixed effects, as might be expected they are in line with the findings in Tables 7a-7c. The point estimates are generally positive and often statistically significant. (note that the 'control group' at this stage also includes establishments that become (part of) MNEs, hence the differences might not be expected to be as pronounced as

in Tables 7a-7c). However once the firm-fixed effects are included there are very few significant coefficients remaining. There is also no difference in this pattern of results when looking at high and low-skill manufacturing industries separately. What this implies is that there is little evidence that outward investment leads to a significant change in establishment behaviour, although the time period of the data is somewhat short. Hence this suggests that the observed differences in performance characteristics are largely attributable to the establishments and firms themselves, rather than being a direct result of outward investment, and supports the proposition that it is the most productive firms that become multinationals.

Table 9. Becoming a multinational: manufacturing and business services

Size	Manufacturing		Business services	
	(1)	(2)	(3)	(4)
Gross output				
UK-MNE_L After	0.258 (0.156)	0.015 (0.059)	0.974* (0.399)	0.555* (0.268)
UK-MNE_H After	0.541** (0.105)	-0.013 (0.048)	0.987** (0.137)	0.074 (0.103)
Value-added				
UK-MNE_L After	0.226 (0.144)	0.036 (0.067)	0.846 (0.451)	0.345 (0.323)
UK-MNE_H After	0.515** (0.101)	-0.031 (0.052)	0.919** (0.138)	-0.031 (0.142)
Employment				
UK-MNE_L After	0.102 (0.126)	-0.038 (0.060)	0.501 (0.378)	0.311 (0.196)
UK-MNE_H After	0.460** (0.087)	-0.021 (0.041)	0.735** (0.125)	-0.013 (0.088)
Labour productivity and wages				
Gross output per employee				
UK-MNE_L After	0.156** (0.049)	0.053 (0.048)	0.252** (0.058)	0.087 (0.064)
UK-MNE_H After	0.081* (0.034)	0.008 (0.030)	0.473** (0.145)	0.244 (0.228)
Value-added per employee				
UK-MNE_L After	0.124** (0.043)	0.074 (0.062)	0.344* (0.170)	0.034 (0.229)
UK-MNE_H After	0.054 (0.031)	-0.010 (0.038)	0.184** (0.065)	-0.018 (0.111)
Average wage				
UK-MNE_L After	0.126** (0.031)	0.031 (0.053)	0.439* (0.214)	0.053 (0.269)
UK-MNE_H After	0.068** (0.021)	0.020 (0.021)	0.244** (0.050)	0.033 (0.054)

...continued

Table 9 continued...

Input intensity	(1)	(2)	(3)	(4)
Investment per employee				
UK-MNE_L After	0.113 (0.091)	0.235 (0.128)	0.128 (0.274)	0.213 (0.385)
UK-MNE_H After	0.108 (0.055)	0.098 (0.067)	0.173 (0.109)	-0.158 (0.155)
Capital stock per employee				
UK-MNE_L After	0.127* (0.057)	-0.016 (0.039)	0.309 (0.207)	0.096 (0.298)
UK-MNE_H After	0.090* (0.039)	-0.012 (0.031)	0.385** (0.088)	0.118 (0.089)
Intermediate inputs per employee				
UK-MNE_L After	0.202** (0.061)	0.032 (0.053)	0.653** (0.225)	0.392 (0.341)
UK-MNE_H After	0.101* (0.041)	0.007 (0.037)	0.355** (0.082)	0.209* (0.095)
Establishment characteristics	Yes	Yes	Yes	Yes
4-digit industry dummies	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
Firm fixed effects	No	Yes	No	Yes
Observations	35,706	35,706	24,187	24,187

Note: additional characteristics included in each regression: age; firm owns multi establishments in 5-digit industry dummy; firm owns multi establishments in manufacturing / business services dummy. Standard errors in parentheses clustered at the firm level. * significant at 5%; ** significant at 1% level.

Source: author's calculations using AFDI and ARD data (Source: ONS).

5 Conclusions

This paper has investigated whether outward investment by UK multinationals affects home-country activity in the UK, and compares the behaviour of multinationals making different geographic outward investments. I find some evidence that multinationals which invest in low-wage economies display behaviour in line with the theory of vertical FDI. Within manufacturing, employment in these firms is orientated towards high-skill industries. They also show slower (more negative) employment growth, a greater propensity to close down plants, and a lower propensity to open new ones in low-skill manufacturing industries compared to other types of firms. This pattern is consistent with labour in low-wage countries being a substitute for labour in low-skill manufacturing industries in the UK.

This type of outward investment may however bring benefits to home-country activities. My results suggest that within high-skill manufacturing industries UK multinationals that invest in low-wage economies display productivity and scale advantages over other UK multinationals and purely domestic firms. While this is in line with outward investment in low-wage

economies leading to higher output and improved efficiency in complementary high-skill industries at home, my results derived from firms which begin to invest overseas suggest that rather than being a result of outward investment, these differences in performance are due to other firm-specific characteristics or assets.

I also investigated behaviour in business services industries. There is some evidence to support the idea that for firms investing in low-wage economies, employment abroad is a substitute for low-skill labour in the UK. However, for business services it is not clear that the majority of industries which are low-skill intensive are in fact tradeable or geographically mobile, hence this finding requires further investigation. Multinationals in business services are typically larger and more productive than domestic establishments, again supporting the idea that it is only the most productive firms that can bear the costs of investing overseas.

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Appendix

Table A1. Low wage countries and tax havens

Low-wage economies			
Albania	Ecuador	Jordan	Rwanda
Algeria	Egypt	Kenya	Senegal
Angola	El Salvador	Laos	Sierra Leone
Bangladesh	Equatorial Guinea	Madagascar	Sri Lanka
Benin	Ethiopia	Malawi	Sudan
Bolivia	Ghana	Mali	Suriname
Bulgaria	Guatemala	Morocco	Syria
Burkina Faso	Guinea	Mozambique	Tanzania
Cameroon	Guyana	Nicaragua	Togo
Cape Verde	Haiti	Niger	Tonga
Central African Republic	India	Nigeria	Vietnam
Chad	Indonesia	Pakistan	Zaire
China	Israel	Papua New Guinea	Zambia
Congo	Iran	Paraguay	Zimbabwe
Djibouti	Ivory Coast	Philippines	
Dominican Republic	Jamaica	Romania	
Tax havens			
Antigua	Bermuda	Isle of Man	St Kitts and Nevis
Bahamas	Channel Islands	Liechtenstein	St Lucia
Bahrain	Cyprus	Luxembourg	St Vincent
Barbados	Gibraltar	Macao	Turks and Caicos Islands
Belize	Grenada	Netherlands Antilles	

Table A2. Industry skill intensity: share of employees with no qualifications

2-digit manufacturing industry	Mean share no qual.s	3-digit business services industry	Mean share no qual.s
15 Food and beverages	0.17	701 Real estate activities with own property	0.08
16 Tobacco	0.15	702 Letting of own property	0.16
17 Textiles	0.30	703 Real estate activities on a fee or contract basis	0.08
18 Clothing	0.41	711 Renting of automobiles	0.09
19 Leather	0.33	712 Renting of other machinery and equipment	0.08
20 Wood and wood products	0.20	713 Renting of other machinery and equipment	0.08
21 Pulp, paper and paper products	0.19	714 Renting of personal and household goods not elsewhere classified	0.12
22 Publishing and printing	0.10	721 Hardware consultancy	0.02
23 Coke, refined petroleum products	0.05	722 Software consultancy and supply	0.01
24 Chemicals	0.11	723 Data processing	0.09
25 Rubber and plastics	0.23	724 Data base activities	0.03
26 Other non-metallic mineral products	0.21	725 Maintenance and repair of office, accounting and computing machinery	0.06
27 Basic metals	0.15	726 Other computer related activities	0.03
28 Fabricated metal products	0.18	731 Research and experimental development on natural sciences and engineering	0.02
29 Machinery and equipment	0.12	732 Research and experimental development on social sciences and humanities	0.03
30 Office machinery and computers	0.07	741 Legal, accounting, book-keeping and auditing activities; tax consultancy; market research and public opinion polling; business and management consultancy; holdings	0.04
31 Electrical Machinery	0.17	742 Architectural and engineering activities and related technical consultancy	0.02
32 Radio, TV and communication equipment	0.13	743 Technical testing and analysis	0.05
33 Medical, precision and optical instruments	0.11	744 Advertising	0.06
34 Motor vehicles	0.16	745 Labour recruitment and provision of personnel	0.05
35 Other transport equipment	0.12	746 Investigation and security activities	0.19
36 Furniture, manufacturing not elsewhere classified	0.21	747 Industrial cleaning	0.40
37 Re-cycling	0.21	748 Miscellaneous business activities not elsewhere classified	0.13
<i>Total</i>	<i>0.18</i>	<i>Total</i>	<i>0.08</i>

Note: manufacturing: average across 4-digit industries within 2-digit industry. Business services: average across 4-digit industries within 3-digit industry.

Source: author's calculations using LFS spring quarters 1995 to 2003.