Productivity, Multinationals and Knowledge Spillovers: Evidence from the UK Retail Sector

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Abstract

This paper discusses the impact of foreign-ownership presence on the productivity performance of domestically-owned British retailers. In specific, we investigate the existence of productivity spillovers, in the form of knowledge transfer. To guide our estimations, we develop a simple Hotelling model in which we show how the transfer of operational knowledge from MNEs to non-MNE retailers, may result to an increase in the productivity of the latter and increased industrial activity in the regions with relatively higher concentration of foreign investment. Our empirical estimations lend support to the assumptions upon which the theoretical model is built, while confirming the positive and highly significant impact of these spillovers on the productivity performance of domestic firms. More specifically, using data from the Annual Respondents Dataset (ARD) we find that positive spillovers exist but are mostly confined to the region in which foreign subsidiaries locate. Furthermore, the productivity benefit from regional FDI spillovers increases with the absorptive capacity of domestic retailers.

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1 Introduction

Despite services accounting for an increasing share of GDP and an increasing share of foreign investment and trade (Griffith et al. [2004]), most of the discussion on the impact of FDI focuses primarily on manufacturing industries (*inter alia* Barrell and Pain [1997]; Driffield and Taylor [2001]; Girma and Wakelin [2002]; and Harris and Robison [2003]). In this paper, we aim to bring new elements into the discussion by studying the importance of multinationals and the impact of FDI on the British retail sector. The internationalisation of retailing accelerated dramatically in the late 1990s (Palmer [2005]; Wrigley [2000]) [1] . In the UK, the importance of foreign-owned retailers has increased significantly (Godley and Fletcher [2001]), especially over the period in which this study focuses on, 1997 to 2003. Over the same period, UK retailers have also expanded their activities internationally. In 2000-2001, eight of the largest UK retailers had overseas operations, although these accounted for less than 20 per cent of their total retail sales (Burt and Sparks [2003]).

Multinational activity is an important factor determining differentials in firms' productivity. The findings from previous works (*inter alia* Caves [1996]; Dunning [2000]) suggest that Multinationals (MNEs), including their foreign affiliates, are superior in their productivity performance relatively to purely domestic firms. MNEs possess some firm-specific advantages that compensate for the higher costs induced by operating in a foreign market. In the case of retailing, firms can derive specific competitive advantages from internationalization, based on utilizing innovative retail formats; their logistics and distribution systems, particularly those that reduce inventory and distribution costs; IT systems and supply chain management; access to low-cost capital for expansion; the transfer of "best practice" knowledge; the depth of their human/management capital resources, giving access to a wide range of international management experience; and the ability to source supplies globally (Wrigley [2000]). Either explicitly or implicitly, these are based on exploiting the firm's comparative knowledge advantages, compared to firms operating only within domestic markets.

This alleged superior performance of MNEs' subsidiaries compared with purely domestic-owned firms has been widely documented in empirical research. For Great Britain, Griffith et al. [2004] found that foreign-owned MNEs are on average significantly more productive (in terms of value added per worker) than British-domestic retailers, and are also slightly more productive than British-based MNEs. The difference with respect to the latest, however, is less stark in the aggregate service sector than in the production sec-

[1]The last decade has witnessed the emergence of a group of multi-format retailers with considerable, and rapidly growing, international sales (e.g. Wal-Mart, IKEA, Tesco). These global retailers typically have subsidiaries in 10-30 countries and extensive international sourcing operations. This level of internationalization is comparable with many manufacturing sectors (see Wrigley, 2000 for more details).

tor. After controlling for input use, Criscuolo and Martin [2005] find that, for the manufacturing sector, British MNEs are as productive as non-US foreign MNEs, while US-owned establishments enjoy a small productivity advantage over their non-US MNE competitors. However, care is required in generalizing from aggregate level studies, or manufacturing specific studies, to retailing, as the multinational effect may be highly sector-specific and dependent on competitive practices within these industries (see, for instance, Tuselmann et al. [2003]). In this paper, we contribute to this discussion by firstly exploring the theoretical foundations of the impact of knowledge spillovers on productivity and the spatial distribution of strictly domestic firms; and secondly by testing the assumptions and implications of the theoretical model, while using it as a guide to parameterize the impact of knowledge spillovers and foreign ownership on the productivity performance of the UK retail sector. Our empirical estimations exploit data drawn from the Annual Respondent Database (ARD) and the Annual Foreign Direct Investment (AFDI) dataset, both available from the Office of National Statistics (ONS), for the period 1997-2003.

Looking beyond the individual firm, anecdotal evidence tends to suggest that the presence of foreign MNEs may have an impact on the productivity of domestic firms. There are two commonly cited sources of positive externalities associated with Foreign Direct Investment (FDI). In the first instance, foreign subsidiaries can increase competition in the domestic market (Barrell and Pain, [1997]). In the second instance, the literature suggests the existence of potential indirect benefits that spill over from foreign to domestic firms, both in terms of technology transfer (Keller [2004]), and upgrading skills in the local labour market via inter-firm labour mobility (Driffield and Taylor, [2001]). Empirical studies, using aggregated and disaggregated UK data, have found positive impacts associated with intra-industry, inter-industry and spatial agglomeration effects (Girma and Wakelin [2002], Harris and Robison [2003]). However, the vast majority of research on the productivity of foreign MNEs in Britain, including those particular studies, has focused on manufacturing. It is therefore important to see if their conclusions about FDI can also be extended to other dynamically growing sectors like retailing, and study the mechanism through which ownership advantages and knowledge transfer may affect the regional performance and distribution of domestic firms.

The objectives of the paper are twofold. First, we seek to study the performance differences across different forms of retailers, characterized according to their degree of internationalization and origin of ownership. Second, we assess the importance of foreign presence for productivity growth in the British retail sector during the period 1997-2003. The potential for positive knowledge spillovers emanating from FDI may have implica-

tion for closing the well-documented UK productivity gap in retailing [2](O'Mahony and de Boer [2002]; Van Ark et al [2002]; Reynolds et al. [2005]). To the best of our knowledge, this is the first paper that uses data on retailing to explore these issues.

The rest of the paper is organised as follows: section 2 discusses the main findings from earlier works on the relationship between foreign ownership and productivity. Section 3 outlines the mechanics of a simple theoretical framework that discusses the impact of MNE-induced knowledge spillovers on the location and performance of strictly domestic firms. Section 4 presents the empirical model relating productivity growth to the FDI spillover variables. Data and an overview of the retail sector are shown in section 5. Section 6 outlines and discusses the results from our econometric estimations. Finally, policy suggestions and concluding remarks are to be found in section 7.

2 Literature Review

The arguments for the existence of FDI spillovers are based on the assumption that MNEs possess firm-specific advantages that compensate for the higher costs induced by operating in a foreign market (Dunning [1977]). These advantages may be in the form of superior management and marketing expertise, technological capabilities or employees' technical knowledge; which can be transmitted to domestic firms, raising their productivity level. Once a multinational has set up a subsidiary, some of these advantages may not be totally internalised and thus spill over to domestic firms. This theory has led to the empirical analysis of two important questions: do foreign-owned firms outperform domestic-owned firms? and; do domestic-owned firms benefit from FDI spillovers?

The evidence for a productivity differential between foreign and domestic firms in favour of foreign MNEs is fairly convincing (Griffith et al. [2004]). However, most of the empirical evidence derives from data on the aggregate economy or on the manufacturing sector, while the evidence for the service sector remains scarce. Moreover, few studies distinguish between the multinational effect and the foreign effect. For instance, when controlling for both effects, Criscuolo and Martin [2005] find that, for the manufacturing sector, British MNEs are as productive as non-US foreign MNEs, while US-owned establishments enjoy a small productivity advantage. However, care is required in generalizing from aggregate level studies, or manufacturing specific studies, to retailing, as the multinational effect may be highly sector specific. The British retail sector presents

[2]More specifically, Basu et al. (2003) find that retail trade, together with hotels and catering, accounts for about three quarters of the US productivity growth boost in the late 1990s; and for one third of the UK productivity slow down during the same period.

a particularly curious case for building upon earlier empirical evidence on the relative superior performance of MNEs and testing the relationship between ownership and the reported performance.

On the other hand, the debate on the existence of FDI spillovers, taking place through business interactions between multinationals (MNE) and domestic firms, has been a hot topic in the economic and business literature (Gorg and Strobl [2003]; Driffield and Taylor [2001], among others). The outcome of the debate is also relevant in terms of policies: a confirming stance is often taken as a justification of expensive incentive policies for the attraction of foreign investors. Nevertheless, the empirical evidence has been ambiguous depending on the data and the methods used[3].

This study focuses on the geographical dimension of FDI spillovers and, in particular, it aims to analyse whether foreign firms have a larger impact on domestic firms if they locate in the same region. There are a number of possible explanations why spillovers may have a regional dimension. First, demonstration effects may be local if domestic firms closely observe and imitate foreign firms in the same region (Blomstrom and Kokko [1996]). Second, the training of employees by foreign MNEs and the subsequent high turnover of labour that characterizes the retail sector may be a major source for regional spillovers (Fosfuri et al. [2001]). As regional labour mobility in the UK is relatively low (Greenaway et al. [2000]), many of the benefits in terms of a more trained workforce with tacit technical knowledge gained from foreign MNEs will be experienced by local retailers. Thirdly, knowledge flows may accrue from direct contacts with local suppliers and distributors (Markusen and Venables [1999]). Finally, competition in the domestic economy between foreign MNEs and domestic firms is an incentive for the latter to make a more efficient use of existing resources and technology or even to adopt new technologies. However, the efficiency of domestic firms may also be negatively affected through this channel, as the presence of foreign subsidiaries may imply significant losses of their market shares, forcing them to operate on a less efficient scale, with a consequent increase in their average costs (Aitken and Harrison [1999]).

In terms of the empirical literature on regional FDI spillovers the evidence is mixed. Sjoholm [1999], for Indonesia; Aitken and Harrison [1999] for Venezuela; and Yudaeva et al. [2003] for Russia, do not confirm this geographically circumscribed dimension. However, the evidence for the UK seems to be more supportive of a regional dimension of the

[3]For surveys see Blomstrom and Kokko (1998), and Gorg and Greenaway [2004]. An interesting meta-study of the different research results is Gorg and Strobl [2002] which shows that the results depend on the research design.

spillover effect. Driffield [2000], using UK sector level data, finds the existence of positive productivity spillovers from FDI in the same manufacturing sector and region [4]. Using establishment-level data for the UK, Girma and Wakelin [2002] and Girma [2003] find positive regional spillovers from FDI. The former finds that domestic firms' Total Factor Productivity (TFP) is positively affected by the foreign presence in the same region, both in the sector defined at a 4-digit level (intra-sectoral spillovers) and in the one defined at a 2-digit level (inter-sectoral spillovers), although the effect of the foreign presence outside the region is found to be negative. The latter study also concludes favourably as to the existence of a regional dimension in the spillover effect.

3 The Model

This section lays out a simple theoretical exercise that shows how the presence of knowledge spillovers, caused by MNEs operating in a region, may act to consolidate the economic activity and output productivity of domestic firms located in the same region. The results that are attained in this section, together with the key assumptions, are then used as a guide for our empirical estimations that are presented and discussed in section 6.

Consider an economy populated by a continuous mass of $\bar{L}$ identical individuals, each endowed with one unit of labour of undifferentiated quality. Production in this economy is carried out by a continuum of firms, each producing a single homogeneous good. The economy is composed of N equally sized regions, each represented by a point on a circle of circumference 1. Firms are owned and managed by entrepreneurs of differentiated abilities, profit-seeking, risk neutral and perfectly rational agents, who are responsible for the production, employment and spatial decisions of their firm. Entrepreneurs are born in one of the N regions and they are imperfectly mobile between regions. Their region of birth is chosen by nature. Once an entrepreneur is born, she comes up with a business plan about setting up a new firm. The business plan is region-specific, based on conceptions and paradigms taken by her birth-region. After conceptualizing a business plan the entrepreneur needs to decide (i) whether it is viable and (ii) where she should locate. Inter-regional market differences prevent the entrepreneur from locating too far away from her region of birth. As such, she is faced with the option of whether to locate in the region in which she currently exists, or in one of the two neighbouring regions. Following these decisions, a new firm is set up in one of the N regions comprising this economy and commences its production activities. For the sake of simplicity and with small loss of generality, we assume that each firm is only allowed to operate a single production unit (multiplant firms are assumed out). In such a manner, the production

[4]However, FDI in the sector as a whole (but not in the region) actually has a negative impact on productivity, probably due to increased competition at the sector level.

activity of a firm x who chooses to locate in region i at time t will be determined by the neoclassical technology:

$$y_{xit} = f(A_{it}, k_{xit}, m_{xit}, l_{it}) = q_{xit}$$

where lower-case letters are used to denote firm values. Notice that in our notation, k and l denote capital and labour inputs, respectively; m is intermediate (material) inputs; and A_{it} is a composite region-specific input, reflecting technological differences across regions [5].

Firms are differentiated both horizontally (by distance from their host region and the efficiency parameter of the region to which they are attached) and vertically (by their own efficiency). Within each region, firm types (θ) follow the same uniform distribution over the interval $[\theta_{max}, \theta_{min}]$, with θ_{max} denoting the firm with the highest own-efficiency parameter and θ_{min} the least own-efficient one. The own-efficiency parameter θ may be interpreted as the managerial knowledge of domestic firms: firms that are managed by more capable entrepreneurs will tend to be characterized by a value of θ that is closer to θ_{max}; whereas for those that are managed by less capable ones, θ will take a value closer to θ_{min}. In any given region, a firm's ability to operate within it will depend partly on the own-efficiency of the firm, as measured by θ. Only firms that are competitive enough, in the sense that they make it above a certain threshold of efficiency (which differs across regions, depending on the presence of spillovers from MNEs) will make non-negative profits and thus choose to operate in that region. A firm that finds unprofitable operating in region i is faced with two options: (i) move to the neighbouring region j, if its efficiency parameter is high enough to surpass the threshold value for that region; or (ii) shut down. Assume that firm types are distributed uniformly across regions and the interval $[\theta_{max}, \theta_{min}]$ to be sufficiently wide, so that at any point in time there is a sufficiently large number of firms operating in the local market, thus ensuring competitive behaviour.

Regions are represented by points on a circle. Regions are not identical with each other, in the sense that each region is characterized by a different level of region-specific efficiency (ϕ). More efficient regions can afford to accommodate less efficient firms, thus making them more attractive investment destinations to a greater mass of entrepreneurs. We interpret regional efficiency as caused by MNE-induced knowledge spillovers. More specifically, each region is endowed with an exogenously determined and time invariant number of MNEs. The technical and operational knowledge of MNEs is disseminated in the form of knowledge spillovers uniformly across the entire business community of domestic firms operating within the region. The greater the managerial knowledge available in a region, the more efficient that region is going to be. This efficiency will be reflected

[5] For simplicity we assume a value added production function through the the theoretical section.

by a greater value of the region-specific efficiency parameter ϕ. Notice the assumption that knowledge spillovers can only disseminate within regions but not across. We justify this assumption on the ground of uniqueness of business environments between regions: different market idiosyncrasies require managers to adjust their management practices to make them compatible with the market environment in which they operate. As a result, a management practice that turns out to be successful in region i may not necessary be successful in region j. Moreover, we assume with minimal loss of generality that, at any point in time, firms can only locate in one of the two neighbouring regions by which they are surrounded.

It follows that for any given pair of regions (i, j) there is going to be a population of firms located between the two points, who need to decide region affiliation. The firms' decision to locate will then be influenced by (i) the physical distance of the firm from region i and region j - the further away a firm is placed from the "city centre", the more expensive it is going to be to affiliate to that region (interpret this as explicit transport costs, or cultural distance etc); (ii) the efficiency of each firm - a firm will have to be efficient enough to bear the operating cost in each region; (iii) region i's relative efficiency comparing to her neighbour j.

Maintaining our earlier assumptions, consider a firm, located at point x on the circle between regions i and j, who chooses to locate in region i. Firm x's profit function will take the form:

$$\pi_{x,i} = p_i q_x - w_i l_x - r k_x - (t(x - i) + \Theta_{i,j})$$

where:
p_i is the price of output (determined entirely by demand conditions in the local market).
A_i denotes region-specific production technology available to all firms operating in region i - it may reflect industry mix differences between regions.
w_i is the wage rate in region i; and r denotes interest rate, assumed to be uniform across all regions.
ϕ_i is the exogenously determined, region-specific efficiency parameter which we interpret as knowledge spillovers induced by the presence of MNEs.
$t(x - i)$ is the (fixed) cost of setting up a new business $x - i$ points away from region i.
$\Theta_{i,j} = \theta_x \frac{\phi_j}{\phi_i}$ is the total efficiency parameter that characterizes firm x and which depends on the firm's efficiency as well as on relative efficiency parameter of region i comparing to that of the neighbouring region j.

Let x^* be the point of the circle at which a firm is indifferent between locating in region i or j. Assuming common capital markets, it follows:

$$p_i q_i - w_i l_i - t(x^* - i) - \theta_x \frac{\phi_j}{\phi_i} = p_j q_j - w_j l_j - t(j - x^*) - \theta_x \frac{\phi_i}{\phi_j}$$

which, when solved for x^* yields:

$$x^* = \frac{(p_i q_i - p_j q_j) + (w_j l_j - w_i l_i) + t(j + i) + \theta_x \frac{\phi_i^2 - \phi_j^2}{\phi_i \phi_j}}{2t} \tag{1}$$

Similarly, for the marginal firm (y^*) located between i and h, we impose the indifference condition to obtain:

$$y^* = \frac{(p_h q_h - p_i q_i) + (w_i l_i - w_h l_h) + t(h + i) + \theta_y \frac{\phi_h^2 - \phi_i^2}{\phi_i \phi_h}}{2t} \tag{2}$$

The total number of firms located in region i will then be given as $s_i^* = x^* - y^*$ (we measure distance anti-clockwise):

$$\begin{aligned} s_i^* &= x^* - y^* \\ &= \frac{(2p_i q_i - p_j q_j - p_h q_h) + (w_j l_j + w_h l_h - 2w_i l_i) + t(j - h) + \theta_x \frac{\phi_i^2 - \phi_j^2}{\phi_i \phi_j}}{2t} \\ &\quad - \frac{\theta_y \frac{\phi_h^2 - \phi_i^2}{\phi_i \phi_h}}{2t} \end{aligned} \tag{3}$$

Notice that s_i^* represents the total number of entrepreneurs that comes up with a business plan wishing to operate in region i, the *total population* of potentially operating firms. It is trivial to show that $\frac{\partial s_i^*}{\partial \phi_i} > 0$, $\frac{\partial s_i^*}{\partial \phi_j} < 0$ and $\frac{\partial s_i^*}{\partial \phi_h} < 0$. We call this "stealing effect" and it represents the first of the two channels through which region i can benefit by accommodating a relatively greater stock of MNEs within its boundaries: Due to a decrease in the managerial costs, entrepreneurs that were previously affiliated with region j will may now consider to set up their business in region i. Or, to put it in simpler terms, the "catch area" of region i expands leftwards on the circle, towards j;

Due to differences in entrepreneurial talent reflecting to differences in efficiency between firms, some of these firms will turn out to be too inefficient to operate and, therefore, they will never come to existence (due to negative expected profits). More specif-

ically, we assume that only only firms with $\theta_x < \theta^*_{i,x}$ will find it profitable to operate, where $\theta^*_{i,x}$ is the threshold value of own-efficiency for a firm located at point x, such that $\pi(i, x, \theta^*_i) = 0$. Naturally, its value follows the rule:

$$\theta^*_{i,x} = \frac{\phi_i}{\phi_j}\left[p_i q_i - w_i l_i - t(x^* - i)\right] \tag{4}$$

Essentially this implies that if the intensity of spillovers in region i exceeds that of region j [6], a greater number of projects will be assessed as viable in region i than in region j (since the first is associated with lower operational costs than the latter). Notice also that if the region-specific efficiency parameters increase simultaneously and proportionally in the two regions, there will be no effect on the allocation of firms between the two regions [7].

Moreover, it is straight forward to see from equation (4) that a higher value of ϕ_i will push the threshold value of minimum efficiency rightwards, implying that more low-efficiency type firms will now be able to set up and operate. We call this *efficiency effect*. The efficiency and stealing effects can then be put together by combining equations (3) and (4) and estimating the actual number of operating firms in region i:

$$N_i = \left[(\theta^*_{x^*} - \theta_{max})(x^* - i) + \frac{1}{2}(\theta^*_i - \theta^*_{x^*})(x - i)\right] + \left[(\theta^*_{y^*} - \theta_{max})(i - y^*) + \frac{1}{2}(\theta^*_i - \theta^*_{y^*})(i - y^*)\right]$$

where $\theta^*_{i,x} = \theta^*_x(\phi_i, \phi_j)$ and $\theta^*_{i,y} = \theta^*_y(\phi_i, \phi_h)$ are defined by equation (4).

Setting $s^*_{i,x} = x^* - i$ and $s^*_{i,y} = i - y^*$ we can estimate the total number of firms as:

$$N^*_i = s^*_{i,x}\left(\frac{\theta^*_{i,x^*}(\phi_i, \phi_j) + \theta^*_{i,i}(\phi_i, \phi_j)}{2} - \theta_{max}\right) + s^*_{i,y}\left(\frac{\theta^*_{i,y^*}(\phi_i, \phi_h) + \theta^*_{i,i}(\phi_i, \phi_h)}{2} - \theta_{max}\right)$$

Since $s^*_{i,x}$, $s^*_{i,y}$, and all θ^*_i are increasing functions of ϕ_i and decreasing functions of ϕ_j and ϕ_h, we conclude that a relative increase in the intensity of knowledge spillovers triggered by a greater number of MNEs operating in this area (relative to the neighbours) should be expected to result in an increase in the number of firms operating in region i.

[6] Perhaps (but not necessarily) because a greater number of MNEs operates in that region. An alternative explanation could be that the quality of MNEs in region i is greater than that of region j etc

[7] This is a direct implication of "new births" being ruled out from our model, for the sake of simplicity. Indeed the focus of this exercise is to show how the presence of knowledge spillovers will affect the regional distribution of a fixed, time invariant but imperfectly mobile, population of domestic firms.

It should be noted at this point that, in order to preserve parsimony in our theoretical exercise, we have so far abstracted from introducing any unnecessary assumptions about the formulation of the composite technology variable A_i. Independently of the region-specific factors that may combine to determine the shape of this variable, our results suggest that a relative increase in the intensity of MNE-induced efficiency spillovers should be expected to lead to a relative increase in the number of domestic firms operating in that region, when compared to its neighbours.

Moreover, these results are only consolidated if A_i is specified explicitly as an increasing function of ϕ_i. Indeed, let $A_i = A_i(\phi_i)$ and $\frac{\partial A_i}{\partial \phi_i} > 0$, thus assuming that ϕ has a direct efficiency/productivity-enhancing effect further to its role of improving firm efficiency. It is then trivial to show from (4) that $\frac{\partial \theta^*_{\text{NEW}}}{\partial \phi_i} > \frac{\partial \theta^*_i}{\partial \phi_i} > 0$, where θ^*_{NEW} is used to denote the new efficiency-threshold value of θ, once the productivity enhancing impact of ϕ has been accounted for. As a result, one should expect such a modification to consolidate further our previous results, by pushing the threshold value of θ further rightwards and thus resulting to a newer increase in the number of firms that are allowed to operate in region i.

To summarize, this section introduces a simple theoretical framework that draws upon the work of Hotelling [1929] and Salop [1979] on spatial competition to analyze the impact of MNE-induced knowledge spillovers on regional economic activity, as measured by the number of firms operating in a single region. Our results rely heavily on three main assumptions: (i) that MNEs outperform domestic competition, and, therefore, the flow of spillovers, if any, can only be from the first to the latter; (ii) these spillovers have a efficiency/productivity-enhancing impact on domestic firms, significant enough to be quantified and measured; and (iii) knowledge can be transferred only within regions, and thus any gains in productivity due to the presence of these spillovers has to be regional in nature. Under these assumptions, we prove that a regions characterized by a relatively higher number of MNEs (and thus a greater intensity of spillovers) should be expected to attract a greater number of domestic, more productive firms.

The remainder of this paper tries empirically the validity of these assumptions, while also exploring the impact that the country of ownership of MNEs may have on the productivity performance of domestic firms. Our empirical results lend support to all of the assumptions claimed in this section, while also providing solid evidence for the impact of foreign investment on domestic economic activity and performance to be in line with our theoretical predictions.

4 Empirical Specification

In this section we discuss the methodological details of our empirical estimations. In particular, subsection 4.1 presents the productivity equation that needs to be estimated using a two-step procedure, in order to address effectively simultaneity and endogeneity problems that have been previously reported as two of the main sources of bias in this type of growth equations. Moreover, subsection 4.2 illustrates in detail how FDI spillovers are modelled and integrated with our governing productivity equation.

4.1 Methodological Overview

To identify the influence of foreign presence on the productivity dynamics of domestic retailers, we employ a two-step procedure (see Griffith [1999]). The first step consists of the estimation of the establishment specific TFP levels, which we relate in a second step to a vector of foreign presence. Specifically, the first step estimates a log-linear transformation of the following Cobb-Douglas production function:

$$Y_{it} = A_{it} K_{it}^{\beta_K} L_{it}^{\beta_L} M_{it}^{\beta_M} \tag{5}$$

where Y_{it} is real gross output of firm i at time t, K_{it} is physical capital, L_{it} is labour (measured in terms of full time equivalents (FTE)), M_{it} represents the real cost of intermediate inputs, and A_{it} is a measure of the firm's time-varying total factor productivity (TFP).

Econometric issues arise in the estimation of the log transformation of equation (5), due to the potential simultaneity bias between input choices and the productivity shocks, which cause the OLS estimates to be biased. Firms observe their own productivity and may respond to a positive productivity shock by using more inputs. A number of solutions have been proposed in the literature to overcome this problem. Among others, these include using firm-level fixed effects and instrumental variable strategy for input choices. We use the semi-parametric procedure suggested by Levinsohn and Petrin [2003], which follows from Olley and Pakes [1996]. Levinsohn and Petrin [2003] argued that by using information on intermediate input choices, one can effectively control for productivity shocks and thus obtain consistent and unbiased estimates of the input coefficients. We also compare these results with those from a General Method of Moments approach following Blundell and Bond (2000) A more detailed account of our methodology on com-

puting TFP can be found in Appendix 1.

The second step relates the estimated establishment's total factor productivity (TFP) to relevant indicators of foreign presence and several control variables. Specifically, to investigate the role of FDI spillovers on retail productivity, we estimate the following total factor productivity (TFP) growth equation [8]:

$$\Delta \ln TFP_{it} = \ln TFP_{i,t-1} + \gamma_j \sum_k \ln FDI^k_{i,t-1} + \Gamma Z_{it} + \beta_t + \delta_r + \eta_j + \epsilon_{it} \tag{6}$$

where i, j, r and t are indices used to denote firms, three-digit industries, regions and time periods, respectively. Equation (6) states that the growth rate of TFP depends on the initial level of TFP ($lnTFP_{i,t-1}$), foreign presence and other set of firm characteristics. Specifically, FDI_{it}, is a vector that captures foreign presence at the three digit industry and/or regional level, and Z_{it} represents a set of variables capturing other firm characteristics, namely distributive services, absorptive capacity (defined below), plant age, a measure of four-digit industry concentration (Herfindahl index), growth rate of market share, relative skills, the number of regions in which the establishments operates and whether the establishment is part of a multi-plant firm. Using a vector of dummies, we further control for time-specific effects (β_t), to account for macro productivity shocks; three-digit industry affiliations (η_j), to capture industry-specific effects; and the region where the establishment is located in (δ_r), to reflect any region-specific influences. Finally, ϵ_{it} is a random error term which is assumed to be distributed independently of the explanatory variables.

One source of concern in the proposed empirical specification is the potential for serial correlation when TFP is measured with error, as appears on both hand sides of our regression. We address this potential problem using detailed micro-level data and include industry, region, and time dummies to control for the impact of fixed effects. In addition, controlling for the simultaneity bias - using Levinsohn and Petrin [2003] - minimizes the measurement error in our TFP indices. Finally, the regressions are only conducted for domestic establishments to prevent any potential bias in the results due to the fact that foreign investors tend to acquire the most successful domestic companies (see Djankov and Hoekman [2000]).

[8] We use a TFP growth rather than levels equation as this purges any establishment specific time invariant effects that impact on TFP in levels.

4.2 *Modelling FDI Spillovers*

Following Girma and Wakelin [2002, 2007], our modelling of FDI is adjusted to account for three potential dimensions of the foreign direct investment vector, FDI_{it}^{k}, as shown in equation (6), with $k \in \{1,2,3\}$. In particular, each of the three dimensions is defined as follows: Firstly, FDI_{it}^{1} is the share of employment of foreign stores located in the firm's region and same three-digit industry affiliation. It is designed to capture the local intra-industry spillover from FDI. Secondly, FDI_{it}^{2} is a measure of foreign presence outside the region but within the same sector. The inclusion of this variable will allow to test the validity of our initial assumption on the locality of knowledge spillovers, upon which the theoretical model has been built. If the productivity impact of FDI is indeed strictly local in nature, one should not expect this type of spillover to be statistically important. Thirdly, FDI_{it}^{3} measures FDI in the wider 2-digit sector (excluding the establishment's three-digit industry) in the region. It is designed to identify the effect of regional inter-industry spillovers on the firm's productivity. The FDI variables in this study are all lagged by one period to allow for the realisation of the spillover effects to take effect.

The intensity of the productivity spillovers, and thus the impact of foreign presence on domestic firms, may not be uniform, but depend , everything else held equal, on the past performance of domestic firms. Indeed, better managed firms may experience a greater benefit, when compared to their weaker, less efficient competitors. This intuitive explanation is in line with our theoretical model in which own efficiency ϕ is shown to have a positive impact on the overall intensity of the spillover effect on firm productivity (Θ) enjoyed by each firm.

To account for this factor, and following previous literature (see, for instance, Girma [2005]), we construct an absorptive capacity variable for each firm based on a measure of the technology (TFP) gap between a non-frontier firm and the technology frontier in industry j at time $t-1$. This is motivated by the idea that domestic firms with productivity levels similar to technological frontier may also be more capable of absorbing the transferred technology. Specifically, absorptive capacity is computed as the individual firm's TFP relative to the average of TFP of the 95th percentile most productive firms at time t in industry j at the three-digit (see, for instance, Kathuria [2000]). This proxy has the advantage of reducing the measurement error by taking into account more than one firm instead of just focusing on the most productive plant.

For the purposes of this paper, we allow the spillover effect to vary across establishments according to their level of absorptive capacity (ABC). Specifically, to investigate

the role of absorptive capacity, we estimate the impact of FDI spillovers on productivity growth via a modified version of equation (6).

$$\begin{aligned} \Delta \ln TFP_{it} &= \alpha_1 \ln TFP_{i,t-1} + \gamma_j \sum_k \ln FDI^k_{i,t-1} + \mu_j \sum_k ABC_{t-1} \ln FDI^k_{i,t-1} \\ &\quad + \Gamma Z_{it} + \beta_t + \delta_r + \eta_j + \epsilon_{it} \end{aligned} \tag{7}$$

If absorptive capacity matters for the pattern of FDI-induced TFP growth, the spillovers regression functions will not be identical across all domestic firms. For this reason the coefficient on the FDI vector in the above equations is explicitly made to depend on absorptive capacity (ABC).

5 Data Description and Characteristics of the British Retail Sector

5.1 Data Description

Our sample of British retailers is drawn from the Annual Respondents Database (ARD) provided by the Office for National Statistics. The retailing sector is covered by SIC92 codes from *52111* to *52740*, i.e. all codes beginning with 52. The ARD dataset consists of individual establishment's records from the Annual Business Inquiry (ABI). Detailed descriptions of this data are provided by Griffith [1999], Barnes and Martin [2002], among others. Haskel and Kwanja [2003] provide a very detailed description for the retail sector. Therefore, only a brief discussion of the data is given here.

It is important to note that the ABI is a stratified random sample where sampling probabilities are higher for large establishments. Only reporting units above a certain employment threshold (currently 250) receive an ABI form every year [9]. Smaller reporting units are sampled by size-region-industry bands. The sampled businesses form the so-called "selected" sample. The remainder of the registered units are not sampled and they form the "non-selected" sample. For the non-selected units, only basic information is recorded in ARD (namely industrial classification, region, employment and foreign ownership status). This sampling structure requires the data to be weighted by sampling weights derived from both the selected and non-selected samples.

Moreover, when working with the ARD dataset, it is important to define the correct level of aggregation at which the analysis has to be carried out. The ABI dataset contains

[9] The threshold was lower in the past. See Barnes and Martin (2002) for more details.

information on enterprises, reporting units (RU) (or the decision-making unit) and local units (LU). Typically, the RU is the plant or unit that replies to the questionnaire and so it may correspond to the decisional centre of the firm. RU may coincide with local units if the firm is a single-plant unit while in a multi-plants unit, the RU is a group of local units. This problem arises because multi-plants companies can choose how to report information to the ABI. Indeed, they can report each plant individually or various groups of plants. Each RU has its own unique identification number, an enterprise and an enterprise group identification number. The problem of multi-plants is particularly relevant for geographical analysis as only in the case of single local unit, there will be no ambiguity with regard to the specific location of an RU. One solution to this problem would be to carry out the empirical analysis at the local level unit. The problem though is that there is not enough information on inputs and outputs at local level unit that would allow us to estimate a production function. Therefore, in common with previous studies (see Oulton [2001]; Girma and Wakelin [2002]; Haskel et al [2002]; and Griffith and Simpson [2004]), we have decided to carry out the analysis at the RU level [10].

Although our methodology abstracts from undertaking the analysis at the local level, there are two important ways in which we have made use of the local unit information contained in the non-selected file. The first is in the construction of measures of regional FDI (see Girma and Wakelin [2002] for a similar approach). Foreign presence in a region and sector is defined in this paper as the proportion of employment accounted for by foreign-owned plants (stores). Simply relying on establishment data could be misleading, as they could report for plants across different regions or sectors. However, using also data on employment, ownership and industrial affiliation from the "non-selected" file, it was possible to correctly calculate the regional FDI variables. The second way information from the non-selected file was used is in the identification of single location (establishments located in a single region) and multiple location establishments (establishments located and operating in more than one regions, in the sense of multi-plant firms).

The information on country ownership recorded in the ARD dataset suffices to allow for the identification of foreign-owned enterprises, but not for the distinction of UK MNEs from strictly domestic firms. To overcome this constraint, we exploit data available from the Annual Foreign Direct Investment (AFDI) register. The AFDI is an annual survey of businesses which requests a detailed breakdown of the financial flows between UK firms and their overseas parents or subsidiaries. The AFDI is thus a survey run at the

[10]Besides approximately two-thirds of retailing outlets were accounted for by stand-alone businesses (see Haskel and Kwanja [2003]). Therefore, most of the data from the ARD used in this study are in effect plant level data.

enterprise or firm. The working definition of FDI for this purpose is that the investment must give the investing firm a "significant" amount of control over the recipient firm. The ONS considers this to be the case if the investment gives the investor a share of at least 10 per cent of the recipient firm's capital. We consequently define as "multinational" each establishment in the ARD that is owned by a firm which appears in the AFDI register [11].

Output is measured by the gross output (Y) deflated by the 4-digit Retail Sales Index[12] deflator available from the ONS. Employment (L) is measured by the number of employees in full time equivalents (FTE)[13]. Intermediate inputs (M) are constructed by using the information on input purchases and are deflated by a weighted average of the producer price indices of the supplying sectors following the approach by Oulton and Srinivasan [2003]. The weights are given by the input-output matrix and represent the proportion of inputs sourced from a given sector. The stock of capital (K) has been constructed by using the perpetual inventory method and the plant level information on investment (see Martin [2002] for more information) and are available from the ONS. Following common practice, any missing observations and negative values on relevant variables have been excluded from our sample, together with those that lack regional information.

5.2 Overview of the British Retail Industry

Retailing is a crucial sector and a major contributor for the UK economy in terms of both output and employment. Recent estimates suggest that the British retail sector generates almost 6 per cent of total GDP and accounts for the employment of 11 per cent of total workforce (Office for National Statistics). Despite its importance, several studies at the aggregate level have identified a labour productivity gap for UK retailers when compared with the productivity performance of their foreign counterparts, notably France, Germany and the US (O'Mahony and de Boer [2002]; Van Ark et al. [2002]; and Reynolds et al. [2005]). In this setting, the role of foreign ownership in determining productivity and affecting country and sector performance becomes increasingly appealing. Does foreign ownership have really any significant positive impact on productivity growth? If that was the case, FDI could be regarded as an important mechanism to close the aforemen-

[11] A reported problem with the AFDI register is that information is not always up-to-date. The register population has varied spuriously over the years with the ONS' success in identifying the firms that have been engaged in FDI. Only after the ONS learns from various sources that a firm has engaged or received FDI, it will include the information in the AFDI register. However, we believe that this problem does not weaken the conclusions that can be drawn from our results.

[12] For the retail sector, the ONS produces a separate index called the Retail Sales Index, which collects retail sales figures on a monthly basis. This is used to produce a disaggregated price index for the 4 digit SIC codes within the retailing sector, which we are using.

[13] The ARD dataset provides information on headcounts and the fraction of employees who are part-time, but not on the number of hours worked. Total hours worked (measured as FTE) are instead obtained from the Labour Force Survey.

tioned productivity gap in retailing.

Traditionally, most of the literature analysing the impact of FDI on productivity has focused on the manufacturing sector. The availability of data and the traditional low levels of internationalisation of firms operating in the service sector have been two of the main reasons behind the lack of research in this area that focuses on services. However, the British retail industry has experienced a rapid process of internationalisation. Presently, it is an industry with an extremely high level of multinational activity. In 2002, 43 per cent of the workforce was employed by multinational corporations (see Griffith et al. [2004]). However, in contrast to other production industries, where there is an equal involvement of British and foreign-owned MNEs, in retailing it is British-owned MNEs that dominate. Nevertheless, as table 1 shows, the presence of foreign-owned MNEs has been increasing rapidly, both in terms of numbers and relative importance.

Table 1: The share (%) of Employment as FTE in the British Retail Sector (SIC92: 52)

		Multinationals	
Year	**British Only**	**British Owned**	**Foreign Owned**
1999	61.3	34	4.7
2003	55.2	33.4	11.4

Source: Office for National Statistics (ONS): Authors' calculations using ARD establishment-level weighted sample data, and the Annual Inquiry into Foreign Direct Investment (AFDI).

Table 2 provides summary statistics of some variables of interest. A careful examination of the context of this table reveals that there is considerable variation in the variables, particularly between different types of retailers.

6 Estimation Results

In order to establish that foreign multinationals have the potential to generate spillovers which could affect positively the productivity of national firms, we show first how they compare to domestically owned firms. In particular, we seek to identify the relevant factors that may explain the performance implications of foreign versus domestic ownership for British retailers, controlling for a number of factors affecting firms' performance. To provide a better understanding of the difference between foreign- and domestic-owned establishments, we follow recent studies that have made a distinction between firm own-

Table 2: Descriptive Statistics for the Key Variables

	TOTAL		FOREIGN		UK MNE	
Variable	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**
$\ln(Y)$	9.122	1.24	10.982	1.473	12.557	1.812
$\ln(VA/L)$	7.593	1.359	9.397	1.566	11.053	1.769
$\ln(L)$	4.636	1.13	6.182	1.403	7.886	1.716
$\ln(M)$	4.163	1.348	6.091	1.53	7.616	1.902
$\ln(K)$	7.072	1.526	9.361	1.64	10.928	1.873
ABC	-0.025	0.147	-0.008	0.13	0.0001	0.078
Advertisement	1.04	9.161	4.737	27.009	3.465	32.522
Assortment	1.067	0.661	1.191	1.034	1.439	1.12
No of regions	1.593	2.036	5.079	4.251	8.763	3.678
Skill	0.003	0.671	0.433	0.512	0.351	0.427
Multi plant	0.299	0.458	0.707	0.456	0.911	0.284
$\ln(TFP)$	4.735	0.348	4.748	0.264	4.79	0.192
Observations	32971		505		384	

Source: Office for National Statistics (ONS): Authors' calculations using ARD establishment-level weighted sample data, and the Annual Inquiry into Foreign Direct Investment (AFDI).

ership and multinational status (see, for example, Doms and Jensen [1998], Criscuolo and Martin [2004] and Baldwin and Hanel [2003]). These studies find that, on average, both indigenous and foreign MNEs tend to outperform strictly domestically-operating firms.

Table 3 reports the estimates of a number of Least Squares regressions designed to test whether foreign establishments exhibit distinct characteristics. The regressions include dummy variables for different groups of retail establishments and control for firm age, size, time dummies, three-digit industry affiliation and regional location. More specifically, we distinguish between foreign MNEs, UK MNEs, domestic multi-plant establishments with plants in different regions, domestic multi-plant establishments with plants in a single region. The base group is made up of domestic single-plant establishments. The coefficients associated to the dummy variables give the marginal effect with respect to the base group.

There are some clear patterns that become quickly evident when the performance of different categories of retailers is examined. The first is that all MNEs (independently of the country of origin) are on average significantly more productive than non-MNEs, domestically operating firms. This finding agrees with another of the fundamental assump-

Table 3: The Impact of Foreign Ownership on Relative Performance

Performance Variable	UK MNE	Foreign MNE	Multi Region	Single Region	No of Observations
Avg. Salary	0.149***	0.286***	0.133***	0.186***	35,368
	(0.043)	(0.037)	(0.017)	(0.01)	
Capital /FTE	0.462***	0.625***	0.072**	-0.209***	33,305
	(0.061)	(0.061)	(0.032)	(0.019)	
Employees, FTE	1.402***	0.261***	-0.03	0.232***	37,099
	(0.154)	(0.075)	(0.026)	(0.014)	
Computer Svc/FTE	0.795***	0.950***	0.593***	0.482***	28,151
	(0.104)	(0.088)	(0.047)	(0.029)	
Labour Productivity	0.386***	0.277***	0.143***	-0.027*	37,099
	(0.051)	(0.053)	(0.023)	(0.014)	
TFP (LP)	0.109***	0.037**	0.029***	0.0004	32,971
	(0.016)	(0.017)	(0.009)	(0.005)	
TFP (Caves et al.)	0.095***	0.042***	0.021***	0.005	26,581
	(0.013)	(0.015)	(0.008)	(0.005)	

Notes: Robust standard errors in parenthesis. In all regressions we control for size, firm's age, and three digit industry, region and time specific effects. Total Factor Productivity (TFP) estimates are obtained using both the Levinsohn and Levin (LP) and the neoclassical approach respectively. * significantly different from zero at the 10 percent level. ** significantly different from zero at the 5 percent level. *** significantly different from zero at the 1 percent level.

tion in our theoretical exercise, where it was assumed that MNEs are (i) more productive than domestic firms and (ii) the direction of the productivity spillover extends from the MNEs towards the domestic competition and not vice versa.

When MNEs are distinguished by their country of ownership, the results in table 3 show that foreign-owned firms pay higher average salaries, have higher capital intensity, use more employees, spend more on computer services per employee and are more productive (both in terms of value added per FTE and TFP) than strictly domestically-operating firms. Across the different groups of retailers, however, UK MNEs stand out as the most productive (in terms of TFP) followed by foreign-owned establishments. The results also show that British and foreign MNEs have non-significantly different estimates of labour productivity. These results are in line with recent research that has shown that a large part of the productivity differential is explained by a multinational effect rather than by a foreign ownership effect [14]. Among other domestic firms, establishments with

[14]See, in particular, Doms and Jensen [1998] for the US and Criscuolo and Martin [2005] for Great Britain.

plants in several regions are more productive than domestic single plants.

Given that foreign-owned retailers experience higher productivity than domestically-owned firms (with the exception of British MNEs), and also they use capital and ICT services more intensively, there is scope for positive externalities accruing to these pure-domestic retailers.

6.1 FDI and Productivity Spillovers

Table 4 presents the results from the estimation of equations (6) and (7) for the sample of all domestic firms. More specifically, specification (i) presents the estimated coefficients of the basic model; specification (ii) expands the model to control for the absorptive capacity of firms and its interaction with foreign firm presence; specification (iii) adds a vector of firm-specific characteristics, namely firm age, whether the firm is multi-plant, the market share growth rate, and a proxy for the skill level; and finally specification (iv) excludes UK MNEs and supermarkets from the sample. In all specifications, we introduce a set of time dummies (to control for time heterogeneity), regional dummies (to control for regional variation) and four-digit industrial sector dummies (to control for sector heterogeneity).

Focusing on the role of foreign presence, we find FDI (a proxy for ϕ in the theoretical model) in the same three-digit sector and region to benefit British retailers, by boosting up their productivity performance. This result is consistent across all specifications. Moreover, the interaction between absorptive capacity and foreign presence (specification 2 and subsequent - it can also be seen as a proxy for Θ) indicates that knowledge spillover from regional FDI is uniformly positive, and increases with absorptive capacity. On the other hand, we fail to find any evidence of a productivity impact from FDI in the same three-digit sector but external to the region. Moreover, the productivity effects of upward and downward linkages resulting from the presence of foreign MNEs in the same region appear to be less significant. This supports the notion that knowledge spillovers from FDI in the British retail sector have a strong regional dimension, that is, spillovers are reduced by geographical distance. It also justifies another of our theoretical assumptions, namely the one that restricts the impact of productivity externalities from extending beyond strictly defined regional borders[15].

[15]This may be appropriate in the case of retailers, when the domestic firm would learn by observing and copying, as well as when the knowledge enters through labour turnover, since labour mobility should be higher within local labour markets than on the national level.

Table 4: Effect of FDI on Domestic Retailers TFP

	(i)		(ii)		(iii)		(iv)	
	Coeff.	**Std. Err.**	**Coeff.**	**Std. Err.**	**Coeff.**	**Std. Err.**	**Coeff.**	**Std. Err.**
$\ln TFP_{t-1}$	-0.619***	(0.073)	-0.644***	(0.074)	-0.682***	(0.070)	-0.684***	(0.073)
$\ln FDI^1_{t-1}$	0.073**	(0.031)	0.155***	(0.048)	0.151***	(0.051)	0.161***	(0.053)
$\ln FDI^2_{t-1}$	0.074	(0.088)	0.069	(0.111)	0.105	(0.107)	0.053	(0.114)
$\ln FDI^3_{t-1}$	0.074*	(0.045)	0.116*	(0.070)	0.102	(0.065)	0.147**	(0.067)
ABC_{t-1}	0.315**	(0.128)	0.195	(0.125)	0.104	(0.114)	0.081	(0.124)
$(lnFDI^1 * ABC)(t-1)$			1.889***	(0.706)	2.123***	(0.763)	2.289***	(0.786)
$(\ln FDI^2 * ABC)_{t-1}$			0.464	(1.394)	0.845	(1.253)	0.782	(1.295)
$(\ln FDI^3 * ABC)_{t-1}$			1.261	(1.154)	1.308	(1.060)	1.712	(1.080)
UK MNE$_t$	0.024**	(0.011)	0.024**	(0.011)	0.025**	(0.010)		
UK single region$_t$	-0.003	(0.007)	-0.005	(0.007)	0.008	(0.010)	0.009	(0.011)
Herfindahl Index$_t$	-0.198***	(0.051)	-0.194***	(0.053)	-0.141***	(0.051)	-0.148***	(0.054)
ΔMarket share$_t$	-0.343	(0.244)	-0.280	(0.258)	-0.136	(0.273)	-0.094	(0.329)
Advertisement$_t$	0.002***	(0.001)	0.002***	(0.001)	0.0001	(0.001)	0.0003	(0.001)
Assortment$_t$	-0.006*	(0.004)	-0.006*	(0.004)	-0.004	(0.004)	-0.006*	(0.004)
National Presence$_t$	0.003***	(0.001)	0.003***	(0.001)	0.004***	(0.001)	0.004***	(0.001)
Age$_t$					-0.002	(0.002)	-0.002	(0.002)
Multiplant$_t$					-0.022**	(0.010)	-0.023**	(0.011)
Skills$_t$					0.107***	(0.010)	0.107***	(0.011)
Regions	yes		yes		yes		yes	
Industry	yes		yes		yes		yes	
Year	yes		yes		yes		yes	
Observations	4231		4231		4228		3584	
F	8.03		8.05		10.00		9.41	

Notes:

1. The dependent variable in all specifications is $\Delta \ln TFP_{it}$.
2. Robust standard errors in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%.
3. All regressions include time, 4-digit industry and regional dummies.
4. Specification (iv) excludes UK MNE's and supermarkets from the analysis.
5. All estimations are conducted on the sample of domestic retailers only.

In all sub-samples and specifications, the estimated coefficient of initial TFP is negative. This is consistent with the notion of β-convergence, suggesting that the fastest productivity growth rates are experienced by those firms with the lowest starting value of productivity. Conditional on initial TFP, we find that retail establishments with higher relative advertisement expenditure and higher national presence grow at a faster rate. The results also suggest that retailers with a greater relative number of product lines grow slower, although this result is less consistent. Other things being equal, multi-plant establishments seem to be growing at lower rates while firms with a positive wage differential with respect to the industry grow faster. The wage differential could be interpreted as a proxy for skill premia, showing that retailers who employ a higher number of skilled workers with respect to the industry average, are characterized by, on average, higher productivity rates. This result remains robust across all specifications.

FDI might also affect the level of competition in local markets, and through this channel, domestic firms' survival, behaviour and performance. To control for this effect, and following Haskel et al. [2002], we have introduced in the regression two measures of potential competition: (a) the growth rate of market share at firm level; and (b) the four digit industry concentration measured by the Herfindahl index. The market share is measured by the firms' sales of own products as a proportion of the four digit industry sales. We expect that - to the extent that these indices reflect changes in the levels of competition - changes in allocative and technical efficiency produced by an increased FDI should be captured by these indeces. Additionally, these variables should also capture changes in other unobservable variables that affect competition and that might have disciplined the domestic industry to become more efficient. The results show that, controlling for the competition effect the coefficient estimate on the regional spillover variable appears significant.

Because the existence of domestic establishments with plants in more than one region may affect the interpretation of regional spillovers, we perform the analysis excluding such establishments from the sample. The results are presented in Table 5. Like before, our estimations focus on the measurement of the impact of foreign presence on the productivity of domestic retailers. The results here confirm that FDI in the same three-digit sector and region benefits British local retailers [16] in the form of higher productivity. More specifically, an increase of 10 percent in FDI^1 increases the productivity of British local retailers by about 15 per cent. This result is consistent across all specifications. Moreover, the interaction between absorptive capacity and foreign presence indicates that knowledge spillover from regional FDI is uniformly positive, and increases with absorptive capacity [17]. For all specifications we are unable to find evidence of a correlation between domestic productivity growth and FDI in the same sector but in a different region

[16] We refer to local retailers as those with stores in one region.

[17] We have tried to interact in a quadratic model absorptive capacity with the FDI variables to allow for non-linearities, however the square terms were not statistically significant.

Table 5: Effect of FDI on single plants and local domestic retailers' TFP

	(i)		(ii)		(iii)		(iv)	
	Coeff.	**Std. Err.**	**Coeff.**	**Std. Err.**	**Coeff.**	**Std. Err.**	**Coeff.**	**Std. Err.**
$\ln TFP_{t-1}$	-0.658***	(0.079)	-0.692***	(0.081)	-0.729***	(0.077)	-0.730***	(0.079)
$\ln FDI^1_{t-1}$	0.107**	(0.046)	0.179***	(0.049)	0.162***	(0.057)	0.160***	(0.055)
$\ln FDI^2_{t-1}$	0.075	(0.116)	0.158	(0.134)	0.167	(0.132)	0.110	(0.136)
$\ln FDI^3_{t-1}$	0.096	(0.072)	0.104	(0.088)	0.117	(0.082)	0.163*	(0.084)
ABC_{t-1}	0.393***	(0.143)	0.157	(0.121)	0.122	(0.119)	0.086	(0.128)
$(\ln FDI^1 * ABC)_{t-1}$			2.053***	(0.651)	2.178***	(0.785)	2.369***	(0.795)
$(\ln FDI^2 * ABC)_{t-1}$			2.712**	(1.381)	2.694**	(1.289)	2.832**	(1.327)
$(\ln FDI^3 * ABC)_{t-1}$			0.625	(1.166)	0.834	(1.084)	1.238	(1.091)
UK MNE$_t$	0.103**	(0.049)	0.093**	(0.046)	0.073	(0.049)		
Herfindahl Index$_t$	-0.240***	(0.076)	-0.235***	(0.078)	-0.167**	(0.076)	-0.174**	(0.077)
ΔMarket share$_t$	-1.398	(1.037)	–1.398	(1.037)	-0.164	(1.373)	0.071	(1.511)
Advertisement$_t$	0.002**	(0.001)	0.002**	(0.001)	-0.0002	(0.001)	-0.0004	(0.001)
Assortment$_t$	-0.015***	(0.005)	-0.015***	(0.005)	-0.009*	(0.005)	-0.010	(0.006)
Age$_t$					-0.001	(0.002)	-0.001	(0.002)
Multiplant$_t$					0.014*	(0.008)	-0.015*	(0.009)
Skills$_t$					0.110***	(0.013)	0.110***	(0.014)
Regions	yes		yes		yes		yes	
Industry	yes		yes		yes		yes	
Year	yes		yes		yes		yes	
Observations	2497		2497		2495		2204	
F	7.21		7.09		8.30		8.13	

Notes:

1. The dependent variable in all specifications is $\Delta \ln TFP_{it}$.
2. Robust standard errors in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%.
3. All regressions models include time, 4-digit industry, and regional dummies.
4. Specification (iv) excludes UK MNE's and supermarkets from the analysis.
5. All estimations are conducted on the sample of domestic retailers only.

Table 6: Effect of FDI on retailers' TFP by Establishment's ICT investment and skills

	Higher ICT		**Lower ICT**		**Higher Skill**		**Lower Skill**	
	Coeff.	**Std. Err.**	**Coeff.**	**Std. Err.**	**Coeff.**	**Std. Err.**	**Coeff.**	**Std. Err.**
$\ln TFP_{t-1}$	-0.746***	(0.100)	-0.727***	(0.096)	-0.696***	(0.085)	-0.852***	(0.135)
$\ln FDI^1_{t-1}$	0.074*	(0.043)	0.236***	(0.070)	0.110**	(0.054)	0.243**	(0.096)
$\ln FDI^2_{t-1}$	0.381**	(0.174)	0.091	(0.169)	0.199	(0.164)	0.145	(0.238)
$\ln FDI^3_{t-1}$	-0.038	(0.130)	0.192**	(0.098)	0.092	(0.088)	0.133	(0.180)
ABC_{t-1}	0.152	(0.203)	0.122	(0.146)	0.258**	(0.135)	-0.086	(0.243)
$(\ln FDI^1 * ABC)_{t-1}$	0.913	(0.635)	2.798***	(0.783)	0.819	(0.731)	3.570***	(0.873)
$(\ln FDI^2 * ABC)_{t-1}$	4.922***	(1.761)	1.453	(1.434)	2.135	(1.490)	4.978**	(2.505)
$(\ln FDI^3 * ABC)_{t-1}$	-0.115	(1.563)	0.998	(1.353)	0.683	(1.299)	0.527	(1.837)
UK MNE$_t$	0.080**	(0.032)	-0.082	(0.190)	0.049	(0.056)	0.135*	(0.080)
Herfindahl Index$_t$	-0.255**	(0.105)	-0.200**	(0.097)	-0.103	(0.100)	-0.288***	(0.097)
ΔMarket share$_t$	1.008	(1.617)	-2.026	(5.307)	-0.692	(1.628)	0.002	(3.649)
Advertisement$_t$	0.001	(0.001)	-0.002	(0.002)	0.000	(0.001)	0.002	(0.005)
Assortment$_t$	-0.006	(0.008)	-0.011	(0.007)	-0.006	(0.006)	-0.017	(0.011)
Age$_t$	0.001	(0.002)	-0.003	(0.005)	-0.001	(0.002)	-0.006	(0.006)
Multiplant$_t$	-0.012	(0.012)	-0.013	(0.011)	0.004	(0.009)	-0.049***	(0.018)
Skills$_t$	0.113***	(0.019)	0.121***	(0.017)	0.113***	(0.016)	0.152***	(0.036)
Regions	Yes		yes		yes		yes	
Industry	Yes		yes		yes		yes	
Year	Yes		yes		yes		yes	
Observations	881		1614		1803		692	
F	5.18		6.63		7.70		4.45	

Notes:

1. The dependent variable in all specifications is $\Delta \ln TFP_{it}$.
2. Robust standard errors in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%.
3. All regressions models include time, 4-digit industry, and regional dummies.
4. A high ICT establishment is defined as investing more than the median firm in the four-digit industry.
5. All estimations are conducted on the sample of domestic retailers located in a single region only.

To shed more light into the retailer's capacity to benefit from FDI spillovers, we classified the sample of local retailers by their intensity in using Information and Communication technologies (ICT) and the skill level of their work force. Both ICT and skills[18] are said to impact on the retailers' ability to innovate and also on their capacity to appropriate the benefits from spillovers. Higher ICT and skilled retailers are defined relative to the median retailer in their four-digit industry. In contrast to previous findings, the results presented in Table 6 suggest that local firms that invest intensively in ICT not only are able to benefit marginally from intra-regional FDI spillovers but also from spillovers generated outside the region. This confirms the importance of ICT in overcoming the traditional barriers due to geographical distance. The results also reveal that the benefits accrued by lower ICT retailers are confined just to regional FDI spillovers. Overall, lower ICT and lower skilled retailers seem to benefit more in terms of productivity gains from regional FDI spillovers, as these may be the ones that operate further away from the technological frontier and therefore have more to learn from their foreign counterparts.

To check the robustness of the baseline results, we provide estimates using a parametric generalized method of moments (GMM) approach. This is an alternative approach to Levinsohn and Petrin [2003] which also accounts for the simultaneity of input choices and the unobserved productivity. Particularly, we estimate a static and dynamic version of an augmented production function using the System GMM estimator by Blundell and Bond [2000], including the FDI spillovers and the rest of controls into the production function. To implement the System GMM we take as instruments the lagged levels dated t-2 and earlier in the differenced equation and lagged first differences of inputs as instruments in the level equation.

The System GMM estimates are reported in Table 7 for the sample of total domestic and only regional retailers. In all specifications we control also for time, four-digit industry and regional dummies. The results of the first two columns are comparable to the results reported in Table 4; while the ones presented in the last two columns are comparable to those in Table 5. Overall, they are consistent with the previous findings, confirming that FDI in the same three-digit industry and region benefits British retailers and those with a higher absorptive capacity obtaining higher gains. The Hansen test for the overidentifying restrictions appears to validate the choice of instruments in all specifications. Nevertheless, for the sample of local retailers, the Arellano-Bond tests on autocorrelation do not seem to support the choice of the System-GMM estimator. Therefore, our preferred set of estimates is those based in the Levisohn and Petrin procedure.

[18]ICT is proxied by the firm's purchases of computer services and is available since 1997. Computer service data in the ARD captures firm purchases of computer related services not capitalised. Data on investment in hardware and software is only available since 2003. The skill level is proxied by relative wages.

Table 7: Effect of FDI on retailers' TFP, GMM approach

	Sample of Total Domestic				Sample of Regional Retailers			
	Static GMM		Dynamic GMM		Static GMM		Dynamic GMM	
	Coeff.	**Std. Err.**	**Coeff.**	**Std. Err.**	**Coeff.**	**Std. Err.**	**Coeff.**	**Std. Err.**
$\ln Y_{t-1}$			0.264*	(0.160)			0.022	(0.311)
$\ln M_t$	0.706***	(0.035)	0.690***	(0.079)	0.648***	(0.049)	0.422***	(0.116)
$\ln L_t$	0.153**	(0.061)	0.099	(0.073)	0.252***	(0.055)	0.244***	(0.083)
$\ln K_t$	0.136***	(0.037)	0.159**	(0.071)	0.072*	(0.041)	0.323***	(0.108)
$\ln M_{t-1}$			-0.197*	(0.118)			0.129	(0.214)
$\ln L_{t-1}$			0.058	(0.075)			0.079	(0.084)
$\ln K_{t-1}$			-0.085	(0.065)			-0.232*	(0.110)
$\ln FDI^1$	0.155***	(0.052)	0.144***	(0.054)	0.182***	(0.057)	0.228***	(0.057)
$\ln FDI^2$	-0.0004	(0.108)	0.057	(0.116)	0.060	(0.145)	0.020	(0.188)
$\ln FDI^3$	0.169***	(0.061)	0.114*	(0.066)	0.169**	(0.085)	0.270**	(0.111)
ABC_t	0.771***	(0.145)	0.172	(0.278)	0.430***	(0.164)	0.382	(0.510)
$(\ln FDI^1 * ABC)$	2.405***	(0.759)	1.898**	(0.861)	2.001***	(0.648)	2.199***	(0.766)
$(\ln FDI^2 * ABC)$	1.089	(1.099)	0.595	(1.314)	2.586**	(1.274)	1.927	(1.336)
$(\ln FDI^3 * ABC)$	2.731***	(0.973)	1.452	(1.143)	1.828*	(1.014)	2.347	(1.808)
UK MNE_t	0.004	(0.026)	0.021	(0.022)	0.098	(0.063)	0.077	(0.085)
$\text{UK single region}_t$	0.014	(0.013)	0.014	(0.012)				
$\text{Herfindahl Index}_t$	-0.180***	(0.063)	-0.122**	(0.062)	-0.237**	(0.096)	-0.231**	(0.095)
$\Delta\text{Market share}_t$	-0.483	(0.428)	0.457	(0.701)	-2.476*	(1.465)	-1.337	(2.815)
Advertisement_t	-0.001	(0.002)	0.000	(0.001)	0.001	(0.002)	0.000	(0.002)
Assortment_t	-0.016*	(0.009)	-0.004	(0.008)	-0.007	(0.010)	0.002	(0.012)
$\text{National Presence}_t$	-0.001	(0.005)	0.004	(0.005)				
Age_t	-0.006**	(0.003)	-0.004	(0.003)	-0.003	(0.003)	-0.008*	(0.004)
Multiplant_t	-0.026*	(0.015)	-0.031**	(0.013)	-0.015	(0.010)	-0.027**	(0.011)
Skill_t	0.031	(0.040)	0.109**	(0.054)	0.106*	(0.056)	0.108	(0.069)
Hansen	110.22	[0.012]	100.30	[0.062]	77.600	[0.524]	30.600	[0.937]
AR(1)	-4.3	[0.000]	-4.4	[0.000]	-2.480	[0.013]	-2.660	[0.008]
AR(2)	0.68	[0.499]	0.88	[0.379]	-0.600	[0.549]	-2.980	[0.003]
Comfac			1.02	[0.383]			2.160	[0.091]
Obs :	4225		4225		2493		2493	
L.R.Elasticities :								
$\ln L$			0.213***	(0.081)			0.330***	(0.103)
$\ln M$			0.670***	(0.048)			0.563***	(0.080)
$\ln K$			0.100**	(0.048)			0.094**	(0.049)

Notes:

1. The dependent variable in all specifications is $\ln Y_{it}$.

2. Robust standard errors in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%. All regressions include time, 4-digit industry and regional dummies.

3. Serial correlation tests are LM tests of the first and second differenced residuals. Sargan-Hansen test of instrument validity is a test of the over-identifying restrictions.

4. All estimations are conducted on the sample of domestic retailers only.

7 Concluding Remarks

In this paper, we have examined two potential benefits of foreign-owned establishments in the British retail sector: better performance of foreign-owned establishment relative to British non-MNEs retailers and positive productivity regional spillovers affecting domestic retailers. In particular, the first part of the paper argues how and why domestic firms should be expected to concentrate in regions where foreign direct investment is most prominent, when productivity-enhancing spillovers are in operation. To do this we use a simple Hotelling model to show that if (i) MNEs outperform (in terms of productivity) strictly domestic firms; (ii) there are positive foreign MNE-induced productivity spillovers; and (iii) if these spillovers are regional in nature; then one should expect the number of domestic firms operating in these regions to increase proportionally to foreign presence , as a response to the increased output productivity that these firms would experience. Our empirical estimations, presented in the second part of the paper, confirm the validity of all of the aforementioned assumptions. Indeed, we find that MNEs on average outperform strictly domestic retailers for all of the definitions of productivity that we employ.

Our empirical methodology is characterized by two important features, that distinguish it from previous studies. First, productivity estimates have been obtained by using semi-parametric techniques in taking account of the endogeneity problem (Levinsohn and Petrin [2003]). Second, our estimations concentrate on the retail sector, a specific service sector that has experienced a rapid process of internationalization in the last decade. Single-sector studies overcome many of the limitations of more aggregate studies by reducing the problems of FDI locating in more productive sectors and the heterogeneity associated with large cross-section datasets.

To analyse the difference between foreign- and domestic-owned retailers, we drew a distinction between ownership and multinational status. We find that the foreign ownership advantage in economic performance is a multinational advantage. UK MNEs and foreign MNEs retailers have superior performance than pure domestic retailers. Compared with foreign MNES, UK MNEs are more productive than their foreign counterparts.

The results have also shown that positive spillovers from foreign MNEs are limited to the region in which these foreign MNEs locate, and the effect increases with the absorptive capacity of domestic firms. Only those local retailers investing intensively in ICT are able to capture FDI externalities beyond regional borders. The competitive pressure exerted by the entry of foreign actors leads to the diffusion of a large set of organisational

innovations (new formats, new marketing strategies, new organisational and information structures, and the re-organisation of supply chains) among local modern retailers. These local spillover effects seem to compensate to a great extent for the destructive effects of competition in terms of productivity gains.

These results have important policy implications. If the productivity growth of domestic retailers benefit from the presence of domestically- and foreign- owned retail MNEs, policies aimed at attracting foreign investment may, as a consequence, be an instrument to reduce the productivity gap and boost the performance of the British retail industry.

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Appendix: Computation of TFP

In the main text we compare results from two alternative approaches that try to deal with the simultaneity bias in production functions, the semi-parametric Levinshon and Petrin [2003] approach and a GMM method [Blundell and Bond, 2000]. This appendix gives some more detail on each method.

1. Levinsohn and Petrin [2003]

Let y_{it} denote the log of output of establishment i in a Cobb-Douglas production function of the following form:

$$y_{it} = \beta_0 + \beta_l l_{it} + \beta_k k_{it} + \beta_m m_{it} + \epsilon_{it} \tag{A-1}$$

where l_{it} and m_{it} are used to denote the logarithmic value of labour and intermediates inputs in logs, respectively, and k_{it} is the logarithm of the region-variable capital. If ϵ is uncorrelated with the right-hand-side variables in equation (A-1), then the production function could be estimated using OLS. However, although productivity is not directly observable to an analyst, it may be observed by the firm. Since the firm adapts its input choice as soon as she observes the productivity shock, inputs turn out to be correlated with the error term of the regression, and thus OLS estimates of production functions yield inconsistent results.

Following Olley and Pakes [1996] and Levinsohn and Petrin [2003] we explicitly consider this endogeneity problem by writing $\epsilon_{it} = v_{it} + \omega_{it}$, where v_{it} is uncorrelated with input choices, and ω_{it} is a productivity shock observed by the firm, but unobserved to the econometrician. Additionally, Levinsohn and Petrin [2003] assume the demand for intermediate inputs m_{it} (e.g. material costs) to depend on the firm's capital k_{it} and the productivity shock, ω_{it}, and show that the same demand is monotonically increasing in ω_{it}. Thus, it is possible for them to write ω_{it} as $\omega_{it} = \phi_t(m_{it}, k_{it})$. Then, equation (A-1) takes the form:

$$y_{it} = \beta_0 + \beta_l l_{it} + \beta_k k_{it} + \beta_m m_{it} + \phi_t(m_{it}, k_{it}) + \theta_{it} \tag{A-2}$$

Equation (A-2) can then be estimated using the procedures discussed in Petrin, Poi, and Levinsohn [2004].

2. 'System' General of Method of Moments (GMM)

Consider a simplified form of the production function:

$$y_{it} = \beta x_{it} + u_{it} \tag{A-3}$$

in which we assume that the stochastic error term, u_{it}, takes the form

$$u_{it} = \lambda_t + \eta_i + \omega_{it} \tag{A-4}$$

$$\omega_{it} = \rho \omega_{it-1} + v_{it} \tag{A-5}$$

The λ_t controls for common macro shocks, η_i represents the firm fixed effect, and v_{it} is a serially uncorrelated error term. The other element of the error term, ω_{it}, is assumed to have an AR(1) component, that in the context of a production function could be attributed to technical change. These equations can be combined together to get the following specification:

$$y_{it} = \pi_1 y_{it-1} + \pi_2 x_{it} + \pi_3 x_{it} + \lambda_t + \eta_i + v_{it} \tag{A-6}$$

where the common factor restriction (COMFAC) is $\pi_1\pi_2 = \pi_3$. Equation (A-4) could in principle be estimated by the first differenced GMM estimator. However, this estimator has been found to have poor finite sample properties when the endogenous variables are highly persistent Blundell and Bond [2000] point out that as long as there is not correlation between the variables in first differences and the error term, lagged differences of the endogenous variables can be used as instruments in level equations. The econometric strategy is then to stack the equations in difference and levels in a system, each with its appropriate instruments. This estimation strategy assumes the absence of serial correlation in the levels error terms and therefore tests for serial correlation are carried out in this context in addition to the Sargan -Hansen test of the overidentifying restrictions in all the GMM results.