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How do Firms' Outward Strategies Relate to their Activity at Home?
Empirical Evidence for the UK

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How do firms' outward FDI strategies relate to their activity at home? Empirical evidence for the UK

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Abstract

This paper investigates the structure of firms' outward FDI and their behaviour at home in both manufacturing and business services sectors. UK multinationals with overseas affiliates in low-wage economies invest simultaneously in a large number of high-wage countries. I find that more productive multinationals operate in a greater number of countries, consistent with their being able to bear the fixed costs of investing in numerous locations abroad. UK manufacturing plants owned by large-scale, low-wage economy outward investors display lower domestic employment growth, in particular in low-skill activities, consistent with low-wage economy labour substituting for low-skill labour in the UK.

Keywords: multinational enterprises; skills; globalisation

JEL Classification: F2

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1 Introduction

This paper provides new empirical evidence on the relationship between the structure of firms' overseas foreign direct investment (FDI) and the performance and organisation of their home-country operations. The paper addresses two questions. First, does sorting into multinational status on the basis of productivity extend to the scale of overseas activity? Second, is there any evidence that off-shoring to low-wage countries has asymmetric effects on high and low-skill activities in the home economy? As much of the debate about the impact of off-shoring has shifted from manufacturing towards mobile service sector activities such as IT services and data processing (see for example OECD, 2007),¹ this paper extends empirical evidence to the business services sector.

Understanding how multinational firms structure and adjust their operations globally, both production and service activities, is important, since they comprise a substantial proportion of employment in OECD economies. Bernard and Jensen (2007) report that US multinationals account for 26% of manufacturing employment in the US; 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 accounting for a further 26% and 14% in the two sectors respectively.² International restructuring can potentially affect large numbers of workers, and have asymmetric effects on employees with different skill levels. It is therefore of considerable interest to governments concerned with the effects of overseas investment and outsourcing on domestic jobs, and on income inequality more broadly.

¹ Recent research includes Liu and Trefler (2008) who analyse the impact of off-shore outsourcing of services to India and China on the US labour market and find small negative effects. However these are outweighed by positive effects of services 'in-shoring', i.e. sales of services from the US to India and China. Amiti and Wei (2009) find evidence that service off-shoring has a positive effect on manufacturing productivity.

² See Griffith et al. (2004) for evidence covering a wider range of sectors in the UK.

The paper contributes to the literature by considering both heterogeneity in firms' outward FDI strategies and heterogeneity in their behaviour at home, distinguishing between low-skill and high-skill-intensive activities. To do this I combine firm-level data on the geographic location of outward FDI with within-firm, plant-level data on home-country activity. I differentiate between firms that invest abroad in relatively low-wage economies and hence might be engaged in vertical FDI, and those that only invest in high-wage economies. I find that firms that invest in low-wage economies simultaneously invest in a large number of high-wage economies, employing complex FDI strategies (Yeaple, 2003). My findings support the proposition that only the most productive firms select to become multinationals (Helpman et al., 2004). While this is now well established in the empirical literature, I extend the existing evidence by demonstrating that for both manufacturing and business services, productivity advantages are systematically related to the scope of overseas investment: firms with higher total factor productivity invest in a larger number of countries, including low-wage economies. This pattern of sorting is consistent with the highest productivity firms being better able to overcome large fixed costs of establishing multiple overseas facilities. That is, selection into multinational status on the basis of productivity extends beyond the decision of whether or not to engage in FDI to the geographic scope of overseas operations. This relationship has also recently been demonstrated for US multinationals by Yeaple (2009).

Firms' overseas investment strategies may affect activity at home, with potentially differential impacts on high and low-skill activities. Relocating low-skill activity to relatively low-wage economies could enable a firm to reduce costs and expand output, with potential positive effects on investment, employment and output in complementary (high-skill) activities at home. I find evidence consistent with differential effects of vertical FDI on firms' high and low-skill manufacturing activity in the UK. By examining employment growth I find some evidence that for firms investing in low-wage economies, labour in relatively low-wage countries may

substitute for relatively low-skilled labour in the UK. This is in line with firms locating activity globally according to countries' comparative advantage, and suggests that low-skill workers are those most likely to be adversely affected by their employers investing overseas in low-wage economies. In addition I find that in high-skill manufacturing industries UK multinationals that invest in low-wage economies are larger, more capital intensive and more intensive in their use of intermediate inputs than other UK multinationals and purely domestic firms. These differences are less pronounced in low-skill manufacturing industries, although this may be driven by selection effects – as argued above, these highly productive firms may have shifted their low-skill activities abroad. I find few systematic relationships between the characteristics of firms' outward investments and their UK tradeable business services operations. These activities, such as R&D, consultancy and IT services, are typically highly skilled.

The paper is structured as follows. The next section outlines the theoretical and empirical background. Section 3 describes the data and presents some descriptive statistics on firms' outward FDI strategies. Section 4 presents the main empirical results 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.³ In practice MNEs undertake both types of overseas investment simultaneously (Yeaple, 2003), however horizontal and vertical FDI can have different implications for the skill-intensity of an MNE's home-country operations. A key difference is that while horizontal FDI could imply an increase in the skill-intensity of production at home

³ 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.

(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 engage in vertical FDI 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.

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 firm production at home. If the good is subsequently used as an intermediate input in production in the home country 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. Firms invest overseas to increase profits and to survive, hence outward investment may lead to higher investment, employment and output compared to if the firm had not chosen to produce abroad. For a firm engaged in vertical FDI locating low-skill activities abroad, any increase in activity at home might be expected to occur in complementary high-skill activities – potentially high-skill manufacturing, or headquarter or R&D services.

Harrison and MacMillan (2008) investigate the effects of outward investment on home-country activity using data on US MNEs and find that for vertical multinationals foreign and domestic (US) employment are complements. Muendler and Becker (2009) examine how MNE employment responds to international wage differentials at both the intensive margin, and the extensive margin (by establishing new facilities abroad). Overall they find home and overseas

employment to be substitutes. They find that a wage increase in the home-economy (Germany) is associated with an increase in employment in developing countries at the extensive margin, and in Central and Eastern European (CEE) economies at both the intensive and extensive margins. While they find no evidence that an increase in wages in developing countries has a significant effect on home-country employment, an increase in wages in CEE countries is found to have a positive effect.⁴ 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, and also differentiate between FDI in low-wage versus developed economies. They find no evidence of negative effects and some evidence of positive scale effects on domestic activity.

However, these studies do not differentiate between employment effects for workers with different skill levels, or heterogeneous effects of outward investment on different types of activity *within* firms in the home economy. As discussed above, vertical FDI may imply asymmetric effects on different activities within firms and hence on different types of workers. This paper assesses these potential heterogeneous effects using plant-level, home-economy data. One paper that does examine the employment effects of outward FDI to different locations and which makes comparisons across MNEs and non-MNEs is Becker and Muendler (2008). The authors use matched employer-employee data to compare job separation rates in manufacturing plants owned by MNEs that expand abroad versus firms that do not. They find that MNEs that expand their activities abroad are more likely to retain jobs in the home economy, in particular jobs held by highly educated workers. But they do not report any systematic differences with respect to whether overseas activity is expanded in a high or low-wage location.⁵

⁴ Further research includes Becker et al. (2005), Braconier and Ekholm (2000), Brainard and Riker (1997), Desai et al. (2009), Hanson et al. (2003), Konings and Murphy (2001) and Riker and Brainard (1997). Chapter 9 of Barba Navaretti and Venables (2004) provides a summary of research on home-country effects of outward FDI. Hanson et al. (2005) analyse within-firm trade and vertical production networks.

⁵ For other research that does differentiate by skill level see Fabbri et al. (2003) for evidence on multinational ownership and the elasticity of labour demand for less-skilled workers. Although I deal with off-shore investment, the paper also relates to the literature on global outsourcing - the decision to contract with an overseas producer

Finally, it is clear that not all firms engage in FDI. Theory suggests that only the most productive firms will invest overseas due to the high fixed costs of establishing operations abroad, (Helpman et al., 2004). Criscuolo and Martin (2009) 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 a positive relationship between productivity and the global scale of a firm's operations might be expected. This has recently been explored empirically by Yeaple (2009). For manufacturing, he finds that the most productive US firms operate in both in a greater number of countries, and on a larger scale in each location. In the analysis below I differentiate between home economy firms operating in high and low-skill manufacturing industries, and also investigate sorting on productivity and the scale of firms' overseas activity for the business services sector.

One issue is that in order to isolate empirically any effect of outward investment or of a specific outward investment strategy it is necessary to address the endogeneity of the investment decision, both with respect to potential reverse causality and unobservable firm characteristics correlated with outward investment behaviour. Rather than try and establish causal effects I look for supportive descriptive evidence in line with differential impacts of firms' outward FDI strategies by comparing the behaviour of firms taking different outward investment decisions. As discussed above theory suggests that any effects may also vary with industry or product characteristics, hence I also compare firms' behaviour in high and low-skill-intensive activities in order to provide evidence on potential heterogeneous impacts on different types of workers. The next section describes the data I use to do this.

rather than produce abroad in-house (Antràs, 2003 and Antràs and Helpman, 2004). Unfortunately I cannot observe outsourcing activity in my data. Hijzen et al. (2005) provide industry-level evidence on outsourcing and the skill-structure of labour demand. See also Liu and Trefler (2008) for an analysis of the impact of services outsourcing.

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 (UK-MNEs) and the structure of their outward FDI. The AFDI register contains annual information on the population of firms undertaking outward investment from the UK, on the country of location of their overseas subsidiaries, associates and branches, and on the 2-digit industry of the outward investment activity.⁶ I use the data from 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 class UK-based affiliates of, for example, US multinationals making outward investments to other European countries from the UK, as foreign-owned). 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. I define an investment in a low-wage economy as an overseas operation in a 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.

⁶ 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.

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 economies;⁷ 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 is that UK-MNEs that invest in both types of economy, and which might be engaged simultaneously in both vertical and horizontal FDI, 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). Given this, and if investment abroad is associated with significant fixed costs, we might expect these multinationals to be among the most productive firms. But it also implies that it will be difficult to cleanly distinguish between behaviour associated with investment in low-wage economies versus investment in a large number of countries. In the analysis in section 4 I differentiate between two types of UK-MNEs: those which invest in low-wage economies (columns (2) and (3) of Table 1) and those which only invest in high-wage economies (column (4) of Table 1), in addition to comparing firms according to the number and composition of their overseas operations.

⁷ 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.

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

Year	All UK-MNEs (1)		Investing in low-wage and high-wage countries (2)			Only investing in low-wage countries (3)		Only investing in high-wage countries (4)	
	Mean no. Countries	Number firms	Mean no. low-wage countries	Mean no. high-wage countries	Number firms	Mean no. low-wage countries	Number firms	Mean no. 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

Note: figures are averages across firms by firm type.

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

Table 2. Outward investment: manufacturing and business services investments, number of countries invested in by firm type

		Invest in business services?		Invest in business services in low-wage country?			
		Yes	No	Yes	No		
Invest in manufacturing?				Invest in manufacturing in low-wage country?			
Yes	(obs)	(356)	(6,091)	Yes	(obs)	(24)	(733)
	Manufacturing no. low-wage countries	1.68	0.32		Manufacturing no. low-wage countries	8.21	3.18
	Manufacturing no. high-wage countries	11.20	3.22		Manufacturing no. high-wage countries	23.83	14.82
	Business services no. low-wage countries	0.37	-		Business services no. low-wage countries	4.08	-
	Business services no. high-wage countries	4.29	-		Business services no. high-wage countries	15.88	0.65
No	(obs)	(4,665)	(8,200)	No	(obs)	(292)	(18,263)
	Manufacturing no. low-wage countries	-	-		Manufacturing no. low-wage countries	-	-
	Manufacturing no. high-wage countries	-	-		Manufacturing no. high-wage countries	0.23	0.66
	Business services no. low-wage countries	0.17	-		Business services no. low-wage countries	2.77	-
	Business services no. high-wage countries	2.48	-		Business services no. high-wage countries	11.76	0.48

Note: figures are averages across firm-year observations by firm type.

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

Table 2 looks at whether firms invest abroad in manufacturing and business service sectors, the extent to which they do so in low-wage countries and the degree to which they make investments in these two sectors simultaneously. The table shows the average number of countries in which firms invest, across years for firms employing different outward investment strategies. The left hand panel of the table shows that firms that make overseas investments in both manufacturing and business service sectors on average invest in a higher number of both low and high-wage countries than firms that only invest abroad in one of these sectors. A large number of firms invest in neither of these sectors, for example those that only invest abroad in agricultural or primary industries. The right hand panel of the table again illustrates that firms making investments in low-wage economies, in this case specifically in manufacturing and business services, typically invest in a larger number of countries, in particular the small minority of firms that invest in low-wage countries in both of these sectors. Firms generally have operations in a larger number of countries in manufacturing than in business services.

3.2 UK plants and establishments

My second data source is the plant and establishment-level data from the British Annual Respondents Database (ARD).⁸ The AFDI information can be linked to the ARD data at the firm level.⁹ To analyse employment and employment growth I use data on the *population* of plants in manufacturing and business service sectors over the period 1998 to 2003. This contains very basic information on employment, age, 5-digit industry, ownership (including whether a

⁸ 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).

⁹ See Criscuolo and Martin (2009) and Griffith et al. (2004) for analyses using these linked data.

plant is owned by a foreign-multinational) and firm structure, and allows me to incorporate entry and exit into the analysis.

Further characteristics, such as productivity and capital intensity,¹⁰ 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. 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 manufacturing industries I use 4-digit industry level deflators to construct real values of gross output, intermediate inputs and capital. Due to a lack of detailed industry-level deflators for business service sectors I use 4-digit industry-year dummies in the regression analysis instead. I provide descriptive information on these data in section 4.

I also use the plant population data to construct further plant and 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

For the period I consider, the ARD data do not contain a plant or establishment-level indicator of skill intensity. Instead I construct an industry-level measure from the UK Labour Force

¹⁰ See Martin (2002) for more information on the construction of the capital stock data.

Survey (LFS). I use a measure of the proportion of employees in an industry who report having no qualifications.¹¹ I create a time-invariant average at the 4-digit industry level using data from 1995 to 2003.¹² 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. I restrict the set of business services sectors to those activities that are likely to be geographically mobile or tradeable using information on trade in services from ONS (2007). This excludes business services such as real estate services, rental activities and industrial cleaning. The tradeable business services sectors, such as R&D, consultancy and IT services, are typically very high-skill sectors.

4 Evidence on the behaviour of outward investors at home

In this section I analyse 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*) which might be expected to be engaged in vertical FDI and those that only invest in high-wage economies (*UK-MNE_H*). I also make comparisons with plants owned by foreign-MNEs and with purely domestic firms. The inclusion of these additional reference groups allows me to isolate whether particular types of UK-MNEs also display systematic differences in behaviour from other firms in the UK economy. I also differentiate between UK-MNEs' outward investment strategies using data on the scale of firms' overseas operations as described in Tables 1 and 2. I distinguish between firm behaviour in high-skill versus low-skill manufacturing industries in the UK where vertical FDI might have differential effects, and

¹¹ The LFS asks individuals for their highest qualification. Individuals are then classified into 7 groups: degree or equivalent; higher education; GCE A-level or equivalent (an advanced school leaving qualification); GCSE A*-C or equivalent (basic school leaving qualification); other qualifications; no qualifications; and don't know. Individuals with no qualifications will therefore have typically left school with no qualifications and obtained no formal vocational qualifications since.

¹² I average over the LFS spring quarters for these years to increase the sample sizes on which the measure is based.

between manufacturing and business service sectors. I begin by examining the relationship between total factor productivity (TFP) and other establishment characteristics and the geographic location and scope of firms' outward investment. I then use the plant-level data to examine entry, exit and employment growth and examine whether there is evidence that employment in low-wage economies substitutes for employment in low-skill industries at home.

4.1 How does MNE productivity relate to the geographic scope of their overseas operations?

I use the establishment-level sample described in section 3.2 to examine differences in TFP for establishments owned by four types of firm (*UK-MNE_L*, *UK-MNE_H*, foreign multinationals and domestic firms). I estimate production functions of the form:

$$\ln Y_{it} = \alpha_1 \ln L_{it} + \alpha_2 \ln M_{it} + \alpha_3 \ln K_{it} + \beta_1 UK - MNE_L_{it} + \beta_2 UK - MNE_H_{it} + \beta_3 FOR_{it} + \chi'_{it} \gamma + t_t + ind_j + \varepsilon_{it} \quad (1)$$

where i indicates establishment and t time, Y , L , M , and K are real gross output, employment, real intermediate inputs and real capital stock respectively, *UK-MNE_L*, *UK-MNE_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 further establishment characteristics that are likely to be correlated with MNE status which include: 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 final 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 standard errors at the firm level and all regressions are weighted using inverse sampling probabilities.

I use data over six years 1998-2003 and run separate regressions for establishments in manufacturing and business services, and within manufacturing for establishments in high-skill and low-skill industries. To do this I rank 4-digit manufacturing industries using the industry-level skill intensity measure (see section 3.3) and split them into thirds. I report results for the high-skill third (the third of industries with the lowest shares of employees with no qualifications, which includes industries in office machinery and computers and precision instruments), and the low-skill third (those with the highest shares of employees with no qualifications, which includes industries in textiles and clothing and rubber and plastics). Table 3 shows the results of this exercise.

For manufacturing the results in column (1) indicate that overall UK-MNEs investing in low-wage economies have significantly higher TFP than establishments owned by other UK-MNEs (at around 5% and 2% higher than domestic establishments respectively). Moreover, from a comparison of columns (2) and (3), this advantage over UK-MNEs that only invest in high-wage economies looks to result from significantly higher TFP in high-skill industries. Indeed the results in column (2) 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. As I discuss below, the fact that this relationship is less apparent in low-skill industries may be driven by selection effects. The results for business services imply that foreign-owned establishments have the highest TFP overall, and suggest that UK-MNEs that invest in low-wage economies have higher TFP than those that do not, although the differences are less clear than for manufacturing.

Table 3. TFP and MNE outward investment strategy: manufacturing and business services

Dep. var.: Ln(gross output) _{it}	Manufacturing			Business services
	All industries (1)	High-skill industries (2)	Low-skill industries (3)	All industries (4)
Ln(employment) _{it}	0.245*** (0.006)	0.252*** (0.012)	0.257*** (0.009)	0.438*** (0.007)
Ln(intermediates) _{it}	0.597*** (0.007)	0.585*** (0.013)	0.596*** (0.013)	0.284*** (0.011)
Ln(capital stock) _{it}	0.133*** (0.005)	0.142*** (0.010)	0.124*** (0.009)	0.234*** (0.0011)
UK-MNE_L _{it}	0.049*** ^a (0.010)	0.061*** ^a (0.016)	0.020* (0.012)	0.094** (0.043)
UK-MNE_H _{it}	0.022*** (0.007)	0.026** (0.011)	0.018** (0.009)	0.054* ^c (0.029)
Foreign-MNE _{it}	0.036*** (0.005)	0.045*** (0.010)	0.028*** (0.009)	0.179*** (0.020)
Age _{it}	-0.0004** (0.0002)	-0.001*** (0.0003)	-0.00005 (0.0003)	0.008*** (0.003)
Multi manuf / bus. serv. dummy _{it}	0.010** (0.005)	0.0004 (0.008)	0.013* (0.008)	0.063*** (0.020)
Multi industry dummy _{it}	0.020** (0.005)	0.024** (0.010)	0.015* (0.008)	0.019 (0.024)
4-digit industry dummies	Yes	Yes	Yes	No
Time dummies	Yes	Yes	Yes	No
4-digit industry-year dummies	No	No	No	Yes
R ²	0.98	0.98	0.98	0.95
Observations	39,396	13,538	13,678	15,633

Note: standard errors clustered at the firm-level in parentheses. ***, **, * significant at 1%, 5%, 10% level. ^a *UK-MNE_L* coefficient significantly different to *UK-MNE_H* coefficient at 5% level, ^b *UK-MNE_L* significantly different to *Foreign-MNE* at 5% level, ^c *UK-MNE_H* significantly different to *Foreign-MNE* at 5% level.

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

As shown in Table 1 those firms that invest in low-wage economies tend to invest in a large number of countries overall. Table 4 replaces the dummy variables for the two types of UK-MNEs with a single UK-MNE dummy variable and a count of the number of countries in which the firm is investing. The results for manufacturing as a whole indicate that firms with higher TFP invest in a larger number of countries, with each additional country being associated with 0.1% higher TFP. Again this relationship appears to be driven by establishments operating in high-skill industries, and raises the possibility that these high productivity firms have located or

outsourced low-skill activities overseas. The coefficient on the number of investments is also positive for business services, but is only statistically significant at the 10% level.

Table 4. Total factor productivity and the geographic scope of outward investment: manufacturing and business services

Dep. var.: Ln(gross output) _{it}	Manufacturing			Business services
	All industries	High-skill industries	Low-skill industries	All industries
Total no. countries invested in _{it}	0.001** (0.0004)	0.001** (0.0004)	-0.0001 (0.0005)	0.0017* (0.0009)
UK-MNE _{it}	0.020*** (0.007)	0.024** (0.011)	0.020** (0.009)	0.046 (0.028)
Foreign-MNE _{it}	0.036*** (0.006)	0.045*** (0.010)	0.028*** (0.009)	0.179*** (0.020)
Other variables as Table 3	Yes	Yes	Yes	Yes
R ²	0.98	0.98	0.98	0.95
Observations	39,396	13,538	13,678	15,633

Note: Control variables as in Table 3. Standard errors clustered at the firm-level in parentheses. ***, **, * significant at 1%, 5%, 10% level.

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

These results show that firms' TFP is positively related to the geographic scope of their overseas investment activity. I interpret this finding as being in line with the hypothesis that only the most productive firms are able to overcome the high fixed costs of investing in a large number of locations abroad. That is, selection into multinational status on the basis of productivity extends beyond the decision to engage in FDI to the scope of overseas operations. Yeaple (2009) reports a similar finding, that the most productive US MNEs invest in a greater number of overseas economies and that they sell more in each country in which they operate. While Yeaple (2009) uses firm-level data for the manufacturing sector to measure parent firm TFP, my results add to his findings by distinguishing between manufacturing firms' high and low-skill intensive home-country activities, and by demonstrating that the empirical relationship extends to the business services sector.

The fact that this relationship between higher TFP and outward investment in low-wage economies is more pervasive in high-skill sectors (high-skill manufacturing and business services) is of interest. Other selection effects may be at work. For example, these large-scale outward investors, which are typically investing in low-wage economies, may be reducing the extent to which they produce low-skill intensive goods in the UK, instead carrying out these activities abroad, (hence the relationship is not observed in low-skill industries). In addition any beneficial effects of off-shoring that occur in the UK might be expected to be observed in complementary (high-skill) activities. In the next section I examine whether there is any further evidence for differential performance across high and low-skill activities in the home economy.

4.2 How do MNEs investing in low-wage economies behave in high and low-skill industries at home?

In this section I examine measures of establishment size, capital intensity and the intensity with which establishments use intermediate inputs using the following descriptive regression:

$$\log(\text{characteristic})_{it} = \beta_1 UK - MNE - L_{it} + \beta_2 UK - MNE - H_{it} + \beta_3 FOR_{it} + \chi'_{it} \gamma + t_t + ind_j + \varepsilon_{it} \quad (2)$$

where the right hand side variables are defined as in equation (1). For ease of exposition Table 5 reports the estimated coefficients for each characteristic as percentage differences from the omitted category (domestic establishments), calculated as $\exp(\beta_i) - 1$ for each of β_1 , β_2 and β_3 , along with indicators of statistical significance, and indicators of whether the β coefficients are significantly different from each other.

The table shows that in both manufacturing and business services establishments owned by multinationals are much larger in terms of output and employment than purely domestic establishments, and that they are more capital intensive and use more intermediate inputs per employee. This overall pattern is well established (for UK evidence see Criscuolo and Martin, 2009 and Griffith et al., 2004). In terms of comparisons across the three different types of

multinationals, affiliates of foreign MNEs typically exhibit the highest values of each of these characteristics.

Table 5. Percentage differences in characteristics relative to domestic establishments, manufacturing and business services

	Manufacturing			Business services
	All industries	High-skill industries	Low-skill industries	All industries
<i>Size</i>				
Gross output				
UK-MNE_L	142% *** ^{a b}	183% *** ^{a b}	113% *** ^b	248% *** ^b
UK-MNE_H	94% *** ^c	97% *** ^c	83% *** ^c	334% *** ^c
Foreign-MNE	239% ***	264% ***	196% ***	560% ***
Employment				
UK-MNE_L	92% *** ^b	111% ***	76% ***	159% *** ^b
UK-MNE_H	71% *** ^c	71% *** ^c	63% *** ^c	248% ***
Foreign-MNE	130% ***	137% ***	113% ***	294% ***
<i>Capital and input intensity</i>				
Capital stock per employee				
UK-MNE_L	34% *** ^{a b}	38% *** ^{a b}	33% *** ^b	53% *** ^b
UK-MNE_H	16% *** ^c	17% *** ^c	17% *** ^c	47% *** ^c
Foreign-MNE	60% ***	59% ***	52% ***	99% ***
Intermediate inputs per employee				
UK-MNE_L	31% *** ^{a b}	41% *** ^{a b}	28% *** ^b	65% *** ^b
UK-MNE_H	18% *** ^c	20% *** ^c	16% *** ^c	59% *** ^c
Foreign-MNE	68% ***	77% ***	56% ***	131% ***
Observations	39,396	13,538	13,678	15,633

Note: Figures reported are $\exp(\beta_i) - 1$ from equation (2). 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 1% level. ^a UK-MNE_L coefficient significantly different to UK-MNE_H coefficient at 5% level, ^b UK-MNE_L significantly different to Foreign-MNE at 5% level, ^c UK-MNE_H significantly different to Foreign-MNE at 5% level.

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

For business services there are no statistically significant differences between the characteristics of the two types of UK-MNE, although the estimates point towards those that only invest in high-wage countries operating larger scale establishments in the home economy. For manufacturing, establishments owned by UK-MNEs investing in low-wage economies generally have higher values of these characteristics than other UK-MNEs, and differences between these two types of firm are more pronounced in high-skill manufacturing activities compared to low.

For example, I find that firms investing in low-wage economies use significantly more intermediate inputs per employee in their high-skill manufacturing activities in the domestic economy, which provides indirect evidence in line with Head and Ries (2002) who found that investment in relatively low per-capita GDP countries was associated with an increase in the skill-intensity of firms' employment at home, and with increased purchases of imported goods.

The findings for manufacturing therefore point towards UK-MNEs investing in low-wage economies as having a lead over other UK-MNEs in terms of productivity and scale in relatively high-skill industries. This pattern, of advantages being clustered in high-skill sectors, is consistent with vertical FDI leading to benefits in industries where the home country may have a comparative advantage. But the results do not enable me to distinguish whether these differences in performance are a result of overseas investment, or whether they can be explained by other firm-specific assets in addition to the relocation of low-skill production abroad.¹³ In the next section I examine whether there is evidence that firms investing in low-wage economies are reducing the scale of their low-skill activities in the UK.

4.3 Is there evidence to suggest that MNEs investing in low-wage economies are offshoring employment in low-skill industries?

To examine employment and employment growth among different types of firm I use the plant-level population data described in section 3.2. Table A3 in the Appendix 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 survivors (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

¹³ I also experimented with a difference-in-differences analysis including firm fixed effects that compared a sub-sample of establishments that made their first outward investments between 1999 and 2003 to the set of establishments that remained domestic. This before/after analysis found little evidence that outward investment results in a significant change in establishment behaviour (although the time period of the data is short and the sample size of firms that enter into MNE status small), instead suggesting that differences between the two groups are attributable to firm-specific characteristics.

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 surviving plants.

Looking across the different ownership categories the table shows that in 1998 UK-MNEs investing in low-wage economies accounted for around 12% of manufacturing employment 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. Part of the substantial increase in employment in surviving foreign-owned establishments appears to have been driven by changes in ownership. Table A4 shows the same information for the set of tradeable business service sectors. The sector saw employment growth of around 640,000 employees over the period. UK-MNEs of both types accounted for a similar share of employment in 2003 as in 1998, but foreign-MNEs increased their share considerably.

To examine where within manufacturing the different types of firm concentrate their activities over time, in Table 6 I distinguish between high-skill and low-skill manufacturing industries. Employment in low-skill manufacturing industries fell to a greater extent 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 versus 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).

Table 6. 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
Exitors	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
Exitors	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.

Table 7. Un-conditional, 5-year exit and entry propensities and employment growth, by firm ownership type and industry skill-intensity

	UK-MNE_L	UK-MNE_H	Foreign-MNE	Domestic	All
Panel A: 5-year exit and entry propensities					
Manufacturing					
<i>All industries</i>					
Exit propensity	0.48	0.44	0.45	0.45	0.45
Entry propensity	0.27	0.34	0.32	0.41	0.40
<i>High-skill industries</i>					
Exit propensity	0.47	0.41	0.47	0.44	0.44
Entry propensity	0.43	0.30	0.50	0.43	0.42
<i>Low-skill industries</i>					
Exit propensity	0.57	0.47	0.44	0.48	0.47
Entry propensity	0.20	0.38	0.29	0.39	0.39
Business services					
Exit propensity	0.68	0.66	0.56	0.50	0.50
Entry propensity	0.52	0.51	0.59	0.58	0.58
Panel B: 2-year employment growth indices, mean (standard deviation)					
Manufacturing					
<i>All industries</i>					
Empgrow surv	-0.043 (0.454)	-0.019 (0.352)	-0.032 (0.381)	0.022 (0.323)	0.019 (0.329)
Empgrow surv, ex, en	-0.289 (1.148)	-0.175 (1.158)	-0.113 (1.246)	-0.022 (1.263)	-0.032 (1.259)
<i>High-skill industries</i>					
Empgrow surv	-0.033 (0.499)	-0.021 (0.363)	-0.029 (0.393)	0.022 (0.317)	0.017 (0.329)
Empgrow surv, ex, en	-0.243 (1.158)	-0.123 (1.180)	-0.127 (1.269)	0.011 (1.269)	-0.005 (1.265)
<i>Low-skill industries</i>					
Empgrow surv	-0.068 (0.377)	-0.022 (0.349)	-0.037 (0.354)	0.015 (0.332)	0.011 (0.334)
Empgrow surv, ex, en	-0.408 (1.159)	-0.210 (1.127)	-0.107 (1.203)	-0.083 (1.277)	-0.091 (1.271)
Business services					
Empgrow surv	0.025 (0.473)	0.018 (0.418)	0.001 (0.510)	0.027 (0.327)	0.027 (0.330)
Empgrow surv, ex, en	-0.061 (1.454)	-0.043 (1.393)	0.115 (1.477)	0.149 (1.379)	0.147 (1.380)

Note: Empgrow defined as in equation (4).

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

Tables A3, A4 and 7 also provide information on the propensities of different types of plant to enter and exit. Panel A of Table 7 shows these exit and entry propensities for plants owned by the four different types of firm, where I measure exit propensity as the proportion of plants of each type present in 1998 to have exited by 2003, and entry propensity as the proportion of plants of each type present in 2003 that entered between 1999 and 2003. The figures show that among manufacturing plants the highest exit rates and the lowest entry rates 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 does

not appear to be a ‘firm-level’ characteristic, since this pattern of high net exit is not present for plants in high-skill industries owned by low-wage country investors. For business services, plants owned by the two types of UK-MNEs display very similar entry and exit rates, although exit rates are higher and entry rates lower than for plants owned by the two other types of firm.

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

$$Empgrow_{it,t-2} = \alpha + \beta_1 UK - MNE_L_{it-2} + \beta_2 UK - MNE_H_{it-2} + \beta_3 FOR_{it-2} + \chi'_{it-2} \gamma + t_t + ind_j + \varepsilon_{it} \quad (3)$$

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

$$Empgrow_{it,t-2} = \frac{E_{it} - E_{it-2}}{(E_{it} + E_{it-2})/2} \quad (4)$$

following Biscourp and Kramarz (2007) and Davis and Haltiwanger (1999), where E_{it} is employment in plant i at time t . This measure varies between -2 (for exitors) and 2 (for entrants). $UK-MNE_L$, $UK-MNE_H$ and FOR are defined as for equation (1), and in further specifications I replace the $UK-MNE_L$, $UK-MNE_H$ dummies with alternative indicators of the characteristics of UK-MNEs. 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 variable with one to indicate that the plant is part of a firm with other plants within the business services sector.¹⁴ Dunne et al. (1988, 1999) and Bernard and Jensen (2007) show that these characteristics are related to exit propensities, for example younger, smaller plants and

¹⁴ For entrants the characteristics variables are necessarily dated t rather than $t-2$.

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.

Panel B of Table 7 shows some descriptive statistics on the dependent variable for plants owned by the four different types of firm. The first row of each subsection shows the mean and standard deviation of the employment growth index among surviving plants only and the second row also includes exitors and entrants. For manufacturing the figures point towards plants owned by UK-MNEs investing in low-wage economies exhibiting the lowest employment growth, in particular when entrants and exitors are included, and to a greater degree in low-skill industries. In business services there is again some indication that plants owned by this group of firms show lower employment growth when entry and exit are taken into consideration, but surviving plants owned by this group show relatively high employment growth.

Table 8 shows the results of the regression exercise for plants in manufacturing. The table has three horizontal panels and in each panel I use a different set of indicators of the characteristics of UK-MNEs. The first three columns present results for surviving plants only, whereas the final three columns present results for the full set of plants (survivors, exitors and entrants). The table only reports the estimated coefficients on the firm ownership dummies and outward investment characteristics variables, and in panel A also reports the results of tests of whether the estimated coefficients on the three ownership dummies are statistically significantly different from each other.

In panel A looking at surviving plants only I find some evidence that plants owned by UK-MNEs investing in low wage economies and plants owned by foreign-multinationals exhibit lower employment growth than purely domestic plants, but no significant differences in employment growth across plants owned by the three types of MNE. Once exitors and entrants are included I find 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, with net exit an important driving factor.

In panels B and C of the table I experiment with alternative indicators of UK-MNEs outward investment strategies. In panel B I use a single dummy variable to indicate a plant owned by a UK-MNE and a count measure of the total number of countries in which the UK-MNE has investments. The results show that UK plants owned by larger scale outward investors typically have lower employment growth, and that the relationship between the scale of outward investment and employment growth is stronger in low-skill industries, in particular once entrants and exitors are included in the analysis.

Since it is difficult to distinguish empirically between investment in a large number of countries, and investment in low-wage countries in panel C I replace the count of the total number of countries with a count of the total number of low-wage countries in which the firm has investments. The pattern of results lends some support to the hypothesis that it is investment in low-wage economies that is most strongly associated with lower employment growth in low-skill manufacturing industries, and also that the relatively high exit rates and low entry rates in Table 7 are an important factor driving this relationship. 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 is in contrast to the findings of Harrison and McMillan (2008) for the US who find that for MNEs engaged in

vertical FDI home and overseas employment are complements. My findings highlight that taking into account the skill-intensity of different production activities in the home economy is likely to be an important factor in this relationship.

Table 9 shows results for business services for surviving plants in columns (1)-(4) and for survivors, exitors and entrants in columns (5)-(8). I estimate four alternative specifications, where in each case domestic plants are the excluded category. In the first column I use ownership dummies for the three types of MNE. In the second I use a single UK-MNE dummy and a count of the total number of country investments. In the third column I use counts of the number of investments the firm has manufacturing industries and in business services industries in low-wage economies. Activity in manufacturing industries in low-wage economies may potentially be complementary to business service activities such as R&D and headquarter functions at home. Investment in business services activity in low-wage economies may be complementary to firms' business services activity at home, but may also act as a substitute, for example off-shoring data processing functions. In the final specification in each case I use indicators of the number of high-wage country investments in manufacturing and business services respectively.

The results show little evidence of a clear pattern between firms' outward investment strategies and employment growth in the UK. The results in column (5) suggest that plants owned by UK-MNEs investing in low-wage economies have lower employment growth compared to domestic plants and plants owned by foreign-MNEs once entrants and exitors are included in the estimation sample, but it is difficult to relate this to any specific investment strategy. The coefficients on the count measures of outward investments are generally imprecisely estimated, although they point towards a positive association between employment growth in business services in the UK and manufacturing investments in low-wage countries, but a negative association with business services investments in low-wage countries (columns (3) and (6)).

Table 8. Employment growth regressions: manufacturing plant population

Dep. var.: <i>Empgrow</i> _{it, it-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)
Panel A						
UK-MNE_L _{it-2}	-0.034* (0.019)	-0.043 (0.029)	-0.034* (0.018)	-0.087** ^{a b} (0.041)	-0.077 (0.059)	-0.164** ^{a b} (0.068)
UK-MNE_H _{it-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)
Foreign-MNE _{it-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 ²	0.02	0.02	0.02	0.05	0.05	0.05
Panel B						
No. country investments _{it-2}	-0.001*** (0.0003)	-0.0005 (0.0004)	-0.001** (0.0005)	-0.002** (0.001)	-0.001 (0.001)	-0.005*** (0.001)
UK-MNE _{it-2}	-0.004 (0.007)	-0.020* (0.012)	0.009 (0.014)	0.030 (0.025)	0.017 (0.040)	0.038 (0.040)
Foreign-MNE _{it-2}	-0.010* (0.005)	-0.015* (0.009)	-0.005 (0.009)	0.056** (0.022)	0.025 (0.036)	0.049 (0.036)
R ²	0.02	0.02	0.02	0.05	0.05	0.05
Panel C						
No. low-wage investments _{it-2}	0.001 (0.003)	0.004 (0.004)	-0.005* (0.003)	-0.007 (0.006)	-0.004 (0.008)	-0.029*** (0.011)
UK-MNE _{it-2}	-0.015* (0.008)	-0.033** (0.014)	0.001 (0.015)	0.010 (0.023)	0.010 (0.038)	0.004 (0.038)
Foreign-MNE _{it-2}	-0.009* (0.005)	-0.014 (0.009)	-0.005 (0.009)	0.056** (0.022)	0.025 (0.036)	0.049 (0.036)
R ²	0.02	0.02	0.02	0.05	0.05	0.05
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 1%, 5%, 10% level. ^a UK-MNE_L coefficient significantly different to UK-MNE_H coefficient at 5% level, ^b UK-MNE_L significantly different to Foreign-MNE at 5% level, ^c UK-MNE_H significantly different to Foreign-MNE at 5% level.

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

Table 9. Employment growth regressions: business services plant population

Dep. var.: $Empgrow_{it, it-2}$	Survivors only				Survivors, exitors and entrants			
	All industries (1)	All industries (2)	All industries (3)	All industries (4)	All industries (5)	All industries (6)	All industries (7)	All industries (8)
UK-MNE_L $_{it-2}$	-0.005 (0.019)				-0.134* ^b (0.074)			
UK-MNE_H $_{it-2}$	-0.003 (0.011)				-0.038 ^c (0.036)			
Foreign-MNE $_{it-2}$	-0.016 (0.011)	-0.016 (0.011)	-0.016 (0.011)	-0.016 (0.011)	0.118** (0.050)	0.118** (0.050)	0.118** (0.050)	0.117** (0.050)
No. country investments $_{it-2}$		0.0002 (0.0003)				-0.001 (0.002)		
UK-MNE $_{it-2}$		-0.006 (0.010)	-0.002 (0.010)	-0.002 (0.010)		-0.053 (0.035)	-0.063* (0.033)	-0.023 (0.038)
No. manufacturing low-wage investments $_{it-2}$			0.001 (0.003)				0.007 (0.007)	
No. business services low-wage investments $_{it-2}$			-0.003* (0.002)				-0.009 (0.016)	
No. manufacturing high-wage investments $_{it-2}$				0.001 (0.001)				-0.001 (0.003)
No. business services high-wage investments $_{it-2}$				-0.001 (0.001)				-0.009 (0.007)
R ²	0.00	0.00	0.00	0.00	0.09	0.09	0.09	0.09
Plant characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4-digit industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	448,647	448,647	448,647	448,647	841,558	841,558	841,558	841,558

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 1%, 5%, 10% level. ^a UK-MNE_L coefficient significantly different to UK-MNE_H coefficient at 5% level, ^b UK-MNE_L significantly different to Foreign-MNE at 5% level, ^c UK-MNE_H significantly different to Foreign-MNE at 5% level.

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

5 Conclusions

This paper has investigated the outward investment strategies of UK multinationals and how these relate to their behaviour at home by making comparisons across plants owned by different types of firms and undertaking different geographic outward investments. For both business services and manufacturing sectors I find a positive relationship between total factor productivity and the geographic scale of multinational firms' overseas investment activity, suggesting that the most productive firms are those able to incur substantial fixed costs of investing in a number of different countries, and that sorting into multinational status on the basis of productivity extends to the worldwide scope of operations.

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. The findings for business services show little evidence of a clear pattern between firms' outward investment strategies and their UK employment growth.

Off-shoring to low-wage economies 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 it is likely that this is due to other firm-specific characteristics or assets, the findings are also in line with outward investment in low-wage economies potentially leading to higher output in complementary high-skill industries at home, although I do not establish any causal relationship.

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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: mean share of employees with no qualifications across 4-digit industries

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

Table A3. Change in employment 1998 to 2003 by firm-ownership type 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).

Table A4. Change in employment 1998 to 2003 by firm-ownership type tradeable business services industries

	Employment 1998		Employment 2003		Plants 1998	Plants 2003
	(1)	(2)	(3)	(4)	(5)	(6)
Continuers	0.87m	60%	1.06m	55%	143,400	143,400
UK-MNE_L	0.04m	3%	0.04m	2%	500	400
UK-MNE_H	0.05m	3%	0.05m	3%	900	1,000
Foreign-MNE	0.06m	4%	0.12m	6%	600	2,200
Domestic	0.73m	50%	0.85m	44%	141,500	139,700
Exitors	0.58m	40%			143,300	
UK-MNE_L	0.03m	2%			1000	
UK-MNE_H	0.03m	2%			1,800	
Foreign-MNE	0.04m	3%			700	
Domestic	0.48m	33%			139,800	
Entrants			0.87m	45%		199,500
UK-MNE_L			0.03m	2%		400
UK-MNE_H			0.05m	2%		1,100
Foreign-MNE			0.16m	8%		3,200
Domestic			0.63m	33%		194,800
All	1.45m	100%	1.93m	100%	286,700	342,900

Note: figures may not sum due to rounding.

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