ESRI

Working Paper No. 395

July 2011

Do Domestic Firms Benefit from Foreign Presence and Competition in Irish Services Sectors?¤

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Do domestic firms benefit from foreign presence and competition in Irish services sectors?*

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June 2011

Abstract

This paper examines whether local firms benefit from the presence of foreign-owned firms in three Irish market-services sectors between 2001 and 2007. I investigate whether domestic firms differ in their ability to benefit from foreign presence using three different measures of absorptive capacity and also whether the foreign subsidiaries differ in their ability to generate spillovers. To account for the difficulty of productivity measurement in services, turnover-based, value-added-based and input-based productivity measures are employed. I find weak evidence of positive spillovers to domestic non-importers in the transport, storage and communication sector. In wholesale and retail trade, foreign presence is associated with lower capital-labour ratios and higher part-time-to-full-time employee ratios among domestic firms. In contrast, import competition is associated with higher productivity of the domestic firms in the transport, storage and communication and the business activities sector.

Keywords: foreign direct investment, absorptive capacity, services, productivity spillovers

JEL Classification: F23, O33, L80

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1 Introduction

Like other countries, Ireland has been actively attracting foreign direct investment for the past 25 years or so. Most of the early foreign direct investment went into manufacturing. More recently, the services sectors have also come into the focus of foreign investors. In 2007, foreign-owned firms still only accounted for 3.6 per cent of firms in the Irish non-financial market-services sectors, but their shares in employment and turnover were much higher at 20 and 36 per cent, respectively. In the services sectors a subsidiary abroad is an important mode of serving customers in another country, as cross-border trade in services frequently requires the service provider and the customer to be in the same physical location for the exchange to take place. Firms setting up subsidiaries abroad typically have a firm-specific advantage that allows them to overcome the disadvantages associated with operating in a foreign market. As a result foreign direct investment (FDI) is considered a major channel for international technology diffusion (Keller, 2004). The presence of efficient foreign-owned firms is expected to raise domestic firm's productivity through technology spillovers, by creating linkages and through competition.

In this paper I examine whether the presence of foreign-owned firms gives rise to horizonal productivity spillovers or competition effects to domestic firms in three non-financial market services sectors in Ireland. Firms are heterogeneous, hence the effect of foreign presence may vary both with the productivity of the domestic firms and the ability of foreign-owned firms to generate spillovers. The ability of domestic firms to absorb knowledge is typically related to their productivity. In this paper I consider three measures of absorptive capacity, (i) distance to the technological frontier, (ii) exporting status and (iii) importing status. In order to examine whether subsidiaries of foreign multinationals differ in their ability to generate spillovers, I assess whether the country of origin of the foreign owner matters. To account for the difficulty of productivity measurement in the services sectors, I employ a number of different measures including input-based measures of productivity.

A substantial literature has focussed on spillovers from foreign to domestic firms in manufacturing industries; Görg and Greenaway (2004) and Crespo and Fontoura (2007) provide surveys, Meyer and Sinani (2009) a meta-analysis. For manufacturing the evidence on the effects of foreign presence for domestic firms is thus far not conclusive. For Ireland, the literature on the effects of foreign presence has found little to no evidence of spillovers in manufacturing (Ruane and Uğur, 2005; Barry et al., 2005). The impact of foreign presence in the services sectors has not received very much attention to date. Vahter

and Masso (2007) find some evidence of positive spillovers from foreign to domestic firms in Estonian manufacturing and services sectors. The do not look at absorptive capacity, however. Añon Higon and Vasilakos (2011) examine the effects of foreign presence and absorptive capacity in the British retail sector. They find a positive effect of foreign presence on the domestic retailers; the effect is larger for firms with greater absorptive capacity. The analysis here is broader in that is covers more than just one market-services sector, and it considers alternative measures of absorptive capacity as well as different productivity measures.

In this paper I consider both the possibility that the domestic firms' ability to absorb knowledge spillovers matters and the possibility that foreign-owned firms differ in their ability to generate them. The different measures of absorptive capacity proposed in the literature rely on the assumption that differences in productivity between domestic firms are important. Kokko et al. (1996); Girma et al. (2001) and Blalock and Gertler (2009) employ the distance to the technological frontier that is the differential in total factor productivity (TFP) between domestic and foreign-owned firms as a measure of absorptive capacity. Barrios and Strobl (2002) and Kinoshita (2001) use firm's R&D status/intensity; and Barrios and Strobl (2002), Girma et al. (2008) and Békés et al. (2009) use firm's exporting status. In this paper, I employ distance to the technological frontier, exporting status and importing status as measures of absorptive capacity. To examine whether foreign-owned firms differ in their ability to generate spillovers, the literature has considered the degree of foreign ownership (Blomström and Sjöholm, 1999; Dimelis and Louri, 2002; Smarzynska Javorcik and Spatareanu, 2008) or their trade orientation (Girma et al., 2008)) or the motivation for FDI (Driffield and Love, 2006). This paper checks whether the effects of foreign presence differ depending on the home country of the foreign subsidiaries' parent.

The measurement of productivity is an obvious concern in any spillover study, but even more so in the services sectors (for a discussion see Griliches (1992)). As services tend to be more heterogenous than goods, it is difficult to measure and compare output (quantities and prices) that accrues only to the service provided. A further concern is whether intermediate inputs can be treated in the same way in the services sectors as they are in manufacturing. To address these issues I employ six different measures of productivity, three of which are based on turnover and three based on value added. Based on the discussion by Wolff (1999), I also employ two input-based indicators of productivity.

I use an unbalanced panel of firms in the Irish services sectors that covers the period from 2001 to 2007 to examine the effects of foreign presence on domestic firms in the same industry.[1] The effects differ across sectors: In transport, storage and communication there is weak evidence that domestic non-importers benefit from foreign presence. For the domestic firms in the wholesale and retail sector the presence of foreign subsidiaries is associated with lower capital-labour ratios and higher shares of part-time-to-full-time employees. Capital-labour ratios are also adversely affected by foreign presence in the business activities sector. In contrast, indirect competition from foreign firms via imports is associated with higher productivity of the domestic firms in the transport, storage and communications and the business activities sector.

The remainder of the paper is structured as follows: Section 2 discusses the potential effects of foreign presence on local firms. Section 3 describes the data set and the methodology. Section 4 first provides descriptive statistics, then presents the results from fixed effects regressions and finally assesses robustness. Section 5 briefly concludes.

2 Potential effects of foreign presence on domestic firms

The presence of foreign-owned firms in the host economy can generate technology or knowledge spillovers to domestic firms, but it may also have effects that are not (or not directly) associated with technology transfer. One possible channel for spillovers is the mobility of labour from foreign to domestic firms. Another possibility is that the physical presence of a multinational's affiliate using a more advanced production technology reduces the costs of learning about and adapting the new technology. This type of effect may accrue to direct competitors (horizontal spillovers) but it may also benefit suppliers or customers of the foreign affiliate and potentially their local competitors (vertical linkages). Another way in which foreign presence may have an effect on the productivity of domestic firms is by introducing additional varieties, supplying higher quality inputs or through competition. Additional competition from efficient foreign firms may lead domestic firms to innovate and reduce inefficiencies which increases their productivity (Aghion et al., 2009). It may also mean lower market shares for domestic firms and/or

[1] Smarzynska Javorcik (2004) introduced spillovers through vertical backward and forward linkages between foreign and domestic firms to the literature. Due to lack of detail in the available input-output tables, this paper focusses on intra-industry (horizontal) effects of foreign presence only.

tougher competition in input markets, in which case their measured productivity may be lower (Aitken and Harrison, 1999).

As firms are heterogenous, not all foreign-owned firms may have the same potential to generate spillover or competition effects. Similarly, the domestic firms are likely to differ in their capacity to absorb spillovers or to cope with additional competition. The extent to which the presence of foreign affiliates impacts on the domestic firms may depend on their degree of involvement with the local economy, i.e. the degree of foreign ownership (Blomström and Sjöholm, 1999; Dimelis and Louri, 2002; Smarzynska Javorcik and Spatareanu, 2008); their trade orientation (Girma et al., 2008)) or the motivation for FDI (Driffield and Love, 2006).

Domestic firms, in turn, differ in their absorptive capacity, that is in their ability to recognise and appropriate valuable knowledge and use it productively. In the model of Findlay (1978) technological progress is faster in the 'backward' region the larger the gap between its own level of technology and that of the 'advanced' region. In contrast, in Glass and Saggi (1998) the constraint for Northern firms wanting to use advanced production technologies in the South is lower the more advanced the technological frontier in the Southern country. This theoretical ambiguity as to whether the least or the most productive countries/firms are most likely to benefit from FDI spillovers is also reflected in the empirical evidence. Kokko et al. (1996) find a positive and significant spillover effect only for domestic firms with moderate technology gaps relative to foreign firms in a cross-section of Uruguayan manufacturing firms. Girma et al. (2001) present evidence that firms with low initial productivity levels have a slower productivity spillover rate in a panel of UK manufacturing firms. Girma and Görg (2007) show that there is a u-shaped relationship between productivity growth and FDI interacted with absorptive capacity in the UK electronics sector, and an increasing relationship with negative effects for the least productive firms in engineering. Blalock and Gertler (2009) find that firms with a greater technology gap to the frontier of the foreign-owned firms benefit more from spillovers, in addition firms with investments in R&D and firms with higher human capital benefit more. Añon Higon and Vasilakos (2011) estimate a positive effect from foreign presence on the domestic firms in the UK retail sector, the effect being larger for firms with greater absorptive capacity.

In the majority of papers the technology gap is measured by productivity differentials between domestic and foreign firms. Alternative measures of absorptive capacity are firm's exporting status (Barrios and

Strobl, 2002; Békés et al., 2009) and firm's R&D intensity (Barrios and Strobl, 2002; Kinoshita, 2001). There is by now ample evidence that both exporters and importers are more productive than their non-trading counterparts. Greenaway and Kneller (2007) and Wagner (2007) provide surveys of exporters and productivity; and Muûls and Pisu (2009) compare exporter and importer productivity in Belgian manufacturing and services sectors. Exporters and importers may either obtain all their information on new technologies and products through their interactions with partners in foreign markets in which case the foreign firms present in their home market will have little else to offer. Or their outward orientation could be an indicator that they are generally more open to learning and also more competitive which would place them in an ideal position to learn also from the foreign firms in their home market. Barrios and Strobl (2002) find that exporting firms benefit more from foreign presence than non-exporting firms in a panel of Spanish manufacturing firms. They find no evidence of a differential impact depending on firm's R&D activity. In contrast, in Békés et al.'s (2009) panel of Hungarian manufacturing firms more productive non-exporters benefit from horizontal and from backward spillovers. In a panel of Czech manufacturing firms Kinoshita (2001) shows that firms which engage in R&D activity benefit more from technology spillovers through FDI.

3 Data and Methodology

3.1 Data and sample

The data set used in this analysis is the Annual Services Inquiry (ASI) for the Republic of Ireland for the period 2001-2007. The ASI is conducted by the Central Statistics Office (CSO); it covers all firms in the non-financial market services sectors with at least one person engaged. The sectors covered are NACE Rev. 1.1. G (50-52) wholesale and retail trade, H (55) hotels, restaurants and bars, I (60-64) transport, storage and communication, K (70-74) real estate, renting and business activities and O (92, 93) other community, social and personal service activities. The ASI contains information on output, inputs, trade and ownership at the enterprise level. The data is a census for firms with 20 or more persons engaged and a stratified sample below this threshold with sampling probabilities increasing with firm size. Response to the survey is compulsory.[2] On average over the period there are 11,700 firms per year varying from

[2]Response rates are typically 70 per cent or higher.

9,160 firms in 2003 to 14,860 firms in 2002. The sample is representative of 86,300 firms on average with the total number of firms increasing from 72,500 in 2001 to 95,360 in 2007.

The effects of foreign presence will be estimated for the domestic firms only, that is those firms that are not classified as foreign in any of their years in the panel. For the analysis, I exclude NACE 2-digit sectors 70 (real estate) and 71 (renting of machinery and equipment without operator and of personal and household goods) as measures of productivity tend to be difficult to define for these sectors. I drop firms that do not at least have one employee in full-time equivalents, that is one full-time employee or two part-time employees. Observations from such firms account for 19 per cent of the sample, they are those operated by the self-employed. Some experimentation comparing labour measured as the number of employees to labour measured as the number of persons engaged suggests that there are systematic differences between firms that employ labour and those that use only own labour. I further exclude firms with two observations that have at least one observation for profit margin smaller than -1, where profit margins are defined as turnover less wages and less purchases of goods and services over turnover. Firms that have all negative observations for profit margin and at least one observation smaller than -1 are also dropped. Firms that are observed only once are excluded as well as NACE 3-digit industries that have at most 5 observations in all years. Table 8 in the Appendix compares means and standard deviations between the sample of domestic firms used and the overall population.

3.2 Empirical Specification and measurement

In estimating intra-industry spillover effects the literature typically examines whether there is a significant effect from the share of employment or output in foreign-owned firms in an industry on the productivity of the domestic firms in the same industry controlling for indicators of competition.[3] I follow this approach and estimate the following equation:

$$Prod_{it} = \alpha_1 fp_{iIrt-1} + \alpha_2 impcomp_{It-1} + \alpha_3 age_{it-1} + \alpha_4 \mathrm{HHI}_{It-1} + \alpha_5 \Delta indto_{It-1} + \lambda_t + \epsilon_{it}. \quad (1)$$

[3]The analysis here is restricted to intra-industry or horizontal spillovers. I have made an attempt at also examining the presence of backward and forward linkages constructed as described in e.g. Smarzynska Javorcik (2004). However, as the Irish input-output tables are not disaggregated below the 2-digit NACE level, the measures obtained tend to be highly correlated with the horizontal foreign presence measure. Including these coefficients introduces substantial noise into these regressions making the estimates of horizontal foreign presence unreliable. In this context it is worth noting that in the vast majority of sectors well over 50 per cent of transactions take place within the same 2-digit industries.

The measurement of productivity $Prod_{it}$ and foreign presence fp_{iIrt} is discussed in detail below. Import competition $impcomp_{It}$ is another potential channel of knowledge transfer from foreign to domestic firms, moreover it may act as a disciplining force that has a positive effect on productivity. Import competition here is defined as the share of imports (c.i.f.) in domestic supply at basic prices plus imports in a 2-digit NACE industry. As control variables equation (1) includes firm age (age_{it}) to take into account differences between firms at different stages in their life cycle. In order to control for product market competition the Herfindahl-Hirschman index HHI_{It} defined at the 3-digit industry level is included. A high HHI may indicate a lack of competition. Foreign firms may prefer to enter fast-growing industries: to control for this possibility industry turnover growth ($\Delta indto_{It}$) is included. Detailed descriptions of the construction and sources of all variables can be found in the Appendix. Equation (1) further includes year dummies (λ_t) to control for effects that are year-specific.

A prominent way to eliminate firm-specific effects in equation (1) is to use first differences. In the present setting this is associated with a large loss in the number of observations. Due to the stratification process used to obtain the information on firms with less than 20 persons engaged, only a small fraction of firms are observed every year; and while a substantial number of firms are observed more than once, these observations do not necessarily date from consecutive years. For this reason, I estimate equation (1) using firm-fixed effects regressions to capture firm- and industry-specific effects that are constant over time. Firm-specific effects such as managerial ability that are observable to the firm but not the econometrician may otherwise be correlated with productivity. Lagging the explanatory variables in order to reduce simultaneity bias still nearly halves the sample size, but the loss in the number of observations is not as great as it would be with first differences in combination with lagged explanatory variables. In order to reduce potential biases due to heteroscedasticity and serial correlation, the standard errors of these regressions are clustered at the firm level.

3.3 Productivity measurement

While there are still a number of unresolved issues around productivity measurement in general, the situation in services sectors is even more complex; Griliches (1992) provides a useful discussion. This has to do with the lack of a widely agreed-upon definition of services, but more importantly with the difficulty of measurement. Many services are unique or at least more heterogenous than goods; this makes it very

difficult to measure and compare output, quantities and prices that accrues to the service provided only. A concern for value-added based productivity measures in the services industries is whether intermediate inputs can be treated in the same way they are treated in goods industries; and if so, which items can be considered as intermediate inputs.[4]

Awaiting better measurement or concepts of productivity that work their way around these issues, in this paper I employ a number of different productivity measures to gain an idea of the importance of measurement. In particular, for $Prod_{it}$ in equation (1) I use three measures of output-based productivity, three similarly-constructed measures of productivity based on value-added and two input-based measures. The first productivity measure is "estimated" total factor productivity, it will be referred to as $eTFP_{it}$ in the following. It is obtained as follows:

$$eTFP_{it} \equiv \ln TFP_{it} = \ln Y_{it} - \hat{\alpha}_t^K \ln K_{it} - \hat{\alpha}_t^L \ln L_{it},$$

where Y_{it} is turnover, K_{it} is capital stock and L_{it} is the labour input. The estimated coefficients $\hat{\alpha}_t^K$ and $\hat{\alpha}_t^L$ are obtained from an OLS regression where the log of turnover is regressed on the log of the two inputs, year, 3-digit industry dummies and 2-digit industry-year interactions. In this way, the TFP measure takes out any systematic differences in input use between sectors, across years, and also removes industry trends. It does not impose restrictions on firm's returns to scale. $eTFP_{it}$ is estimated for each NACE letter sector separately. The alternative measure $eTFPva_{it}$ is obtained in a similar fashion by using value added VA_{it} instead of Y_{it}.

The second type of productivity measure is a superlative index of TFP similar to that in Griffith et al. (2009). These indices are based on a flexible translog production function assuming constant returns to scale and perfect competition (Caves et al., 1982a,b). Each firm's TFP - referred to as $iTFP_{it}$ in the following - is evaluated relative to the geometric mean of all other establishments in the same 3-digit industry (averaged over all years), which serves as a reference point:

$$iTFP_{it} = \ln \frac{Y_{it}}{\bar{Y}_I} - \sum_{z=K,L} \sigma_{it}^z \ln \frac{x_{it}^z}{\bar{x}_I^z}.$$

[4] E.g. does writing a report add value to the paper it is printed on?

A bar above a variable denotes a geometric mean; that is, $\bar{Y}_I$ and $\bar{x}_I$, are the geometric means of output and use of factor of production z in industry I. The variable $\sigma_i = (\sigma_i + \bar{\sigma}_I)/2$ is the average of the factor share in firm i and the geometric mean factor share. The factor share of labour is based on wages. Constant returns to scale are imposed by making capital the residual, so that $\sum_z \sigma_z = 1$. Again, a similar measure $iTFPva_{it}$ based on VA_{it} instead of Y_{it} is used.

As a third type of productivity measure I use traditional labour productivity measures defined as $LP_{it} = \ln(Y_{it}/L_{it})$ and similarly $LPva_{it}$ using value added VA_{it} instead of Y_{it}. In all of the above turnover and value added are brought to constant 2007 values using, respectively, sectoral level output or value added prices from the EUKLEMS database (EUKLEMS (2009), for a description see O'Mahony and Timmer (2009)). The labour input L_{it} is calculated as the number of full-time employees plus one half times the number of part-time employees. Service sectors use part-time labour intensively and this way of calculating the labour input leads to much more consistent values of turnover per employee over time than using the total number of employees. K_{it} is capital stock obtained from capital acquisitions and disposals using the perpetual inventory method; a detailed description can be found in the Appendix.

Wolff (1999) argues that in contrast to output, inputs are more easily measured in services sectors. He suggests using indirect indicators of productivity growth in services based on changes in the input mix. In particular for his study at the industry level he uses changes in the inter-industry coefficients, capital-labour ratios, material-labour ratios and changes in the occupational composition in employment. This is based on the observation that productivity growth in the goods-producing sectors has been associated not only with higher output per unit of input but also with increasing capital-labour and material-labour ratios. Changes in capital-labour ratios should be evident in levels as well. For this reason, I use the log of the capital-labour ratio K/L_{it} as an alternative "productivity" measure. Changes in the occupational composition would be another interesting indicator, however, in the dataset at hand the ratio of part time to full time employees pt/ft_{it} is the only labour-force-related indicator that can be constructed. To the extent that this share is based on the firm's needs more than on the employee's convenience, it may reflect uncertainties in the business environment.

3.4 Foreign presence and absorptive capacity

In equation (1) foreign presence (fp_{iIrt}) is measured at the firm level. It is defined as employment in foreign-owned firms (i.e. all firms whose ultimate beneficiary owner is located abroad) in NACE 3-digit industry I and region $r = R_1, R_2$ at time t weighted by each firm i's activity (employment share) in regions 1 and 2 as follows:

$$fp_{iIrt} = \frac{\sum_{i \in FO_{IR_1t}} (Empl_{it})}{(Total\ empl)_{IR_1t}} * activity_{iR_1t} + \frac{\sum_{i \in FO_{IR_2t}} (Empl_{it})}{(Total\ empl)_{IR_2t}} * activity_{iR_2t}. \quad (2)$$

As spillovers tend to be localised the geographic dimension is important. Information on firm's regional activities in the dataset is available only at NUTS2 level, thus there are only two regions, namely the Southeast region and the Border, Midlands and West region. The Southeast region includes Dublin; it hosts roughly 90 per cent of foreign activity in the Irish services sectors.

As mentioned earlier, in addition to estimating equation (1) using foreign presence as defined above, I also consider the domestic firms' absorptive capacity. First, I define absorptive capacity as distance to the technological frontier of the foreign-owned firms. In the literature different definitions of absorptive capacity have been used. The measure abs_{it} used here is obtained by subtracting the domestic firm's productivity from the most productive foreign firm's productivity in the same NACE 3-digit sector and dividing by the most productive foreign firm's productivity. This is in the spirit of Blalock and Gertler (2009) as it has a straightforward interpretation, i.e. a value of .1 suggests that the particular domestic firm is 10 per cent less productive than the most productive foreign firm in its 3-digit industry. The reference (frontier) firm is the same as in Girma and Görg (2007), and results are qualitatively similar if using median productivity of the top quintile of foreign-owned firms in the same industry as the frontier group as do Añon Higon and Vasilakos (2011). For the two index-based measures of TFP ($iTFP_{it}$ and $iTFPva_{it}$) absorptive capacity is the absolute deviation from the most productive foreign-owned firm in the industry as these measures take on positive and negative values. The regressions using this measure then include the foreign presence term fp_{iIrt-1} and the interaction term with absorptive capacity $fp_{iIrt-1} \times abs_{it-1}$; the base effect of absorptive capacity is captured by the firm-fixed effect.

Second, I consider firms' trading status as an indicator of absorptive capacity, I use both exporting status and importing status. The argument is that trading firms have higher productivity than their

non-trading counterparts. To capture this in the regression I interact the lagged foreign presence measure fp_{iIrt-1} with the exporting status of the domestic firms in one case and with their importing status in the second case. Thus, taking exporting status to illustrate this, I obtain two measures $fp_{iIrt-1} \times \exp_{it-1}$ and $fp_{iIrt-1} \times \text{non-exp}_{it-1}$. The first term is equal to fp_{iIrt-1} when the domestic firm i is an exporter in year $t-1$ and the second term is equal fp_{iIrt-1} when the domestic firm i is not an exporter in year $t-1$.

To examine potential differences in the ability of foreign-owned firms to generate spillovers, I group the foreign-owned firms into four categories based on their country of origin.[5] This is motivated by evidence for the UK where subsidiaries of US multinationals have the greatest productivity advantage relative to domestic firms, whereas subsidiaries of multinationals from the EU or other countries are on par with British multinationals in the UK (Criscuolo and Martin, 2009). Here I distinguish between the UK, the US, the EU15[6] (excluding the UK) and the remaining countries (ROW) and calculate separate foreign presence measures as indicated in equation (2) for each of these groups. The UK and US are the largest foreign investors in Ireland followed by the EU15 countries. The main investors from EU15 are the Netherlands, Germany and France. Among the ROW group Switzerland, Canada and Japan are the most prominent investors.

4 Results

4.1 Descriptive Statistics

Figure 1 shows the development of foreign presence in the five market-services sectors jointly and in each broad sector individually. In wholesale and retail trade (G); transport, storage and communication (I) and real estate, renting and business activities (K) a rather small share of foreign-owned firms accounts for a substantial portion of employment and output. The shares of foreign presence in sectors H (hotels, bars and restaurants) and O (other community, social and personal services) much lower. In addition, in these two sectors less than two per cent of firms are exporters making it nonsensical to use export status as an indicator of absorptive capacity, I therefore exclude them from further analysis.

[5] Javorcik and Spatareanu (2011) examine whether the owner's origin matters for vertical spillovers in Romania.

[6] Austria, Belgium, Denmark, Finland, France, Germany, Greece, Italy, Ireland, Luxembourg, Netherlands, Portugal, Spain, Sweden.

Figure 1: Foreign presence in the services sectors

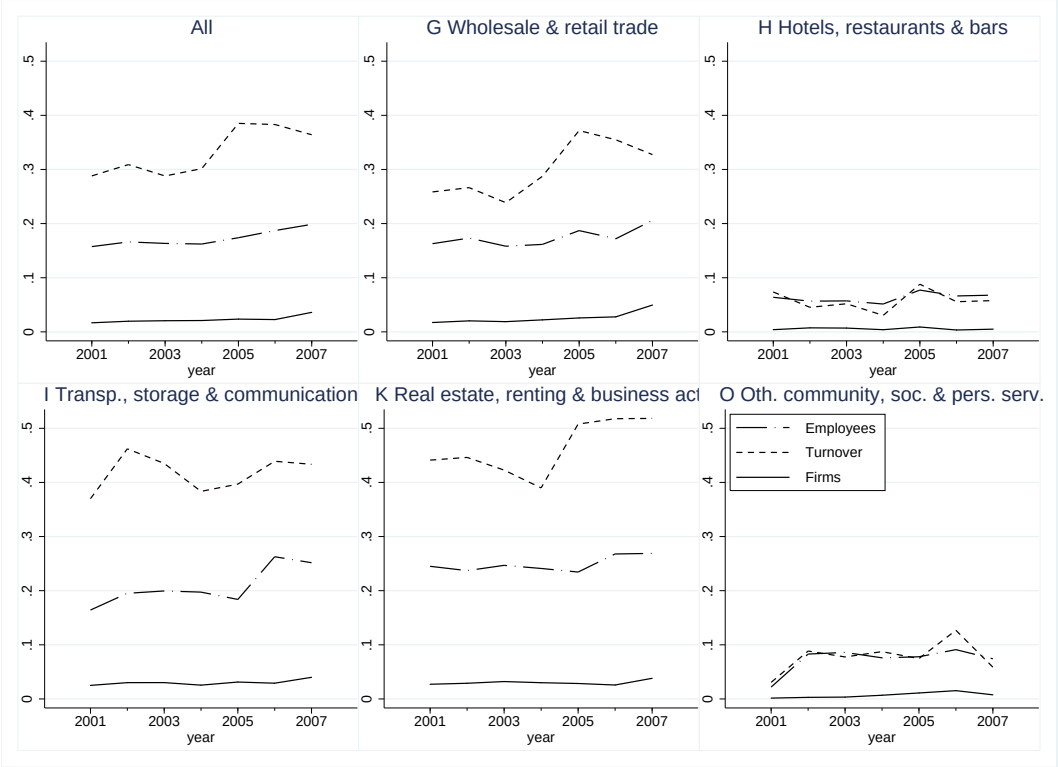

Table 1: Descriptive statistics for foreign presence shares and control variables

	G, I & K		G		I		K(excl. 70,71)	
	me	sd	me	sd	me	sd	me	sd
fp_{iIrt}	0.192	0.155	0.161	0.108	0.208	0.233	0.206	0.163
$fpUK_{iIrt}$	0.069	0.071	0.078	0.075	0.058	0.087	0.048	0.046
$fpUS_{iIrt}$	0.045	0.087	0.018	0.043	0.057	0.115	0.078	0.100
$fpEU15_{iIrt}$	0.039	0.049	0.031	0.038	0.045	0.058	0.039	0.052
$fpROW_{iIrt}$	0.018	0.050	0.012	0.019	0.037	0.104	0.015	0.042
$impcomp_{It}$	0.243	0.267	0.126	0.202	0.084	0.067	0.548	0.187
age_{it}	2.472	0.704	2.539	0.688	2.391	0.716	2.295	0.743
HHI_{It}	0.049	0.073	0.035	0.039	0.114	0.161	0.067	0.084
$\Delta indgr_{It}$	0.073	0.257	0.058	0.246	0.016	0.196	0.145	0.311

Note: Regression sample before taking lags. The foreign presence measures for UK, US, EU15 and ROW are calculated as in equation (2) for each country (group). EU15 excludes the UK. Import competition $impcomp_{It}$ is calculated as the share of imports (c.i.f.) in domestic supply plus imports at basic prices by 2-digit NACE industry.

Figure 1 suggests that foreign presence has been relatively stable over the 7-year period at this level of aggregation. For the analysis foreign presence fp_{iIrt} is calculated at the 3-digit industry level as in equation (2). The means and standard deviations of this variable displayed in Table 1 show that there is more variation at this level. The table also displays the relative shares of each of the four groups of foreign investors. Overall the UK is the largest investor, followed by the US and the EU. In the business activities sector (K (excl. 70,71)), however, the US is the largest foreign investor. Table 1 further shows summary statistics for import competition and the remaining explanatory variables. Import competition is much more important than foreign presence in the business activities sector, but less important in both wholesale and retail trade (G) and transport, storage and communication (I).

Table 2 shows the differences in productivity between domestic and foreign-owned firms at the 25th, 50th and 75th percentile. For all productivity measures and in all sectors foreign-owned firms are always more productive than domestic firms. For brevity I do not report lengthy tables with Kolmogorov-Smirnov tests of first-order stochastic dominance which confirm that indeed the distribution of foreign-owned firms stochastically dominates that of the domestic firms for nearly all productivity measures in each sector and year individually.[7] The only instances where first-order stochastic dominance is not confirmed at the 10 per cent level or better is sector K in 2003, 2004, 2006 and 2007 for the TFP index based on value added $iTFPva_{it}$. This confirms that there is potential for knowledge to spill over from foreign to domestic firms. Foreign firms also use capital more intensively, but have lower shares of part-time to full-time employees than domestic firms.

The entries for the different groups of foreign investors show that the different groups of foreign investors cannot always be unambiguously ranked across productivity measures and sectors. When all sectors are grouped together, the most productive firms tend to be EU15 or US firms. In sector G subsidiaries of US companies are the most productive for all productivity measures. In sector I the first rank tends to go to EU15 or ROW firms. In sector K (excl. 70,71) the differences in productivity between the different groups of foreign-owned firms are smaller, as a result the ranking is much less clear-cut. Subsidiaries of UK firms tend to be among the least productive foreign-owned firms across all productivity measures and sectors.

[7] Available from the author on request.

Table 2 also shows summary statistics on the different dependent variables and the corresponding measures of absorptive capacity (abs). For the estimated TFP measures and for the two labour productivity measures, the productivity gap to the most productive foreign firm in the same 3-digit industry is between 16 and 19 per cent for all sectors jointly and for sectors G and I. In the business activities sector K (excl. 70,71) the gaps are somewhat larger, domestic firms are 19 to 25 per cent less productive than the most productive foreign firm in the same 3-digit industry. For the two index measures ($iTFP_{it}$ and $iTFPva_{it}$) the absorptive capacity measures are absolute deviations as these measures are centred around the mean. These measures, in contrast, suggest that - on average - firms in sector K are closer to the technological frontier than in the other sectors and in all sectors taken together.

Table 2: Productivity differences

	G, I & K			G			I			K(excl. 70,71)		
	p25	p50	p75	p25	p50	p75	p25	p50	p75	p25	p50	p75
$eTFP_{it}$												
dom	9.99	10.96	11.55	10.91	11.31	11.80	10.15	10.57	11.30	9.00	9.42	9.82
n-exp	9.95	10.91	11.47	10.87	11.24	11.70	10.11	10.51	11.22	8.96	9.39	9.78
exp	10.33	11.33	11.97	11.23	11.68	12.22	10.46	10.88	11.55	9.25	9.62	10.05
n-imp	9.71	10.79	11.44	10.90	11.28	11.78	10.11	10.51	11.21	8.97	9.39	9.77
imp	10.71	11.23	11.72	10.94	11.35	11.81	10.43	10.88	11.53	9.25	9.63	10.09
abs	0.10	0.18	0.26	0.08	0.16	0.22	0.11	0.16	0.21	0.19	0.27	0.32
for	10.03	11.23	12.09	11.22	11.76	12.47	10.69	11.57	12.39	9.24	9.73	10.51
UK	10.12	11.16	11.85	11.09	11.52	12.15	10.61	11.23	12.14	9.17	9.68	10.25
US	9.70	10.87	12.11	11.60	12.11	13.14	10.48	11.59	12.38	9.28	9.83	10.59
EU15	10.46	11.52	12.31	11.41	11.82	12.49	10.89	11.78	12.95	9.26	9.76	10.35
ROW	10.17	11.30	12.34	11.22	11.88	12.62	11.07	11.73	12.55	9.28	9.76	10.78
$eTFPva_{it}$												
dom	9.40	9.85	10.28	9.49	9.93	10.39	9.47	9.86	10.25	9.19	9.65	10.04
n-exp	9.36	9.81	10.22	9.44	9.88	10.30	9.45	9.84	10.23	9.16	9.64	10.03
exp	9.61	10.08	10.55	9.80	10.28	10.70	9.58	9.95	10.31	9.35	9.73	10.07
n-imp	9.32	9.77	10.18	9.39	9.82	10.26	9.45	9.84	10.21	9.17	9.65	10.04
imp	9.60	10.03	10.47	9.67	10.09	10.52	9.59	9.94	10.35	9.29	9.67	10.02
abs	0.12	0.18	0.25	0.11	0.18	0.24	0.10	0.15	0.22	0.14	0.21	0.27
for	9.72	10.25	10.90	10.13	10.62	11.17	9.81	10.33	11.21	9.32	9.82	10.25
UK	9.71	10.21	10.73	10.05	10.49	10.95	9.80	10.27	10.90	9.23	9.74	10.14
US	9.68	10.18	11.02	10.30	11.02	11.75	9.76	10.14	11.14	9.44	9.88	10.33
EU15	9.83	10.34	11.05	10.16	10.65	11.20	9.78	10.42	11.44	9.38	9.89	10.27
ROW	9.69	10.32	10.97	10.14	10.68	11.17	9.90	10.63	11.37	9.29	9.80	10.36
$iTFP_{it}$												
dom	-0.65	-0.03	0.57	-0.64	-0.02	0.57	-1.00	-0.45	0.69	-0.49	0.04	0.54
n-exp	-0.70	-0.06	0.53	-0.69	-0.05	0.54	-1.04	-0.51	0.65	-0.52	0.00	0.50

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Table 2 – continued from previous page

	G, I & K			G			I			K(excl. 70,71)		
	p25	p50	p75	p25	p50	p75	p25	p50	p75	p25	p50	p75
exp	-0.42	0.15	0.74	-0.43	0.13	0.77	-0.70	-0.16	0.78	-0.30	0.22	0.68
n-imp	-0.67	-0.04	0.56	-0.65	-0.01	0.59	-1.03	-0.50	0.64	-0.52	0.00	0.51
imp	-0.60	-0.00	0.57	-0.63	-0.03	0.55	-0.83	-0.23	0.78	-0.31	0.20	0.70
abs	0.76	0.99	1.28	0.71	0.98	1.30	0.74	1.21	1.51	0.83	0.98	1.15
for	-0.28	0.38	1.23	-0.33	0.34	1.08	-0.20	0.91	1.99	-0.24	0.30	1.13
UK	-0.40	0.26	0.91	-0.53	0.14	0.72	-0.13	0.54	1.39	-0.28	0.33	1.06
US	-0.17	0.47	1.51	-0.07	0.75	1.74	-0.53	0.97	1.82	-0.16	0.32	1.16
EU15	-0.20	0.45	1.46	-0.22	0.43	1.27	-0.12	1.26	2.68	-0.20	0.20	1.11
ROW	-0.26	0.51	1.30	-0.29	0.51	1.14	-0.16	0.96	1.93	-0.33	0.26	1.39
$iTFPva_{it}$												
dom	-0.61	0.01	0.59	-0.66	-0.03	0.58	-0.72	-0.13	0.55	-0.45	0.13	0.63
n-exp	-0.64	-0.02	0.57	-0.70	-0.06	0.53	-0.74	-0.15	0.54	-0.45	0.12	0.64
exp	-0.50	0.14	0.69	-0.51	0.17	0.76	-0.63	-0.05	0.55	-0.44	0.14	0.61
n-imp	-0.65	-0.03	0.56	-0.76	-0.11	0.49	-0.74	-0.15	0.56	-0.44	0.13	0.65
imp	-0.54	0.08	0.64	-0.53	0.09	0.68	-0.70	-0.08	0.45	-0.53	0.07	0.52
abs	0.75	0.99	1.31	0.74	1.01	1.34	0.79	1.06	1.40	0.74	0.94	1.19
for	-0.16	0.42	1.08	-0.04	0.54	1.23	-0.04	0.59	1.65	-0.31	0.21	0.76
UK	-0.24	0.37	0.96	-0.19	0.38	1.00	-0.10	0.56	1.25	-0.36	0.20	0.79
US15	-0.10	0.39	1.10	0.22	0.79	1.75	0.11	0.37	1.27	-0.22	0.24	0.76
EU	-0.11	0.54	1.23	0.04	0.62	1.28	-0.03	0.90	1.97	-0.38	0.20	0.74
ROW	-0.16	0.43	1.14	0.05	0.62	1.17	-0.04	0.57	1.84	-0.38	0.14	0.75
LP_{it}												
dom	11.54	12.08	12.64	11.95	12.35	12.86	11.38	11.83	12.54	10.96	11.40	11.80
n-exp	11.49	12.02	12.54	11.91	12.27	12.74	11.34	11.79	12.48	10.88	11.35	11.74
exp	11.84	12.47	13.12	12.29	12.77	13.32	11.70	12.08	12.77	11.31	11.68	12.09
n-imp	11.40	11.96	12.51	11.93	12.31	12.82	11.34	11.78	12.47	10.90	11.35	11.73
imp	11.86	12.32	12.85	11.98	12.40	12.90	11.66	12.11	12.77	11.34	11.72	12.17
abs	0.11	0.17	0.24	0.09	0.15	0.21	0.09	0.14	0.20	0.17	0.24	0.29
for	11.80	12.50	13.34	12.29	12.83	13.56	11.82	12.67	13.61	11.34	11.87	12.65
UK	11.74	12.36	13.09	12.17	12.58	13.24	11.78	12.39	13.36	11.23	11.72	12.31
US	11.70	12.54	13.51	12.61	13.24	14.36	11.52	12.73	13.48	11.42	11.92	12.76
EU15	11.99	12.69	13.46	12.45	12.92	13.56	12.12	12.77	13.85	11.44	11.92	12.61
ROW	11.87	12.55	13.50	12.29	12.98	13.73	12.30	12.99	13.59	11.30	12.02	12.92
$LPva_{it}$												
dom	10.23	10.70	11.17	10.11	10.57	11.02	10.41	10.82	11.21	10.48	10.99	11.37
n-exp	10.19	10.65	11.12	10.07	10.50	10.93	10.40	10.79	11.20	10.43	10.96	11.35
exp	10.54	10.99	11.38	10.43	10.94	11.36	10.56	10.94	11.26	10.71	11.10	11.45
n-imp	10.18	10.66	11.14	10.01	10.45	10.90	10.39	10.79	11.19	10.45	10.97	11.36
imp	10.35	10.79	11.22	10.31	10.73	11.18	10.55	10.93	11.33	10.67	11.08	11.43
abs	0.12	0.18	0.24	0.11	0.17	0.23	0.09	0.15	0.24	0.14	0.20	0.25
for	10.75	11.26	11.79	10.77	11.27	11.84	10.71	11.26	12.05	10.72	11.27	11.69
UK	10.68	11.13	11.59	10.73	11.13	11.61	10.71	11.13	11.73	10.63	11.13	11.49
US	10.86	11.36	12.04	10.99	11.67	12.44	10.59	11.10	11.99	10.86	11.33	11.74

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Table 2 – continued from previous page

	G, I & K			G			I			K(excl. 70,71)		
	p25	p50	p75	p25	p50	p75	p25	p50	p75	p25	p50	p75
EU15	10.77	11.30	11.90	10.77	11.30	11.87	10.79	11.35	12.54	10.78	11.29	11.73
ROW	10.71	11.31	11.94	10.70	11.28	11.85	10.84	11.60	12.13	10.67	11.19	11.87
K/L_{it}												
dom	7.56	8.45	9.38	7.48	8.40	9.36	8.08	9.26	10.23	7.63	8.37	9.09
n-exp	7.49	8.38	9.34	7.41	8.31	9.30	8.06	9.28	10.20	7.55	8.32	9.06
exp	8.00	8.73	9.52	7.95	8.75	9.56	8.38	9.24	10.41	8.04	8.62	9.24
n-imp	7.50	8.38	9.33	7.39	8.29	9.29	8.01	9.23	10.18	7.57	8.32	9.04
imp	7.74	8.59	9.48	7.66	8.54	9.45	8.43	9.51	10.61	8.04	8.69	9.32
for	7.82	8.65	9.48	7.81	8.70	9.52	7.74	8.47	9.38	7.90	8.68	9.47
pt/ft_{it}												
dom	0.00	0.08	0.50	0.00	0.16	0.75	0.00	0.00	0.18	0.00	0.02	0.20
n-exp	0.00	0.11	0.62	0.00	0.25	0.90	0.00	0.00	0.18	0.00	0.03	0.25
exp	0.00	0.03	0.14	0.00	0.04	0.15	0.00	0.02	0.14	0.00	0.02	0.10
n-imp	0.00	0.10	0.61	0.00	0.26	1.00	0.00	0.00	0.20	0.00	0.02	0.25
imp	0.00	0.07	0.33	0.00	0.09	0.40	0.00	0.03	0.12	0.00	0.02	0.11
for	0.00	0.02	0.10	0.00	0.04	0.22	0.00	0.02	0.09	0.00	0.00	0.05

Note: Regression sample before taking lags including the foreign-owned firms. EU15 excludes the UK. abs refers to absorptive capacity measured as the difference in productivity between the most productive foreign firm and each domestic firm relative to the productivity of the most productive foreign firm in the same 3-digit industry. For the two index-based productivity measures $iTFP_{it}$ and $iTFPva_{it}$ it is the absolute difference in productivity between the most productive foreign firm and each domestic firm.

Table 3: Shares of exporters and importers by industry

	exporters		importers		number of firms	
	2001	2007	2001	2007	2001	2007
G	0.15	0.16	0.37	0.41	3030	2561
I	0.08	0.15	0.10	0.19	575	370
K (excl. 70,71)	0.12	0.16	0.10	0.16	1379	1054
G,I & K	0.14	0.16	0.27	0.32	4984	3985

Note: Regression sample before taking lags.

Table 3 shows the shares of exporting and importing firms by sector for 2001 and 2007. In all sectors there are more importers than exporters. The productivity measures in Table 2 confirm that on average domestic exporters are more productive than domestic non-exporters. A similar observation is true on the import side. The figures suggest than on average also domestic importers tend to be more productive than domestic non-importers, however, there are more exceptions here. Unreported Kolmogorov-Smirnov tests of stochastic dominance (available on request) confirm the existence of first-order stochastic dominance of the various productivity measures for exporters over non-exporters for most

sectors, years and productivity measures. Exceptions are sector I for various productivity measures and sector K for the $iTFPva_{it}$ measure. For importers and non-importers the tests frequently do not reject the null hypothesis that their productivity distributions are equal, especially in Sectors I and K.

4.2 Estimation Results

Table 4 first shows the estimates of the effects of foreign presence when all three market-services sectors are combined. The top panel shows the basic effect of foreign presence on domestic firms' productivity. The coefficients on foreign presence exhibit different signs for the different productivity measures, the signs on the TFP index measures are positive, whereas they are negative on the other four productivity measures. Only the coefficients for estimated TFP and labour productivity based on turnover are significant at the 10 and 5 per cent level, respectively. LP_{it} is the only productivity measure for which there is a significant effect from import competition. The control variables are largely insignificant.

When the interaction term between foreign presence and the distance-to-frontier measure is included in the regression to capture the domestic firms' absorptive capacity as in the second panel of Table 4, for most of the productivity measures the coefficients on foreign presence change quite a bit. Now the effect from foreign presence is significantly negative for two of the value-added-based productivity measures. The interaction terms are significant except for $iTFPva_{it}$. For the productivity measures based on turnover they suggest that the greater the distance to the frontier the smaller the benefits from foreign presence. In contrast, for the measures based on value added they suggest that firms further from the technological frontier benefit more. However, in combination with the (mostly insignificant) base effects going in opposite directions to the interaction terms (with the exception of LP_{it}) these contradictory results are coherent to some degree in that for the turnover-based measures the firms closest to the frontier experience the most positive effects whereas for the value-added-based measures the firms closest to the frontier experience the least negative effects.

Careful inspection of these results reveals that the changes in the base effect (fp_{iIrt} are sizeable compared to those in the panel above. This suggests that despite the absorptive capacity measure being lagged by one period, including these measures still introduces a degree of endogeneity in the regression

Table 4: Fixed effects panel regressions - sectors G, I & K(excl. 70,71) jointly

Dep. Var.	$eTFP_{it}$	$eTFPva_{it}$	$iTFP_{it}$	$iTFPva_{it}$	LP_{it}	$LPva_{it}$	K/L_{it}	pt/ft_{it}
fp_{iIrt-1}	-0.131$^{(*)}$	-0.039	0.113	0.154	-0.146*	-0.036	-0.163	0.262
	(0.074)	(0.139)	(0.103)	(0.156)	(0.069)	(0.138)	(0.156)	(0.240)
$impcomp_{It-1}$	0.084	0.019	0.103	-0.012	0.169**	0.071	0.002	-0.138
	(0.084)	(0.146)	(0.136)	(0.183)	(0.058)	(0.137)	(0.202)	(0.172)
age_{it-1}	0.080$^{(*)}$	-0.008	0.144*	0.065	0.044	-0.027	-0.242*	-0.155
	(0.043)	(0.061)	(0.065)	(0.076)	(0.040)	(0.058)	(0.108)	(0.249)
HHI_{It-1}	0.113	0.072	0.042	-0.008	0.080	0.035	-0.112	0.096
	(0.085)	(0.166)	(0.143)	(0.218)	(0.072)	(0.158)	(0.230)	(0.161)
$\Delta indgr_{It-1}$	-0.004	-0.016	0.006	-0.018	0.007	-0.012	0.075*	-0.036
	(0.014)	(0.024)	(0.019)	(0.027)	(0.012)	(0.024)	(0.033)	(0.043)
within-R^2	0.039	0.002	0.007	0.002	0.020	0.001	0.076	0.002
Obs	14297	13719	14294	13719	14445	13863	14303	14274
Firms	6161	6017	6159	6017	6218	6075	6163	6120
fp_{iIrt-1}	-0.013	-0.338*	0.134	0.190	-0.060	-0.327*		
	(0.097)	(0.163)	(0.105)	(0.171)	(0.082)	(0.160)		
$fp_{iIrt-1} \times abs_{it-1}$	-0.638$^{(*)}$	1.522**	-0.039*	-0.029	-0.446$^{(*)}$	1.631**		
	(0.332)	(0.458)	(0.017)	(0.027)	(0.250)	(0.461)		
$impcomp_{It-1}$	0.062	0.105	0.086	0.040	0.157**	0.167		
	(0.084)	(0.153)	(0.137)	(0.187)	(0.058)	(0.142)		
within-R^2	0.042	0.005	0.009	0.003	0.020	0.004		
Obs	14058	12987	14056	12987	14246	13163		
Firms	6049	5742	6048	5742	6119	5809		
$fp_{iIrt-1} \times \exp_{it-1}$	-0.135	-0.240	0.184	-0.031	-0.122	-0.208	-0.211	0.215
	(0.120)	(0.177)	(0.159)	(0.214)	(0.099)	(0.170)	(0.235)	(0.172)
$fp_{iIrt-1} \times$ n-$\exp_{it-1}$	-0.129$^{(*)}$	0.046	0.080	0.231	-0.156*	0.037	-0.142	0.284
	(0.076)	(0.148)	(0.109)	(0.166)	(0.068)	(0.146)	(0.162)	(0.278)
$impcomp_{It-1}$	0.084	0.017	0.104	-0.013	0.169**	0.070	0.001	-0.138
	(0.084)	(0.145)	(0.136)	(0.182)	(0.058)	(0.136)	(0.201)	(0.172)
within-R^2	0.039	0.003	0.007	0.002	0.020	0.002	0.076	0.002
$fp_{iIrt-1} \times \text{imp}_{it-1}$	-0.091	0.077	0.146	0.269	-0.107	0.078	-0.150	0.277
	(0.082)	(0.146)	(0.115)	(0.170)	(0.075)	(0.144)	(0.174)	(0.175)
$fp_{iIrt-1} \times$ n-imp_{it-1}	-0.170$^{(*)}$	-0.146	0.080	0.048	-0.182*	-0.138	-0.176	0.247
	(0.088)	(0.172)	(0.123)	(0.189)	(0.083)	(0.170)	(0.187)	(0.321)
$impcomp_{It-1}$	0.082	0.013	0.101	-0.018	0.166**	0.066	0.001	-0.139
	(0.084)	(0.146)	(0.137)	(0.183)	(0.058)	(0.137)	(0.202)	(0.175)
within-R^2	0.040	0.003	0.007	0.002	0.020	0.002	0.076	0.002
$fpUK_{iIrt-1}$	-0.163	-0.006	-0.416*	-0.066	-0.178$^{(*)}$	-0.003	0.678*	-0.192
	(0.122)	(0.342)	(0.190)	(0.361)	(0.106)	(0.340)	(0.298)	(0.643)
$fpUS_{iIrt-1}$	0.141	0.135	0.416*	0.370	0.026	0.059	-0.765**	-0.039
	(0.136)	(0.242)	(0.186)	(0.276)	(0.106)	(0.237)	(0.271)	(0.277)
$fpEU15_{iIrt-1}$	-0.278	-0.290	0.123	0.073	-0.390*	-0.373	-0.423	1.070*
	(0.172)	(0.248)	(0.220)	(0.300)	(0.155)	(0.246)	(0.335)	(0.519)
$fpROW_{iIrt-1}$	-0.140	-0.090	0.541$^{(*)}$	0.242	-0.001	0.060	-0.462	-0.105
	(0.196)	(0.167)	(0.278)	(0.262)	(0.127)	(0.163)	(0.364)	(0.192)
$impcomp_{It-1}$	0.086	0.020	0.104	-0.010	0.169**	0.071	-0.005	-0.126
	(0.086)	(0.149)	(0.136)	(0.186)	(0.058)	(0.138)	(0.203)	(0.168)
within-R^2	0.040	0.002	0.009	0.002	0.021	0.002	0.078	0.002

Note: Standard errors adjusted for clustering at the firm level in parenthesis; **, *, $^{(*)}$ indicate significance at 1, 5, 10 per cent respectively. All regressions include the same controls as specified in the base regression in the top panel as well as year dummies. If not specified, numbers of observations and firms are identical to those in top panel.

that makes it impossible to obtain a reliable estimate of the effect.[8] Blalock and Gertler (2009) solve this problem by defining the productivity gap as the average gap in the first three years and then only use the remaining years in the sample for estimation. In the present context such an approach would imply using only the larger firms which are observed every year which in turn would reduce the sample size considerably and complicate comparisons with the specifications that use trade status as alternative measures of absorptive capacity.

The results where export and import status are used as alternative measures of absorptive capacity do not suggest that the effects of foreign presence vary hugely by type of firm. The negative effect of foreign presence on $eTFP_{it}$ and LP_{it} from above is picked up by the non-exporters and the non-importers only. The results from splitting foreign presence do not suggest that country of origin matters for the presence of spillover/competition effects for four out of the six conventional productivity measures. For $iTFP_{it}$ and for K/L_{it} the results indicate that the effects from UK and US investment cancel each other out. The negative effect on LP_{it} is picked up by investment from the EU. The presence of subsidiaries from EU15 countries seems to be associated with higher shares of part-time-to-full-time employees.

To summarize, there are little to no robust effects of foreign presence or import competition when looking at the three services sectors jointly. Measuring absorptive capacity by distance to the technological frontier yields significant results that go in opposite directions for the turnover- and the value-added-based productivity measures, however compared to the other indicators of absorptive capacity they appear to be plagued by endogeneity issues. The following results will show whether the absence of effects from foreign presence is due to grouping the three rather different services sectors together.

Tables 5-7 contain the same estimations as Table 4 for each of the three services sectors, namely wholesale and retail trade (G); transport, storage and communication (I); and business activities (K, excl.70,71) individually. For sector G we observe no significant effect of foreign presence for any of the conventional productivity measures. Also the vast majority of control variables is insignificant. The results for absorptive capacity based on distance to the frontier are similar in direction to those in Table 4 where all sectors are included. Judging from the changes in the main effect of foreign presence relative to the base panel they suffer from similar endogeneity issues. Splitting the foreign presence variable by

[8]The correlations between the dependent variable and the lagged interaction of foreign presence with absorptive capacity are negative and significant except for $LPva_{it}$. They range from zero to -.21 and they are more negative for the turnover-based $eTFP$ and LP measures.

Table 5: Fixed effects panel regressions - Wholesale and Retail (G)

Dep. Var.	$eTFP_{it}$	$eTFPva_{it}$	$iTFP_{it}$	$iTFPva_{it}$	LP_{it}	$LPva_{it}$	K/L_{it}	pt/ft_{it}
fp_{iIrt-1}	-0.048	0.075	0.286	0.360	-0.135	0.024	-0.710*	0.498*
	(0.088)	(0.312)	(0.183)	(0.334)	(0.083)	(0.312)	(0.284)	(0.203)
$impcomp_{It-1}$	-0.007	-0.113	-0.155	-0.213	0.026	-0.103	0.278	-0.101
	(0.075)	(0.190)	(0.165)	(0.234)	(0.067)	(0.188)	(0.249)	(0.117)
age_{it-1}	0.002	-0.042	0.086	0.044	-0.019	-0.054	-0.164	-0.101
	(0.052)	(0.092)	(0.101)	(0.120)	(0.045)	(0.088)	(0.131)	(0.153)
HHI_{It-1}	-0.168	-0.154	-0.584*	-0.496	-0.057	-0.122	0.890(*)	0.389
	(0.123)	(0.341)	(0.288)	(0.454)	(0.114)	(0.331)	(0.463)	(0.364)
$\Delta indgr_{It-1}$	0.024(*)	0.004	0.003	-0.013	0.028*	0.005	0.038	-0.036
	(0.014)	(0.032)	(0.021)	(0.037)	(0.014)	(0.032)	(0.031)	(0.039)
within-R^2	0.100	0.006	0.013	0.006	0.044	0.004	0.119	0.004
Obs	9253	8720	9251	8720	9316	8779	9253	9230
Firms	3854	3726	3853	3726	3866	3739	3854	3822
fp_{iIrt-1}	0.083	-0.305	0.498*	0.558	0.065	-0.353		
	(0.108)	(0.382)	(0.195)	(0.374)	(0.108)	(0.382)		
$fp_{iIrt-1} \times abs_{it-1}$	-0.689*	2.458**	-0.148**	-0.048	-1.111**	2.524**		
	(0.279)	(0.629)	(0.037)	(0.062)	(0.298)	(0.633)		
$impcomp_{It-1}$	-0.024	0.011	-0.212	-0.151	0.027	0.031		
	(0.076)	(0.202)	(0.166)	(0.242)	(0.067)	(0.201)		
within-R^2	0.103	0.010	0.020	0.006	0.047	0.008		
Obs	9091	8108	9089	8108	9179	8185		
Firms	3796	3519	3795	3519	3815	3536		
$fp_{iIrt-1} \times \exp_{it-1}$	-0.032	-0.036	0.348	0.252	-0.137	-0.089	-0.810(*)	0.503**
	(0.124)	(0.337)	(0.302)	(0.445)	(0.105)	(0.330)	(0.461)	(0.178)
$fp_{iIrt-1} \times$ n-$\exp_{it-1}$	-0.056	0.124	0.257	0.407	-0.135	0.072	-0.664*	0.496*
	(0.096)	(0.334)	(0.197)	(0.354)	(0.091)	(0.334)	(0.303)	(0.227)
$impcomp_{It-1}$	-0.006	-0.117	-0.153	-0.217	0.025	-0.108	0.274	-0.101
	(0.074)	(0.190)	(0.163)	(0.233)	(0.067)	(0.188)	(0.246)	(0.117)
within-R^2	0.100	0.007	0.013	0.006	0.044	0.004	0.119	0.004
$fp_{iIrt-1} \times \text{imp}_{it-1}$	-0.061	0.199	0.290	0.509	-0.153(*)	0.144	-0.741*	0.493*
	(0.091)	(0.303)	(0.188)	(0.336)	(0.087)	(0.302)	(0.297)	(0.196)
$fp_{iIrt-1} \times$ n-imp_{it-1}	-0.025	-0.154	0.279	0.083	-0.103	-0.199	-0.654(*)	0.507*
	(0.109)	(0.396)	(0.226)	(0.418)	(0.104)	(0.398)	(0.350)	(0.246)
$impcomp_{It-1}$	-0.007	-0.111	-0.155	-0.210	0.025	-0.101	0.278	-0.101
	(0.075)	(0.192)	(0.165)	(0.237)	(0.067)	(0.190)	(0.249)	(0.117)
within-R^2	0.100	0.007	0.013	0.006	0.044	0.004	0.119	0.004
$fpUK_{iIrt-1}$	-0.186	0.182	-0.513(*)	-0.172	-0.099	0.234	0.658	0.725*
	(0.136)	(0.673)	(0.274)	(0.715)	(0.127)	(0.668)	(0.416)	(0.314)
$fpUS_{iIrt-1}$	0.090	-0.343	0.492	0.007	-0.010	-0.382	-0.836	0.542
	(0.170)	(0.425)	(0.437)	(0.528)	(0.152)	(0.427)	(0.710)	(0.562)
$fpEU15_{iIrt-1}$	-0.156	-0.148	0.343	0.330	-0.304(*)	-0.260	-1.073(*)	0.694*
	(0.170)	(0.421)	(0.347)	(0.515)	(0.168)	(0.416)	(0.565)	(0.338)
$fpROW_{iIrt-1}$	0.478	-0.039	1.951(*)	1.217	0.111	-0.237	-3.107(*)	0.475
	(0.320)	(0.650)	(1.033)	(0.857)	(0.259)	(0.691)	(1.730)	(0.471)
$impcomp_{It-1}$	-0.005	-0.089	-0.142	-0.178	0.025	-0.081	0.254	-0.113
	(0.074)	(0.188)	(0.163)	(0.237)	(0.067)	(0.185)	(0.246)	(0.118)
within-R^2	0.101	0.007	0.016	0.006	0.044	0.004	0.122	0.004

Note: Standard errors adjusted for clustering at the firm level in parenthesis; **, *, (*) indicate significance at 1, 5, 10 per cent respectively. All regressions include the same controls as specified in the base regression in the top panel as well as year dummies. If not specified, numbers of observations and firms are identical to those in top panel.

Table 6: Fixed effects panel regressions - Transport, Storage and Communication (I)

Dep. Var.	$eTFP_{it}$	$eTFPva_{it}$	$iTFP_{it}$	$iTFPva_{it}$	LP_{it}	$LPva_{it}$	K/L_{it}	pt/ft_{it}
fp_{iIrt-1}	0.168	0.129	0.233	0.205	0.140	0.222	-0.120	-0.040
	(0.182)	(0.231)	(0.221)	(0.201)	(0.205)	(0.239)	(0.374)	(0.196)
$impcomp_{It-1}$	0.978**	0.505	1.549**	1.105	0.860**	0.429	-1.074	0.578
	(0.325)	(0.553)	(0.522)	(0.677)	(0.318)	(0.545)	(0.757)	(0.630)
age_{it-1}	-0.007	-0.153	0.067	-0.076	-0.050	-0.159	-0.161	-0.125
	(0.115)	(0.127)	(0.180)	(0.198)	(0.108)	(0.123)	(0.253)	(0.177)
HHI_{It-1}	-0.134	-0.064	-0.018	0.063	-0.198(*)	-0.123	-0.326	0.096
	(0.126)	(0.307)	(0.279)	(0.421)	(0.119)	(0.294)	(0.449)	(0.193)
$\Delta indgr_{It-1}$	-0.002	-0.204	0.007	-0.211	-0.006	-0.225(*)	-0.033	0.177(*)
	(0.063)	(0.127)	(0.093)	(0.139)	(0.066)	(0.129)	(0.153)	(0.099)
within-R^2	0.087	0.031	0.063	0.023	0.052	0.026	0.063	0.007
Obs	1321	1295	1320	1295	1348	1322	1321	1314
Firms	664	658	663	658	674	668	664	643
fp_{iIrt-1}	0.382	-0.001	0.283	0.501	0.148	0.035		
	(0.259)	(0.241)	(0.222)	(0.319)	(0.238)	(0.232)		
$fp_{iIrt-1} \times abs_{it-1}$	-0.898	1.151	-0.173	-0.417	-0.031	1.266		
	(0.715)	(1.149)	(0.116)	(0.270)	(0.673)	(1.089)		
$impcomp_{It-1}$	0.997**	0.419	1.464**	0.984	0.867**	0.323		
	(0.322)	(0.601)	(0.507)	(0.666)	(0.319)	(0.591)		
within-R^2	0.097	0.037	0.079	0.031	0.053	0.032		
Obs	1296	1250	1296	1250	1329	1283		
Firms	646	635	646	635	657	646		
$fp_{iIrt-1} \times \exp_{it-1}$	0.121	-0.352	0.210	-0.252	0.089	-0.294	-0.139	-0.138
	(0.250)	(0.405)	(0.280)	(0.302)	(0.281)	(0.430)	(0.447)	(0.212)
$fp_{iIrt-1} \times$ n-$\exp_{it-1}$	0.195	0.308	0.245	0.375(*)	0.168	0.408(*)	-0.110	0.016
	(0.162)	(0.212)	(0.222)	(0.212)	(0.184)	(0.213)	(0.394)	(0.218)
$impcomp_{It-1}$	0.979**	0.520	1.550**	1.119(*)	0.861**	0.446	-1.074	0.581
	(0.325)	(0.548)	(0.523)	(0.672)	(0.317)	(0.539)	(0.758)	(0.630)
within-R^2	0.088	0.037	0.063	0.027	0.053	0.033	0.063	0.007
$fp_{iIrt-1} \times \text{imp}_{it-1}$	0.095	-0.228	0.030	-0.307	0.108	-0.129	0.184	-0.028
	(0.218)	(0.194)	(0.267)	(0.201)	(0.236)	(0.206)	(0.356)	(0.155)
$fp_{iIrt-1} \times$ n-imp_{it-1}	0.239	0.356(*)	0.428(*)	0.531**	0.170	0.437*	-0.414	-0.051
	(0.165)	(0.205)	(0.237)	(0.193)	(0.201)	(0.206)	(0.487)	(0.245)
$impcomp_{It-1}$	0.976**	0.507	1.544**	1.108(*)	0.859**	0.433	-1.067	0.578
	(0.324)	(0.548)	(0.519)	(0.668)	(0.318)	(0.540)	(0.753)	(0.630)
within-R^2	0.089	0.035	0.066	0.030	0.053	0.030	0.067	0.007
$fpUK_{iIrt-1}$	-0.068	0.015	-0.195	-0.070	-0.054	0.137	0.290	0.566
	(0.220)	(0.281)	(0.350)	(0.373)	(0.247)	(0.309)	(0.655)	(0.388)
$fpUS_{iIrt-1}$	0.260	0.006	0.869	0.593	0.125	0.190	-1.322	0.403
	(0.357)	(0.528)	(0.711)	(0.785)	(0.367)	(0.540)	(1.211)	(0.778)
$fpEU15_{iIrt-1}$	0.259	-0.253	0.656	0.342	0.131	-0.217	-0.769	0.379
	(0.451)	(0.499)	(0.468)	(0.603)	(0.519)	(0.530)	(0.824)	(0.685)
$fpROW_{iIrt-1}$	0.069	0.042	0.259	0.279	0.002	0.134	-0.395	-0.218
	(0.149)	(0.188)	(0.297)	(0.322)	(0.170)	(0.187)	(0.528)	(0.234)
$impcomp_{It-1}$	1.035**	0.501	1.649**	1.154(*)	0.910**	0.434	-1.165	0.652
	(0.320)	(0.560)	(0.532)	(0.688)	(0.313)	(0.551)	(0.785)	(0.639)
within-R^2	0.088	0.031	0.068	0.023	0.051	0.026	0.068	0.010

Note: Standard errors adjusted for clustering at the firm level in parenthesis; **, *, (*) indicate significance at 1, 5, 10 per cent respectively. All regressions include the same controls as specified in the base regression in the top panel as well as year dummies. If not specified, numbers of observations and firms are identical to those in top panel.

Table 7: Fixed effects panel regressions - business activities (K, excl. 70,71)

Dep. Var.	$eTFP_{it}$	$eTFPva_{it}$	$iTFP_{it}$	$iTFPva_{it}$	LP_{it}	$LPva_{it}$	K/L_{it}	pt/ft_{it}
fp_{iIrt-1}	-0.015	0.067	0.093	0.212	-0.089	0.007	-0.378$^{(*)}$	-0.152
	(0.106)	(0.173)	(0.143)	(0.204)	(0.098)	(0.168)	(0.209)	(0.649)
$impcomp_{It-1}$	0.573**	0.618*	0.546*	0.632	0.575**	0.608*	0.113	0.321
	(0.183)	(0.307)	(0.272)	(0.385)	(0.171)	(0.298)	(0.412)	(0.439)
age_{it-1}	0.115	-0.007	0.213*	0.119	0.074	-0.038	-0.094	-0.040
	(0.076)	(0.082)	(0.087)	(0.097)	(0.074)	(0.081)	(0.211)	(0.621)
HHI_{It-1}	0.205	0.138	0.189	0.115	0.187	0.135	0.278	0.351
	(0.169)	(0.274)	(0.227)	(0.330)	(0.153)	(0.263)	(0.352)	(0.532)
$\Delta indgr_{It-1}$	0.022	0.002	0.040	0.020	0.011	-0.005	0.033	-0.078
	(0.030)	(0.042)	(0.037)	(0.047)	(0.027)	(0.041)	(0.084)	(0.107)
within-R^2	0.035	0.017	0.016	0.007	0.045	0.020	0.012	0.005
Obs	3723	3704	3723	3704	3781	3762	3729	3730
Firms	1664	1653	1664	1653	1700	1689	1666	1677
fp_{iIrt-1}	0.311*	0.094	0.087	0.175	0.158	-0.017		
	(0.140)	(0.223)	(0.143)	(0.218)	(0.142)	(0.221)		
$fp_{iIrt-1} \times abs_{it-1}$	-1.731**	-0.266	0.008	-0.006	-1.304*	0.070		
	(0.468)	(0.941)	(0.009)	(0.019)	(0.515)	(1.003)		
$impcomp_{It-1}$	0.409*	0.570$^{(*)}$	0.499$^{(*)}$	0.610	0.449*	0.563$^{(*)}$		
	(0.206)	(0.320)	(0.288)	(0.400)	(0.186)	(0.312)		
within-R^2	0.048	0.018	0.017	0.007	0.050	0.021		
Obs	3671	3629	3671	3629	3738	3695		
Firms	1628	1608	1628	1608	1669	1648		
$fp_{iIrt-1} \times \exp_{it-1}$	0.032	-0.093	0.193	0.100	-0.027	-0.134	-0.513$^{(*)}$	-0.271
	(0.172)	(0.256)	(0.219)	(0.306)	(0.162)	(0.241)	(0.284)	(0.479)
$fp_{iIrt-1} \times$ n-$\exp_{it-1}$	-0.032	0.129	0.055	0.254	-0.113	0.062	-0.327	-0.106
	(0.108)	(0.181)	(0.144)	(0.215)	(0.101)	(0.177)	(0.221)	(0.727)
$impcomp_{It-1}$	0.569**	0.630*	0.537*	0.641$^{(*)}$	0.569**	0.620*	0.125	0.332
	(0.183)	(0.307)	(0.268)	(0.388)	(0.173)	(0.296)	(0.406)	(0.447)
within-R^2	0.035	0.017	0.016	0.007	0.046	0.021	0.012	0.005
$fp_{iIrt-1} \times \text{imp}_{it-1}$	0.124	0.262	0.227	0.388$^{(*)}$	0.045	0.203	-0.368	-0.183
	(0.139)	(0.198)	(0.182)	(0.235)	(0.123)	(0.192)	(0.246)	(0.423)
$fp_{iIrt-1} \times$ n-imp_{it-1}	-0.095	-0.047	0.016	0.108	-0.163	-0.105	-0.384	-0.135
	(0.124)	(0.212)	(0.163)	(0.243)	(0.121)	(0.208)	(0.240)	(0.809)
$impcomp_{It-1}$	0.554**	0.596$^{(*)}$	0.528*	0.613	0.559**	0.588$^{(*)}$	0.112	0.325
	(0.183)	(0.307)	(0.268)	(0.380)	(0.174)	(0.300)	(0.411)	(0.455)
within-R^2	0.038	0.019	0.017	0.008	0.048	0.022	0.012	0.005
$fpUK_{iIrt-1}$	0.372	0.003	0.742*	0.529	0.156	-0.177	-1.113$^{(*)}$	-4.297
	(0.280)	(0.430)	(0.368)	(0.513)	(0.277)	(0.423)	(0.610)	(3.235)
$fpUS_{iIrt-1}$	0.149	0.455	0.365$^{(*)}$	0.693$^{(*)}$	0.006	0.345	-0.696**	-0.274
	(0.160)	(0.333)	(0.209)	(0.366)	(0.137)	(0.324)	(0.266)	(0.475)
$fpEU15_{iIrt-1}$	-0.317	-0.282	-0.193	-0.127	-0.426	-0.342	-0.414	2.196
	(0.312)	(0.352)	(0.386)	(0.429)	(0.278)	(0.336)	(0.460)	(1.820)
$fpROW_{iIrt-1}$	-0.209	-0.064	-0.440*	-0.293	-0.070	0.001	0.623	-0.314
	(0.170)	(0.298)	(0.219)	(0.369)	(0.175)	(0.272)	(0.387)	(0.586)
$impcomp_{It-1}$	0.589**	0.631*	0.558*	0.629$^{(*)}$	0.596**	0.628*	0.135	0.366
	(0.175)	(0.309)	(0.258)	(0.375)	(0.162)	(0.301)	(0.381)	(0.348)
within-R^2	0.038	0.019	0.021	0.011	0.047	0.022	0.016	0.007

Note: Standard errors adjusted for clustering at the firm level in parenthesis; **, *, $^{(*)}$ indicate significance at 1, 5, 10 per cent respectively. All regressions include the same controls as specified in the base regression in the top panel as well as year dummies. If not specified, numbers of observations and firms are identical to those in top panel.

export and import status as alternative indicators of absorptive capacity yields no significant effects for either group in the case of the conventional productivity measures. With the exception of 3 out of 24 coefficients - which are significant at the 10 per cent level only - a similar observation is true when the potential of foreign subsidiaries to generate spillovers is taken into account by using foreign presence measures based on the country of origin as done in the bottom panel of Table 5.

Interestingly, for the input-based productivity measures there is a negative effect of foreign presence on domestic firms' capital-labour ratios and a positive effect on the share of part-time to full-time employees. The negative effect on K/L_{it} is slightly higher - but not significantly so - for domestic exporters and domestic importers compared to non-exporters and non-importers, respectively. The coefficients on pt/ft_{it} for traders and non-traders are also not significantly different from each other. Differentiating foreign presence by the home country of the foreign subsidiaries suggests that the negative effects on the capital-labour ratios is due to investment from the EU and the rest of the world, however these coefficients are only significant at the 10 per cent level. The effect on the ratio of part-time to full-time employees appears to be due to investment from the UK and the EU. Note also that this latter effect seems to be driven by the retail sector (NACE 52) only as it disappears when this sector is excluded from the estimations for sector G (estimation not reported).

For sector I (transport, storage and communication) there are no significant effects of foreign presence on domestic firms' productivity in the base model for any of the productivity measures (Table 6). However, for all three turnover-based productivity measures there is a positive effect from import competition. In terms of absorptive capacity, there is no effect from the distance-to-frontier measure. Yet non-importers appear to benefit from foreign presence as measured by four out of six conventional productivity measures. This effect is more marked for the value-added based measures. Two of the coefficients for non-exporters are also significant, but only at the 10 per cent level. The distinction by foreign subsidiaries' home country does not yield significant effects. Further investigation suggests that the effect on non-importers is driven by NACE 2-digit sector 63 "supporting and auxiliary transport activities, activities of travel agencies". In estimations where one of the five NACE 2-digit sectors in sector I is omitted at a time, the positive effect on non-importers turns insignificant when sector 63 is excluded (estimations not reported). It is also worth noting that the effect of foreign presence on domestic non-importers is only significant for those productivity measures where the Kolmogorov-Smirnov tests described in Section 4.1 do not reject

the hypothesis that the productivity distributions of importers and non-importers in sector I are equal in some or all of the years. Thus, this effect may not be productivity related.

As Table 7 shows, also in the business activities sector (K, excl. 70, 71) there is no significant effect from foreign presence on domestic firm's productivity. However, here there is a significant positive effect from import competition for nearly all conventional productivity measures. For two of the turnover-based productivity measures we obtain patterns and endogeneity issues similar to those described for Table 4 when absorptive capacity is measured by distance to the frontier. Splitting foreign presence by trading status does not yield any evidence of differential effects from foreign presence. For the $iTFP$ measure the effect from UK investors is positive whereas that from ROW investors is negative. There is a negative effect on the capital-labour ratio of domestic firms which is significant only at the 10 per cent level. It affects domestic exporters only and is driven by investment from the US and the UK.

Thus, overall the effects of foreign presence on the domestic firms in the same sector in Irish services are at best slim. The absence of results when the three sectors are combined suggests that service sectors are best looked at individually and it may even be questionable whether the aggregation to NACE letter level used here is appropriate.[9] For the domestic firms in the wholesale and retail sector the presence of foreign subsidiaries is associated with lower capital-labour ratios and higher shares of part-time-to-full-time employees. This suggests that foreign presence in this sector creates a more uncertain business environment for the domestic firms. There is suggestive evidence that capital-labour ratios are also adversely affected by foreign presence in the business activities sectors. In transport, storage and communication domestic there is weak evidence that non-importers benefit from foreign presence. Indirect competition from foreign firms via imports is associated with higher productivity of the domestic firms in the transport, storage and communications and the business activities sectors.

From a methodological point of view, the results presented here suggest that defining absorptive capacity as distance to the technological frontier based on the productivity measure that is also used as dependent variable does not produce reliable results. This is because it introduces too much endogeneity into the regressions at short lag lengths. Using the distinction by domestic firms' trading status as an indicator of absorptive capacity permits a refinement of results in one out of three sectors. Finally, there is some indication that turnover-based measures of productivity may lead to different conclusions compared

[9]Sample size in some of the sectors examined is already small, therefore I do not investigate this further.

to value-added based measures of productivity. Input-based measures of productivity are informative in three out of six regressions.

4.3 Robustness

In the present context two issues appear especially important in terms of robustness checks.[10] One is the measurement of foreign presence and the other is the sampling frame underlying the dataset. In terms of measurement, defining foreign presence based on turnover instead of employment yields qualitatively and quantitatively very similar results. The same is true if foreign presence is measured using full-time equivalents (i.e. full-time employees plus one-half the number of part-time employees). For the analysis I prefer to use employment, because the activity shares in the data set in equation (2) are based on employment.

To check whether the different sampling probabilities for firms of different size matter, I split the sample into firms with a median number of persons engaged of 20 or more and those below. For firms with 20 or more persons engaged the sample is a census (bar non-response) of all firms. At this split these larger firms account for 42-47 per cent of the underlying regression sample depending on the sector, however, due to the sampling procedure, the regressions for the large firms are based on 53-57 per cent of the observations in the full sample. This split reveals some differences between the two groups of firms, although in many cases it is variables that were significant at the 10 per cent level that turn insignificant and vice versa.

The results for all sectors grouped together appear to be mainly driven by the large firms. For the large firm sample, the negative effect on LP_{it} remains, the negative effect on $eTFP_{it}$ is insignificant. In the sample of smaller firms there is a negative and significant effect on domestic exporters $eTFPva_{it}$; all other coefficients that are significant in the full sample turn insignificant except for some instances where foreign presence is split by the investor's country/region of origin.

Splitting the sample for each sector individually shows that in the wholesale and retail sector (G) the effect of foreign presence is more likely to be positive for the large firms and more likely to be negative for the small firms (though not significantly so). The negative effect on capital-labour ratios only affects the large firms. The increase in part-time-to-full-time employees only affects the small firms, it is significant

[10] Results described in this section are available from the author on request.

for exporters and importers only. For the transport, storage and communication sector (I) the effect of foreign presence is more likely to be negative for the large firms (not significant) and more likely to be positive for the small firms (significantly so). In contrast to the results in Table 6, when splitting the sample only the turnover-based productivity measures get significant coefficients. The negative effect among the larger firms applies to exporters and importers, whereas the positive effect for the small firms applies to both traders and non-traders alike. The positive effect from import competition is much stronger and significant in more cases in the small firm sample. In the business activities sector (K, excl. 70,71) the negative effect on capital-labour ratios applies to the large firms only where it does not distinguish between exporters and non-exporters or importers and non-importers. The positive effect from import competition in this sector is significant only in the large firm sample.

5 Concluding remarks

In this paper I examine the effects of foreign presence on domestic firms taking into account their absorptive capacity as well as taking into account differences in foreign firms' ability to generate spillovers in three Irish market-services sectors. The effects differ across sectors: In the wholesale and retail sector the presence of foreign subsidiaries seems to create a more uncertain business environment for the domestic firms as it is associated with lower capital-to-labour ratios and higher shares of part-time-to-full-time employees. Capital-labour ratios are also adversely affected by foreign presence in the business activities sectors. For the transport, storage and communication sector there is weak evidence that domestic non-importers benefit from foreign presence. While foreign presence does not exert much of an effect, indirect competition from foreign firms via imports is associated with higher productivity of the domestic firms in the transport, storage and communications and the business activities sector. There is no coherent evidence that the subsidiaries of a certain host country/region differ in their ability to generate spillovers.

From a methodological point of view the paper raises two issues. First, defining absorptive capacity as distance to the technological frontier based on the productivity measure that is also used as the dependent variable introduces a degree of endogeneity to the regressions which makes the results unreliable. Second, productivity measures based on value added may lead to different conclusions than productivity measures based on output (sales). In the services sectors, input-based measures of productivity prove informative.

In terms of policy implications, the results at the very least raise a question mark over the policies pursued and money spent to attract and keep the subsidiaries of foreign multinationals in Ireland. While domestic firms benefit from import competition in two out of three market-services sectors, there is only weak evidence that they benefit from the presence of foreign-owned firms in only one of these sectors. Thus, production-related or other subsidies paid to the subsidiaries of foreign multinationals are not associated with significant returns to the domestic firm population.

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A Appendix

Table 8: Means and standard deviations of the main variables across different samples

	Domestic firms in sectors G, I, K (excl.70/71)		Domestic firms in regression sample	
	weighted	unw	weighted	unw
turnover	2.443(28.59)	8.906(67.07)	4.352(40.94)	11.88(78.88)
capital stock	0.197(7.936)	0.794(18.58)	0.337(10.35)	0.950(19.72)
employment	10.29(120.0)	35.80(284.9)	17.45(167.1)	46.19(325.3)
empl. in full-time equiv.	9.013(95.82)	31.03(226.7)	15.19(129.8)	39.75(251.3)
exporters	0.092(0.289)	0.136(0.343)	0.103(0.304)	0.155(0.362)
importers	0.209(0.407)	0.274(0.446)	0.236(0.424)	0.301(0.458)
avg. no. of obs. per year	34254	6109	16045	4237

Note: Note: Turnover and capital stock in millions of constant 2007 Euros. Domestic firms are all firms that are never foreign-owned in any of the years observed. Regression sample as described in Section 3.1.

Data description

age_{it} One plus the difference between the current year and the year the firm was first recorded on the CSO's business register or the year of the first observation - whichever is smaller.

$impcomp_{It}$ Share of imports (c.i.f.) in total domestic supply at basic prices plus imports by 2-digit NACE industry. Obtained from the tables entitled "Supply at basic prices by year, products and industries" published for 2001-2007 as part of the National Accounts by the CSO.

$\Delta indto_{It}$ Growth rate of turnover by industry as published by CSO from the ASI deflated using 2-digit level output deflators from EUKLEMS (2009). Figures are mainly at the 3- and 4-digit level, in some instances at the 2-digit level. Where aggregates are not published at the same level of disaggregation in all years, they are obtained from the dataset directly (using the grossing factors provided by CSO with the dataset). Growth rates from figures obtained in this way are only used if they are larger than -.5 and smaller than 1, otherwise the rate for the next level of aggregation is used.

HHI_{it} Herfindahl-Hirschman index calculated as the sum of squared market shares $[\sum_{i \in I}(Y_{it}/Y_{It})^2]$ in each 3-digit industry using the grossing factors provided by CSO with the dataset.

K_{it} Capital stock calculated based on capital investments and disposals using the perpetual inventory method. Starting stocks are obtained by breaking down previous year's end of year industry-level capital stocks obtained from CSO to the firm level using the firm's share in industry-level fuel use. Capital acquisitions and

capital disposals are deflated using the implicit industry-level deflators from the industry-level capital stocks. Depreciation rates are those underlying CSO's calculations of industry level capital stocks (Central Statistics Office, 2009). Assumed asset lives are as follows: 15 years service lives for machinery and equipment; 10 years for road freight vehicles and cars; 8 years for computers and office machinery; 55 years for buildings in wholesale and retail trade and hotels and restaurants (G, H), 50 years for buildings in transport and business activities (I, K), 30 years for buildings in personal services (O); and 5 years for software. Industry-level depreciation rates are obtained by weighting the CSO's depreciation rates for each asset by industry-mean asset shares in total capital acquisitions that are reweighted to add up to 1 (available from 2003 only). This amounts to depreciation rates of 0.1790 for sector G, 0.1348 for sector H, .2197 for sector I, .2451 for sector K and .1668 for sector O. Capital disposals are not deducted in the first year the firm is observed. No depreciation is applied in years when the firm is not observed.

L_{it} Number of employees in full-time equivalents calculated as the number of full-time employees plus 1/2 times the number of part-time employees.

VA_{it} Value added deflated to constant 2007 values using value-added deflators at the 2-digit level obtained from EUKLEMS (2009). Value added is defined by CSO as turnover - purchases for direct resale + opening stock - closing stock - purchases of other goods (which include postage, utilities bills, stationary, insurance, rent, royalties, catering services, travel expenses, depreciation and other business activities).

Y_{it} Turnover deflated to constant 2007 values using output deflators at the 2-digit level obtained from EUKLEMS (2009).

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